

**Eufaula Lake Shoreline Management Plan
Revision and Master Plan Supplement
Environmental Impact Statement**

Recreation Study Report
Eufaula Lake, Oklahoma

United States Army
Corps of Engineers
Tulsa District

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Acronyms

ARC	American Recreation Coalition
ATV	All Terrain Vehicle
BAOT	Boats At One Time
BD	Boating Density
BOR	Bureau of Reclamation
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
EM	Engineer Manual
EP	Engineer Pamphlet
ER	Engineer Regulation
ERDC	Engineering Research and Design Center
IWR	Institute for Water Resources
MP	Master Plan
MSL	Mean Sea Level
NPS	National Park Service
NRMS	Natural Resources Management System
NRRS	National Recreation Reservation Service
O&M	Operations and Maintenance
ODWC	Oklahoma Department of Wildlife Conservation
OF	Outdoor Foundation
OIF	Outdoor Industry Foundation
OMB	Office of Management and Budget
OMBIL	Operations and Maintenance Business Information Link
OMP	Operations Management Plan

OTRD	Oklahoma Tourism and Recreation Department
PWC	Personal Water Craft
REAS	Recreation Economic Assessment System
RV	Recreational Vehicle
SMP	Shoreline Management Plan
TBC	Total Boat Capacity
TVA	Tennessee Valley Authority
USACE	US Army Corps of Engineers
USFS	United States Forest Service
WALROS	Water and Land Recreation Opportunity Spectrum
WMA	Wildlife Management Area

Executive Summary

During the spring and summer of 2012, a recreation study was conducted as part of the Environmental Impact Statement (EIS) for the Shoreline Management Plan (SMP) revision and Master Plan (MP) supplement for Eufaula Lake. The primary objectives of the Recreation Study were to:

- Collect and compile existing data on land-based recreation, relevant to Eufaula Lake;
- Quantify, characterize, and map existing recreation facilities and uses in and around Eufaula Lake;
- Conduct water-based recreation surveys to establish current use and user density for water-based recreation and recommend appropriate carrying capacity and density limits for water-based recreation;
- Conduct a dispersed use recreation survey to determine the amount, type, and location of existing dispersed use at Eufaula Lake; and
- Analyze data and assess potential impacts to recreation potentially resulting from the alternatives under consideration in the EIS.

During the data collection phase of the study, a nationwide literature review was also conducted to identify studies of similar nature. Data collected for the study included recreation related visitation statistics, occupancy rates, boating accident, and public fatality information. Recreation-related economic impact data for Eufaula Lake was also updated and revealed an estimated \$56,496,000 annual benefit to the thirty-mile region around the lake.

The lake was sub-divided into six areas and all data and survey collection activities were correlated to those areas. Each lake area was again divided into one of two categories; 1) “restricted water,” which is water that is less than three feet deep and/or encumbered by standing timber and is only considered safe for operating non-motorized watercraft or motorized watercraft engaged in fishing, or 2) “un-restricted water,” which is water that is considered safe for all types of boating activities. Using GIS mapping and aerial photographs, it was determined there were 44,790 surface acres of restricted water and 52,218 surface acres of un-restricted water at normal pool elevation 585.0 above mean sea level (MSL).

A major component of the Recreation Study was to conduct a water-based recreation survey that identified, quantified, and characterized water-based recreation activities on Eufaula Lake. The water-based recreation survey included four sub-component surveys, three of which focused on boat density and one that focused on swimming beach use.

The boating density surveys included; 1) Boat ramp – empty boat trailer counts, 2) Marina – rented, but empty wet slip counts, and 3) Aerial boat counts. During the 2012 recreation season, four high-use weekends were selected at which time two flyover boat count surveys were conducted each day, one in the morning and one in the afternoon. There were a total of four flyovers each survey weekend and a total of sixteen flyovers in all. The largest boat count for any survey period was 2,174, which indicates that the current boat density is approximately 24 acres per boat, based on the unrestricted water surface acres.

Additional data obtained from the surveys revealed the following statistics on water-based recreational use:

- Forty two percent of the boats on the water came from boat ramps in public recreation areas.
- Forty three percent of the boats on the water came from marinas, which are privately operated.
- Fifteen percent of the boats on the water came from private/community docks and boat ramps located in private subdivisions.
- The overall occupancy rate for marinas on Eufaula Lake is 85 percent.
- The overall Lake Use Rate is 24 percent, which means that during peak use periods 24 percent of the boats at the lake will actually be on the lake at one time.
- The use of designated swim beaches is at approximately 10 percent of total capacity, although low usage during the 2012 survey season was most likely the result of a blue green algae advisory that was in effect during the survey periods.

Another major component of the Recreation Study was to develop and conduct a dispersed use recreation survey in order to characterize and quantify dispersed use at Eufaula Lake. Dispersed use recreation is visitation that occurs on U.S. Army Corps of Engineers (USACE) owned land and water that is located outside of designated recreation areas and that is not captured via any type of traffic counting device. To accomplish this, a mail-back survey was developed and mailed to 4,000 randomly selected area property owners within 0.25 mile of the lakeshore. The response rate to the survey was 25 percent and the analysis revealed the following information:

- Eighty seven percent of households within one-quarter mile from the lake own and operate a boat on Eufaula Lake.
- Ninety seven percent of the vegetation modification permits issued to survey respondents under the Shoreline Management Plan allow mowing to occur on government property.
- In 2011, survey respondents spent a total of 1,539,852 visitor hours recreating on USACE land and water outside of a designated recreation area.
- When the survey data was extrapolated and applied to the total population within one-quarter mile of the lake, there were approximately 2,971,207 visitor days in 2011 attributable to dispersed use recreation.

Additional results of the Recreation Study included the following:

- The regional average annual visits per acre of land are 90, while the average for Eufaula Lake is 40.
- There appears to be a shortage of designated picnic sites within the region. Data indicates there are approximately 4,068 picnickers annually per picnic site.
- Annual visits to Eufaula Lake have been increasing an average of two to three percent each year.
- Ninety-four percent of the visitor hours at Eufaula Lake occur from 1 April through 30 September.

- Seventy percent of the annual visits at Eufaula Lake occur in recreation areas located in Lake Areas 3 and 4, which are located east of US 69 and north of Highway 9A.
- Eufaula City Park and Highway 9 Landing have the largest number of average annual visits per acre at 2,090 and 1,383, respectively.
- The overall occupancy rate at USACE campgrounds is 22 percent and the weekend occupancy rate averages 37 percent. During July, which is the peak use month, the average campground occupancy rate is 46 percent overall and 66 percent on weekends.
- While visitation continues to increase at USACE-managed recreation areas, visitation to State Parks on Eufaula Lake has remained level or decreased over the past five years.

After analyzing the existing data and the results from the survey data, it was determined the boating carrying capacity for Eufaula Lake should be approximately 3,500 boats on the water at one time and the total boat capacity for the lake should be approximately 14,200 vessels. Using the current lake use rate of 24 percent, it appears that Eufaula Lake has reached approximately 54 percent of its total boat capacity and 62 percent of its capacity for the number of boats on the water at one time. Adhering to these capacity limits would ensure that boating density does not exceed the 15 acres of water surface per boat that is recommended in this analysis.

It is recommended that revisions to the SMP and MP or approvals of future development proposals be limited to ensure the recommended capacity levels established in this Recreation Study Report are not exceeded. This would help ensure that the recreation opportunities and experiences afforded by Eufaula Lake are protected for current and future generations.

Section 1

Introduction

Located on the Canadian River, Eufaula Lake was authorized by Congress through the 1946 Rivers and Harbors Act for the purposes of flood control, water supply, hydroelectric power, and navigation. Subsequent legislation added fish and wildlife management and recreation as authorized project purposes. Construction of the dam and lake began in December 1956 and was completed in February 1964. Located mainly in McIntosh and Pittsburg counties, with small portions in Haskell, Muskogee, and Okmulgee counties, the lake, nicknamed the "gentle giant," has over 800 miles of shoreline and approximately 105,500 surface acres, which makes it the largest lake entirely within the state borders of Oklahoma and the ninth largest U.S. Army Corps of Engineers (USACE) lake in the country (USACE 2011b). Eufaula Lake was dedicated on September 25, 1964 by President Lyndon B. Johnson. The lake's maximum depth is eighty-seven feet, and the mean depth is about twenty-three feet. With a drainage area of 47,522 square miles, the lake's major water sources are the Canadian, North Canadian, and Deep Fork Rivers (Oklahoma Historical Society 1964).

The Flood Control Act of 1944 gave USACE specific authority to provide public outdoor recreation facilities. Section Four of the Act states in part: "The Chief of Engineers...is authorized to construct, maintain and operate public park and recreational facilities in reservoir areas under control of (the Department of the Army), and to permit the construction, maintenance and operation of such facilities."

The recreation mission of USACE is to manage and conserve natural resources, while providing quality public outdoor recreation opportunities to serve the needs of present and future generations. A wide variety of outdoor recreation opportunities exist on lands and waters managed by USACE. In fact, USACE is the largest federal provider of outdoor recreation in the United States (USACE 2011a).

Currently, USACE is in the process of revising the Shoreline Management Plan (SMP) and supplementing the Master Plan (MP) for Eufaula Lake. Due to potential impacts associated with the activities that may be allowed under the various shoreline designations and land use allocations of these plans, USACE determined that an Environmental Impact Statement (EIS) was required to disclose those potential impacts. In support of the environmental analysis, a recreation study was conducted to assess the potential impacts to outdoor recreation for each of the proposed alternatives being considered under the EIS.

1.1 Recreation Study

This Recreation Study Report for Eufaula Lake covers four main topics, which focus on different types of outdoor recreation areas, facilities, opportunities, and activities found in and around Eufaula Lake. The Recreation Study Report includes:

- Land-Based Recreation
- Land/Water Interface Recreation
- Water-Based Recreation

- Dispersed Use Recreation

1.1.1 Land-based Recreation

Land-based, outdoor recreation includes opportunities, activities, areas, and facilities that typically occur on, or adjacent to, USACE-owned land and water, such as camping, hiking, hunting, picnicking, all-terrain vehicle (ATV) use, wildlife/bird viewing, or sightseeing. The purpose of the analysis of land-based recreation is to identify, quantify, characterize, and map land-based recreation areas and facilities around Eufaula Lake, which will provide a baseline from which to measure potential impacts to land-based recreation that would be associated with each of the alternatives under consideration in the EIS.

Land-based recreation areas include campgrounds, day-use areas, overlooks, ATV trails/areas, and wildlife management areas (WMA). Facility types typically found within these recreation areas include campsites, picnic sites, hunting areas, and trails. At Eufaula Lake, these recreation areas are managed by several entities, including USACE, the State of Oklahoma, county and city governments, and private/commercial concessionaires. This information is described in detail in Section 3.

1.1.2 Land/Water Interface Recreation

Land/Water Interface Recreation refers basically to the facilities that enable water-based recreation to occur. Land/water interface recreation facilities include boat ramps, marinas, boat docks, and swimming beaches. The purpose of the analysis of land/water interface recreation is to identify, quantify, characterize, and map land/water interface facilities around Eufaula Lake, which will provide a baseline from which to measure potential impacts to water-based recreation, associated with each of the alternatives under consideration in the EIS. This information is described in detail in Section 4.

1.1.3 Water-based Recreation

Water-based recreation refers to recreational activities that occur on the water. This includes boating, fishing, swimming, water skiing-tubing, cruising (pleasure boating), and all other recreational activities that occur on or in the water. The purpose of the analysis of water-based recreation is to identify, quantify, characterize, and map water-based opportunities and activities around Eufaula Lake, which will provide a baseline from which to measure potential impacts to water-based recreation associated with each of the alternatives under consideration in the EIS.

Four different recreation surveys were conducted at Eufaula Lake during the 2012 recreation season, which included boat density surveys, marina surveys, boat ramp and parking lot surveys, and swim beach surveys. Each of these is described in detail in Section 5.

1.1.4 Dispersed Use Recreation

Dispersed use recreation is visitation that occurs on USACE-owned land and water that occurs outside of designated recreation areas and is not captured via any type of traffic counting device. To obtain information about dispersed use recreation at Eufaula Lake, a mail-in survey was developed and mailed to 4,000 residents living within one quarter mile of the lakeshore around Eufaula Lake. This information is presented in detail in Section 6.

Section 2

Methodology

This section identifies relevant public laws, regulations, and policies, and the methodology used to conduct the recreation study for Eufaula Lake. This section includes a description of the methods used to collect data, to conduct surveys (including land and water-based recreation surveys and a dispersed use survey), and to analyze and document recreational activities on and around Eufaula Lake.

2.1 Laws, Regulations and Policies

The following laws, regulations and policies provide guidance to and serve as the regulatory framework for the recreation study. Proposed actions that would not be in compliance with adopted laws, regulations, or policies may be considered to have a significant impact.

2.1.1 Rivers and Harbors Act of 1894, as Amended, Title 33 of the United States Code (U.S.C.)

The Rivers and Harbors Act applies to activities within navigable waters of the U.S. Actions that may affect the navigability of waters of the U.S., such as bridge or causeway construction, aids to navigation, or dock construction, are regulated under this Act. This Act also regulates the management and modification of flood control structures.

2.1.2 Flood Control Act of 1944, as Amended (16 U.S.C. 460)

Section 4 of this Act authorizes USACE, under the supervision of the Secretary of the Army, to construct, maintain, and operate public park and recreational facilities at water resources development projects (16 U.S.C. 460(d)). Local interests are also permitted to construct, operate, and maintain such facilities with permission from the Secretary of the Army. Water areas of all such projects shall be open to public use generally, for boating, swimming, bathing, fishing, and other recreational purposes; and ready access to and exit from such water areas along the shores of such reservoirs shall be maintained for general public use, when such use is not found to be contrary to the public interest. The lease of public lands and structures at water projects is also authorized. Recreational uses must be consistent with state laws for the protection of fish and game.

2.1.3 Federal Water Project Recreation Act of 1965, as Amended; Public Law (PL) 89-72, 16 U.S.C. 4601-12 *et seq.*

This Act requires federal agencies to consider potential outdoor recreational opportunities and fish and wildlife enhancement when planning navigation, flood control, reclamation, hydroelectric, or multipurpose water resource projects.

2.1.4 Rules and Regulations Governing Public Use of Water Resources Development Projects Administered by the Chief of Engineers; 36 CFR 327

Title 36 CFR Part 327 regulates activities at Civil Works projects. Part 327.30 regulates shoreline management and specifically requires preparation of an SMP for each USACE project where private shoreline use is allowed. The purpose of the plan is to protect and manage shorelines of all Civil Works

water resources development projects under USACE jurisdiction in a manner that will promote the safe and healthful use of these shorelines by the public while maintaining environmental safeguards to ensure a quality resource for use by the public. The objectives of all management actions are to achieve a balance between permitted private uses and resource protection for general public use. The SMP must honor past written commitments. It must be reviewed at least once every five years and revised as necessary. Private shoreline uses may be allowed through a shoreline use permit review and approval process.

2.1.5 Engineer Manual 1110-1-400 - Recreation Facility and Customer Service Standards

This Engineer Manual (EM) provides general guidance for the rehabilitation of existing, and the design and construction of new, recreation areas and facilities, the provision of customer services, and recreation program evaluation activities at recreation areas managed by USACE. The overall purpose of this EM is to establish a uniform level of quality nationwide by which USACE-managed parks will meet the needs of current and future park customers. The criteria in the EM apply to both new recreation areas and the rehabilitation of existing areas, and it serves primarily as a conceptual design document for use by operations personnel when developing public facilities.

2.1.6 EM 1110-2-410 - Roads and Circulation Standards

This document provides guidance and standards for roads and circulation access for roadways within and leading to USACE recreation areas

2.1.7 Engineer Pamphlet 1130-2-550 – Recreation Operations and Maintenance Guidance and Procedures

This Engineer Pamphlet (EP) establishes guidance for the management of recreation programs and activities and for the operation and maintenance of USACE recreation facilities and related structures at civil works water resources projects. The EP supplements Engineer Regulation (ER) 1130-2-550, Recreation Operations and Maintenance Guidance and Procedures.

2.1.8 ER 1110-2-400 - Design of Recreation Sites, Areas, and Facilities

This ER establishes policy and guidance for the design of recreation sites, areas, and facilities.

2.1.9 ER 1130-2-406 - Shoreline Management Regulation

This regulation provides guidance on the management of shorelines at Civil Works projects consistent with 36 CFR 327.30 and other applicable laws and regulations.

2.1.10 ER 1130-2-550 - Recreation Operations and Maintenance Guidance and Procedures

This regulation establishes the policy for the management of recreation programs and activities and for the operation and maintenance of USACE recreation facilities and related structures at civil works water resources projects.

2.1.11 ER 1165-2-400 - Recreation Planning, Development and Management Policies

This regulation defines the objectives, philosophies, and basic policies for the planning, development, and management of outdoor recreation and for the enhancement of fish and wildlife resources at USACE water resources development projects.

2.1.12 ER 1165-2-503 Office of Management and Budget Clearance for the Questionnaires for U.S. Army Engineer Civil Works Studies and Projects

This regulation provides instructions on clearance for the *Questionnaires for U.S. Army Engineer Civil Works Studies and Projects* (OMB Control Number 0710-0001) and provides guidance on the development and use of the questionnaires under this approval.

2.1.13 USACE Policy for Non-Recreational Outgrants – 2009

The purpose of this guidance is to establish a consistent nationwide policy that will be applied to evaluate non-recreational real estate outgrant requests for use of Civil Works lands and waters.

2.1.14 USACE Policy for Recreational Outgrants – 2005

The purpose of this guidance is to establish a consistent nationwide policy that will be applied to evaluate requests for recreation development at USACE water resources development projects.

2.1.15 USACE Recreation Strategic Plan – March 31, 2011

The Recreation Strategic Plan provides long-term guidance for the USACE recreation program to ensure that the program continues to provide safe, quality outdoor recreation opportunities for the public. The plan recognizes that water-based recreation is the major attraction of USACE recreation areas. The plan represents a framework that can guide field manager decisions to achieve recreation program strategic goals and objectives.

2.1.16 Water and Land Recreation Opportunity Spectrum Handbook - 2011, U.S. Department of the Interior, Bureau of Reclamation

The Water and Land Recreation Opportunity Spectrum (WALROS) is a tool to understand the type and location of six types of water-related recreation opportunities, otherwise known as WALROS classes. The six WALROS classes range across a spectrum of urban, suburban, rural developed, rural natural, semi-primitive, and primitive recreation opportunities. A particular “package” of activities, setting attributes, experiences, and benefits defines each WALROS class.

2.1.17 Water-Related Development Policy for Fort Worth District Lakes, April 2002

This policy was developed by the USACE Fort Worth District to evaluate proposals for water-related development and is used by districts in the Southwestern Division including the Tulsa District.

2.2 Data Collection

Data was collected from existing data sources and from field studies conducted specifically for this analysis. Existing data sources used in the analysis are described in Section 2.2.1. Field studies were conducted during four weekends during the 2012 recreation season. The field study methods are described in

Sections 2.2.2 and 2.2.3 and were based on the results of a literature search on recreational use survey methods. A mail-in survey to lakeshore residents was also used to collect data about dispersed recreation and is described in Section 2.2.4.

Because of the size of the study area, Eufaula Lake and adjoining lands were divided into six lake areas in order to facilitate the analysis and impact assessment. Lake areas are generally described in **Table 2-1** and shown on **Figure 2-1**. All recreation data collection activities and surveys correlate to these six areas.

Table 2-1. Lake Area Number and Description

Lake Area #	Area Description	Lake Area Acreage at 585.0 MSL
1	Portion of the lake lying north of I-40	12,385
2	Portion of the lake lying south of I-40 and west of US 69	16,173
3	Portion of the lake lying east of US 69, north of Highway 9A, and west of Standing Rock Cut	18,128
4	Portion of the lake lying east of Standing Rock Cut	15,115
5	Portion of the South Canadian River Arm lying west of US 69	9,963
6	Portion of the lake lying south of Highway 9A	25,244
Total		97,008

2.2.1 Land-based Recreation Data

Existing data sources that provided land-based recreation data included, but were not limited to:

- OMBIL (Operations and Maintenance Business Information Link) USACE – OMBIL is an executive information system and contains data regarding USACE Operations and Maintenance (O&M) programs, including recreation. The recreation component of OMBIL is typically used for conducting data analysis, reporting performance measures, updating information on websites such as recreation.gov, and providing recreation information for travel publications and campground guides.
- NRMS (Natural Resources Management System) – The NRMS is the database that was used by USACE prior to OMBIL. Some of the static data and information contained in the NRMS, such as land and water acres, was used to validate any questionable data found within OMBIL.
- NRRS (National Recreation Reservation Service) – The NRRS provides “one-stop” reservation shopping to the public for a wide range of Federal recreation areas, facilities, and activities that are managed by USACE, U.S. Forest Service, National Park Service, Bureau of Land Management, and Bureau of Reclamation. Facilities and activities that can be reserved include campsites, group picnic shelters, and tours.
- Real Estate Management Information System (REMIS) – REMIS is a real estate database managed by USACE.
- Oklahoma Department of Wildlife Conservation – The Department provided information about hunting and fishing opportunities and wildlife lands licensed from USACE.

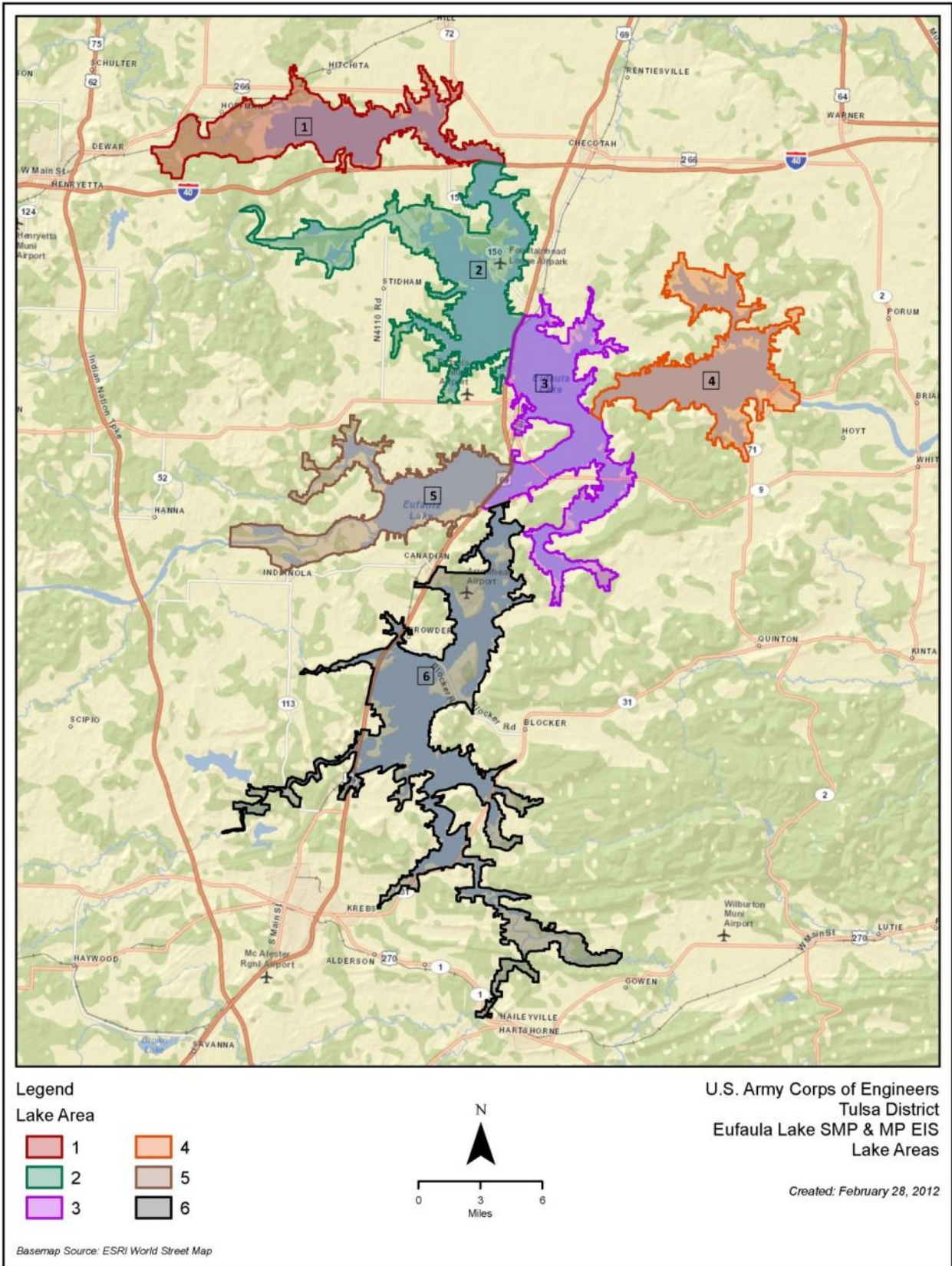


Figure 2-1. Lake Areas

- Oklahoma Highway Patrol, Marine Division – The Division provided statistics on boating accidents on Eufaula Lake.
- Institute for Water Resources (IWR)
- Oklahoma State University
- U.S. Department of the Interior – Bureau of Reclamation
- Oklahoma Tourism and Recreation Department
- Outdoor Industry Association – Outdoor Foundation
- American Recreation Coalition
- Published studies and surveys conducted by other entities

The data was collected, reviewed for accuracy, analyzed, and compiled into an easy to understand format to describe the existing conditions. The study team also quantified and characterized existing land-based recreation opportunities and uses and identified trends that may influence future decisions regarding land-based recreation at Eufaula Lake. Data on car parking spaces and car/boat trailer parking spaces could not be validated in the field, since many of the parking spaces are not delineated with pavement markings.

The land-based recreation data collection and analysis focused primarily on opportunities and activities that typically occur on or adjacent to USACE land, such as camping, hiking, hunting, and picnicking. Visitation statistics, occupancy rates, and user density were included in the analysis. This data provided a “snapshot” of existing land-based recreation facilities and conditions. The existing condition provides a baseline from which to compare the potential impacts of various alternatives.

Data from federal, state, county, and city governments, as well as private entities that provide public recreation facilities and activities were also incorporated into the analysis. Field verification visits were conducted for representative sites and/or areas of concern to ensure the accuracy of data collected from other sources.

2.2.2 Land/Water-Interface Recreation Data and Surveys

In addition to the land-based recreation data, the sources identified in Section 2.2.1 also provided information on land/water-interface recreational activities and facilities. Land/water-interface recreational opportunities include facilities and activities that occur at swimming beaches, marinas, fishing piers, private/community docks, and boat ramps. Visitation statistics and user density were included in the analysis. Existing facilities and conditions related to land/water-interface recreation were identified and documented.

Field observations were conducted at major land/water-interface recreation areas to document and quantify land/water-interface recreational activities and uses, including swimming beaches, fishing/hunting from the shoreline, and wildlife/nature viewing/photography from the shoreline. General field observations were conducted during site visits and recreation survey periods in the 2012 recreation season. This data provided a general understanding of the type of activities and locations at Eufaula Lake

where land/water-interface recreation occurs. Detailed information and survey results are described in Section 4 of this study.

2.2.3 Water-based Recreation Data and Surveys

The data collected through the water-based recreation survey was used to identify, quantify, and characterize water-based recreation activities occurring on Eufaula Lake. These surveys included boat density counts, boat trailer counts at boat ramp parking lots, marina slip counts, and a mail-in survey sent to lake area residents (the mail-in survey is described in Section 2.2.4). For the purpose of the water-based recreation surveys, all water areas of the lake were categorized as “restricted” or “unrestricted” water. Restricted water is defined as: water that is less than three feet deep at the normal pool elevation of 585.0 above mean sea level (MSL) and/or water where there is standing timber. Restricted water is only considered safe for operating non-motorized watercraft or motorized watercraft engaged in fishing activities. Unrestricted water is defined as: open water that is considered safe for all types of boating activities. Unrestricted water is greater than three feet deep at the normal pool elevation of 585.0 MSL and contains no standing timber. The amount of “restricted” and “unrestricted” water within each of the six lake areas was quantified.

GIS mapping was used to produce a visual depiction of restricted and unrestricted waters on the lake. These definitions are also used in formulating recommendations concerning the boating carrying capacity for the lake.

2.2.3.1 Boat Density Survey

Boat density and lake capacity were evaluated using the concepts and methodologies outlined in the Water and Land Recreation Opportunity Spectrum (WALROS), published by the Department of the Interior and used extensively by federal, state, and local land and water management agencies that provide outdoor recreation opportunities. Using these standards, a preliminary estimate of the acceptable density range for Eufaula Lake was determined to be 20 to 50 acres of unrestricted water surface acres per boat. This standard was used to evaluate data obtained during surveys and applied to each of the six lake areas, as well as the entire lake. Once the survey data was collected and analyzed, a more refined estimate was calculated and established.

Various methods were used to collect data on boating opportunities, including inventories of car/trailer spaces at public boat ramps, marina (wet and dry) storage slip occupancy, private docks and community dock slips on four heavy use weekends during the 2012 recreation season. Aerial surveys (flyovers) by helicopter were also conducted the same weekends. These surveys quantified the number and types of vessels using Eufaula Lake during peak use periods. The dates of the boat counts are shown in **Table 2-2**.

Table 2-2. Survey Weekend Dates in 2012

Survey Weekend	Actual Dates
#1	April 7 and 8
#2	May 26 and 27
#3	June 16 and 17
#4	June 30 and July 1

Two aerial surveys were scheduled for each survey date; once in the morning and once in the afternoon. The helicopter flyovers were scheduled to coincide with heavy use periods, 10AM to 1 PM and 3PM to 6PM. Two flyovers occurred in all six lake areas on each date.

During all of the flyovers, two observers were in the helicopter; one to record the type of vessel and recreational activity and the other to take photographs of areas and activities where high densities occurred to identify those locations on a map and to document uses. The following six categories were identified, tallied, and recorded:

Power Boats and Activities:

- Pleasure Boating
- Fishing
- Water Skiing/Tubing
- Personal Water Craft (PWCs and Jet Skis)

Non-Powered Boats and Activities:

- Kayak/Canoe/Row Boat
- Sail Boat

Data collected during these surveys was used to establish current boating density, to quantify the type of recreational uses existing on the lake, and to guide the development of procedures to establish a water-based recreational carrying capacity for Eufaula Lake.

Detailed information and survey results are described in Section 5 of this report.

2.2.3.2 Marina and Boat Ramp Surveys

At the same time as each of the aerial surveys, ground observation teams were dispatched to all major recreation areas, swimming beaches, fishing piers, boat ramps, and marinas to document usage from the ground. During these “on-the-ground” surveys, the number of empty boat trailers at boat ramps and in designated campgrounds were tallied to help determine the number of boats on the water and their respective area of origination. Areas to be surveyed from the ground were identified in collaboration with USACE Project staff. It should be noted that not every boat ramp and public recreation area was surveyed. For example, many boat ramps are located in private subdivisions and do not include the types of recreational facilities normally associated with public recreation areas such as restrooms or parking lots.

The number of rented but empty boat slips and rented but empty dry storage slips at each marina were tallied to determine the number of boats on the water from each marina location. At marinas with a public boat ramp, empty boat trailers at each boat ramp parking lot were also counted.

2.2.3.3 Swim Beach Surveys

Ground observation surveys were conducted in areas with designated swimming beaches. The focus of these surveys was to count the number of beach users during heavy use periods. In designated swimming beach areas, the USACE Engineering and Design Recreation and Customer Service Standards (EM 1110-1-

400) were used to establish beach carrying capacity. Existing beach use was calculated and compared to the beach carrying capacity standards.

2.2.4 Dispersed Use Recreation Survey

Dispersed use recreation is visitation to USACE-owned land and water that is located outside of designated recreation areas and which is not captured via any type of traffic counting device. The majority of dispersed use recreation at the lake occurs from the following user groups:

- Shoreline Use Permit Holders
- Minor Real Estate License Holders
- Households in subdivisions adjacent to USACE property that are not permit or license holders
- Marina wet slip and dry storage renters
- Hunters/fishermen using areas located on and/or adjacent to USACE property
- Visitors to private campgrounds located in outgranted areas or areas immediately adjacent to USACE property

In order to obtain a comprehensive understanding of recreational use in and around Eufaula Lake, a survey was developed and mailed to lake area residents. The focus of the dispersed use recreation survey was to estimate the amount, type, and location of dispersed use recreational activities at Eufaula Lake. The survey instrument was developed using questions from similar, pre-approved Office of Management and Budget (OMB) public surveys. USACE policy guidance contained in ER 1165-2-503 was used to obtain the required approval from OMB for conducting the surveys.

The focus of the survey was to obtain information related to frequency, duration, character, and location of recreational uses and information on perceptions of lake and shoreline management, specific management issues, and policies related to shoreline and lake management. The design and layout of the survey instrument was kept simple and as easy to understand as possible.

The six lake areas identified and established in the water-based recreation survey were used in this survey in order to obtain area-specific information from survey respondents. An easy-to-read map with the six lake areas was included with each survey. The survey instrument is included in **Appendix A**.

A list of potential dispersed recreation users was compiled that included all Shoreline Use Permit holders and households within areas adjacent to Eufaula Lake. Addresses were obtained from USACE files and from parcel data from county assessors' offices. Potential survey respondents were selected to ensure that a geographically dispersed and representative sample size was obtained.

Information related to economic impacts and expenditure patterns by private and community dock owners was obtained from surveys conducted at similar USACE lakes (USACE 2001, 2002, 2008a, b, c, d, and 2011b). Information related to economic expenditures by marina slip renters, hunters, and fishermen was also obtained from surveys conducted at lakes similar to Eufaula Lake (Brazos River Authority 2006a, b, Bureau of Reclamation 1998, 2004, Canandaigua Lake Watershed Council 2010, Friends of Clam Lake 2009, La Grange County Lakes Council 2006, Lake Ripley Management District 2003, Outdoor Foundation 2010a and b, 2011, and US Coast Guard 2002, 2011).

The survey data obtained from the mail-in survey, along with data obtained from surveys conducted at other lakes regarding marina slip renters, hunters, and fishermen, was analyzed, extrapolated, and applied to the dispersed use recreation groups at Eufaula Lake in order to estimate the total dispersed use recreation at the lake.

The data related to recreational use by marina slip renters that was obtained during the water-based recreation survey was incorporated into the dispersed use recreation survey analysis.

All data collected from the mail-in survey was placed into a database for analysis and evaluation. Information obtained from the survey included:

- Survey respondent demographics
- Boat ownership and use
- Vessel types and use
- Frequency and amount of use
- Lake area recreational preferences
- Recreational activities
- Perceptions on density and overuse
- Perceptions about lake and shoreline management issues and policies at Eufaula Lake

Detailed information and survey results are included in Section 6 of this report.

2.3 Tools Used for Analysis

The WALROS is a tool used to understand the type and location of six types of water and land recreation opportunities, known as WALROS classes. The six WALROS classes include a spectrum of urban, suburban, rural developed, rural natural, semi-primitive, and primitive recreation opportunities, each containing a specific “package” of activities, setting attributes, experiences, and benefits. A detail description of each of the six classes, along with a detailed explanation of the WALROS system, can be found in **Appendix B**.

The WALROS is an extremely useful tool for conducting complex recreation studies, such as this one for Eufaula Lake. It provides a template for establishing the physical, social, and managerial attributes of the study area; conducting recreation area and facility inventories; quantifying and mapping the current supply of recreation opportunities; establishing recreation-related carrying capacities; and for analyzing potential impacts associated with the various alternatives.

The WALROS system is well established within the professional recreation community and is used extensively by USACE, Bureau of Reclamation, U.S. Forest Service, National Park Service, Tennessee Valley Authority, as well as many state and county park and recreation departments across the country. The WALROS system was used extensively in conducting this recreation study for the Eufaula Lake EIS.

2.3.1 Recreation Opportunities

A recreation opportunity can be defined as the opportunity for a visitor to participate in a recreation activity, within a specific setting, that provides a particular type of experience and which results in a variety of benefits. A recreation opportunity is comprised of four basic components: the setting, activity, experience, and benefit. For each of the six WALROS classifications on the spectrum from urban to primitive, there are six integrated packages containing appropriate settings, activities, and experiences. **Figure 2-2** illustrates the WALROS system for classifying the components of a recreation opportunity. Each of these components was evaluated for the Eufaula Lake region (within 50 miles) in order to determine the appropriate WALROS classification for Eufaula Lake.

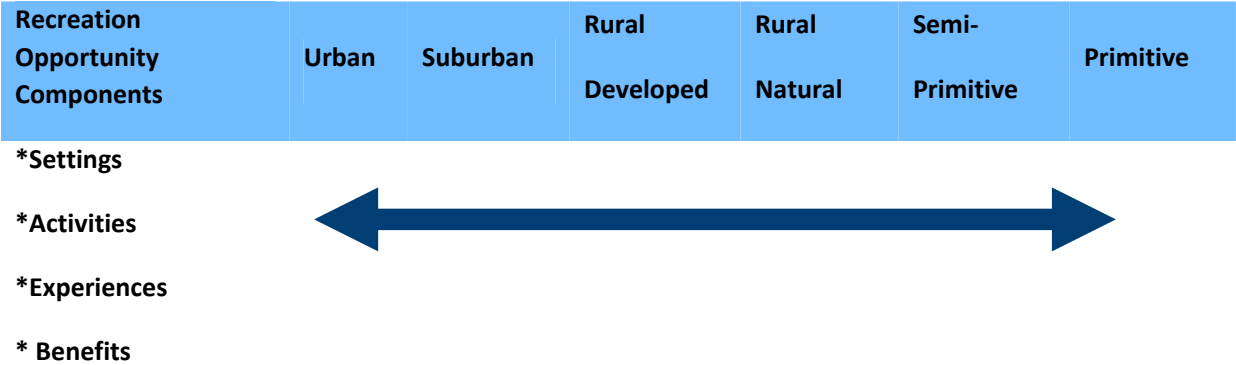


Figure 2-2. WALROS Recreation Opportunity Categories

2.4 Impact Analysis

All data and information obtained, including surveys, were compiled, consolidated, reviewed, analyzed, and evaluated. The analysis included an evaluation of appropriate recreational carrying capacities for the lake. A literature review of studies completed on USACE lakes similar to Eufaula Lake was conducted to identify appropriate methods to be used in establishing a recreational carrying capacity. The data from Eufaula Lake and from similar USACE lakes was analyzed to evaluate the various alternatives and their potential impacts on appropriate carrying capacities for the lake for the various types of recreational uses.

Data and statistics about past boating accidents were reviewed to assess potential safety issues on the lake. Locations were identified where there has been a higher than usual incidence of boating accidents. Potential impacts on recreation from each of the proposed alternatives identified for the Draft EIS were evaluated, including secondary and cumulative impacts.

Section 3

Land-Based Recreation

There are a variety of land-based recreation opportunities, activities, areas, and facilities located at Eufaula Lake and within the region. This report focuses primarily on areas and facilities that typically occur on, or adjacent to, USACE-owned land and water. These activities include camping, hiking, hunting, picnicking, ATV use, wildlife/bird viewing, and sightseeing.

3.1 Land-Based Recreation Areas in the Region

In order to have a better understanding of the current recreation conditions at Lake Eufaula, a desktop inventory of recreation areas and facilities located within a 50-mile radius of Eufaula Lake was conducted. This area was established based on studies conducted by USACE, which establish the camping market area for USACE lake projects to be approximately 50 miles and the day-use market area to be approximately 30 miles. These mileage limits are used as a standard in the majority of USACE studies and reports. Also, a survey conducted by the Outdoor Foundation, *“A Special Report on Camping – 2011,”* found that not more than 64 percent of people who participate in outdoor recreation activities will travel further than 100 miles from their home to participate in those activities. Since land-based recreation activities are comprised of both overnight and day-use visitors, a 50-mile radius from Eufaula Lake was considered adequate, and is used to define the region for this analysis.

Regional recreation facilities were divided into two main categories. These categories include recreation facilities managed by USACE, and those managed by others. For facilities managed by entities other than USACE, some information about the types of recreation facilities and visitation was not available. For example, the number of picnic sites at state, county, city, and private recreation areas was not available. Therefore, comparisons about recreational facilities and activities were sometimes difficult to establish on a regional basis. Recreation areas where data was not sufficiently complete were not included in regional comparative analyses. The most reliable and consistent data and information was provided by USACE. Therefore, in many cases, comparative analyses only include USACE lakes within the region.

3.1.1 Regional Recreation Areas and Facilities Managed by USACE

There are four other USACE lakes within 50 miles of Eufaula Lake. They are:

- Fort Gibson Lake
- Robert S. Kerr Lake
- Tenkiller Ferry Lake
- Webbers Falls Reservoir

Each of these lakes has a variety of land-based recreation areas and facilities. **Table 3-1** depicts the number and type of land-based recreation features and visitation and acreage data for these lakes, including Eufaula Lake. **Figure 3-1** depicts the locations of these lakes.

Table 3-1. Regional USACE-Managed Lakes with Land-based Recreation Facilities

Lake Name	Recreation Areas	Picnic Sites	Camp Sites	Trail Miles	Annual Visits	Land Acres	Water Surface Acres	Shoreline Miles	Total Acres
Eufaula Lake	21	79	993	15	2,295,602	56,880*	105,793*	600*	162,673*
Fort Gibson Lake	32	33	388	0	1,972,836	52,458	19,900	220	72,358
Robert S. Kerr Lake	12	7	102	0	311,030	12,951	43,788	250	56,739
Tenkiller Ferry Lake	24	38	1,026	11	3,274,803	17,587	12,900	130	30,487
Webbers Falls Reservoir	10	16	101	1	713,138	4,388	11,600	157	15,988
Total	99	173	2,610	27	8,567,409	144,264	193,981	1,357	338,245

Source: USACE 2012. "Value to the Nation" report data from 2010.

* Please note these numbers may not be consistent with those computed for this study which used more accurate and up-to-date GIS software for measurements. However, in order to make meaningful comparisons with other regional lakes, it was important to use the same data source. Therefore, these numbers may be different than those found in other sections of this report.

3.1.2 Regional Recreation Areas and Facilities Managed by Other Entities

There are several state parks and private RV parks within the region. Campsites and trails are the primary land-based recreation facilities provided at these parks. **Table 3-2** identifies these parks, their managing entities, and the number of campsites and/or miles of trails.

Table 3-2. Other Campgrounds within the Region

Recreation Area Name	Managing Entity	# of Campsites	Miles of Trails	Acres
Dripping Spring State Park	State of Oklahoma	147	0	1,150
Robbers Cave State Park	State of Oklahoma	114	25	8,246
Greenleaf State Park	State of Oklahoma	178	2	565
McGee Creek State Park	State of Oklahoma	41	20	2,600
Clayton Lake State Park	State of Oklahoma	72	2	500
Wister Lake State Park	State of Oklahoma	184	2	39,131
Checotah/Eufaula Lake KOA	Private RV Park	59	1	20
Marvel Resort	Private RV Park	112	0	105
Sallisaw/Ft. Smith West KOA	Private RV Park	62	0	25
TOTAL		981	52	52,342

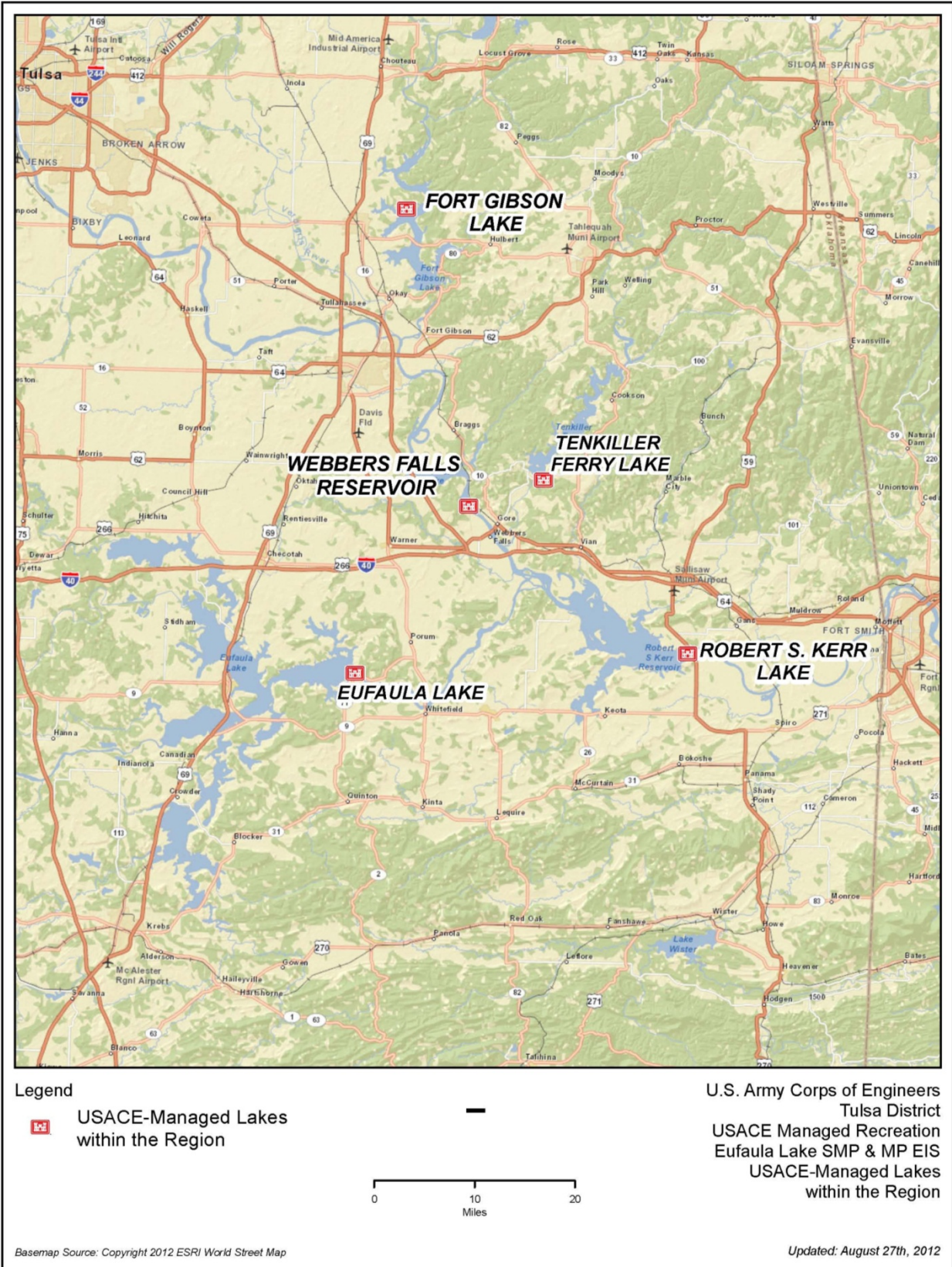


Figure 3-1. USACE Lakes within 50 Miles

3.1.3 Regional Summary of Recreation Areas and Facilities

Table 3-3 includes a summary of data from all the lakes, parks, and recreation areas within 50 miles of Eufaula Lake, including Fort Gibson Lake, Robert S. Kerr Lake, Tenkiller Ferry Lake, Webbers Falls Reservoir, Wister Lake State Park, Okmulgee/Dripping Spring State Park, Robbers Cave State Park, Greenleaf State Park, McGee Creek State Park, Clayton Lake State Park, Marvel Resort, Checotah/Lake Eufaula West KOA Campground, and Sallisaw/Ft. Smith West KOA. **Table 3-3** provides a comparison of recreation areas and facilities within the region, and identifies the percentage of the regional total located at Eufaula Lake.

Table 3-3. Regional Recreation Areas, Facilities, and Physical Attributes Compared to Eufaula Lake

Physical Attribute	Regional Average	Regional Total	Eufaula Lake Total	Eufaula Lake % of Regional Total
Water Surface Acres	38,799	193,993	105,793*	55%
Land Acres	14,043	196,594	56,880*	29%
Shoreline Miles	271	1,357	600*	44%
# of Recreation Areas	8	99	21*	21%
# of Campsites	257	3,591	993*	28%
# of Picnic Sites	35	173	79*	46%
Miles of Trails	6	79	15	29%
# of ATV Areas	1	1	1	100%

Source: USACE 2012. "Value to the Nation" report data from 2010.

* Please note these numbers may not be consistent with those computed for this study which used more accurate and up to date GIS software for measurements. However, in order to make meaningful comparisons with other regional lakes, it was important to use the same data source. Therefore, these numbers may be different than those found in other sections of this report.

3.1.4 Regional Comparison of Land-based Recreation at USACE Lakes

In order to ensure consistency and accuracy in comparing land-based recreation information and data, the following comparisons only include data from the USACE lakes within the region. The source of this information was the USACE *Value to the Nation* report data from 2010 (USACE 2012).

3.1.4.1 Visitation and Recreation Activity

Within the region there is an average of 90 annual visits per land acre. Both Tenkiller Lake and Webbers Falls Reservoir greatly exceeds the regional average for annual visits. Eufaula Lake is well below the regional average, and appears to have additional capability for meeting land-based recreation opportunities within the region. **Figure 3-2** depicts annual visits per land acre.

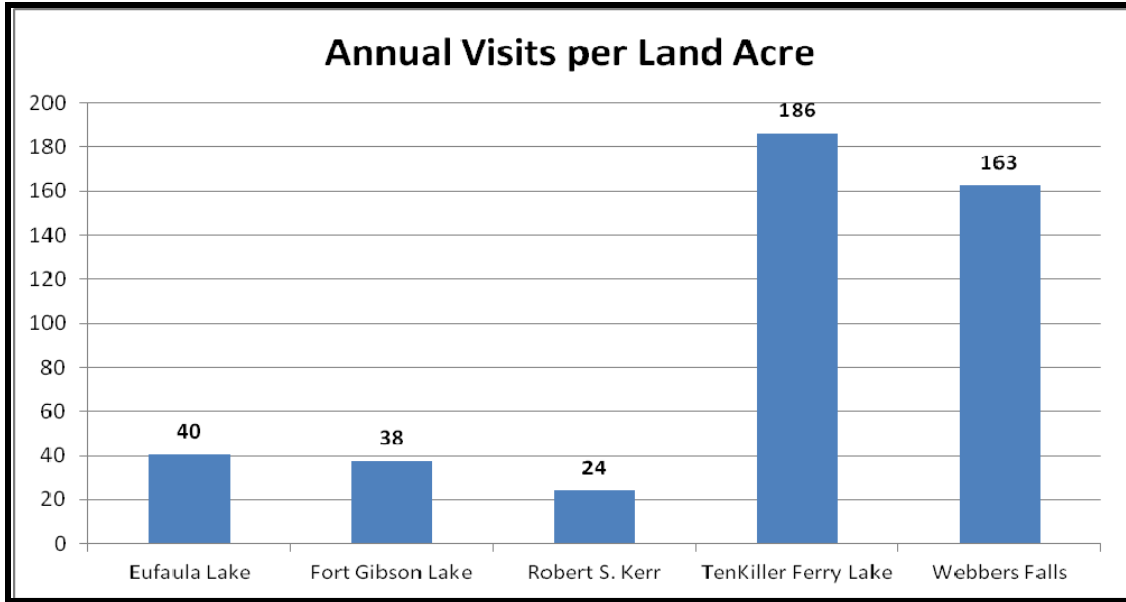


Figure 3-2. Annual Visits per Land Acre for USACE Lakes within the Region

Within the region there is an average of 4,068 annual picnickers per picnic site. The review and evaluation of information and data related to picnic sites and picnickers shows there are insufficient picnicking opportunities provided at Eufaula Lake and within the region. There are only 173 picnic sites within the region, and 79 of those sites are located at Eufaula Lake. During field observations, a shortage of picnic facilities at Eufaula Lake was noticed; picnicking activities routinely occurred at locations other than designated picnic sites, including picnics taking place from the backs of pick-up trucks and other vehicles. **Figure 3-3** depicts the annual number of picnickers per picnic site.

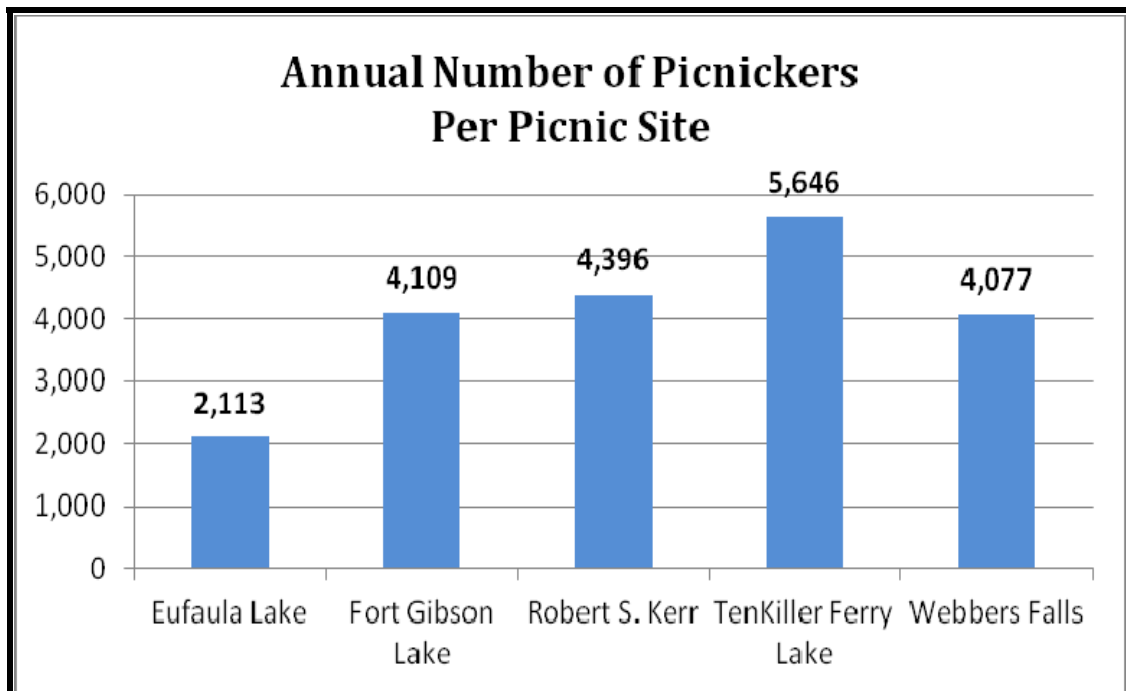


Figure 3-3. Annual Number of Picnickers per Picnic Site for USACE Lakes in the Region

The review of hunting-related data and information indicates there is an average of 1.57 hunters per acre of land within the region. On average, there is 1 acre per hunter. **Figure 3-4** depicts the annual number of hunters per land acre at USACE-managed lakes in the region. **Figure 3-5** depicts the number of land acres per hunter within the same region.

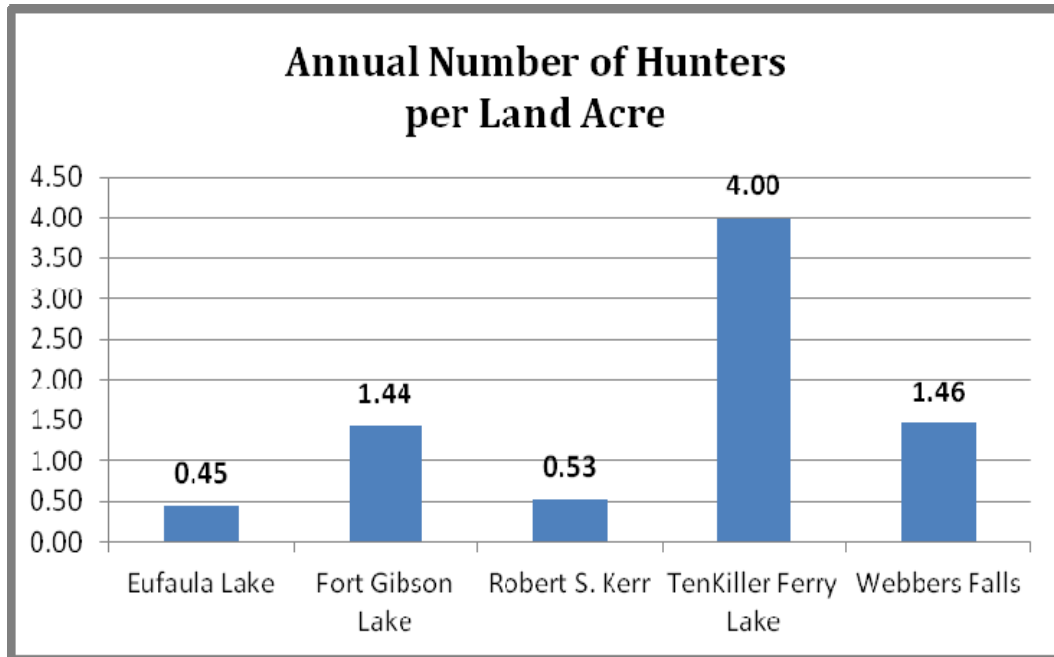


Figure 3-4. Annual Number of Hunters per Land Acre for USACE Lakes in the Region

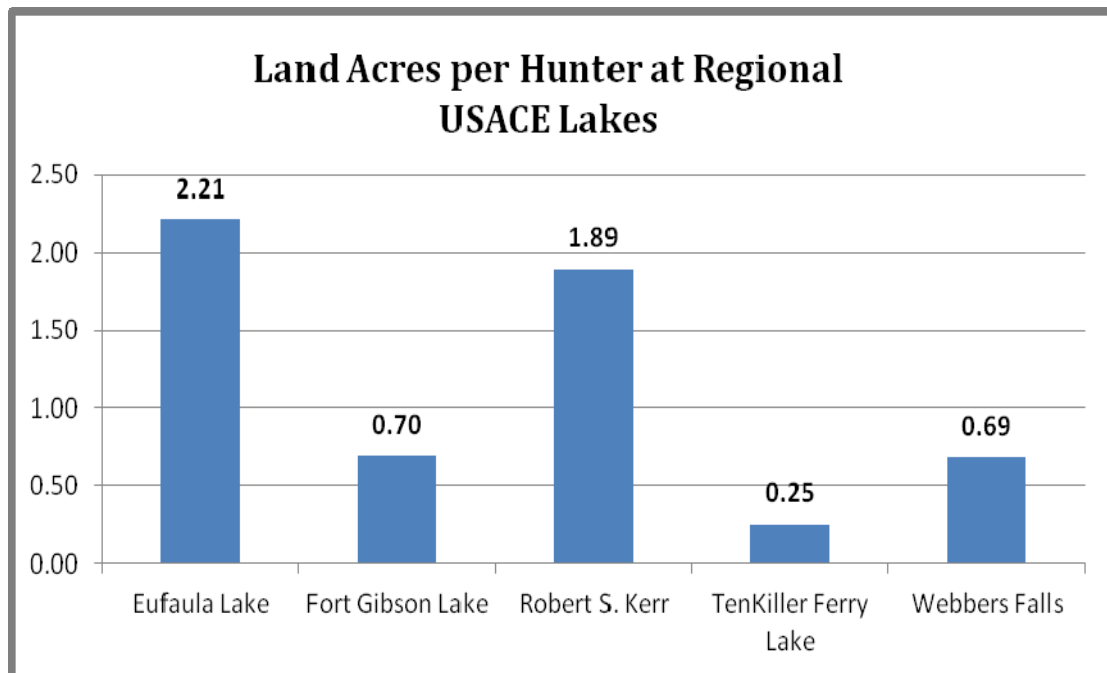


Figure 3-5. Land Acre per Hunter for USACE Lakes in the Region

Figure 3-6 depicts the annual number of sightseers per land acre for USACE-managed lakes in the region. As shown in **Figure 3-6**, Tenkiller Ferry Lake and Fort Gibson Lake have a significantly higher number of sightseers than other lakes in the region. Eufaula Lake has significantly fewer annual sightseers than the regional average of 57 annual sightseers per land acre.

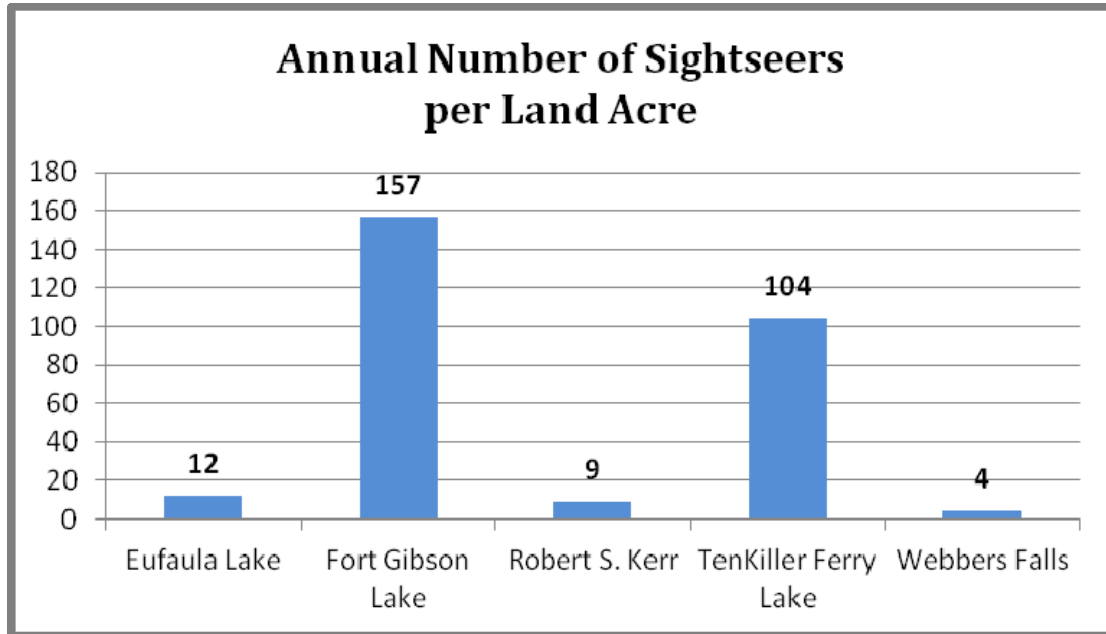


Figure 3-6. Annual Number of Sightseers per Land Acre for USACE Lakes in the Region

3.2 Land-Based Recreation Areas at Eufaula Lake

Three land use classifications identified in the Eufaula Lake MP and Operational Management Plan (OMP) may be applied to lands used for recreation: High Density Recreation, Future/Inactive Recreation Areas, and Low Density Recreation. In addition to lands classified specifically for recreation, a fourth classification, Wildlife Management, is also used extensively for recreational purposes, such as hunting. Although all of these lands are owned by USACE, they are managed by several different entities. **Table 3-4** provides a summary by land use classification, acreage and managing entity.

Table 3-4. Land Allocation Acres and Managing Entity

Land Classification	Managing Entity	Acres
High Density Recreation	USACE	4,490
	Oklahoma State Parks	5,388
	Municipal and County Parks	688
	Commercial Concession Marinas	221
Total High Density Recreation		10,787
Low Density Recreation	USACE	19,375
Total Low Density Recreation		19,375
Wildlife Management	USACE	8,756
	Oklahoma Department of Wildlife Conservation	20,956
Total Wildlife Management		29,712
Grand Total – Lands Used for Recreation		59,874

There are 21 designated public recreation areas at Eufaula Lake that total 10,787 acres, and which are managed by a variety of entities, including: USACE, State of Oklahoma, county and municipal governments, and private commercial concessionaires. This acreage includes some land that is not owned by USACE but which is within the Eufaula Lake study area (*i.e.* 332 acres owned by Oklahoma State Parks and located within the two state parks). USACE manages 14 areas, the State manages two areas, municipal and county governments manage five areas, and there are seven marinas operated by private concessionaires, two of which are located within the state parks. In addition, there is a 450-acre ATV area managed by USACE located below the Eufaula Lake Dam, which is not included in the total acreage. **Table 3-5** provides a summary of recreation areas, their type, managing entity, acreage, and the lake area number within which each recreation area is located.

Table 3-5. Recreation Area by Type, Managing Entity, Acreage, and Lake Area Number

Recreation Area Name	Type of Recreation Area	Acres	Managed By	Lake Area Number
Arrowhead State Park and Area 51 Marina	Multipurpose	2,202	State of Oklahoma	6
Belle Starr CG	Campground	569	USACE	3
Below Dam Fishing Area	Fishing	4	USACE	N/A
Below Dam ATV Area	ATV area	450	USACE	N/A
Belle Starr Marina	Marina	156	Leased Commercial Concession	3
Brooken Cove	Campground	550	USACE	4
Cardinal Point	Day Use	285	USACE	6
Coles Evergreen Marina	Marina	18	Leased Commercial Concession	4
Crowder City Park	Day Use	11	City of Crowder	6
Crowder Point	Multipurpose	243	City of Crowder	6
Dam Site South	Campground	646	USACE	4
Duchess Creek Marina	Marina	47	Leased Commercial Concession	4
Elm Point	Multipurpose	244	USACE	6
Eufaula City Park	Marina	111	City of Eufaula and Leased Commercial Concession	3
Eufaula Cove South	Boat Ramp	81	City of Eufaula	3
Gaines Creek	Boat Ramp	575	USACE	6
Gentry Creek	Campground	414	USACE	1
Hickory Point	Boat Ramp	265	USACE	6
Holiday Cove	Boat Ramp	174	USACE	2
Highway 31 Landing	Boat Ramp	203	USACE	6
Highway 9 Landing	Campground	215	USACE	3
Highway 9 Landing Marina	Marina	N/A	Leased Commercial Concession	3
Juniper Point	Boat Ramp	242	City of Crowder	6
Lake Eufaula State Park and Marina	Multipurpose	2,854	State of Oklahoma	2
Mill Creek	Multipurpose	54	USACE	5
Oak Ridge	Multipurpose	136	USACE	6
Porum Landing	Campground	160	USACE	4

3.2.1 Recreation Areas and Facilities

Recreation areas contain a wide range of land-based recreation facilities and amenities, including campsites, picnic sites, group shelters, and trails. In total there are 1,001 campsites, 82 picnic sites, 10 group shelters, 15 miles of trails, and 93 miles of roadways that provide access to the lake. **Table 3-6** provides a summary of number of land-based recreation facilities by managing entity.

Table 3-6. Land-based Recreation Facilities

Type of Land-Based Recreation Facility	Managed by USACE	Managed by Outgrant	Total Facilities
Entrance Station	6	0	6
Campsite with Electric	394	336	730
Campsite Without Electric	70	201	271
Total Campsites	463	537	1,000
Gate/Park Attendant Site	10	0	10
Group Camp Area	1	1	2
Dump Station	8	5	13
Restrooms, Vault	28	22	50
Restrooms, Vault with Showers	11	25	36
Total Vault Type Facilities	39	47	86
Restrooms, Waterborne	18	12	30
Restrooms, Waterborne with Showers	16	0	16
Bath Change House	2	0	2
Total Waterborne Type Facilities	36	12	48
Court, Multi-Purpose	0	4	4
Golf Course	0	2	2
Picnic Site	12	70	82
Group Picnic Area	1	3	4
Group Picnic Shelter	5	5	10
Playground Equipment	5	5	10
Car Spaces ¹	788	790	1,578
Car/Trailer Spaces ¹	525	526	1,051
Total Car and Car/Trailer Spaces¹	1,313	1,316	2,629
Road, Miles Paved	39	41	80
Road, Miles Unpaved	6	7	13
Total Road Miles (Paved and Unpaved)	45	48	93
Trail, Equestrian, Miles of Trail	0	10	10
Trail, Hiking, Miles of Trail	1	3	4
Trail, Interpretive, Miles of Trail	0	1	1
Total Trail Miles	1	14	15

Data Source: OMBIL- Recreation Facilities Annual Report for FY: 2011 – Eufaula Lake

¹ During the first recreation survey on April 7-8, 2012 it was determined that the number of car and car/trailer spaces could not be confirmed, since many spaces are not delineated with pavement markings.

Note: Recreation facilities related to Land/Water Interface and Water-based recreation activities are addressed in later chapters of this Recreation Study Report

3.2.2 Visitation

The designated recreation areas at Eufaula Lake routinely receive a total of over two million visits annually. Eufaula Lake is the second most visited USACE Lake in the State of Oklahoma, and consistently ranks within the top twenty-five most visited USACE Lakes in the country (USACE 2012).

Three different measurements are used in this report to quantify visitation. These measurements include Visits, Visitors Hours, and Visitor Days. Each measure is used to satisfy different needs when quantifying and analyzing data related to visitation. The following are the definitions for each of the three measurements of visitation (USACE 2011).

3.2.2.1 Visit

A "Visit" is defined as one person participating in recreation activities within a developed recreation area for any period of time. For instance, one person picnicking for 30 minutes is one visit; one person camping for 14 consecutive days is also one visit.

3.2.2.2 Visitor Hour

A "Visitor Hour" is an aggregate of use, by one or more persons engaging in recreational activities, during continuous or intermittent periods of time, amounting to one hour. For example, one person recreating for one hour or two persons recreating for one half-hour each, are both equal to one visitor hour.

3.2.2.3 Visitor Day

The "Visitor Day" is used to normalize "visits" and "visitor hours." For example, one person camping for 24 hours is equal to one visitor day, and one person hiking for 4 hours is also equal to one visitor day.

Table 3-7 provides a summary of visitation to designated recreation areas at Eufaula Lake from 1999-2011. **Figure 3-7** depicts Visits to designated recreation areas at Eufaula Lake from 1999-2011. **Figure 3-8** depicts Visitor Hours to designated recreation areas. **Figure 3-9** depicts Visitor Days to designated recreation areas.

Table 3-7. Annual Visitation Data for Designated Recreation Areas at Eufaula Lake

Year	Visits	Visitor Hours	Visitor Days = (VH/12)
1999	2,127,100	30,832,300	2,569,358
2000	2,023,218	27,270,326	2,272,527
2001	1,677,042	24,686,224	2,057,185
2002	2,064,190	26,979,323	2,248,277
2003	1,684,023	24,553,386	2,046,116
2004	1,479,222	20,772,372	1,731,031
2005	1,160,328	16,530,554	1,377,546
2006	2,439,782	38,299,340	3,191,612
2007	2,010,768	28,722,746	2,393,562
2008	2,115,305	26,878,585	2,239,882
2009	3,171,728	37,353,764	3,112,814
2010	2,295,601	23,986,225	1,998,852
2011	2,608,951	23,218,664	2,020,895

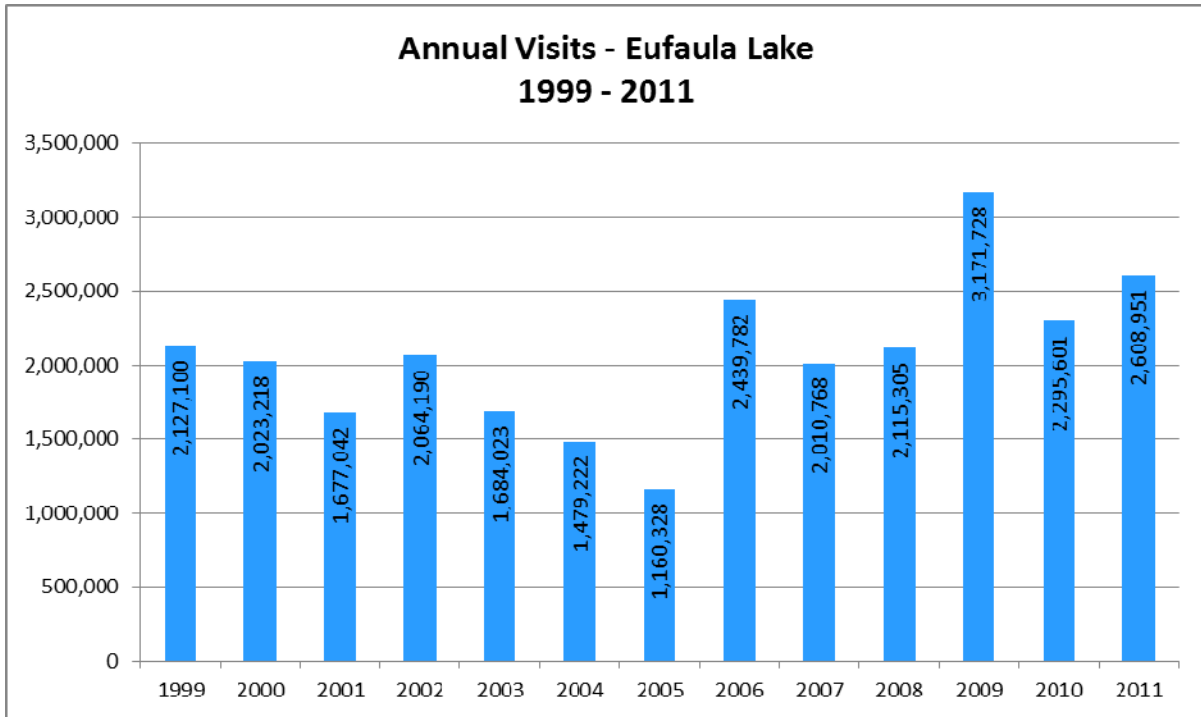


Figure 3-7. Annual Visits for Designated Recreation Areas at Eufaula Lake (1999-2011)

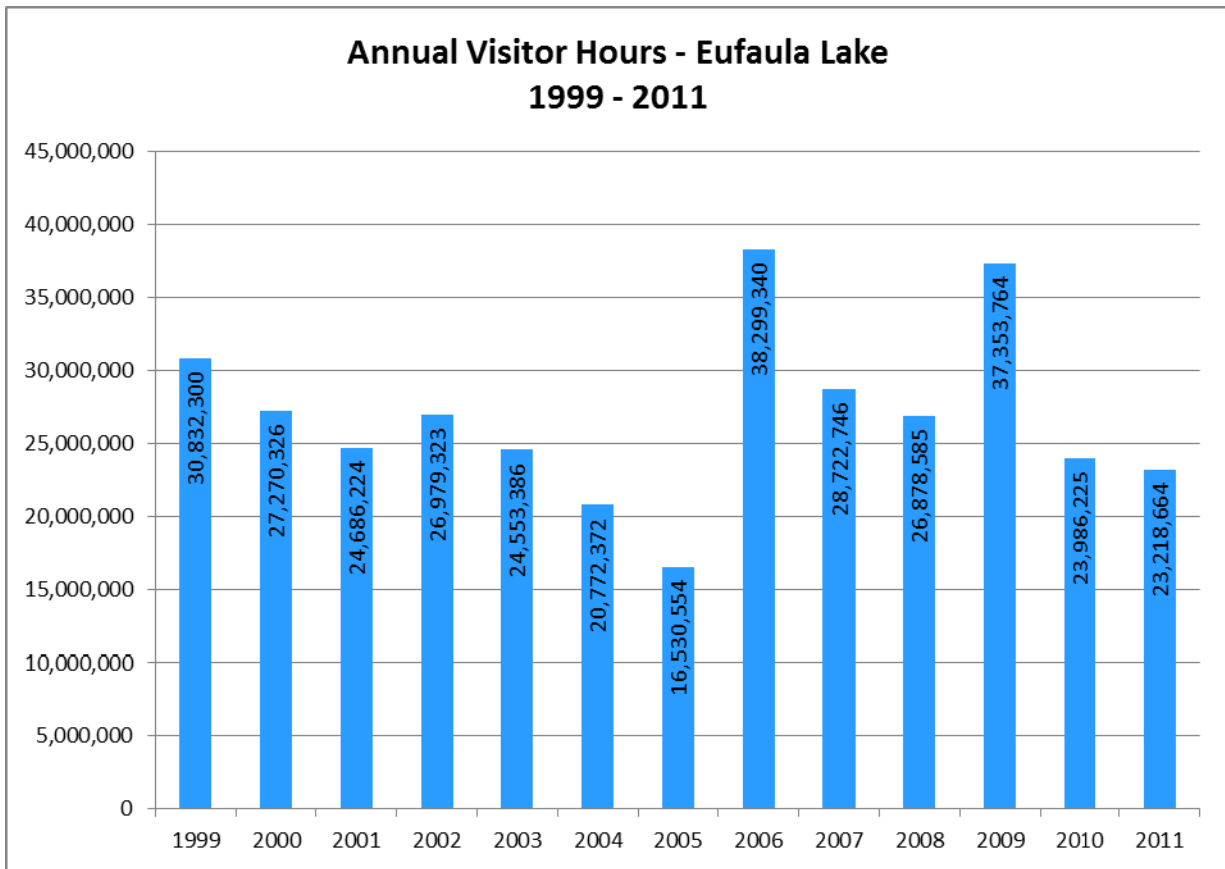


Figure 3-8. Annual Visitor Hours for Designated Recreation Areas at Eufaula Lake (1999 – 2011)

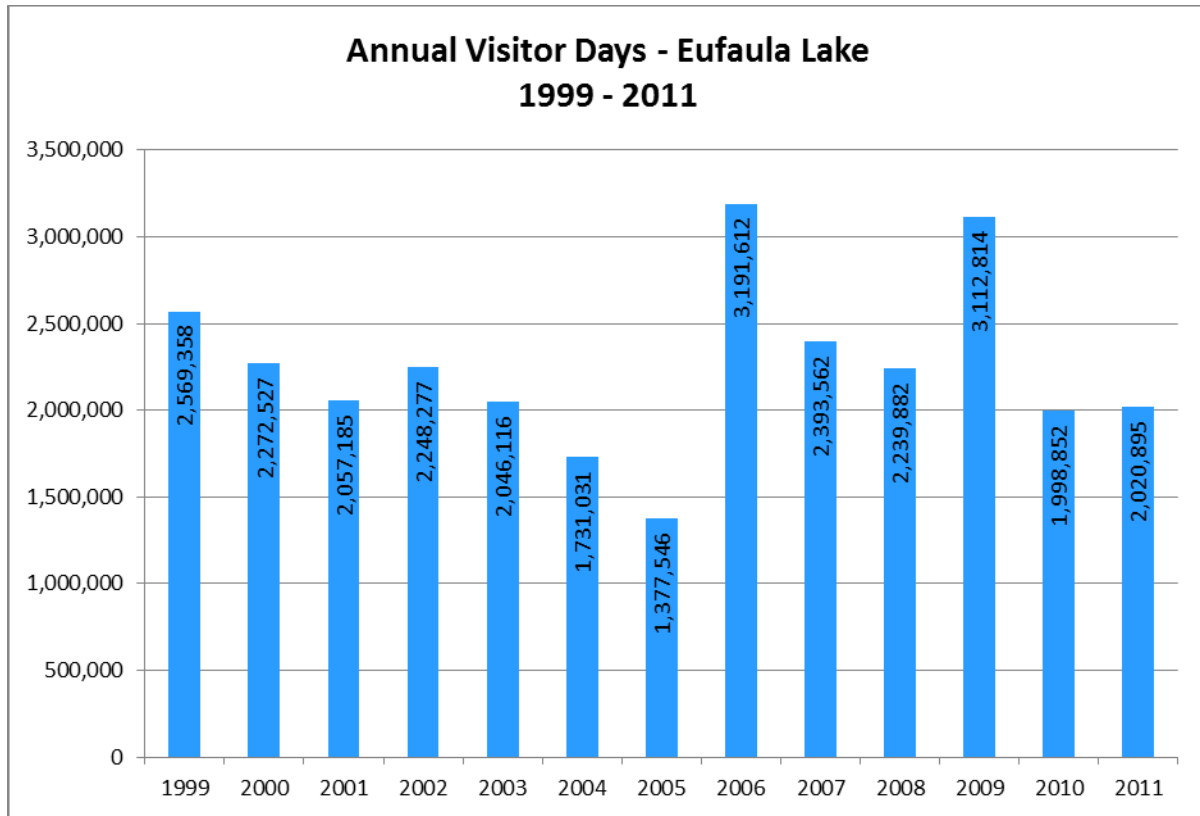


Figure 3-9. Annual Visitor Days for Designated Recreation Areas at Eufaula Lake (1999 – 2011)

3.2.2.4 Visitation Facts for Eufaula Lake

The following information is based on a twelve-year average (1999-2011) of visitation data for designated recreation areas.

- 94 percent of the Visitor Hours at Eufaula Lake occur from 1 April through 30 September
- 88 percent of the Visits at Eufaula Lake occur from 1 April through 30 September
- July is typically the highest visitation month, with 20 to 22 percent of the annual total
- December, January and February are the lowest visitation months, and receive approximately 1 percent of the annual total each month, for a total of 3 percent over the three months
- Approximately 60 percent of the annual visitation occurs during June, July, and August
- Approximately 20 percent of the visitation occurs in recreation areas managed by local governments
- Approximately 15 percent of the visitation occurs in recreation areas managed by the State of Oklahoma
- Approximately 65 percent of the visitation occurs in recreation areas managed by USACE

- Visitation trends at Eufaula Lake are consistent with visitation trends elsewhere within USACE-owned lands

Figure 3-10 depicts the percentage of total visits to Lake Eufaula by lake area. Refer to **Figure 2-1** for lake areas.

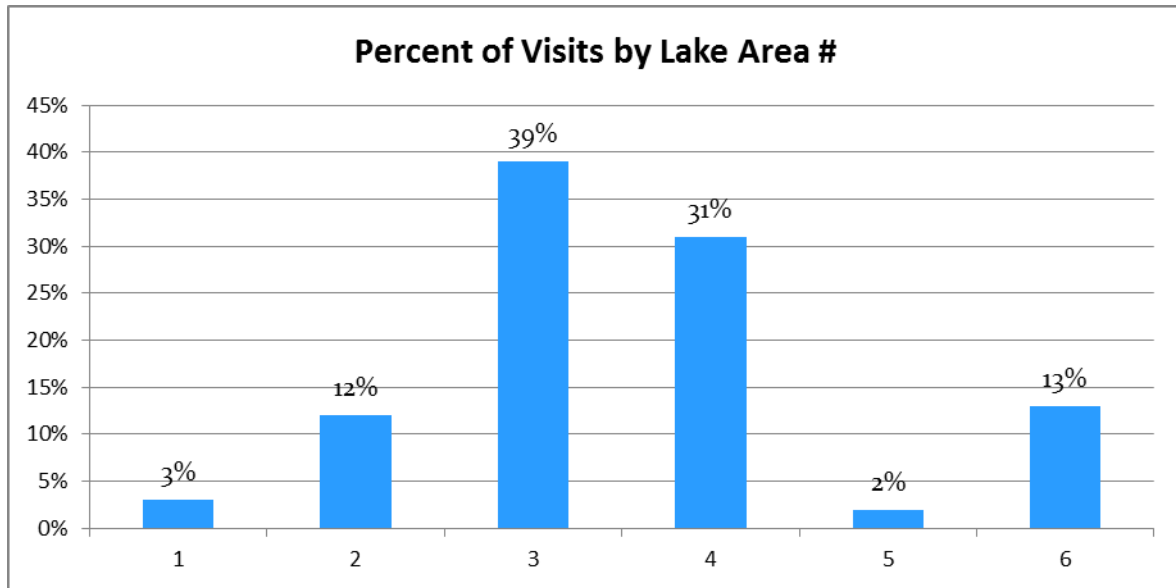


Figure 3-10. Visits by Lake Area Number (Represented as percent of Total Visits)

3.2.2.5 Annual Visits per Acre

In order to make normalized comparisons of visitation, it is useful to calculate the number of annual visits per acre of designated recreation land. **Table 3-8** identifies the number of annual visits per acre of designated recreation area land within each lake area. **Figure 3-11** represents the number of annual visits per acre by recreation area.

Recreation areas in Lake Areas 3 and 4 receive 70 percent (39 percent and 31 percent, respectively) of the annual visits to the lake, while recreation areas in Lake Areas 1 and 5 receive only five percent of the annual visitation (three percent and two percent, respectively). Although recreation areas in Lake Areas 3 and 4 receive a larger percentage of the total lake visitation, recreation areas in Lake Areas 3 and 5 receive the largest number of visits per acre of designated recreation area land. The reason for the high concentration of use in Lake Area 5 is due to the fact that Lake Area 5 only has one designated recreation area, Mill Creek, which is only 54 acres in size.

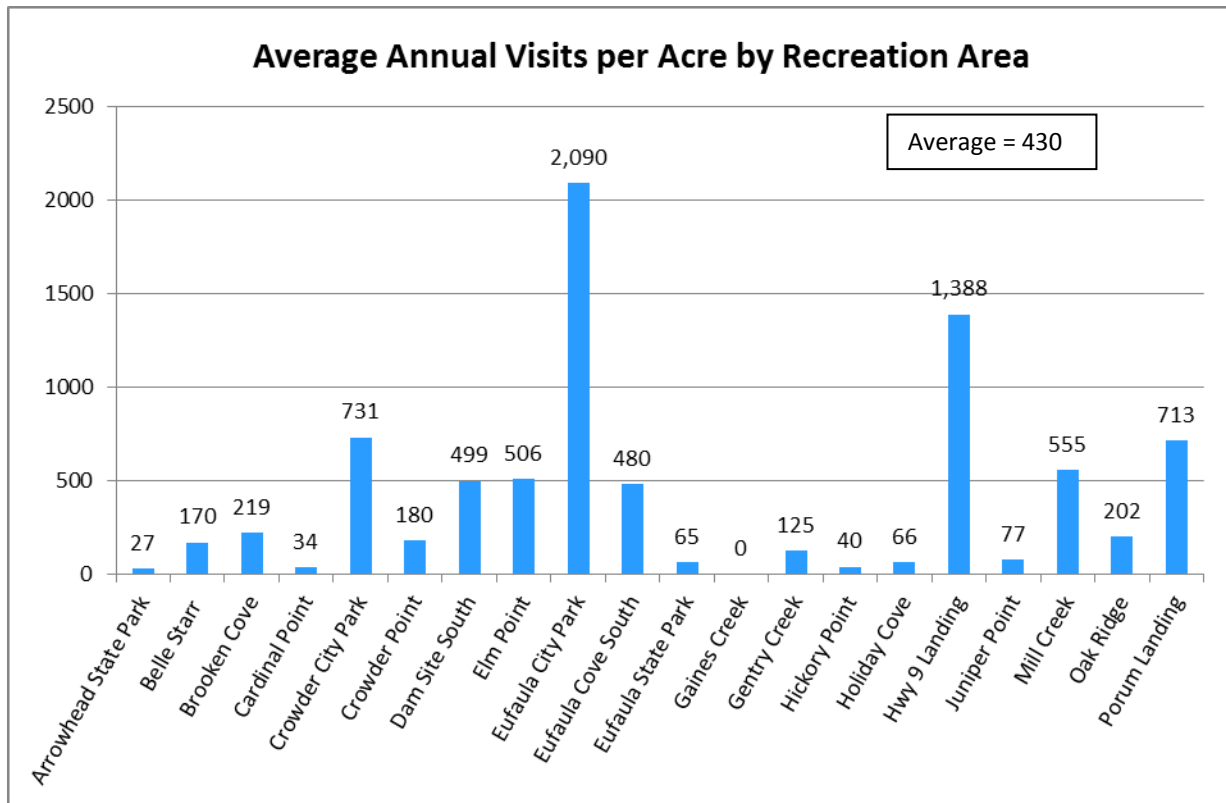
By far the highest concentration of lake recreation use occurs in Lake Areas 3 and 4, which is consistent with the percentage of use that occurs at established recreation areas in those same areas. The highest concentration of use occurs in the Eufaula City Park and Highway 9 Landing recreation areas, which receive an average of 2,083 and 971 annual visits per acre, respectively. The lowest concentration of use occurs in Arrowhead State Park, Lake Eufaula State Park, and Cardinal Point Recreation Area, which receive an average of thirty-one, forty-two and thirty-nine annual visits per acre, respectively.

The average for all recreation areas combined is 430 annual visits per acre. For all USACE lands nationwide there is an average of 84 annual visits per acre, while the average for all USACE lakes within the Tulsa

District is 58 annual visits per acre. Therefore, comparatively, the number of average annual visits per acre of designated recreation area land at Eufaula Lake is significantly higher than at other USACE lakes across the country and elsewhere within the Tulsa District. Gaines Creek Recreation Area is closed; therefore, the average number of visits per acre is shown as zero.

Table 3-8. Annual Visits per Acre Land within Designated Recreation Areas by Lake Area

Lake Area Number	Annual Visits/Lake Area (Land Acres)
1	125
2	65
3	674
4	404
5	555
6	54



Visits per Acre = 5-Year average annual visits/recreation area acreage
 Where no visitation data is available, the annual visits are shown equal to 0.

Figure 3-11. Average Number of Annual Visits per Acre by Recreation Area

3.2.3 Recreation Areas Managed by USACE

USACE manages 16 recreation areas: six campgrounds, one day-use area, three multi-purpose areas, four boat ramps, one fishing area below the dam, and one ATV area below the dam. All of these recreation areas have land-based recreation facilities. **Table 3-9** summarizes the visitation and occupancy rate information for each of the recreation areas managed by USACE and **Table 3-10** summarizes the facilities

available at each recreation area. Additional information about the recreation areas is summarized in the bullets that follow the tables. Maps that show the layout of each recreation area are in **Appendix E**.

It is important to note that data related to car parking spaces and car/trailer parking spaces could not be validated in the field because many of the parking spaces are not delineated with pavement markings. Because of this, it is more difficult to determine the number of recreation opportunities and carrying capacity limits for a variety of recreation activities. This will be addressed in other sections of the recreation study.

Table 3-9. Recreation Area Visitation and Occupancy Rates

Recreation Area	Average Annual Visitor Days	Average Annual Visitor Hours	Average Annual Occupancy Rate Weekdays	Average Annual Occupancy Rate Weekends	Average Annual Occupancy Rate	Average Length of Stay (days)	Average Annual Revenue	Average Annual Visits Per Acre
Belle Starr Campground	22,591	542,184	25.76%	43.59%	33.39%	3.52	\$80,981	170
Brooken Cove Campground	9,181	220,344	29.72%	41.14%	34.58%	4.19	\$42,735	219
Cardinal Point Recreation Area	1,330	15,965	ND	ND	ND	ND	ND	34
Dam Site South Campground	5,843*	140,232*	16.90%	21.46%	14.02%	3.13	\$17,160	499
Elm Point Campground and Recreation Area	30,073	360,875	ND	ND	ND	ND	ND	506
Gaines Creek Recreation Area	ND	ND	ND	ND	ND	ND	ND	ND
Gentry Creek Campground	4,751	114,018	13.52%	27.85%	19.51%	3.09	\$14,940	125
Hickory Point Recreation Area	11,828	104,062	ND	ND	ND	ND	ND	40
Highway 31 Landing Recreation Area	ND	ND	ND	ND	ND	ND	ND	ND
Highway 9 Landing Campground	15,091	362,184	25.67%	41.40%	32.93%	3.58	\$62,699	1,388
Holiday Cove Recreation Area	11,606	100,043	ND	ND	ND	ND	ND	66
Mill Creek Campground and Recreation Area	29,788	256,112	ND	ND	ND	ND	ND	555
Oak Ridge Campground and Recreation Area	31,040	270,400	ND	ND	ND	ND	ND	202
Porum Landing Campground	11,673	280,146	30.51%	46.26%	37.17%	3.79	\$43,793	713

ND = No Data

* Includes visitation for Below Dam Fishing Area and ATV Area

Table 3-10. Land-based Recreation Facilities by USACE-managed Recreation Area

Type of Land-Based Recreation Facility	Belle Starr CG	Brooken Cove CG	Cardinal Point	Dam Site	Elm Point	Gaines Creek	Gentry Creek	Hickory Point	Highway 31 Landing	Highway 9 Landing	Holiday Cove	Mill Creek	Oak Ridge	Porum Landing
Entrance Station	1	1	0	1	0	0	1	0	0	1	0	0	0	1
Campsite with Electric (with water) ¹	115 (115)	75 (75)	0	32 (32)	15 (15)	0	25 (14)	0	0	70 (60)	0	0	8 (0)	54 (54)
Campsite Without Electric (with water) ¹	0	0	0	26 (26)	2	0	12	0	1	10	0	16 (0)	4 (0)	0
Total Campsites	115	75	0	58	17	0	37	0	1	80	0	16	12	54
Gate/Park Attendant Site	2	2	0	2	0	0	1	0	0	0	0	0	0	2
Group Camp Area	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dump Station	2	1	0	1	1	0	1	0	0	1	0	0	0	1
Restrooms, Vault	2	2	2	4	3	0	5	0	0	4	0	3	2	1
Restrooms, Vault with Showers	0	2	0	3	0	0	1	0	0	2	0	0	2	0
Total Vault Type Facilities	2	4	2	7	3	0	6	0	0	6	0	3	4	1
Restrooms, Waterborne	4	3	0	4	0	0	1	0	0	5	0	0	0	3
Restrooms, Waterborne with Showers	4	3	0	3	0	0	1	0	0	2	0	0	0	3
Bath Change House	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Total Waterborne Type Facilities	8	6	0	7	0	0	2	0	0	9	0	0	0	6
Court, Multi-Purpose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golf Course	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picnic Site	0	0	10	0	0	0	0	1	0	0	0	1	0	5
Group Picnic Area	1	1	0	1	1	0	0	0	0	1	0	0	0	1
Group Picnic Shelter	2	3	0	2	1	0	0	0	0	1	0	0	0	1
Playground Equipment	1	1	0	1	0	0	0	0	0	1	0	0	0	1

Table 3-10. Land-based Recreation Facilities by USACE-managed Recreation Area

Type of Land-Based Recreation Facility	Belle Starr CG	Brooken Cove CG	Cardinal Point	Dam Site	Elm Point	Gaines Creek	Gentry Creek	Hickory Point	Highway 31 Landing	Highway 9 Landing	Holiday Cove	Mill Creek	Oak Ridge	Porum Landing
Car Spaces ²	339	80	5	138	5	0	0	5	20	112	28	7	0	49
Car/Trailer Spaces ²	100	20	10	83	20	17	23	20	55	72	36	10	28	31
Total Car and Car/Trailer Spaces ¹	439	100	15	221	25	17	23	25	75	184	64	17	28	80
Road, Miles Paved	7	5	1	3.6	1	3	3	1	4	4	1	1	2	2.4
Road, Miles Unpaved	0	1	1	2	0	1	0	0	1	0	0	0	0	0
Total Road Miles (Paved and Unpaved)	7	6	2	5.6	1	4	3	1	5	4	1	1	2	2.4
Trail, Equestrian, Miles of Trail	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trail, Hiking, Miles of Trail	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Trail, Interpretive, Miles of Trail	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Trail Miles	0	0	0	1	0	0	0	0	0	0	0	0	0	0

¹ The second number in parentheses represents the number of sites with water hookups.

² During the first recreation survey on April 7-8, 2012 it was determined that the number of car and car/trailer spaces could not be confirmed, since many spaces are not delineated with pavement markings.

- **Belle Starr Campground** is 569 acres in size and is located in Lake Area 3.
- **Brooken Cove Campground** is 550 acres in size and is located in Lake Area 4.
- **Cardinal Point Recreation Area** is 285 acres in size and is located in Lake Area 6. The area is managed as a boating access area.
- **Dam Site South Campground** is 646 acres in size and is located in Lake Area 4. The campground is 226 acres and the remaining acreage includes Below Dam Fishing Area (4 acres) and the ATV area (416 acres).
- **Elm Point Campground and Recreation Area** is 244 acres in size and is located in Lake Area 6.
- **Gaines Creek Recreation Area** is 575 acres in size and is located in Lake Area 6. The area is managed as a boating access area.
- **Gentry Creek Campground** is 414 acres in size and is located in Lake Area 1.
- **Hickory Point Recreation Area** is 265 acres in size and is located in Lake Area 6. The area is managed as a boating access area.
- **Highway 31 Landing Recreation Area** is 203 acres in size and is located in Lake Area 6. The area is managed as a boating access area.
- **Highway 9 Landing Campground** is 215 acres in and is located in Lake Area 3.
- **Holiday Cove Recreation Area** is 174 acres in size and is located in Lake Area 2. The area is managed as a boating access area.
- **Mill Creek Campground and Recreation Area** is 54 acres in size and is located in Lake Area 5.
- **Oak Ridge Campground and Recreation Area** is 136 acres in size and is located in Lake Area 6.
- **Porum Landing Campground** is 160 acres in size and is located in Lake Area 4.

3.2.4 Campground Occupancy Rates and Revenue

Campground occupancy rates vary greatly between campgrounds and between weekdays (Monday through Thursday) and weekends (Friday through Sunday). The overall average weekday occupancy rate for USACE-managed campgrounds is 21.95 percent, while the overall average weekend occupancy rate is 36.77 percent. The overall total average occupancy rate is 28.34 percent. The occupancy rate is defined as the number of campsites occupied divided by the number of campsites available. **Figure 3-12** provides a comparison of campground occupancy rates for USACE campgrounds at Eufaula Lake. **Figure 3-13** depicts annual campground revenue. The reason for the increase in campground revenue in 2009 was not readily apparent. However, the decrease in revenue during 2011 was most likely the result of blue-green algae blooms and construction at three campgrounds that delayed opening until after the recreation season had begun at Eufaula Lake during that year. Detailed campground occupancy rate and revenue data is included in **Appendix C**.

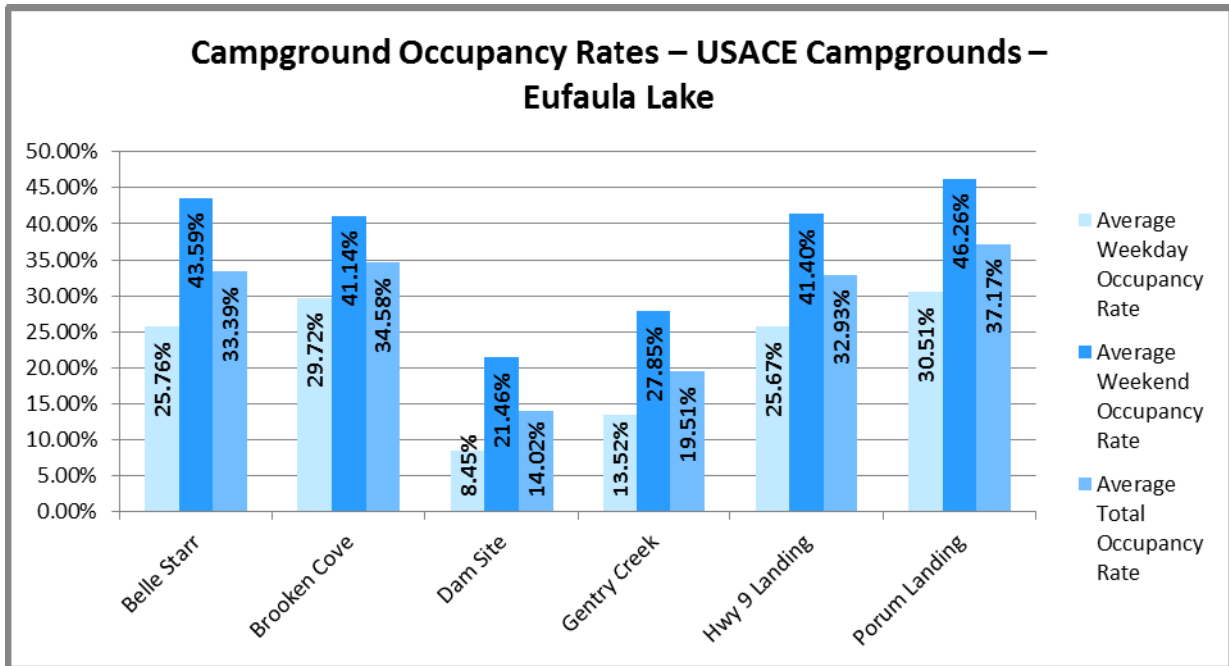


Figure 3-12. Campground Occupancy Rates in USACE Campgrounds at Eufaula Lake

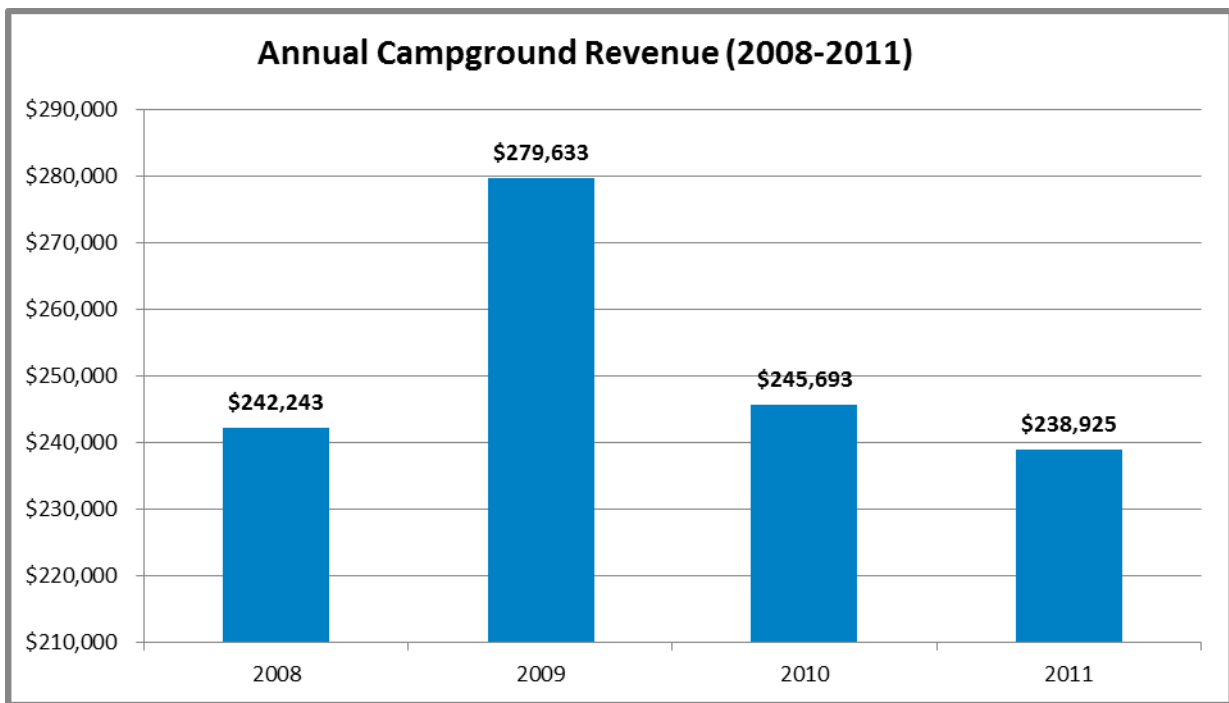


Figure 3-13. Annual Campground Revenue (2008-2011)

3.2.4.1 Campground Occupancy Rates – Peak Season Month

Camping, like many other outdoor recreational activities, is seasonal in nature. Peak use occurs during the summer months when schools are not in session. Visitation records show that July is consistently the heaviest-use month each year.

In order to obtain a more accurate assessment of camping at Eufaula Lake, occupancy rates for the month of July were averaged for the most recent 5-year period. The results show that during the month of July, the overall campground occupancy rate is 45.68 percent and the weekend occupancy rate is 65.53 percent. Belle Starr Campground has the highest weekend occupancy rate at 83.18 percent, while Dam Site South Campground has the lowest weekend occupancy rate of 27.98 percent. July occupancy rates averaged over the most recent five-year period for each campground are presented in **Figure 3-14**. Occupancy rates for the months of June and August were slightly lower than the month of July. Occupancy rates during July are significantly higher (**Figure 3-14**) when compared to occupancy rates calculated for the entire year (**Figure 3-12**).

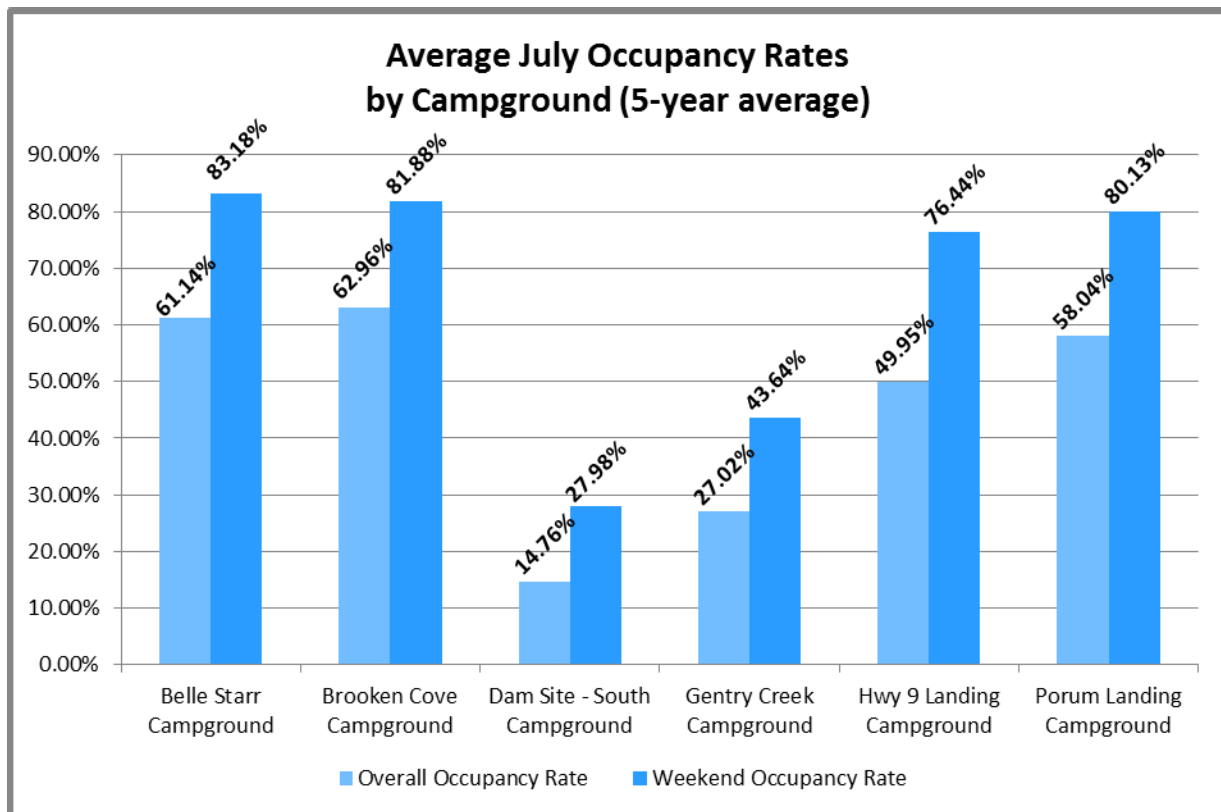


Figure 3-14. Average July Occupancy Rates by Campground (5-year average)

Although detailed occupancy rate data for other USACE lakes within the region was not available, a review of the annual number of campers per campsite reveal that occupancy rates at Eufaula Lake and Webbers Falls Lake are the highest within the region. **Figure 3-15** depicts the annual number of campers per campsite for USACE lakes within the region. The average annual number of campers per campsite for USACE lakes within the region is 42. Based on the occupancy rates at Eufaula Lake, it is estimated that campground occupancy rates during peak use months at Tenkiller Ferry Lake and Robert S. Kerr Lake are somewhat less than those at Eufaula Lake.

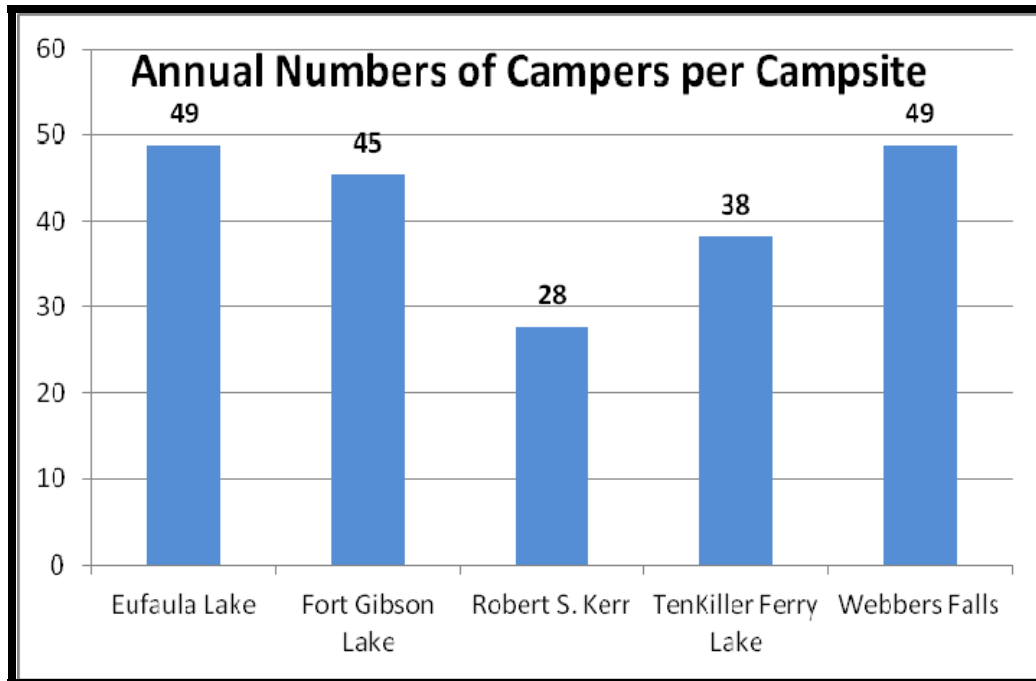


Figure 3-15. Annual Number of Campers per Campsite for USACE Lakes in Region

A recent report by the Outdoor Foundation (2011) indicates that between 2006 and 2011, participation in camping has decreased by approximately 7 percent, with the most significant decrease occurring between 2010 and 2011. Although the economic downturn may appear to be the most logical reason for this decrease, the most cited reason for reducing the number of camping trips by frequent campers is the lack of time due to work and family commitments. Only 5 percent cited the economy as the reason for taking fewer camping trips, which indicates that camping is somewhat recession-proof. Based on this information, it appears there are adequate camping opportunities within the region for the foreseeable future.

3.2.5 Recreation Areas Managed by the State of Oklahoma

There are two state parks and six state wildlife management areas (WMAs) located on Eufaula Lake. The two state parks are Arrowhead State Park, which is 2,203 acres in size, and Lake Eufaula State Park (formerly known as Fountainhead State Park), which is 2,852 acres in size. The six WMAs on Eufaula Lake total 48,564 acres. Visitation data for these State Parks is shown in **Table 3-11**. Arrowhead State Park visitation for 2007-2011 is depicted in **Figure 3-16**. Lake Eufaula State Park visitation is depicted in **Figure 3-17**.

Table 3-11. Annual Visitation to State Parks (2007-2011)

State Park Name	2007	2008	2009	2010	2011
Arrowhead State Park	111,817	109,480	104,503	124,791	72,839
Lake Eufaula State Park	339,465	285,194	203,475	192,617	390,843

Source: USACE 2011b

3.2.5.1 Arrowhead State Park

Arrowhead State Park is a large (2,203 acres) multi-purpose park with a variety of public recreation facilities and amenities. The park is located in Lake Area 6. Annual visits per acre to the park average 27. A map of the park is shown in **Appendix E**. The park features include:

- Airplane landing strip
- Arrowhead stables
 - Horse rental
 - Riding lessons
- Twenty-five miles of multipurpose trails (including horseback riding, hiking, mountain biking)
- Campground
 - 100 Tent sites
 - 91 RV sites (40 with full hook-ups)
- Marina
 - Restaurant
 - Bait and fishing tackle store
 - Swimming beach
- 18-hole golf course
 - 72 Par
 - Pro shop
 - Driving range
 - Putting green
- Group camp area
 - Kitchen
 - Bunkhouses (holding up to 144 people)
- Picnic pavilion
- Playgrounds
- Miniature golf course

The park originally included a lodge that provided overnight accommodations for public use. However, the lodge facility is now used as a treatment center for teens dealing with drug addiction and is operated by Narcanon International.

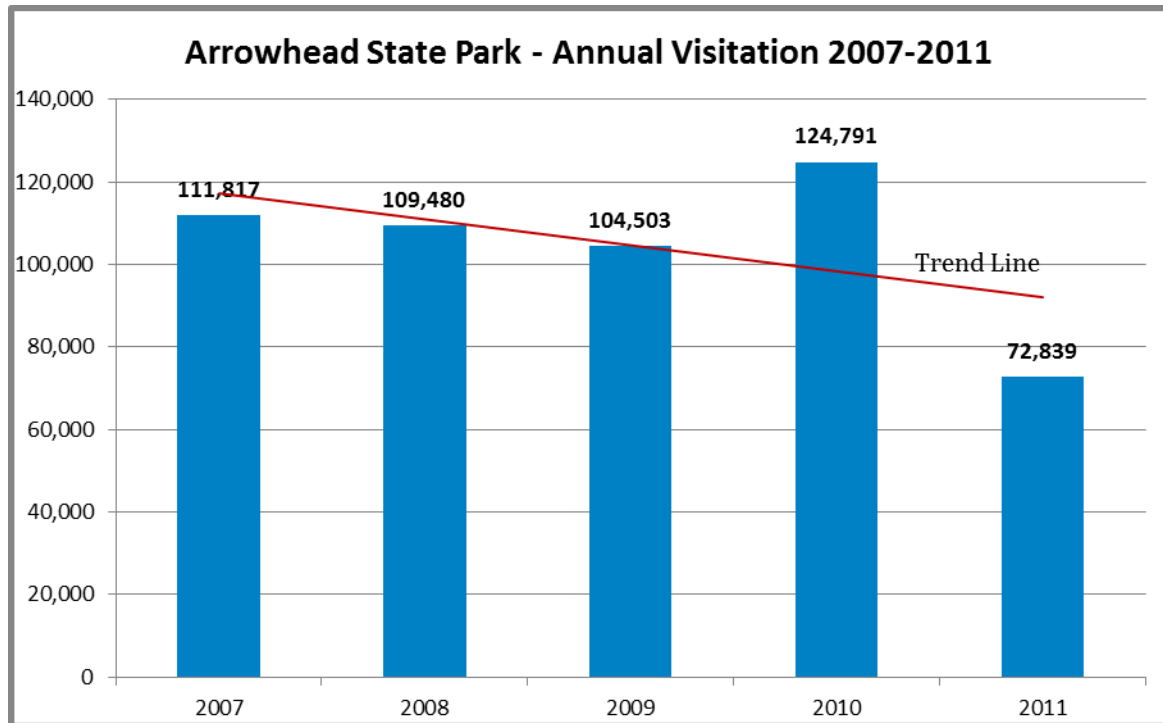


Figure 3-16. Arrowhead State Park Annual Visitation (2007-2011)

3.2.5.2 Lake Eufaula State Park

Lake Eufaula State Park (formerly Fountainhead State Park) is a very large (2,852 acres) multipurpose state park with a wide variety of facilities and amenities. The park is located in Lake Area 2. The average annual visits per acre to the park is 65. A map of the park is shown in **Appendix E**. The park features include:

- Airplane landing strip
- Deep Fork Nature Center
- Campground (RV and tent sites)
- 18-hole golf course (operated by the Muskogee Creek Nation)
 - Pro shop
 - Putting green
- Marina
 - Bait and fishing tackle shop
 - Enclosed heated fishing dock

- Hiking trails
- Mountain bike trails
- Group camp area with bunkhouses (holding 96 people)
- Playgrounds
- Children’s fishing pond

The park originally included a lodge that provided overnight accommodations for public use. For a time the lodge was privately operated and was called Fountain Head Resort Hotel, but it has since been razed.

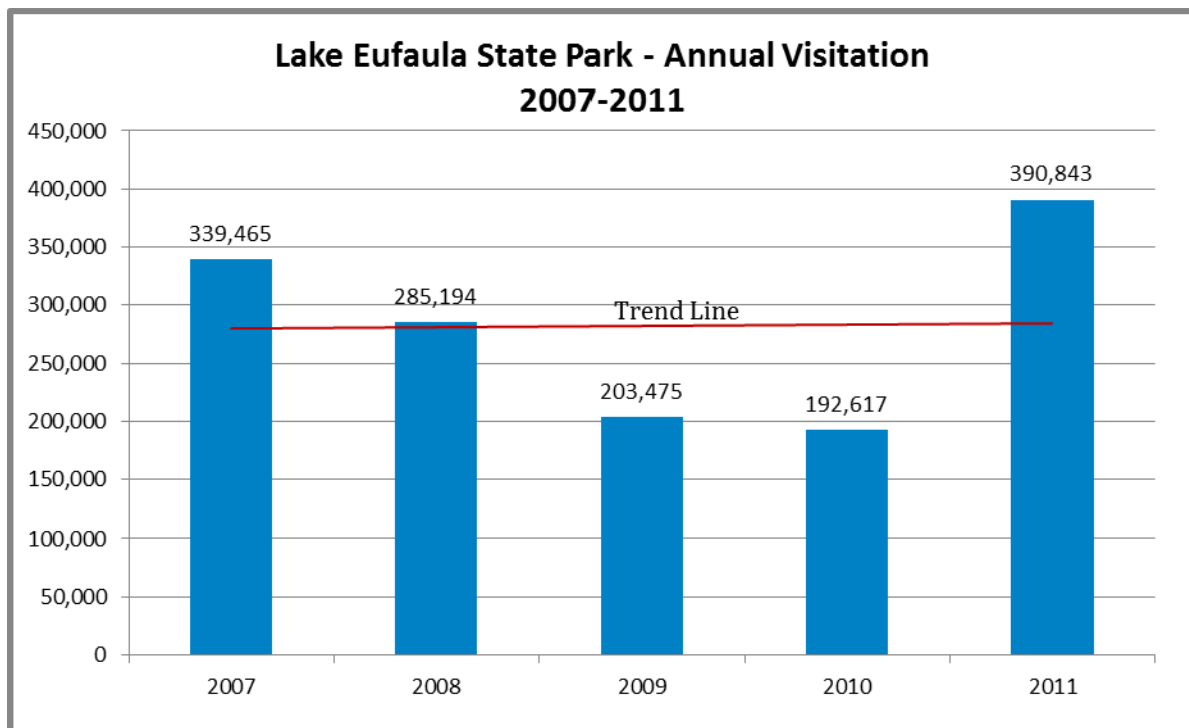


Figure 3-17. Lake Eufaula State Park Annual Visitation (2007-2011)

3.2.5.3 Wildlife Management Areas (WMA)

There are six WMAs around Eufaula Lake containing a total of 48,564 acres, of which 20,956 acres are owned by USACE and licensed to the Oklahoma Department of Wildlife Conservation (ODWC). According to ODWC, these lands are designated as WMAs to accurately reflect the overall objectives for these lands and the results of management activities conducted thereon (2012). Depending on the specific management objectives, all or part of any particular WMA may be designated as a public hunting area, game management area, migratory bird refuge, waterfowl refuge, or wetland development unit. **Table 3-12** provides a summary of the name and acreage of each WMA at Eufaula Lake. Visitation data is not available specifically for WMAs. However, according to the 2010 Outdoor Recreation Participation Report published by the Outdoor Foundation, approximately 5.4 percent for all Americans ages six and older participate in some form of hunting each year. According to the 2006 National Survey of Fishing, hunting, and Wildlife-Associated Recreation report for the state of Oklahoma, approximately 7% of the state’s population go hunting at least once each year. Using the population of the six-county region around

Eufaula Lake of 201,071 as the primary source of hunter visits, this would equate to approximately 14,075 hunting-related visits annually to WMAs at Eufaula Lake. **Figure 3-18** depicts the locations of WMAs at Eufaula Lake.

Table 3-12. Wildlife Management Areas at Eufaula Lake

Area Name	Acres
Deep Fork Arm	17,250
Duchess Creek Arm	3,014
Gaines Creek Arm	4,700
Mill Creek Arm	3,200
North Canadian Arm	11,200
South Canadian Arm	9,200

3.2.6 Recreation Areas Managed by County and City Governments

Local governments manage five recreation areas, including Crowder City Park, Eufaula City Park, Crowder Point, Eufaula Cove South, and Juniper Point. Combined, the five recreation areas contain a total of 688 acres.

3.2.6.1 Crowder City Park and Crowder Point Recreation Areas

These two recreation areas are managed by the City of Crowder. They are located in Lake Area 6, and total 254 acres in size. The average annual visitation to these parks is 57,535, which equates to 911 average annual visits per acre. The locations of these areas are shown on a map in **Appendix E**. Land-based recreation facilities include:

- Sanitary dump station
- Twelve vault restrooms with showers
- Sixty campsites
- Two group picnic shelters
- Eighty-three car parking spaces
- Twenty-two car/trailer parking spaces
- Thirty-four picnic sites
- Four miles of paved road

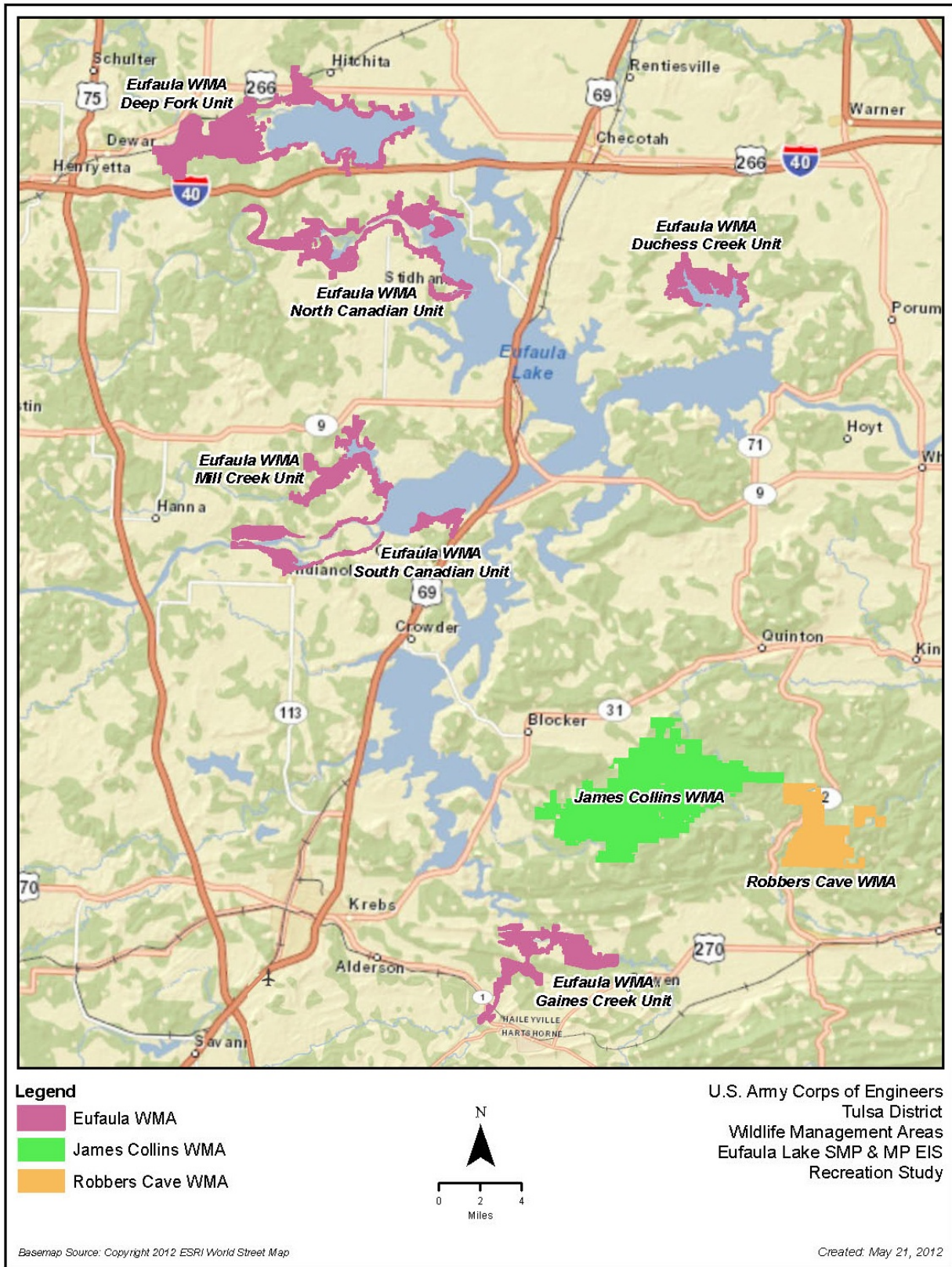


Figure 3-18. Wildlife Management Areas – Eufaula Lake

3.2.6.2 Eufaula City Park and Eufaula Cove South

These two recreation areas are managed by the City of Eufaula and are located in Lake Area 3. Together, they total 192 acres in size, and the average annual visitation to these areas is 265,903, which equates to 2,570 average annual visits per acre. The city has sub-leased portions of these recreation areas to private concessionaires for the operation of a marina, restaurants, and Yogi Bear’s Jellystone Park-Camp Resort. The layout of Eufaula City Park and Eufaula Cove South are shown on a map in **Appendix E**. Yogi Bear’s Jellystone Park Camp Resort is described in Section 3.2.6.3. Land-based recreation facilities managed by the City of Eufaula include:

- Eight campsites (no electricity)
- One hundred fifty-five car parking spaces
- One hundred sixty car/trailer parking spaces
- Playground
- Sanitary dump station
- Vault restroom
- Three vault restrooms with showers
- Grocery store
- Two restaurants
- Snack bar
- Two multipurpose play courts
- Eighteen picnic sites
- Six miles of paved road
- Three miles of unpaved road

3.2.6.3 Yogi Bear’s Jellystone Park-Camp Resort

This facility is located within the Eufaula City Park lease area, in Lake Area 3. The City of Eufaula has sub-leased a portion of their out-granted area to Yogi Bear’s Jellystone Park-Camp Resort. The campground/resort provides a variety of facilities and activities geared toward families with children, which include:

- Twenty-two RV sites (full hook-ups)
- Twenty-three cabins (kitchen or kitchenette, full bath, air conditioning, TV)
- Putt-putt golf

- Aqua park
- Shuffleboard
- Playground

The area is open from mid-May through the first week in September, or approximately 120 days each year. Data provided by the campground/resort operator indicates that visitation in 2010 and 2011 was 22,860 and 27,346, respectively. Occupancy rates for this facility cannot be determined, since it is not known how much of the visitation was attributable to overnight visitation.

3.2.6.4 Juniper Point Recreation Area

This recreation area is 242 acres in size and is located in Lake Area 5. Juniper Point Recreation Area is managed by the City of Crowder. The average annual visitation is 21,576, which equates to 77 average annual visits per acre. The layout of Juniper Point Recreation Area is shown on a map in **Appendix E**. Land-based recreation facilities include:

- Vault restroom
- Vault restroom with shower
- Twenty-five car parking spaces
- Sixty-nine car/trailer parking spaces
- Sixteen picnic sites
- Three miles of paved road

3.2.7 Other Existing Land-based Recreation Areas and Facilities

There are several other land-based recreation areas within the Eufaula Lake area. Two of these areas are located below the Eufaula Lake Dam and are managed by USACE. The others are privately-owned RV parks and campground facilities located near Eufaula Lake.

3.2.7.1 Eufaula Dam Fishing and ATV Use Areas

Below Eufaula Dam there is an area for fishing and an area for ATV use. The fishing area is maintained by USACE and is approximately 4 acres in size. It is used exclusively for fishing from the shoreline. No facility or visitation data is available for this area. USACE has also set aside an area below the dam that is approximately 450 acres in size and is used exclusively for the operation of ATVs. No facility or visitation data is available for this area.

3.2.7.2 Checotah/Lake Eufaula West KOA Campground

The Checotah/Lake Eufaula West KOA Campground is located immediately adjacent to Eufaula Lake in Lake Area 1. The campground is located at I-40 and Pierce Road Exit #255. The campground has a wide variety of recreation facilities and amenities that include:

- Fifty-four recreational vehicle (RV) sites (full hook-up)
- Nine tent sites

- Four cabins (kitchenette, air-conditioned)
- Store/gift shop (camping/RV supplies, groceries, local crafts)
- Restaurant (full menu)
- Swimming pool
- Laundry
- Group meeting room
- Fishing pond (catch and release)
- Petting zoo (barnyard animals)
- Hiking trails
- Sports field/playground/pet walk

3.2.7.3 Terra Starr RV Park – Checotah, OK

This RV Park is member-owned and only open to the public on a limited basis (seven days per year). Stays of more than seven days per year require payment of an annual maintenance fee, purchase of an Undivided Deeded Interest, and transfer/filing fee. The park includes:

- One hundred forty-five RV sites (full service)
- One hundred forty-five RV sites (partial service)
- Playground
- Miniature golf
- Multi-purpose court
- Swimming pool

There are a few other RV parks and campgrounds near Eufaula Lake. However, they are either very small areas offering little more than a place to park an RV, or are membership-only campgrounds that are not open to the general public.

3.3 Land-based Recreation Economic Impact

According to visitation data provided by USACE, approximately 59 percent of the annual visits to Eufaula Lake are attributable to land-based recreation activities. This equates to approximately 1,416,000 visits annually.

The USACE Recreation Economic Assessment System (REAS) is a recreation economic model originally developed at Michigan State University and later refined by USACE Engineering Research and Development Center (ERDC). REAS was applied to the visitation data to assess the economic value of the land-based recreation at Eufaula Lake. Land-based recreation visitors spend an average of \$23.54 per visit (adjusted to 2012 dollars), which is approximately \$33,332,640 of annual economic impact to the 30-mile region around

Eufaula Lake. For all types of recreation at Eufaula Lake, the annual economic impact is estimated to be \$56,496,600. It is difficult to break out economic impacts based upon type of recreation activity because there is significant crossover recreation among recreation activities. That is, a single visit may include both land-based and water-based recreational activities. Economic data are compiled by “visit,” and generally do not distinguish between the various activities a visitor may engage in during a particular visit. In addition, water-based activities are often dependent on land and land/water interface facilities, so economic benefits are not necessarily separable. Detailed information about REAS and the calculations for Eufaula Lake can be found in **Appendix D**.

3.4 Carlton Landing Proposed Development

Carlton Landing is a 1,650-acre privately-owned site, located adjacent to USACE property in Lake Area 3, approximately 2.8 miles southwest of Longtown. The developer is requesting a change in the shoreline designation of the USACE-owned shoreline adjacent to the development, as well as issuance of a commercial concession lease, in order to construct and operate a 300-slip marina and other recreation-related facilities which would be available to the public.

There are a variety of land-based recreation features proposed for the Carlton Landing development. The proposal identifies the following land-based recreation features:

- Nature center, which will include:
 - Fish and wildlife educational exhibits
 - Butterfly garden
 - Children’s tree-house exhibit
 - Kids-to-nature play area
 - Outdoor classroom
 - Overlook tower
 - Trails
 - Outdoor picnic area
- Adventure zone, which will include:
 - Gibbon slack line course
 - Rock climbing wall
 - Bungee bounce area
 - Bouldering course
 - Ropes course
 - Pony rides

- Structures, which will include:
 - Refuge shelters
 - Picnic facilities
 - “Glamping” (upscale camping) facilities – permanent campsite structures
 - Primitive campsites
 - Group camp area
 - Toilets and bathhouses
 - Commercial concession facilities (drinks, snacks, bike rental)
 - Outdoor amphitheater
- Trails, which will include:
 - Improved pathways to accommodate electric golf carts
 - Horse riding trails
 - Single track mountain biking trails
- Infrastructure and general facilities, which will include:
 - Retaining walls
 - Parking areas
 - Access roads
 - Dog parks

Section 4

Water-Based Recreation and Land/Water Interface Recreation Facilities

Water-based outdoor recreation includes opportunities and activities that typically occur on water areas managed for recreational purposes by USACE and governed by 36 CFR, Chapter III, Part 327, Rules and Regulations Governing Public Use of Water Resource Development Projects Administered by the Chief of Engineers (38 FR 75520, 23 March 1973) Title 36, Chapter III, Part 327. This includes activities such as boating, swimming, fishing and water skiing/tubing. The purpose of this chapter is to identify, quantify, characterize and map water-based recreation activities and land/water interface recreation facilities around Eufaula Lake, which will serve as a baseline from which to measure the potential impacts to water-based recreation under each of the alternatives being considered in the EIS. In addition, density and carrying capacity for existing water-based recreation activities are evaluated and assessed.

According to the National Recreation and Park Association, water is the number one recreation attraction in America. Swimming in lakes, streams and waters is ranked among the top ten recreational activities. Lakes and oceans remain the top vacation destinations in America. Whether one uses aquatic resources to swim, boat, ski, or fish or simply to take advantage of surrounding resources such as bicycle paths, walkways, and hiking trails, water is a recreation resource that offers rest, relaxation, fun, and fitness.

There are a variety of water-based recreation opportunities/activities and land/water interface recreation facilities located within the region and at Eufaula Lake. This section of the report focuses on recreational activities that typically occur on water, such as swimming, boating, fishing, and water skiing/tubing, as well as the land/water interface recreation facilities that enable those opportunities and activities.

A useful tool and source of information is the Water and Land Recreation Opportunity Spectrum (WALROS). The WALROS Users' Handbook, Second Edition is included in its entirety in **Appendix B**. The basic premise of WALROS is the classification of recreational activities and settings to achieve a desired experience that result in benefits to the individual, community, economy and environment. Appendix B of the WALROS Handbook includes an extensive list of locations where WALROS has been tested and used for planning or management purposes.

4.1 Regional Land/Water Interface Recreation Facilities

As in the other sections of this Recreation Study, a 50-mile radius from Eufaula Lake defines the region for the analysis of land/water interface recreation facilities. Water-based recreational opportunities are basically determined and limited by the quantity of land/water interface recreation facilities that provide access to the water, such as boat ramps, marinas, swim beaches, private and community docks. A desktop inventory of these facilities was conducted in order to quantify the water-based recreational opportunities available within the region.

In addition to the four other USACE lakes within 50-miles of Eufaula Lake, as identified in Section 3.1.1 (See **Figure 3-1**), one additional lake (Wister Lake) was included in the regional analysis of land/water interface recreation facilities and water-based recreation activities within the region. Wister Lake is a USACE lake

within the region, but was excluded from regional comparative analysis of USACE managed recreation facilities in the land-based recreation portion of this report (Section 3), since the land-based facilities are managed by the State of Oklahoma.

Table 4-1 depicts the number and type of land/water interface recreation facilities at USACE lakes within the region. The source of this data was USACE – OMBIL- 2010, USACE – Value to the Nation and NRMS - 1999 (static data only). The Eufaula Lake percentages of the total regional USACE water-based recreation facilities are:

- Water Surface Acres – 54 percent
- Public Boat Ramps – 32 percent
- Car/Trailer Spaces – 30 percent
- Marina Slips – 40 percent
- Private/Community Boat Docks – 67 percent
- Boats served by Private/Community Boat Docks – 79 percent
- Swim Beaches – 26 percent

Table 4-1. Regional Water-Based Recreation Facilities at USACE Regional Lakes

Lake Name	Water Surface Acres	Boat Ramps Located in Public Recreation Areas	Car/Trailer Spaces at Public Boat Ramps	Marina Slips	Private And Community Docks	Total Boats Served by Private and Community Docks	Average Number of Boats Served Per Private/Community Dock	Swim Beaches	Number of Car Parking Spaces at Swim Beaches
Eufaula Lake	97,008*	33	1,096	1,097	1,669	5,439	3.3	5	734
Fort Gibson Lake	19,900	26	737	184	547	917	1.7	1	758
Robert S. Kerr Lake	43,800	5	306	100	0	0	0	2	335
Tenkiller Ferry Lake	12,900	33	915	1,264	288	572	2.0	9	705
Webbers Falls Lake	11,600	8	328	65	0	0	0	1	125
Wister Lake	7,333	5	122	0	0	0	0	1	50
Total	179,641	110	3,504	2,710	2,504	6,928	2.3	19	2,707

* Water surface acres for Eufaula Lake were changed as a result of more accurate GIS measurement capabilities

Even though Eufaula Lake comprises slightly more than half of all the water surface acres available within the region, only about 30 percent of the public boat ramps and car/trailer parking spaces within the region

are located there. Conversely, nearly 70 percent of the regional private and community docks and nearly 80 percent of the regional boats served by those docks are located at Eufaula Lake. (See Figures 4-1 and 4-2)

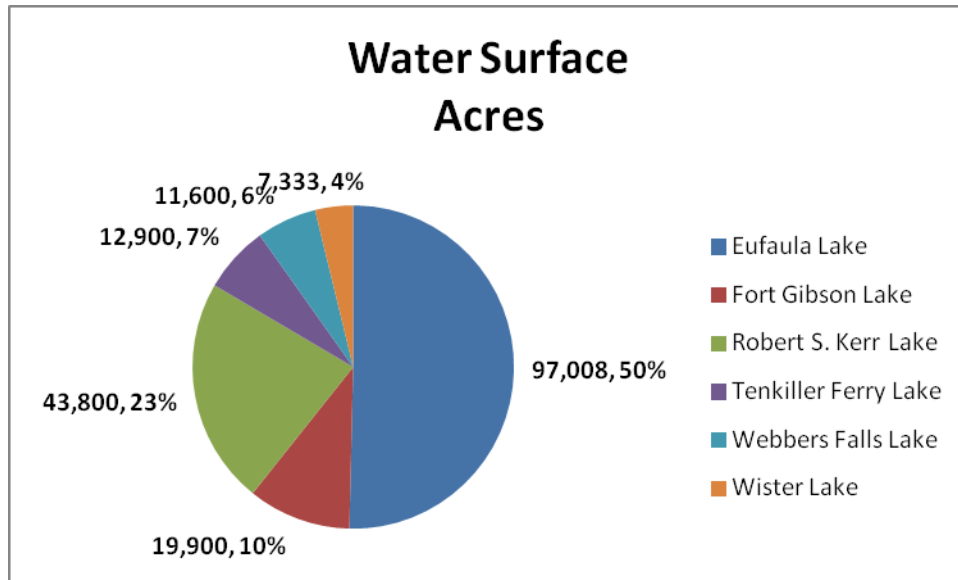


Figure 4-1. Water Surface Acres of Regional Lakes

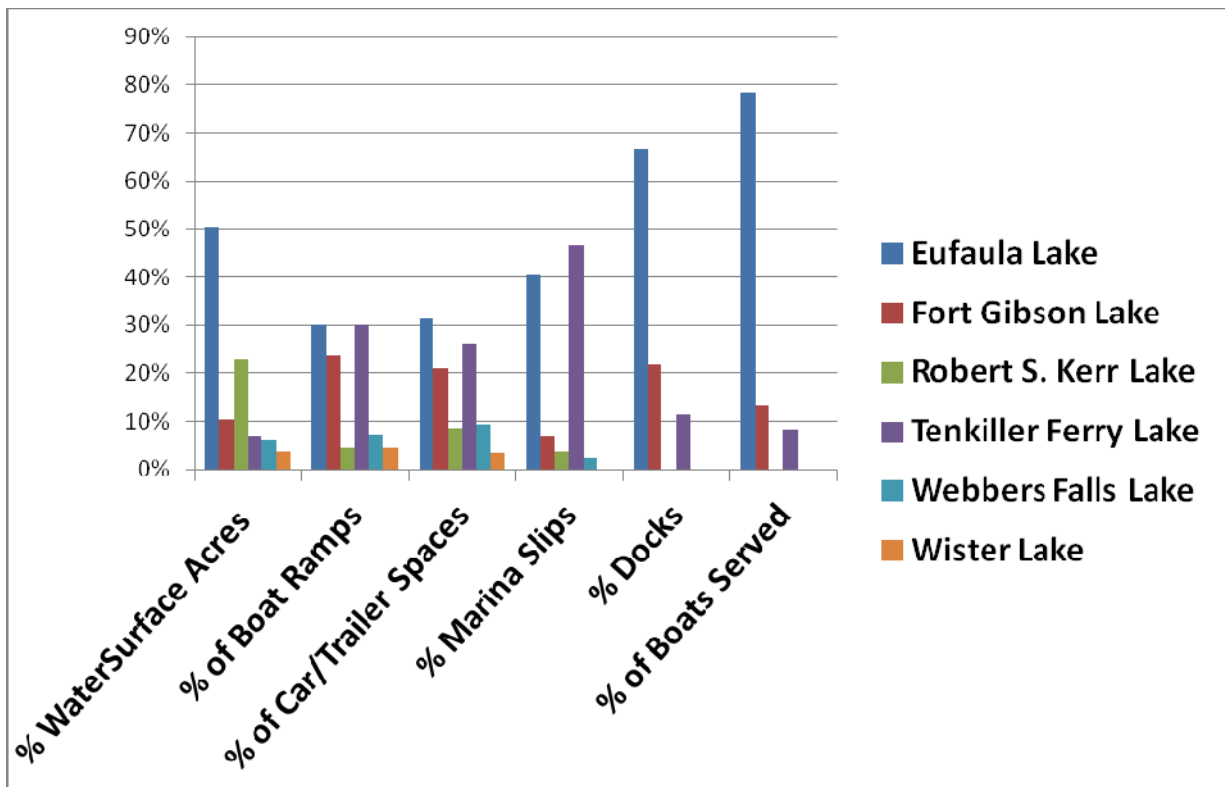


Figure 4-2. Percent of Water-based Recreation Facilities at Regional Lakes

This apparent imbalance in facilities requires additional explanation. There are thirty-three boat ramps located within designated public recreation areas at Eufaula Lake. There are forty-three additional boat ramps located elsewhere around the lake. Therefore, fifty-seven percent of the boat ramps located on Eufaula Lake are not located within designated public recreation areas. Although these additional boat ramps are considered public boat ramps, they are used almost exclusively by residents that live in or near the subdivisions where the boat ramps are located. Typically, these boat ramps do not have directional signs as to their location, have minimal car and car/trailer parking capacity and are not designed, operated or maintained to accommodate recreational use by members of the general public. In some cases, general public access is restricted because of controlled access into the subdivision where the boat ramp is located. Many members of the public would not feel comfortable using one of these boat ramps because of the private nature of their appearance and lack of public recreation support facilities, such as restrooms, designated parking spaces, playgrounds, picnic sites, etc. These boat ramps are outgranted by USACE to local homeowner associations or local county governments for the convenience they provide to local residents. **Figure 4-3** depicts the number of boat ramps by lake area that are located in public recreation areas and those that are located within subdivisions, adjacent to the lake.

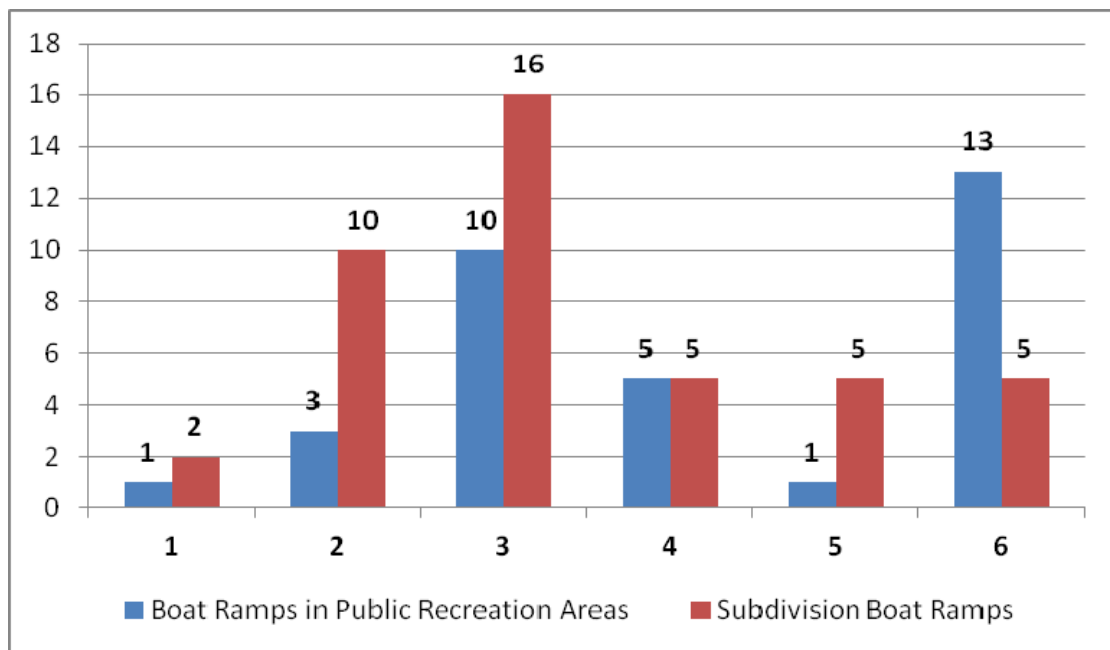


Figure 4-3. Boat Ramps by Lake Area Located in Public Recreation Areas and Adjacent Subdivisions

On the average, there are 3.3 boats served by each private and community dock on Eufaula Lake. The average for all other USACE lakes nationwide is 1.4 boats per dock and the average for all other lakes within the Tulsa District is 1.5 boats per dock. Therefore, the average number of boats per private and community boat dock at Eufaula Lake is more than twice that of other USACE Lakes throughout the country.

4.2 Regional Water-based Recreation Opportunities

Land/water interface recreation facilities are the critical links that allow water-based recreation opportunities to be provided and activities to occur. Land/water interface recreation facilities include boat ramps, swimming beaches, marinas, and private and community docks. Water-based recreation

opportunities would not exist if not for the land/water interface recreation facilities. Recreational boating activities cannot occur without a marina, boat ramp, or boat dock to provide access to the water surface. Likewise, swimming at designated locations cannot occur, if not for the swimming beach. This is true for all types of water-based recreation activities.

4.2.1 Boating

Recreational boating opportunities are largely dependent upon and limited by the quantity of land/water interface recreational infrastructure facilities such as, boat ramps, marinas, and boat docks, which provide recreational boating access to the water.

For the purposes of this study, regional recreation boating opportunities were calculated by adding the following facility numbers together for USACE lakes within the region:

- Number of Car/Trailer Parking Spaces at public boat ramp parking lots
- Number of Marina Slips
- Number of boats served by private/community docks

When calculating recreational boating opportunities, the type of water-based recreation activity, such as fishing from a boat, water skiing, or pleasure cruising is not of importance. The opportunity for recreational boating is based on the ability to place a boat or vessel on the water surface and the ability to do that is based on the quantity and availability of land/water interface facilities and infrastructure, such as boat ramps, marinas, and docks that provide access to the water surface area.

Using data from **Table 4-1**, the following formula was used to estimate regional recreational boating opportunities:

$$\begin{aligned}
 & 3,504 \text{ (car/trailer spaces at public boat ramps)} \\
 & + 2,710 \text{ (marina slips)} \\
 & + 6,928 \text{ (boats served by private and community docks)} \\
 & = 13,142 \text{ (Regional Recreational Boating Opportunity Coefficient)}
 \end{aligned}$$

According to U.S. Coast Guard statistics, 2002 National Recreational Boating Survey Report, the average number of people on-board a recreational boat when underway is three. Therefore, regional boating opportunities can be calculated by multiplying the regional boating opportunity coefficient (13,142) by 3 ($13,142 \times 3 = 39,426$). Therefore, within the region, there are **39,426** opportunities for persons to go boating and participate in boating recreation-related activities at any given point in time.

4.2.2 Swimming

For the purposes of this study, swimming opportunities and activities were limited to swimming that occurs at designated swimming beaches at USACE lakes within the region. Limiting the study area to designated swimming beaches only allows a comparative analysis to be conducted on swimming activities within the region.

Standards for the design and operation of swimming beaches at USACE lakes are contained in EM 1110-1-400, Recreation Facility and Customer Service Standards, 1 Nov 2004. Paragraph 5.4.4.1 indicates: "Swim

area sizing should be based on the assumption that approximately 60 percent of the total number of beach users will be on the beach at one time, with 30 percent in the water and 10 percent elsewhere. As a rule of thumb, a turnover factor of 3 will be used for design purposes. Ideally, 50 square feet of sand and turf and 30 square feet of swimming area inside the buoyed safety area should be provided for each person. Swim area capacities will vary according to the attendance, supervision, size of swim area, anticipated usage, and type of swim area experience desired. Any space standard used to compute swim area capacity should be flexible enough to accommodate these factors. Parking areas should be sized to prevent overcrowding of swim areas.” In addition, **Table 2-4** of EM 1110-1-400 indicates there should be one car parking space for every three swimmers, which is the same load factor used in the USACE – Visitor Estimating and Reporting System (VERS), which is used for calculating recreation visitation at USACE lakes.

Using these design standards and load factors, we can estimate the approximate number of swimming opportunities available at USACE lakes within the region. The formula used to estimate swimming opportunities is:

- Swimming Opportunities = (Number of Car Parking Spaces at Recreation areas with Designated Swim Beaches) X 3 (VERS Load Factor and Parking Space Requirement for Swim Beaches)
- Regional swimming opportunities can be determined using data from **Table 4-1** in the following formula:

$$\begin{aligned} & 2,707 \text{ (number of car parking spaces at recreation areas with designated swim beaches)} \\ & \quad \times \quad 3 \text{ (number of persons per car)} \\ & = 8,121 \text{ (Regional Swimming Opportunities)} \end{aligned}$$

USACE Recreation and Facility Customer Services Standards (EM 110-1-400) assume that 60 percent of potential swimmers will be on the beach and that 30 percent will actually be swimming at one time. By applying the recommended 30 square feet of swimming area inside the buoyed safety area for each person, we can estimate the regional requirement for the water component for designated swim beaches. The following formula is used to calculate the square feet of water area needed for designated swim beaches within the region:

$$\begin{aligned} & 8,121 \text{ (Regional Swimming Opportunities)} \\ & \quad \times \quad 0.30 \text{ (Estimated percentage of people in water)} \\ & = 2,436 \text{ (Maximum Estimated number of people in water swimming)} \\ & \quad \times \quad 30 \text{ (Square feet per person)} \\ & = 73,080 \text{ SF (Regional Square Feet of swimming area inside buoyed safety areas)} \end{aligned}$$

While actual swimming beach use is not known for other USACE lakes within the region, from survey data gathered at Eufaula Lake, current swimming beach use during peak use periods was estimated and compared to USACE standards to estimate the current percentage of carrying capacity for swimming at designated swim beaches located at Eufaula Lake. Data analysis and information specific to swimming at Eufaula Lake is included in Section 5.3 of this report.

4.3 Water-Based Recreation at Eufaula Lake

As in other sections of this report, the lake was divided into six lake areas as depicted in **Figure 2-1**. At the normal operating pool of 585 MSL, the total water surface of Eufaula Lake is 97,008 acres. The water surface acres and the percentage of the total for each of the six lake areas are identified in **Table 4-2**.

Table 4-2. Water Surface Acres at 585.0 MSL – By Lake Area

Lake Area	Water Surface Acres	Percentage of Total Water Surface Acreage
1	12,385	13%
2	16,173	17%
3	18,128	19%
4	15,115	15%
5	9,963	10%
6	25,244	26%

4.3.1 Restricted and Unrestricted Water Areas at Eufaula Lake

The water surface acres of the lake and of each lake area were categorized into one of two general water classifications: Restricted or Unrestricted.

Restricted water is defined as water that is less than three feet deep at the normal pool elevation of 585.0 MSL (Mean Sea Level) and/or water where there is standing timber. Restricted water is only considered safe for operating non-motorized watercraft or motorized watercraft engaged in fishing activities. An example of restricted water is presented in **Figure 4-4**.

Unrestricted water is defined as open water that is considered safe for all types of boating activities. Unrestricted water is greater than three feet deep at the normal pool elevation of 585.0 MSL and contains no standing timber. An example of unrestricted water is presented in **Figure 4-5**.

Table 4-3 identifies the unrestricted and restricted water surface acres for the entire lake and each of the six lake areas. **Figure 4-6** graphically depicts this information. Overall, Eufaula Lake includes 44,790 acres of restricted water surface and 52,218 acres of unrestricted water surface, which is 46 percent and 54 percent of the total water surface acres, respectively. In Lake Areas 1, 2, and 5 the amount of restricted water surface acres is greater than the amount of unrestricted water surface acres.

Table 4-3. Restricted and Unrestricted Water Acres – Eufaula Lake

Lake Area	Unrestricted Water Surface Acres	Restricted Water Surface Acres	Total Water Surface Acres
1	1,517	10,868	12,385
2	4,877	11,296	16,173
3	14,781	3,347	18,128
4	11,833	3,282	15,115
5	0	9,963	9,963
6	19,210	6,034	25,244
Total	52,218	44,790	97,008



Figure 4-4. Example of Restricted Water



Photo 4-5. Example of Unrestricted Water

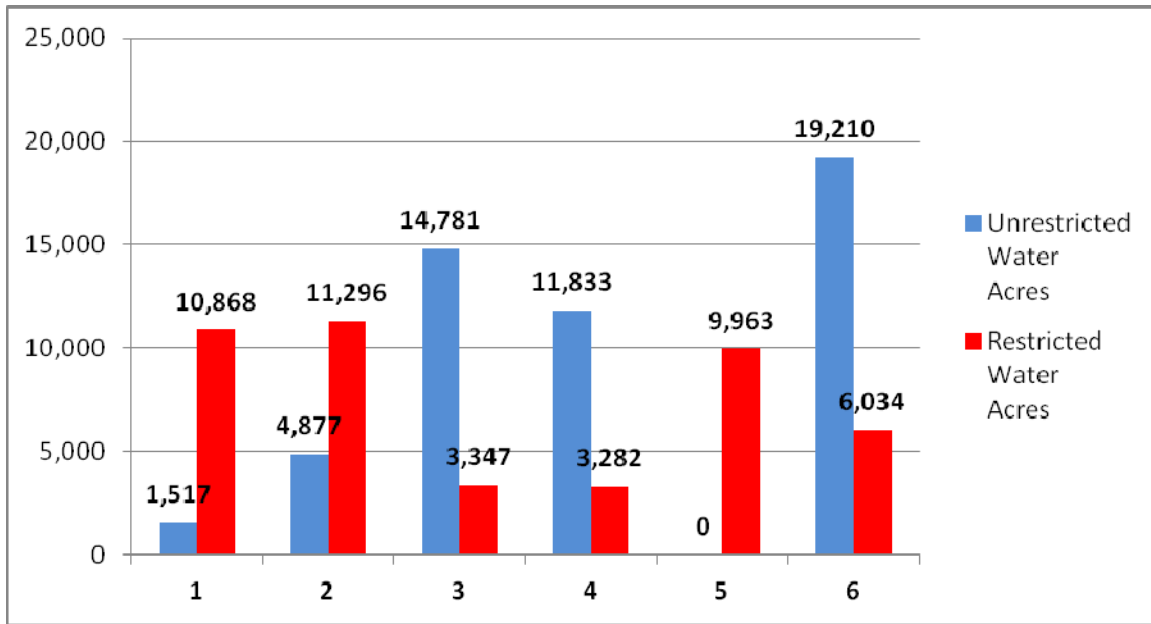


Figure 4-6. Acres of Restricted and Unrestricted Water Acres by Lake Area – Eufaula Lake

Restricted water surface acres encumbered by standing timber were established using GIS mapping and aerial photographs. Restricted water surface acres where water depths were less than three feet deep were obtained from [Appendix C of the Volumetric Survey Report of Eufaula Lake, June 2004 Survey, Prepared by the Texas Water Development Board](#). The table in this appendix identifies the number of water surface acres for Eufaula Lake in one tenth foot increments. This data was used to determine that there are approximately 9,492 water surface acres where water depths are less than three feet. **Table 4-4** identifies the water surface acres for each lake area that was classified as Restricted.

Table 4-4. Water Surface Acres Classified as Restricted by Lake Area

	Lake Area 1	Lake Area 2	Lake Area 3	Lake Area 4	Lake Area 5	Lake Area 6	Total
Water Surface Acres Encumbered by Standing Timber	9,629	9,679	1,534	1,770	9,176	3,510	35,298
Water Surface Acres Less Than Three Feet Deep	1,239	1,617	1,873	1,512	787	2,524	9,492
Total Restricted Water Surface Acres	10,868	11,296	3,347	3,282	9,963	6,034	44,790

The two primary reasons for the high percentage of restricted water area are 1) the overall shallowness of the lake resulting from the gently rolling topography in the region and 2) the large amount of standing timber intentionally left in the lake during construction for the purpose of fish habitat improvement.

4.3.2 Water and Land Recreation Opportunity Spectrum (WALROS) Classification

While determining the amount of restricted and unrestricted water area is a major consideration when estimating boating carrying capacity, another important step is to establish the appropriate WALROS

classification. The WALROS classification process was developed through a collaborative effort based on expert opinions, professional experience, published articles and plans, and sound professional judgment.

In order to help establish the appropriate WALROS classification for Eufaula Lake, three inventory assessments were conducted.

1. **Physical Inventory** – Physical attributes are features that are relatively permanent or fixed and not likely to change. The protocol worksheet for the physical inventory is provided as **Table 4-5**.
2. **Social Inventory** – Social attributes include the type of current recreational uses, nearby land and water activities, and special values and meanings associated with the area. The protocol worksheet for the social inventory is provided as **Table 4-6**.
3. **Management Inventory** - Management attributes are those features that are provided for, managed, and may be changed by the managing agency or its partners. The protocol worksheet for the management inventory is provided as **Table 4-7**.

The inventory results, as well as other WALROS criteria, indicate the appropriate WALROS classification for Eufaula Lake is **Rural Developed**, which has an associated boating capacity range of twenty to fifty water surface acres per boat. These three inventories were also conducted for each of the six individual lake areas. However, the results were so similar for each of the six lake areas, it was determined that it is appropriate to also assign the Rural Developed WALROS classification to each of the six lake areas.

Table 4-5. Physical Inventory Protocol

Physical Inventory Protocol Sheet						
Degree of development —Degree that dams, major bridges, marinas, parks, resorts, highways, or other municipal, residential, industrial, or commercial structures are present.	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%
Sense of closeness to a community —Degree that visitor’s sense that they are close to the sights, sounds, and smells typical of a community.	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%
Degree of natural resource modification —Degree that the visitors are aware that human activity, technology, or development has altered the natural resources.	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%
Distance from development on or adjacent to the water resource —Mileage from dams, major bridges, marinas, resorts, or other municipal, industrial, commercial, or residential areas.	Less than 0.5 miles	0.5–2 miles	2–5 miles	5–8 miles	8–10 miles	More than 10 miles
Degree that natural ambiance dominates the area —Degree that there is a sense of tranquility and opportunity to see, hear, and smell nature.	Very minor, very little, or rare 0–3%	Minor, little, or seldom 3–10%	Occasional, infrequent, or periodic 10–20%	Prevalent, common, or apparent 20–50%	Very prevalent or widespread 50–80%	Extensive, dominant, or a great deal 80–100%
WALROS Classification The red number indicates the classification selected	1 Urban	2 3 Suburban	4 5 Rural Developed	6 7 Rural natural	8 9 Semi- primitive	10 11 Primitive

Highlighted cells indicate the category selected

Table 4-6. Social Inventory Protocol

Social Inventory Protocol Sheet											
Degree of visitor presence — Degree that the sights, sounds, and smells of other visitors, their equipment, their impacts, or litter are present.	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%					
Degree of visitor concentration — Degree that visitors congregate in the area (e.g., service area, launches, entrances, swim areas, trailheads, vistas, picnic, or camp areas).	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%					
Degree of recreation diversity — Degree that there is a mixture of recreation activities being participated in or equipment being used.	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%					
Distance to visitors services, security, safety, comforts, and conveniences.	Less than 0.5 miles	0.5–2 miles	2–5 miles	5–8 miles	8–10 miles	More than 10 miles					
Degree of solitude and remoteness —Degree that visitors view themselves as being alone and far away from civilization, in a wild and remote place.	Very minor, very little, or rare 0–3%	Minor, little, or seldom 3–10%	Occasional, infrequent, or periodic 10–20%	Prevalent, common, or apparent 20–50%	Very prevalent or widespread 50–80%	Extensive, dominant, or a great deal 80–100%					
Degree of non-recreational activity — Degree of sights, sounds, and smells of non-recreational activities (i.e., shipping, trains, factories, roads, houses, airplanes, mining, and farming).	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%					
WALROS Classification The red number indicates the classification selected	1 Urban	2 Suburban	3 Suburban	4 Suburban	5 Rural Developed	6 Rural natural	7 Rural natural	8 Rural natural	9 Semi-primitive	10 Semi-primitive	11 Primitive

Highlighted cells indicate the category selected

Table 4-7. Management Inventory Protocol

Management Inventory Protocol Sheet											
Degree of management structures —Degree that management facilities, buildings, interpretive signage, equipment, buoys, mileage markers, entry stations, towers, security lighting, administrative offices and compounds are present.	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%					
Distance to on-site developed recreation facilities and services —Mileage to developed campgrounds, restaurants, stores, medical services, marinas, resorts, pump stations, amphitheaters, picnic sites, play areas, telephone, showers, visitor centers, etc.	Less than 0.5 miles	0.5–2 miles	2–5 miles	5–8 miles	8–10 miles	More than 10 miles					
Distance from developed public access facilities —Mileage to developed and well-maintained access points such as parking lots, trailheads, entrances, boat launches, access roads, and other staging or launching areas.	Less than 0.5 miles	0.5–2 miles	2–5 miles	5–8 miles	8–10 miles	More than 10 miles					
Frequency of seeing management personnel —Likelihood of seeing management presence such as rangers, local sheriff or police, entrance station staff, hosts, maintenance workers, lifeguards, marina operators, concessionaires, guides, and other people of authority	Extensive, dominant, or a great deal 80–100%	Very prevalent or widespread 50–80%	Prevalent, common, or apparent 20–50%	Occasional, infrequent, or periodic 10–20%	Minor, little, or seldom 3–10%	Very minor, very little, or rare 0–3%					
WALROS Classification	1	2	3	4	5	6	7	8	9	10	11
The red number indicates the classification selected	Urban		Suburban		Rural Developed		Rural natural		Semi- primitive		Primitive

Highlighted cells indicate the category selected

4.3.3 Swimming Opportunities – Eufaula Lake

There are five designated swim beaches located on Eufaula Lake, located in the following recreation areas:

- Arrowhead State Park – Lake Area 6
- Eufaula City Park – Lake Area 3
- Lake Eufaula State Park – Lake Area 2
- Highway 9 Landing Recreation Area – Lake Area 3
- Porum Landing Recreation Area – Lake Area 4

Only the swim beaches located at Highway 9 Landing, Porum Landing, and Eufaula City Park have delineated and buoyed swim areas, as required by EM 1110-1-400, Recreation Facility and Customer Service Standards, 1 Nov 2004. Information about each swim beach is located in **Table 4-8**.

Table 4-8. Designated Swimming Beach Information

Recreation Area Name	Lake Area #	Sand Beach (Square Feet)	Delineated Swim Area (Square Feet)	Number of Car Parking Spaces
Arrowhead State Park	6	195,024 SF	0 SF	158
Eufaula City Park	3	44,225 SF	9,210 SF	115
Lake Eufaula State Park	2	9,000 SF	0 SF	300
Highway 9 Landing	3	27,820 SF	94,250 SF	112
Porum Landing	4	6,112 SF	16,320 SF	49
TOTAL		282,181 SF	119,780 SF	734

Based on the square feet of delineated swim area and using the USACE standard of 30 square feet per swimmer, the delineated swim areas at Eufaula Lake will accommodate approximately 3,993 swimmers at one time. This does not include the water areas at swim beaches without delineated swim areas. However, this is not a concern because the limiting factor for all the swim beaches at Eufaula Lake is not the amount of sand beach or water swim area, but rather is the number of available parking spaces to accommodate beach users. In total, there are 734 vehicle parking spaces located near swim beaches. Using a load factor of three people per vehicle, the estimated maximum number of people that could use swim beaches at one time is 2,202, which is significantly less than the 3,993 people that can be accommodated within delineated swim areas at the lake.

The same limiting factor is true for the sand beach areas at all swim beaches. Based on the existing square feet of sand beach area and using the USACE standard of fifty square feet per person, the sand beach areas at Eufaula Lake will accommodate approximately 5,644 people at one time. Again, however, the limiting factor is the number of existing vehicle parking spaces, which would limit the number of beach users at one time to 2,202 people.

Based on this analysis, there is an adequate amount of square feet of delineated swim area and square feet of sand beach area to accommodate the maximum potential number of beach users at Eufaula Lake.

4.3.4 Recreational Boating Opportunities – Eufaula Lake

Recreational boating opportunities are largely dependent upon and limited by the quantity of land-based and land/water interface recreational infrastructure facilities such as, boat ramps, marinas, boat docks, and car/trailer parking spaces, which provide recreational boating access to the water.

There are six categories of boating activities included in this study; four of the categories are for powerboats and their associated recreational activities and two of the categories are for non-powered boats and their associated recreational activities. The six categories include:

- Power Boat/Cruising – Pleasure Boating
- Power Boat/Fishing
- Power Boat /Water Skiing/Tubing
- Personal Water Craft (PWC)
- Non-Powered/Kayak-Canoe/Row boat
- Non-Powered/Sail boat

The data in **Table 4-9** can be used to estimate recreational boating opportunities for Eufaula Lake and for each of the six lake areas. As discussed in Section 4.1, recreational boating opportunities are largely dependent upon and limited by the quantity of land-based and land/water interface recreational infrastructure facilities such as, boat ramps, marinas, boat docks, and car/trailer parking spaces, which provide recreational boating access to the water surface.

Table 4-9. Recreational Boating Opportunities by Lake Area Number – Eufaula Lake

Lake Area	Water Surface Acres	# of Car/Trailer Spaces at Public Boat Ramps	# of Marina Slips	# of Boats Served by Private and Community Boat Docks	Estimated # of Boats Served by Boat Ramps Managed by Non-Government Entities	Total Number of Existing Boating Opportunities
1	12,385	23	0	149	95	267
2	16,173	186	82	700	197	1,165
3	18,128	419	762	1,647	339	3,167
4	15,115	154	235	2,053	152	2,594
5	9,963	10	0	198	96	304
6	25,244	304	18	776	339	1,437
Eufaula Lake (All Lake Areas)	97,008	1,096	1,097	5,523	1,218	8,934

Note: Boats served by boat ramps located outside of designated recreation areas was estimated by taking the population within ¼ mile of the lake for each lake area multiplied by .06 percent (percent of OK residents that own boats)

The formula for estimating the recreational boating opportunities at Eufaula Lake is basically the same as the formula used for estimating regional boating opportunities, except that an additional data component

is included. This data is the boating opportunities provided through boat ramps managed by non-government entities, such as homeowners associations and/or local government entities on behalf of local subdivision residents. Boating opportunities are thus calculated by adding: 1) number of car/trailer spaces at public boat ramps; 2) number of marina slips; 3) number of boats served by private and community boat docks and 4) number of boats served by boat ramps located in subdivisions adjacent to the lake. There are currently approximately 8,934 recreational boating opportunities provided at Eufaula Lake.

In addition to estimating existing boating capacity, estimates on future potential boating capacity can also be derived by using data from **Table 4-9**. For example, if the current ratio of 3.3 boats per boat dock prevails, for every new private dock that is placed on the lake, an average of 3.3 additional boats could be placed on the water; for marina slips and car/trailer parking spaces, there is a one to one relationship. For each marina slip or car/trailer parking space that is added, one additional boat can be placed on the water. Also, population increases in subdivisions adjacent to the lake would allow for additional boats to be placed on the water. According to the U.S. Coast Guard publication “Recreation Boating Statistics – 2010,” there are 209,457 registered recreational boats in the State of Oklahoma, which means that approximately six percent of Oklahoma residents own a boat. Therefore, one can reasonably expect that for every 100-person increase in population in adjacent subdivisions, an additional 6 boats could potentially be placed on the water. This data is depicted in **Table 4-10**.

Using data from **Table 4-10**, estimates can be derived concerning potential increases in the number of boats on the lake under each of the alternatives analyzed in the EIS. These results are discussed later in this report.

Table 4-10. Potential Increase in Boat Numbers Resulting from Land/Water Interface Facilities

Category	Coefficient	Increase in Number of Boats
1 Private Boat Dock	3.3	3.3
1 Marina Slip	1	1
1 Car/Trailer Space	1	1
100 - increase in adjacent subdivision's population	6	6

4.3.5 Fishing Tournaments and Special Event Permits – Eufaula Lake

Each year, Eufaula Lake is host to a variety of fishing tournaments and other boating-related special events, such as regattas, poker runs, and parades. Information and data related to these water-related special events was obtained from USACE for the most recent five-year period (2007 – 2011). This data is presented below.

Fishing Tournaments (Figure 4-7)

- There is an average of 56 fishing tournaments held each year on Eufaula Lake.
- There is an average of 58 boats associated with each fishing tournament.
- Each year, there is an average of 3,299 boats associated with fishing tournaments on Eufaula Lake.

Boating-Related Special Events (Figure 4-8)

- There is an average of nine boating-related special events each year on Eufaula Lake
- There is an average of 268 boats associated with each boating-related special event
- Each year, there is an average of 2,600 boats associated with water-related special events

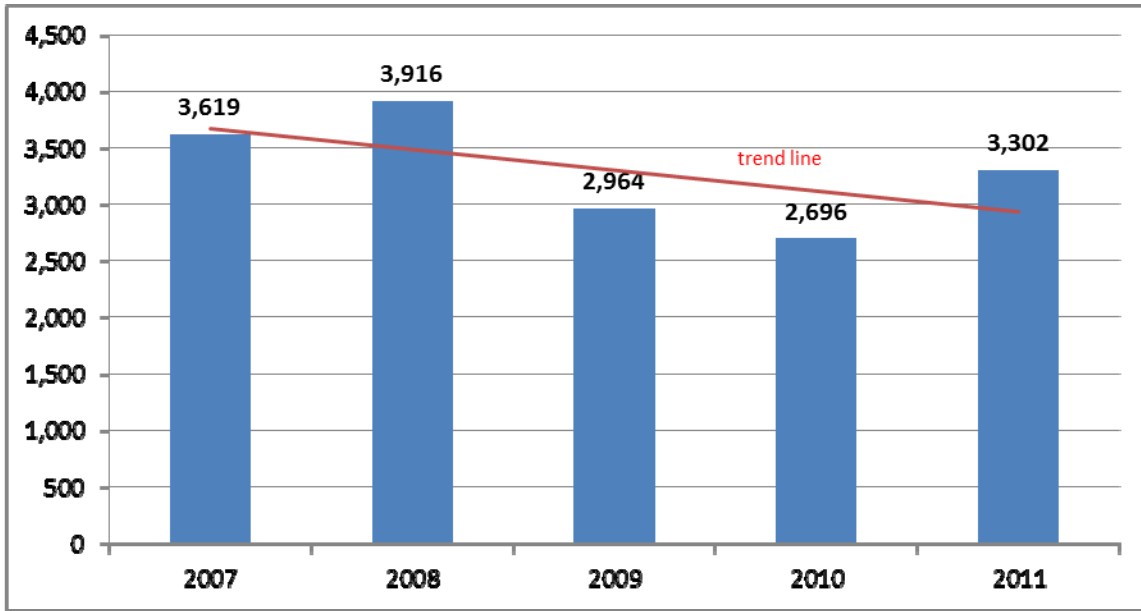


Figure 4-7. Number of Boats Used in Fishing Tournaments on Eufaula Lake 2007-2011

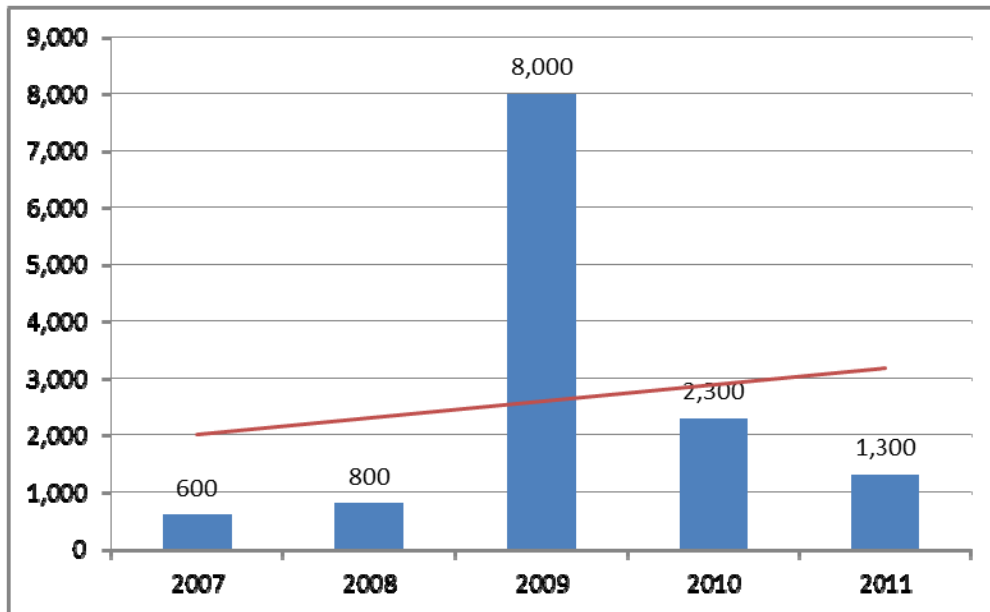


Figure 4-8. Number of Boats Used During Special Events on Eufaula Lake 2007-2011

Fishing Tournaments and Boating-Related Special Events Combined (Figure 4-9)

- There is an average of 66 events each year.
- There is an average of 163 boats associated with each event.
- Each year, there is an average of 5,899 boats associated with the combination of fishing tournaments and boating-related special events.

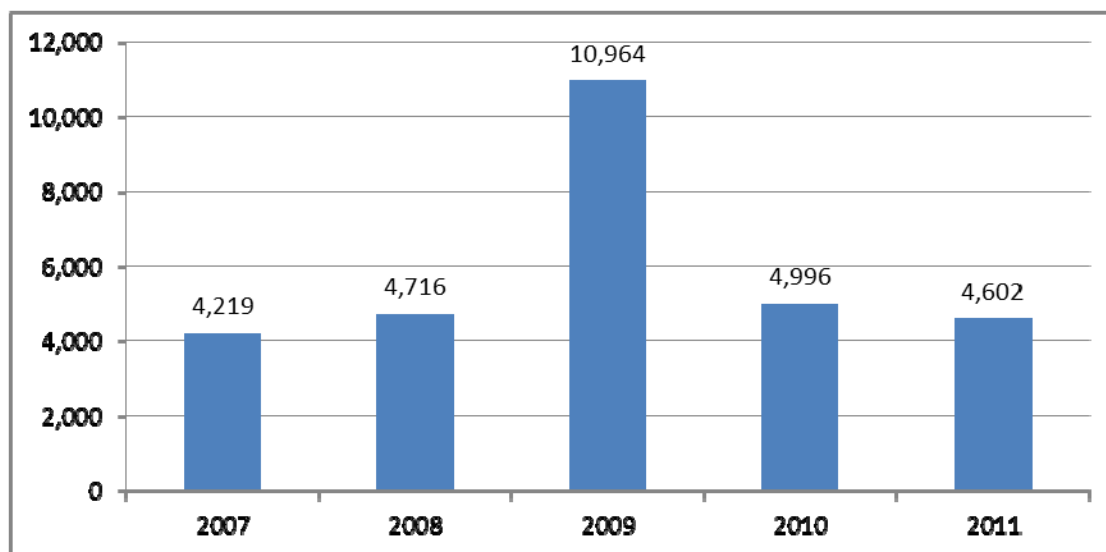


Figure 4-9. Number of Boats Used in Fishing Tournaments and Special Events on Eufaula Lake 2007-2011

The majority of the fishing tournaments and special events occur during the summer recreation season when the lake is the busiest. Typically, fishing tournaments and other special events are of short duration, so their impacts are relatively short-lived. However, boats associated with these events may create higher than usual boat traffic and congestion in certain parts of the lake. In addition, fishing tournaments or special events that occur on holiday or peak use weekends during the recreation season, may create significant safety issues and/or visitor conflicts caused from increased user density.

4.4 Boating Accidents – Eufaula Lake

The Oklahoma State Highway Patrol Marine Division is responsible for enforcing the boating laws within the state. They also are the responsible agency for boating accident investigation and maintaining the database for boating accidents within the state. Nine years of data (2003 – 2011) on boating accidents at Eufaula Lake was analyzed. From 2003 through 2011, there were 58 boating accidents reported on Eufaula Lake. The approximate location of each accident is identified in **Figure 4-10**. Boating accidents by year are depicted in **Figure 4-11**. The number of boating accidents and number of vessels involved in those accidents are depicted by lake area in **Figure 4-12**. The analysis that follows is based on the data provided by the state.

- In Oklahoma, there are 2.029 boating accidents per 100,000 in population.
- Oklahoma ranks as the ninth highest state in the United States for the number of recreational boating accidents with injuries, where alcohol was a contributing factor.

- Oklahoma is the 12th highest state in the nation for the number of fatal boating accidents per capita (0.386 per 100,000 people).

Annually in Oklahoma, there is an average of 0.058 boating accident per square mile of water surface area.

Even though the trend line for the number of boating accidents each year shows a downward trend, the number of boating accidents is still an area of concern, particularly in Lake Areas 3 and 4.

Data analysis specific to Eufaula Lake for the period from 2003 through 2011, revealed the following information:

- There were 82 vessels involved in 58 boating accidents (**Figure 4-12**).
- Property damage from boating accidents totaled \$256,350, representing an average of \$4,420 per accident (**Figure 4-14**).
- Twelve deaths and 62 injuries were caused by boating accidents (**Figure 4-13**).
- Alcohol was a contributing factor in 26 percent of the boating accidents.
- In 62 percent of the boating accidents, only one vessel was involved, while two or more vessels were involved in the remaining 38 percent.
- Twenty one percent of all boating accidents resulted in a fatality.
- Seventy six percent of all boating accidents resulted in an injury.
- Forty seven percent of all boating accidents occurred in Lake Area 3.
- Sixty six percent of all boating accidents occurred in Lake Areas 3 and 4.
- Sixty seven percent of all boating fatalities occurred in Lake Areas 3 and 4.
- Sixty eight percent of all boating-related injuries occurred in Lake Areas 3 and 4.
- Seventy nine percent of all boating accidents occurred on a weekend or holiday.

In Lake Areas 3 and 4, the average number of vessels involved per boating accident was significantly higher than in other lake areas, which strongly suggests that high boat density and overcrowding may be a critical factor in these two lake areas. Sixty-six percent of all boating accidents and 71 percent of all vessels involved in boating accidents occurred in Lake Areas 3 and 4.

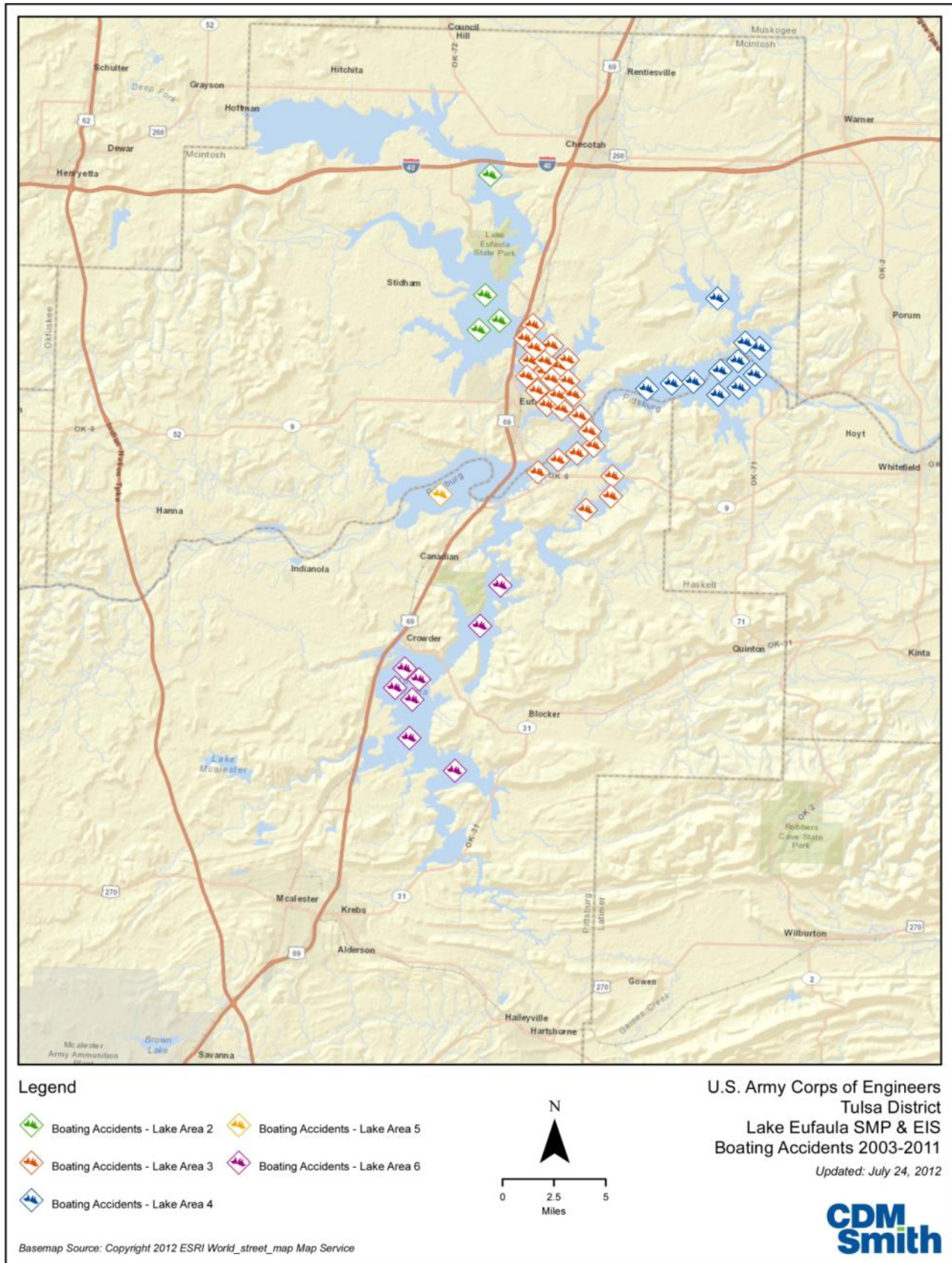


Figure 4-10. Boating Accident Locations (2003 – 2011)

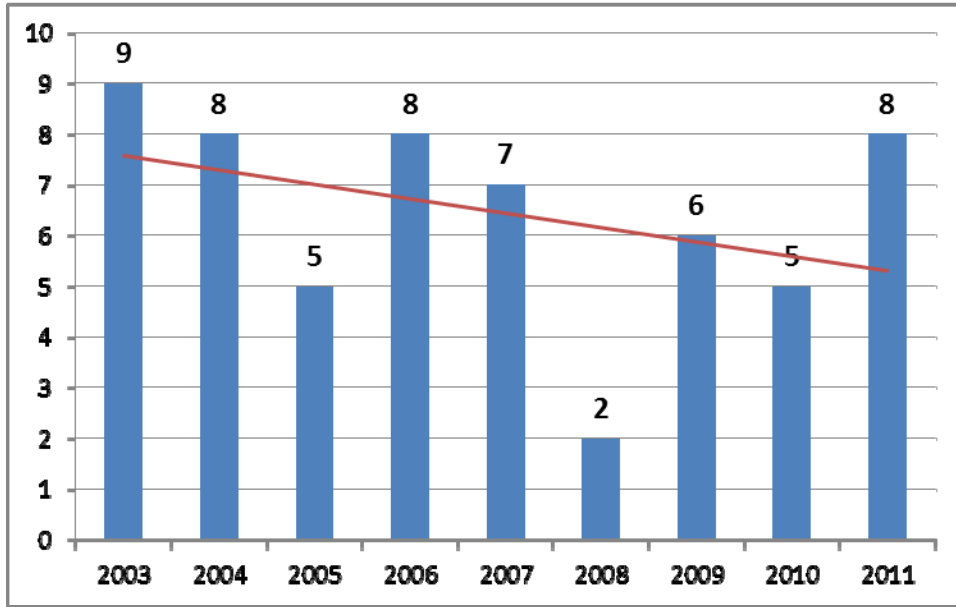


Figure 4-11. Number of Boating Accidents by Year 2003-2011

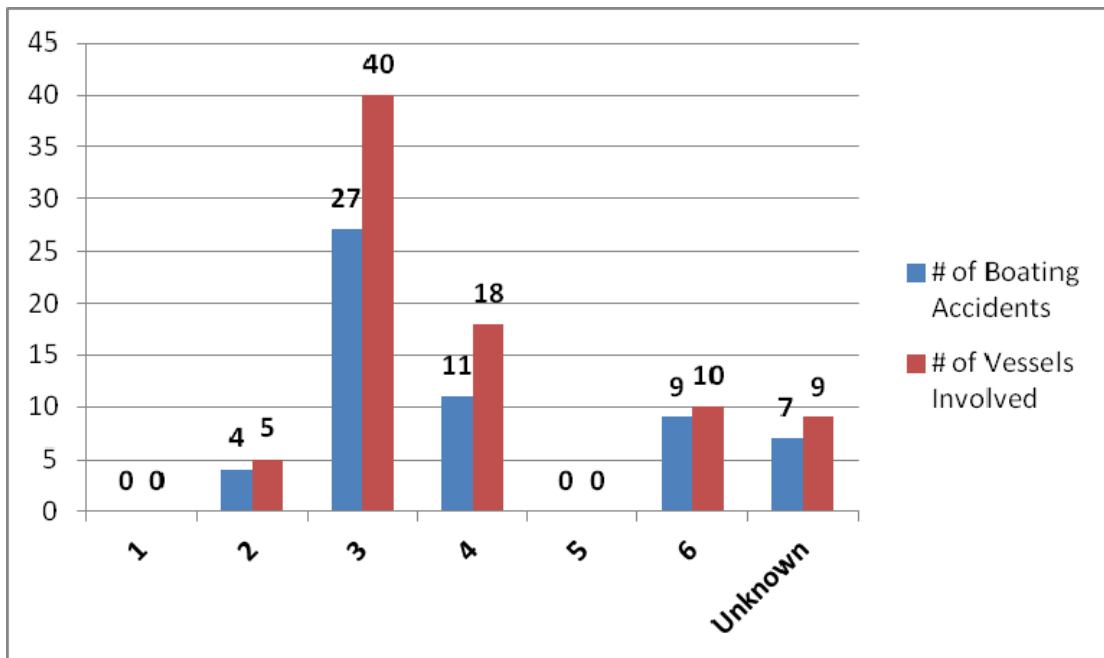


Figure 4-12. Number of Boating Accidents and Number of Vessels Involved by Lake Area (2003-2011)

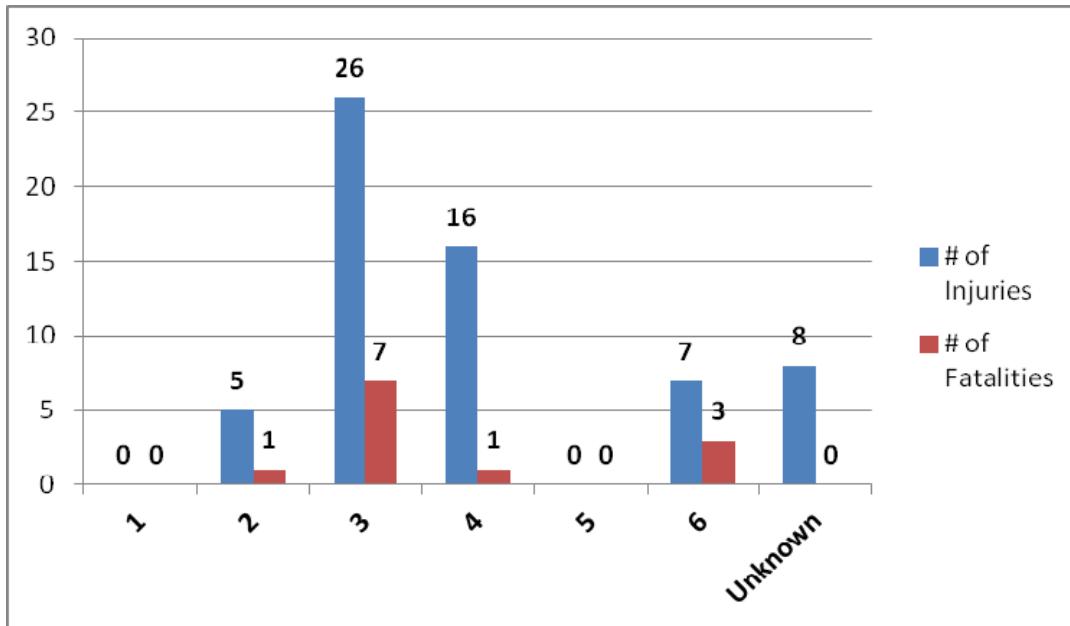


Figure 4-13. Number of Boating Fatalities and Injuries by Lake Area (2003-2011)

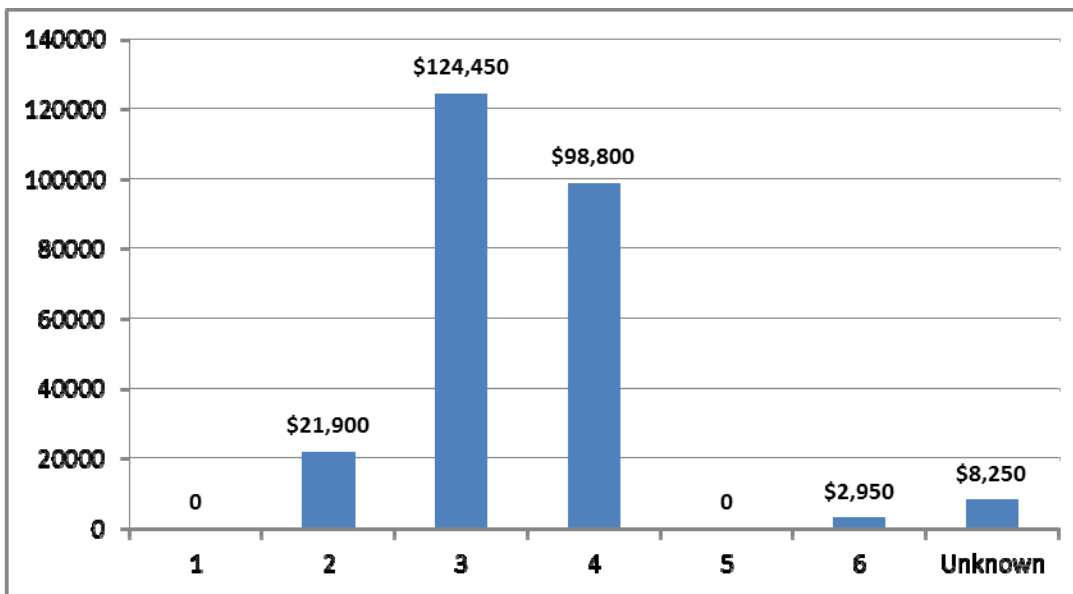


Figure 4-14. Boating Accident Property Damage Dollar Amount by Lake Area, 2003-2011

Table 4-11. Annual Average Number of Boating Accidents per Square Mile of Water Surface by Lake Area

Lake Area	Water Surface Square Miles	Average Annual Number of Boating Accidents	Boating Accidents Per Square Mile of Water Surface Area
1	19.35	0	0.0
2	25.27	0.44	0.017
3	28.33	3.0	0.106
4	23.62	1.2	0.051
5	15.57	0.0	0.0
6	39.44	1.0	0.025
TOTAL	151.88	6.44	0.042

Average for State of Oklahoma is 0.058

Sixty-seven percent of boating-related fatalities and 68 percent of all boating-related injuries occurred in Lake Areas 3 and 4. All of the accidents and vessels involved in accidents in Lake Areas 3 and 4 resulted in multiple person injuries. This indicates, the severity of accidents in these two lake areas is extremely significant and most likely is the result of too many boats in these areas. This is further substantiated by the fact that 87 percent of all property damage resulting from boating accidents was from accidents that occurred in Lake Areas 3 and 4 (Figure 4-16). Additional information and the database for boating accidents can be found in Appendix F.

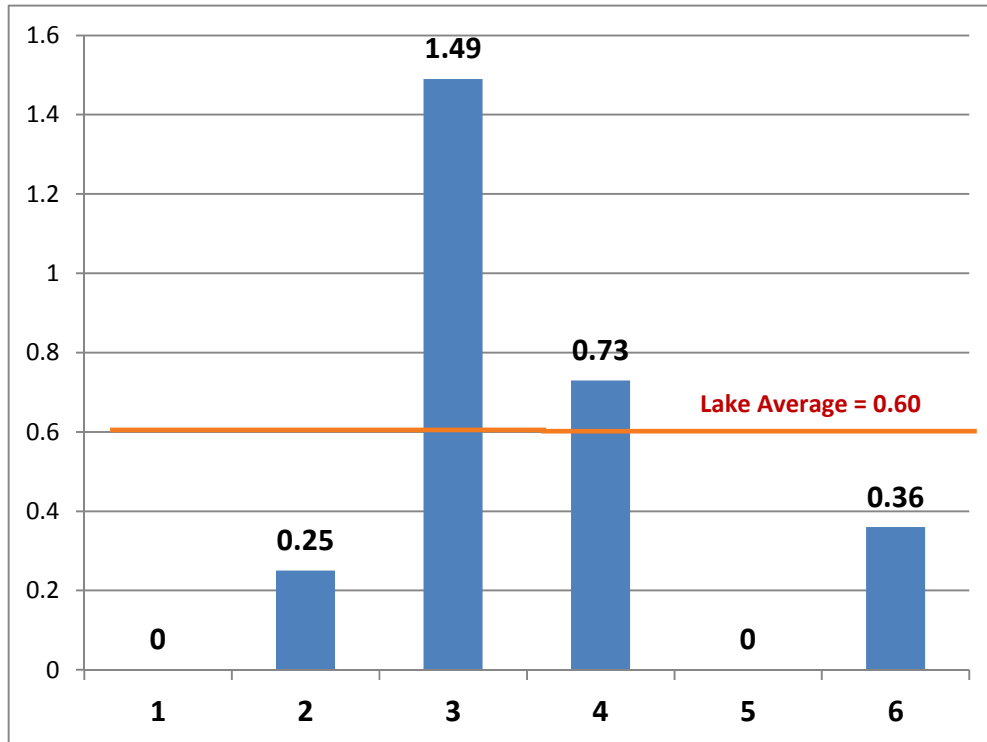


Figure 4-15. Accidents per 1,000 Water Surface Acres by Lake Area (2003-2011)

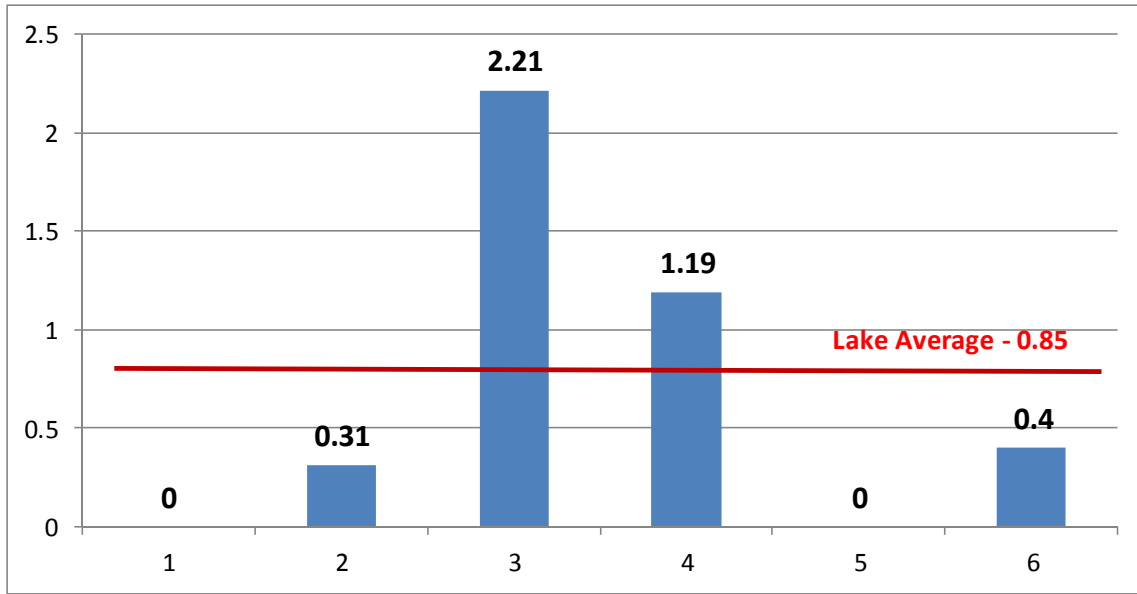


Figure 4-16. Number of Vessels Involved in Boating Accidents per 1,000 Water Surface Acres by Lake Area Number (2003-2011)

4.5 Recreation-Related Public Fatalities at Eufaula Lake

Unfortunately, each year people have accidents while participating in water-based recreational activities that result in injury or death. USACE has implemented an extensive water safety outreach program to help reduce the number of recreation-related accidents, injuries, and deaths. A recreation-related fatality is a fatality that occurs while the victim was engaged in a recreational activity. Recreation-related public fatality data from 1999-2011 was provided by USACE. The approximate location of each recreation-related, public fatality is identified in **Figure 4-17**.

From 1999 through 2011, there were 36 recreation-related fatalities at Eufaula Lake, which is an average of 2.7 fatalities per year (**Table 4-12**). The number of recreation-related fatalities by year is identified in **Figure 4-18**. Simply looking at the number of fatalities each year does not provide sufficient information to be meaningful. Therefore, additional analysis was conducted to determine if any trends were evident or other useful information could be determined. Analysis of the data revealed the following information:

- Seventy five percent (27) of the fatalities occurred on a Friday, Saturday, or Sunday.
- The average time of day fatalities occurred was 2:45PM.
- The average age of the victims was 38 years.
- Eighty one percent of the victims were male.
- Fifty nine percent of the public fatalities were boating-related (USACE national average = 42 percent).
- Alcohol was involved in 28 percent of the fatalities (USACE national average = 21 percent).

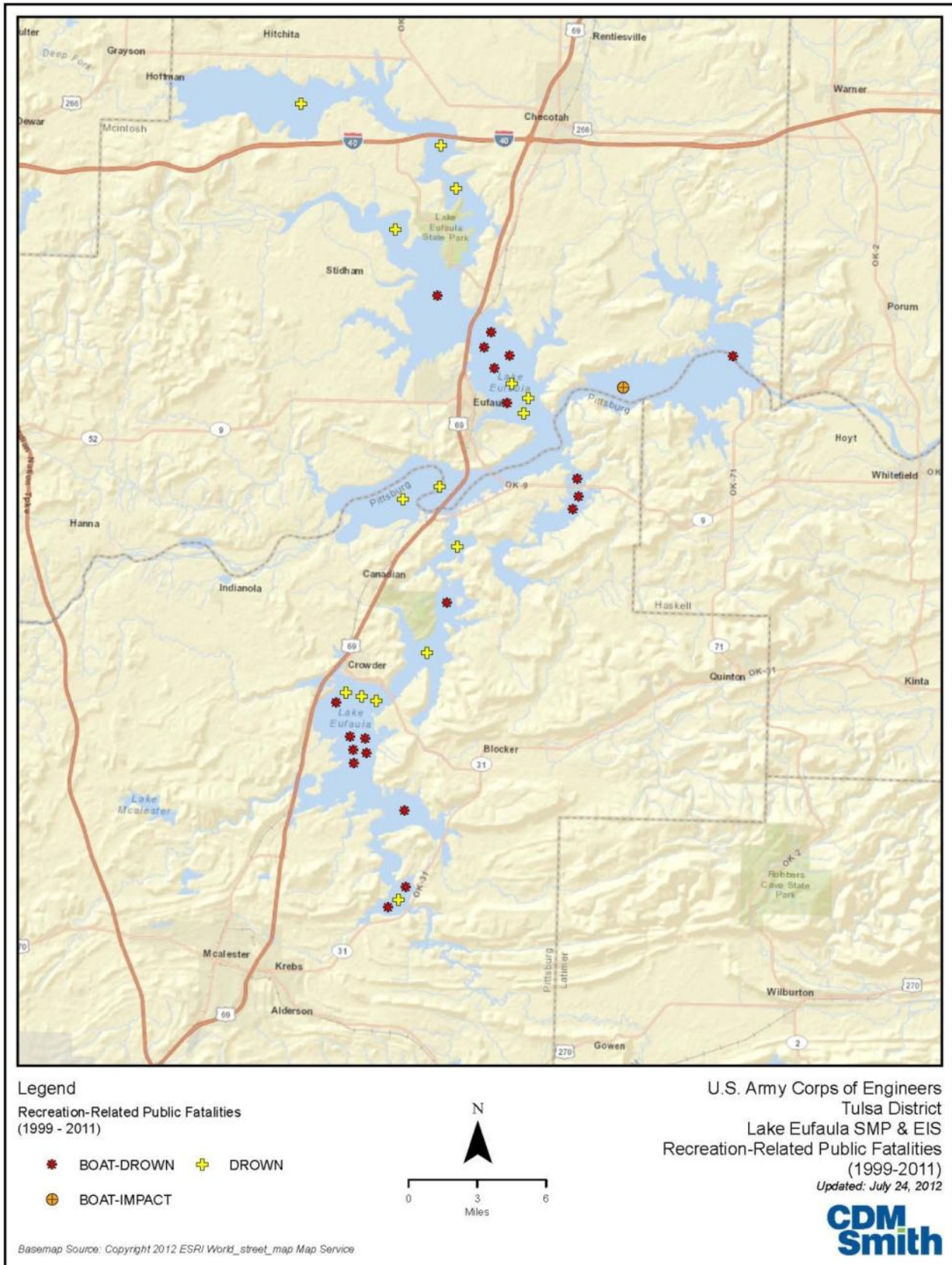
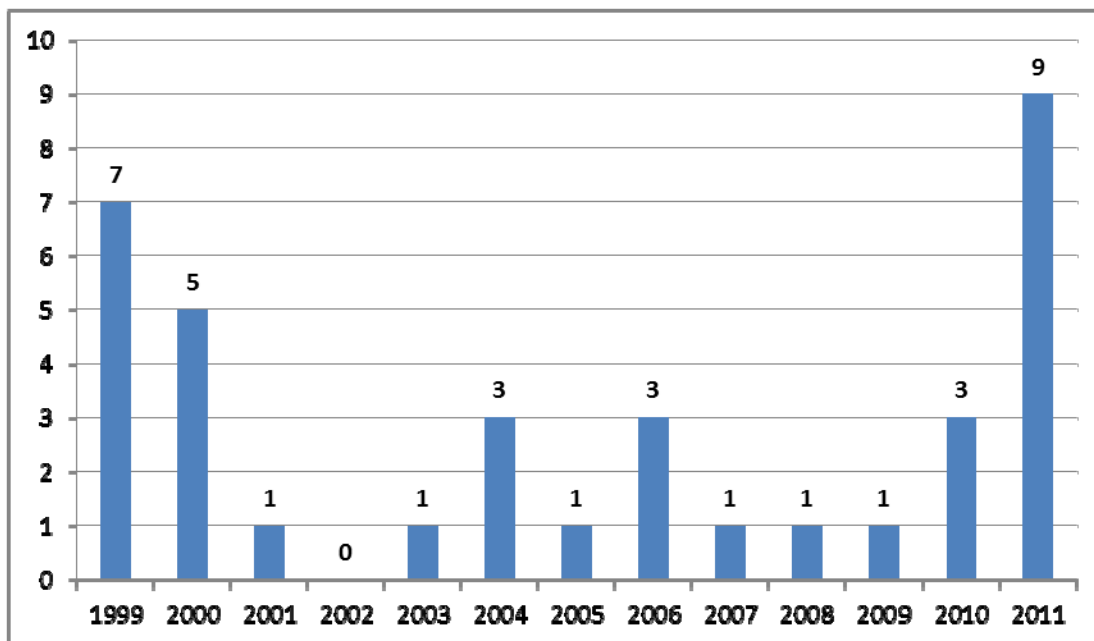


Figure 4-17. Recreation Related Public Fatalities – Eufaula Lake (1999 – 2011)

Table 4-12. Public Fatalities by Lake Area

Lake Area	# of Fatalities
1	2
2	4
3	11
4	2
5	2
6	15

**Figure 4-18. Recreation-related Public Fatalities by Year at Eufaula Lake**

4.5.1 USACE Public Fatality Frequency Rates

Annually, USACE measures public fatalities by calculating the frequency rate based on visitor days of use. The formula for calculating public fatality frequency rate is (# of fatalities/ million visitor days of use). The maximum tolerance level established by USACE is 0.77 and is expressed as the number of fatalities per million visitor days of use. Using the above formula, annual frequency rates for public fatalities at Eufaula Lake were calculated for 1999 through 2011 and are depicted in **Figure 4-19**. In six of the thirteen years, public fatalities at Eufaula Lake exceeded USACE maximum tolerance levels for public fatalities. In 2011, there were nine public fatalities resulting in a frequency rate of 3.96 fatalities per million visitor days of use. This is the highest annual public fatality frequency rate at Eufaula Lake for the past thirteen years. By comparison, the average national USACE public fatality frequency rate in 2009 was 0.76, in 2010 it was 0.56, and in 2011 it was 0.69. During only one out of the past thirteen years have there been no public fatalities at Eufaula Lake.

4.5.2 Public Fatality Frequency Rate by Lake Area

Using the same formula as above, public fatality frequency rates for each of the six lake areas were calculated and are shown in **Figure 4-20**. The number of fatalities within each lake area were totaled for 1999 through 2011 and then divided by the number of visitor days for each respective lake area for the same period. This calculates the frequency rate, which is expressed as the number of fatalities per million visitor days of use. Again, the maximum tolerance level established by USACE is 0.77. Only Lake Area 4 falls below USACE established tolerance levels for public fatalities. Although, Lake Area 3 had the largest number of fatalities, Lake Area 5 had the highest public fatality frequency rate of all lake areas. In addition, 54 percent of the combined boating-related fatalities and boating accidents occurred in Lake Area 3.

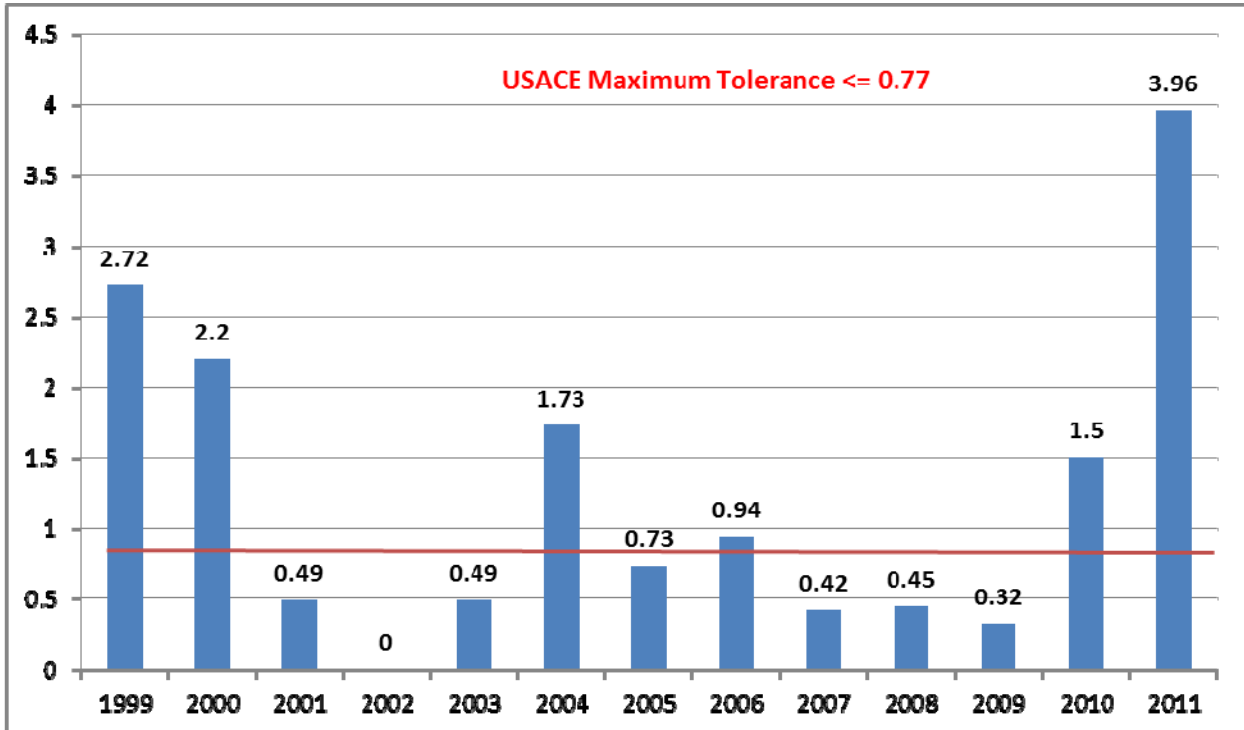


Figure 4-19. Annual Public Fatality Frequency Rate at Eufaula Lake, 1999-2011 (Number of Fatalities per Million Visitor Days)

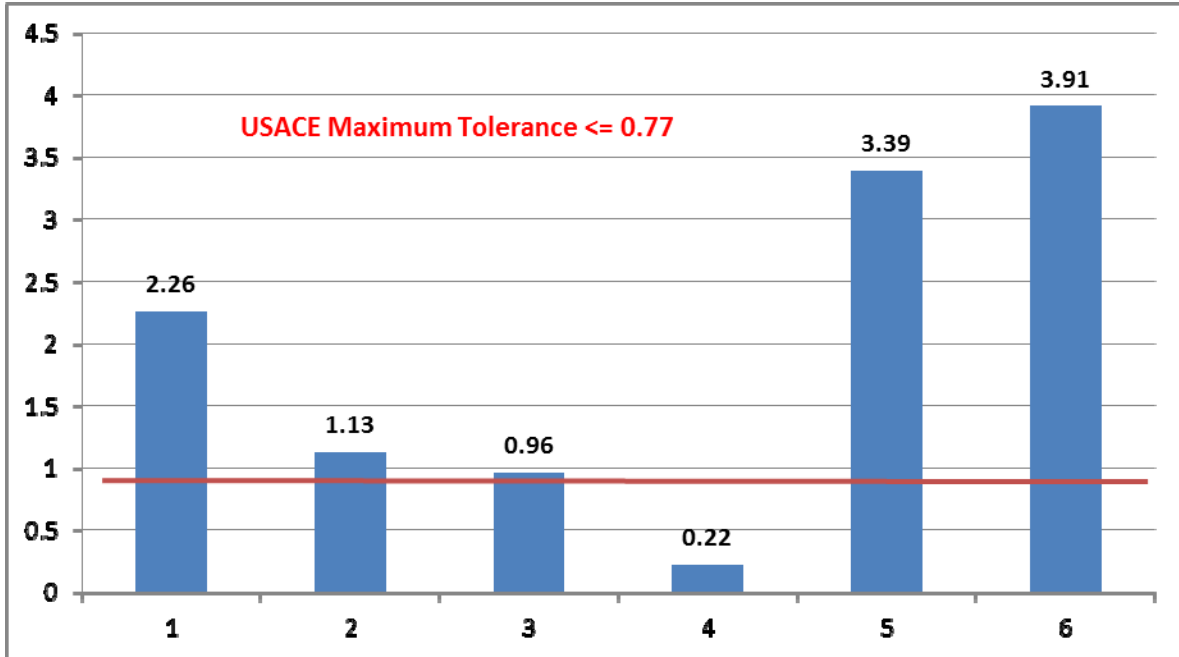


Figure 4-20. Average Public Fatality Frequency Rate by Lake Area Number (1999 – 2011) (Number of Fatalities per Million Visitor Days)

The analysis reveals that recreation-related public fatalities at Eufaula Lake are higher than should be expected. It appears that boating-related fatalities and the use of alcohol are significant areas of concern. While Lake Areas 5 and 6 receive only two percent and thirteen percent of the total lake visitation, respectively, they have the highest public fatality frequency rates, compared to other lake areas. Additional information concerning recreation related public fatalities can be found in **Appendix G**.

Section 5

Water-Based Recreation Surveys

Four different recreation surveys were conducted at Eufaula Lake during the 2012 recreation season. Data collected through these surveys was used to identify, quantify, and characterize the water-based recreation activities occurring on Eufaula Lake. These surveys included boat density and observations of parking lot use and beach use.

On March 30, 2012, twenty-four survey team members attended a two-hour training session that provided an overview of the EIS and detailed information about the purpose and types of recreation surveys to be conducted. The training package used for this training is included in **Appendix H**.

Training participants were assigned to one of ten survey teams. Although no formal survey instruments were used, standardized data collection sheets were developed and used during each of the surveys. Samples of each of the data collection survey sheets can be found in **Appendix I**. Survey team members also documented their findings by taking photographs of existing uses and conditions at the areas and facilities surveyed. These photographs can be found in **Appendix J**.

It should be noted that for all of the survey periods in 2012, there was a blue-green algae advisory in effect at Eufaula Lake. When an advisory is in effect, USACE urges the public to exercise caution when swimming, water skiing, and coming into contact with lake water. Visitors are also advised to avoid areas with visible algae accumulation or discolored water. A blue-green algae advisory is issued by the Oklahoma Department of Tourism and Recreation anytime test results exceed 100,000 cells per milliliter of water. At that level, there is an elevated risk of experiencing adverse health effects (**See Figures 5-1 and 5-2**). This advisory may have kept people from visiting the lake who normally would have, had the advisory not been in place; although this could not be substantiated through review of any available data.



Figure 5-1
Blue-Green Algae Blooms – Photos Taken on June 30, 2012 – Lake Area 1



Figure 5-2

All twenty-four major public recreation areas were included in the surveys. A list of recreation areas and facilities included in the surveys is provided in **Table 5-1**.

Table 5-1. Land/Water Interface Recreation Facilities by Lake Area

Lake Area	Recreation Area Name	# of Beaches	# of Boat Ramps	# of Launch Lanes	# of Car Spaces	# of Car/Trailer Spaces	# of Wet Slips	# of Dry Storage Spaces
1	Gentry Creek	0	2	2	0	39	0	0
Lake Area 1 Total		0	2	2	0	39	0	0
2	Lake Eufaula State Park and Marina	1	2	2	300	150	82	0
2	Holiday Cove	0	1	1	28	36	0	0
Lake Area 2 Total		1	3	4	328	186	82	0
3	Belle Starr CG	0	1	2	339	100	0	0
3	Belle Starr Marina	0	1	1	60	35	122	0
3	Eufaula City Park and Eufaula Marina	1	2	5	115	150	397	0
3	Eufaula Cove (South)	0	1	1	40	10	0	0
3	Highway 9 Landing CG	1	3	3	112	72	0	0
3	Highway 9 Landing Marina (+87 dry storage)	0	0	0	63	52	232	87
Lake Area 3 Total		2	8	10	729	419	751	87
4	Brooken Cove CG	0	1	1	80	20	0	0
4	Coles Evergreen Marina	0	0	0	30	10	108	0
4	Dam Site CG	0	2	3	138	83	0	0
4	Duchess Creek Marina	0	0	0	40	10	132	0
4	Porum Landing CG	1	2	3	49	31	0	0
Lake Area 4 Total		1	5	6	337	154	240	0
5	Mill Creek	0	1	1	7	10	0	0
Lake Area 5 Total		0	1	1	7	10	0	0
6	Arrowhead State Park (Area 51 Marina)	1	1	2	158	46	21	0
6	Oak Ridge	0	1	1	0	28	0	0
6	Crowder City Park	0	1	2	3	27	0	0
6	Cardinal Point	0	1	1	10	0	0	0
6	Crowder Point (East and West)	0	3	4	83	22	0	0
6	Juniper Point	0	2	2	28	69	0	0
6	Elm Point	0	1	1	5	20	0	0
6	Hickory Point	0	1	1	5	20	0	0
6	Highway 31 Landing	0	1	1	20	55	0	0
Lake Area 6 Total		1	12	15	312	287	21	0
Grand Total		5	31	36	1,713	1,095	1,094	87

Note: The facility totals in table 5-1 are different than the facility totals found in Chapter 4, because the data originated from two different USACE sources. The data source used in Chapter 4 is USACE – Value to the Nation -2010 and was used in order to make regional comparisons. The data source used in table 5-1 is OMBIL – 2011, and only tabulates data for Eufaula Lake.

5.1 Aerial Boat Count Survey

Aerial boat count surveys were conducted in order to identify the number and type of vessels using Eufaula Lake during specific high use weekends during the 2012 recreation season (**Figure 5-3**). Aerial boat count surveys were conducted during four flyover weekends, including a peak fishing season weekend in April, Memorial Day weekend, the Fourth of July weekend, and a weekend in June, with a total of sixteen helicopter flyovers. Alternative dates were also established in the event that weather conditions prohibited helicopter operations or clear visibility of the lake. **Table 5-2** provides a summary of the primary and alternate survey dates, although conditions allowed all surveys to be conducted on the primary dates.



Figure 5-3. Aerial Boat Count Survey Team

Table 5-2. Primary and Alternate Survey Dates

	Primary Survey Dates	Alternate Survey Dates
Flyover #1	7-8 April 2012	14-15 April 2012
Flyover #2	26-27 May 2012	2-3 June 2012
Flyover #3	16-17 June 2012	23-24 June 2012
Flyover #4	30 June and 1 July 2012	7-8 July 2012

Two flyovers occurred on each date, once in the morning and once in the afternoon. Flyovers were scheduled for times to coincide with heavy recreational use periods; 10AM to 1PM and 3PM to 6PM. Flyovers were sequenced in reverse order each survey day in order to obtain equally distributed data. **Table 5-3** depicts the flyover sequence schedule used for the surveys.

Table 5-3. Flyover Sequence Schedule – 2012 Recreation Season

Flyover Sequence								
Day	Date	AM/PM	Lake Area Number					
Saturday	7-Apr	AM	1	2	3	4	5	6
	7-Apr	PM	6	5	4	3	2	1
Sunday	8-Apr	AM	6	5	4	3	2	1
	8-Apr	PM	1	2	3	4	5	6
Saturday	26-May	AM	6	5	4	3	2	1
	26-May	PM	1	2	3	4	5	6
Sunday	27-May	AM	1	2	3	4	5	6
	27-May	PM	6	5	4	3	2	1
Saturday	16-Jun	AM	1	2	3	4	5	6
	16-Jun	PM	6	5	4	3	2	1
Sunday	17-Jun	AM	6	5	4	3	2	1
	17-Jun	PM	1	2	3	4	5	6
Saturday	30-Jun	AM	6	5	4	3	2	1
	30-Jun	PM	1	2	3	4	5	6
Sunday	1-Jul	AM	1	2	3	4	5	6
	1-Jul	PM	6	5	4	3	2	1

The first flyover in April focused on popular fishing locations and areas of the lake where there is standing timber. The remaining flyover dates focused on other areas of the lake, which are generally categorized as open water areas and are more conducive to pleasure boating, water skiing, personal watercraft use, and sailing. However, all lake areas were surveyed during each flyover.

During all of the flyovers, an observer in the helicopter recorded the number, type of vessel, and recreational activity. Data was tallied and recorded in one of the following six categories:

Power Boats and Activities

1. *Pleasure Boating*
2. *Fishing*
3. *Water Skiing/Tubing*
4. *Personal Water Craft (PWCs and Jet Skis)*

Non-Powered Boats and Activities

5. *Kayak/Canoe/Row Boat*
6. *Sail Boat*

Another observer took photographs to assist in documenting the usage, density and type of recreational activities observed (**Figure 5-4**).



Figure 5-4. Aerial Boat Count Survey - Lake Area 4 - May 26, 2012

5.2 Boat Ramp and Marina Surveys

Within the same period as each of the flyovers, ground observation teams were dispatched to all major recreation areas, swimming beaches, fishing piers, boat ramps, and marinas to observe and conduct surveys regarding usage.

During these “on-the-ground” surveys, the number of empty boat trailers at boat ramps and in designated campgrounds were tallied to help determine the number of boats on the water and their respective area of origination (**Figure 5-5**).



Figure 5-5. Boat Ramp Parking Lot

Not every boat ramp and public facility was surveyed; areas included in the surveys were coordinated and agreed upon with USACE Project staff. **Table 5-1** identifies the recreation areas included in these surveys.

For each boat ramp parking lot surveyed, the following information was collected:

- Number of vehicles with empty boat trailers parked in designated parking areas
- Number of vehicles with empty boat trailers parked in undesignated areas (**Figure 5-6**)
- If there was a campground within or close to the recreation area where the boat ramp was located, the number of empty boat trailers located at campsites or other parking areas within the campground were also counted



Figure 5-6. Empty Boat Trailers – Parked in Un-designated Area

To determine the number of boats on the water from each respective marina location, the number of rented but empty boat slips and rented but empty dry storage slips at each marina was tallied. At marinas where there is a public boat ramp, the numbers of empty boat trailers in boat ramp parking lots were also counted.

For each marina, the following information was collected:

- Number of wet slips currently rented
- Number of wet slips available for rent
- Number of empty but rented wet slips
- Number of vehicles with empty boat trailers parked in designated parking areas
- Number of vehicles with empty boat trailers parked in undesignated areas
- At Highway 9 Landing Marina the number of boats from dry storage that were out on the lake were also counted as this is the only marina on the lake that provides dry storage

5.3 Swim Beach Usage Survey

Ground observation surveys were conducted in areas with designated swimming beaches. The focus of these surveys was to count the number of beach users during heavy use periods (**Figure 5-7**).



Figure 5-7. Designated Swim Beach

In designated swimming beach areas, calculations using USACE *Engineering and Design Recreation and Customer Service Standards* (EM 1110-1-400) were used to establish beach carrying capacity and compare existing beach use to those standards. For each swim beach, the following information was collected:

- Number of people in the water inside the buoyed swim area
- Number of people on the sand area of the swim beach
- Number of people on the turf and other land areas around the beach
- Number of vehicles parked in designated parking areas
- Number of vehicles parked in undesignated areas

5.4 Recreation Survey Results

This section of the Recreation Study focuses on the results obtained from the four types of recreation surveys conducted at Eufaula Lake during the 2012 recreation season. During these surveys, a large amount of data and information was obtained. However, only the most significant and pertinent data is presented here. The completed survey forms are in the Administrative Record for the project.

5.4.1 Aerial Boat Count Survey Results

A total of 11,656 boats were tallied during the sixteen aerial boat count surveys. Of all the boats counted, 99 percent were power boats, while only one percent were non-powered vessels. The most popular boating-related recreation activity was fishing (43 percent), followed by pleasure boating/cruising (33 percent), personal watercraft (20 percent), water skiing/tubing (3 percent), kayak/canoe/row boat (1 percent), and sailboat (<1 percent). **Figure 5-8** provides a graphical representation of this data.

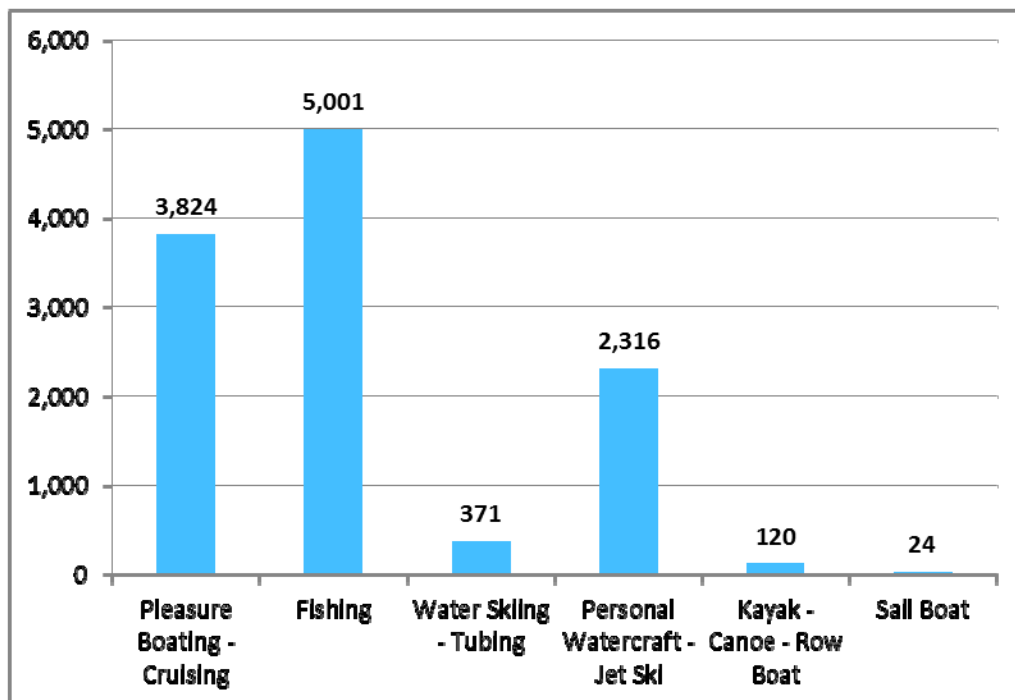


Figure 5-8. Total Boat Counts by Type of Vessel and Activity

The type of vessel and associated recreational activity varied between lake areas. However, fishing from a power boat was the most popular activity in all lake areas except for Lake Area 4, where pleasure boating was the most popular activity. **Figure 5-9** displays this data.

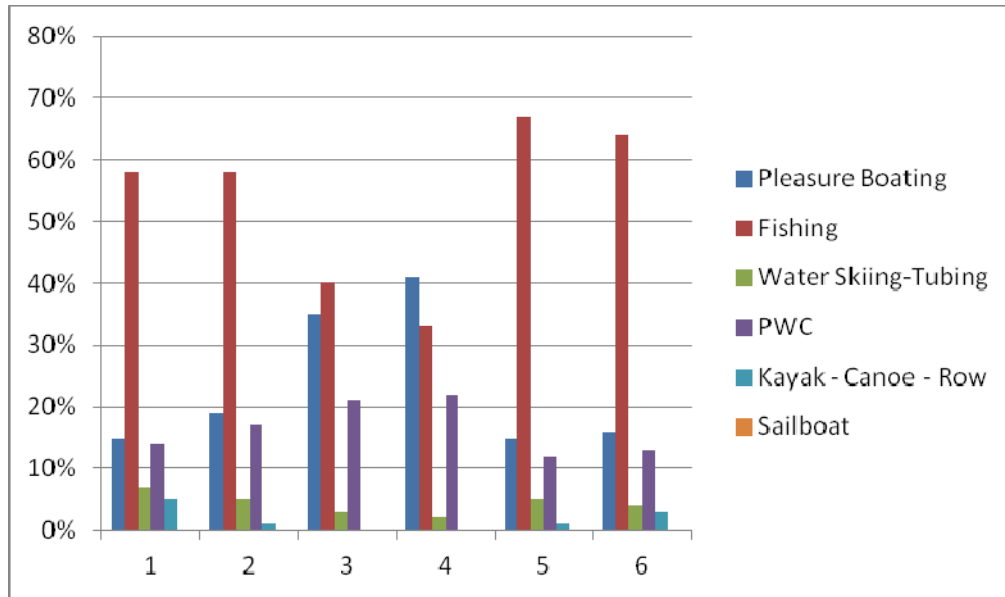


Figure 5-9. Percent Boating Activity by Lake Area

The least number of boats counted during any survey period was on the afternoon of April 8, 2012, when only 70 boats were observed on the lake. The most number of boats counted during any survey period was on the afternoon of June 30, 2012, when 2,174 boats were observed on the lake. The boat counts by survey period and lake area are included in **Table 5-4**.

Table 5-4. Total Boat Counts by Lake Area and Survey Period

Date	AM or PM	Lake Area 1	Lake Area 2	Lake Area 3	Lake Area 4	Lake Area 5	Lake Area 6	Totals
7-Apr-12	AM	6	29	33	43	20	88	219
7-Apr-12	PM	10	15	31	52	1	51	160
8-Apr-12	AM	5	13	16	13	4	28	79
8-Apr-12	PM	3	17	10	11	5	24	70
26-May-12	AM	5	44	233	25	10	48	365
26-May-12	PM	43	90	426	358	29	101	1,047
27-May-12	AM	8	37	144	30	9	27	255
27-May-12	PM	44	91	272	206	24	69	706
16-Jun-12	AM	23	62	243	192	18	92	630
16-Jun-12	PM	44	79	544	677	32	126	1,502
17-Jun-12	AM	24	48	176	178	12	46	484
17-Jun-12	PM	31	68	268	215	10	39	631
30-Jun-12	AM	22	45	352	253	35	68	775
30-Jun-12	PM	41	91	979	958	38	67	2,174
1-Jul-12	AM	36	84	346	376	18	38	898
1-Jul-12	PM	69	65	760	675	30	60	1,659

The existing boating density for Eufaula Lake is calculated by dividing the unrestricted water surface acres by the boat count from the survey period that tallied the most number of boats.

$$52,218 / 2,174 = 24 \text{ acres/boat}$$

Overall, for all of the survey periods, Lake Area 3 tallied the most number of boats, with 4,833, followed by Lake Area 4 with 4,047. Seventy-six percent of all the boats tallied were counted in Lake Areas 3 and 4. Total boat counts by lake area are shown in **Figure 5-10**.

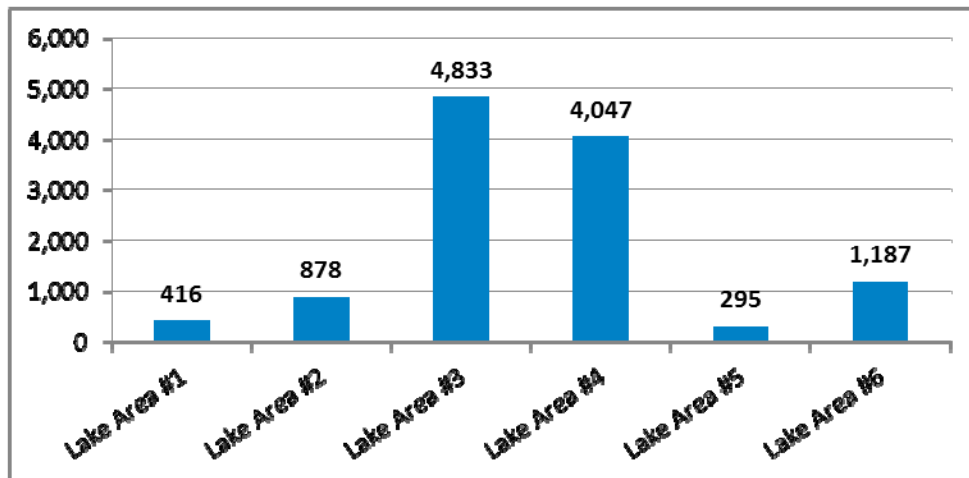


Figure 5-10. Total Boat Counts by Lake Area

The percent of total boats by lake area is shown in **Figure 5-11**.

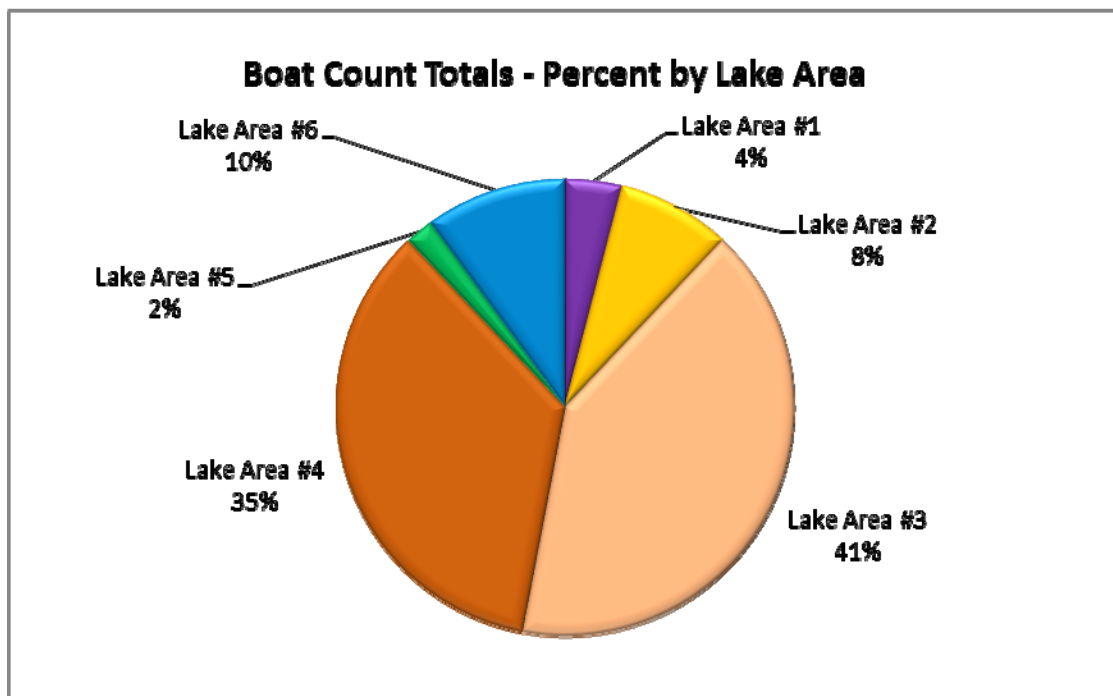


Figure 5-11. Percent of Total Boat Counts by Lake Area

5.4.2 Marina Survey Results

There are seven commercial concession marinas located on Eufaula Lake that contain a total of 1,099 wet slips. The overall occupancy rate for all marinas at the time the marina surveys were conducted was 85 percent. **Table 5-5** identifies the following information for each marina: name of the marina, lake area where the marina is located, total number of wet slips, average number of wet slips rented and the occupancy rate (percent of capacity), at the time the marina surveys were conducted.

Table 5-5. Marina Information

Marina Name	Lake Area	Number of Wet Slips	Average Number of Rented Wet Slips	Average Wet Slip Occupancy Rate (Percent of Capacity)
Arrowhead State Park (Area 51 Marina)	6	18	1	6%
Belle Starr Marina	3	122	116	95%
Coles Evergreen Marina	4	108	89	82%
Duchess Creek Marina	4	140	131	94%
Eufaula Cove Marina	3	397	305	77%
Lake Eufaula State Park Marina	2	82	82	100%
Highway 9 Landing Marina	2	232	209	90%
Total	N/A	1,099	933	85%

The only marina that offers dry storage is Highway 9 Landing Marina, which offers a total of 87 dry storage spaces. However, these spaces were not included in the marina survey, since some of the dry storage spaces were also used for RV storage and it could not be determined how many of the dry storage spaces were rented for boat storage or how many of the boats from dry storage were actually out on the lake during the surveys.

Table 5-6 is a summary of marina information broken down by lake area. There are no marinas located in Lake Area 1 or Lake Area 5.

Table 5-6. Marina Information by Lake Area

Lake Area	Total Number of Wet Slips	Average Number of Rented Wet Slip	Average Occupancy Rate
2	314	291	93%
3	519	421	81%
4	248	220	89%
6	18	1	6%
Total	1,099	933	85%

Pertinent information from each of the survey periods is listed in **Table 5-7**. This data revealed the following information:

- For all survey periods, there were a total of 4,503 boats on the water that came from marina wet slips.
- For all survey periods, there were a total of 506 boats on the water that came from boat ramps located at marinas.
- For all survey periods, there were a total of 5,009 boats on the water that originated from marinas.
- Over all survey periods, the most number of boats from marinas was tallied on May 26, 2012 during the afternoon survey, when 447 were counted as being on the water.
- For all survey periods, the lake use rate for rented marina wet slips was approximately 30 percent, which means that during peak use periods approximately 30 percent of the boats that occupy a rented wet slip at a marina will actually be out on the lake.
- For all survey periods, the overall lake use rate for marinas was approximately 26 percent, which means that during peak use periods approximately 26 percent of total marina wet slips would contribute one boat to the water surface of the lake. Therefore, every 100 marina slips generate approximately 26 boats on the water at one time during peak use periods. This figure is significant since it provides a measuring stick for estimating the number of boats that would actually be out on the water from marinas at any given point in time.

Table 5-7. Pertinent Data from Marina Surveys by Survey Period

Date	AM or PM	Wet Slips (Total)	Rented Wet Slips	Wet Slips Available for Rent	Rented but Empty Wet Slips (Boats on the Water)	Empty Boat Trailers in Designated Parking Spaces at Marinas	Empty Boat Trailers in Undesignated Areas at Marinas	Total # of Boats on the Water from Marinas
7-Apr-12	AM	1,099	900	199	316	10	2	328
7-Apr-12	PM	1,099	900	199	315	7	6	328
8-Apr-12	AM	1,099	900	199	304	0	4	308
8-Apr-12	PM	1,099	900	199	295	0	4	299
26-May-12	AM	1,099	935	164	267	12	39	318
26-May-12	PM	1,099	936	163	395	12	40	447
27-May-12	AM	1,099	936	163	257	15	48	320
27-May-12	PM	1,099	936	163	366	15	31	412
16-Jun-12	AM	1,099	939	160	238	6	7	251
16-Jun-12	PM	1,099	941	158	279	6	7	292
17-Jun-12	AM	1,099	941	158	235	13	18	266
17-Jun-12	PM	1,099	941	158	255	27	8	290
30-Jun-12	AM	1,099	955	144	250	22	21	293
30-Jun-12	PM	1,099	955	144	304	14	43	361
1-Jul-12	AM	1,099	955	144	191	14	19	224
1-Jul-12	PM	1,099	955	144	236	16	20	272
Totals		17,584	14,925	2,659	4,503	189	317	5,009

5.4.3 Boat Ramp Parking Lot Survey Results

A total of 4,935 empty boat trailers (refer to Section 5.4.5 for detailed explanation) were tallied during all survey periods. The percentage of empty boat trailers by lake area were:

- Lake Area 1 – 3 percent
- Lake Area 2 – 4 percent
- Lake Area 3 – 44 percent
- Lake Area 4 – 30 percent
- Lake Area 5 – 2 percent
- Lake Area 6 – 17 percent

These percentages represent the origination location for the boats on the water from each lake area for all survey periods. Empty boat trailer counts for each lake area and survey period are included in **Table 5-8**.

Table 5-8. Empty Boat Trailer Counts from Boat Ramp Parking Lots and Percent of Capacity

Date	AM or PM	Lake Area 1	Lake Area 2	Lake Area 3	Lake Area 4	Lake Area 5	Lake Area 6	Total ¹	Percent of Capacity ²
7-Apr-12	AM	8	28	23	34	11	103	207	19%
7-Apr-12	PM	8	22	7	23	10	86	156	14%
8-Apr-12	AM	8	26	4	14	8	35	95	9%
8-Apr-12	PM	8	5	4	9	7	23	56	5%
26-May-12	AM	6	4	172	103	7	69	361	33%
26-May-12	PM	13	1	426	268	13	74	795	73%
27-May-12	AM	11	0	186	136	8	44	385	35%
27-May-12	PM	12	1	287	210	16	62	588	54%
16-Jun-12	AM	10	10	119	73	6	58	276	25%
16-Jun-12	PM	10	16	206	144	8	70	454	41%
17-Jun-12	AM	6	9	71	32	6	29	153	14%
17-Jun-12	PM	7	9	89	91	3	32	231	21%
30-Jun-12	AM	7	13	124	73	4	55	276	25%
30-Jun-12	PM	9	21	178	144	6	52	410	37%
1-Jul-12	AM	3	5	76	58	4	20	166	15%
1-Jul-12	PM	10	5	176	91	6	38	326	30%
Total		136	175	2,148	1,503	123	850	4,935	Avg. 28%

Notes:

- 1 This is the number of empty boat trailers tallied during each survey period. This includes empty boat trailers located in designated car/trailer spaces, empty boat trailers located in undesignated locations and empty boat trailers located within campgrounds adjacent to the boat ramps where surveys were conducted. One empty boat trailer equals one boat on the lake.
- 2 Percent Capacity is the percent of the total available car/trailer parking spaces for boat trailers that were occupied during the survey period. The calculation for determining percent of capacity is the sum of empty boat trailers located in designated car/trailer spaces, plus empty boat trailers in undesignated locations, plus empty boat trailers located within campgrounds, divided by the number of designated car/trailers spaces located within the recreation area where the boat ramp is located. To further clarify how percent of capacity was calculated, all empty boat trailers within the recreation

area where the surveys were conducted were tallied and included in the computation, not just empty boat trailers located within designated car/trailer parking spaces. See the following key and formula:

KEY:

- X* – Number of empty boat trailers located in designated car/trailer parking spaces
- XX* – Number of empty boat trailers located in un-designated parking areas
- XXX* – Number of empty boat trailers located within campgrounds adjacent to the boat ramp
- N* – Total number of empty boat trailers
- Y* – Total number of designated car/trailer spaces within the recreation area

FORMULA:

$$(X + XX + XXX) = N$$

$$N/Y = \text{Percent of Capacity}$$

According to data provided by USACE, there are a total of 1,096 car/trailer parking spaces located in recreation areas where empty boat trailer counts were conducted. At the following recreation areas, there were one or more survey periods where the number of empty boat trailers exceeded the number of available car/trailer parking spaces:

- Belle Starr Marina
- Brooken Cove Campground
- Cardinal Point
- Crowder Point
- Eufaula Cove South
- Porum Landing

Even though capacity was exceeded at the above recreation areas during some of the survey periods, it was not a common event. Overall, boat ramps at Eufaula Lake operated at 28 percent of total capacity on average during the survey. Maximum usage of 73 percent of total capacity was recorded on May 26, 2012 during the afternoon survey.

Of the 4,935 empty boat trailers tallied, 2,775 (56 percent) were located in a designated car/trailer parking space within the boat ramp parking area, 1,039 (21 percent) were located in undesignated parking areas, such as on the grass or along road shoulders, and 1,121 (23 percent) were located in campgrounds where the boat ramps were located or in campgrounds adjacent to boat ramps where surveys were conducted.

It should be noted that parking in undesignated locations appears to be a common practice by lake visitors. Even when there are designated car/trailer spaces available, there is a significant amount of parking that occurs in undesignated locations.

5.4.4 Swimming Beach Survey Results

There are five designated swim beaches on Eufaula Lake. Information about each of these swim beaches was presented in Section 4.3.3. Over all of the swim beach surveys, there were a total of 1,104 swimmers actually in the water, 854 people on the sand portion of the beaches and 560 people on the turf areas adjacent to the beaches. **Table 5-9** provides a summary total of the number of people tallied for each of the designated swim beaches.

Table 5-9. Swim Beach Survey Data Totals

Swim Beach Location	# of People in the Water	# of People on the Sand Beach	# of People on Turf Areas Adjacent to the Beach	# of Vehicles Parked in Designated Parking Spaces	# of Vehicles Parked in Undesignated Areas
Eufaula State Park	113	42	281	132	1
Eufaula City Park	486	572	214	337	892
Highway 9 Landing	316	149	22	108	11
Porum Landing	71	16	8	19	1
Arrowhead State Park	118	75	35	29	53
Total	1,104	854	560	625	958

As discussed in Section 4.3.3, there is more than adequate swim beach area to accommodate the number of people tallied during each of the survey periods. Even with the amount of parking that occurs in undesignated areas, none of the swim beaches were near capacity during any of the survey periods. The most number of people tallied during all survey periods occurred on May 26, 2012 at Eufaula City Park, during the afternoon survey when there were a total of 200 people counted (50 in the water, 75 on the beach and 75 on the turf areas adjacent to the beach).

5.4.5 Combined Recreation Survey Results and Analysis

By combining and analyzing data from the various recreation surveys, the origination source for boating activity on Eufaula Lake was determined. The number of empty boat trailers from the Boat Ramp Parking Lot Survey forms was added together with the number of rented but empty marina slips and empty boat trailers at marina boat ramps from the Marina Survey forms, to determine the origination location for boats on the water during the survey periods. When the sum of this data is subtracted from the boat counts from the Aerial Boat Count Survey forms, the number of boats on the water that originated from private/community docks and boat ramps located in subdivisions adjacent to the lake can also be estimated. The following is a summary of the data extracted from each of the pertinent data fields from recreation survey forms.

- Total number of empty boat trailers at boat ramps located in public recreation areas was 4,935.
- Total number of empty, but rented marina slips was 4,503.
- Total number of empty boat trailers located at marina boat ramps was 523.
- Total number of boats tallied from aerial boat counts was 11,656.

Using the following formula, the number of boats during the survey periods that came from private/community docks and boat ramps located in adjacent subdivisions can be estimated.

$$\begin{aligned}
 & 11,656 \text{ (total boats on the water)} \\
 & - \underline{9,961 \text{ (4,935 + 4,503 + 523) (sum of empty boat trailers and slips counted)}} \\
 & = 1,695 \text{ (boats originating from private docks and subdivision boat ramps)}
 \end{aligned}$$

Table 5-10 depicts the total boat count tallies from the land survey teams and aerial boat counts for all survey periods. The data from this table was used to estimate the number of boats originating from private/community docks and boat ramps located in subdivisions. Please note that the numbers in column F do not represent the actual number of boats originating from private/community docks for each individual lake area, since that number cannot be established using this data. The number of boats originating from private/community docks from each individual lake area was established using information from Dispersed Use Recreation Survey data, which is presented in Section 6. The percentage use of each lake area as established by the Dispersed Use Recreation Survey data was used to help estimate the percentages presented in **Table 5-11**. The formulas for **Table 5-10** are: $A+B+C = D$ and $E-D = F$.

Table 5-10. Combined Survey Results

Lake Area	A Empty Boat Trailers at Boat Ramps	B Empty Marina Slips	C Empty Trailers at Marina Boat Ramps	D ¹ Total Land Count (Empty Marina Slips and Empty Boat Trailers)	E Aerial Boat Count	F ² Estimated Number of Boats from Private Docks/Subdivision Boat Ramps
1	136	0	0	136	416	280
2	175	651	42	868	878	10
3	2,148	3,127	208	5,483	4,833	-650
4	1,503	709	225	2,437	4,407	1,610
5	123	0	0	123	295	172
6	850	16	48	914	1,187	273
Total	4,935	4,503	523	9,961	11,656	1,695

¹ Column D is the sum of columns A + B + C

² Column F is calculated by subtracting column D from column E ($F = E - D$)

Therefore, 42 percent of the boats on the water during survey periods came from boat ramps located in public recreation areas, while 39 percent came from marina wet slips, 4 percent came from boat ramps located at marinas and 15 percent came from private/community docks and subdivision boat ramps (**Figure 5-12**).

When this data is then sub-divided into lake areas, the origination and destination location of boats on the water during the survey periods can be determined. By comparing the number of empty boat trailers and empty marina slips by lake area to the aerial boat counts by lake area, the percentage of boats from each category can be used to estimate the information in **Table 5-11**. Although not yet presented, the data from the Dispersed Use Recreation Survey was used to determine the origination location of boats from private/community docks and the primary lake area where boats from those docks are normally operated. This was done in order to help determine the origination and destination location of boats originating from private and community docks so that they could be represented in **Table 5-11**.

Table 5-11 shows that two percent of all boats on the lake originated in Lake Area 1 and that Lake Area 1 was the destination of four percent of all boats on the lake, at the time the surveys were conducted. Each row of the table can be read in the same manner.

Even though this data represents a snapshot of boat origination and destination locations at the time of the surveys, it can be assumed to be accurate for any given period of time, since the surveys were equally distributed among all lake areas and between morning and afternoon survey periods.

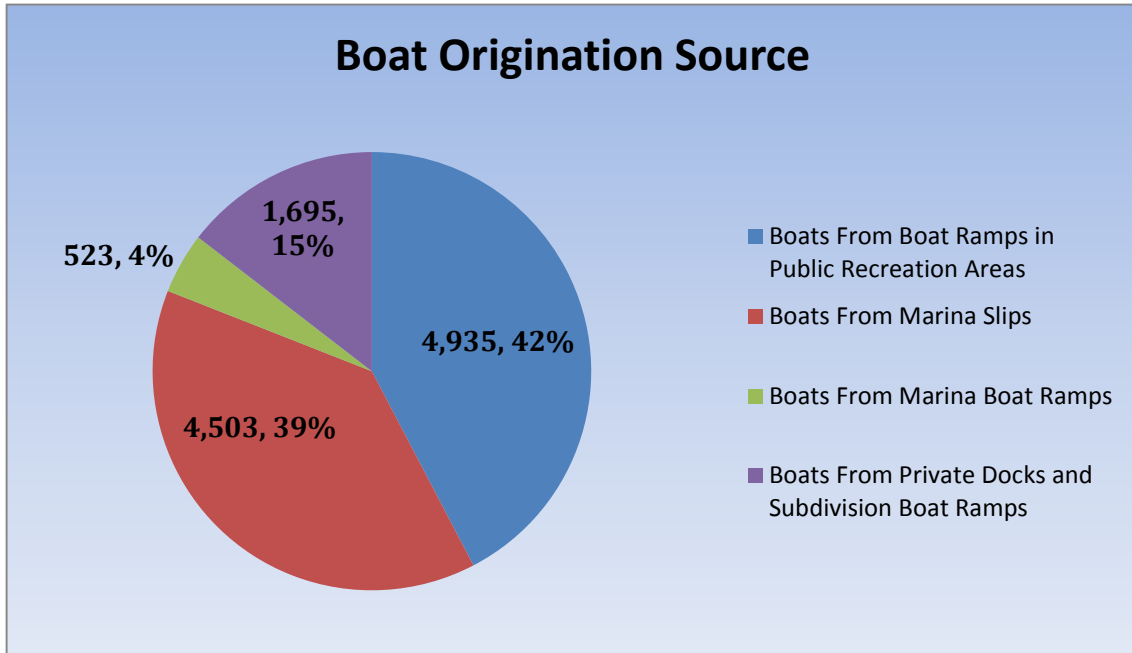


Figure 5-12. Origination Source for all Boats during Survey Periods

Table 5-11. Lake Area Origination and Destination Location of Boats

Lake Area	Percentage of Eufaula Lake Boats Originating in Indicated Lake Area	Percentage of Eufaula Lake Boats Destined for Indicated Lake Area
1	2%	4%
2	10%	8%
3	49%	40%
4	25%	35%
5	2%	3%
6	12%	10%

5.4.5.1 Boating Lake Use Rates

The maximum number of boats counted during any survey period was 2,174. This occurred on Saturday, June 30, 2012 during the afternoon survey. The maximum overall boating Lake Use Rate of 24 percent can be calculated by dividing the maximum boat count (2,174) by the number of boating opportunities (8,934) (from **Table 4-9**). Therefore, during peak use periods, one can reasonably expect that 24 percent of all the boats from all origination sources will be on the lake at any given time. This percentage is within the range found in studies of a similar nature (e.g. Brazos River Authority 2006a, b, Bureau of Reclamation 1998, 2004, USACE 2001).

In summary, the Lake Use Rates by boating origination source were found to be:

- Overall – 24 percent
- Marinas – 26 percent
- Boat Ramps in Public Recreation Areas – 28 percent
- Private/Community Docks and Subdivision Boat Ramps -25 percent

5.5 Estimating Boating Capacity for Eufaula Lake

A variety of boating capacity studies have been conducted for a wide range of lakes throughout the United States. No two studies or outcomes from those studies are the same and there are no agreed-upon scientific standards, processes or procedures for establishing a definitive boating capacity for a particular body of water. For the purposes of this study, a nationwide literature review was conducted, which identified previously conducted studies of a similar nature. These studies were screened for similarities and differences with the existing conditions at Eufaula Lake. These studies were then used as a resource in order to identify the most appropriate methods for determining the boating capacity at Eufaula Lake. Each of the studies included as part of this review are cited in the References section and are available in the Administrative Record for the project.

All of the studies reviewed included one or more of the following five analysis categories:

Use characteristics – Use characteristics are those data which indicate how the lake is being used and by whom. Carrying capacity studies use a variety of techniques to estimate the total number of boats, the number and type of boats used at peak and non-peak times, and the distribution of use. Studies reviewed used the following methods to estimate use.

- On-the-water surveys
- On-the-ground surveys
- Contact surveys
- Mail-back surveys
- Aerial flyovers
- Parking lot vehicle counts

Usable lake area – The most common method used to calculate usable lake surface area was to subtract a shoreline buffer zone of predetermined width from the total acreage of the lake. Buffer zone widths ranged from 100 to 200 feet. Also, recommended were 400 foot buffer zones around marinas and swimming beaches. In situations where there is a fluctuating lake level, other considerations were included, such as using the lowest lake depth in conjunction with a shoreline buffer zone when calculating useable lake area.

Boating density – Boating density, measured in surface acres per watercraft, was the most consistent component used in estimating carrying capacity. Some studies provided aggregate densities, applicable to the entire lake, while others specified a density for each type of watercraft. Boat densities ranged from

one to 3,200 acres per boat. However, the most commonly recommended boating density ranges were from 10 to 110 usable water surface acres per vessel.

Lake Use rate – Lake Use rate is a measure of the estimated number of boats on the lake at any given time from all water surface access sources, such as marinas, boat ramps and private boat docks. This is also known as the Boats At One Time (BAOT) coefficient. Lake Use rates ranged from 10 percent to 50 percent, with the most commonly recommended range of rates, between 25 and 50 percent.

Boaters’ perceptions of crowding – Boaters’ perceptions of crowding on the water are typically measured through on-site surveys or mail-in surveys. Crowding is typically perceived to be highest on holiday weekends, but no significant relationships have been found between perceived crowding and boater satisfaction.

Portions of the five analysis categories as described above were used to estimate boating capacity for Eufaula Lake. Each of the analysis categories as they were applied to the analysis for Eufaula Lake is described below:

Use Characteristics: Each of the Recreation Surveys used to measure Use Characteristics were described in detail in Section 4.5. They included:

- Boat Ramp Parking Lot Surveys (Empty boat trailers)
- Marina Surveys
- Swimming Beach Usage Surveys
- Aerial Boat Count Flyover Surveys
- Dispersed Use Recreation mail-back surveys

Useable Lake Area: The method for determining useable lake area (unrestricted water surface acres) was described in Section 4.3.1. For Eufaula Lake, useable lake area or unrestricted water is defined as water that is greater than three feet deep at the normal operating pool level of 585 MSL and that is not encumbered with standing timber. Restricted water is water that is less than three feet deep and/or is encumbered by standing timber. GIS mapping and aerial photographs were used to make these measurements. **Table 5-12** identifies the water surface acres of unrestricted (useable) and restricted water by lake area.

Table 5-12. Acres of Unrestricted and Restricted Water Surface by Lake Area

Lake Area Number	Unrestricted Water Surface Acres	Restricted Water Surface Acres	Total Water Surface Acres
1	1,517	10,868	12,385
2	4,877	11,296	16,173
3	14,781	3,347	18,128
4	11,833	3,282	15,115
5	0	9,963	9,963
6	19,210	6,034	25,244
Total	52,218	44,790	97,008

Boating Density: The method used to measure boating density at Eufaula Lake was described in Section 5.4 and was determined to currently be 24 water surface acres per vessel. Data from the aerial boat counts was used to measure boating density.

Lake Use Rate: Data from the Marina Surveys, Boat Ramp Parking Lot Surveys, Mail-back surveys, and Aerial Flyovers were used to measure Lake Use Rate. The overall Lake Use Rate for Eufaula Lake was determined to be 24 percent.

Boater’s Perceptions of Crowding: Data from the Mail-back surveys was used to measure boaters’ perceptions of crowding. When responding to the following question: “*How significant a problem is there from too many boats on the lake?*” Only two percent of the respondents indicated there was a significant or very serious problem with too many boats on the lake. However, when asked to identify the lake areas deliberately avoided when boating and the reason why, ten percent of those that responded that they avoided certain lake areas indicated that the reason for avoidance was because of too many boats or overcrowded conditions.

5.5.1 Boating Carrying Capacity for Eufaula Lake

Based on the review of previous studies, it was determined that 10 to 15 acres of water surface per boat represented a conservative aggregate estimate of optimum boating density. High-speed watercraft, such as PWCs and boats with motors greater than 50 horsepower, require more space, so it is recommended that 15 acres of water surface per boat be used as the optimum boating density for calculating carrying capacity at Eufaula Lake.

The formula for calculating boating carrying capacity is:

$$\text{Optimal number of boats} = \text{Unrestricted water surface acres} / \text{Optimum boating density}$$

Therefore, the optimal number of boats on Eufaula Lake is calculated by:

$$52,218 \text{ divided by } 15 = \mathbf{3,481}$$

This means that when there are more than 3,481 boats on the water surface at one time, the overall carrying capacity of the lake has been exceeded.

Using the current Lake Use Rate of 24 percent, the maximum number of boats that can be safely accommodated at mooring facilities, such as private/community boat docks and marinas and from boat ramps, should not exceed a combined total of approximately 14,200 boats.

Therefore, Eufaula Lake has currently reached approximately 54 percent of its total boat capacity and approximately 62 percent of the capacity of boats on the water at one time. These values are calculated as follows:

Current Percent of Total Boat Capacity:

5,439 (Number of boats moored at private community docks)

+1,099 (Number of Marina Slips)

+ 1,096 (Number of Car/Trailer Parking Spaces at public recreation area boat ramps)

7,634 (current number of boats)

Calculation: $7,634/14,200 = 54$ percent

Current Percent of Boats at One Time Capacity:

2,174 (Maximum number of boats counted on the water at one time)

Calculation: $2,174/3,481 = 62$ percent

Section 6

Dispersed Use Recreation

Dispersed use recreation is visitation that occurs on USACE land and water that is located outside of designated recreation areas and that is not captured via any type of traffic counting device. The majority of dispersed use recreation at Eufaula Lake occurs from the following user groups:

- Shoreline Use Permit Holders
- Minor Real Estate License Holders
- Households in subdivisions adjacent to USACE property that are not permit or license holders
- Marina wet slip renters
- Hunters/fishermen using wildlife management areas located on and/or adjacent to USACE property
- Visitors to private campgrounds located in outgranted lease areas or immediately adjacent to USACE property

To obtain information about dispersed use recreation occurring on Eufaula Lake, a mail-in survey was developed. In accordance with USACE regulation ER 1165-2-503, Office of Management and Budget Clearance for the Questionnaires for U.S. Army Engineer Civil Works Studies and Projects, 31 October 2007, approval was obtained from the Office of Management and Budget (OMB) on April 26, 2012, to conduct a mail-in survey. A copy of the survey justification request along with the survey instrument can be found in **Appendix A**.

The primary purpose of the survey was to obtain information related to frequency, duration, characterization, and location of recreation use activities, and on perceptions of lake management and specific management issues and policies related to shoreline and lake management at Eufaula Lake.

The address list for potential survey respondents was developed from information provided by USACE, which included the addresses of all Shoreline Use Permit holders, minor real estate License holders, as well as addresses from parcel data obtained from County Assessors offices for households within one-quarter mile from the lake. These addresses were then categorized into six groups that corresponded with the six lake areas used in other portions of the Recreation Study.

The number of household addresses selected from each lake area was proportionally the same as the population percentages for the six lake areas to ensure a geographically dispersed and representative sample size was obtained. Then, four thousand potential survey respondents were randomly selected from this list. **Table 6-1** presents the number of surveys mailed to households within each lake area.

Surveys were mailed to potential respondents during the first week of May and completed survey responses were requested to be returned by May 30, 2012. In all, 986 surveys were returned, which equates to a 25 percent response rate, a 95 percent confidence level and a 2.69 percent margin of error rate. Based upon this information, it was determined that the survey results were representative of the population and could

be extrapolated and applied to the entire population or portions of the population without the need for any sampling or selection bias adjustments.

Table 6-1. Number of Households Where Surveys were mailed by Lake Area

Lake Area	Total Population	Percent of Total Population	Number of Surveys Mailed
1	1,591	8%	320
2	3,283	16%	640
3	5,655	28%	1,120
4	2,537	12%	480
5	1,600	8%	320
6	5,643	28%	1,120
Total	20,309	100%	4,000

6.1 Dispersed Use Recreation Survey Results

The responses received to the Dispersed Use Recreation Survey are summarized in this section. The complete database of survey responses is available in the Administrative Record for the project. Each question from the survey is presented below with the total of the survey responses shown in red.

1. Do you own, rent, or have interest in a permanent or seasonal residence located within one-quarter mile of Eufaula Lake in Oklahoma? (Circle)

A. YES

878

B. NO... (If No, Thank you for your time. Please return this survey in the envelope provided)

108

Note: Survey forms where the respondent answered “no” were not considered in the analysis, since they contained no pertinent data

2. Using the map included with this survey, please circle the lake area number where this residence is located. (Circle)

A. LAKE AREA #1

53 (6 percent)

B. LAKE AREA #2

127 (14 percent)

C. LAKE AREA #3

260 (30 percent)

D. LAKEAREA #4

194 (22 percent)

E. LAKE AREA #5

48 (5 percent)

F. LAKE AREA #6

193 (22 percent)

Blank: 3 (<1 percent)

3. How many people including yourself use or live in this residence? _____ PEOPLE

Range: 1 to 52

Average: 4.1

Lake Area	Number of People Living in Residence	Average Number of People per Residence
1	169	3.2
2	412	3.6
3	1,123	4.4
4	970	5.0
5	162	3.5
6	67	3.6
Total	3,506	Average 4.1

4. Do you own or rent this residence? (Circle)

A. OWN

876 (100 percent)

B. RENT

2 (< 1 percent)

C. OTHER (Specify _____)

0 (0 percent)

5. Do you permit others to use this lake residence when you are not present? (Circle)

A. YES

373 (43 percent)

B. NO

504 (57 percent)

Blank: 1 (<1 percent)

6. Is this your permanent address? (Circle)

A. YES

382 (44 percent)

B. NO... (If NO, What are the city, state, and zip code of your permanent residence?)

496 (56 percent)

41 respondents have permanent residence out-of-state

455 respondents have permanent residence within the State of Oklahoma

7. Do you or others that use this residence recreate on Eufaula Lake? (Circle)

A. YES

836 (95 percent)

B. NO... (If No, Thank you for your time. Please return this survey in the envelope provided)

42 (5 percent)

8. How many years have you recreated on Eufaula Lake? _____ Years

Range: 1 to 55

Average: 22.9

Blank: 53

Total: 18,597

9. Does the property where this residence is located share a common boundary with Government land? (Circle)

A. YES

613 (73 percent)

B. NO

223 (27 percent)

Blank: 42

10. Do you have a shoreline use permit for a boat dock on Eufaula Lake? (Circle)

A. YES

543 (65 percent)

B. NO

291 (35 percent)

Blank: 44

11. Do you have any permits with the Corps of Engineers for maintaining any other facilities or activities on Government land? (Circle)

A. YES... (If Yes, How many of each of the following permits do you have?)

467 (56 percent)

B. NO... (If No, Please Put a '0' on the Blanks)

367 (44 percent)

Blank: 44

C. UTILITY RIGHT OF WAY (*i.e.* Electric, Water, Telephone Line): _____ PERMITS

0: 757

1: 113

2: 7

3: 1

D. UNDERBRUSHING: _____ PERMITS

0: 845

1: 30

2: 3

E. MOWING: _____ PERMITS

0: 447

1: 407

2: 23

3: 1

F. PRIVATE RAMP/ROAD: _____ PERMITS

0: 863

1: 15

G. IMPROVED ACCESS (*i.e.* Stairs, walkways): _____ PERMITS

0: 854

1: 24

H. OTHER PERMITS (How many?): _____ PERMITS

0: 35

1: 44

Specify Type(s): _____)

Beautification: 1

Boat Dock: 37

Swim Beach: 1

Unloading: 1

Water Use: 4

Blank: 83

12. Do you or others that use this residence own or have partial interest in a boat or watercraft operated on Eufaula Lake? (Include Personal Water Craft (PWCs) and jet skis as watercraft.) (Circle)

A. YES... (If yes, Please indicate how many of each type of boat or watercraft was operated on Eufaula Lake)

760 (90 percent)

B. NO... (If no, Please skip to question # 19)

82 (10 percent)

Blank: 36

C. _____ POWER BOAT USED FOR FISHING, WATER SKIING/TUBING, PLEASURE BOATING

616 responses used to calculate percentages for 12.C

(Note: One respondent indicated they owned 25 power boats. It was determined to be a commercial entity and was removed from further analysis.)

Average: 1.25

Total: 770

1: 494 (80 percent)

2: 100 (16 percent)

3: 16 (3 percent)

4: 4 (1 percent)

6: 2 (<1 percent)

D. _____ PERSONAL WATER CRAFT (PWC/JET SKI)

268 responses used to calculate percentages for 12.D

Average: 1.5

Total: 403

1: 156 (58 percent)

2: 95 (35 percent)

3: 14 (5 percent)

4: 2 (1 percent)

7: 1 (<1 percent)

E. _____ PONTOON BOAT/HOUSE BOAT

301 responses used to calculate percentages for 12.E

Average: 1.03

Total: 311

1: 291 (97 percent)

2: 10 (3 percent)

F. _____ KAYAK/CANOE/ROW BOAT

97 responses used to calculate percentages for 12.F

Average: 1.20

Total: 116

1: 81 (84 percent)

2: 13 (13 percent)

3: 3 (3 percent)

G. _____ SAIL BOAT

28 responses used to calculate percentages for 12.G

Average: 1.11

Total: 31

1: 27 (96 percent)

2: 1 (2 percent)

3: 1 (2 percent)

13. About how many weekend days and weekdays did you and others that use this residence, boat on Eufaula Lake in 2011?

A. WEEKEND DAYS IN 2011: _____

Range: 1 to 105

Average: 32.5

Total: 21,993

Blank: 19

B. WEEK DAYS IN 2011:_____

Range: 1 to 260

Average: 47.3

Total: 31,536

Blank: 19

C. (TOTAL DAYS)....._____

Range: 1-365

Average - 75.5

Total - 53,818

Blank: 19

- 14. In 2011, about how many hours did you or others that use this residence, spend on Eufaula Lake each time you used your boat or watercraft?**

_____ NUMBER OF HOURS EACH TIME BOAT WAS USED

Range: 1 to 720

(NOTE: There was apparent confusion with this question. Responses greater than 48 hours were excluded for this question)

Average: 5.5 hours

- 15. About how many people accompany you or others that use this residence, each time you use your boat or watercraft on Eufaula Lake?**

_____ (ENTER THE NUMBER OF PEOPLE, INCLUDING YOURSELF)

Range: 1 to 60

(NOTE: Responses greater than 10 were excluded for this question)

Average: 4.4

- 16. Here is a list of activities that you and others that use this residence may have participated in during the past year while boating on Eufaula Lake. Overall, during the past year, about what percent of time is spent on these activities? (Total Respondents – 877)**

A. CRUISING _____%

Range: 1 to 100

593 (68 percent)

Average for this activity: 28 percent

B. FISHING _____%

Range: 1 to 100

606 (69 percent)

Average for this activity: 69 percent

C. SWIMMING FROM BOAT _____%

Range: 1 to 70

480 (55 percent)

Average for this activity: 16 percent

D. WATER-SKIING/TUBING _____%

Range: 1 to 100

434 (49 percent)

Average for this activity: 21 percent

E. RELAXING/SUNNING _____%

Range: 0 to 95

413 (47 percent)

Average for this activity: 20 percent

F. RAFTING W/OTHER BOATS _____ %

Range: 1 to 60

88 (10 percent)

Average for this activity: 13 percent

G. OTHER ACTIVITIES _____ % (Please describe) _____

Range: 1 to 100

72 (8 percent)

Average for this activity: 30 percent

H. TOTAL _____% (BE SURE TOTAL = 100)

17. Using the map included with this survey, please identify the lake area where you most frequently use your boat or watercraft.

_____ LAKE AREA NUMBER (Using the map, enter the lake area number 1 – 6)

Lake Area #1: 33 (4 percent)

Lake Area #2: 91 (12 percent)

Lake Area #3: 266 (35 percent)

Lake Area #4: 186 (26 percent)

Lake Area #5: 38 (5 percent)

Lake Area #6: 140 (18 percent)

18. Using the map included with this survey please identify any and all Lake Areas that you deliberately avoid and the reason you avoid that particular Lake Area? (Enter lake area number 1-6 and reason)

_____ LAKE AREA NUMBER, (REASON YOU AVOID THIS AREA _____)

_____ LAKE AREA NUMBER, (REASON YOU AVOID THIS AREA _____)

_____ LAKE AREA NUMBER, (REASON YOU AVOID THIS AREA _____)

_____ LAKE AREA NUMBER, (REASON YOU AVOID THIS AREA _____)

First Tier of Lake Areas Avoided:

Lake Area #1: 193 (56 percent)

Lake Area #2: 26 (8 percent)

Lake Area #3: 27 (8 percent)

Lake Area #4: 30 (9 percent)

Lake Area #5: 23 (7 percent)

Lake Area #6: 45 (12 percent)

Blank: 416

- Most common reasons for deliberately avoiding Lake Area #1
 - Distance – Too Far
 - Water Quality – Too muddy, dirty
 - Navigation/Underwater Hazards – Trees, Too shallow
- Most common reasons for deliberately avoiding Lake Area #2
 - Navigation/Underwater Hazards – Trees, Too shallow
- Water Quality – Too muddy, dirt
- Most common reasons for deliberately avoiding Lake Area #3
 - Too many boats/Overcrowding
- Most common reasons for deliberately avoiding Lake Area #4
 - Too many boats/Overcrowding
- Most common reasons for deliberately avoiding Lake Area #5
 - Navigation/Underwater Hazards – Trees, Too Shallow

- Most common reasons for deliberately avoiding Lake Area #6
 - Distance – Too Far
 - Navigation/Underwater Hazards – Trees, Too shallow

19. Here is a list of land-based recreational activities that you or others that use this residence may have participated in during the past year at Eufaula Lake. Please circle the activities that you or others participated in last year that occurred outside of a developed recreation area. (Circle all that apply)

A. FISHING/HUNTING/TRAPPING FROM THE SHORELINE

Blank: 71

Yes: 599 (74 percent)

No: 207 (26 percent)

B. SWIMMING FROM THE SHORELINE

Blank: 67

Yes: 594 (73 percent)

No: 216 (27 percent)

C. HIKING/WALKING/STROLLING

Blank: 65

Yes: 422 (52 percent)

No: 390 (48 percent)

D. CAMPING

Blank: 70

Yes: 114 (14 percent)

No: 693 (86 percent)

E. PICNICKING

Blank: 68

Yes: 225 (28 percent)

No: 584 (72 percent)

F. BIRD/WILDLIFE VIEWING/NATURE STUDY/COLLECTING (Rocks, Driftwood, etc.)

Blank: 68

Yes: 303 (37 percent)

No: 506 (63 percent)

G. SIGHTSEEING

Blank: 68

Yes: 295 (36 percent)

No: 514 (64 percent)

H. OTHER (Specify: _____)

Blank: 614

20. From the list of activities you selected in question #19, about how many times did you and others that use this residence, participate in each activity during the past year? (Enter the number of times during the past year)

A. _____ FISHING/HUNTING/TRAPPING FROM THE SHORELINE

Range: 1 to 365

Average: 34.6

Total: 20,060

Blank: 98

B. _____ SWIMMING FROM THE SHORELINE

Range: 1 to 200

Average: 20.6

Total: 11,752

Blank: 104

C. _____ HIKING/WALKING/STROLLING

Range: 1-365

Average: 39.7

Total: 15,762

Blank: 107

D. _____ CAMPING

Range: 1 to 130

Average: 9.4

Total: 992

Blank: 111

E. _____ PICNICKING

Range: 1 to 202

Average: 12.4

Total: 2,571

Blank: 111

F. _____ BIRD/WILDLIFE VIEWING/NATURE STUDY/COLLECTING (Rocks, Driftwood, etc.)

Range: 1 to 365

Average: 52.3

Total: 14,340

Blank: 112

G. _____ SIGHTSEEING

Range: 1 to 365

Average: 27.5

Total: 7,229

Blank: 116

H. _____ OTHER (Specify: _____)

Range: 1 to 365

Average: 43.8

Total: 1,797

Blank: 357

For questions 21 – 25 place an “X” in the space below your response.

21. How much do private docks interfere with your use of the lake?	Do Not Interfere at All	Slightly Interferes	Somewhat Interferes	Seriously Interferes	Tremendously Interferes
	726	57	30	10	7
Blank: 47	87 percent	7 percent	4 percent	1 percent	1 percent
22. How serious a problem would it be for lakefront homeowners to clear underbrush along the shoreline?	Not At All of a Problem	A Slight Problem	Somewhat of a Problem	Significant Problem	Very Serious Problem
	596	98	76	30	25
Blank: 53	72 percent	12 percent	9 percent	4 percent	3 percent
23. Is there a problem with too many private docks on the lake?	Not at All of a Problem	A Slight Problem	Somewhat of a Problem	Significant Problem	Very Serious Problem
	635	116	56	12	12
Blank: 53	77 percent	14 percent	7 percent	1 percent	1 percent
24. How significant a problem is there from too many boats on the lake?	Not At All of a Problem	A Slight Problem	Somewhat of a Problem	Significant Problem	Very Serious Problem
	604	151	53	10	7
Blank: 53	73 percent	18 percent	7 percent	1 percent	1 percent
25. How significant a problem would it be for lakefront homeowners to mow to the water's edge?	Not At All of a Problem	A Slight Problem	Somewhat of a Problem	Significant Problem	Very Serious Problem
	642	71	65	20	22
Blank: 58	78 percent	9 percent	8 percent	2 percent	3 percent

There were 129 unsolicited comments received from respondents.

6.2 Dispersed Use Recreation Survey Analysis

One of the primary purposes for conducting the Dispersed Use Recreation Survey was to develop an up-to-date estimate on the amount of dispersed use recreation that occurs annually at Eufaula Lake. Four thousand Dispersed Use Recreation Surveys were mailed out and 995 surveys were returned for a 25 percent return rate (Figure 6-1).

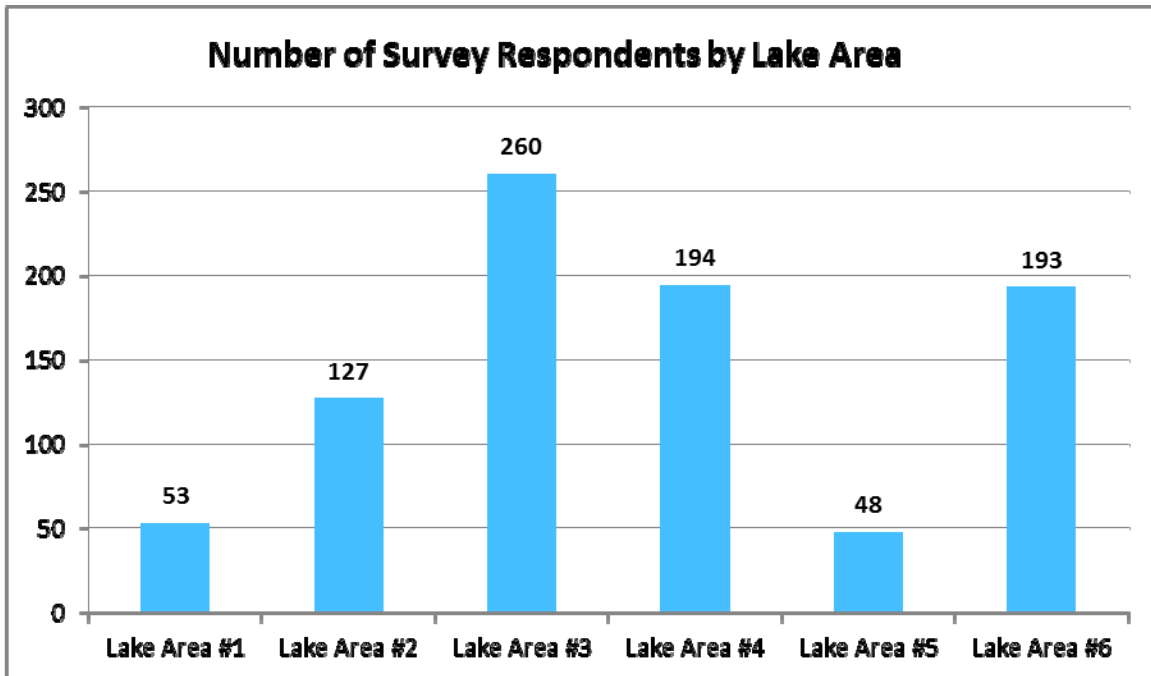


Figure 6-1. Number of Survey Respondents by Lake Area

Analysis of the data revealed the following findings:

- Most respondents own their residence (99.77 percent). Only 2 respondents rent their residence.
- Forty three percent of the respondents allow others to use their residence when they are not present.
- Forty four percent of the respondents claim this residence as their permanent address.
- Fifty six percent of the respondents indicate this residence is a seasonal home.
- Ninety two percent of seasonal residents live within the State of Oklahoma; only eight percent have a permanent address out of state.
- Respondents have recreated on Eufaula Lake an average of 22.9 years.
- Respondents have recreated on Eufaula Lake a combined total of 18,597 years.
- Seventy three percent of the respondents share a common boundary with the government land surrounding the lake.
- Sixty five percent of respondents have a Shoreline Use Permit for a boat dock on Eufaula Lake.
- Respondents indicated that a total of 492 permits for either under-brushing or mowing have been issued to them. However, only 36 (7 percent) were issued simply for under-brushing. The remaining 456 (97 percent) were issued for mowing (**Figure 6-2**).
- Respondent boat owners have operated their boats on Eufaula Lake an average of 22.6 years.
- Respondents operate a total of 1,631 vessels on Eufaula Lake (**Figure 6-3**).

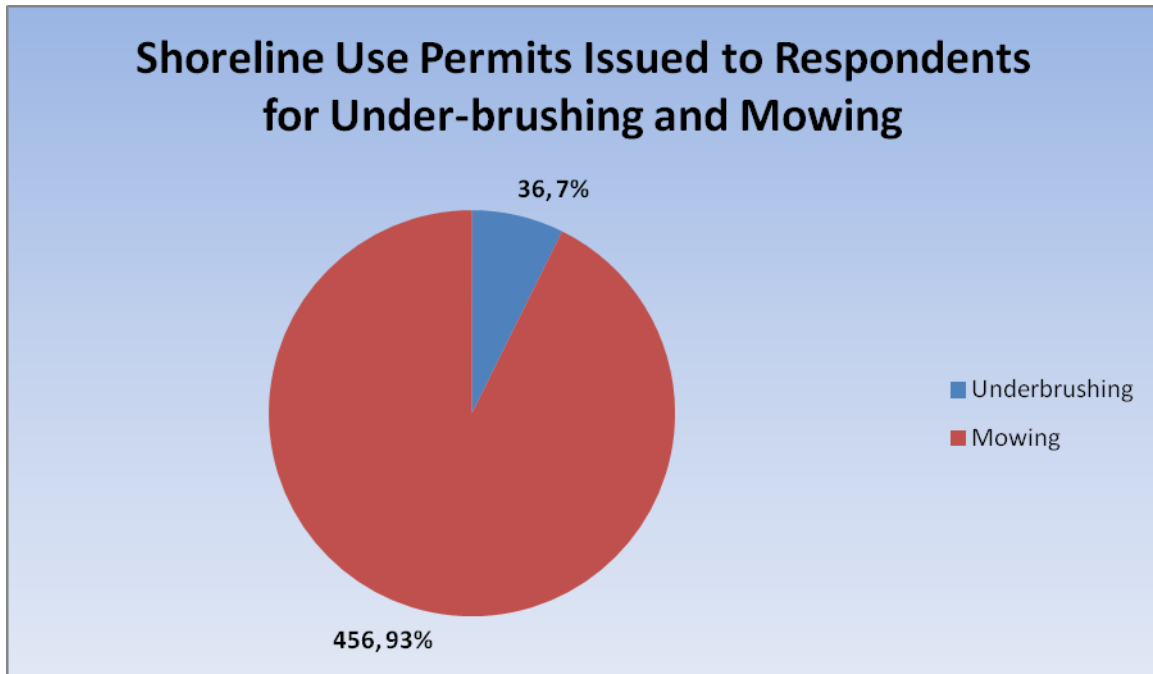


Figure 6-2. Shoreline Use Permits Issued to Respondents for Under-brushing and Mowing

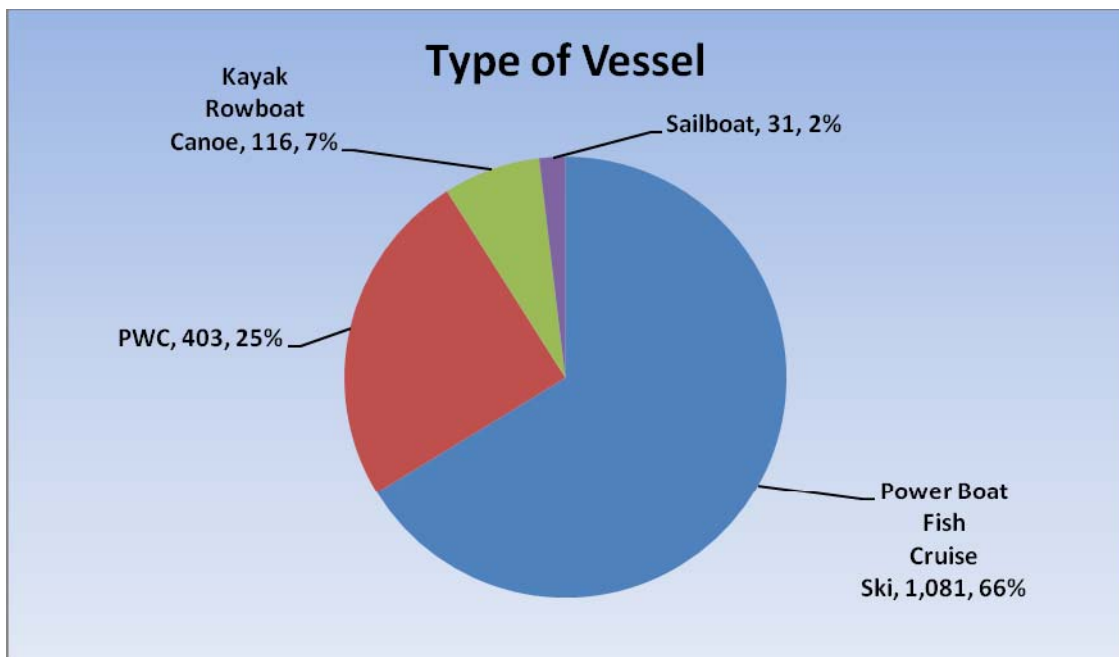


Figure 6-3. Type of Vessels Operated by Respondents

- Ninety one percent of respondents' boats are powered vessels.
- Personal Watercraft comprise 27 percent of respondents' powered vessels on Eufaula Lake.
- Respondents own a total of 1,618 vessels that are operated on Eufaula Lake. Twenty-six percent (416) of those vessels are operated by respondents that do not have a shoreline use permit for a boat dock. The remaining 1,202 vessels are operated by respondents that do have a shoreline use permit for a boat dock.
- There are a total of 416 boats operated by respondents without a boat dock permit.
- Respondents operate their boats an average of 75.5 days per year.
- Respondents operate their boats an average of 5.5 hours each time they use their vessel.
- There is an average of 4.4 people on-board each time the vessel is used.
- Activities while boating are shown in **Figure 6-4**. (Note: percentages total more than 100 percent, since boaters may participate in more than one activity.)
- The most frequently used lake areas by all respondent boaters are shown in **Figure 6-5**.

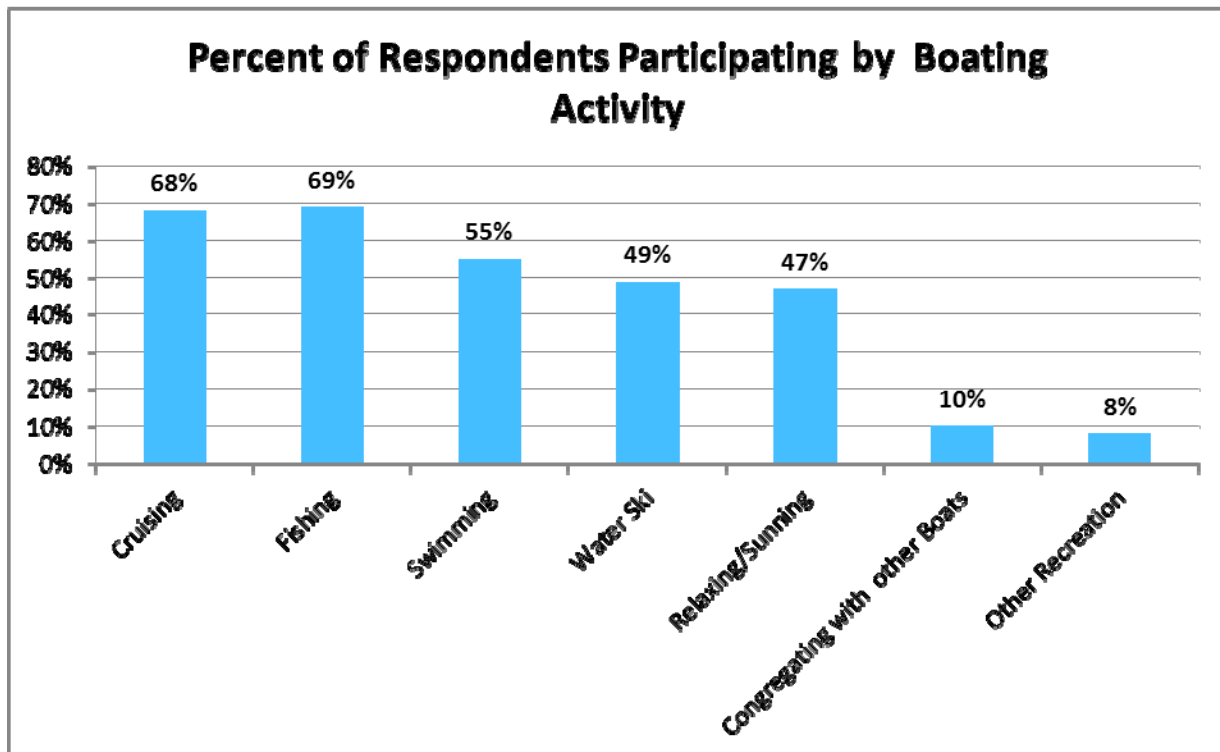


Figure 6-4. Percent of Respondents Participating by Boating Activities

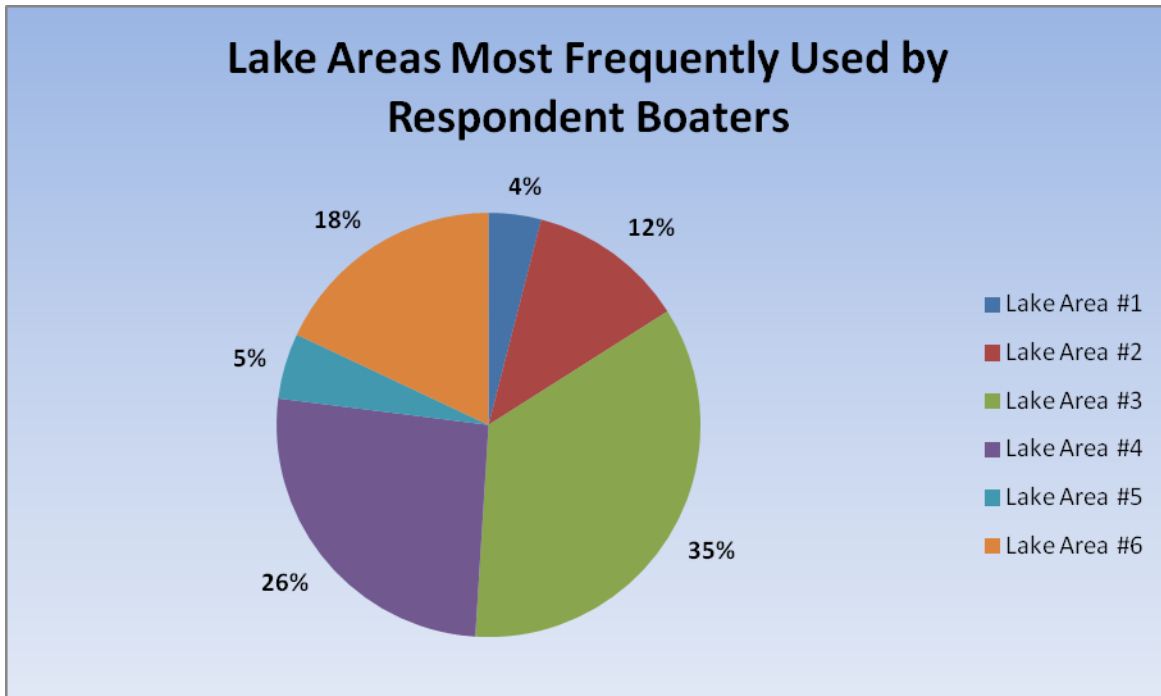


Figure 6-5. Lake Areas Most Frequently Used by Respondent Boaters

- The percent of all respondent boaters that deliberately avoid certain lake areas are as follows:
 - Lake Area 1: 22 percent
 - Lake Area 2: 3 percent
 - Lake Area 3: 3 percent
 - Lake Area 4: 3 percent
 - Lake Area 5: 3 percent
 - Lake Area 6: 5 percent
- The number of visitor days in 2011 attributable to respondents participating in land-based recreation activities that occurred on USACE land outside of a designated recreation area (Dispersed Use Recreation) are shown on **Figure 6-6**.
- In 2011, respondents spent a total of 20,060 visitor days fishing/hunting/trapping along the shoreline, outside of designated recreation areas.
- In 2011, there were 53,818 visitor days attributable to respondents participating in water-based recreation activities.
- In 2011, respondents spent a total of 128,321 visitor days recreating outside of a designated recreation area; 58 percent were attributable to land-based activities and 42 percent to water-based activities.

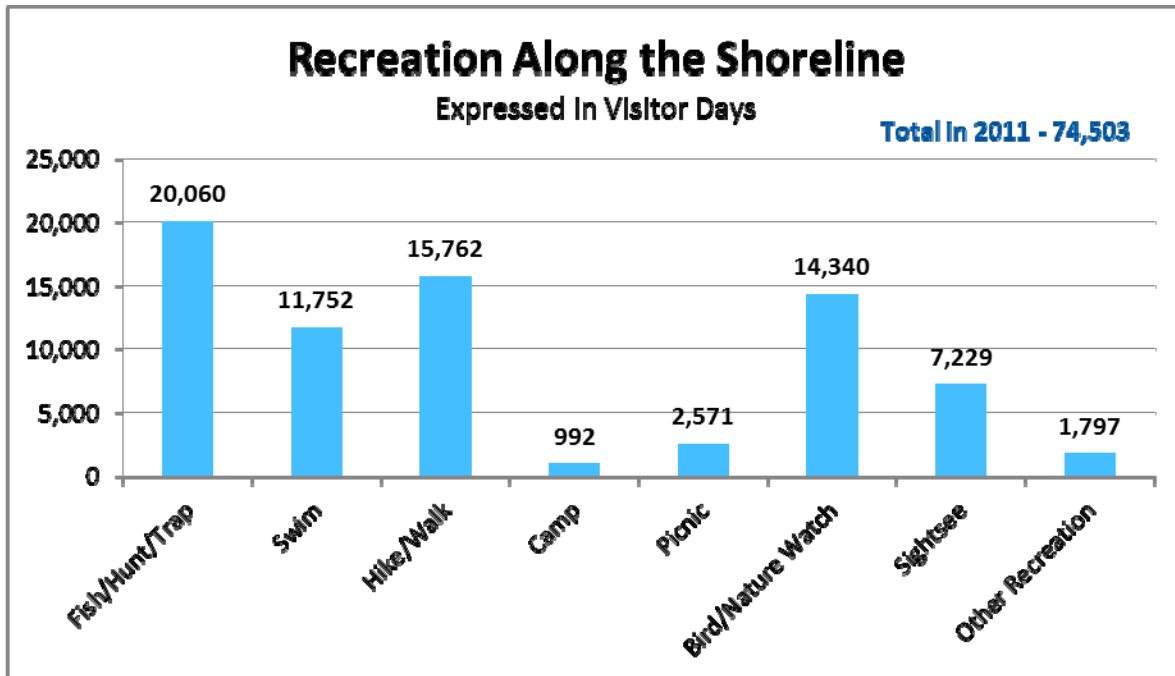


Figure 6-6. Recreation Along the Shoreline, Expressed in Visitor Days

- In 2011, respondents spent a total of 1,539,852 visitor hours recreating on USACE land and/or water outside of a designated recreation area (dispersed use recreation).
- In 2011, each respondent spent an average of 146.3 dispersed use recreation visitor days recreating on USACE land and/or water.
- Extrapolating the survey data and applying it to the total population living within one-quarter mile of Eufaula Lake indicates that in 2011 there were approximately 2,971,207 dispersed use recreation visitor days spent on USACE land and/or water.

6.2.1 Dispersed Use Recreation from Residents within One-quarter Mile of Eufaula Lake

According to the most recent census data, there are approximately 20,309 people living within one-quarter mile of Eufaula Lake. The largest percentage of dispersed use on the lake is generated by people that live within one-quarter mile of the lake and this was the target audience for the survey. The dispersed use generated by other groups of users is relatively small compared to the use generated by adjacent residents. According to the survey results, these residents participate in the full range of activities at the lake as other lake visitors.

The survey data reveals there were a total of 128,321 dispersed use recreation visitor days from survey respondents in 2011. Dividing this number by the number of valid surveys (878) used to calculate this information, it is estimated that each person living within one-quarter mile of the lake spends an average of 146.3 visitor days annually recreating on USACE land and/or water outside of a designated recreation area. Multiplying this number by the total population within one-quarter mile of the lake, indicates in 2011 there

were approximately 2,971,207 dispersed use recreation visitor days spent by local residents on USACE land and water at Eufaula Lake.

6.2.2 Dispersed Use Recreation from Marina Slip Renters

Since visitation data from marinas is not included in visitation calculations by USACE for Eufaula Lake, the visitor days associated with those facilities also needed to be evaluated. To accomplish this, data from the marina surveys, conducted as part of the water-based recreation study at Eufaula Lake, and data from studies previously conducted by USACE at marinas located on other USACE lakes, was used to estimate the total number of annual visitor days associated with marinas on Eufaula Lake.

According to three studies published by USACE in February 2008 for marinas located on Harry S. Truman Dam and Reservoir, Raystown Lake, and Lake Sidney Lanier, it was estimated that marina slip renters average approximately thirty trips per year to participate in boating-related recreational activities and that there is an average of 3.71 people on board during each trip (USACE 2008a, b, and c).

Using this data in conjunction with the occupancy rate data collected for marinas on Eufaula Lake, the approximate number of visitor days associated with marina slip renters is estimated. There are 1,099 wet slips at marinas located on Eufaula Lake and the average occupancy rate was determined to be 85 percent. The following formula was used to calculate annual visitor days from marinas at Eufaula Lake:

1,099	Number of Marina Wet Slips
X 0.85	Occupancy rate
= 934	Average number of occupied wet slips
934	Average number of occupied wet slips
X 30	Average number of trips per year
= 28,020	Total Boat Trips per year
28,020	Total Boat Trips per year
X 3.71	Average number of people on board during each trip
= 103,954	Total annual visitor days attributable to marina slip renters

6.2.3 Dispersed Use Recreation from Wildlife Management Areas (WMAs)

As discussed in Section 3.2.5.3, there are approximately 14,075 annual dispersed use recreation visitor days attributable to WMAs at Eufaula Lake.

6.2.4 Dispersed Use Recreation from Campgrounds Immediately Adjacent to Eufaula Lake

There are two private campgrounds located immediately adjacent to USACE property at Eufaula Lake: Terra Starr RV Park (Lake Area 3) and Checotah/Lake Eufaula West KOA Campground (Lake Area 1). However, as discussed in Section 3.2.7.3, the Terra Starr RV Park is basically a local residential development and dispersed use recreation visitation associated with this area is included in visitation estimates from residents within one-quarter mile of Eufaula Lake.

The Checotah/Lake Eufaula West KOA Campground, located adjacent to USACE property in Lake Area 1 receives approximately 20,808 annual visits. Through personal interviews with the campground owners, it was learned that approximately 75 percent of the visitors to the campground also use the hiking trails located on USACE property. When hiking on the trails, visitors also participate in nature photography, wildlife viewing, fishing from the shoreline, kayaking and canoeing. This indicates that approximately 15,606 dispersed use recreation visitor days occur annually on USACE property from this campground.

6.2.5 Dispersed Use Recreation Visitation Summary – Eufaula Lake

Prior to this study, the source of data used for estimating dispersed use recreation at USACE lakes and recreation projects was recreation use surveys that were conducted in the 1980s. Many of the load factors and calculations used for estimating visitor use are, therefore, out-of-date. USACE recreation projects have not been able to update this information, because there was no new or updated data from current surveys or studies that could be used to update the outdated data being used in the visitor estimating and reporting systems (VERS).

The data obtained during the Recreation Study for Eufaula Lake during the 2012 recreation season indicate that the load factors and calculations used for estimating dispersed use recreation visitation at Eufaula Lake should be updated. **Table 6-2** presents the recommended current data for estimating dispersed use recreation. This data was obtained directly from the OMB approved Dispersed Use Recreation Survey conducted at Eufaula Lake in May 2012 and other on-site surveys conducted during the 2012 recreation season.

Table 6-2. Recommended Update to Annual Dispersed Use Recreation Visitation Data – Eufaula Lake

Source of Dispersed Use Recreation	Annual Dispersed Use Recreation Visitor Days	Annual Dispersed Use Recreation Visitor Hours
Residents located within one-quarter mile of Eufaula Lake	2,971,207	35,654,484
Marinas	103,954	1,247,448
Wildlife Management Areas	14,075	168,900
Campgrounds Immediately Adjacent to USACE property	15,606	187,272
Total	3,104,842	37,258,104

Section 7

Environmental Consequences

As part of the recreation study and in conjunction with the EIS for the Eufaula Lake SMP and MP revisions, an analysis has been completed for each of the five alternatives described in the Draft EIS, including:

- No Action Alternative:
- Alternative 1: Limited Development shoreline allocations as they existed under the 1981 SMP:
- Alternative 2: Limited Development shoreline allocations somewhat reduced from the No Action Alternative based on dock suitability criteria:
- Alternative 3: Shoreline allocation for Limited Development somewhat increased compared to the No Action Alternative but constrained by dock suitability criteria; and
- Alternative 4: Shoreline allocation for Limited Development greatly increased compared to the No Action Alternative and approval of a lease of government land in support of the Carlton Landing development proposal.

This analysis describes potential impacts associated with each of the types of recreational uses described in the previous sections and how those recreational uses might be affected under each of the alternatives. Potential secondary and cumulative impacts that can be reasonably anticipated are also described.

The No Action Alternative would be a continuation of the existing policies and shoreline allocations into the future. The No Action Alternative is the basis against which all other alternatives are to be compared. As a result, the environmental impacts associated with each of the alternatives under consideration are compared to both current and potential future conditions that have not yet been realized.

It should be understood that the No Action Alternative depicts the conditions that would occur, including secondary and cumulative impacts, if there is no change to the existing SMP or MP. While there would be no change to the existing shoreline allocations under the No Action Alternative, there are currently many miles of undeveloped shoreline that are allocated as Limited Development and which could be developed at some time in the future. This future potential development could reasonably be expected to include additional dock construction and alteration of the existing shoreline vegetation. The “future condition” under the No Action Alternative would be expected to be different from the current existing condition.

One of the key components in determining impacts is the number and density of boat docks. Private boat docks may only be permitted along shorelines allocated as Limited Development. Existing USACE policy and the current Eufaula Lake SMP both require boat docks to be placed a minimum of 50 feet from other docks. Although in reality, the average distance between docks most likely would be greater than 50 feet because of the irregular shape of the shoreline, shallow water depths, and similar factors. However, the impact analysis must consider the maximum potential build-out for each alternative being evaluated. In addition, no more than 50 percent of the shoreline allocated as Limited Development may be developed. Thus the total width of private boat docks must be less than 50 percent of the shoreline allocated as

Limited Development. One of the primary considerations for assessing impacts under each of the alternatives is the number of boat docks that could ultimately be placed on the shoreline within the parameters of each alternative being evaluated (**Table 7-1**).

The calculation for number of boat docks per mile of shoreline is:

1 mile = 5,280 feet

Average dock width at Eufaula Lake = 31.8 feet

Required dock spacing = 50 feet between docks

$5,280' / 50' = 64$ boat docks per mile

$64 / 2 = 32$ boat docks per mile of Limited Development shoreline (50% density limitation)

Table 7-1. Maximum Potential Number of Private Boat Docks Under Each Alternative

Alternative	Limited Development Shoreline (miles)	Limited Development Shoreline (feet)	Average Dock Width + 50 foot spacing	Number of Docks X .50 ¹	Maximum Number of Docks
No Action	271	1,430,880	81.8	17,492	8,746
Alternative 1	42	221,760	81.8	2,711	1,355 ²
Alternative 2	182	960,960	81.8	11,747	5,873
Alternative 3	367	1,937,760	81.8	23,688	11,844
Alternative 4	479	2,529,120	81.8	30,918	15,459

¹ The maximum potential number of docks that could be built under each alternative is based on an average width of 31.8 feet and a minimum dock spacing of 50 feet with 50% density limit applied.

² – Although this value is less than the total number of existing docks, over half of the existing docks are located outside of areas that would be designated as Limited Development under Alternative 1. Therefore, an additional 605 docks could be constructed along the Limited Development shorelines under Alternative 1.

Currently, there are a total of 1,673 private and community boat docks authorized and in place under the existing SMP for Eufaula Lake. There are 5,439 boats located at these docks, which indicates that the average number of boats per boat dock is approximately 3.3 boats per dock.

7.1 Shoreline Zoning Designation Definitions

ER 1130-2-406, *Shoreline Management at Civil Works Projects*, provides policy guidance for the USACE Shoreline Management Program. The definitions for each of the shoreline allocation classifications are provided below.

(1) Limited Development. Limited Development areas are those areas in which private facilities and/or activities may be allowed. Modification of vegetation by individuals may be allowed following the issuance of a permit. Potential low and high water conditions and underwater topography should be carefully evaluated before shoreline is allocated as Limited Development.

(2) Public Recreation. Public Recreation areas are those areas designated for commercial concessionaire facilities, federal, state, or other similar public use. No private shoreline use facilities and/or activities will be permitted within or near designated or developed public recreation areas. The term “near” depends on

the terrain, road system, and other local conditions, so actual distances must be established on a case-by-case basis in each project shoreline management plan. No modification of land forms or vegetation by private individuals or groups of individuals is permitted in public recreation areas.

(3) Protected Shoreline. Protected Shoreline areas are those areas designated to maintain or restore aesthetic, fish and wildlife, cultural, or other environmental values. Shoreline may also be so designated to prevent development in areas that are subject to excessive siltation, erosion, rapid dewatering, or exposure to high wind, wave, or current action, and/or in areas in which development would interfere with navigation. No shoreline use permits for floating or fixed recreation facilities will be allowed in Protected areas. Some modification of vegetation by private individuals, such as clearing a narrow meandering path to the water, or creation of a firebreak, may be allowed following the issuance of a permit, if the resource manager determines that the activity will not adversely impact the environment or physical characteristics for which the area was designated as protected. In making this determination, potential effects on water quality are also considered.

(4) Prohibited Access. Prohibited Access areas are those in which public access is not allowed or is restricted for health, safety or security reasons. These could include hazardous areas near dams, spillways, hydro-electric power stations, work areas, water intake structures, and similar structures. No shoreline use permits are issued in Prohibited Access areas.

7.2 Master Plan Land Allocations and Classifications

Engineering Pamphlet (EP) 1130-2-550, Chapter 3, establishes the regulatory framework and general definition for land allocations and land use classifications described in the master plan for a USACE lake project. All lands are allocated in accordance with the congressionally authorized purposes for which they were acquired. Project lands are allocated into one of four categories:

- Operations: lands acquired for operation of the project (*e.g.*, flood control, hydropower, navigation, water supply, etc.);
- Recreation: separable lands acquired in accordance with authorizing documents for public recreation;
- Fish and Wildlife: separable land acquired in accordance with authorizing documents for fish and wildlife management; or,
- Mitigation: land acquired or designated in accordance with authorizing documents to offset losses associated with development of the project (USACE 1996).

At Eufaula Lake, all project lands are allocated to operations. There are no lands that were authorized or acquired with specific, separable purposes of recreation, fish and wildlife management, or mitigation. No changes to these allocations would occur as a result of the proposed MP revision.

Allocated lands are further classified to provide for development and resource management consistent with authorized project purposes and the provisions of other Federal laws. Land classification categories describe the primary purpose for which project lands are managed. The following sections describe the land classifications used in a project master plan as described in EP 1130-2-550, their occurrence at Eufaula Lake, and their general relationship to the SMP shoreline designations described in Section 7.1.

7.2.1 Project Operations

This classification includes those lands required for the dam, operations center, office, maintenance compound and other areas that are used solely for project operations. Privately-owned facilities are not permitted in these areas and recreational access is also generally prohibited. The lands at Eufaula Lake allocated for project operations are the lands containing the dam, spillway, and project buildings, excluding the overlook (USACE 1977). Project Operations lands are consistent with the Prohibited Access shoreline designation in the SMP.

7.2.2 High Density Recreation

High Density Recreation lands include those acquired for project operations and those acquired specifically for recreation and designated for use as developed public use areas for intensive recreational activities by the visiting public. These uses can include areas for concessions (marinas, comprehensive resorts, etc.) and quasi-public development (USACE 1977). Private floating facilities are not allowed in these areas. High Density Recreation lands are consistent with the Public Recreation shoreline designation in the SMP.

7.2.3 Mitigation

This classification is only used for lands with an allocation of Mitigation that were acquired specifically for the purposes of offsetting losses associated with development of the project. As no such lands exist at Eufaula Lake, this lands classification category is not used in the Eufaula Lake MP.

7.2.4 Environmentally Sensitive Areas

This classification is used for areas where scientific, ecological, cultural, or aesthetic features have been identified. These areas are generally managed to ensure they are not adversely impacted. Typically, limited or no development of public use is allowed on land in this classification (USACE 1996) and no agricultural or grazing uses are permitted on these lands. Lands appropriate for this classification occur sporadically around Eufaula Lake and include old growth timber, forested wetlands, and cultural resource sites. This land classification is consistent with the Protected shoreline designation in the SMP.

7.2.5 Multiple Resource Management Lands

This classification allows for the designation of a predominant use with the understanding that other compatible uses may also occur on these lands. Land classification maps included in the Eufaula Lake MP reflect the predominant sub-classification, rather than just the Multiple Resource Management classification. The Multiple Resource Management sub-classifications are described in the following sections.

7.2.5.1 Low Density Recreation

As defined in EP 1130-2-550, the Low Density Recreation sub-classification of the Multiple Resource Management classification is appropriate for lands with minimal development or infrastructure, and which support passive public recreational use such as hiking, primitive camping, wildlife observation, hunting, or similar low-density recreational activities. This land classification exists extensively at Eufaula Lake. No agricultural uses are permitted on these lands except on an interim basis (USACE 1977). Depending upon site conditions, this sub-classification is consistent with either Limited Development or Protected shoreline designations in the SMP.

7.2.5.2 Wildlife Management

These lands were acquired for project operations and allocated as habitat for fish and wildlife or for propagation of such species (USACE 1977). Lands in this category should be available for low density recreational activities. These lands occur around Eufaula Lake and include ODWC-licensed lands, which are used for hunting and fishing recreational activities. This sub-classification is consistent with the Protected shoreline designation in the SMP.

7.2.5.3 Vegetation Management

These lands are defined as being used for management activities for the protection and development of forest and vegetative cover (USACE 1996). This sub-classification is only applied to a few areas in the current (1977) Eufaula Lake MP. It is likely that the proposed MP supplement will use the Environmentally Sensitive classification for these limited areas, which would not change the existing management of these lands. This sub-classification is consistent with the Protected shoreline designation in the SMP.

7.2.5.4 Future/Inactive Recreation Areas

Lands classified as Future/Inactive Recreation Areas include those planned for recreation, but never developed for such uses. This classification also includes areas with site characteristics that are compatible with potential future recreational development and recreation areas that are closed. The original 1977 MP designated five areas for Recreation – Intensive Use that have not been developed as such. At Eufaula Lake these areas include: Big Ridge (70 acres), Canadian Landing (47 acres), Duchess Creek (99 acres), Onapa Creek (78 acres), and Roundtree Landing (270 acres). This sub-classification is consistent with the Protected shoreline designation in the SMP. If any of these areas are selected for active recreational development, its MP classification would need to be changed to High Density Recreation, and the SMP designation would need to be changed to Public Recreation.

7.2.6 Easement Lands

Easement lands are those for which USACE holds an easement real estate interest but not fee title. Use and management of easement lands is conducted in accordance with the terms and conditions of the easement estate acquired for the project (USACE 1996). While easements may be obtained for operations or conservation benefits, all of the easements at Eufaula Lake are flowage easements. These easements are found all around Eufaula Lake and are often located at higher elevations than the shoreline lands owned in fee. Flowage easements allow USACE to flood these lands during high flows for flood control purposes. Habitable structures are not allowed on flowage easement lands, and private developments that would involve filling, dredging, or construction require USACE review and approval prior to such activities. As these lands are privately-owned, they are not subject to assignment of MP classifications used for federally-owned lands described above. However, where they exist, shorelines of flowage easement lands are classified into the various SMP designations for the purposes of permitting floating facilities only.

7.3 Boating-related Terminology, Definitions, and Calculation Formulas

Some of the terminology used to describe and measure boating-related activities require further explanation to ensure they are understood and clearly defined. For the purposes of this study the following definitions are provided.

- **Boats At One Time (BAOT):** Total number of boats on the water surface, actively being used for recreational purposes, at any given point in time. (Note: this number can be derived from an actual boat count or calculated to estimate a future condition by multiplying the Lake Use Rate percent by the projected or estimated number of boats.) Currently, the BAOT for Eufaula Lake is 2,174. This number was derived from aerial boat count surveys conducted between April and July 2012. The most number of boats counted during any survey period was 2,174.
- **Boating Density (BD):** Boating density is a measure of use that is calculated by dividing the number of unrestricted water surface acres by the total number of boats at one time (BAOT) and is expressed as the number of acres per boat. Currently, the BD for Eufaula Lake is 24 acres per boat and was calculated as follows:

$$52,218 \text{ (unrestricted water acres)}/2,174 \text{ (BAOT from aerial boat count survey)} = 24 \text{ Acres per boat}$$

The current BAOT was established during the aerial boat count surveys, when the most number of boats tallied during any survey period was 2,174. Since the surveys were conducted during peak use periods, using the largest number of boats tallied for any survey period provides more certainty that under current conditions this amount would not likely be exceeded.

- **Total Boat Capacity (TBC):** The total number of boats that can be moored or stored at an approved moorage facility, such as a marina or boat dock, plus the total number of boats that can be placed on the water surface, using an approved boat ramp or launch facility. (Note: the number of boats that can be placed on the water surface from public boat ramps is typically the same as the number of car/trailer parking spaces.) Currently, the TBC for Eufaula Lake is 8,934 boats and was calculated as follows:

$$\begin{aligned} &1,096 \quad \text{Car/Trailer Spaces at Boat Ramps in public recreation areas} \\ &+1,097 \quad \text{Marina Wet Slips} \\ &+5,523 \quad \text{Boats from Private Boat Docks} \\ &+1,218 \quad \text{Boats from Subdivision Boat Ramps} \\ &=8,934 \quad \text{TBC} \end{aligned}$$

- **BAOT Capacity:** BAOT Capacity differs from BAOT, in that BAOT Capacity is a projected calculation that represents a pre-determined number that is established to represent the carrying capacity limit for the number of boats on the water at one time. The number is calculated by dividing the number of unrestricted water surface acres by the desired or appropriate boating density. Currently, the BAOT Capacity for Eufaula Lake is 3,500 boats and was calculated as follows:

$$52,218 \text{ (unrestricted water surface acres)}/15 = 3,481 \text{ rounded to } 3,500$$

- **Lake Use Rate** – Lake Use rate is calculated by dividing TBC into BAOT. Currently the lake use rate for Eufaula Lake is 24 percent, and was calculated as follows:

$$2,174/8,934 = 24 \text{ percent}$$

7.4 No Action Alternative

The No Action Alternative includes the following main components:

- Existing shoreline allocations under the SMP would not change.
- MP land use classifications maps would not be revised to be consistent with the 1998 SMP shoreline allocations. Although the maps would not be revised, land would continue to be managed as though the MP were consistent with the 1998 SMP. This is the existing baseline condition with respect to land management.
- Existing vegetation management policies would not change.
- The lease request for a public marina and other public recreation facilities at Carlton Landing would not be approved.
- Individual requests to change shoreline allocations would not be approved.

Under the No Action Alternative, there are 271 miles of shoreline designated as Limited Development. Therefore, the maximum potential number of docks that could be permitted under the No Action Alternative is 8,746 boat docks. Applying the current average number of boats per dock (3.3 boats/dock), approximately 28,862 boats ($3.3 \times 8,746 = 28,862$) could be at the lake under a worst case scenario of full build out of the No Action Alternative. **Figure 7-1** depicts the current number of boat docks and boats compared to the No Action Alternative maximum build-out potential.

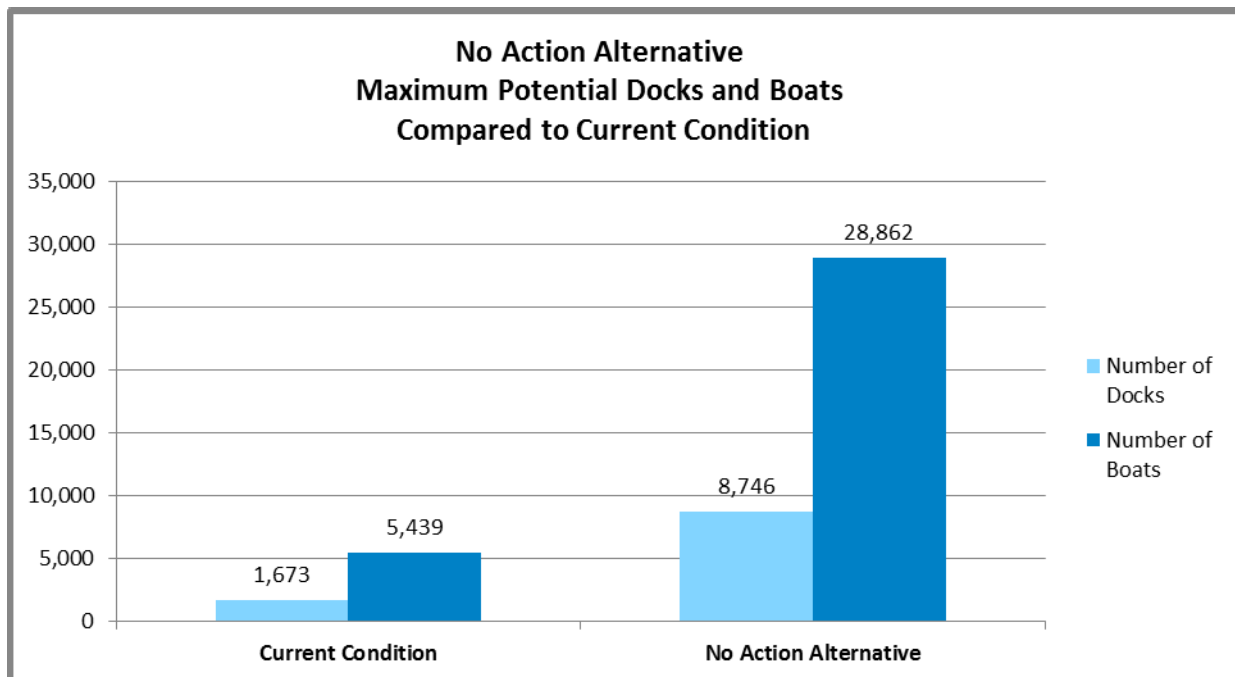


Figure 7-1. No Action Alternative – Maximum Potential Docks and Boats

7.4.1 Potential Recreation Impacts Under the No Action Alternative

7.4.1.1 Land-based Recreation

The No Action Alternative would not result in any direct changes to land-based recreational facilities at Eufaula Lake. Although there are no direct impacts to land-based recreation resulting from the No Action Alternative, the indirect impacts could be substantial over time. Studies conducted by USACE, Bureau of Reclamation (BOR) and the Outdoor Foundation indicate a high degree of crossover recreation activity participation among outdoor recreation enthusiasts. Surveys conducted by USACE indicate that persons that boat also participate in the following land-based recreation activities at the identified percentage rates:

- Picnicking – 50 percent
- Camping – 44 percent
- Hiking/Walking/Biking – 33 percent
- Hunting – 3 percent
- Sightseeing – 1 percent

Using the crossover activity participation rates from USACE surveys, one could reasonably expect increases to land-based recreation visits at Eufaula Lake. Because the No Action Alternative has the potential to substantially increase the number of boat docks on the lake and thus the number of boaters, there could be secondary impacts to land-based recreation. **Table 7-2** represents the potential impact to land-based recreational use, upon reaching the maximum potential build-out of docks under the No Action Alternative. Data from the USACE Recreation Economic Assessment System (REAS) provides the basis for the formula used in calculating this visitation increase is: (# of boats) x (3) average boating party size) x (crossover participation percentage rate) = (land-based crossover visits from boaters).

Table 7-2. Potential Long-term Secondary Impacts to Land-based Recreation Under the No Action Alternative

Boating Crossover Rates by Activity	Current #of Annual Visits by Activity*	Visits Resulting from boating crossover participation	Total Potential Visits
Picnicking (50%)	166,957	43,293	210,250
Camping (44%)	48,563	38,098	86,661
Hiking (33%)	N/A	N/A	N/A
Hunting (3%)	25,713	2,598	28,311
Sightseeing (1%)	700,122	866	700,988
Total	941,355	84,855	1,026,210

* Data source: USACE – Value to the Nation – 2010 data set

The number of annual visits for picnicking is currently about 167,000. There are 79 developed picnic sites at Eufaula Lake which could provide approximately 230,680 picnicking opportunities per year (79 sites times 2 (the number of parties that can use a site per day) times 4 (the average size of a picnic party) times 365 days per year). Since picnicking is not a year round activity, many recreationists are probably using locations other than designated picnic spots. Although the total potential visits under the No Action

Alternative is less than this theoretical opportunity, the lack of picnic facilities and opportunities would become noticeably apparent.

As discussed in Section 3.12, campgrounds are currently at about 28 percent capacity, although the summer and weekend rates are higher. Therefore, the maximum camping opportunity available would be 173,439 annual visits. Under the No Action Alternative, the availability of campsites would likely be impacted during peak use periods, particularly in the month of July.

In addition to increases in the potential number of boaters, the potential for residential development adjacent to Limited Development shorelines that are currently undeveloped could result in an increase in the population within one quarter mile of the shoreline and thus an increase in the number of people who participate in dispersed use land-based recreational activities.

7.4.1.2 Water-based Recreation

Potential impacts on water-based recreation most likely would be significant, particularly over the long term. The recommended boating density is 15 water surface acres per boat, which equates to 3,500 BAOT and a TBC of 14,200 boats. **Figure 7-2** compares BAOT and TBC for current conditions at Eufaula Lake and under the No Action Alternative compared to recommended capacity limits for Eufaula Lake.

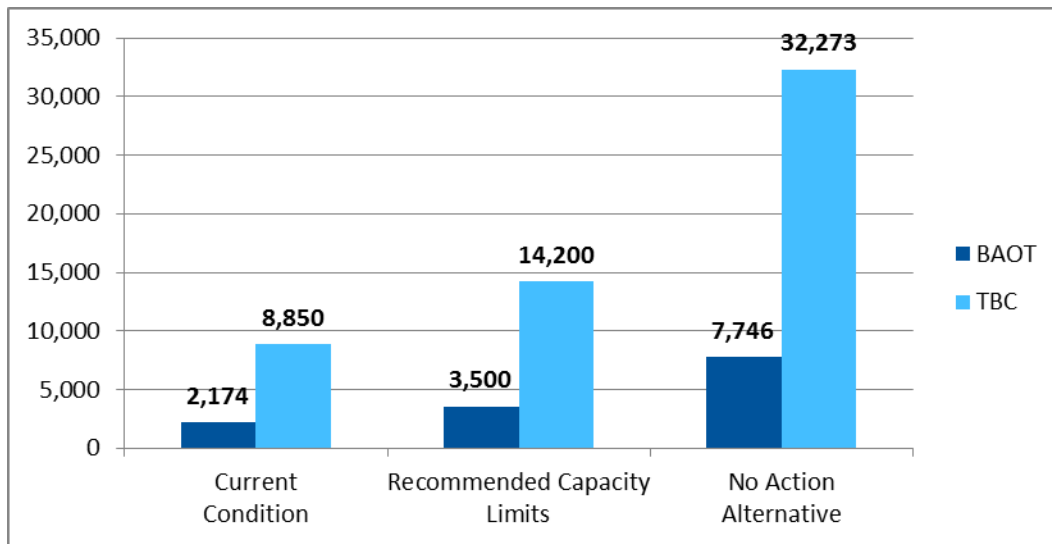


Figure 7-2. No Action Alternative Compared to Current Condition and Recommended Capacity

The No Action Alternative has the potential to allow BAOT and TBC to be over two times greater than recommended capacity limits. Maximum boat density under the No Action Alternative would be approximately 6.7 acres per boat. From a nationwide review of boating capacity studies, the minimum boating density is typically 15 acres per boat. However, the most common range is from 20 to 50 acres per boat.

At this level of boating density, one could reasonably expect increases in boating accidents, injuries, and fatalities. As an example, currently the average boating density in Lake Areas 3 and 4 is 13.7 acres per boat, while the average for all other lake areas is 57 acres per boat. Between 2003 and 2011, 66 percent of the boating accidents occurred in Lake Areas 3 and 4. In addition, the number of boating accidents per thousand water surface acres in Lake Areas 3 and 4 is nearly double that of other Lake Areas. This is a

strong indication that as boating density increases (BD number is lower), the number and frequency of boating accidents will also increase.

The No Action Alternative would most likely require implementation of a range of mitigation measures, such as; boat horsepower restrictions, creation of boating activity use zones, implementation of speed limit restrictions, or one-way directional travel restrictions. Restricting the use of certain types of watercraft, such as PWCs would most likely also be required. Increased boating law enforcement resources would also be required. Recreational boating experiences and boater satisfaction would most likely be degraded.

7.5 Alternative 1

Alternative 1 would involve keeping the shoreline allocations for Limited Development as they existed under the 1981 SMP. It includes the following main components:

- Limited Development shoreline allocations would be reduced to only those areas that were mapped as Limited Development in the 1981 SMP and the MP land classification “low density recreation” would be applied to those areas.
- Limited Development areas not designated as Limited Development in the 1981 SMP would be converted to Protected and areas classified as “low density recreation” in the MP would either stay “low density recreation” or be changed to another “multiple resource management” classification to be consistent with that shoreline allocation.
- MP land use classifications maps would be revised to be consistent with the SMP shoreline allocations.
- Existing permitted facilities in areas that would be converted from Limited Development to Protected would be grandfathered until the facilities fail to meet the criteria set forth in 36 CFR 33 327.30(h). (This provision would affect approximately 908 docks.)
- The vegetation management policies would be changed to apply the extended buffer vegetation management zone policies.
- The request for Public Recreation shoreline allocation at Carlton Landing would not be approved. The lease request for a public marina and other recreational amenities at Carlton Landing would not be granted.
- Individual zoning requests would not be approved and some requests to maintain Limited Development would be reversed to Protected allocations.

Under Alternative 1, there would be 42 miles of shoreline designated as Limited Development. Therefore, the maximum potential number of docks that could be permitted under Alternative 1 is 1,355 boat docks. However, a closer analysis of the individual segments that would be allocated as Limited Development under Alternative 1 reveals that there would be sufficient space for an additional 605 docks. In addition, the existing docks would be grandfathered in; therefore, the total potential number of docks under Alternative 1 would be 2,278. Applying the current 3.3 average number of boats per boat dock equates to approximately 7,517 boats ($3.3 \times 2,278 = 7,517$). The estimated potential maximum number of boat docks under Alternative 1 compared to the No Action Alternative and the existing condition is shown in **Figure 7-3**.

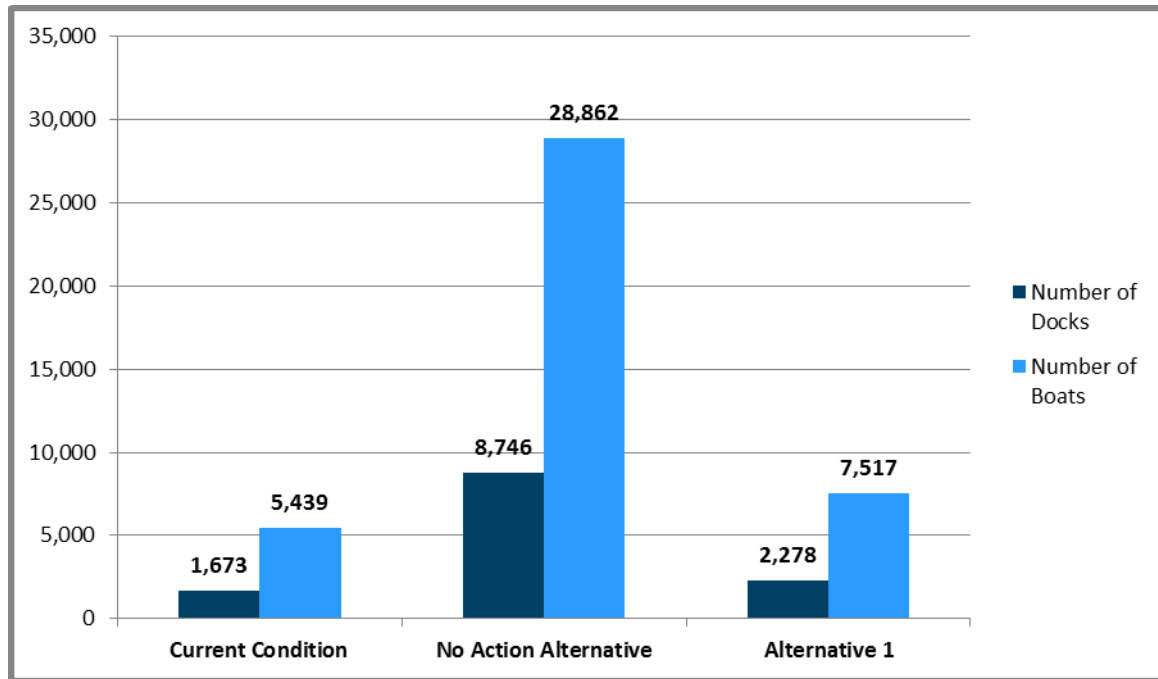


Figure 7-3. Alternative 1: Maximum Potential Docks and Boats

7.5.1 Potential Recreation Impacts Under Alternative 1

7.5.1.1 Land-based Recreation

Alternative 1 would have no potential direct impacts and negligible secondary and cumulative impacts to land-based recreation at Eufaula Lake. There would be a slight increase in the number of boat docks and boats compared to the current condition but the potential numbers at build out would be significantly less than under the No Action Alternative and within the available capacity at Eufaula Lake.

7.5.1.2 Water-based Recreation

Alternative 1 would have no direct impact and negligible secondary and cumulative Impacts on water-based recreation. Alternative 1 would allow for a slight increase in the number of docks and their associated boats compared to the current condition at Eufaula Lake. Approximately 908 existing docks would be grandfathered and allowed to remain and over time, the number of docks would be reduced through attrition. This alternative would greatly reduce the potential number of docks and boats as compared to the No Action Alternative.

The potential maximum number of boat docks and associated boats under Alternative 1 would be within recommended capacity limits. Boat density would be approximately 19.9 acres per boat, which is within the range from other studies on lakes similar to Eufaula Lake. Therefore, there would be no effect on water-based recreation under Alternative 1.

The potential BAOT and TBC under Alternative 1 as compared to the No Action Alternative, current conditions, and recommended capacity limits are shown in **Figure 7-4**.

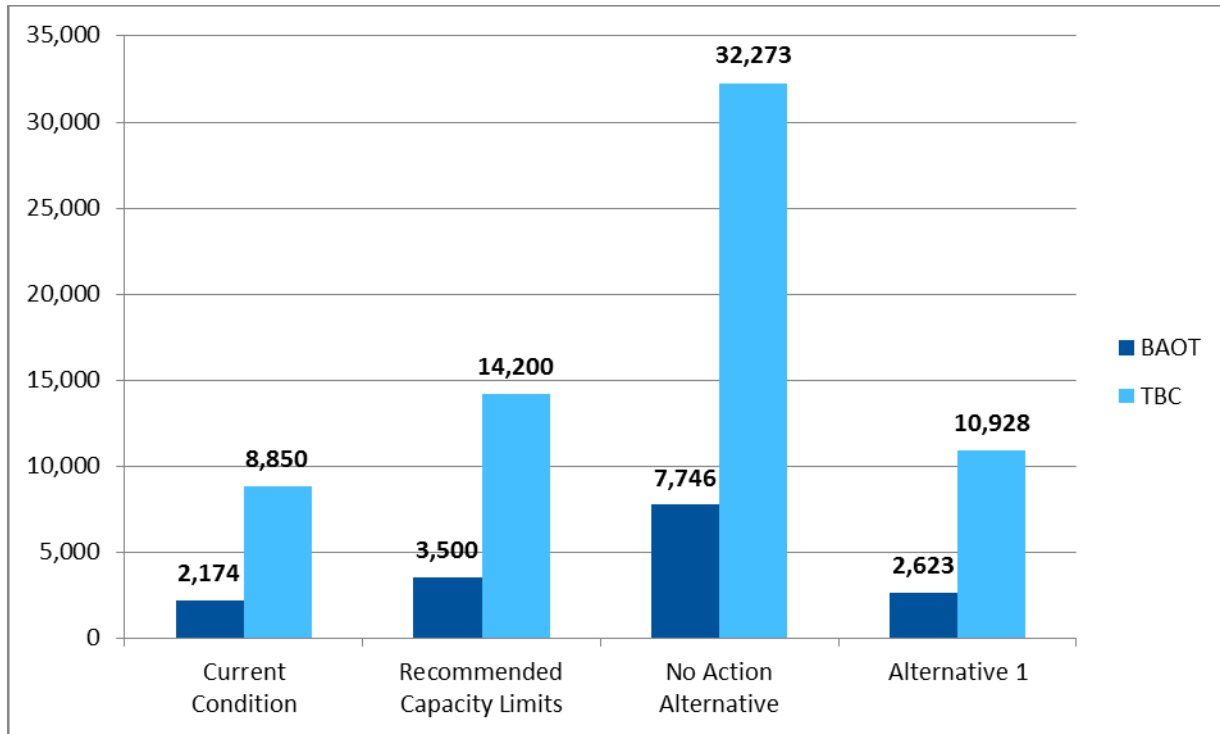


Figure 7-4. Alternative 1 Compared to No Action Alternative, BAOT, Total Boat Capacity and Current Condition

7.6 Alternative 2

Alternative 2 would designate Limited Development shoreline allocations based on dock suitability criteria. The amount of Limited Development shoreline under Alternative 2 would be somewhat reduced from the No Action Alternative. Alternative 2 includes the following main components:

- Limited Development areas that do not have existing adjacent subdivisions and which are unsuitable for dock development would be converted to Protected and the MP land classification “low density recreation” would either stay “low density recreation” or be changed to a “multiple resource management” classification to be consistent with the SMP allocation.
- Any existing permitted facilities in areas that would be changed to the Protected allocation would be grandfathered until the facilities fail to meet the criteria set forth in 36 CFR 327.30(h).
- The vegetation management policies would be changed to apply the extended vegetation management zone policy.
- The MP land use classification maps would be revised to be consistent with the SMP shoreline allocations.
- The request for Public Recreation shoreline allocation at Carlton Landing would not be approved.
- The lease request for a public marina and other public shoreline recreational facilities at Carlton Landing would not be granted.

- Limited Development designated areas on the south side of Longtown Arm across from the proposed Carlton Landing (Area L shown on **Figure 2-9**) would remain Limited Development since these areas meet the criteria for dock suitability.

Under Alternative 2, there would be 182 miles of shoreline designated as Limited Development. Therefore, the maximum potential number of docks that could be permitted under Alternative 2 would be 5,873 boat docks. Applying the current 3.3 average number of boats per boat dock equates to approximately 19,381 boats ($3.3 \times 5,873 = 19,381$). **Figure 7-5** depicts the estimated potential maximum number of boat docks associated with Alternative 2 as compared to the previously discussed alternatives and the existing condition.

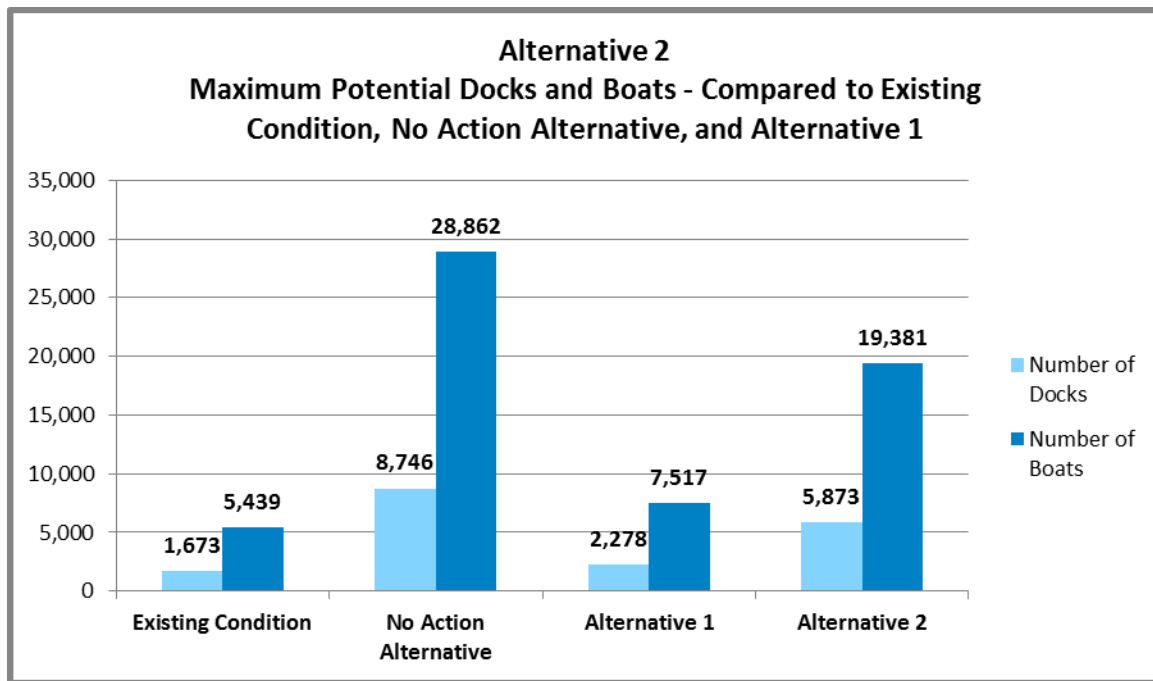


Figure 7-5. Alternative 2 – Maximum Potential Docks and Boats

7.6.1 Potential Recreation Impacts Under Alternative 2

7.6.1.1 Land-based Recreation

Although there would be no direct impacts to land-based recreation resulting from Alternative 2 because the alternative would not result in any direct changes to land-based recreational opportunities, the secondary impacts could be considerable over time.

Although the alternative would result in fewer potential boat docks than under the No Action Alternative there would still be an increase in the number of boats and boaters recreating at the lake compared to the existing condition. The potential increase in use of land-based recreational facilities can be calculated with crossover activity participation rates from USACE surveys. **Table 7-3** represents the potential impact to land-based recreation use, upon reaching the maximum potential build-out of docks under Alternative 2. The formula used in calculating this visitation increase is: (# of boats) x (3) average boating party size) x (crossover participation percentage rate) = (land-based crossover visits from boaters).

Table 7-3. Potential Long-term Secondary Impacts to Land-based Recreation Under Alternative 2

Activity	Current # of Annual Visits*	Additional Visits Resulting from Boating Crossover Participation	Total Potential Visits
Picnicking (50%)	166,957	29,072	196,029
Camping (44%)	48,563	25,583	74,146
Hiking (33%)	N/A	N/A	N/A
Hunting (3%)	25,713	1,744	27,457
Sightseeing (1%)	700,122	581	700,703
Total	941,355	56,980	998,335

* Data source: USACE – Value to the Nation – 2010 data set

Under Alternative 2 the lack of picnic facilities and opportunities would become more apparent. Also, the availability of campsites would be somewhat impacted, during peak use periods, particularly in the month of July.

7.6.1.2 Water-based Recreation

The potential impacts to water-based recreation most likely would be significant, particularly over time. The recommended boating density for Eufaula Lake is 15 water surface acres per boat, which equates to 3,500 BAOT and a TBC of 14,200 boats. Under Alternative 2, potential boating density would be approximately 9.6 acres per boat, which is more dense than the recommended density. The estimated BAOT would be 5,514 boats, which is also greater than the recommended level. The TBC would also be exceeded by over 8,000 boats. As in the No Action Alternative, one could reasonable expect increases in boating accidents, injuries and fatalities.

Alternative 2 would most likely require implementation of a range of mitigation measures such as boat horsepower restrictions, creating boating activity use zones, implementing speed limit restrictions, or one-way directional travel restrictions. Restricting the use of certain types of watercraft, such as PWCs would most likely be required. Increased boating law enforcement resources would also be required.

Recreational boating experiences and boater satisfaction would most likely be extremely degraded

The current boating density for Eufaula Lake is 24 acres per boat with an associated BAOT of 2,174. **Figure 7-6** depicts Alternative 2 compared to the No Action Alternative and Alternative 1 and compared to the BAOT capacity and TBC for current conditions at Eufaula Lake.

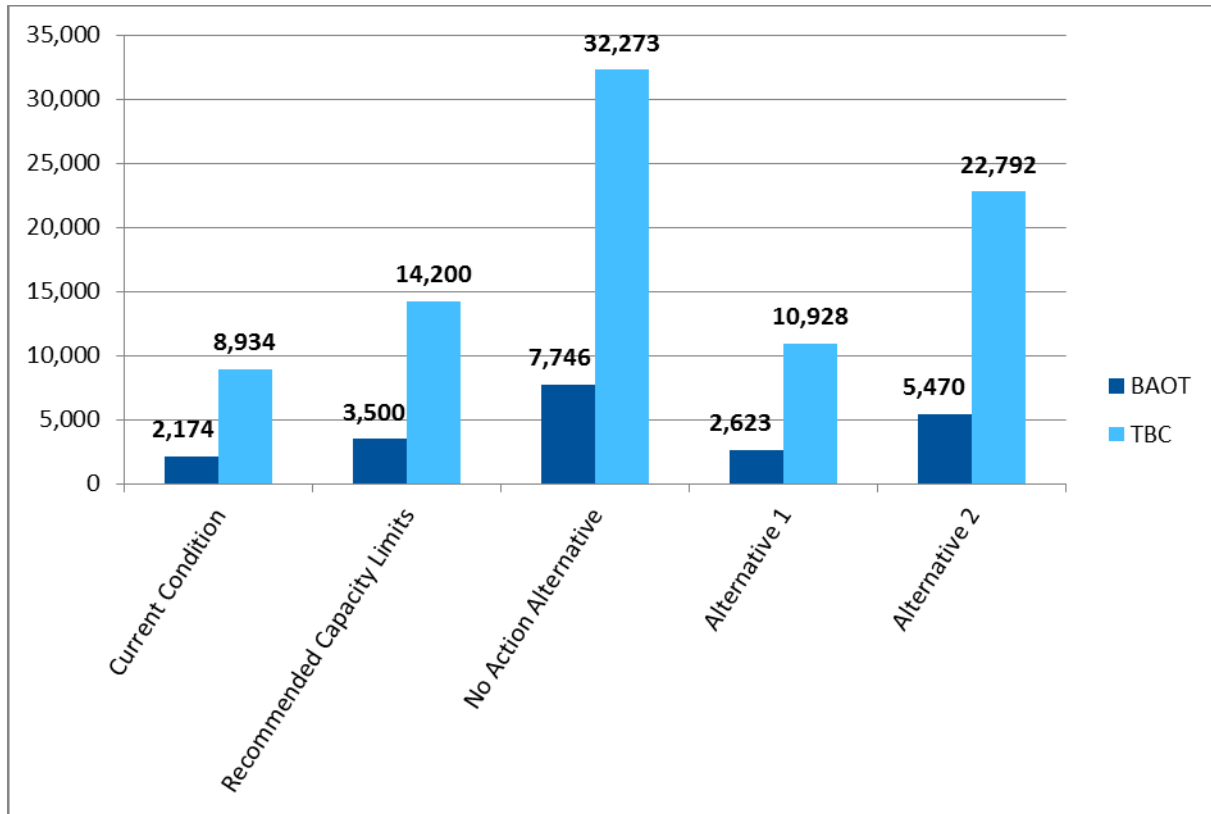


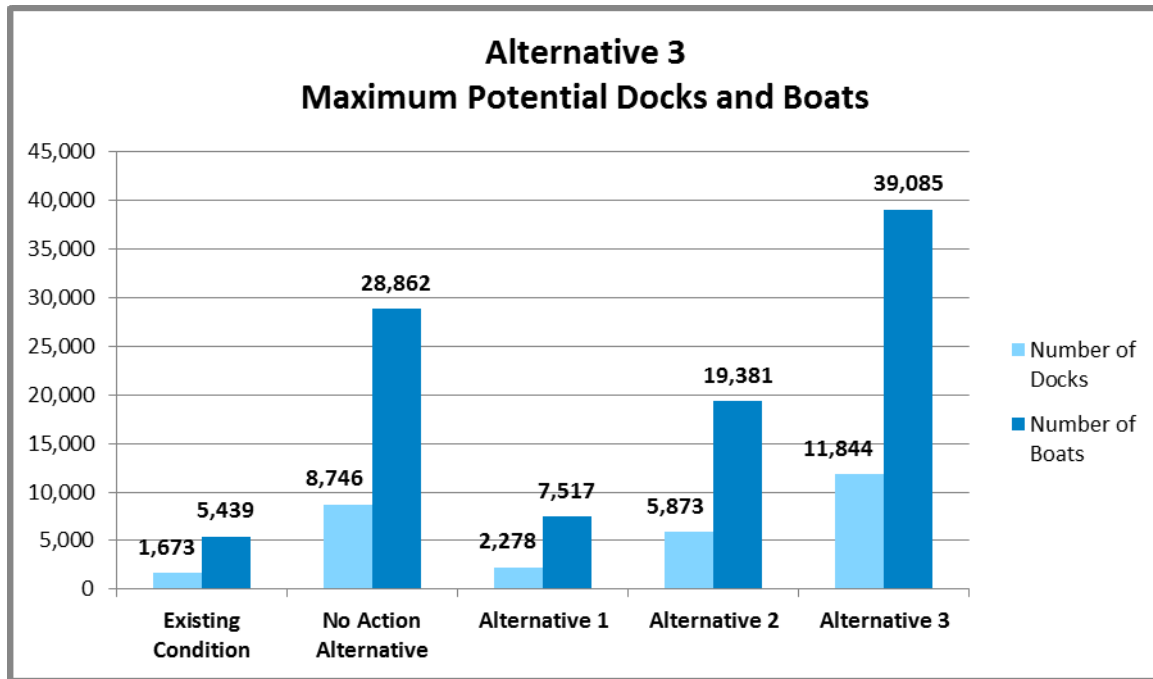
Figure 7-6. Alternative 2 Compared to No Action Alternative, BAOT, Total Boat Capacity, and Current Condition

7.7 Alternative 3

Alternative 3 would somewhat increase the shoreline allocation for Limited Development as compared to the No Action Alternative, but it would be constrained by dock suitability criteria. Alternative 3 includes the following main components:

- Unencumbered Protected shoreline areas (*i.e.* areas with no existing license agreement for use of the government shoreline to other agencies or organizations) that are also suitable for docks would be converted to Limited Development and the corresponding areas in the MP would be changed to “low density recreation” classified lands.
- MP land use classifications maps would be revised to be consistent with the SMP shoreline allocations.
- The vegetation management policies would be changed to apply the baseline buffer vegetation management policy.
- The Carlton Landing shoreline area allocations would be changed from Protected to Limited Development.
- The lease request for a public marina and other public shoreline recreational facilities at Carlton Landing would not be granted.

Under Alternative 3, there would be 367 miles of Limited Development shoreline. Therefore, the maximum potential number of docks that could be permitted under Alternative 3 would be 11,844 boat docks. Applying the current 3.3 average number of boats per boat dock equates to approximately 39,085 boats ($3.3 \times 11,844 = 39,085$). **Figure 7-7** depicts the estimated potential maximum number of boat docks included in Alternative 3 compared to the alternatives previously discussed.



Figure

e 7-7. Alternative 3 – Maximum Potential Docks and Boats

7.7.1 Potential Recreation Impacts Under Alternative 3

7.7.1.1 Land-based Recreation

Although there would be no direct impacts to land-based recreation resulting from Alternative 3 because the alternative would not result in any direct changes to land-based recreational opportunities, the secondary impacts could be considerable over time.

The alternative would result in more potential boat docks than under the No Action Alternative and thus more boats and boaters recreating at the lake. The potential increase in use of land-based recreational facilities can be calculated with crossover activity participation rates from USACE surveys. **Table 7-4** represents the potential impact to land-based recreation use, upon reaching the maximum potential build-out of docks under Alternative 3. The formula used in calculating this visitation increase is: (# of boats) x (3) average boating party size) x (crossover participation percentage rate) = (land-based crossover visits from boaters).

Under Alternative 3 the lack of picnic facilities and opportunities would become more noticeably apparent. Also, the availability of campsites would be significantly impacted, during peak use periods, particularly in the month of July.

Table 7-4. Potential Long-term Secondary Impacts to Land-based Recreation Under Alternative 3

Activity	Current # of Annual Visits*	Additional Visits Resulting from Boating Crossover Participation	Total Potential Visits
Picnicking (50%)	166,957	58,628	225,585
Camping (44%)	48,563	51,592	100,155
Hiking (33%)	N/A	N/A	N/A
Hunting (3%)	25,713	3,518	29,231
Sightseeing (1%)	700,122	1,173	701,295
Total	941,355	114,911	1,056,266

* Data source: USACE – Value to the Nation – 2010 data set

7.7.1.2 Water-based Recreation

The potential impacts to water-based recreation most likely would be significant, particularly over the long term.

Alternative 3 would have the potential to exceed BAOT and TBC by nearly three times the recommended capacity limits. Boat density under Alternative 3 would be approximately 5.1 acres per boat compared to the minimum recommended boating density of 15 acres per boat and as compared to the more common range of 20 to 50 acres per boat (Figure 7-8).

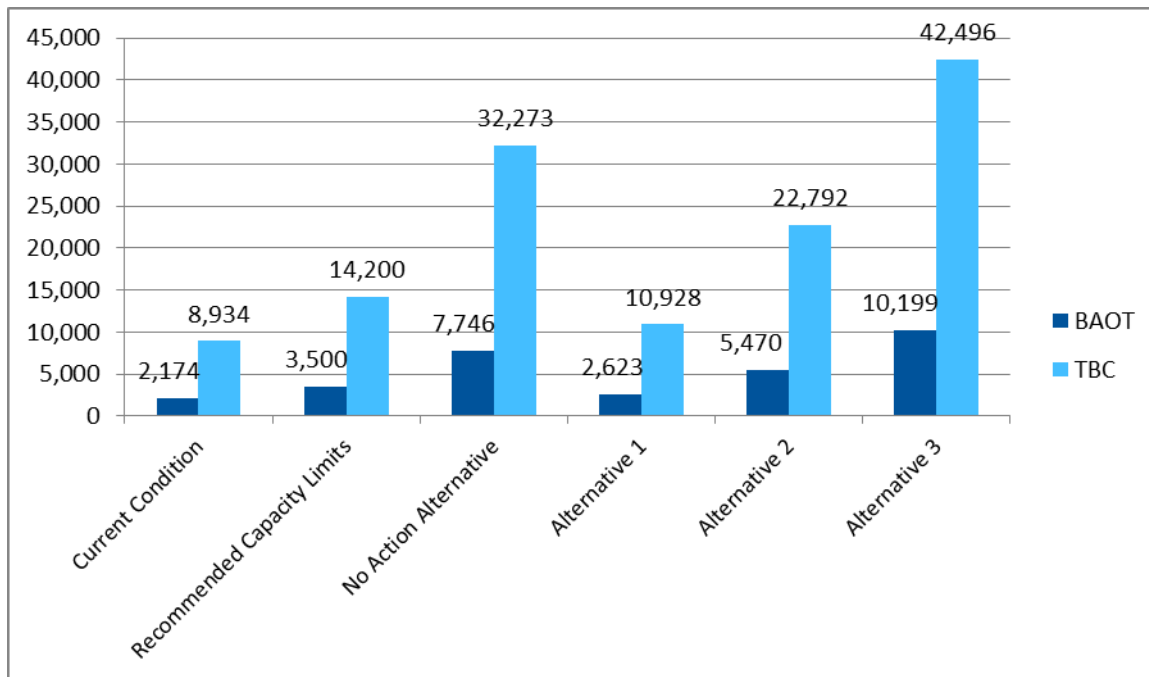


Figure 7-8. Alternative 3 Compared to No Action Alternative, BAOT, Total Boat Capacity, and Current Condition

At the very high boating density that would potentially occur under Alternative 3, one could reasonably expect dramatic increases in boating accidents, injuries, and fatalities. Under current conditions at Eufaula

Lake, the boating density in Lake Areas 3 and 4 is nearly twice the boating density in the rest of the Lake Areas. Between 2003 and 2011, 66 percent of the boating accidents occurred in Lake Areas 3 and 4. In addition, the number of boating accidents per thousand water surface acres in Lake Areas 3 and 4, is nearly double that for other Lake Areas (Section 4.4). This is a strong indication that as boating density increases (BD number is lower), the number and frequency of boating accidents will also increase. Thus it is likely that at a boating density nearly three times greater than the existing condition, the number of accidents would be significantly greater than under the existing condition. At build out under the worst case scenario, Alternative 3 would result in almost 30 percent greater BAOT and TBC than the No Action Alternative with a proportionate increase in impacts.

Alternative 3 would likely require implementation of a range of mitigation measures that could include horsepower restriction limitations for boats, establishment of boating activity use zones, speed limit restrictions, or one-way directional travel restrictions. Restricting the use of certain types of watercraft, such as PWCs would most likely also be required. Proportionate increases in boating enforcement resources would also result with this alternative. Even with such mitigation measures, however, it is likely that significant adverse impacts would remain.

Recreational boating experiences on the lake would most likely be extremely degraded from the current conditions and as compared to those that would occur under the No Action Alternative.

The additional private docks that could result from shoreline zoning changes adjacent to the Carlton Landing development would represent an extremely minor increase, compared to the scale of shoreline zoning changes elsewhere on the lake under this alternative.

7.8 Alternative 4

Alternative 4 would greatly increase the shoreline allocation for Limited Development compared to the No Action Alternative and would grant a lease for a marina at the proposed Carlton Landing development. Alternative 4 includes the following main components:

- With the exception of the one specific request to change the existing Protected allocation to Public Recreation, all unencumbered Protected shoreline areas (*i.e.* areas that are not leased to other agencies or organizations) would be converted to Limited Development regardless of suitability for docks.
- In the MP, only the “wildlife management” classification would remain unchanged and all of the “environmentally sensitive area”, “low density recreation”, “vegetation management”, and “future/inactive recreation” would be converted to “low density recreation” (with the exception of the Carlton Landing area, which would be converted to “high density recreation”).
- The vegetation management policies would be changed to apply the baseline buffer vegetation management zone policy.
- MP land use classifications maps would be revised to be consistent with the SMP shoreline allocations.
- The shoreline allocations at Carlton Landing on the north side of Longtown Arm would be changed from Protected to Public Recreation. The similar request by the City of Eufaula to convert a Limited Development area to Public Recreation would also be implemented. A third request to

reduce the amount of existing Public Recreation through conversion to Limited Development would be approved.

- The lease request for a public marina and other public shoreline recreational facilities at Carlton Landing would be granted.
- A channel through the standing timber in Longtown Arm would be cleared to allow boat access around Roundtree Landing to the southwest side of Carlton Landing and more direct access to the town center.

Under Alternative 4 there would be 479 miles of Limited Development shoreline. Therefore, the maximum potential number of docks that could be permitted under Alternative 4 would be 15,459 boat docks. Applying the current 3.3 average number of boats per boat dock equates to approximately 51,015 boats ($3.3 \times 15,459 = 51,015$). **Figure 7-9** depicts the estimated potential maximum number of boat docks that could be built under Alternative 4 as compared to alternatives previously discussed.

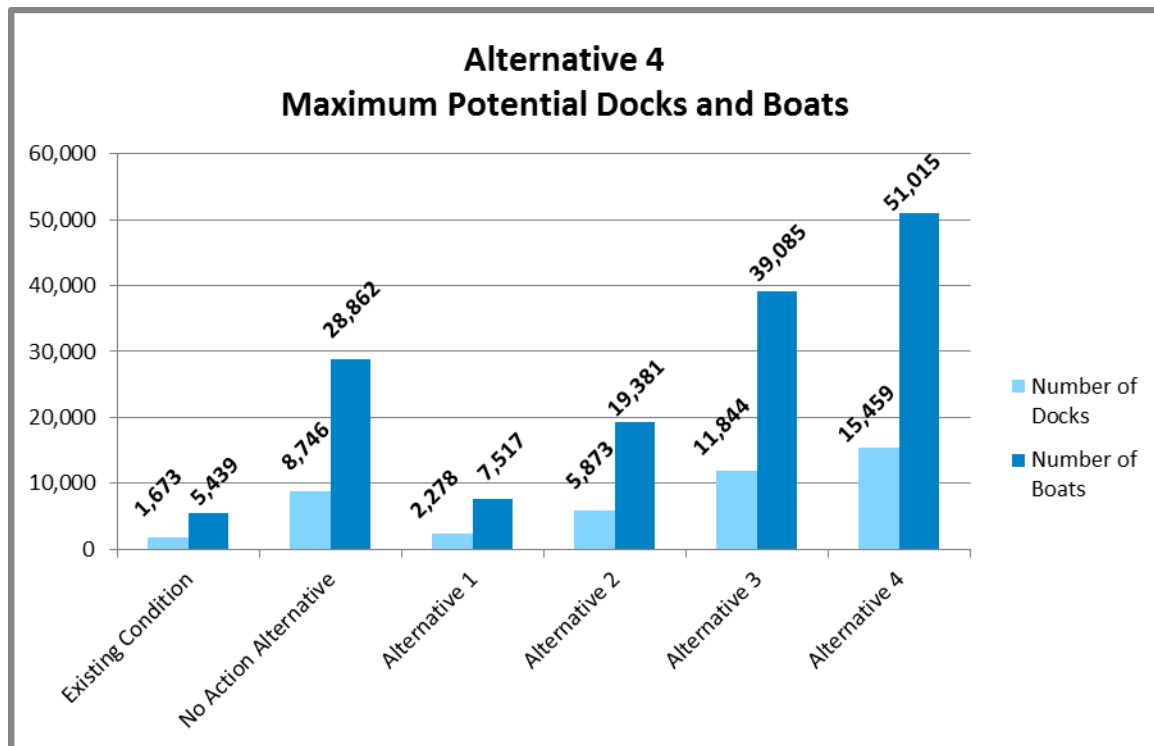


Figure 7-9. Alternative 4 – Maximum Potential Docks and Boats

7.8.1 Potential Recreation Impacts Under Alternative 4

7.8.1.1 Land-based Recreation

Although there would be no direct impacts to land-based recreation resulting from Alternative 4 because the alternative would not result in any direct changes to land-based recreational opportunities, the secondary impacts could be considerable over time.

The alternative would result in more potential boat docks than under the No Action Alternative and thus more boats and boaters recreating at the lake. The potential increase in use of land-based recreational

facilities can be calculated with crossover activity participation rates from USACE surveys. **Table 7-5** represents the potential impact to land-based recreation use, upon reaching the maximum potential build-out of docks under Alternative 4. The formula used in calculating this visitation increase is: (# of boats) x (3) average boating party size) x (crossover participation percentage rate) = (land-based crossover visits from boaters).

Table 7-5. Potential Long-term Secondary Impacts to Land-based Recreation Under Alternative 4

Activity	Current # of Annual Visits*	Additional Visits Resulting from Boating Crossover Participation	Total Potential Visits
Picnicking (50%)	166,957	76,523	243,480
Camping (44%)	48,563	67,340	115,903
Hiking (33%)	N/A	N/A	N/A
Hunting (3%)	25,713	4,591	30,304
Sightseeing (1%)	700,122	1,530	701,652
Total	941,355	149,984	1,091,339

* Data source: USACE – Value to the Nation – 2010 data set

Under Alternative 4 the lack of picnic facilities and opportunities would become noticeably apparent. Also, the availability of campsites would be significantly impacted, during peak use periods, particularly in the month of July.

The recreation facilities proposed for public land along the shoreline adjacent to Carlton Landing would have minimal impact on land-based recreation at Eufaula Lake. Although they would be open to the public, the proposed recreation facilities would primarily be used by residents of Carlton Landing and would not represent a significant change in the available land-based recreational opportunities at the lake. The conceptual design and layout of recreation facilities would provide minimal opportunity for use by drive-in visitors. Therefore, the potential impact would be extremely limited.

7.8.1.2 Water-based Recreation

The potential impacts of Alternative 4 on water-based recreation would be significant, particularly over the long term.

Alternative 4 would have the potential to exceed BAOT and TBC by nearly four times the recommended capacity limits. Boat density under Alternative 4 would be approximately 4.0 acres per boat compared to the minimum recommended boating density of 15 acres per boat and as compared to the more common range of 20 to 50 acres per boat (**Figure 7-10**).

At the very high boating density that would potentially occur under Alternative 4, one could reasonably expect dramatic increases in boating accidents, injuries, and fatalities. Under current conditions at Eufaula Lake, the boating density in Lake Areas 3 and 4 is nearly twice the boating density in the rest of the Lake Areas. Between 2003 and 2011, 66 percent of the boating accidents occurred in Lake Areas 3 and 4. In addition, the number of boating accidents per thousand water surface acres in Lake Areas 3 and 4, is nearly double that for other Lake Areas (Section 4.4). This is a strong indication that as boating density increases (BD number is lower), the number and frequency of boating accidents will also increase. Thus it is likely that at a boating density nearly four times greater than the existing condition, the number of accidents

would be significantly greater than under the existing condition. At build out under the worst case scenario, Alternative 4 would result in almost 60 percent greater BAOT and TBC than the No Action Alternative with a proportionate increase in impacts.

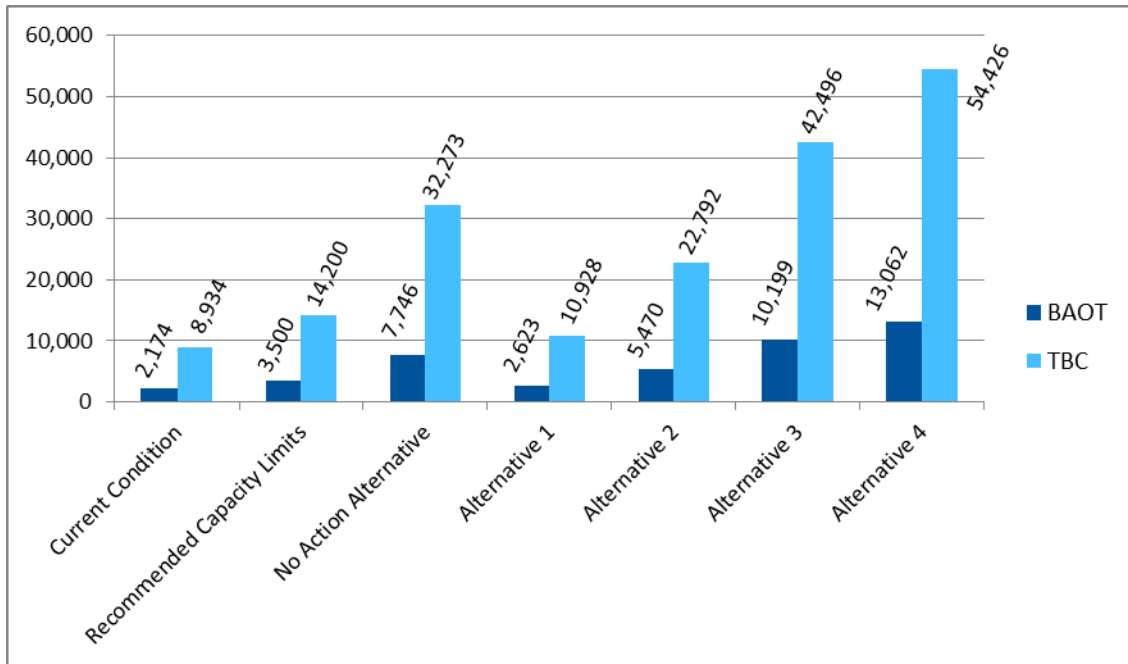


Figure 7-10. Alternative 4 Compared to No Action Alternative, BAOT, Total Boat Capacity, and Current Condition

Alternative 4 would likely require implementation of a range of mitigation measures that could include horsepower restriction limitations for boats, establishment of boating activity use zones, speed limit restrictions, or one-way directional travel restrictions. Restricting the use of certain types of watercraft, such as PWCs would most likely also be required. Proportionate increases in boating enforcement resources would also result with this alternative. Even with such mitigation measures, however, it is likely that significant adverse impacts would remain.

Recreational boating experiences on the lake would most likely be extremely degraded from the current conditions and as compared to those that would occur under the No Action Alternative.

Under Alternative 4, the addition of a marina at Carlton Landing would have very little impact, compared to the scale of shoreline zoning changes and potential increases in the number of boat docks and boats elsewhere on the lake. The addition of a marina would likely only generate an additional 66 to 72 BAOT. Boats from the proposed marina would thus comprise less than one percent of the total maximum potential BAOT of 13,113, under this alternative.

Section 8

Conclusions

Existing data was collected and compiled, an extensive review of similar studies was completed, and a variety of surveys were conducted; on-the-ground, in the air, and through the mail. The findings of the Recreation Study are summarized in this section.

There is no single alternative that will result in the ability to meet future recreation demands and at the same time protect the resource base that makes Eufaula Lake a unique and enjoyable place to recreate. Most likely, a combination of elements from each of the alternatives will produce a sustainable balance between development and resource protection. It must be emphasized that quality recreational experiences are dependent upon the availability and sustainability of the natural resource base in which those experiences occur. If the natural resource base is degraded, the recreational experience will be also.

Other boating capacity studies and data collected during the Recreation Study at Eufaula Lake clearly indicate a boating density greater than 15 acres per boat results in a perceptible and measureable increase in boating accidents, injuries, and fatalities. Therefore, it is strongly recommended that this boating density be used to guide the number of boats approved for placement on Eufaula Lake.

The following capacity limits would result from implementation of 15 acres per boat as the appropriate boating density for Eufaula Lake:

- 14,200 Total Boat Capacity (TBC) (calculated using unrestricted water acres divided by 15)
- 3,500 Boats At One Time (BAOT) capacity (calculated by multiplying the TBC by the Lake Use Rate 0.24)

It is recommended that once the TBC is reached, no additional Shoreline Use Permits for private individual or community boat docks should be issued, regardless of the shoreline zoning. Likewise, no new development proposals that would increase the TBC should be approved.

Using this approach would provide an established and predictive method for evaluating and assessing impacts associated with growth from the Shoreline Management Program, as well as development proposals that may impact the total number of boats on the lake. In addition, this approach would provide for resource protection to ensure sustainability into the foreseeable future.

Using historical data, as well as data obtained from surveys conducted at Eufaula Lake, the following assumptions are made:

- The predictive growth rate for the number of Shoreline Use Permits issued for private docks will continue to be approximately 2 percent per year or 10 percent per five-year period.
- The Lake Use Rate for combined boating activities will continue to remain at approximately 24 percent.

- The average number of boats associated with each private boat dock will continue to remain at approximately 3.3 boats per dock. (Note: This would also provide the opportunity to implement policy changes to limit the number of boats per dock, which in turn would provide the ability to issue additional boat dock permits.)

Using the described method and above assumptions and projecting the predictive condition twenty years into the future would produce the following analysis for the year 2031:

	2,800	Estimated number of private docks
X	<u>3.3</u>	average boats per dock
=	9,240	Total boats from private docks
+	1,096	Number of car/trailer spaces in public recreation areas
+	1,097	Number of Marina Slips at existing Marinas
+	1,183	Estimated number of boat from Subdivision boat ramps
+	<u>400</u>	Estimated number of Marina Slips and Boats from Carlton Landing Development
=	13,016	Total number of Boats

Under this scenario the boating density would be 16.7 acres per boat and there would still be available capacity to issue permits for an additional 359 boat docks, or accommodate an additional 1,184 marina wet slips, or any combination that did not exceed the TBC of 14,200. Current conditions indicate Eufaula Lake has reached approximately 60 percent of available capacity.

Based on the predictive rate of increase, it appears there are adequate land-based recreation facilities to meet demand for the foreseeable future.

These assumptions and predictions of future conditions would be true for all of the alternatives, including the No Action. Within a 20-year planning time horizon (growth to 2031), none of the alternatives would exceed the recommended carrying capacity for the lake. However, alternatives that provide for more miles of Limited Development shoreline may set public expectations for private dock development that would be in conflict with the recreational carrying capacity of the lake over the long-term.

The differences between alternatives are related to the magnitude of the total possible growth at full build out. None of the alternatives would result in a faster rate of growth over another. Only Alternative 1 would result in a future build out condition that remains within the recommended carrying capacity of the lake.

All of the other alternatives would result in significant adverse impacts related to water-based recreational activities. Even with implementation of the recommended mitigation measures, significant adverse impacts would remain. Many of the proposed mitigation measures, while protecting public safety, would themselves detract from the recreational boating experience.

Through the public process associated with the Eufaula Lake EIS, USACE would develop a preferred alternative that balances the public demand for opportunities to construct private docks with the needs of the larger public for a safe and enjoyable recreational experience at the lake. The findings of the Recreation Study would be used to inform USACE decisions in the development of the preferred alternative.

Section 9

References Cited

- Brazos River Authority. 2006a. Boating Capacity Study, Lake Granbury, Texas – April 2006.
- Brazos River Authority. 2006b. Boating Capacity Study, Possum Kingdom Lake, Texas – April 2006.
- Bureau of Reclamation. 1998. A Study of Boater Recreation on Lake Berryessa, California– Summer 1998. U.S. Department of the Interior, Bureau of Reclamation.
- Bureau of Reclamation. 2004. Ririe Reservoir Recreation Carrying Capacity Study. U.S. Department of the Interior, Bureau of Reclamation.
- Bureau of Reclamation. 2011. Water and Land Recreation Opportunity Spectrum (WALROS) Users’ Handbook, Second Edition – September 2011. U.S. Department of the Interior, Bureau of Reclamation.
- Canandaigua Lake Watershed Council. 2010. Canandaigua Lake Peak Use Boat Inventory and Carrying Capacity Analysis – June 1, 2010.
- Elkhart, Kosciusko, and Noble Counties, Indiana. 2007. Wawasee Carrying Capacity Report.
- Friends of Clam Lake. 2009. Clam Lake Watercraft Carrying Capacity Study– July 26, 2009.
- LaGrange County Lakes Council Inc. and Steuben County Lakes Council, Inc. 2006. Full to Overflowing: A Study of Lake Carrying Capacity. LaGrange County Lakes Council, Inc., LaGrange, Indiana, and Steuben County Lakes Council, Inc., Angola, Indiana. May 23, 2006.
- Lake Ripley Management District. 2003. Lake Ripley Watercraft Census and Recreational Carrying Capacity Analysis. December 2003.
- Oklahoma Department of Wildlife Conservation (ODWC). 2012. Accessed at: <http://www.eregulations.com/oklahoma/hunting2011/department-managed-area-rules/>
- Oklahoma Highway Patrol, Marine Division. 2011. Boating Accident Data for Eufaula Lake – 2003 – 2011.
- Oklahoma Historical Society. 1964. *Daily Oklahoman* (Oklahoma City), 26 September 1964. Accessed at: <http://digital.library.okstate.edu/encyclopedia/entries/L/LA007.html>
- Outdoor Foundation. 2010a. Outdoor Recreation Participation Report. Accessed at: <http://www.outdoorfoundation.org/research.participation.2010.html>
- Outdoor Foundation. 2010b. Special Report on Fishing and Boating 2010, Recreational Boating and Fishing Foundation, USACE Recreation Strategic Plan (2011).
- Outdoor Foundation. 2011. A Special Report on Camping – 2011. Accessed at: <http://www.outdoorfoundation.org/research.camping.2011.html>

- Texas Water Development Board. 2004. Volumetric Survey Report of Eufaula Lake.
- USACE. 1977. Eufaula Lake Master Plan. Tulsa District, USACE.
- USACE. 2001b. Recreational Carrying Capacity Study for Greer's Ferry Lake, Arkansas. Little Rock District, USACE.
- USACE. 2002. Private Boat Dock Carrying Capacity Study for Lake Sidney Lanier, Georgia. Mobile District, USACE. October 29, 2002.
- USACE. 2007a. Office of Management and Budget Clearance for the Questionnaires for the U.S. Army Engineer Civil Works Studies and Projects, 31 October 2007, ER 1165-2-205
- USACE. 2007b. OMB approved survey questionnaire. Customer Satisfaction – Lake Visitation Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007c. OMB approved survey questionnaire. Customer Satisfaction – Permit Application Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007d. OMB approved survey questionnaire. Hunter Profile Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007e. OMB approved survey questionnaire. Lake Boater Summer Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007f. OMB approved survey questionnaire. Lake Residents Recreation Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007g. OMB approved survey questionnaire. Lake Visitor Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007h. OMB approved survey questionnaire. Marina Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007i. OMB approved survey questionnaire. Recreation Activities Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007j. OMB approved survey questionnaire. Recreation Customer Satisfaction Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007k. OMB approved survey questionnaire. Recreation Management Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007l. OMB approved survey questionnaire. Recreation Respondent Profile Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2007m. OMB approved survey questionnaire. Recreation Sites Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>

- USACE. 2007n. OMB approved survey questionnaire. Recreation Value Questionnaire Survey. Accessed at: <http://www.iwr.usace.army.mil/index.php/surveys>
- USACE. 2008a. Economic Impacts from Spending by Marina Slip Renters at Harry S. Truman Dam and Reservoir, (ERDC/EL TR-08-7). February 2008.
- USACE. 2008b. Economic Impacts from Spending by Marina Slip Renters and Private Dock Owners at Lake Sidney Lanier, (ERDC/EL TR-08-6). February 2008.
- USACE. 2008c. Economic Impacts from Spending by Marina Slip Renters at Raystown Lake, (ERDC/EL TR-08-5). February 2008.
- USACE. 2008d. Economic Impacts from Spending by Private Dock Owners at Hartwell Lake, (ERDC/EL TR-08-11). March 2008.
- USACE. 2008e. Economic Impacts from Spending by Private Dock Owners at Lake Barkley, (ERDC/EL TR-08-8). February 2008.
- USACE. 2011a. Eufaula lake Operational Management Plan, 2011. Tulsa District, USACE.
- USACE. 2011b. Operations and Maintenance Business Information Link (OMBIL) Data. Provided by USACE, Tulsa District, Tulsa, OK
- USACE. 2011c. Recreation-related public fatality data for Eufaula Lake – 1999 – 2011. USACE, Tulsa District, Tulsa, OK.
- USACE. 2011d. Recreation-related public fatality statistics. National Water Safety Program, USACE.
- USACE. 2011e. Recreation Strategic Plan - April 2011. Accessed at: <http://corpslakes.usace.army.mil/visitors/pdfs/RecreationStrategicPlan.pdf>
- USACE. 2011f. Recreation Strategic Plan. Accessed at: <http://corpslakes.usace.army.mil/visitors/pdfs/RecreationProgramStatistics.pdf>.
- USACE. 2012a. Recreation Economic Assessment System (REAS). Accessed at: <http://corpslakes.usace.army.mil/employees/economic/reas.cfm>.
- USACE. 2012b. Recreation-related public fatality statistics for Southwest Division. USACE, Southwest Division.
- USACE. 2012c. Recreation-related public fatality frequency rate data and maximum tolerance levels. USACE Headquarters, Safety and Occupational Health Office.
- USACE. 2012d. Value to the Nation website. Accessed at: <http://www.corpsresults.us/recreation/index.cfm>
- USACE. 2012. Value to the Nation website. <http://www.corpsresults.us/recreation/index.cfm>
- U.S. Coast Guard. 2002. National Recreational Boating Survey Report – 2002.
- U.S. Coast Guard. 2011. Recreational Boating Statistics 2010.