Grand Lake State Park
Resource Management Plan
2012 (Updated 2013)

Delaware, Mayes and Ottawa Counties,
Oklahoma

Lowell Caneday, Ph.D.; Michael Bradley, Ph.D; Kaowen (Grace)
Chang, Ph.D.; Debra Jordan, Re.D.; Tatiana Chalkidou, Ph.D.
Acknowledgements

The authors acknowledge the assistance of numerous individuals in the preparation of this Resource Management Plan. On behalf of the Oklahoma Tourism and Recreation Department’s Division of State Parks, staff members were extremely helpful in providing access to information and in sharing of their time. The essential staff providing assistance for the development of the RMP included Tracey Robertson, manager of Grand Lake State Park at the beginning of the RMP project; Sherri Burris, manager, who became lead manager for Grand Lake State Park during the RMP process; Chad McCall, park manager; Kevin Mallow, manager of the golf course; John Chinn, ranger; and Greg Snider, Regional Manager of the Northeast Region, with assistance from many other members of the staff throughout Grand Lake State Park. Sherri Burris responded quickly to every request for information – tremendously helpful in the preparation of the RMP!

Assistance was also provided by Deby Snodgrass, Kris Marek, and Doug Hawthorne – all from the Oklahoma City office of the Oklahoma Tourism and Recreation Department.

It is the purpose of the Resource Management Plan to be a living document to assist with decisions related to the resources within the park and the management of those resources. The authors’ desire is to assist decision-makers in providing high quality outdoor recreation experiences and resources for current visitors, while protecting the experiences and the resources for future generations.

Lowell Caneday, Ph.D., Regents Professor
Leisure Studies
Oklahoma State University
Stillwater, OK 74078
Abbreviations and Acronyms

ADAAG .................................................... Americans with Disabilities Act Accessibility Guidelines
CCC ................................................................. Civilian Conservation Corps
CDC ........................................................................ Centers for Disease Control
CLEET ........................................................... Council on Law Enforcement Education and Training
CPSC ........................................................................... Consumer Product Safety Commission
GIS ........................................................................................ Geographic Information Systems
GPS ......................................................................................................... Global Positioning System
GRDA ................................................................................ Grand River Dam Authority
EPA ............................................................ Environmental Protection Agency
mcf ........................................................................................................................ million cubic feet
MCL .................................................................................................. Maximum Contaminate Level
NAAQS ................................................................................ National Ambient Air Quality Standards
NAWQA ............................................................................ National Water Quality Assessment Program
NEPA ............................................................................ National Environmental Policy Act
NPRM ........................................................................... Notice of Proposed Rule Making
OSU ........................................................................ Oklahoma State University – Stillwater
OTRD .............................................................. Oklahoma Tourism and Recreation Department
OWRB ................................................................................ Oklahoma Water Resources Board
PBCR ................................................................................ Primary body contact recreation
pH ........................................................................................................... potential for hydrogen ions
ppm ......................................................................................................................... parts per million
R .............................................................................................................................................. Range
RMP .............................................................................................. Resource Management Plan
SCORP ............................................................ Statewide Comprehensive Outdoor Recreation Plan
T ........................................................................................................... Township
USACE ........................................................................ United States Army Corps of Engineers
USFWS ........................................................................ United States Fish and Wildlife Service
USGS .............................................................................. United States Geological Survey
WBDO ................................................................................ Waterborne Disease Outbreak
## Table of Contents

Acknowledgements .......................................................................................................................... 3  
Abbreviations and Acronyms ........................................................................................................... 4  
Table of Contents ............................................................................................................................. 5  
List of Tables ................................................................................................................................... 8  
List of Figures .................................................................................................................................. 9  
Mission Statement of the Oklahoma Tourism and Recreation Department .................................. 12  
Vision Statement .............................................................................................................................. 12  
OTRD Values .................................................................................................................................. 12  
Chapter 1 – Introduction ................................................................................................................ 13  
Resource Management Plan: Purpose and Process ......................................................................... 13  
Planning Process .............................................................................................................................. 13  
Agencies Involved ............................................................................................................................ 14  
Chapter 2 – Project Description ..................................................................................................... 17  
About Grand Lake State Park .......................................................................................................... 17  
Purpose and Significance Statements ............................................................................................. 17  
Geographic Location of Grand Lake State Park ............................................................................ 17  
Community and Regional Context ................................................................................................. 19  
Brief History of Delaware County .................................................................................................... 21  
Brief History of Mayes County ......................................................................................................... 24  
Brief History of Ottawa County ....................................................................................................... 26  
Demographic and Socioeconomic Conditions and Impact ............................................................ 29  
Competing and Complementary Recreational Opportunities ......................................................... 34  
Regional and Park History .............................................................................................................. 35  
Natural and Cultural Resources in the Park .................................................................................... 36  
Climate and Air Quality .................................................................................................................. 36  
Archeology of Grand Lake State Park ............................................................................................ 37  
Topography ...................................................................................................................................... 43  
Geology ............................................................................................................................................ 45  
Soil .................................................................................................................................................... 49
Hydrology ........................................................................................................................................62
Vegetative Cover ..........................................................................................................................76
Wildlife ..........................................................................................................................................76
Accessibility ...................................................................................................................................82
Chapter 3 – Current Status of the Resource ..............................................................................85
Recreational Development ..........................................................................................................85
Grand Lake State Park at Spring River Canoe Trails .................................................................86
Grand Lake State Park at Twin Bridges .....................................................................................90
Grand Lake State Park at Bernice .............................................................................................96
Grand Lake State Park at Honey Creek ..................................................................................103
Grand Lake State Park at Disney .............................................................................................109
Grand Lake State Park at Little Blue .........................................................................................112
Grand Lake State Park at Cherokee Grandview ........................................................................113
Grand Lake State Park at Cherokee Lakeside ..........................................................................116
Grand Lake State Park at Cherokee Riverside ........................................................................118
Grand Lake State Park at Grand Cherokee ...........................................................................120
Grand Lake State Park at Spavinaw .........................................................................................121
Grand Lake State Park at Snowdale ........................................................................................125
Hiking/Walking/Riding Trails ..................................................................................................129
Public Access and Entry Aesthetics .........................................................................................130
Park Visitation ..........................................................................................................................130
Recreational Use of Park Facilities ..........................................................................................131
Recreational Use of Grand Cherokee Golf Course .................................................................134
Public Perception of Grand Lake State Park ...........................................................................134
User Evaluations of Grand Lake State Park ............................................................................135
Park Management ....................................................................................................................135
Staffing .......................................................................................................................................136
Revenue and Expenses ............................................................................................................137
Hazards Analysis – Natural and Operational ...........................................................................138
Natural Hazards .......................................................................................................................138
Operational Hazards ................................................................................................................140
Law Enforcement .....................................................................................................................141
Policy-Related Exposures ........................................................................................................142
List of Tables

Table 2.1 – Population in the counties around Grand Lake State Park ...........................................29
Table 2.2 – Demographic comparison by county ...........................................................................30
Table 2.3 – County household characteristics .................................................................................31
Table 2.4 – Financial characteristics in Delaware, Mayes, & Ottawa Counties ..............................32
Table 2.5 – Education of regional population ..................................................................................32
Table 2.6 – Employment characteristics in the Grand Lake area .....................................................33
Table 3.1 – Campground detail for Grand Lake State Park at Twin Bridges ..............................96
Table 3.2 – Campground detail for Grand Lake State Park at Bernice ........................................102
Table 3.3 – Campground detail for Grand Lake State Park at Honey Creek ................................108
Table 3.4 – Campground detail for Grand Lake State Park at Disney ...........................................111
Table 3.5 – Campground detail for Grand Lake State Park at Little Blue ....................................113
Table 3.6 – Campground detail for Grand Lake State Park at Cherokee Grandview ...............115
Table 3.7 – Campground detail for Grand Lake State Park at Cherokee Lakeside ..................117
Table 3.8 – Campground detail for Grand Lake State Park at Cherokee Riverside .................119
Table 3.9 – Campground detail for Grand Lake State Park at Grand Cherokee ............120
Table 3.10 – Campground detail for Grand Lake State Park at Spavinaw ......................124
Table 3.11 – Campground detail for Grand Lake State Park at Snowdale ..............................129
Table 3.12 – Camping and total visitation ......................................................................................131
Table 3.13 – Camping at Grand Lake State Park (north) ..........................................................132
Table 3.14 – Lake hut rentals ........................................................................................................133
Table 3.15 – Camping at Grand Lake State Park (south) ............................................................133
Table 3.16 – Number of golfers at Grand Cherokee Golf Course ............................................134
Table 3.17 – Staffing at Grand Lake State Park ...........................................................................136
Table 3.18 – Staffing at Grand Cherokee Golf Course ..............................................................136
Table 3.19 – Expense at Grand Lake State Park ...........................................................................137
Table 3.20 – Revenue at Grand Lake State Park .........................................................................137
Table 3.21 – Other revenue streams at Grand Cherokee Golf Course .......................................138
Table 3.22 – Ranger staff at Grand Lake Golf Course .................................................................141
List of Figures

Figure 1.1 – Entry sign for Grand Lake State Park at Bernice ......................................................15
Figure 1.2 – Entry sign for Grand Lake State Park at Spavinaw ...................................................15
Figure 1.3 – Entry sign for Grand Lake State Park at Cherokee Lakeside ....................................16
Figure 2.1 – Utilization of purpose and significance statements ...................................................18
Figure 2.2 – Grand Lake State Park ...............................................................................................19
Figure 2.3 – Impoundments in the Grand River corridor ..............................................................20
Figure 2.4 – Delaware County, Oklahoma ....................................................................................21
Figure 2.5 – Mayes County, Oklahoma ..........................................................................................24
Figure 2.6 – Ottawa County, Oklahoma ........................................................................................26
Figure 2.7 – Spavinaw Dam ...........................................................................................................35
Figure 2.8 – Pensacola Dam ..........................................................................................................35
Figure 2.9 – Robert S. Kerr Dam ...................................................................................................36
Figure 2.10 – Ecoregions of Oklahoma ..........................................................................................44
Figure 2.11 – Grand River corridor ..............................................................................................63
Figure 2.12 – Grand River stream gages .......................................................................................65
Figure 2.13 – Grand River alluvial zones ......................................................................................66
Figure 2.14 – Spring River BUMP report ......................................................................................68
Figure 2.15 – Upper Grand Lake BUMP report ..........................................................................69
Figure 2.16 – Mid-Grand Lake BUMP report .............................................................................70
Figure 2.17 – Honey Creek arm BUMP report .........................................................................71
Figure 2.18 – Lower Grand Lake BUMP report ..........................................................................72
Figure 2.19 – Upper Lake Hudson BUMP report ........................................................................73
Figure 2.20 – Lower Lake Hudson BUMP report .......................................................................74
Figure 2.21 – Lake Spavinaw BUMP report ...............................................................................75
Figure 2.22 – American burying beetle ......................................................................................77
Figure 2.23 – Whooping crane ....................................................................................................78
Figure 2.24 – Piping plover ..........................................................................................................79
Figure 2.25 – Gray bat ..................................................................................................................80
Figure 2.26 – Ozark big-eared bat ...............................................................................................81
Figure 2.27 – Ozark cavefish .......................................................................................................81
Figure 3.33 – Utility facilities in Area B .................................................................107
Figure 3.34 – Amenities in Area C .........................................................................107
Figure 3.35 – Grand River channel below Pensacola Dam ..................................108
Figure 3.36 – Entrance sign for Grand Lake State Park at Disney ......................109
Figure 3.37 – Grand Lake State Park at Disney, Little Blue, and Cherokee .........109
Figure 3.38 – South portion of Disney area ............................................................110
Figure 3.39 – North portion of Disney area ............................................................111
Figure 3.40 – Grand Lake State Park at Little Blue .................................................112
Figure 3.41 – Signage in Cherokee Grandview .....................................................113
Figure 3.42 – Detail of Grand Lake State Park near Pensacola Dam ....................114
Figure 3.43 – Views in Cherokee Grandview .......................................................115
Figure 3.44 – Views in Cherokee Lakeside area ..................................................116
Figure 3.45 – Amenities in Cherokee Lakeside area ............................................117
Figure 3.46 – Views in Cherokee Riverside area ..................................................118
Figure 3.47 – Amenities in Cherokee Riverside area ............................................119
Figure 3.48 – Grand Cherokee recreational vehicle area ....................................120
Figure 3.49 – Grand Cherokee Golf Course .........................................................121
Figure 3.50 – Grand Lake State Park at Spavinaw ...............................................122
Figure 3.51 – Detail of Grand Lake State Park at Spavinaw .................................123
Figure 3.52 – Recreation at Grand Lake State Park at Spavinaw .......................123
Figure 3.53 – Amenities at Grand Lake State Park at Spavinaw ..........................124
Figure 3.54 – Grand Lake State Park at Snowdale ..............................................125
Figure 3.55 – Detail of Grand Lake State Park at Snowdale .................................126
Figure 3.56 – Signs and scenes in Grand Lake State Park at Snowdale ...............127
Figure 3.57 – Views in or from Grand Lake State Park at Snowdale ..................128
Figure 3.58 – Amenities in Grand Lake State Park at Snowdale ..........................128
Figure 3.59 – Trail amenities in Grand Lake State Park at Twin Bridges ............129
Figure 3.60 – Poison ivy near Cherokee area .....................................................139
Figure 3.61 – Views at Grand Lake State Park .....................................................144
Mission Statement of the Oklahoma Tourism and Recreation Department

The mission of the Oklahoma Tourism and Recreation Department is to advance Oklahoma’s exceptional quality of life by preserving, managing, and promoting our natural assets and cultural amenities.

Vision Statement

The vision of the Oklahoma Tourism and Recreation Department is to promote and enhance tourism throughout the state; protect and preserve the environment and natural resources; educate the public about Oklahoma’s people and places; provide exceptional customer service to all citizens and visitors; create a team environment in which all employees are successful, productive, and valued; embrace and seek diversity in our workforce and those we serve.

OTRD Values

- Responsibility and leadership
- Respect
- Quality
- Exemplary customer service
- Balance and self-fulfillment
- Teamwork and communication
- Flexibility
- Creativity and innovation
- Coordination
- Commitment
- Integrity
Chapter 1 – Introduction

Resource Management Plan: Purpose and Process

The Resource Management Plan (RMP) program and policy is to document management responsibilities to balance the use of water and land resources as they relate to recreation; in this instance, Grand Lake State Park. As a guiding plan, the RMP seeks to propose long-term policy that limits adverse impacts to critical resources while providing protection and management of fish, wildlife, and other natural and cultural resources. In addition, the RMP will provide guidelines for public health and safety, public access, and a wide variety of outdoor recreational opportunities.

The purpose and scope of the RMP are to provide background information, identify the policies and goals governing the management of Grand Lake State Park and its incorporated resources, summarize the plan’s components, and provide descriptive and historical information related to the project.

The ultimate purpose of the RMP is to establish a management framework for the conservation, protection, enhancement, development, and use of the physical and biological resources at Grand Lake State Park. With regard to Grand Lake State Park, the RMP is to:

- Provide managers and decision-makers with long-term direction and guidance for the successful management of the resources at Grand Lake State Park;
- Ensure that management of the resources is compatible with authorized purposes;
- Ensure that recreation experiences and facilities are compatible with other environmental resources;
- Ensure that planned developments are based on public need and the ability of the environmental resources to accommodate such facilities and use; and
- Resolve issues and concerns related to management of the environmental resources.

Planning Process

The planning process for preparation of this Resource Management Plan included discussion between research staff at Oklahoma State University (OSU) and management personnel from Oklahoma State Parks. In addition, the process incorporated (1) the acquisition of archival information from libraries, state parks, books, research reports, and other sources; (2) interviews of state park personnel; (3) records provided by state park management; (4) input from members of the public through surveys, comments cards, and focus groups; and (5) searches of the Internet for information that expanded on other archives.

The purposes of public involvement are to inform the public and solicit public response regarding their needs, values, and evaluations of proposed solutions. Public involvement programs are designed not only to meet state and federal regulations, but also to include interested individuals, organizations, agencies, and governmental entities in the decision-making process. Techniques used for public involvement include interviews, workshops, advisory committees, informational brochures, surveys, and public hearings. The process of public
involvement is important to help strengthen the relationship between public and government agencies involved in the proposed plan. The relative success of public involvement techniques and the participation of supporting government agencies regarding the program as a whole is indicated by how well informed the public is and by how much the public has contributed to making environmentally sound, feasible decisions that are supported by a significant segment of the public. The public involvement process for the Grand Lake State Park RMP is incorporated into the text of this document.

The original concept in preparation of an RMP is a federal action that requires compliance with the National Environmental Policy Act (NEPA); therefore, the public involvement process must fulfill the RMP and NEPA requirements as well as those of other entities. Oklahoma State Parks has committed the agency to follow a similar model at the state level for all state parks.

Using several public involvement methods to gain insight into the concerns of the public and governmental agencies potentially affected by provisions of the Grand Lake State Park RMP, representatives from OSU compiled and analyzed the data. The public involvement process offered citizens and various interest groups information about the project and its potential impacts. This course of action was used to gather information, ideas, and concerns regarding the different issues to be compiled and addressed to determine issues of public concern. The issues were then evaluated resulting in alternative solutions and recommendations for the park.

Finally, the RMP process included integration of global positional system (GPS) technology into Geographic Information System (GIS) software to document features and attributes within the park. This component of the process permits an on-going record of facilities with their respective attributes, locations, and conditions. As a result, the GPS and GIS components of the RMP process are integral to on-going implementation and application of the planning effort.

**Agencies Involved**

In 2006, Oklahoma State Parks, through the Oklahoma Tourism and Recreation Department (OTRD), contracted with Oklahoma State University to prepare Resource Management Plans for each park. This agreement has been renewed annually since 2006. The current agreement specified Grand Lake State Park during 2011 – 2012, and the intent of the agreement is to continue the RMP process across all state parks in Oklahoma.

The RMP agreement became effective July 1, 2011 between Oklahoma Tourism and Recreation Department and Oklahoma State University. Following a meeting between OTRD and OSU staff, information, reports, and comment cards were provided to OSU for review. In accordance with the RMP contract, OSU performed research services and delivered reports to OTRD concluding with a written plan for Grand Lake State Park in June 2012.

The authority for the agreement between OTRD and OSU is based upon Title 74 § 2213 as authorized by Engrossed Senate Bill 823 of the 2005 session: “The Commission may contract for the study, analysis, and planning as reasonably necessary to aid in determining the feasibility of leasing, selling or privately managing or developing the property or facilities under the control of the Commission. The Commission shall be exempt from the competitive bidding requirements of the Competitive Bidding Act for the purpose of soliciting, negotiating, and effectuating such a contract or contracts.”
Further, this authority is specified in Title 74 § 2215 which states: the Division of State Parks, subject to the policies and rules of the Commission shall formulate, establish, maintain, and periodically review, with public participation, a resource management plan for each state park. The resource management plan, upon approval by the Commission, shall be considered a guide for the development, utilization, protection, and management of the state park and its natural, cultural, historic, and recreational resources.

Figure 1.1 – Entry sign for Grand Lake State Park – Bernice area

Figure 1.2 – Entry sign for Grand Lake State Park – Spavinaw
Figure 1.3 – Entry sign for Grand Lake State Park – Cherokee Lakeside
Chapter 2 – Project Description

About Grand Lake State Park

The Division of State Parks, a part of the Oklahoma Tourism and Recreation Department, is
governed by the laws of the state of Oklahoma. These laws define the authority for the Division
and the context in which individual state parks are managed. Title 74 § 2214 of the Oklahoma
Statutes states that the Division of State Parks shall, subject to the policies and rules of the
Commission:

1. Conserve, preserve, plan, supervise, construct, enlarge, reduce, improve,
maintain, equip and operate parkland, public recreation facilities, lodges,
cabins, camping sites, scenic trails, picnic sites, golf courses, boating, and
swimming facilities, and other similar facilities in state parks reasonably
necessary and useful in promoting the public use of state parks under the
jurisdiction and control of the Commission;

2. Supervise the management and use of state properties and facilities under
the jurisdiction of the Commission. The Commission may adopt rules to
lease concessions in any state-owned facility if the Commission deems it
feasible;

3. Authorize those employees in the Park Manager job family classification
series, as established by the Oklahoma Office of Personnel Management, to
maintain administrative control over all facilities, programs, operations,
services, and employees in the park to which they are assigned; and

4. Enforce the rules and policies governing the use of and conduct of patrons in
all recreational facilities and properties of the Commission.

Purpose and Significance of Grand Lake State Park

An initial requirement of the RMP process is the development of a purpose statement for the
property under consideration. The process selected for the development of resource management
plans for state parks requires purpose statements and statements of significance for each park.
These statements drive the decisions as to planning for the respective parks, since individual
parks in the state park system do not have identical purposes or intents.

At the initiation of this project, a purpose statement for Grand Lake State Park did not exist. As a
result, it was necessary that one be developed. While Grand Lake State Park had recently been
organized as a single management unit, several of the components were perceived as being
separate parks. Research staff from OSU worked with OTRD staff, representing Grand Lake
State Park and the broader agency, to develop a draft purpose statement. During that process
staff created the following statement with the intent of preparing a singular statement to
encompass all the separate properties assigned to Grand Lake State Park.

The purpose of Grand Lake State Park, in its various locations, is to provide for
the protection and public enjoyment of the scenic and recreational values that
exist in the diverse state park properties near Grand Lake of the Cherokees
extending through the Grand River watershed offering a tourist destination designed and developed to attract and serve visitors, to provide opportunities for visitors to enjoy the scenery, to instill an appreciation of those scenic, recreational, and environmental values supplemented by a built and modified park environment, and to stimulate the local economy.

Similarly, in response to requests from the research staff, OTRD personnel, in cooperation with the research staff, developed a statement of significance for Grand Lake State Park. That statement follows:

Grand Lake State Park is significant because it serves all people, local residents and tourists, by providing public access to Grand River and Grand Lake, one of the largest Oklahoma lakes, and surrounding environments. As such, Grand Lake State Park, at its varied locations, is an important component of the tourism attraction because it offers enclaves of the public recreation estate in the Grand Lake area. Grand Lake State Park is significant as the provider of initial memories for many guests at Grand Lake, the sustainer of those memories and traditions, the protector of the natural environment, and the provider of education and recreation appropriate to that environment.

Figure 2.1 demonstrates the inter-relationship of purpose and significance statements with the mission of the management agency in decisions related to a given park or property. This model has been developed by the National Park Service to assure consistency between the mission of the National Park Service and the operation of their respective properties. In a similar manner, park purpose statements and park significance must be consistent with the mission of the Oklahoma Tourism and Recreation Department.
Geographic Location of Grand Lake State Park

Grand Lake State Park is located in northeastern Oklahoma, with various nodes of the park located in Delaware, Mayes, and Ottawa counties. The park is located on the western uplift of the Ozark Mountains. Pryor Creek is the largest city in Mayes County, Grove is the largest city in Delaware County, and Miami is the largest city in Ottawa County.

The various properties that are components of Grand Lake State Park are aligned in a northeast to southwest pattern along the Spring River and Neosho River which join to form the Grand River corridor. The Grand River corridor has been impounded at three locations forming a series of three lakes: Grand Lake o’ the Cherokees, Lake Hudson, and Fort Gibson Lake. This series of three lakes is shown in Figure 2.3 on the following page. Grand Lake is the largest of the lakes and is furthest upstream. The Spavinaw area of Grand Lake State Park is located on a tributary flowing into the Grand River.
Grand Lake State Park extends through three counties in northeastern Oklahoma: Delaware County, Mayes County, and Ottawa County, with a minor border extending into Craig County. The following presentation provides details on the region.

Delaware County borders Adair and Cherokee County to the south, Mayes County to the west, Craig County to the northwest, and Ottawa County to the north. Delaware County also borders McDonald County, Missouri to the northeast and Benton County, Arkansas to the east. The county seat is Jay, Oklahoma and the largest city is Grove. Smaller communities in Delaware County include Bernice, Colcord, Kansas, Leach, Twin Oaks, Cleora, West Siloam Springs, and Flint Creek. Two large lakes dominate the region: Grand Lake o’ the Cherokees and Lake Eucha.

Mayes County borders Delaware County to the east, Rogers County to the west, Craig County to the north, Wagoner County to the south, and Cherokee County to the southeast. The county seat is Pryor Creek, Oklahoma. Pryor Creek is also the largest city in Mayes County. Smaller communities in Mayes County include Adair, Spavinaw, Chouteau, Locust Grove, Langley, Disney, and Salina. There are five large bodies of water that are partially or totally within Mayes County: Lake Fort Gibson, Lake Spavinaw, Grand Lake o’ the Cherokees, Lake Hudson, and the Salina Pumped Storage Project (Lake W.R. Holway). The city of Tulsa owns Lake Spavinaw, using it primarily as a water source. Grand River Dam Authority (GRDA) manages Lake Fort Gibson, Grand Lake o’ the Cherokees and Lake Hudson for flood control and hydroelectric power generation.

Ottawa County borders Craig County to the west and Delaware County to the south. Ottawa County also borders Cherokee County, Kansas to the north, Newton County, Missouri to the east, and McDonald County, Missouri to the southeast. The county seat of Ottawa County is
Miami. Miami, Oklahoma is the largest city in Ottawa County. Smaller communities in Ottawa County include Wyandotte, Afton, Commerce, Fairland, and Quapaw. There are two notable abandoned cities in Ottawa County: Cardin and Picher. Grand Lake o’ the Cherokees is the only large body of water in Ottawa County, with the Neosho and Spring Rivers being other valuable water resources.

Due to the various nodes of Grand Lake State Park being located across three counties and quite distanced from other nodes, travel to and from the park nodes is provided via a variety of routes. Interstate 44; U.S. Highways 59, 60, 66, 69, and 412; and State Highways 10, 20, 25, 28, 82; along with several county, city, and rural roads offer a host of routes to access various parts of Grand Lake State Park.

Community and Regional Context

Brief History of Delaware County

The following history of Delaware County was written by Rose Stauber for the Oklahoma Historical Society and retrieved from the website for the Oklahoma Historical Society (http://digital.library.okstate.edu/encyclopedia/entries/D/DE010.html).

Located in northeastern Oklahoma, Delaware County is bordered on the east by McDonald County, Missouri, and Benton County, Arkansas, on the south by Adair and Cherokee counties, on the west by Mayes and Craig counties, and on the north by Ottawa County. U.S. Highway 59 crosses the region north and south. The Cherokee Turnpike, also U.S. Highway 412, crosses the southern end of Delaware County. Other important routes include State Highways 10, 20, 28, 85, 116, 125, and 127. The county lies on the western slopes of the Ozark Plateau, an area of forests, prairies, and farm land. The Grand River and Elk River are the major water courses in the county's northern portion, while Flint Creek and the Illinois River drain in the southern part. The Ozark limestone holds neither oil nor any minerals but provides an abundant supply of water. The county’s total land and water area is 792.33 square miles. At least three different periods of prehistoric peoples have been documented in Delaware County. By 2004 twenty-three Archaic, seventeen Woodland, and sixty-three Eastern Villager archaeological sites had been tested. In
1939, before Grand Lake filled, University of Oklahoma archaeologists excavated along Grand River and Honey Creek, uncovering many artifacts. The sites, similar to the Hopewell Culture that resided in the Kansas City, Missouri area 2000 to 1400 years ago, are now under the lake. In more modern times, few American Indians lived in the present county until the federal government began relocating tribes. Beginning in 1828 the Western Cherokee were relocated from Arkansas, settling mainly outside future Delaware County, in the southern part of the region that later became the Cherokee Nation. One of the chiefs, Thomas Chisholm (grandfather of Sen. Robert L. Owen), settled just west of Maysville, Arkansas. He was buried there in 1834 in the oldest-known marked grave in the county. In 1832 the Seneca from Ohio were removed to Indian Territory into lands that extended into present northeastern Delaware County. Some of the Eastern Cherokee arrived in 1836 and 1837, but the main body came late 1838 into 1839. About 1820 a group of Delaware who had befriended the Cherokee against the Osage settled Delaware Town, located approximately two miles south of present Eucha on Spavinaw Creek, where it now lies under Lake Eucha. The Cherokee named the surrounding area Delaware District.

Delaware County was created at statehood in November 1907. The first county judge and clerk were sworn in by Cherokee John H. Gibson, mayor of Grove. As the only incorporated town in the county at statehood, Grove was designated the seat of government. However, a movement soon emerged to relocate the county seat. Those who wanted it in the county’s center banded together, found a place on Jay Washbourne's allotment, platted a town, won a vote to make Jay the county seat, and built a wooden courthouse. Meanwhile, an entrepreneur built a concrete courthouse just outside of the Jay plat. The wooden courthouse mysteriously burned, tempers flared, guns appeared, and the governor called out the military. A judge ruled in favor of the Jay plat, and in 1912 the records went into the Jay courthouse. Nevertheless, Grove citizens complained about the difficulty of holding court at Jay, because of poor roads and insufficient accommodations.

At the turn of the twentieth century subsistence farming served as the principal occupation. Much changed in the century's first two decades. Better transportation, refrigerated railroad cars, new farm equipment, and agricultural education brought improvements. The value of dairy products rose from $127,389 in 1919 to $186,499 ten years later. Egg production increased from 390,006 dozen in 1919 to 636,835 in 1929. Over time, labor-intensive row crops and grains gave way to cattle. In 1920 the county had 2,176 farms with 257,671 acres. This held steady until the 1960s, when the number began decreasing. In the 1970s poultry, mainly broilers, became a key product. In 1997 there were 1,303 farms covering 364,620 acres. The value of agricultural products sold that year was $94 million, approximately two-thirds of which were poultry products.

Three lakes changed the face and the economy of Delaware County. In 1924 the city of Tulsa, completed a water-supply dam at Spavinaw on Spavinaw Creek in Mayes County. Lake Spavinaw impounds water into Delaware County. Although small, the lake began to attractweekenders and day-trippers. In 1940 a dam on Grand River was completed, and Grand Lake o’ the Cherokees was filled. Grand Lake sprawls north across Delaware County into Ottawa County. Creation of the lake also displaced hundreds of people, covered roads, and necessitated relocation of a number of cemeteries. Sailboat Bridge on Grand Lake is the second-longest bridge over water in Oklahoma. Tulsa's growing need for water caused it to revisit Spavinaw Creek, and in 1952 an upstream dam was completed, creating Lake Eucha. It became a popular fishing and recreation area. The lake inundated the Cherokee town of Eucha, the home of
Cherokee Chief Charles Thompson, or Oochalata, who was buried there. The town and the cemetery were relocated. The chief is buried just inside the gate of the new cemetery, the grave marked by a military stone for his Civil War service to the Union. After World War II a boom began. Tourism and retirement became big business. In 1965 Green Country, Incorporated, formed to coordinate promotion and development of sixteen northeast Oklahoma counties. In 2000 the three largest occupation groups, each at 23.4 percent of the labor force, were management, professional, and related occupations; production, transportation and material moving occupations; and sales and office jobs. Service occupations involved 15.9 percent, while farming and related jobs involved only 1.8 percent. Rail access assisted in community growth over the years. In 1896 Congress authorized the Arkansas Northwestern Railway to build a line from Southwest City, Missouri, northwest to the Kansas line between Baxter Springs and Chetopa. Under the name of the Arkansas and Oklahoma Railroad, a line was built from Rogers, Arkansas, to Grove, reaching there in 1900. The next year, the St. Louis and San Francisco Railway bought the line, which never extended beyond Grove, and was abandoned in 1940. In 1912-13 the Kansas, Oklahoma, and Gulf Railroad built tracks through the region to connect Kansas and Texas. Upon entering Delaware County, the line looped west and then southwest, following the west bank of Grand River and exiting into Craig County. In 1912 the town of Bernice was platted on both sides of the railroad near the crossing of Horse Creek. Many businesses in Needmore, two miles east, moved to Bernice. Further east, Rabbit, a small community north of Grove, later renamed Copeland, and Switch developed. When Grand Lake was built, Bernice relocated to higher ground on the west side of Horse Creek, and some of the railway grade was moved. The line was abandoned in 1966, and the railway grade, including the Horse Creek Bridge, became State Highway 85A.

In 1910 Delaware County had a population of 11,469; only five counties had fewer people. This did not change appreciably until 1970 when the population surged. The 2000 census recorded 37,077, more than fifty-nine other counties. In 2004 the census revealed that while rural counties were losing population, Delaware County was the fifth-fastest-growing in the state. In addition to tourism, a tight labor market, aggressive action to attract employers, and a growing economy in adjacent northwest Arkansas contributed to these changes. Since the surge of whites into Indian Territory in the nineteenth century's last decades, they have outnumbered other groups. In 1900 the census of Indian Territory recorded whites at 77.2 percent and American Indians at 13.4. The 2000 census tallied whites 70.2 percent and American Indians 22.3. The county offers several recreation areas and historic sites. Just south of Lake Eucha is the 14,316 acre Spavinaw Wildlife Management Area. State parks include Honey Creek at Grove and Bernice at Bernice, Lake Eucha south of Jay, and Natural Falls near West Siloam Springs. Har-Ber Village, a large museum, is west of Grove. Near present Oaks is Moravian Springplace Mission. Southwest of Maysville, Arkansas, is the site of Fort Wayne. Six properties have been listed in the National Register of Historic Places. Polson Cemetery (NR 77001092), west of Southwest City, Missouri, is the burial place of Major Ridge, John Ridge, and Stand Watie. Northwest of Grove in the Seneca-Cayuga area is the still-active Splitlog Church (NR 72001061) built by Mathias Spitlog. The Hildebrand-Beck Mill (NR 72001062) stands on Flint Creek just north of U.S. Highway 412 east of Kansas, Oklahoma. The Talbot Library and Museum in Colcord displays artifacts and provides genealogy resources. Notable natives of Delaware County include Lee B. Smith (1844-1917), an adopted Cherokee who served on the Cherokee Nation Council and was the county's first state legislator. John H. Gibson (1861-1940) owned the Grove Sun and served in local and state offices.
Mayes County is located near the northeastern corner of Oklahoma. Surrounding counties include Craig to the north, Delaware to the east, Cherokee and Wagoner to the south, and Rogers to the west. The topography of the county’s 683.51 square miles is divided by the Grand River, and of the total area 27.37 square miles is surface water. The eastern half lies on the edge of the Ozark Plateau, or Ozark Uplift, characterized by flat areas divided by deep, V-shaped stream valleys. The western half of the county lies in the Prairie Plains. The incorporated towns include Adair, Chouteau, Disney, Grand Lake, Langley, Locust Grove, Pensacola, Pryor Creek, Salina, Spavinaw, Sportsmen Acres, and Strang. Mayes County has numerous prehistoric sites, with one Paleo-Indian (prior to 6000 B.C.), thirty-five Archaic (6000 B.C. to A.D. 1), twenty-five Woodland (A.D. 1 to 1000), and thirty-one Plains Village (A.D. 1000 to 1500). The locations of most of these are confidential, and man-made lakes now cover some of them. Many of the streams’ and towns’ French names are credited to that country's early voyageurs such as Jean Baptiste Bénard de La Harpe, a French explorer who came to the area in 1719. Early in the nineteenth century French trader, Maj. Jean Pierre Chouteau established a trading post near present Salina, trafficking with the Osage who had already located in the region. This was one of the first white settlements in Oklahoma. The state’s earliest mission, school, church, and white cemetery were created with the establishment of Union Mission in 1820, five miles southeast of present Chouteau. In 1828 the Western Cherokee acquired this region in present Oklahoma for its land in Arkansas. In the 1830s Eastern Cherokee arrived from Georgia, Tennessee, and North Carolina, where they had lost their homeland. In 1835 Rev. Samuel A. Worcester installed Oklahoma's first printing press at the mission. During the Civil War military action occurred in the area. In July 1862, near present Locust Grove, a skirmish occurred when Union Col. William Weer and three hundred of his troops surprised a Confederate force of a similar number. Approximately one-third of the rebels surrendered, and the rest escaped. In July 1863, the first Cabin Creek engagement developed as Col. Stand Watie attempted to intercept a U.S. supply
train traveling to Fort Gibson. Federal Col. James Williams defeated the famed Cherokee Confederate leader, who had expected reinforcements. In September 1864, Brig. Gen. Watie and Brig. Gen. Richard Gano successfully captured a Union supply train near the same location in the second Cabin Creek engagement. This led to a skirmish at Pryor Creek when Col. James Williams's Union force-marched his troops to reclaim the supply train. The Confederates escaped. Early transportation routes helped the region develop. The East Shawnee Trail, an early cattle trail, followed the Grand River through present Mayes County. The Texas Road passed through, with two stage stops in the area. Two railroads provided services. The Missouri, Kansas and Texas Railroad was built in 1871-72, and was joined later by the Missouri, Oklahoma and Gulf Railway, whose “Golfen Spike” was driven at Strang in February 1913. In 1841 the area now comprising Mayes County became part of the Saline District of the Cherokee Nation. The creation of Mayes County began with the constitution of the proposed State of Sequoyah in August 1905. The document designated forty-eight counties. Nine of these, including Mayes, became part of the state by the Oklahoma Constitutional Convention, effective at statehood on November 16, 1907. The county name honors Cherokee Chief Samuel H. Mayes.

Pryor, or Pryor Creek, named for early trader and Indian subagent Nathaniel Pryor, became the county seat. The fertile soil of the Ozark Plateau and the climatic conditions of the Prairie Plains permit the cultivation of a variety of crops, including corn, soybeans, wheat, sorghum, and hay. The more rugged land is used for raising cattle and dairy farming. These agricultural activities played an early role in county history. Beginning in 1941 the county’s economy began to change with the creation of the Oklahoma Ordnance Works, a government-owned, DuPont-operated munitions plant located south of Pryor. Closed at the end of World War II, the facility remained empty for many years as prolonged negotiations took place to transform it into a center for industry. In 1960 the site became the Mid-America Industrial Park, and the manufacturing of paper, cement, fertilizer, and other products began to replace agriculture as the main economic activity. Mayes County is central to the Grand River Dam Authority (GRDA), created in 1935 by the Oklahoma Legislature for flood control and hydroelectricity production. The county contains GRDA’s operation and maintenance headquarters, three dams with generating facilities (the Pensacola Dam, the Robert S. Kerr Dam, and the Salina Pumped Storage Project), and the GRDA Coal-Fired Complex, a thermal-generation facility. Interstate 44, the Will Rogers Turnpike, crosses the northwestern corner of the county. U.S. Highway 69 travels north and south in the western half, as does State Highway 82 in the eastern half. U.S. Highway 412 crosses the southern part of the county; State Highway 28 crosses the northern part, and State Highway 20 the central, all east and west. In 1910, 13,596 people lived within the county. The population increased each decade to 21,668 in 1940. The number declined to 19,743 by 1950. From that date, the population grew to 38,369 in 2000, with 72.1 percent white, 18.9 percent American Indian, 1.5 percent Hispanic, 0.5 percent Asian, and 0.3 percent African American. One of the county's most notable citizens was Willard Stone (1916-1985), Cherokee sculptor inducted into the Oklahoma Hall of Fame in 1970. Another notable citizen, Ben Tincup (1894-1980), born in Rogers County but raised north of Pryor, was an American Indian who played major-league baseball. On June 18, 1917, he pitched a perfect game for the minor-league Little Rock Travelers. In 1982 Chouteau’s Johnny Ray became the first Pittsburgh Pirate to be selected as Rookie of the Year by the National Baseball League. In 1976, Salina’s Carl Belew was inducted into the Nashville Songwriters Hall of Fame for his award-winning country songs performed by Charlie Pride, Jim Reeves, Waylon Jennings, and others. Mayes County is home to several public schools, Northeastern Technology Center, South Campus (vo-tech), and Rogers
State University, Pryor Campus. There are six county properties listed in the National Register of Historic Places: the Farmers and Merchants Bank (NR 83002091) in Chouteau, the Territorial Commercial District of Chouteau (NR 83002093), the Pensacola Dam (NR 03000883), Union Mission Site (NR 71000668) near Mazie, Cabin Creek Battlefield (NR 71000669), and the Lewis Ross-Cherokee Orphan Asylum Springhouse (NR 83002092) near Salina.

**Brief History of Ottawa County**

The following history of Ottawa County was written by Larry O’Dell for the Oklahoma Historical Society and retrieved from the website for the Oklahoma Historical Society ([http://digital.library.okstate.edu/encyclopedia/entries/O/OT003.html](http://digital.library.okstate.edu/encyclopedia/entries/O/OT003.html)).

Located in Oklahoma’s northeastern corner, Ottawa County contains 484.73 square miles of land and water. Created at 1907 statehood the county is bordered by Kansas on the north, Missouri on the east, Delaware County on the south, and Craig County on the west. The name honors the Ottawa tribe. The environmental setting displays two separate characteristics, the Ozark Plateau and the Osage Plains. The Ozark Plateau of the eastern part of the county gives way to the plains west of the Neosho River. The plains region here has also been classified as the Neosho Lowlands. The Neosho (Grand) and Spring rivers once merged in the county, but they now drain into the Lake o’ the Cherokees, known as Grand Lake, impounded in 1940. Most of the archaeological work relating to the Paleo-Indian period in Ottawa County has involved surface collection. William H. Holmes conducted two early, professional archaeological examinations here. In 1894 he investigated a chert quarry near Peoria, and in 1901 he surveyed a marsh known as Sulphur Springs near Afton, finding spear and arrow points, tools, and knives associated with mammoth and mastodon teeth. At the beginning of the twentieth century there were eight Archaic sites (6000 B.C. to A.D. 1), sixteen Woodland sites (A.D. 1 to 1000), and six Plains Village sites (A.D. 1000 to 1500). After the Osage ceded their claim to the area, in 1828 the Western Cherokees acquired the region by ceding their Arkansas lands to the United States. Beginning in 1831 the federal government began to reacquire part of the land lying in present Ottawa County in order to relocate smaller tribes. The first such treaty between the Seneca living on the Sandusky River in Ohio and the federal government was concluded on February 28, 1831. A few months later the United States made an agreement with another Seneca band and the
Shawnee of Ohio. Both of these treaties contained a clause promising a sawmill and blacksmith shop. In 1833 a treaty with Quapaw assigned them 150 sections of land near the Seneca. In 1867 the federal government purchased land from the Seneca/Shawnee and the Quapaw to relocate several tribes then residing in Kansas. These included the Peoria, Kaskaskias, Weas, Piankeshaws, Miami, Ottawa, and Wyandotte. After the Modoc War (1872-73) 153 Modoc were placed on the Quapaw Reservation. From 1838 to 1871 the Neosho Agency administered these tribes’ affairs, operating from several different locations over time. From 1851 through 1861 it occupied the Crawford Seminary, founded in 1843 near the present site of Peoria by the Methodist Episcopal Church as a school for Quapaw children east of Spring River. In 1848 the school had moved several miles north to a healthier environment, and it closed in 1852. Moved to Fort Scott, Kansas, during the Civil War, the Neosho Agency reopened in 1865 under Special Indian Agent George Mitchell in present Ottawa County and in July 1871 became the Quapaw Agency, serving only the tribes located in northeastern Indian Territory (beginning in 1849 several Indian nations then located in Kansas had been placed under the Neosho Agency, and the official Neosho agent lived there after the Civil War). In 1869 the Society of Friends (Quakers) established a mission for the Wyandotte. It evolved into a boarding school for Seneca, Wyandotte, and Shawnee children, with classes initiated in 1872. Over the years the school was known by several names, including the Wyandotte Mission, Seneca Indian School, Seneca, Shawnee, and Wyandotte Industrial Boarding School, and Seneca Boarding School. In 1870 a school opened for the Ottawa, in 1871 a school for the Peoria was established north of the reservations in Baxter Springs, Kansas, and in 1871 a boarding school for the Quapaw and Modoc was founded. From 1894 until 1927 St. Mary’s of the Quapaw, a Catholic facility, served that tribe. By the late 1890s most of the Quapaw Agency’s charges had taken allotments.

Although lead and zinc mining occurred in the Missouri portion of the Tri-State Lead and Zinc District (southwestern Missouri, southeastern Kansas, and northeastern Oklahoma) as early as the 1850s, mining began in present Ottawa County near Peoria in 1891. Soon numerous mining camps emerged, including Picher, Lincolnville, Hattonville (later Commerce), Century, and Cardin. The industry also led to instant growth in preexisting towns, such as Miami and Quapaw. The Quapaw tribe initially held the rights to most of the land that produced the valuable ore. By the 1910s companies began to buy, rather than lease the land, and as a result, a few large corporations monopolized the lead and zinc fields. These included the Commerce Mining and Royalty Company, the Eagle-Picher Company, the Childers Mining Company, the LaClede Lead and Zinc Company, and the American Lead and Zinc Company. Several smelters also operated, heat-refining the ore into a marketable product.

In 1926, at the region’s peak of production, Ottawa County stood as the largest source of lead and zinc in the world. By the 1960s most of the mines had closed, leaving mine shafts, sinkholes, chat piles, and other dangers for the next generation. By 2000 the Tar Creek Superfund Site, a federally funded clean-up project, centered on Picher and encompassed most of the former lead and zinc production centers. Limestone, timber, and tripoli have also been extracted in Ottawa County. In 1912 tripoli, primarily used as an abrasive, was found near Peoria and continued to be mined into the twenty-first century, with 29,277 tons produced in 2002. Transportation routes had emerged in the area by the early 1800s. The Texas Road and later two branches of the Shawnee Trail, which followed the Grand River from Fort Gibson, traversed present Ottawa County, connecting Texas to Kansas. In 1871 the Atlantic and Pacific Railroad, acquired in 1876 by the St. Louis and San Francisco Railway, laid tracks through the area southwesterly to Vinita. In 1901 the Kansas City, Fort Scott and Memphis Railway, leased to the St. Louis and San
Francisco Railway that same year, built from the Kansas border to Afton. In 1906-07 the Southwest Missouri Railroad built an interurban line from Baxter Springs, Kansas, to Picher to haul lead and zinc. In 1908-09 the Oklahoma, Kansas and Missouri Inter-Urban Railway constructed a line from Miami to Commerce to also service the mining industry, completing another branch in 1916 from Commerce to Century. In 1919 the Northeast Oklahoma Railroad purchased the Oklahoma, Kansas and Missouri and in 1939 bought the Southwest Missouri Railroad. In 1912-13 the Missouri, Oklahoma and Gulf Railroad, eventually sold to the Kansas, Oklahoma and Gulf Railway, laid rails from the Kansas-Oklahoma line south through Ottawa County to Wagoner. Historically, corn has been the key agricultural product. In 1907 Ottawa County farmers planted 55,483 acres of it, as well as 8,276 acres of wheat, and 5,800 acres of oats. In 1934 they planted 19,823 acres of corn, 19,873 acres of oats, and 12,040 acres of wheat. By 1960 wheat had taken the lead, with 22,000 acres planted, followed by 9,600 acres of corn, and 6,500 acres of oats. That year farmers planted 13,400 acres of sorghums. In 2002 wheat continued to be the leading cash crop, with seventy-seven farms planting 23,032 acres, but soybeans grew in importance, with 21,786 acres planted by seventy farms. Corn had diminished in consequence, and only 3,642 acres were planted. Ranching has also supplemented the county’s economy. In 1907 residents owned 9,145 swine, 7,715 cattle, and 3,589 horses. By 1935 ranchers had increased the cattle to 19,957, and there were 10,984 swine and 3,974 horses. By 1960 the cattle industry continued to grow with 31,000 head, while the hog business had declined to 6,200. In 2002 the U.S. Department of Agriculture inventoried 53,833 cattle and 5,969 hogs and pigs in Ottawa County.

In the first half of the twentieth century many of the county’s businesses catered to the lead and zinc industry. These included machine shops, drilling companies, iron and metal supply companies, welding outfits, and a number of retail entities serving the miners. The chat, or rock fragmented waste, from the lead and zinc mines could be used as aggregate for road construction and concrete production, and a trucking industry developed to haul it. In 2002 the Flint Rock Products company utilized 588,429 tons of chat. In 1945 a B. F. Goodrich tire manufacturing plant opened northwest of Miami, providing jobs and boosting the county’s sagging economy as lead and zinc production declined. On August 23, 1985, known in the region as “Black Friday,” Goodrich announced the plant’s closing. Educational, medical, and recreational facilities developed to serve families in the mining region. In 1919 Oklahoma created the Miami School of Mines, which evolved into Northeastern Oklahoma Junior College (1924), and then Northeastern Oklahoma Agricultural and Mechanical College (1943). Miami also acquired an Integris medical complex and the Northeast Area Vo-Tech Center. In 1940 the Grand River Dam Authority completed construction on the Pensacola Dam, creating the Lake O’the Cherokees or popularly Grand Lake. Lying mostly in Delaware County, the lake extends into Ottawa County, attracting recreational dollars and development. In 1907 the county’s population stood at 12,827, and it increased to 15,713 in 1910. As the lead and zinc industry flourished, the number climbed, reaching 41,108 in 1920 and gradually declined with mining industry. In 1930 there were 38,542 residents, in 1940 35,849 residents, and 28,301 residents in 1960. In 1970 the population registered 29,800 and ascended to 32,870 in 1980. Various transportation arteries were created to serve residents and industry. The Will Rogers Turnpike (Interstate 44) cuts diagonally through the county, entering Missouri at Oklahoma’s northeastern corner. U.S. Highways 59, 60, and 69 traverse Ottawa County in a general north-south direction. State Highways 10, 10C, 25, 69A, 125, and 137 also serve travelers. Historic U.S. Highway Route 66 also ran through the county, and several related sites have been placed on the National Register of Historic Places, including
Miami’s Original Nine-Foot Section of Route 66 Roadbed (NR 94001610), Afton’s Cities Service Station (NR 95000039), Horse Creek Bridge (NR 95000040), Miami’s Marathon Oil Company Service Station (NR 95000041), Miami’s Riviera Courts Motel (NR 04000524), and the Narcissa D-X Gas Station (NR 03001240) near Miami.

Two successful athletes hailed from Ottawa County, baseball Hall-of-Famer Mickey Mantle of Commerce and Heisman trophy-winning football star Steve Owens of Miami. Also with county ties are artists Joe Beeler and Charles Banks Wilson, and composer and educator Louis W. Ballard. In 1916 Harry S. Truman, future United States president, invested in an unsuccessful Ottawa County lead and zinc mine. National Register of Historic Places properties include Miami’s George L. Coleman, Sr., House (NR 83002113), Coleman Theater (NR 83002114), and the Ottawa County Courthouse (NR 04000122). In the Miami vicinity lies the Modoc Mission Church and Cemetery (NR 80003293), the Peoria Indian School (NR 83002116), and the Peoria Tribal Cemetery (NR 83002117). The John Patrick McNaughton Barn (NR 91001903) is in the Quapaw area, and the Tri-State Zinc and Lead Ore Producers Association Office (NR 03000097) is in Picher. The latter site contains the Picher Mining Field Museum.

In 2000 the county’s population stood at 33,194, with 74.3 percent white, 16 percent American Indian, 3.3 percent Hispanic, 0.6 percent African American, and 0.2 percent Asian. At the end of the twentieth century Ottawa County’s incorporated towns included Afton, Cardin, Commerce, Fairland, North Miami, Peoria, Picher, Quapaw, and Wyandotte, with Miami as the governmental seat.

Demographic and Socioeconomic Conditions and Impact

The U.S. Bureau of Census provides summary data related to the demographic profile of the residents of Mayes, Ottawa and Delaware counties. The 2010 Census had been conducted at the time of the preparation of this RMP providing an up-to-date assessment of the population.

The following tables provide this summary based upon data retrieved during May 2012 from the U.S. Census at [http://factfinder2.census.gov](http://factfinder2.census.gov).

| Table 2.1 – Population in the Counties around Grand Lake State Park |
|---------------------|-----|-----|
| Year                | 2000 | 2010 |
| Mayes County        | 38,369 | 41,259 |
| Ottawa County       | 33,194 | 31,848 |
| Delaware County     | 37,077 | 41,487 |

Based upon the population figures in Table 2.1 and comparing that to data from the 2000 census, it is apparent that the population of Mayes and Delaware Counties has increased in the past decade (7.53% and 11.9% respectively), both of which are higher rates than is true for the state of Oklahoma. However, census data reveals that Ottawa County has declined in population by
about 1% during that same decade. The 2010 census provides additional information on the trends in the population. As summarized in the 2010 United States Census, the population of the three counties has changed in the following ways:

- In Delaware, Mayes, and Ottawa, the percentage of females in the population is more than males;
- Median age has increased in Delaware, Mayes, and Ottawa counties, an indication that people are living longer and fewer children are being born into families in the counties;
- The percentage of Black or African American individuals in the population in Delaware, Mayes, and Ottawa counties has increased slightly during the last decade;
- The percentage of American Indian individuals in the population in Delaware, Mayes, and Ottawa counties has increased during the decade;
- The percentage of Hispanic/Latino individuals of any race has increased dramatically over the past decade, almost doubling in Delaware, Mayes, and Ottawa counties, although still below the percentage for the statewide population.

**Table 2.2 – Demographic Comparison by County**

Source: 2010 U.S. Census Data

<table>
<thead>
<tr>
<th>Factor</th>
<th>Details</th>
<th>Delaware</th>
<th>Mayes</th>
<th>Ottawa</th>
<th>Oklahoma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td>Male</td>
<td>20,470</td>
<td>20,572</td>
<td>15,537</td>
<td>1,816,749</td>
</tr>
<tr>
<td></td>
<td>(49.3%)</td>
<td>(49.9%)</td>
<td>(48.8%)</td>
<td>(49.4%)</td>
<td></td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td></td>
<td>21,017</td>
<td>20,687</td>
<td>16,311</td>
<td>1,858,590</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(50.7%)</td>
<td>(50.1%)</td>
<td>(51.2%)</td>
<td>(50.6%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>Median Age (years)</td>
<td>45.2</td>
<td>38.5</td>
<td>38.9</td>
<td>36.3</td>
</tr>
<tr>
<td>Under 18 Years of Age</td>
<td>9,307</td>
<td>10,514</td>
<td>7,856</td>
<td>911,484</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(22.4%)</td>
<td>(25.5%)</td>
<td>(24.7%)</td>
<td>(24.8%)</td>
<td></td>
</tr>
<tr>
<td>18 Years of Age and Over</td>
<td>32,180</td>
<td>30,745</td>
<td>23,992</td>
<td>2,762,318</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(77.6%)</td>
<td>(74.5%)</td>
<td>(75.3%)</td>
<td>(75.2%)</td>
<td></td>
</tr>
<tr>
<td>65 Years of Age and Over</td>
<td>8,536</td>
<td>6,471</td>
<td>5,418</td>
<td>491,422</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(20.6%)</td>
<td>(15.7%)</td>
<td>(17.0%)</td>
<td>(13.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td>White</td>
<td>27,811</td>
<td>28,044</td>
<td>21,969</td>
<td>2,720,135</td>
</tr>
<tr>
<td></td>
<td>(67.0%)</td>
<td>(68.0%)</td>
<td>(69.0%)</td>
<td>(72.2%)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>92</td>
<td>169</td>
<td>245</td>
<td>267,179</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.2%)</td>
<td>(0.4%)</td>
<td>(0.8%)</td>
<td>(7.4%)</td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>9,277</td>
<td>8,823</td>
<td>6,007</td>
<td>259,809</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(22.4%)</td>
<td>(21.4%)</td>
<td>(18.9%)</td>
<td>(8.6%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>999</td>
<td>490</td>
<td>1,213</td>
<td>65,548</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.5%)</td>
<td>(1.2%)</td>
<td>(3.8%)</td>
<td>(1.8%)</td>
<td></td>
</tr>
<tr>
<td>Two or More Races</td>
<td>3,308</td>
<td>3,733</td>
<td>2,414</td>
<td>263,896</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(8.0%)</td>
<td>(9.0%)</td>
<td>(7.6%)</td>
<td>(7.2%)</td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>Of Any Race</td>
<td>1,248</td>
<td>1,097</td>
<td>1,499</td>
<td>302,167</td>
</tr>
<tr>
<td></td>
<td>(3.0%)</td>
<td>(2.7%)</td>
<td>(4.7%)</td>
<td>(8.2%)</td>
<td></td>
</tr>
</tbody>
</table>

The characteristics of the population detailed in Table 2.2 indicate that Delaware, Mayes, and Ottawa counties have populations that are older than the general population of Oklahoma. This
may be a reflection of the rural nature of the counties and the influx of senior citizens moving to the Grand Lake area. Delaware, Mayes, and Ottawa counties have a slightly lower percentage of persons indicating they are White (67%, 68%, and 69% respectively) than is true in Oklahoma more broadly (72.2%). By contrast, all three counties show a much higher percentage of Native Americans or American Indians (22.4%, 21.4%, and 18.9%) than the 8.6% of the population identified as American Indian across the state. In addition, the state of Oklahoma reports 8.9% of its population to be Hispanic of any race, however Delaware, Mayes, and Ottawa counties are much lower, with 3%, 2.7%, and 4.7% respectively.

Table 2.3 – County Household Characteristics

Source: 2010 U.S. Census Data

<table>
<thead>
<tr>
<th>Household Related Factor</th>
<th>Delaware</th>
<th>Mayes</th>
<th>Ottawa</th>
<th>Oklahoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Households</td>
<td>17,093</td>
<td>16,008</td>
<td>12,345</td>
<td>1,421,705</td>
</tr>
<tr>
<td>Population In Households</td>
<td>41,194</td>
<td>40,660</td>
<td>30,862</td>
<td>3,563,497</td>
</tr>
<tr>
<td>Households With A Child or Children Under 18</td>
<td>(28.4%)</td>
<td>(33.9%)</td>
<td>(33.1%)</td>
<td>(29.9%)</td>
</tr>
<tr>
<td>Households With Persons 65 Years and Over</td>
<td>(35.3%)</td>
<td>(29.1%)</td>
<td>(31.3%)</td>
<td>(9.9%)</td>
</tr>
<tr>
<td>Occupied Housing Units</td>
<td>17,093</td>
<td>16,008</td>
<td>12,345</td>
<td>1,421,705</td>
</tr>
<tr>
<td>Vacant Housing Units</td>
<td>7,725</td>
<td>3,231</td>
<td>1,715</td>
<td>222,523</td>
</tr>
<tr>
<td>Owner Occupied Housing Units</td>
<td>13,295</td>
<td>12,042</td>
<td>8,993</td>
<td>969,959</td>
</tr>
<tr>
<td>Renter Occupied Housing Units</td>
<td>3,798</td>
<td>3,966</td>
<td>3,352</td>
<td>451,746</td>
</tr>
</tbody>
</table>

The general household characteristics represented in Delaware, Mayes, and Ottawa counties are similar to those across Oklahoma. The majority of residents in these counties reside in households, while the other residents live in settings that might include group homes or other congregate living. This pattern is common across Oklahoma.

The percentage of households in Delaware, Mayes, and Ottawa counties that are below the established poverty levels is 16.1%, 12.8%, and 13.8% respectively. Mayes and Ottawa counties percentages of persons below the established poverty levels are slightly lower than the 14% poverty rate across the state of Oklahoma. Delaware County had a higher rate of poverty households when compared to the state level.

In consideration of individuals rather than households, Delaware County reports 21.2% of its population below the poverty level as compared with 16.2% across the state of Oklahoma, while Mayes and Ottawa County have lower percentage of individuals below the poverty level (16.9%, 18.2%) although still higher than is true across the state. This is verified by the median household income in the counties at $34,383 for Delaware County and $35,483 for Ottawa County which are considerably below the median income for the state, and well below the $50,745 median income for Mayes County,
Table 2.4 – Financial Characteristics in Delaware, Mayes, & Ottawa Counties

<table>
<thead>
<tr>
<th>Characteristic or Factor</th>
<th>Delaware</th>
<th>Mayes</th>
<th>Ottawa</th>
<th>Oklahoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Household Incomes</td>
<td>$34,383</td>
<td>$50,745</td>
<td>$35,483</td>
<td>$42,979</td>
</tr>
<tr>
<td>Households Below Poverty Level</td>
<td>16.1%</td>
<td>12.8%</td>
<td>13.8%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Individuals Below Poverty Level</td>
<td>21.2%</td>
<td>16.9%</td>
<td>18.2%</td>
<td>16.2%</td>
</tr>
</tbody>
</table>

Financial characteristics in a population tend to be highly correlated with educational levels within the population. Table 2.5 reports the level of education attained by persons in Delaware, Mayes, and Ottawa counties above the age of 25. For comparison purposes, approximately 85.4% of Oklahomans have completed a high school diploma or equivalency as contrasted with 82% of the eligible population in Delaware County, 83.3% of the eligible population in Mayes County, and 82.5% of the eligible population in Ottawa County. In addition, approximately 22.6% of all Oklahomans have completed a baccalaureate degree or higher as compared with 14.3% of the eligible population in Delaware County, 11.8% of the eligible population in Mayes County, and 13.1% in Ottawa County.

Table 2.5 – Education of Regional Population

<table>
<thead>
<tr>
<th>Educational Attainments</th>
<th>Delaware</th>
<th>Mayes</th>
<th>Ottawa</th>
<th>Oklahoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 9th Grade</td>
<td>1,504</td>
<td>1,443</td>
<td>1,096</td>
<td>115,248</td>
</tr>
<tr>
<td>(5.2%)</td>
<td>(5.3%)</td>
<td>(5.2%)</td>
<td>(4.8%)</td>
<td></td>
</tr>
<tr>
<td>9th to 12th Grade, No Diploma</td>
<td>3,623</td>
<td>3,060</td>
<td>2,595</td>
<td>232,987</td>
</tr>
<tr>
<td>(12.6%)</td>
<td>(11.3%)</td>
<td>(12.3%)</td>
<td>(9.8%)</td>
<td></td>
</tr>
<tr>
<td>High School Diploma or</td>
<td>12,236</td>
<td>11,053</td>
<td>7,862</td>
<td>775,478</td>
</tr>
<tr>
<td>Equivalency</td>
<td>(42.6%)</td>
<td>(40.8%)</td>
<td>(37.2%)</td>
<td>(32.6%)</td>
</tr>
<tr>
<td>Some College, No Degree</td>
<td>5,484</td>
<td>6,667</td>
<td>4,768</td>
<td>559,367</td>
</tr>
<tr>
<td>(19.1%)</td>
<td>(24.6%)</td>
<td>(22.6%)</td>
<td>(23.5%)</td>
<td></td>
</tr>
<tr>
<td>Associate Degree</td>
<td>1,735</td>
<td>1,640</td>
<td>2,034</td>
<td>159,557</td>
</tr>
<tr>
<td>(6.0%)</td>
<td>(6.1%)</td>
<td>(9.6%)</td>
<td>(6.7%)</td>
<td></td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>2,724</td>
<td>2,248</td>
<td>1,852</td>
<td>362,043</td>
</tr>
<tr>
<td>(9.5%)</td>
<td>(8.3%)</td>
<td>(8.8%)</td>
<td>(15.2%)</td>
<td></td>
</tr>
<tr>
<td>Graduate or Professional Degree</td>
<td>1,389</td>
<td>960</td>
<td>912</td>
<td>176,139</td>
</tr>
<tr>
<td>(4.8%)</td>
<td>(3.5%)</td>
<td>(4.3%)</td>
<td>(7.4%)</td>
<td></td>
</tr>
</tbody>
</table>

Another demographic factor that is highly correlated with financial characteristics and educational characteristics is employment. The employment figures for the three counties are reported in Table 2.6. The American Community Survey estimated unemployment in Oklahoma as of 2010 at 3.9%. As of 2010, Delaware, Mayes, and Ottawa counties reported unemployment to be approximately 7.6%, slightly higher than was true for the state of Oklahoma. Workforce reports for all three counties indicated that employment opportunities grew during this period, allowing both counties to exceed national employment statistics throughout the recession.
Another demographic factor that assists in understanding the local population is related to persons with disabilities. The 2010 census reported that among those persons in Delaware County over the age of five, there are 8,040 individuals (20.1%) of the population with a disability. This percentage decreases in the population from ages 18 to 64 years to 18.9% or 4,384 individuals. Among those persons aged 65 years or more, 40.8% or 3,185 individuals have one or more disabilities. The 2010 census reported that among those persons in Mayes County over the age of five, there are 8,160 individuals (20.1%) of the population with a disability. This percentage increases in the population from ages 18 to 64 years to 20.7% or 4,972 individuals. Among those persons aged 65 years or more, 45.7% or 2,783 individuals have one or more disabilities. The 2010 census reported that among those persons in Ottawa County over the age of five, there are 6,926 individuals (22.0%) of the population with a disability. This percentage decreases in the population from ages 18 to 64 years to 19.7% or 3,616 individuals. Among those persons aged 65 years or more, 47.5% or 2,511 individuals have one or more disabilities. The 2010 census reported that among persons in Oklahoma, there are 576,551 (15.7%) of the population with a disability.

<table>
<thead>
<tr>
<th>Table 2.6 – Employment Characteristics in the Grand Lake area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
</tr>
<tr>
<td>Population In Labor Force (16+)</td>
</tr>
<tr>
<td>Employed</td>
</tr>
<tr>
<td>Private Wage and Salary Workers</td>
</tr>
<tr>
<td>Government Workers</td>
</tr>
<tr>
<td>Self-Employed</td>
</tr>
<tr>
<td>Unpaid Family Workers</td>
</tr>
</tbody>
</table>

In summary, Delaware, Mayes, and Ottawa counties mostly rural area with approximately 56.2, 58, and 68 persons per square mile as compared to an average of 55.2 for Oklahoma. Ottawa County is much more densely populated at 68 persons per square mile than are Mayes and Delaware counties.

Grove, Oklahoma is the largest population base in Delaware County with a population of 6,623, or 16.0% of those living in Delaware County. Pryor (Pryor Creek) is the largest population base in Mayes County with a population of 9,539, or 23.1% of those living in Mayes County. Miami, Oklahoma dominates the population base for Ottawa County with a population of 13,570, or 43% of those persons living in Ottawa County.

This three-county region shows a higher percentage of American Indians in the population than is true across Oklahoma. The population of Mayes County shows a higher average household income than the statewide average but Delaware and Ottawa counties show lower average household incomes compared to the state average. Oklahoma’s population for whom poverty status is determined was 616,610 (16.9%). Delaware County (21.0%), Mayes County (18.5%),
and Ottawa County (19.9%) all have higher levels of poverty than shown across the general population in Oklahoma. This might indicate a smaller percentage of “middle class” individuals in the population, especially in Mayes County. The population in the three-county area has achieved lesser educational attainment than is true across Oklahoma, but has sustained a higher level of employment. In addition, the residents of this area report more disabilities than are found in the general Oklahoma population.

Competing and Complementary Recreational Opportunities

Northeast Oklahoma and the adjoining areas in southwest Missouri and northwest Arkansas provide an environment of forests, lakes, and a variety of terrain that offers some similar outdoor recreation experiences to those provided at Grand Lake State Park. A few of these areas – primarily private developments – have been developed to a greater extent than that within the Grand Lake property. However, other properties, such as U.S. Army Corps of Engineers’ (USACE) sites, have not been developed to the level that is present at Grand Lake State Park.

This is true of Table Rock Lake in southwest Missouri, an USACE lake associated with tourism in Branson, Missouri. Table Rock Lake is approximately 120 miles east of Grand Lake and provides a lake environment for boating activity, fishing, camping, and a much more developed recreation experience. Table Rock State Park is located on the east side of that lake, south of Branson, Missouri. To the east and slightly south of Grand Lake, the USACE have developed Beaver Lake, an impoundment on the White River. Beaver Lake is approximately 70 miles east of Grand Lake. Hobbs State Park is located on the southwestern portion of the lake.

Public recreation facilities at Table Rock Lake and Beaver Lake are managed through the USACE. These locations offer camping facilities similar to several of the campgrounds at Grand Lake State Park, but with few other amenities or services.

Grand Lake o’ the Cherokees, with 46,500 surface acres is larger than is Table Rock Lake (43,100 acre surface area), and Beaver Lake (31,700 acre surface area). Both Table Rock and Beaver lakes are direct competition for persons desiring a lake experience for recreation.

Numerous private, commercial recreation operations have been developed on and near Grand Lake – and a few additional private resort operations are located in the region. Most of these serve specific clientele desiring the specific amenities at those preferred locations. As such, these private resorts do not directly compete with Grand Lake State Park locations.

Roaring River State Park and Table Rock State Park in southwest Missouri are state parks within two hours driving distance of Grand Lake State Park. Roaring River State Park offers camping, multi-use trails, fishing, camping, dining, cabins, and has a lodge. Roaring River State Park offers a variety of interpretive programs through the Ozark Chinquapin Nature Center. Table Rock State Park offers boating, fishing, camping, multi-use trails, camping, cabins, dining, and offers interpretive programming. Hobbs State Park Conservation Area, Prairie Grove Battlefield, and Devil’s Den State Park in northwest Arkansas are state parks within two hours driving distance of Grand Lake State Park. Hobbs State Park Conservation Area offers miles of multi-use trails, camping, and lake access. Devil’s Den State Park offers camping, cabins, multi-use trails, dining, general store, and a pool on-site, but does not offer a lake environment. Prairie Grove Battlefield offers multi-use trails, interpretive programming, and a museum on-site. Each of these locations offers similar experiences to those available at Grand Lake State Park.
Regional and Park History

The history of Grand Lake State Park is a fitting reminder of the two rivers (Neosho and Spring) that form one river (Grand River). In the same way, the history of Grand Lake State Park has two formative elements that have become one in the present. The first of those formative elements is associated with the Spavinaw property, whereas all the remaining properties in Grand Lake State Park are associated with the second major formative element – the Grand River Dam Authority.

Spavinaw Hills State Park was one of the original seven state parks in Oklahoma, developed during the 1930s with an eight park at Lake Murray. The actual location of Spavinaw Hills State Park was on the south shore of Spavinaw Lake, east of the present location of Grand Lake State Park at Spavinaw. Figure 2.7 shows the impoundment of Spavinaw Creek from which the former Spavinaw Hills State Park would have been on the upstream lake. Spavinaw Hills State Park was home to a Civilian Conservation Corps company and has numerous structural reminders of the work completed by members of that company.

Grand Lake State Park at Spavinaw is a distinctly separate property from the original Spavinaw Hills location – the history of the original Spavinaw Hills location has regional value. The present property is 35 acres located along Spavinaw Creek. On October 9, 1959, E. M. Knight granted the state of Oklahoma a warranty deed for the 35 acres adjoining Spavinaw Creek, below the impoundment and spillway which are part of the water supply system for the City of Tulsa.

The remainder of the properties associated with Grand Lake State Park and Grand Lake itself are dependent upon the history of the Grand River Dam Authority (GRDA), also known as the Pensacola Project. The Pensacola project is operated by the Grand River Dam Authority under license agreement (1494-002) from the Federal Energy Regulatory Commission. The Grand River Dam Authority (GRDA) was formed in 1935 by the Oklahoma Legislature (Oklahoma Statutes, Title 82 § 861 et seq.) and established as a “conservation and reclamation district.” The established district encompasses twenty-four counties in Oklahoma. Licensing of GRDA for operation of the lake has included requirements of recreation management plans, shoreline management plans, and environmental impact assessments (Caneday, et al., 1996; Grand River Dam Authority, 82 O.S. § 861).

The Authority is funded primarily by revenues from sale of electric power, now generated by thermal (coal-fired) generating plants as well as by hydroelectric generation. In addition GRDA is authorized to control, store, preserve, distribute and sell the water in its impoundments for “irrigation, power and other useful purposes.” Recreation is among those useful purposes. As the
licensee to operate the Pensacola Project, the Grand River Dam Authority must cooperate with the USACE, Tulsa District, to provide flood protection in the Grand Neosho River corridor (33 CFR Ch. II § 208.25). “Normal” pool elevation is listed as 744’ above sea level, while maximum power pool is 745’. Between 745’ and 755’ Pensacola Datum (PD: Pensacola Datum is 1.07 feet below mean sea level), the USACE, Tulsa District, controls discharges, managing for flood control.

The Robert S. Kerr Dam, originally titled the Markham Ferry Project, was constructed between 1958 and 1964 downstream from the Pensacola Project. This dam is near Locust Grove, Oklahoma, and impounds Lake Hudson. A third hydroelectric facility managed by GRDA is the Salina Pumped Storage Project which provides water to the W.R. Holway reservoir (Roberson, 2012).

As a result of the large lakes that have been impounded along the Grand River, the northeast Oklahoma region has been significantly changed. In addition to the physical changes to the landscape, GRDA provided electricity to the rural communities leading to development throughout the region.

**Natural and Cultural Resources in the Park**

**Climate and Air Quality**

According to the Oklahoma Climatological Survey, the Grand River corridor is part of the Ozark Highlands in the east and the Caves and Prairies (also known as the Irregular Plains) in the west. The Ozark Highlands is an irregular and heavily forested landscape while the Caves and Prairies region is less forested and contains more grassland. Average annual precipitation ranges from about 42 inches in western Mayes County to 48 inches along the Oklahoma/Arkansas border. May and October are the wettest months, on average, but much of the spring through fall receives sufficient rainfall. Nearly every winter has at least one inch of snow, with one year in four having ten or more inches.

Temperatures average near 61 degrees, with a slight increase from north to south. Temperatures range from an average daytime high of 92 degrees in July and August to an average low of 27 degrees in January. The region averages a growing season of 212 days, and plants that can withstand short periods of colder temperatures may have an additional three to six weeks.

Winds from the south to southeast are quite dominant, averaging eight miles-per-hour. Relative humidity, on average, ranges from 45% to 96% during the day. During the year, humidity is highest in June and lowest in March and April. Winter months tend to be cloudier than summer months. The percentage of possible sunshine ranges from an average of about 50% in winter to nearly 75% in summer.

Thunderstorms occur on about 52 days each year, predominantly in the spring and summer. Tornado activity in the northeastern portion of Oklahoma is above the statewide average. It is 4.6
times above overall U.S. average. Tornadoes in this region have caused 143 injuries and three deaths since 1950. Each of the years—1957, 1959, 1974 (2), and 1980—recorded a category 3 (maximum wind speeds 158-206 mph) tornado (National Weather Service, 2012).

**Archeology of Grand Lake State Park**

According to Abbott & Marston (2007), about fourteen thousand years ago nomadic hunter-gatherer groups inhabited the Ozark Plateau. Archaeologists studied these peoples through their pictographs, burial mounds, and campsites. In the historic era the principal American Indian tribes indigenous to the Oklahoma section of the plateau were the Osage and Quapaw, with the Quapaw inhabiting only a small area in the southeastern Ozarks. These tribes were not nomadic, but lived in villages, although they still depended largely on hunting.

**PREHISTORIC NATIVE PEOPLES**

Brooks (2007) provides a comprehensive early history of the Mayes County area. Most Oklahomans identify with the Five Civilized Tribes, the Cheyenne, the Comanche, and other contemporary Native people of the state. Representing approximately eight percent of Oklahoma’s population, they are frequently discussed in historic accounts of the settling of Indian Territory. However, other less-well-known Native people inhabited Oklahoma for many thousands of years prior to European arrival on the southern plains in the mid-1500s. The Wichita and the Caddo can be traced back in prehistory at least two thousand years, and the Osage and Apachean-speaking people can perhaps be documented here prior to the arrival of Europeans. Other groups with no historic tribal connections may have lived here or passed through beginning some 30,000 years ago. Prehistoric groups demonstrated remarkable adaptability to diverse settings and changing environmental conditions across Oklahoma. The archaeological record in some 17,500 sites offers evidence for the presence of prehistoric or early historic people over an incredible expanse of time from perhaps 30,000 years ago to as recently as the Dust Bowl era.

The next period, the time of Early Specialized Hunters, refers to our earliest well-documented inhabitants, known in the literature as the “Clovis and Folsom cultures.” Clovis people occupied Oklahoma around 11,000 to 12,000 years ago, while Folsom occurred somewhat later, around 10,000 years ago. Both are viewed as specialized hunters, not so much for what they hunted but for manner in which they hunted. For example, Clovis groups hunted mammoths as well as a variety of other game, whereas Folsom people specialized in hunting giant, now-extinct bison (*Bison antiquus*). Stalking and killing mammoth or giant bison, large and potentially dangerous game, was not a capricious activity; it required complex knowledge and strategy far beyond that needed for hunting deer or other modern game (with perhaps the exception of bison). Both societies used well-designed, chipped-stone tools. Their spear points, in particular, reflect special craftsmanship. Other weapons, tools, and possibly ornaments were made of ivory, bone, and wood. Because of the hunting emphasis, Clovis and Folsom technology might not have been as expansive as that of later peoples.

The Early Specialized Hunters were nomadic groups who moved from one favorable location to another in search of game and perhaps edible plants. In Folsom’s case, their movements were very likely dictated by bison herds’ distribution and migration. Although these groups are generally thought to have lacked complex social or political organization, some individuals
(perhaps elders) must have provided information necessary for decisions about when and where to relocate, who would participate in the hunt, and how to meet basic group needs.

Some 10,000 years ago the environment of eastern Oklahoma was much like that of today. In present-day Mayes County prehistoric people were woodlands inhabitants and lived in large groups/bands. They had an expansive hunting and collecting economy. Evidence from the Packard site in Mayes County, the Quince site in Atoka County, and Billy Ross site in Haskell County point to greater use of local lithic (stone) resources, suggesting reduced mobility and a greater range of tools, including those for plant processing.

Between approximately 9000 and 4000 years ago, various Native peoples termed Hunters and Collectors occupied Oklahoma. Hunters and Gatherers and Late Mobile Foragers are among the designations cataloguing these peoples in past literature. Following trends that began with Dalton culture, hunting of game continued, but emphasis began to shift toward collecting edible plants. Although the Hunters and Collectors remained quite mobile, they were probably less so than the more specialized hunters that had lived at the end of the ice age. Existing in an environment much like that of our time, Hunters and Collectors moved their settlements from one seasonally available set of resources to another during the year. Diversified resource use contributed to a more expansive inventory of weaponry and tools, especially tools related to plant procurement. Group size was probably quite fluid, the size of the group dictated by resource availability as well as by tasks at hand. However, this “mapping on” to seasonal availability of food resources also required greater group coordination and undoubtedly led to increasing concentration of decision-making authority in the hands of some individuals. This era also presents the first available evidence for concepts of an afterlife, represented by planned burial and special treatment of deceased group members.

During this time of some 4000 to 2000 years ago significant changes occurred in the character of prehistoric societies, and they became Hunters, Gatherers, and Traders (recognized in past literature as Foragers occupying the Archaic Period; 35 known sites exist in this region). With the increases in population, group mobility and access to resources became more restricted, and some of the first evidence for conflicts between societies appears. So does its alternative, exchange or trade. Greater concern with subsistence needs led to not only greater reliance on harvesting and perhaps cultivating plants but also to consistent storage of foods for periods of scarcity. Increased population, conflict, and plant cultivation necessitated more complex political and social leadership. During this time religious beliefs became more visibly expressed in formal, sometimes ritual treatment of deceased leaders and other important people. These interrelated agents of change brought about diversification in technology as well. Weapons and tools for processing animals and plants remained in common use, although there was a notable increase in tools for grinding seeds and nuts. Complex carbohydrates may have increasingly formed the staple base of diet. A distinction present at this time was the presence of true ornaments, some made of bone and shell; some may have signified greater status of the wearer.

During the time of the Hunters, Gatherers, and Traders a stable climate permitted groups to reestablish their presence in various regions. Rainfall increased in the next period, called Agricultural Beginnings (circa 2000 to 1200 years ago, which previous scholarship placed in the Middle Prehistoric period or identified as Early Farmers and in some localities as Woodland; 25 known sites exist). Conditions of larger population, reduced mobility, and greater knowledge of plant cultivation catalyzed the true beginnings of agriculture. It is interesting, if not somewhat paradoxical, however, that Agricultural Beginnings may have started earlier in the west and
central regions of Oklahoma than in the east, where populations were greater. Perhaps in southeastern Oklahoma societies could ignore plant cultivation because of the abundant resources of stream and river valleys. Throughout the state populations are thought to have continued some type of geometric population growth, along with decreasing mobility and an even greater dependence on edible plants. Social, political, and religious changes born during the prior time of Hunters, Gatherers, and Traders (conflict, social complexity, and religious practices) became more expressed and more widespread. Native groups continued to build and use storage facilities and constructed more permanent dwellings.

More importantly, three particularly significant technological innovations during Agricultural Beginnings set the stage for future evolutionary trajectories. The bow and arrow radically changed two social practices, hunting and conflict. Groups no longer had to gather for a collective hunt; hunters could go forth in groups of two to three and with the extended range of the bow still have a profitable hunting expedition. The bow and arrow also further enabled conflict, fostering increased mortality when opposing groups met. Development of pottery permitted two new concepts, a more permanent, secure means of storage and a new means of preparing foods. The new technology included adoption and improvement of axes and adzes for forest clearing and framing wooden structures. The manufacture of specialized goods for social and religious purposes also continued.

The number of places containing expressions of these Agricultural Beginnings groups is greater than those for the preceding period, although not excessively so. Probably fewer than a thousand such sites have been documented. The pattern follows that identified for Hunters, Gatherers, and Traders, in respect to a north-south and east-west distinction. In eastern Oklahoma the Arkansas River again served as a boundary between cultural groups. To the north, in Delaware and Mayes counties, lived a distinct people, termed the “Cooper culture,” that have relationships to groups occupying the Kansas City, Missouri, area some 1500 years ago. While the Kansas societies built mounds where their leaders were buried, no such earthworks have been found in Oklahoma. Thus, relationships to the Kansas groups are demonstrated in styles of spear points, ceramics, and clay figurines. Other indigenous groups also apparently lived in the area contemporaneously with the Cooper people. Both groups in northeastern Oklahoma used a number of rock shelters as seasonal camps.

Between 1200 and 550 years ago Oklahoma was occupied by numerous societies of Native Americans called Agricultural Villagers who lived in settled communities and farmed (31 known sites exist). Known in some earlier literature as occupying the Late Prehistoric Period or as Village Farmers, these varied peoples continue the pattern that started during the Agricultural Beginnings period. Throughout much of the state, they lived in well-built, grass-roofed houses with vertically set, wooden-post walls plastered with mud. In some instances villages demonstrated evidence of a planned layout. At any given time, a village might accommodate up to two hundred persons. Population rapidly accelerated during this time, bringing about not only greater community size but also greater density of settlement. In some areas villages might occur as frequently as a mile and half-apart along favored stretches of river valley. In eastern Oklahoma another important architectural practice, in addition to housing, was the construction of a variety of earthen mounds. Some were temple mounds where priestly leaders resided, and others were burial mounds for political and religious leaders. In the central and western parts of Oklahoma archaeologists have found no mound construction, but this does not mean that the societies necessarily lacked religious complexity.
During the past 750 to 1000 years people increasingly emphasized certain edible plants in the diet, and plant domestication efforts expanded. By the time of Agricultural Villagers, tropical plants such as corn, beans, and squash as well as native species such as chenopodium, amaranth, marshelder, sumpweed, and sunflower were domesticated. By the late thirteenth century farming was a major enterprise, requiring field maintenance as well as coordination of field placement between different societies. Hunting continued as well, and a diversity of animals supplemented a carbohydrate-laden diet. In fact, some of the elite leaders of groups in eastern Oklahoma preferred to eat an alternative, healthier diet high in proteins and wild plants, rather than corn. In the west, Agricultural Villagers who were adapted to a plains environment invested much effort in hunting of bison and other plains animals. In the Agricultural Villagers period, technology, already highly sophisticated, expanded even more. The bow and arrow became a mainstay for hunting as well as a weapon in conflicts between groups. Because of the agricultural emphasis, stone tools, like grinding stones and basins for processing corn and other grains, proliferated. On the plains, agricultural activity brought into use numerous bone tools, including bison-bone hoes and digging sticks. Other bone items functioned as awls/needles, scrapers, beads, breastplates, and even whistles. While it had been only nominally decorated and had a minimum of forms during the preceding period, in the Agricultural Villagers period pottery exploded into a multiplicity of forms and stylistic expressions. Bowls, jars, plates, bottles, and effigy forms have been found. Decoration on vessels included incising, engraving, punctuation, appliqué, as well as polishing. Pottery color no longer resulted from simple differences in firing. Slips were used to color the vessels, and glazes were used to change the character of the external and internal surfaces. Other mediums for material culture, including copper, crystal, and a variety of minerals for ornaments, also express this evolutionary acceleration. Textiles were widely used, but the difficulty of preserving these fragile materials limits knowledge of the extent of use. Of particular note in technology is an increasing use of material goods in expressing ritual and religious concepts.

The political, social, and religious systems of Native peoples likewise became more complex and were manifested in physical symbols such as mounds and special structures, especially in eastern Oklahoma. Population expansion and dramatically increased reliance on agriculture brought greater need for more strategically organized society. In general, dependence on agriculture also caused more involvement with religious practitioners to support and maintain a system. However, it must be noted that an absence of a visual evidence of religious complexity does not necessarily mean that groups were not complex; it may mean that the people did not demonstrate religious belief in a visible way.

Because of the increase in the number of settlements as well as their proximity to modern times, thousands of Village Agriculturalist occupation sites have been documented, especially in the Arkansas and Red river drainage systems. For some 650 years these people followed a life way adapted to an agricultural economy. These people were of the Caddoan tradition.

The Agricultural Villagers period marks the first time prehistoric groups can be linked to historically known Native societies (or “tribes”). It preceded a new era that brought many turbulent changes and transformed groups in Oklahoma and elsewhere.

The next period, that of Coalesced Villagers/Communal Hunters, just prior to a historically known past, reflects incredible changes in Native societies (in previous literature akin to the Transitional Late Prehistoric Period and Early Historic Buffalo Hunters). The times changed some Native groups from settled Agricultural Villagers to nomadic, communal bison hunters in a
short span of fifty to one hundred years. The years between roughly 550 and 200 years ago have also been termed protohistory, a time before a well-documented written and visual record of the past. Many and profound changes marked the beginning of Coalesced Villagers/Communal Hunters.

The late fifteenth and early sixteenth centuries continued a cycle of drought conditions that had begun back in the thirteenth century. However, now the drought was accompanied by significantly cooler temperatures, causing some scholars to term this the “Little Ice Age.” Colder temperatures especially shortened the growing season and may have caused many groups to abandon agriculture or to scale back its intensity. Of course, these same conditions fostered massive bison herds and led to even greater predation on the bison by plains-adapted groups.

In this period new people came to Oklahoma and the surrounding region, upsetting the delicate balance among groups in Oklahoma and the Southern Plains. Native peoples were forced south out of the Rocky Mountains, the Basin Plateau range, and the northern plains. The arrival of the Kiowa, Apache, Comanche, and somewhat later, the Cheyenne and Arapaho created new societal dynamics throughout the area. However, the greatest challenge came with the arrival of Europeans.

Arriving in the mid-sixteenth century, Europeans brought many new elements, drastically altering the economies, political and religious systems, and basic ways of life of Native peoples. Foremost among these elements was disease. Measles, smallpox, and diphtheria nearly destroyed some “tribes” forcing survivors to join with other groups. Because of their more sedentary lifestyle, the Coalesced Villagers suffered more devastation from disease than did the Communal Hunters. Europeans also brought material goods, further altering Native society. The horse changed the nature of hunting as well as warfare. In combination with firearms, it revolutionized groups such as the Comanche, transforming them into “the warlords of the plains.” Europeans used trade to pit one Native group against another and also tried to force the Christian religion on Native people. Against this background of turmoil, it is not surprising that the archaeological record of this period is poorly documented and even more poorly understood.

As suggested above, two different patterns of life ways existed during this time. Some groups formed Coalesced Villages, living much like their Agricultural Villagers ancestors. However, the villages were much larger, holding perhaps five hundred to one thousand inhabitants. There is historic documentation to indicate that villages were seasonally abandoned while the occupants pursued bison herds for two to three months. Some villagers groups were highly mobile, maintaining portable dwellings (e.g., tipis) while following the bison herds across the plains. But even the Coalesced Villagers settlements exhibited less permanency than during the preceding period.

THE PACKARD SITE

The Oklahoma Archeological Survey (n.d.) provides information related to one of the significant archeological sites in the Mayes County area—the Packard site. The site is no longer accessible to archeological study because the waters of Lake Hudson now cover it. In 1962, with the impending construction of the Robert S. Kerr Dam, the National Park Service funded excavations at the Packard site to recover as much information as possible about the people who had lived along Saline Creek over the millennia before the area was flooded by Lake Hudson. The excavations over two seasons revealed some 9,500 years of human occupation.
In the first 30 inches of deposit, archeologists found evidence of the pottery-making farmers and earlier hunter-gatherers who used bow and arrows to bring down deer on this western edge of the Ozark forests. The Packard site probably functioned as a camp for hunters sent out from farming villages where corn, beans and squash were grown to bring back game from the salt springs found a half mile from the site. That top 30 inches of deposit represents about 2,000 years of history.

The nine feet of deposit below this held the 7,500 year record of the hunting-gathering people who used spears and darts rather than bows and arrows and who gathered wild plants rather than tending crops. The first hunters came to visit the Packard site nearly 5,000 years before the first Egyptian pyramid was built.

They made the spear points at the right from flint gathered from the bed of Saline Creek or nearby outcrops. Archeologists excavated a fire pit built by these people. Flakes of their flint-working were left around the fireplace, probably just as they fell from the hand of the toolmaker. The charcoal in the fire was carefully collected, mailed to a laboratory and radiocarbon-dated to 9,500 years before the present time.

CULTURAL RESOURCES OF SOUTHERN TWIN BRIDGES AREA

During preparation of the RMP for Grand Lake State Park, Algonquin Consultants, Inc. was in the process of conducting an assessment of cultural resources in the Twin Bridges area. This assessment included a National Register evaluation of pre-contact site 34OT9 in Ottawa County. That report (Hawkins, Kovic, and Bulmer; 2012) was completed at the same time as the initial RMP for Grand Lake State Park. It is also noted that this report, Cultural Resources Survey of the Southern Twin Bridges Area, Grand Lake State Park and National Register Evaluation of Precontact Site 34OT9, Ottawa County, Oklahoma, contains sensitive information and is not for public distribution. OTRD has received this report from Algonquin Consultants as a separate document from the RMP.

The following conclusions drawn and recommendations made by Algonquin consultants are reported from that document (Hawkins, Kovic, and Bulmer; 2012).

Test excavations designed to assess the National Register eligibility of Site 34OT9 – a stratified site containing PaleoIndian, Early Archaic, Middle Archaic, and Late Archaic components – revealed that the site is eligible for listing under Criterion D. That is, the site has yielded, and is likely to continue to yield, information important to a study of prehistory. Given the depth at which artifacts were recovered and the likelihood that cultural deposits at this site resulted from either long-term occupations or repeated re-occupations, human burials may also be present.

Only one confluence of the Neosho and Spring rivers exists. This area clearly was important to early residents of northeastern Oklahoma from the earliest times that people lived in the region, as witnessed by the information recovered from Site 34OT9 to-date. Preservation of Site 34OT9, or data recovery when construction or other adverse effects are planned, is imperative.

Several recommendations are tendered herewith for Site 34OT9, which lies in the portion of Twin Bridges State Park [sic: Grand Lake State Park – Twin Bridges Area] south of Route 60.
1. It is recommended that no further earth-moving activities at Site 34OT9 be conducted until such time as the recovery of data that the site contains takes place in those areas where impacts are slated to occur. Even areas currently covered by pavement (e.g., parking areas and roads) likely still contain significant archaeological deposits beneath any previous impacts to the upper solum caused by parking area and road construction.

2. Earth-moving activities that should be halted also include those related to camping and other recreational pursuits, such as fire pit excavation and the burying of fish remains. In particular, the central picnic area should be off-limits to any further construction or recreation related impacts.

3. One of the proposed action alternatives is to raise the current grade of the parking area by 1.5 ft to an elevation of 750.5 ft, instead of overlaying two inches of asphalt on the existing pavement. Contractors would raise the grade by bringing in and applying 3,000 ft³ of fill. If federal funds are used to acquire the fill, then the area from which the fill is borrowed is subject to Section 106 of the National Historic Preservation Act and would require a survey to identify cultural resources prior to fill excavation.

4. As well, the seasonally inundated southern one-third of the project area should be surveyed and evaluated in order to ascertain the integrity of its archaeological deposits – and the impact that inundation and wave action have had on them – and to make recommendations for the preservation of this portion of the site, if warranted.

5. The bluff edge in the northwestern corner of the Park should be stabilized to prevent further land loss and adverse effects to any portion of Site 34OT9 that may remain intact there.

6. Artifact collecting is a popular pursuit at Twin Bridges State Park, especially in that area that is seasonally inundated. Collectors surface hunt and also dig for artifacts. This activity should be halted and also prevented from occurring further.

**Topography**

Grand Lake State Park is in the Central Irregular Plains Ecoregion, a band of tallgrass prairie separating the forested Ozark Highlands from the Cross Timbers that is broken by limestone and sandstone cuestas, buttes, hills, and nearby level areas underlain by shale. Fire is required to maintain the grasslands. In its absence, woody plants such as sumac, blackberries, and persimmons invade the grasslands. Geohydrology of the Central Irregular Plains portion of the watershed is characterized by soils derived from shale, sandstone, and limestone. In some nearly level areas, clay pan soils occur. On limestone slopes, exposed limestone slabs and gravels occur. Major streams have low gradients, meander considerably, and develop wide valleys except on areas of very hard rocks. Groundwater in the Central Irregular Plains tends to be saline and is more likely to be anoxic, as opposed to fresh, oxygenated groundwater generally found in the Ozark Highlands (Oklahoma Secretary of Environment, 2010).

According to the U.S. Fish and Wildlife Service (Ozark Plateau, n.d.), the Caves and Prairie Ecoregion, also called the Central Irregular Plains, is a belt of prairie that separates the Cross Timbers from the forests of the Boston Mountains and Ozark Highlands. Interbedded Pennsylvanian-age shale, sandstone, limestone, and coal occur; the alternating hard-soft strata dip westward, forming nearly flat to irregular plains, low hills, and east-facing cuestas. The landform mosaic is distinct from the Flint Hills, Arkansas Valley, and Ozark Highlands. Natural vegetation is mostly tallgrass prairie, but forests and woodlands, dominated by post oak, blackjack oak, and black hickory, are native on stony hilltops. Today, The Central Irregular
Plains is a mix of rangeland, grassland, woodland, floodplain forests, and farmland; cropland is most extensive on nearly level plains, and overall, is more common than in other nearby Ecoregions. Rivers and streams typically have low gradients, slowly moving water, muddy banks, and meander in wide valleys. Stream substrates and habitats vary from a high quality, variable mix of conditions to silt- and mud-choked channels. Runoff from bituminous coal mining has degraded water quality and affected aquatic biota in a few streams. The redfin shiner, suckermouth minnow, redfin and orange throat darters, smallmouth buffalo, river carpsucker, black and golden redhorses, spotted suckers, yellow and black bullheads, and flathead catfish occur; diversity and richness of aquatic fauna is markedly lower than in the Ozark Highlands.

Ozark Highlands: In Oklahoma, the Ozark Highlands is a level to highly dissected plateau composed of flat-lying, cherty limestone. It is lithologically distinct from surrounding ecoregions and is less rugged than the Ouachita Mountains and Boston Mountains. Karst features and clear, cool, Bank erosion has choked many channel reaches with cherty gravel, causing the reaches to become braided and dominated by unstable run habitat; in the process, many natural pools have been lost. In the Ozark Highlands, both habitat diversity and species richness are high and sensitive fish species are common. Minnows, sunfishes, and darters are plentiful. The banded sculpin and slender madtom occur in small streams, especially where aquatic macrophytes are present, and the southern red belly dace inhabits headwaters. The shadow bass is nearly limited to the Ozark Highlands. Other common fishes include the orange throat darter, stippled darter, greenside darter, fantail darter, northern hog sucker, white sucker, Ozark minnow, cardinal shiner, and big eye shiner. The most important game species is the smallmouth bass (Oklahoma Secretary of Environment, 2010).

The Oklahoma Conservation Commission further describes the Ozark Highlands ecoregion as a highly dissected, partially forested ecoregion with many Karst features. The majority of this limestone plateau is predominantly an oak-hickory forest, but stands of oak and pine are also common. The maximum elevation of the Ozark Highlands in Oklahoma is about 1,500 feet and the maximum relief between hillcrests and valley bottoms is about 400 feet. Soils are often cherty and have developed from carbonate rocks or interbedded chert, sandstone, and shale. Soil thickness can range from less than a meter to several meters, but generally soils are thin. Caves, sinkholes, and underground drainage occur, heavily influencing surface water availability, water temperature, and the potential for surface and groundwater pollution. Clear, cold, perennial spring-fed streams with gravel or bedrock bottoms are common. In addition, many small dry
valleys occur where overland flow is entirely runoff-driven. Soil permeability can be as much as 15.0 cm/hr, resulting in a high potential for the leaching of dissolved constituents from the surface to ground water (Adamski et al. 1995). In general, ionic adsorption capacity of the ultisols of the Ozark Highlands is minimal. Thus, ionic constituents in infiltrating water are not readily absorbed by most soils and are easily flushed into nearby streams and shallow ground water (Adamski et al. 1995).

Geology
The Ozark Highlands region contains the oldest surface rocks in the state, limestones that formed about 345 million years ago during the latter part of the Mississippian Period. These rocks show that during the Late Mississippian, the land was alternately above and below sea level. When the sea advanced, limestones (and occasionally shales) were deposited. When the sea retreated, erosion set in. The Mississipian limestones contain chert (or flint). Because chert is much harder and more resistant to weathering than limestone, erosion of the softer limestone has left a thick blanket of chert gravel on hilltops and ridges.

The U.S. Geological Survey (2012) provides extensive information about the geology of the Ozark Plateau. Thus, the following information is adapted from their work.

Stratigraphy
The stratigraphy of the Ozark Plateaus study unit is complex. The basement crystalline rocks in the study unit are overlain by a sequence of sedimentary rocks of Paleozoic age. The sedimentary-rock sequence consists predominantly of dolomites and limestones of Cambrian through Mississippian age in some areas and sandstones and shales of Pennsylvanian age in other areas. In addition, lateral changes in lithology, the absence of some geologic units in parts of the study unit, and nomenclature, which has evolved independently in the four states, result in different stratigraphic sequences over the study unit. These units are briefly described in the following section.

Precambrian Units
Igneous and metamorphic rocks of Precambrian age underlie the Ozark Plateaus and crop out in several places in the eastern part of the study unit. Elsewhere, these rocks are buried under as much as 5,000 ft of sedimentary rock. Structural relief of the rocks can be as much as 1,000 ft in a few miles. These igneous rocks are mainly felsic (silica rich) rocks such as granite and rhyolite with mafic (silica poor) intrusions consisting of diabase and gabbro. Felsic rocks contain minerals such as quartz and potassium feldspar, which are resistant to weathering. In contrast, the mafic rocks contain minerals such as pyroxene and calcium plagioclase, which weather easily (Adamski et al., 1995).

The igneous rocks of Precambrian age also contain commercially important quantities of several trace elements, including iron, lead, manganese, and silver. In addition, uranium and thorium are present in some of these rocks (primarily the granites) in concentrations as large as 34 and 54 mg/kg (milligrams per kilogram), respectively.

Cambrian and Ordovician Units
Rocks of Cambrian and Ordovician age in the study unit crop out mainly in the Salem Plateau. The geologic units of Cambrian and Ordovician age range in thickness from less than 50 ft to more than 4,000 ft; and average about 2,000 ft thick. In general, the units consist predominantly
of dolomites, cherty dolomites, sandstones, and limestones, although shales are present in some areas mainly as discontinuous beds and thin partings. The basal unit of the Cambrian and Ordovician rocks, the Lamotte Sandstone of Late Cambrian age, rests unconformably on igneous rocks of Precambrian age. It is a well-sorted quartz sandstone, which is arkosic and conglomeratic at its base. Its thickness ranges from less than 50 ft to nearly 500 ft. The Lamotte Sandstone grades upward into the Bonneterre Dolomite or equivalent, which is also of Cambrian age. The Bonneterre Dolomite is a fine- to medium grained dolomite that crops out in the vicinity of the St. Francois Mountains. It contains glauconite and pyrite, and it can contain locally minor amounts of chert and shale. It is 200 to 300 ft in thickness near the St. Francois Mountains, but the thickness decreases southward to about 70 ft in northern Arkansas. In southeastern Missouri, the Bonneterre Dolomite is extensively mineralized, containing abundant lead- and zinc-sulfide deposits. Other trace elements, such as cobalt, copper, nickel, and silver, are present in lower concentrations in the Bonneterre Dolomite.

The Davis Formation and Derby-Doe Run Dolomite are shaly to silty, glauconitic dolomites that crop out in a roughly circular band around the St. Francois Mountains. Thickness of the Davis Formation near its type locality is about 160 ft; thickness of the Derby-Doe Run Dolomite is about 115 ft. These dolomites are relatively impermeable compared to the other units of Cambrian and Ordovician age. The Potosi and Eminence Dolomites, which represent the top of the Cambrian section, are fine- to coarse-grained dolomites with dense chert, drusy quartz, and, in northern Arkansas, glauconitic green shale. These units are exposed in southeastern Missouri. Thicknesses of the Potosi and Eminence Dolomites in Missouri average about 300 to 350 ft each, but total thickness for the two formations combined diminishes to 300 ft in northern Arkansas. Both units contain barite, which has been mined in southeastern Missouri. The Gasconade Dolomite consists of a basal sandstone member, the Gunter Sandstone, and upper and lower dolomite members. It crops out extensively in southeastern Missouri. The Gunter Sandstone Member is a fine- to coarse-grained quartz sandstone, which can be dolomitic. Thickness ranges from 30 to 120 ft. Chert is present in both dolomite members and can constitute more than 50 percent of the lower member. The upper dolomite member contains much less chert than does the lower member. Thickness of the Gasconade Dolomite ranges from 300 ft in central Missouri to more than 700 ft in northern Arkansas.

The Roubidoux Formation consists of sandstones, dolomites, and cherty dolomites. It crops out extensively in central, south-central, and southeastern Missouri. The dolomites are fine to medium grained, and the sandstones are loosely cemented. In northern Arkansas, it can contain a few pyritic black shales. Thickness generally increases to the south-southeast and ranges from 100 to 450 ft. The Jefferson City, Cotter, and Powell Dolomites, and the Smithville Formation consist of dolomite with chert, sandstone lenses, and a few shale beds. These units are pyritic, and the Smithville Formation contains lead and zinc ore. The units are exposed in southern Missouri and northern Arkansas. Thickness of each unit averages about 200 ft.

The Everton Formation contains sandy dolomite and sandstone members, which crop out extensively in northern Arkansas. It contains a few shale beds, none of which are laterally continuous. It can exceed 1,000 ft in thickness. The St. Peter Sandstone unconformably overlies the Everton Formation and crops out mainly in northern Arkansas. It is loosely cemented, well-rounded quartz sandstone that can be as much as 300 ft thick. Its contact with the overlying Joachim Dolomite is lithologically gradational.
Silurian and Devonian Units
Rocks of Silurian and Devonian age are thin, and most are not laterally continuous in the study unit. Most of the units in this interval exist only in northern Arkansas and parts of Missouri. The most significant unit is the black, pyritic, thinly bedded Chattanooga Shale. This shale ranges in thickness from less than 10 to 100 ft, but averages about 70 ft in thickness. It contains phosphate, glauconite, and minor amounts of uranium.

Mississippian Units
Rocks of Mississippian age in the study unit are predominantly fine- to coarse-grained limestones and cherty limestones. These units have a total thickness of about 200 to 500 ft and crop out extensively in the Springfield Plateau. Because of lateral facies changes and independent geologic studies in different states, the same sequence of rocks has different nomenclature throughout the study unit. For example, the St. Joe Limestone and the Boone Formation in northern Arkansas are equivalent to the entire sequence from the Compton Limestone to the Keokuk Limestone in southern Missouri. As with the underlying rocks of Cambrian and Ordovician age, secondary mineralization fissile, pyritic, and carbonaceous shale with abundant iron concretions. In north-central Arkansas, the shale is interbedded with thin layers of finely crystalline limestones.

Pennsylvanian Units
Rocks of Pennsylvanian age crop out in the Boston Mountains of northern Arkansas, and in the Osage Plains of western Missouri, southeastern Kansas, and northeastern Oklahoma. In general, rocks of Pennsylvanian age rest unconformably on rocks of Mississippian age; however, in the north-central part of the study unit, rocks of Mississippian age are missing, and rocks of Pennsylvanian age directly overlie rocks of Ordovician age. In northern Arkansas, three geologic units—the Hale Formation, the Bloyd Shale, and the Atoka Formation-- are of Pennsylvanian age. The Hale Formation and Bloyd Shale are massive sandstones with limestone, shale, and coal beds. The Atoka Formation is mostly dark shales with sandstones and sandy limestones. Total thickness of the section in the southern part of the study unit ranges from 1,000 to 2,000 ft.

Rocks of Pennsylvanian age in western Missouri, southeastern Kansas, and northeastern Oklahoma consist of four groups--Cherokee, Marmaton, Pleasanton, and Kansas City--and have a combined thickness that ranges from 40 to 700 ft. Lithologies are mostly shales and sandstones with some limestones. Black shales in the section can be uranium-bearing. Bituminous coal beds are present in the Cherokee and Marmaton Groups. In places, these same units produce oil and gas.

Post-Paleozoic Units
Sediments of Cretaceous through Quaternary age in the study unit consist of unconsolidated sands, gravels, and clays. These sediments crop out in the Mississippi Alluvial Plain and as thin alluvial deposits in some of the major stream valleys.

Structural Geology
The Ozark Plateaus Province is underlain by a structural dome formed by a series of uplifts that has occurred since Precambrian time. Total uplift is approximately 5,000 ft. The dome is asymmetrical; the dip of sedimentary rocks is greater to the east-southeast than it is to the south, west, or north. For example, regional dip east of the St. Francois Mountains is 150 ft/mi (feet per
mile, whereas regional dip in southwestern Missouri is about 10 ft/mi. The dip to the south increases to 200 ft/mi on the southern flank of the Boston Mountains as a result of faulting in the area.

Extensive fracturing, jointing, and faulting of the rocks has resulted from the uplifting. Photolineament analyses of the Boone Formation in northwestern Arkansas indicate that fractures generally trend northwest, northeast, and east-west (Adamski, 1987). Joints are present in many of the rocks of Paleozoic age. Joints trend east-west, north-south, northwest-southeast, and northeast-southwest. Dip of these joints generally is vertical.

Major faults in the Ozark Plateau trend in a northwesterly direction. Displacement can be as much as 1,000 ft. Some of the major faults form escarpments visible for several miles. Several distinct ring-shaped fault systems exist in the Ozark Plateaus of Missouri. One such structure, the Decaturville Structure in Camden County, Missouri, is about 4 miles in diameter. It consists of a pegmatite of Precambrian age exposed in the center and surrounded by rocks of Ordovician age.

**Geological History**

Granite and rhyolite rocks of Precambrian age crystallized about 1.2 to 1.5 billion years ago in the Ozark Plateaus and adjacent areas. These igneous rocks form the basement complex of the study unit. After igneous activity ceased, the landscape was eroded prior to Late Cambrian time when the Lamotte Sandstone and Bonneterre Dolomite were deposited. Deposition of marine carbonates was nearly continuous, with brief periods of erosion and deposition of clastic sediments, from Late Cambrian to Middle Ordovician time. The area was extensively eroded prior to the deposition of the Everton Formation (Missouri Division of Geology and Land Survey, written communication, 1992). After deposition of the Everton Formation, the Ozark Plateaus area was uplifted and the sediments were extensively eroded. Geologic units from the St. Peter Sandstone through Fernvale Limestone were subsequently deposited, but uplifting limited sediment deposition from Middle Ordovician to Early Devonian time. After the Early Devonian time, the Ozark Plateaus area was uplifted again and eroded.

Sediments of Middle Devonian and Mississippian age were subsequently deposited in this area. Limestones of Mississippian age were deposited in shallow seas that inundated the Ozark Plateaus area. After Mississippian time, the northern part of the Ozark Plateaus area was uplifted and tilted. Rocks of Devonian and Mississippian age were beveled, exposing rocks of Ordovician age over much of the area. Sediments of Pennsylvanian age were deposited by transgressing seas and by riverine systems, in places, directly on the exposed rocks of Ordovician age. Periodic uplifts formed unconformities in the rocks of Pennsylvanian age. The Ozark Plateaus area was uplifted and extensively eroded after Pennsylvanian time. The fluvial and marine sediments were deposited in Late Cretaceous and early Tertiary time. Subsequent uplifting exposed the area to erosion, generating the current topography.

Common rocks of the area include galena, limestone, and chert. Galena is lead sulfide (PbS), the principal mineral of lead ore. It occurs as metallic to lead-gray, cube shaped crystals that break into cubic, right-angled fragments. Some galena crystals are very large. Galena is heavy, has a metallic luster on fresh surfaces, has a gray-black streak, and is so soft that it will mark on paper. Galena was once mined in the Tri-State mining district, once one of the most important lead- and zinc producing areas in the world. Although the mines are now closed, galena can still be found at old mine dump sites.
Limestone is a sedimentary rock composed mostly of calcite. It is formed in marine environments by organic means or by chemical deposition. Many animals and plants take calcium carbonate out of the water and secrete it to form shells or skeletons. As these organisms die, they drop to the bottom of the ocean, lake, or river. Over time, the organic parts decay and the calcium carbonate accumulates to form limestone. Chemically deposited limestones are formed when calcium carbonate dissolved in water falls out of solution and settles to the bottom. The limestones that crop out in the Ozark Plateau contain chert and were deposited during the Mississippian Period. The best places to see these cherty limestones are roadcuts or steep cliffs along stream valleys. Economically, these Mississippian limestones were very important because they contained valuable lead and zinc ores.

Chert (or flint) is common in many limestones as nodules or continuous beds. It is opaque and ranges in color from white to gray or brown to black. It breaks with a shell-like (conchoidal) fracture, and the edges of the broken pieces are sharp. Chert is a sedimentary rock composed of microscopic crystals of quartz (silica, SiO2). Humans have used chert for thousands of years to make tools and weapons. In Cherokee County, chert fragments are commonly found in the dumps at abandoned lead and zinc mines.

**Soil**

The following material on soil typology and limitations for recreational development is derived from custom soil reports from NRCS data (USDA National Resources Conservation Service, 2011) generated for each of the individual park properties. Maps are provided in the Appendix. Soils that have very similar profiles make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, are an example.
Some surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example of a miscellaneous area (NRCS, 2010). Custom soil maps of each of the properties at Grand Lake State Park are included in the Appendix due to their size, detail, and number.

**SPRING RIVER:** The soils at Bicentennial are Waben gravelly silt loam with three to eight percent slopes and Razort gravelly silt loam with up to one percent slopes. The soils at Josephine Smith are Clarksville stony silt loam with 12 to 50 percent slopes covered with Britwater silt loam and Kanima gravelly clay loam.

**TWIN BRIDGES:** Angler’s Paradise is primarily Britwater silt loam. By contrast, the upper areas of Twin Bridges at Echo Hollow and Eagle Bluff are composed of two soil types: Clarksville gravelly silt at the higher elevations with 0 to 3 percent slopes, and Clarksville stony silt with 12 to 60 percent slopes.

**BERNICE:** The higher levels of Bernice away from Grand Lake are Eldorado silt loam with slopes from one to three percent; the soils closer to Grand Lake with slopes of three to 12 percent are Eldorado stone silt and Britwater gravelly silt.

**HONEY CREEK:** The upper elevations of Honey Creek are Clarksville gravelly silt loam with slopes of 1 to 8 percent, comprising about one third of the property. The remainder of the property ranges in slope from 5 to 50 percent and is Clarksville stony silt loam.

**DISNEY:** Essentially, the entire Disney property is covered with Clarksville gravelly silt loam, 20 to 50% slopes. Less than 1% of the park includes the Verdigris silty clay loam, 0 to 1% slopes, frequently flooded soil type.

**LITTLE BLUE:** The Little Blue is spread across two counties—Mayes and Delaware. The Mayes County area encompasses almost 53% of the park. Its primary soil type is Clarksville gravelly silt loam, 1 to 8% slopes (38.6% of the entire Little Blue property). Verdigris silty clay loam, 0 to 1% slopes covers 8.8% of the park property, and Razort gravelly loam, 0 to 1% slopes (which are occasionally flooded) covers 5.5% of the entire park. In Delaware County 30.5% of the Little Blue property is covered in Razort gravelly loam, 0 to 3% slopes; another 15.4% of the park is covered with Clarksville very gravelly silt loam, 1 to 8% slopes. The remaining areas include less than 1% coverage of any specific soil type.

**CHEROKEE GRANDVIEW:** The predominant soil type in the Cherokee unit is Clarksville gravelly silt loam, 20 to 50% slopes (63.3%), followed by Clarksville gravelly silt loam, 1 to 8% slopes (34.6%). Two percent of the area is identified as water.

**CHEROKEE LAKESIDE:** This park area consists of Clarksville stony silt loam, 5 to 20% slopes, which is 98.2% of the park and a dam (1.2% of the park). When reporting limitations of development on soils in this report, the dam was not rated.

**CHEROKEE RIVERSIDE:** Slightly more than 98% of Riverside is covered with Verdigris silty clay loam, 0 to 1 percent slopes, which occasionally floods. The remaining 2% of the area is water.

**GRAND CHEROKEE:** Over 70 percent of the Grand Cherokee unit is covered in Verdigris silty clay loam, 0 to 1% slopes, occasionally flooded soil type (71.7%). The remaining areas of the park are covered by either Clarksville gravelly silt loam, 1 to 8% slopes or Verdigris silty clay loam, 0 to 1% slopes, frequently flooded soil (13.9% and 13.4%, respectively).
**SPAVINAW**: The Razort component makes up 90 percent of the map unit. Slopes are 0 to 1 percent. This component is on flood plains on valleys. The parent material consists of silty alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This soil does not meet hydric criteria.

The Clarksville component makes up 85 percent of the map unit. Slopes are 20 to 50 percent. This component is on hillslopes on hills on uplands. The parent material consists of loamy colluvium over residuum weathered from cherty limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This soil does not meet hydric criteria.

Slightly more than 70% of the Spavinaw property includes Razort gravelly loam, 0 to 1% slopes, which are occasionally flooded. Clarksville stony silt loam, 20 to 50% slopes is found in approximately 10% of the area. The remaining (approximate) 20% of the state park is covered with water.

**SNOWDALE**: Over 50% of the Snowdale area of the State Park includes Dennis silt loam, 3 to 5% slopes (53.5%). Another 22% includes Craig silt loam, 3 to 5 percent slopes, and 10% is covered with Parsons silt loam, 0 to 1 percent. The remaining small areas include Dennis silt loam 1 to 3%, and Eldorado gravelly silt loam, 1 to 8% slopes.

**Soil Suitability for Recreational Development**

The National Resources Conservation Service (NRCS) collects and reports soil data, which is then made available online. Based on the data, reports that are specific to unique locations may be generated. An ecological site assessment is conducted as part of this analysis. For this RMP, a soil suitability report was generated for the Grand Lake State Park, which is located in Mayes County, Ottawa County, and Delaware County. Thus, the following section provides information related to soil suitability for various types of recreational development in the county and park.

**Ecological Site and Suitability Assessment**

Individual soil map unit components can be correlated to a particular ecological site. The Ecological Site Assessment section includes ecological site descriptions, plant growth curves, state and transition models, and selected National Plants database information.

An “ecological site” is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, which has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.
For most areas of consideration, the NRCS (2010) rates suitability indicating the extent to which the soils are limited based on all of the soil features that affect development. “Not limited” indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. “Somewhat limited” indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. “Very limited” indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Because properties adjacent to lakes are susceptible to erosion, the NRCS (2010) also provided ratings related to the hazard of soil loss from roads without a sealed surface and trails (erosion hazard). The ratings are based on soil erosion factor K, slope, and content of rock fragments. The hazard is described as “slight,” “moderate,” or “severe.” A rating of “slight” indicates that little or no erosion is likely; “moderate” indicates that some erosion is likely, that roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and “severe” indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

**Lawns, Landscaping, and Golf Fairways**

This interpretation rates soils for their use in establishing and maintaining turf for lawns and golf fairways and ornamental trees and shrubs for residential or commercial landscaping. Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required.

The ratings are based on the use of soil material at the site, which may have been altered by some land smoothing. Irrigation may or may not be needed and is not a criterion in rating. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality; vegetation, access to water, potential water impoundment sites, and access to public sewer lines. Soils that are subject to flooding are limited by the duration and intensity of flooding and the season when flooding occurs. In planning for lawns, landscaping, or golf fairways, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

**SPRING RIVER**: The soils at Bicentennial and Josephine Smith are somewhat limited for lawns and grassy areas because of gravel content and slopes.
**TWIN BRIDGES**: The Britwater silt loam in Angler’s Paradise is not limited for lawns and grassy areas. By contrast, the upper areas of Twin Bridges are somewhat to very limited because of gravel and slopes.

**BERNICE**: The higher Eldorado silt loam with slopes from one to three percent is not limited for lawns; however, the soils closer to Grand Lake with slopes of three to 12 percent are somewhat limited.

**HONEY CREEK**: The entire property at Honey Creek is rated as very limited for lawns, landscaping, and golf due to issues with slope, gravel content, droughty conditions, and large stone content.

**DISNEY**: The entire Disney property is rated as very limited for lawns, landscaping, and golf fairways due to issues with slope, gravel content, droughty conditions, and large stone content. Flooding is an additional concern.

**LITTLE BLUE**: The following soil types are rated as very limited for lawns, landscapes, and golf fairways: Clarksville very gravelly silt loam, 1 to 8% and 20 to 50% slopes (due to gravel content, large stones, droughty conditions); and Verdigris silty clay loam, 0 to 1%, frequently flooded (due to flooding). Those soil types with ‘somewhat limitations’ include Razort gravelly loam, 0 to 3% slopes and occasionally flooded (flooding, gravel content) and Clarksville gravelly silt loam, 1 top 8% slopes.

**CHEROKEE GRANDVIEW**: The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as very limited for lawns, landscaping, and golf fairways due to large stone content and droughty conditions. The one-third of the park unit that includes the same soil, but at 1 to 8% slope is rated as somewhat limited due to large stone content and droughty conditions.

**CHEROKEE LAKESIDE**: The soil in this area, Clarksville stony silt loam, 5 to 20% slopes, is rated as somewhat limited for lawns, landscaping, and golf fairways due to slope, gravel content, droughty conditions, and large stone content.

**CHEROKEE RIVERSIDE**: Slightly more than 98% of Riverside is covered with Verdigris silty clay loam, 0 to 1 percent slopes. The remaining 2% of the area is water. The Verdigris soil type is somewhat limited for lawns, landscaping, and golf fairways due to flooding.

**GRAND CHEROKEE**: The largest soil type in this unit is Verdigris silty clay loam, 0 to 1% slopes, occasionally flooded; this soil type along with the Clarksville gravelly silt loam, 1 to 8% slopes soil are rated as somewhat limited for lawns, landscaping, and golf course fairways due to potential for flooding and large stone content. The Verdigris silty clay loam, 0 to 1% slopes, frequently flooded area is rate as very limited due to flooding.

**SPAVINAW**: The Razort gravelly loam, 0 to 1% slope is rated as somewhat limited for development of lawns, landscaping, and golf fairways due to concerns over flooding and relatively high gravel content. The Clarksville stony silt loam, 20 to 50% slopes is highly limited due to slope, gravel content, droughty, and large stone content.

**SNOWDALE**: The Dennis silt loam, 3 to 5% slope soil is considered somewhat limited for the creation of lawns, landscaping, and golf fairway development due to depth to saturated zone. The Craig silt loam soil is not limited for this type of development. The other soil types are rated as somewhat limited due to depth to saturated zone, and the gravel content.
Off-Road, Off Trail Erosion Hazard

Off-road motorcycle trails are intended primarily for recreational use. They require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to water table, ponding, flooding, and texture of the surface layer.

The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The ratings are both verbal and numerical. The hazard is described as “slight,” “moderate,” “severe,” or “very severe.” A rating of “slight” indicates that erosion is unlikely under ordinary climatic conditions; “moderate” indicates that some erosion is likely and that erosion-control measures may be needed; “severe” indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and “very severe” indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

SPRING RIVER: Bicentennial and Josephine Smith are slight to moderate risks for erosion.

TWIN BRIDGES: The soils at Twin Bridges are rated as slight to moderate risk for erosion, especially in the steeper slopes facing east and west.

BERNICE: The soils at Bernice are rated as slight risk for erosion.

HONEY CREEK: The soils at Honey Creek are rated as moderate to slight risk for erosion.

DISNEY: The soil type at Disney is rated as being at moderate risk for erosion due to slope and erodibility.

LITTLE BLUE: All but one soil type found in the Little Blue park area are rated as slight risk of erosion due to off-road use. Clarksville stony silt loam with 20 to 50% was rated as having a moderate risk of such erosion, largely due to its steepness.

CHEROKEE GRANDVIEW: The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as being at moderate risk of erosion hazards due to off-road use (slope), while the 1 to 8% slopes are rated as having a slight risk of erosion.

CHEROKEE LAKESIDE: The soil in this area, Clarksville stony silt loam, 5 to 20% slopes, is rated as being at a slight risk of erosion due to off-road, off-trail use.

CHEROKEE RIVERSIDE: Essentially, the entire area of Riverside includes Verdigris silty clay loam, 0 to 1 percent slopes. This soil type is rated as having a slight risk of off-road, off-trail erosion.

GRAND CHEROKEE: All soil types in this park area are rated as being at slight risk for erosion due to off-road, off-trail use.

SPAVINAW: Slightly more than 70% of the Spavinaw area includes Razort gravelly loam, 0 to 1% slopes, which are occasionally flooded. This soil type is rated as having slight limitations for erosion concerns. The Clarksville stony silt loam, 20 to 50% slopes is found in approximately 10% of the area and is rated as moderately limited for erosion hazards.
**SNOWDALE:** The Dennis silt loam 3 to 5% slopes has moderate risk of erosion if off-road, off-trail development is undertaken. This also holds true to Craig silt loam, 3 to 5% and Eldorado gravelly silt loam—all due to slope and erodibility. Parsons silt loam, 0 to 1% has a slight risk of erosion.

**Camp Areas**

Camp areas are tracts of land used intensively as sites for tents, trailers, campers, and the accompanying activities of outdoor living. Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas.

The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, saturated hydraulic conductivity (Ksat), and toxic substances in the soil.

**SPRING RIVER:** The areas with limited slopes are not limited for campsite development.

**TWIN BRIDGES:** Angler’s Paradise is not limited for campsite development, while the crest of Eagle Bluff and Echo Hollow are somewhat limited. The slopes to the east and west are very limited for campsite development.

**BERNICE:** The soils at Bernice are rated as somewhat limited near Grand Lake for campsite development due to flooding.

**HONEY CREEK:** The entire property at Honey Creek is rated as very limited for campsite development due to gravel content, slope, and steepness of those slopes.

**DISNEY:** The Clarksville soil type at Disney is rated as very limited for camp development due to slope, gravel content, and flooding.

**LITTLE BLUE:** The Razort gravelly loam, 0 to 3% slopes, is occasionally flooded and the Verdigris silty clay loam, 0 to 1%, is frequently flooded. Both soil types are rated as very limited for camp development due to flooding and gravel content. The Clarksville gravelly silt loam, 1 top 8% slopes are rated as not limited for this type of development.

**CHEROKEE GRANDVIEW:** The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as very limited for development of camp areas due to large stone content and slope. The one-third of the park unit that includes the same soil, but at 1 to 8% slope is rated as not limited for camp development.

**CHEROKEE LAKESIDE:** The Clarksville stony silt loam, 5 to 20% slopes, is rated as somewhat limited for camp development due to gravel content.
CHEROKEE RIVERSIDE: The soil type in this area, Verdigris silty clay loam, 0 to 1 percent slopes, is rated as very limited for the development of camp areas due to flooding.

GRAND CHEROKEE: Both Verdigris silty clay loam soil types that have potential for flooding are rated as very limited for the development of camp areas (due to flooding). The area covered by the Clarksville gravelly silt loam, 1 to 8% slopes soil are rated as not limited for camp development.

SPAVINAW: The Razort gravelly loam, 0 to 1% slopes soil type is rated as very limited for camping development due to the likelihood of flooding and gravel content. The Clarksville stony silt loam, 20 to 50% slopes is also rated as very limited for camp development due to its steep slope and the gravel content.

SNOWDALE: The Dennis silt loam 1 to 3% and 3 to 5% slopes are very limited for camp development in the Snowdale area; both due to depth to saturated zone and slow water movement. Parsons silt loam, 0 to 1% has similar limitations. The other two soil types—Craig silt loam, 3 to 5% and Eldorado gravelly silt loam, 1 to 8% slopes—are rated as somewhat limited for camp development.

Paths and Trails

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The NCRS ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road trails are intended primarily for recreational use. They require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to water table, ponding, flooding, and texture of the surface layer.

SPRING RIVER: Bicentennial is somewhat limited for paths and trails due to flooding. By contrast, Josephine Smith is somewhat to very limited due to slope.

TWIN BRIDGES: With the exception of the extreme slopes east and west, Twin Bridges is not limited for paths and trails.

BERNICE: Bernice is not limited for paths and trails, although some areas are subject to flooding.

HONEY CREEK: The extreme northern area of Honey Creek is very limited for paths and trails due to the slope. Other than that location, Honey Creek is not limited for this purpose.

DISNEY: The Clarksville soil type at Disney is rated as somewhat limited for off-road motorcycle trails due to slope. At the same time, the area is rated as very limited for walking paths and hiking trails due to slope and flooding.

LITTLE BLUE: Most of the soil types in Little Blue are rated as not limited for the development of any type of trail (off-road motorcycle, walking paths, and hiking trails). The Verdigris soil type is identified as somewhat limited due to concerns with flooding.

CHEROKEE GRANDVIEW: The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as very limited for development of off-road motorcycle trails due to slope. The one-third of
the park unit that includes the same soil, but at 1 to 8% slope is rated as not limited for this type of use. The same ratings and comments apply to the development of walking paths and hiking trails in the park.

CHEROKEE LAKESIDE: The soil in this area, Clarksville stony silt loam, 5 to 20% slopes, is rated as not limited for all types of trails (off-road motorcycle, walking paths, hiking trails).

CHEROKEE RIVERSIDE: The soil type in this area, Verdigris silty clay loam, 0 to 1 percent slopes, is rated as not limited for the development of all types of trails: off-road motorcycle trails, walking paths, and hiking trails.

GRAND CHEROKEE: The only soil type that is somewhat limited for all types of trail development (off-road motor cycle, walking paths, and hiking trails) is the Verdigris silty clay loam, 0 to 1% slopes, frequently flooded soil. Other soil types in Grand Cherokee are not limited for this type of trail development.

SPAVINAW: The Razort gravelly loam, 0 to 1% slopes soil type is rated as not limited for the development of paths and trails. In contrast, the Clarksville stony silt loam, 20 to 50% slopes is rated as very limited for paths and trails due to its steep slope.

SNOWDALE: The Dennis silt loam 1 to 3% and 3 to 5% slopes are somewhat limited for off-road motorcycle trails; both due to depth to saturated zone. Parsons silt loam, 0 to 1% slopes has similar limitations. The other two soil types—Craig silt loam, 3 to 5% and Eldorado gravelly silt loam, 1 to 8% slopes—are rated as not limited for the creation of off-road motorcycle trails. The same limitations exist for walking paths and trails in the Snowdale area.

**Picnic Areas**

Picnic areas are natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, saturated hydraulic conductivity (Ksat), and toxic substances in the soil.

SPRING RIVER: The entire area of Bicentennial is somewhat limited for picnic areas due to gravel content and flooding. At Josephine Smith, the higher portion of the property with Britwater silt loam is not limited for picnic areas, whereas the remainder of the property is very limited due to slope and gravel content.

TWIN BRIDGES: Angler’s Paradise is not limited for picnic areas, but Eagle Bluff and Echo Hollow are limited due to gravel content and slope. The upper elevations with level surfaces are somewhat limited for this use.

BERNICE: Almost all of Bernice is somewhat limited due to gravel and slope in the Eldorado stony silt loam.
HONEY CREEK: All of the Clarksville formation at Honey Creek is very limited due to slope and gravel composition.

SPAVINAW: The Razort gravelly loam, 0 to 1% slopes soil type is rated as somewhat limited for the development of picnic areas due to its gravel content. The Clarksville stony silt loam, 20 to 50% slopes is rated as very limited for picnic areas due to its steep slope and the gravel content.

SNOWDALE: The Parsons silt loam, 0 to 1% slopes is the only soil type rated as very limited; this is due to depth of saturated zone and slow water movement. The other soil types—Dennis silt loam 1 to 3% and 3 to 5% slopes, Craig silt loam 3 to 5%, and Eldorado gravelly silt loam, 1 to 8% slopes are rated as somewhat limited; this is most often due to slow water movement and depth to saturated zone.

CHEROKEE RIVERSIDE: The soil type in this area, Verdigris silty clay loam, 0 to 1 percent slopes, is rated as not limited for the development of picnic areas.

CHEROKEE LAKESIDE: The soil in this area, Clarksville stony silt loam, 5 to 20% slopes, is rated as somewhat limited for the development of picnic areas due to gravel content and slope.

CHEROKEE GRANDVIEW: The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as very limited for development of picnic areas due to slope and gravel content. The one-third of the park unit that includes the same soil, but at 1 to 8% slope is rated as not limited for picnic areas.

GRAND CHEROKEE: The only soil type that is somewhat limited for all picnic areas) is the Verdigris silty clay loam, 0 to 1% slopes, frequently flooded soil. Other soil types in Grand Cherokee are not limited for picnic area development.

LITTLE BLUE: In the Mayes County portion of Little Blue both the Razort gravelly loam, 0 to 3% slopes, occasionally flooded and the Verdigris silty clay loam, 0 to 1%, frequently flooded are rated as very limited for development of picnic areas due to flooding and gravel content. The Clarksville gravelly silt loam, 1 to 8% slopes is rated as not limited for this type of development. In the Delaware County portion of the Little Blue property, one of the two predominant soil types (Clarksville very gravelly silt loam, 1 to 8% and 20 to 50% slopes) is rated as very limited for picnic development due to concerns about gravel and steepness. The other major soil type in this portion of the park, Razort gravelly loam, 0 to 3% slopes, occasionally flooded, is identified as somewhat limited due to gravel and large stone content.

DISNEY: The Clarksville soil type at Disney is rated as very limited for development of picnic areas due to slope, gravel content, and flooding.

**Playground Areas**

Playgrounds/play groups are areas used intensively for sports and games, such as baseball, football, and similar activities. Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The NRCS ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table,
ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, saturated hydraulic conductivity (Ksat), and toxic substances in the soil.

**SPRING RIVER:** All of Bicentennial is very limited for playgrounds due to gravel content, slope, and flooding. Josephine Smith is somewhat to very limited for playgrounds due to the slope and gravel content, as well as potential for flooding in low lying areas.

**TWIN BRIDGES:** All of the property north of Highway 60 is rated as very limited for playgrounds, whereas Angler’s Paradise is somewhat limited.

**BERNICE:** All of Bernice is somewhat limited to very limited for playgrounds due to gravel and slope of the soil composition.

**HONEY CREEK:** The entire property is very limited for playgrounds due to gravel, slope, and slow water movement.

**DISNEY:** The Clarksville soil type at Disney is rated as very limited for playground development due to slope, gravel content, and flooding.

**LITTLE BLUE:** Other than the Clarksville gravelly silt loam, 1 to 8% slope soil, which is rated as somewhat limited, all soil types are rated as very limited. Reasons for that rating include gravel, slope, flooding, and slow water movement.

**CHEROKEE GRANDVIEW:** The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as very limited for development of playgrounds due to slope and gravel content. The one-third of the park unit that includes the same soil, but at 1 to 8% slope is rated as somewhat limited for playgrounds for the same reasons (gravel content and slope).

**CHEROKEE LAKESIDE:** The Clarksville stony silt loam, 5 to 20% slopes soil type is rated as very limited for the installation of playgrounds due to gravel content and slope.

**CHEROKEE RIVERSIDE:** The soil type in this area, Verdigris silty clay loam, 0 to 1 percent slopes, is rated as somewhat limited for the installation of playgrounds due to flooding concerns.

**GRAND CHEROKEE:** In terms of the installation of playgrounds, the only soil type that is very limited for playgrounds is the Verdigris silty clay loam, 0 to 1% slopes, frequently flooded soil; this is due to flooding concerns. The other soil types in Grand Cherokee are somewhat limited for playground installation due to gravel content, slope, and flooding concerns.

**SPAVINAW:** The Razort gravelly loam, 0 to 1% slopes soil type and the Clarksville stony silt loam, 20 to 50% slope soil types are rated as very limited for playground areas. Both soil types have large gravel content, and the Clarksville soil type is found in very steep areas.

**SNOWDALE:** The Dennis silt loam 1 to 3% and 3 to 5% slopes are very limited for camp development in the Snowdale area; both due to depth to saturated zone, slow water movement, and slopes. Parsons silt loam, 0 to 1% has similar limitations as does Eldorado gravelly silt loam, 1 to 8% slopes. The remaining soil type—Craig silt loam, 3 to 5%—are rated as somewhat limited for playground development.

**Septic Tank Absorption Fields**

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24
and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

**SPRING RIVER:** Bicentennial is very limited for septic fields because of seepage, flooding, and slow water movement. The property at Josephine Smith is somewhat to very limited for septic fields due to slow water movement through the soil.

**TWIN BRIDGES:** All of Twin Bridges is somewhat to very limited for septic absorption fields due to slow water movement and slope.

**BERNICE:** All of Bernice is somewhat limited for septic tanks and absorption fields due to slow water movement in the Eldorado soils.

**HONEY CREEK:** The extreme northern portion of Honey Creek is very limited for septic absorption fields due to steep slopes and slow water movement. The remainder of the area is somewhat limited for the same reasons.

**DISNEY:** The Clarksville stony silt loam, 20 to 50% slopes soil type at Disney is rated as very limited for the installation of septic tank absorption fields due to slope, slow water movement, and flooding.

**LITTLE BLUE:** The two predominant soil types on the Little Blue property are Clarksville gravelly silt loam, 1 to 8% slopes and Razort gravelly loam, 0 to 3% slopes, occasionally flooded are rated as very limited for the use of septic tank absorption fields due to concerns with flooding, seepage, and slow water movement. The other two major soil types—Clarksville very gravelly silt loam, 1 to 8% and 20 to 50% slopes and Razort gravelly loam, 0 to 1% slopes, occasionally flooded—are rated as somewhat limited due to slow water movement.

**CHEROKEE GRANDVIEW:** The Clarksville gravelly silt loam, 20 to 50% slopes soil type is rated as very limited for installation of septic tank absorption fields due to slope and slow water movement. Likewise, the one-third of the park unit that includes the same soil, but at 1 to 8% slope is rated as somewhat limited for septic tank systems due to slow water movement.

**GRAND CHEROKEE:** Most of the Grand Cherokee unit is rated as very limited for the use of septic tank absorption fields due to slow water movement and flooding issues. The Clarksville gravelly silt loam, 1 to 8% slopes soil type is rated as somewhat limited due to slow water movement.

**CHEROKEE LAKESIDE:** The soil in this area, Clarksville stony silt loam, 5 to 20% slopes, is rated as somewhat limited for the installation of septic tank absorption fields of picnic areas due to slope and slow water movement.
CHEROKEE RIVERSIDE: The soil type in this area, Verdigris silty clay loam, 0 to 1 percent slopes, is rated as very limited for the development of septic tank absorption fields due to flooding and slow water movement.

SPAVINAW: The Razort gravelly loam, 0 to 1% slope soil type and the Clarksville stony silt loam, 20 to 50% slope soil type, are rated as very limited for the installation of septic tank absorption fields. Razort soils are susceptible to flooding and seepage in the bottom layers; water movement in these soils is also slow. The Clarksville soil type shares the slow water movement of the Razort soils; the steep slope causes issues for septic tank use.

SNOWDALE: All soil types, except Eldorado gravelly silt loam, 1 to 8% slopes are rated very limited for the installation of septic tank absorption fields. This is due to depth to saturated zone and slow water movement. The Eldorado soil type is rated as somewhat limited for slow water movement.

**Sewage Lagoons**

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Ksat is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a Ksat rate of more than 14 micrometers per second are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

SPRING RIVER: As with septic systems, Bicentennial is very limited for lagoons due to slope, flooding, and gravel composition. Josephine Smith is somewhat to very limited for lagoons due to potential for seepage and the slope of the area.

TWIN BRIDGES: The area north of Highway 60 is very limited for lagoons due to slope and seepage, whereas Angler’s Paradise is somewhat limited because of seepage.

BERNICE: All of Bernice is somewhat to very limited for sewage lagoons due to slope and potential for seepage.

HONEY CREEK: The Clarksville formation is subject to seepage and has sloping formations. As a result, Honey Creek is very limited for lagoons.
DISNEY: The Clarksville stony silt loam, 20 to 50% slopes soil type at Disney is rated as very limited for the installation of lagoons due to slope, seepage, and flooding.

LITTLE BLUE: All the major soil types in the Little Blue park area are rated as very limited for the installation of sewage lagoons. Slope and seepage are the two major concerns in this park area.

CHEROKEE GRANDVIEW: All of the soil types in the Cherokee park unit are rated as very limited for sewage lagoons due to concerns with seepage and slope.

CHEROKEE LAKESIDE: The soil in this area, Clarksville stony silt loam, 5 to 20% slopes, is rated as very limited for the development of lagoons due to gravel content and slope.

CHEROKEE RIVERSIDE: The soil type in this area, Verdigris silty clay loam, 0 to 1 percent slopes, is rated as very limited for the development of sewage lagoons due to flooding and possible seepage.

GRAND CHEROKEE: All soil types in this park unit are rated as very limited for the use of sewage lagoons due to seepage, slope, and flooding issues.

SPAVINAW: The Razort gravelly loam, 0 to 1% slope soil type and the Clarksville stony silt loam, 20 to 50% slope soil type, are rated as very limited for the installation of sewage lagoons. Razort soils are susceptible to flooding and seepage in the bottom layers. The Clarksville soil type shares the seepage issues of the Razort soils; the steep slope also causes issues for sewage lagoons.

SNOWDALE: All soil types, except Eldorado gravelly silt loam, 1 to 8% slopes and Craig silt loam 3 to 5% slopes are rated very limited for sewage lagoons. This is due to depth to saturated zone, seepage, and slope. The Eldorado and Craig soil types are rated as somewhat limited for the same reasons.

Hydrology

Water, both surface and ground, is critical to the Grand Lake corridor. The USGS (n.d.) provides a description of the underlying aquifer system in the Grand Lake State Park area. The Ozark Plateaus aquifer system (also known as the Roubidoux Aquifer) underlies large areas of southern Missouri and northern Arkansas, and small areas of northeastern Oklahoma and southeastern Kansas. The Ozark Plateaus aquifer system consists mainly of Paleozoic carbonate rocks and underlies an area of about 2,400 square miles in northeastern Oklahoma. The area lies mostly in the Ozark Plateaus Physiographic Province, and includes all or parts of Adair, Cherokee, Craig, Delaware, Mayes, and Ottawa Counties.

The chemical quality of water from the Ozark Plateaus aquifer system is suitable for most purposes, although the water may be moderately hard to very hard. Water in the Springfield Plateau aquifer, which is directly connected to the surface in places by sinkholes and caverns, is susceptible to contamination from surface sources. Withdrawals of water from the Ozark Plateaus aquifer system in Oklahoma totaled about 9 million gallons per day during 1985. About 6 million gallons per day was withdrawn for public supply and about 2 million gallons per day was withdrawn for domestic and commercial uses. About 1 million gallons per day was pumped for industrial, mining, and thermoelectric-power uses, and about 100,000 gallons per day was withdrawn for agricultural purposes.
Water quality issues are of concern in the Grand Lake region because, as noted by the USFWS (n.d.) Karst environments are highly vulnerable to groundwater pollution. Water enters the groundwater systems rapidly as it passes through sinkholes and cracks and crevices in the ground surface, such as fractures in streambeds (i.e., losing streams), or fractured limestone under thin layers of permeable soils. Groundwater in karst areas can travel as quickly as a few thousand feet to over a mile per day. Degradation of sensitive, underground habitats and the associated groundwater can, therefore, occur rapidly in areas of karst topography. These and other characteristics of karst ecosystems make the underground environment relatively fragile and highly susceptible to disturbances.

Water quality of the Grand Watershed Planning Region is exemplified by the Grand (Neosho) River and its tributaries, and numerous minor and major water supply/flood control reservoirs. It is contained nearly equally in two adjacent ecoregions, the Central Irregular Plains (CIP) in the west and the Ozark Highlands in the east. A small portion of the Boston Mountains adjoins along the southern tip of the region.

The Osage Cuestas cover nearly a third of the region’s western geographical area drained by the Middle to Lower Neosho River and tributaries, including Big Cabin and Pryor Creeks. The area is an irregular plain, underlain by sandstone, shale, and limestone. It is dominated by rangeland and some cropland, interspersed with native tallgrass prairies and extensive, but disconnected oak-hickory forest. Typically, turbid and deep, streams meander in broad, low gradient valleys with incised banks. Habitat can be good, but in many areas is choked by mud/silt. The Neosho River intersects the area at the confluence of Big Cabin Creek, below Grand Lake. Also, a majority of the Hudson (Markham Ferry) and Fort Gibson Lake drainages are contained within the area. Salinity is moderate with mean conductivity ranging from 270 μS/cm (Neosho) to 530 μS/cm (Big Cabin). Reservoir salinity ranges from than 200 μS/cm to greater than 300 μS/cm. Streams are eutrophic, and total nitrogen (TN) and phosphorus (TP) values are moderate, with TP ranging from 0.18 (Pryor) to 0.30 ppm (Neosho) and TN from 0.89 (Pryor) to 1.79 ppm (Big Cabin). Reservoirs are phosphorus-limited, and Fort Gibson is eutrophic, while Hudson (Markham Ferry) is hyper-
eutrophic. In streams, water clarity is good on the Neosho (turbidity = 15 NTU) to fair (Big Cabin = 30 NTU) to poor (Pryor = 75 NTU). Lake clarity is average to good, with average Secchi depths of 65 (Hudson) to 80 cm (Fort Gibson). Ecological diversity varies throughout depending on habitat degradation and sedimentation and is typically lower than ecoregions to the east but higher than to the west.

This region is inundated in the north-central by the Cherokee Plains of the CIP. The area is much flatter than the Osage Cuestas and underlain mostly by poorly draining clay soils and hardpan. It is dominated by cropland, with interspersed native tallgrass prairie and sparse oak-hickory stands. In the northern part of the ecoregion, the Tar Creek superfund site is located in the Miami area. Streams are diverse through the ecoregion. They are wider and shallower and sand/clay dominated with some cobble/gravel. The area is typified by the upper Neosho River, and tributaries such as Tar Creek. Salinity is moderate with a typical conductivity mean of 358 μS/cm on the Neosho. Streams are typically eutrophic/hyper-eutrophic. The TP and TN means on the Neosho are 0.17-0.21 and 1.30-1.38 ppm, respectively. Stream water clarity is fair to poor, with turbidity means ranging from 37-52 NTU. Ecological diversity is average and impacted by poor habitat, sedimentation, and toxicity related to mine tailings.

The Ozark Highlands covers the eastern two-thirds of the area and is represented by two intermingled ecoregions—the Springfield Plateau (Plateau) and the Dissected Springfield Plateau-Elk River Hills (Dissected-Elk Hills). The Ozarks are comprised of a dissected plateau underlain by flat, cherty limestone, shale, and dolomite, and intersected by numerous level valleys. With much greater relief than the plains ecoregions to the west, it is much less rugged than the Boston and Ouachita Mountains to the south. Sub-surface flow is karst and numerous springs feed typically perennials streams. Dense oak-hickory-pine forests cover uplands, while native grasslands, hay fields, and pastureland are common in the low-lying valleys. Poultry feeding operations and intense sub-urbanization have become more prevalent and have negatively affected water quality. Increasing bank erosion has increased gravel loads to streams and created braided systems, with unstable pool habitats and extensive sub-surface flow. Despite extensive riparian disturbance, habitat degradation, and increasing nutrient loads, ecological diversity remains high, with several species of fish distinctive to the Ozarks in Oklahoma, including the shadow bass and northern hogsucker.

The main differences between the two ecoregions are greater forest density, more intense relief and dissection, and narrower valleys in the Dissected-Elk Hills. Representative Plateau streams include the middle Honey Creek, Neosho, Spring, and Elk Rivers. Grand and Hudson Lakes are representative Plateau lakes. Spring Creek exemplifies the Dissected-Elk Hills, as well as Eucha and Spavinaw Lakes and W.R. Holway Reservoir. Salinity is moderate in the Plateau with mean conductivity ranging from 200 (Spring River) to 545 μS/cm (Honey Creek), while lower in the Dissected-Elk Hills (Spring Creek = 154 μS/cm). Lakes typically range from 170 to nearly 400 μS/cm. In streams, nutrient concentrations range from lows of TP = 0.02 and TN = 0.63 ppm at Spring Creek, to highs of 0.21 (Spring River TP) and 2.86 ppm (Honey Creek TN). Trophic status in streams varies from oligotrophic (Spring and Honey Creeks) to mesotrophic (Neosho and Elk Rivers) to eutrophic (Spring River). Lakes are typically phosphorus limited and on the high end of mesotrophic to nearly hyper-eutrophic. Stream clarity ranges from good (Spring River = 18 NTU) to excellent, with turbidity means less than 3 at Elk River and Spring and Honey Creeks. Lake clarity is excellent at many lakes, with mean Secchi depths from 100
The Grand region is underlain by several major and minor bedrock and alluvial aquifers. Water from the Northern, Middle, and Lower Neosho River alluvial aquifers yield water that is generally hard, typically of a sodium/calcium bicarbonate type, and in some areas, exceeds drinking water standards. Alluvial aquifers are highly vulnerable to contamination from surface activities due to their high porosities and permeability and shallow water tables. However, alluvial water is generally suitable for most purposes. The major bedrock aquifer of the region is the Roubidoux. Part of the Ozark aquifer, the Roubidoux underlies nearly two-thirds of the region. Water is hard but generally has low total mineral content. However, in the far western portion of the aquifer, concentrations of chloride, sulfate, and fluoride exceed drinking water standards, and there is naturally occurring radioactivity in some areas. Large concentrations of gross-alpha radioactivity and radium-226 occur near the western edge and appear to be correlated with chloride concentrations. The aquifer is a confined aquifer and is not vulnerable to contamination from surface activities. Water from the adjacent minor Boone Formation is of good quality, but due to its lithology, the aquifer is susceptible to contamination from surface sources. Sinkholes and fractures provide direct conduits for precipitation and runoff to transport contaminants to the water table. Lead and zinc ores were mined from the Boone Formation in northeastern Oklahoma, southeastern Kansas, and southwestern Missouri from about 1890 to 1970. Water in the abandoned zinc and lead mines is contaminated with acid mine water.

Underground mining for lead and zinc by the room-and-pillar method began in 1891 and lasted through early 1970. As water filled the mines, the native sulfide minerals dissolved creating acid mine water. Acid mine drainage containing high concentrations of heavy metals began discharging into Tar Creek in 1979 from natural springs, boreholes, and open mine shafts. It is estimated that seventy six thousand (76,000) acre-feet of shallow ground water is contaminated, approximately 75 million tons of mining waste piles (known as “chat”) remain on the surface of the ground, and flotation ponds (wet or dry ponds containing mine tailings) cover approximately 800 acres. The chat contains heavy metal pollutants, such as lead, cadmium, and zinc.

The principal groundwater-bearing units within the Site are the Mississippian Boone Formation and the Cambro-Ordovician Roubidoux Formation. The headwaters of Tar Creek are located in...
Cherokee County, Kansas; the creek flows southward through the Site and into the Grand River. Lytle Creek is a major tributary of Tar Creek. The headwaters of Beaver Creek are located north of Quapaw; the creek flows through the Quapaw powwow grounds and into the Spring River. Tar Creek and Beaver Creek are impacted by contaminated mine drainage, and the entire site is located within the watershed of Grand Lake. Water impairments include surface water degradation by the discharge of acid mine water, and the threat of contamination of the Roubidoux aquifer by downward migration of acid mine water from the overlying Boone aquifer through abandoned wells connecting the two.

**Groundwater Protection**

The Oklahoma Water Quality Standards (OWQS) sets the criteria for protection of groundwater quality as follows: “If the concentration found in the test sample exceeds [detection limit], or if other substances in the groundwater are found in concentrations greater than those found in background conditions, that groundwater shall be deemed to be polluted and corrective action may be required.”

Wellhead Protection Areas are established by the Oklahoma Department of Environmental Quality (ODEQ) to improve drinking water quality through the protection of groundwater supplies. The primary goal is to minimize the risk of pollution by limiting potential pollution-related activities on land around public water supplies.

Oil and Gas Production Special Requirement Areas, enacted to protect groundwater and/or surface water, can consist of specially lined drilling mud pits (to prevent leaks and spills) or tanks whose contents are removed upon completion of drilling activities; well set-back distances from streams and lakes; restrictions on fluids and chemicals; or other related protective measures.

Nutrient-Vulnerable Groundwater is a designation given to certain hydrogeologic basins that are designated by the OWRB as having high or very high vulnerability to contamination from surface sources of pollution. This designation can impact land application of manure for regulated agriculture facilities.

Class 1 Special Source Groundwaters are those of exceptional quality and particularly vulnerable to contamination. This classification includes groundwaters located underneath watersheds of
Scenic Rivers, within OWQS Appendix B areas, or underneath wellhead or source water protection areas.

**Surface Water**

In addition to the issues related to ground water, there are serious issues related to surface water in northeastern Oklahoma (and beyond). Some of the concerns related to surface water in the Grand River corridor originate with the Superfund Site surrounding Tar Creek, which flows into the Spring River. Other concerns are related to dissolved oxygen, temperature, pH, and total nutrients. Numerous studies have been conducted on Grand Lake and Lake Spavinaw to increase the understanding of effects of human activity on surface water.

However, the summer of 2011 brought surface water quality into the forefront of discussion related to Grand Lake, recreational activity, and the economy. Blue-green algae blooms initiated closure of several recreation areas immediately before the July 4th holiday.

Blue-green algae exist in all surface water impoundments and are a natural component of aquatic ecosystems. The algae become a problem when they reproduce at an explosive rate. This is known as a “bloom.” These blooms are the result of nutrient enrichment, principally phosphorous, of the water.

Most blue-green algae blooms appear as surface sum, clumps (colonies) floating in the water, or simply a strong green color in the water. Very often, they are also accompanied by foul odors (septic, fishy, or petroleum-like odors are the most common). The algae are not evenly distributed throughout the water body and are moved about by the wind. The concentrations of algae in a particular area may vary on a daily, or even hourly, basis. The blue-green algae do not kill fish or affect the flesh of fish.

Blue-green algae are cyanobacteria and produce a toxin when they die. Swimming in an area with a moderate concentration of algae may result in a skin rash, itching, or respiratory difficulty. Ingestion of water with a high concentration of the algae may result in sickness. Further, ingestion of water with an extremely high concentration of blue-green algae toxins may, in extreme cases, result in death (Health warning, n.d.).

In 2011, the first major outbreaks of blue-green algae occurred in Horse Creek Cove north of Grand Lake State Park at Bernice. The immediate response in 2011 included announcements to “stay out of the water” in affected lakes and streams. During 2012, the various agencies responsible for communication regarding water quality had taken a broader educational approach.

Surface water quality remains an issue in all the waters associated with Grand Lake State Park. The following Beneficial Use Monitoring Program (BUMP) reports on these waters indicate that all surface waters associated with Grand Lake State Park are eutrophic at some time during the year – primarily during summer months between the Memorial Day to Labor Day holidays. Eutrophic waters are the ultimate host for algae blooms.

It should be noted that these BUMP reports indicate that waters in most areas of the Grand River corridor do not support full body contract recreation or there is inadequate information to make a recommendation. The Oklahoma Water Resources Board provides BUMP reports for approved uses of the water.
### Spring River at Quapaw

#### Sample Record
- **Times Visited:** 100
- **Station ID:** 121600070010-001AT
- **County:** Ottawa
- **Location:** East of the Town of Quapaw near State Highway 137
- **Latitude/Longitude:** 36.93462871, -94.74614371
- **Planning Watershed:** Grand (8-digit HUC -11070207)

#### Stream Data

<table>
<thead>
<tr>
<th>Parameter (Descriptions)</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Temperature (°C)</td>
<td>18.0</td>
<td>18.8</td>
<td>2.6/31.2</td>
<td>68.8% of values &gt;OWQS of 10</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>18</td>
<td>15</td>
<td>1/70</td>
<td></td>
</tr>
<tr>
<td>pH (units)</td>
<td>7.87</td>
<td>7.96</td>
<td>7.20/8.43</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen (ppm)</td>
<td>9.12</td>
<td>8.82</td>
<td>4.90/14.47</td>
<td></td>
</tr>
<tr>
<td>Hardness (ppm)</td>
<td>145.5</td>
<td>150.5</td>
<td>16.9/240.0</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids (ppm)</td>
<td>217.1</td>
<td>217.9</td>
<td>90.9/319.1</td>
<td></td>
</tr>
<tr>
<td>Specific Conductivity (μS)</td>
<td>342.5</td>
<td>340.6</td>
<td>142.0/827.0</td>
<td></td>
</tr>
<tr>
<td>Chloride (ppm)</td>
<td>14.4</td>
<td>12.1</td>
<td>5.0/34.5</td>
<td></td>
</tr>
<tr>
<td>Sulfate (ppm)</td>
<td>37.0</td>
<td>34.5</td>
<td>17.8/104.0</td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus (ppm)</td>
<td>0.212</td>
<td>0.216</td>
<td>0.000/0.454</td>
<td></td>
</tr>
<tr>
<td>Nitrate/Nitrite (ppm)</td>
<td>1.563</td>
<td>1.645</td>
<td>0.050/3.270</td>
<td></td>
</tr>
<tr>
<td>Chlorophyll A (mg/m²)</td>
<td>9.8</td>
<td>7.2</td>
<td>1.6/37.4</td>
<td>TSI=53.0</td>
</tr>
<tr>
<td>Fecal Coliform (cfu/100ml)*Geo. Mn.:</td>
<td>59.0*</td>
<td>40.0</td>
<td>&lt;10/3700</td>
<td></td>
</tr>
<tr>
<td>Enterococcus (cfu/100ml)*Geo. Mn.:</td>
<td>34.8*</td>
<td>10.0</td>
<td>&lt;10/33000 Mean&gt; OWQS of 33</td>
<td></td>
</tr>
<tr>
<td>E. Coli (MPN/100ml)*Geo. Mean</td>
<td>31.1*</td>
<td>20.0</td>
<td>&lt;10/3448</td>
<td></td>
</tr>
</tbody>
</table>

#### Beneficial Uses

- **Fish & Wildlife Propagation**: NS
- **Aesthetics**: S
- **Agriculture**: S
- **Primary Body Contact Recreation**: NS
- **Public & Private Water Supply**: S
- **Fish Consumption**: NS

**Notes**: Fish consumption not supporting for Thallium and Lead
Fish & Wildlife Propagation not supporting for Lead

---


---

**Figure 2.14 – Spring River BUMP report**
## Grand, Upper Lake (10-13)

### Sample Period
- October 2009 - July 2009

### Times Visited
- 4

### Sampling Sites
- 13

### General
- **Location**: Mayes County
- **Impoundment**: 1940
- **Area**: 1,820 acres
- **Capacity**: 13,900 acre-feet
- **Purposes**: Flood Control, Hydropower

### Parameter (Descriptions)

<table>
<thead>
<tr>
<th>Parameter (Descriptions)</th>
<th>Result</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Turbidity</td>
<td>32 NTU</td>
<td>87% of values &gt; OWQS of 25 NTU (n=18)</td>
</tr>
<tr>
<td>Average True Color</td>
<td></td>
<td>Did not collect for true color</td>
</tr>
<tr>
<td>Average Secchi Disk Depth</td>
<td>35 cm</td>
<td></td>
</tr>
<tr>
<td>Water Clarity Rating</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Trophic State Index</td>
<td>59</td>
<td>Previous value = 62</td>
</tr>
<tr>
<td>Trophic Class</td>
<td>Eutrophic</td>
<td></td>
</tr>
<tr>
<td>Salinity</td>
<td>0.10 – 0.25 ppt</td>
<td></td>
</tr>
<tr>
<td>Specific Conductivity</td>
<td>251 – 500.7 μS/cm</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>7.16 – 8.20 pH units</td>
<td></td>
</tr>
<tr>
<td>Oxidation-Reduction Potential</td>
<td>175 – 477 mV</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Up to 33% of water column &lt; 2.0 mg/L in August</td>
<td></td>
</tr>
<tr>
<td>Surface Total Nitrogen</td>
<td>0.71 mg/L to 1.94 mg/L</td>
<td></td>
</tr>
<tr>
<td>Surface Total Phosphorus</td>
<td>0.032 mg/L to 0.192 mg/L</td>
<td></td>
</tr>
<tr>
<td>Nitrogen to Phosphorus Ratio</td>
<td>12:1</td>
<td>Phosphorus limited</td>
</tr>
</tbody>
</table>

### Beneficial Uses

<table>
<thead>
<tr>
<th>Beneficial Uses</th>
<th>Turbidity</th>
<th>pH</th>
<th>Dissolved Oxygen</th>
<th>Metals</th>
<th>TOC</th>
<th>True Color</th>
<th>Sulfates</th>
<th>Chlorides</th>
<th>Total Dissolved Solids</th>
<th>En &amp; E coli</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish &amp; Wildlife Propagation</td>
<td>NS</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Primary Body Contact Recreation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEI</td>
</tr>
<tr>
<td>Public &amp; Private Water Supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- S = Fully Supporting
- NS = Not Supporting
- NEI = Not Enough Information
- * = Did not collect for these parameters

---


---

**Figure 2.15 – Upper Grand Lake BUMP report**
## Grand, Mid Lake (4-9)

### Sample Period
- October 2009 - July 2009
- Times Visited: 4
- Sampling Sites: 13

### General
- Location: Mayes County
- Impoundment: 1940
- Area: 1,820 acres
- Capacity: 13,900 acre-feet
- Purposes: Flood Control, Hydropower

### Parameters
#### Profile
- Average Turbidity: 14 NTU
- Average Secchi Disk Depth: 03 cm
- Water Clarity Rating: Average to good
- Trophic State Index: 60
- Trophic Class: Eutrophic

#### Nutrients
- Salinity: 0.10 – 0.20 ppt
- Specific Conductivity: 247 – 368 μS/cm
- pH: 7.02 – 8.84 pH units
- Oxidation-Reduction Potential: Up to 59% of water column < 2.0 mg/L in July
- Dissolved Oxygen: Occurred at site 7
- Surface Total Nitrogen: 0.72 mg/L to 2.18 mg/L
- Surface Total Phosphorus: 0.038 mg/L to 0.147 mg/L
- Nitrogen to Phosphorus Ratio: 15:1

### Beneficial Uses
- Fish & Wildlife Propagation
- Aesthetics
- Agriculture
- Primary Body Contact Recreation
- Public & Private Water Supply

### Notes/Comments
- 17% of values > OWQS of 25 NTU (n=24)
- Did not collect for true color
- Previous value = 60
- Phosphorus limited

---


---

Figure 2.16 – Mid-Grand Lake BUMP report

---

70
### Honey Creek at Grove

#### Sample Record
- **Times Visited**: 167
- **Station ID**: 12160303290-001AT
- **County**: Delaware
- **Location**: Southeast of the city of Grove on County Road N4670
- **Latitude/Longitude**: 36.5477/3713.94.1207/2263
- **Planning Watershed**: Grand (8-digit HUC - 11070206)

#### Stream Data

<table>
<thead>
<tr>
<th>Parameter (Description)</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Temperature (°C)</td>
<td>16.4</td>
<td>16.6</td>
<td>5.2/25.4</td>
<td></td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>3</td>
<td>2</td>
<td>1/8</td>
<td></td>
</tr>
<tr>
<td>pH (units)</td>
<td>7.72</td>
<td>7.70</td>
<td>7.00/8.60</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen (ppm)</td>
<td>9.32</td>
<td>8.80</td>
<td>4.38/14.60</td>
<td></td>
</tr>
<tr>
<td>Hardness (ppm)</td>
<td>155.5</td>
<td>155.0</td>
<td>17.5/260.0</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids (ppm)</td>
<td>348.4</td>
<td>317.8</td>
<td>151.0/665.6</td>
<td></td>
</tr>
<tr>
<td>Specific Conductivity (μS)</td>
<td>544.0</td>
<td>498.5</td>
<td>237.0/1040.0</td>
<td></td>
</tr>
<tr>
<td>Chloride (ppm)</td>
<td>70.8</td>
<td>75.3</td>
<td>14.0/148.0</td>
<td></td>
</tr>
<tr>
<td>Sulfate (ppm)</td>
<td>46.1</td>
<td>44.0</td>
<td>12.8/112.0</td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus (ppm)</td>
<td>0.067</td>
<td>0.067</td>
<td>0.025/0.371</td>
<td></td>
</tr>
<tr>
<td>Nitrate/Nitrite (ppm)</td>
<td>2.643</td>
<td>2.690</td>
<td>0.680/4.810</td>
<td></td>
</tr>
<tr>
<td>Chlorophyll A (mg/m³)</td>
<td>2.3</td>
<td>0.7</td>
<td>0.1/17.9</td>
<td>TSI=38.9</td>
</tr>
<tr>
<td>Fecal Coliform (cfu/100mL)(&lt;Geo. Mn.)</td>
<td>154.0*</td>
<td>155.0</td>
<td>&lt;10.0/1600</td>
<td></td>
</tr>
<tr>
<td>Enterococcus (cfu/100mL)(&lt;Geo. Mn.)</td>
<td>82.9*</td>
<td>84.5</td>
<td>25.0/327.0</td>
<td></td>
</tr>
<tr>
<td>E. Coli (MPN/100mL)(&lt;Geo. Mean)</td>
<td>131.3*</td>
<td>135.0</td>
<td>20.0/80.0</td>
<td>Mean&gt; OWQS of 126</td>
</tr>
</tbody>
</table>

#### Nutrients
- **Beneficial Uses**
  - Fish & Wildlife Propagation
  - Aesthetics

#### Bacteria
- **Beneficial Uses**
  - Primary Body Contact Recreation
  - Public & Private Water Supply
  - Fish Consumption

---

**Figure 2.17 – Honey Creek arm BUMP report**
## Lower Grand Lake BUMP report

### Grand, Lower Lake (1-3)

<table>
<thead>
<tr>
<th>Sample Period</th>
<th>Times Visited</th>
<th>Sampling Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 2008 - July 2009</td>
<td>4</td>
<td>13</td>
</tr>
</tbody>
</table>

**General**

- **Location**: Mayes County
- **Impoundment**: 1940
- **Area**: 1,820 acres
- **Capacity**: 13,900 acre-feet
- **Purposes**: Flood Control, Hydropower

<table>
<thead>
<tr>
<th>Parameter (Description)</th>
<th>Result</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Turbidity</td>
<td>6 NTU</td>
<td>100% of values &lt; OWQS of 25 NTU (n=12)</td>
</tr>
<tr>
<td>Average True Color</td>
<td></td>
<td>Did not collect for true color</td>
</tr>
<tr>
<td>Average Secchi Disk Depth</td>
<td>110 cm</td>
<td></td>
</tr>
<tr>
<td>Water Clarity Rating</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>Trophic State Index</td>
<td>56</td>
<td>Previous value = 50</td>
</tr>
<tr>
<td>Trophic Class</td>
<td>Eutrophic</td>
<td></td>
</tr>
</tbody>
</table>

**Parameters**

<table>
<thead>
<tr>
<th>Profile</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salinity</td>
<td>0.10 – 0.20 ppt</td>
</tr>
<tr>
<td>Specific Conductivity</td>
<td>208 – 369 µS/cm</td>
</tr>
<tr>
<td>pH</td>
<td>6.76 – 8.63 pH units</td>
</tr>
<tr>
<td>Oxidation-Reduction Potential</td>
<td>66 – 591 mV</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Up to 53% of water column in the Fall &amp; up to 68% &lt; 2.0 mg/L in July</td>
</tr>
</tbody>
</table>

**Nutrients**

- **Surface Total Nitrogen**: 0.73 mg/L to 1.68 mg/L
- **Surface Total Phosphorus**: 0.029 mg/L to 0.092 mg/L
- **Nitrogen to Phosphorus Ratio**: 17:1
  - Phosphorus limited

### Beneficial Uses

- **Fish & Wildlife Propagation**: S, S, NS, *
- **Aesthetics**: S
- **Agriculture**: *
- **Primary Body Contact Recreation**: NEI
- **Public & Private Water Supply**: S

*S = Fully Supporting, NS = Not Supporting, NEI = Not Enough Information

*Did not collect for these parameters

**Sampling and Assessment by the Oklahoma Water Resources Board**
# Hudson, Upper (5-8)

## Sample Period
- November 2008 - August 2009

## Times Visited
- 4

## Sampling Sites
- 8

## General
- **Location**: Mayes County
- **Impoundment**: 1984
- **Area**: 10,900 acres
- **Capacity**: 200,300 acre-feet
- **Purposes**: Flood Control, Hydropower

## Parameter (Description) - Result - Notes/Comments

<table>
<thead>
<tr>
<th>Parameter (Description)</th>
<th>Result</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Turbidity</td>
<td>13 NTU</td>
<td>100% of values &lt; OWQS of 25 NTU (n=15)</td>
</tr>
<tr>
<td>Average True Color</td>
<td></td>
<td>Did not collect for true color</td>
</tr>
<tr>
<td>Average Secchi Disk Depth</td>
<td>66 cm</td>
<td></td>
</tr>
<tr>
<td>Water Clarity Rating</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Trophic State Index</td>
<td>54</td>
<td>Previous value = 58</td>
</tr>
<tr>
<td>Trophic Class</td>
<td>Eutrophic</td>
<td></td>
</tr>
<tr>
<td>Salinity</td>
<td>0.10 – 0.14 ppt</td>
<td></td>
</tr>
<tr>
<td>Specific Conductivity</td>
<td>243 – 283 μS/cm</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>7.04 – 8.50 pH units</td>
<td></td>
</tr>
<tr>
<td>Oxidation-Reduction Potential</td>
<td>373 – 567mV</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Up to 13% of water column &lt; 2.0 mg/L in August</td>
<td></td>
</tr>
<tr>
<td>Surface Total Nitrogen</td>
<td>0.52 mg/L to 1.57 mg/L</td>
<td></td>
</tr>
<tr>
<td>Surface Total Phosphorus</td>
<td>0.040 mg/L to 0.120 mg/L</td>
<td></td>
</tr>
<tr>
<td>Nitrogen to Phosphorus Ratio</td>
<td>12:1</td>
<td>Phosphorus limited</td>
</tr>
</tbody>
</table>

## Benefits

- **Fish & Wildlife Propagation**: S S S *
- **Aesthetics**: S *
- **Agriculture**: *
- **Primary Body Contact Recreation**: NEI
- **Public & Private Water Supply**: NEI

## Beneficial Uses

- **Click to learn more about Beneficial Uses**

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Turbidity</th>
<th>pH</th>
<th>Dissolved Oxygen</th>
<th>Metals</th>
<th>TOC</th>
<th>True Color</th>
<th>Sulphates</th>
<th>Chlorides</th>
<th>Total Dissolved Solids</th>
<th>E. coli</th>
<th>Chlorophyllae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish &amp; Wildlife Propagation</td>
<td>S</td>
<td>S</td>
<td>S S S *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>S</td>
</tr>
<tr>
<td>Primary Body Contact Recreation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEI</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- *S* = Fully Supporting
- *NS* = Not Supporting
- *NEI* = Not Enough Information
- *Did not collect for these parameters*

**NTU** = nephelometric turbidity units  
**μS/cm** = micromhos per centimeter  
**mV** = millivolts  
**mg/L** = milligrams per liter  
**Chlorophyll-a** = Chlorophyll-a


---

**Figure 2.19 – Upper Lake Hudson BUMP report**
## Hudson, Lower (1-4)

<table>
<thead>
<tr>
<th>Sample Period</th>
<th>Times Visited</th>
<th>Sampling Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2008 - August 2009</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

### General
- **Location**: Mayes County
- **Impoundment**: 1964
- **Area**: 10,900 acres
- **Capacity**: 200,300 acre-feet
- **Purposes**: Flood Control, Hydropower

### Parameters
#### Profile
- **Salinity**: 0.10 – 0.14 ppt
- **Specific Conductivity**: 241 – 287.6 μS/cm
- **pH**: 7.00 – 8.16 pH units
- **Oxidation-Reduction Potential**: 384 – 535mV
- **Dissolved Oxygen**: Up to 11% of water column < 2.0 mg/L in August
- **Trophic State Index**: 54
  - Previous value = 58
- **Trophic Class**: Eutrophic

#### Nutrients
- **Surface Total Nitrogen**: 0.55 mg/L to 1.92 mg/L
- **Surface Total Phosphorus**: 0.048 mg/L to 0.120 mg/L
- **Nitrogen to Phosphorus Ratio**: 13:1
  - Phosphorus limited

### Beneficial Uses
- **Fish & Wildlife Propagation**
  - *: Fully Supporting
  - #: Not Supporting
- **Aesthetics**: *
- **Agriculture**: *
- **Primary Body Contact Recreation**: NEI
- **Public & Private Water Supply**

### Notes/Comments
- Average Turbidity: 13 NTU
  - 100% of values < OWQS of 25 NTU (n=16)
- Average True Color: Did not collect for true color
- Water Clarity Rating: Average

---


---

**Figure 2.20 – Lower Lake Hudson BUMP report**
Figure 2.21 – Lake Spavinaw BUMP report
Vegetative Cover

The Ozark Plateau is in the Eastern Tallgrass Prairie Conservation Region (Manders, 2007). The Ozark portion is a mixture of prairie, woodlands and forests. Tallgrass prairie and some sandstone and limestone glades have been found on uplands. Some areas contain native rangeland grass species such as big bluestem, little bluestem, Indian grass and porcupine grass. Forests include oaks, hickories, other trees and shrubs covering most of the hillsides. Pecan, Shumard oak, pin oak, white sassafras, and river birch grow along rivers and streams. Flowering dogwood thrives on uplands and some uplands include large manmade clearings. Most prairies have been cleared. Low-lying lands surrounding Spring River support many different species of plants.

Wildlife

Traditionally the Ozark Plateaus Ecoregion extends through Missouri, Arkansas, Oklahoma and Kansas. The limestone geology of the ecoregion results in abundance of karst caves and underground spaces and passageways. These underground habitats are characterized by a suite of crustacean and salamander inhabitants, which can be observed and sampled in caves, where humans can enter these habitats, and in springs, where underground waters reach the surface.

Subterranean Ozark habitats support a number of endemic aquatic crustaceans and have a diverse salamander fauna. Most of the aquatic crustaceans show the typical troglobitic features: reduced eyes, reduction or loss of pigmentation, attenuation of antennae, legs and sensory hairs, and well developed tactile and chemical sensory systems. Some epigean forms can also be found.

Troglobitic crayfish, isopods and amphipods in the Ozarks (and in other karst areas) are often known from small geographic areas; often from a single cave or a few clustered caves. Salamanders of the Ozark underground tend to have ranges covering the ecoregion and extending beyond the borders, although there is one endemic, *Typhlotriton spelaeus*.

Potential threats to subterranean karst dwellers include toxic and organic pollutants, hydrologic changes (for example, by changes in land use in the aquifer recharge zone), and direct and indirect disturbance by humans using caves. In the Ozark Plateau area of Oklahoma, the most serious threat is organic pollution that can enter the aquifer from hog and chicken farms in the area.

The Oklahoma Department of Wildlife and Conservation (ODWC, 1993) reports that 311 vertebrate species are native to the Ozark Highlands ecoregion. Three have been extirpated, and 10 have been introduced. Further, 327 vertebrate species are native to Central Irregular Plains; 6 of those have been extirpated and 12 introduced.

The USFWS maintains records of species of concern, and that information, combined with that from ODWC, includes endangered, threatened, and other statuses of various wildlife species. Threatened or endangered species that may be present in the County and State are listed on the federally-listed endangered, threatened, proposed and candidate species inventory prepared by the US Fish and Wildlife Service, Oklahoma Ecological Services (Wildlife Service). According to the Wildlife Service, the following species are classified as follows:

- American Burying Beetle – Endangered
- American Peregrine Falcon – Recovery
- Eskimo Curlew – Endangered [Possibly extinct]
- Interior Least Tern – Endangered
- Whooping Crane – Endangered
- Piping Plover – Threatened
- Neosho Mucket Mussel – Candidate
- Sprague’s Pipit – Candidate
- Arkansas Darter – Candidate
- Ozark Big-Eared Bat – Endangered
- Ozark cavefish – Threatened
- Gray bat – Endangered

The Grand Lake area in Oklahoma is home to several threatened, endangered, or candidate species of wildlife. The two endangered species include the interior least tern (Sterna antillarum) and the whooping crane (Grus Americana). The piping plover (Charadrius melodus) is designated as a threatened species and the mountain plover (Charadrius montanus) is a candidate for the federally threatened designation.

**American Burying Beetle (Nicrophorus americanus)**

The American burying beetle (ABB) is a large (0.98-1.4 inches) shiny black beetle, has hardened protective wing covers (elytra) that meet in a straight line down the back. Each elytron has 2 scalloped shaped orange-red markings. The most diagnostic feature is the large orange-red marking on the raised portion of the pronotum (shield over the mid-section between head and wings), which is circular in shape with flattened margins and raised central portion. Has orange-red frons (a mustache-like feature) and single orange-red marking on top of head (triangular in females and rectangular in males), large antennae with notable orange clubs at tips.

The American Burying Beetle is federally-listed as endangered (54 FR 29652; July 13, 1989). Critical habitat has not been designated. At the time of listing in 1989, there were only two known populations, one in Oklahoma and one in Rhode Island.

The ABB is currently restricted to the eastern and western extremities of its historic range, ABB have disappeared from over 90% of their historic range. Habitat loss, alteration, and degradation have been attributed to the decline. In Oklahoma, ABB is currently known to occur in over 21 counties. Of particular concern for ABB conservation is earth disturbances from construction projects because ABB are usually underground or under leaf litter during the daytime and can easily be killed if soil is compacted or removed.

The ABB is an annual species (lives for just one year), nocturnal (active only at night), a strong flier, usually reproduces only once, and undergoes complete metamorphosis. ABB is active in summer and inactive during winter. During winter months when temperatures are below 60°F (15°C) ABB bury their bodies in the soil to overwinter. When temperatures are above 60°F
(15°C) they emerge from the soil and begin mating and reproduction. ABB are scavengers dependent on carrion for their life cycle and must compete with vertebrate and other invertebrate species for carrion. Reproduction involves burying a small vertebrate carcass (1-9 ounces; 35-250 grams), laying eggs beside the carcass, then larvae feeding on the carcass until mature. Both parents provide care to their young.

**Least Tern (Interior Population *Sterna antillarum*)**

The least tern is the smallest member of the tern family at about 9 inches long (23 cm) with a wingspan of 20 inches (50 cm). They have a grayish back and wings, and snowy white undersides. Least terns have a forked tail and narrow pointed wings. They can be distinguished from all other terns by their combination of a black crown, white forehead, and a variable black-tipped yellow bill. First-year birds have a dark bill, a dark gray eye stripe, and a dusky brown cap.

Formerly the major river systems of the Midwestern United States served as habitats for the Least Tern. These rivers included the Red, Rio Grande, Arkansas, Missouri, Ohio, and Mississippi river systems. Currently, they occur as small remnant colonies throughout their former range. In Oklahoma, least terns nest along most of the larger rivers.

Least terns arrive at breeding sites from late April to early June where they typically spend four to five months. Pairs go through an elaborate courtship period that includes courtship feedings and a variety of postures and vocalizations. Least terns nest in small colonies on exposed salt flats, river sandbars, or reservoir beaches. Nests are small scrapes in the sand, and usually two or three eggs are laid. The young are fairly mobile soon after hatching. Both parents feed the young and remain with them until fall migration. Least terns will travel four or more miles (6+ km) from their breeding colonies to find the small fish that make up the major part of their diet.

The least tern was federally listed as an endangered species on May 28, 1985 (50 FR 21784). Least terns have declined due to habitat loss from permanent flooding by reservoirs and channelization projects, unpredictable water discharge patterns, and overgrowth of brush and trees. The recreational use of sandbars by humans is a major threat to the tern’s reproductive success. Population declines of least terns have been attributed to habitat loss or degradation where dams, reservoirs, and other changes to river systems have eliminated most historic least tern habitat. Narrow forested river corridors have replaced the wide channels dotted with sandbars that are preferred by the terns. In addition, recreational activities on rivers and sandbars disturb the nesting terns, causing them to abandon their nests. ATVs, hiking, picnicking, boating and swimming on or near sandbars where birds nest is not advised.

**Whooping Crane (*Grus americanas*)**

At 5 feet (1.5 m), the whooping crane is the tallest American bird. It is a snowy white, long-necked bird with long legs. Its black primary feathers show only during flight. Adults have a red crown and a patch of black feathers below the eye. Young are whitish overall, but have a rusty-colored head and neck.

Whooping cranes pass through Oklahoma each spring and fall during migration. During migration, whooping cranes sometimes are sighted in Oklahoma along rivers, in grain fields, or in shallow wetlands. Whooping cranes primarily use shallow,
seasonally and semi permanently flooded palustrine wetlands and various cropland and emergent wetlands.

The whooping crane is a bi-annual migrant, traveling between its summer habitat in central Canada, and its wintering grounds on the Texas coast, across the Great Plains of the U.S. in the spring and fall of each year. Autumn migration normally begins in mid-September, with most birds arriving on the Texas wintering grounds between late October and mid-November. Spring migration departure dates are normally between late March and mid-April, with the last birds usually leaving by May 1. Whooping cranes migrate south as singles, pairs, in family groups, or as small flocks of 3 to 5 birds. They are diurnal migrants and stop daily to feed and rest. Whooping cranes eat a variety of things, including insects, frogs, small birds, rodents, minnows, and waste grains.

By the mid-1940s, only 15 whooping cranes were present in the wild. The whooping was federally listed as an endangered species on March 11, 1967 (32 FR 4001). An intensive captive-breeding program and careful protection of wild flocks have slowly increased the number in the wild to more than 120. Whooping cranes have declined primarily because of loss of wintering and breeding habitat. Current threats to wild cranes include collisions with manmade objects such as power lines and fences, shooting, predators, disease, habitat destruction, severe weather, and a loss of two thirds of the original genetic material.

**Piping Plover (Charadrius melodus)**

The piping plover is a 5-inch long pale grayish-brown shorebird with a white breast. During the breeding season, it has a black breast band that is sometimes incomplete and a black bar between its eyes. The bill is dull orange with a black tip and the legs and feet are orange.

Piping plovers occur in three disjunct populations in North America: Northern Great Plains, Great Lakes, and Atlantic Coast. This species migrates through Oklahoma each spring and fall.

In Oklahoma, the piping plover is a biannual migrant, traveling between its nesting habitat to the north of Oklahoma (the Great Plains population nests from Kansas to southern Canada), and its wintering grounds on the gulf coast.

Migration through Oklahoma is likely to occur from March-May and July-September. Piping plovers usually migrate as individuals or small groups and may be seen along sandbars of major rivers, salt flats, and mudflats of reservoirs. Piping plovers forage on these shoreline habitats and eat small invertebrates.

The Great Plains population of piping plover was federally listed as a threatened species on December 11, 1985 (50 CFR 21784). There is no designated critical habitat for piping plovers in Oklahoma. Conservation of this species has focused on breeding and wintering habitat and relatively little is known about the habitat used during migration. During migration, piping plovers have been documented in many areas of Oklahoma from the panhandle to the eastern border and probably migrate through or over all of Oklahoma.
Gray Bat (*Myotis grisescens*)

The gray bat is a medium-sized bat with an overall length of about 3.5 inches and a wingspan of 10 - 11 inches. Weights range between approximately 7 - 16 grams. The gray bat can be distinguished from other species in the genus *Myotis* by the uniform color of its dorsal fur in which hair shafts are the same color from base to tip. The dorsal fur is gray, but often bleaches to reddish-brown by early summer. Additionally, the wing membrane attaches at the ankle of the foot instead of at the base of the toes as in other members of the genus *Myotis*.

The gray bat occurs in limestone karst areas (i.e., a landscape marked by caves, sinkholes, springs and other features) of the southeastern and midwestern United States. In Oklahoma, it occurs in the Ozark Highlands ecoregion in the northeastern part of the state.

Gray bats inhabit caves year-round. They are known to migrate up to 300 miles between summer and winter caves. Gray bats have such specific cave requirements that fewer than five percent of caves are suitable. Winter hibernation sites typically are deep vertical caves that trap large volumes of cold air. Summer caves must be warm or have restricted rooms that can trap the body heat of clustered bats. Gray bats mate in the fall when they begin to arrive at hibernacula. During hibernation, the species typically forms large clusters with some aggregations numbering in the hundreds of thousands of individuals. It is estimated that 90 percent of the species range-wide population hibernates in only nine caves. No hibernating colonies are known from Oklahoma. Adult females begin to emerge from hibernation in late March, followed by juveniles and adult males. Females become pregnant after emerging in the spring, and form maternity colonies in caves of a few hundred to many thousands of individuals. Gray bat summer colonies typically use several roosting caves located along a stream, river, or reservoir.

Within Oklahoma, maternity colonies are known from caves in Adair, Cherokee, Delaware, and Ottawa counties. A single offspring is born in late May or early June. Newborns typically become volant within 21-33 days after birth. Gray bats feed on flying insects over bodies of water including rivers, streams, and lakes. Mayflies, caddisflies, and stoneflies make up the major part of their diet, but beetles and moths also are consumed.

The gray bat was federally-listed as endangered on April 28, 1976. The gray bat has declined primarily due to human disturbance in caves. Habitat loss and degradation and contamination from pesticides also are considered a cause of decline. Natural flooding and impoundment of waterways has resulted in temporary impacts to some caves and the complete submersion and loss of other important cave sites. Conservation efforts include protecting known gray bat caves and wooded riparian corridors along streams near caves. Recovery efforts also include educating the public about the danger of disturbing bats and their ecological importance.
Ozark Big-eared Bat (*Corynorhinus townsendii ingens*)

USFWS. OK Ecological Services Field Office. 2011.

The Ozark big-eared bat is a medium-sized bat with distinctively large ears (1.2 – 1.5-inches long). Prominent lumps occur on either side of the face. The long fur is light to dark brown on the back and paler tan underneath. The bat is about 3.5 – 4.5 inches long, has a wingspan of 12 – 13 inches, and weighs from 5 – 13 grams.

The current range of the Ozark big-eared bat includes the Ozark Highlands and Boston Mountains ecoregions of northeastern Oklahoma and northwestern and north-central Arkansas. The population is estimated to currently consist of about 1,800 individual bats. The Ozark big-eared bat inhabits caves year-round. The caves typically are located in oak-hickory hardwood forests. Ozark big-eared bats mate during fall and winter. Colonies typically begin to form at hibernacula in October and November. Both sexes hibernate together in clusters that typically range from 2 – 135 individuals. Hibernating colonies gradually begin to break up in spring from April through May. Females also become pregnant during this time and slowly begin to congregate at warm maternity caves to give birth and rear their young over the summer. The formation of maternity colonies usually occurs between late April and early June. Ozark big-eared bats generally return to the same maternity caves each year. Females give birth to a single offspring in May or June after a two-three month gestation period. Young bats grow quite rapidly and are capable of flight at three weeks and are weaned by six weeks. Maternity colonies usually begin to break up in August. Males are solitary during the summer maternity period. The Ozark big-eared bat typically forages in edge and forested habitats. They primarily feed on moths, but also are known to eat beetles and other flying insects.

The Ozark big-eared bat was federally-listed as endangered on November 30, 1979 due to its small population size, reduced and limited distribution, and vulnerability to human disturbance. Threats to the Ozark big-eared bat include vandalism and human disturbance at maternity roosts and hibernacula, and the loss and fragmentation of foraging habitat. Conservation efforts include locating and protecting caves known to be used by the Ozark big-eared bat and foraging habitat around the caves. Recovery efforts also include educating the public about the danger of disturbing bats and their ecological importance.

Ozark Cavefish (*Amblyopsis rosae*)

Ozark cavefish are small fish reaching a total length of about two inches. The fish are true troglobites or obligatory cave inhabitants, and live most of their life in total darkness. They have only rudimentary eyes and no optic nerve. They also lack pigment, but appear pinkish-white because their translucent skin reveals blood and organs.

The species occurs in caves within the Springfield Plateau of the Ozark Highlands in northwest Arkansas, southwest Missouri, and northeast Oklahoma.
Knowledge of cavefish life history is limited. The species is believed to have low reproductive capacity and to be slow to reproductive maturity. Only about 20 percent of the population is believed to breed in any given year. Infrequent reproduction may be an adaptation to a limited food supply which is typical of cave environments. The size and shape of the gill chamber indicate that the species may be a gill chamber brooder. The Ozark cavefish is considered the most adapted of all the cavefish for cave life due to well-developed sensory papillae. They tend to occur in caves with groundwater recharge and generally are acknowledged to be a groundwater obligate. Ozark cavefish occur in flowing cave streams with chert rubble substrate and pool areas. They also have been found in wells and sinkholes. This species primarily feeds on small crustaceans such as copepods, isopods, and amphipods. Cavefish also prey upon small crayfish, oligochaetes (e.g., segmented worms), small salamanders, and salamander larvae.

The Ozark cavefish was listed as threatened on November 1, 1984 due to habitat alteration and over-collecting. In the past, removal for scientific purposes and the aquaria trade had a demonstrated impact. Habitat degradation and pollution due to agricultural activities and development currently are considered primary threats to the Ozark cavefish. Conservation efforts include protecting caves used by the cavefish and the recharge area (the area involved with input of water into the cave system) of these caves. Recovery efforts also include educating the public about the sensitive nature of cave ecosystems, the highly specialized and often rare fish and wildlife species that inhabit caves, and land use practices that help prevent pollution of caves.

Accessibility

The Oklahoma State Parks Division strives for accessibility for those with disabilities in all its park locations and facilities and has an access plan for the Division. Many parks and facilities were designed and constructed before the passage of the 1990 Americans with Disabilities Act (ADA), and well before the Americans with Disabilities Act Accessibility Guidelines (ADAAG) were developed. Further, by its very nature, the natural environment may not lend itself to easy access for those with mobility impairments.

The technical provisions of the ADA permit deviation from the stated guidelines. These provisions allow deviation from full compliance if accessibility cannot be provided because (1) compliance would cause substantial harm to cultural, historic, religious or significant natural features or characteristics; (2) substantially alter the nature of the setting or purpose of the facility; (3) require construction methods or materials that are prohibited by federal, state or local regulations or statutes; or (4) would not be feasible due to terrain or the prevailing construction practices.

In 2007, the United States Access Board issued a Notice of Proposed Rule Making (NPRM) for outdoor developed areas. These rules and their associated interpretations have direct bearing on the consideration of access in Grand Lake State Park. The minimum requirements found in the NPRM for outdoor developed areas are based on several principles developed through the regulatory negotiating process. They include (U.S. Access Board, 2009):

1. Protect the resource and environment
2. Preserve the experience
3. Provide for equality of opportunity
4. Maximize accessibility
5. Be reasonable
6. Address safety
7. Be clear, simple, and understandable
8. Provide guidance
9. Be enforceable and measurable
10. Be consistent with Americans with Disabilities Act Accessibility Guidelines (as much as possible)
11. Be based on independent use by persons with disabilities

Grand Lake State Park has relatively few trails developed in any of the various locations. However, several of the roadways function in much the same way as trails. Any one designated trail may make use of all or several surface types. If major trail redesign or construction were to occur, it would be important to ensure compliance with the ADA standards where appropriate. The NPRM addresses ten provisions that must be considered related to trail accessibility. These provisions are:

1. Surface – must be firm and stable
2. Clear tread width – minimum of 36 inches
3. Openings in surface – may not permit passage of sphere one-half inch in diameter
4. Protruding object – minimum of 80” of clear headroom above the trail
5. Tread obstacles – cannot exceed a maximum of two inches
6. Passing space – minimum of 60” by 60” at intervals of 1000’ or less
7. Slope – addresses cross slope and running slope
8. Resting intervals – at least 60” in width
9. Edge protection – not necessarily required, but may be provided
10. Signage – information on distance and departure from technical provisions

An example of possible signage for trails as suggested by the National Center on Accessibility is shown in Figure 2.28. As of 2010, no specific signs have been designated for universal communication related to accessible trails. However, these signs communicate the concept of accessibility in outdoor developed recreation spaces that include trails.

Other considerations related to access for persons with disabilities include “Braille trail” concepts that allow persons with visual limitations to enjoy the features of a trail. This is particularly true if the trail is interpretive in nature, with signs communicating information related to natural, cultural, historic, or other significant topics related to the park environment.

In an effort to fully disclose the extent of accessibility within state parks, the Oklahoma State Park Division developed terms to describe...
two levels of access; these terms are used in State Parks publications: *accessible* and *usable*.

*Accessible* indicates that the park “substantially complies with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). The facility is connected with a barrier-free-route-of-travel from an accessible parking area.”

*Usable* indicates that the “facility allows significant access. Some individuals with disabilities may have difficulty and need assistance. Due to topography and the primitive nature of some sites, parking and connecting routes may not be accessible to all with disabilities” (OTRD, 2007).

OTRD began development of the properties at Grand Lake State Park before the passage of the ADA; thus, many of the established structures do not meet the explicit requirements of the law. In several locations, OTRD has added accessible restrooms, developed hard surface campsites, installed walkways, and made other efforts to improve accessibility. However, the number of designated accessible campsites and parking spaces in several locations are inadequate. In other settings, the restrooms are not accessible. The existing trails in these properties are not currently accessible trails, and such modification may not be desirable. The natural terrain varies considerably and is quite rocky; in addition, the environment includes vulnerable animal species. Thus, ADAAG-defined accessibility to every area of the park is not practical, nor necessarily desirable.

Throughout Grand Lake State Park, it will be necessary to complete a thorough review of accessibility, particularly on several of the older playgroups. In addition and in light of continuous updating, new rule-making, and interpretation of rules on-going vigilance related to accessibility is required.

An example of this rule-making and interpretation took effect March 15, 2011 under the Department of Justice ruling that specified “other power-driven mobility devices” (OPDMD) that could be used on trails by individuals with mobility limitations. At present, the expectation is that the operating entity (OTRD) shall “make reasonable modifications in policies, practices, or procedures to permit the use of other power-driven mobility devices by individuals with mobility disabilities, unless the public entity can demonstrate that the class of OPDMD cannot be operated in accordance with legitimate safety requirements that the public entity has adopted based on actual risks” (American Trails, 2011). For Grand Lake State Park, it will be necessary to review policies related to ATVs and ORVs that are utilized on roadways.
Chapter 3 – Current Status of the Resource

Recreational Development

The properties that are included in Grand Lake State Park today were previously managed as several separate state park properties. These properties were known as Spring River Canoe Trails, Bernice, Honey Creek, Little Blue, Disney, Snowdale, Cherokee I, II and III, Spavinaw, and Twin Bridges.

Located in Oklahoma’s Green Country, Grand Lake State Park is a historic, economic, natural, and recreational resource. Management of Grand Lake State Park encompasses operation of a complex facility including lodging, food services, air transportation, roads and vehicular transportation, boating, and a wide range of recreational experiences and amenities.

The map below, Figure 3.1, provides an overview of the properties that make up Grand Lake State Park and the relative locations of those properties. The park has access to Grand Lake o’ the Cherokees with 46,500 surface acres of water, Lake Hudson with 12,000 surface acres of water, and Lake Spavinaw with 1,636 surface acres of water. The park has access to numerous other rivers, creeks, and streams that are in or flow through the three-county area.
Grand Lake State Park includes a golf course, marinas, numerous campgrounds, and other facilities. These facilities are detailed in the following discussion. For ease of presentation, the discussion and presentation begins at the northeast portion of Grand Lake State Park and proceeds southwesterly along the Grand River corridor.

For visitors entering Grand Lake State Park, frequently used access routes vary within the northeastern area of Oklahoma. For many visitors, using I-44 allows for easy connections and access to U.S and Oklahoma highways. These highways enable access to the various properties of Grand Lake State Park. Specific access to each property within Grand Lake State Park is discussed within the property descriptions.

**Grand Lake State Park at Spring River Canoe Trails**

Spring River Canoe Trails, formerly managed under Twin Bridges State Park, is on the Spring River. Spring River is one of the two rivers that merge to form the Grand River. Spring River Canoe Trails offers access to over 20 miles of canoe trails or blueways with two canoe ramps located within the park area. Spring River Canoe Trails has 38 unimproved campsites (although officially day-use only), a group shelter, and 20 picnic tables available for day users. Anglers have the opportunity of access to Spring River, known as a good fishing spot.
Figure 3.3 – Detail of Grand Lake State Park – Spring River Canoe Trails area

GRAND LAKE STATE PARK
SPRING RIVER CANOE TRAILS

KEY TO SYMBOLS
- CANOE LAUNCH
- PICNIC
- PICNIC SHELTER
The land now used for Spring River Canoe Trails (about 30 acres) was originally owned by the Wyandotte Indians. The area has a unique history with the Nimiyipuu – Nez Perce, as the tribe was placed in Indian Territory in what is now the Spring River area. The tribe moved closer to Tonkawa and later back to the Pacific Northwest eight years after their removal from their homeland. This history is commemorated at Bicentennial area with a sign as shown below in Figure 3.4. The Spring River area later became private farmland until acquired by the Grand River Dam Authority, and was then sold to the state of Oklahoma for park development in 1980.

Grand Lake State Park at Spring River Canoe Trails has two principal locations. The Bicentennial unit is in a rural area most easily accessed along First Street heading east out of Quapaw, Oklahoma. The property is subject to flooding of Spring River and has little topsoil covering the chert base. This is evident in the photograph of the road leading to the river.

Figure 3.4 – Commemoration of Nez Perce in Indian Territory

Figure 3.5 – River access at Bicentennial
The Bicentennial property has minimal development as shown in Figure 3.6, but does receive local use by anglers and boaters. During the year of visitation related to preparation of the RMP, there was no evidence of campers staying at the property. However, there was evidence of activity including picnicking and other day use. One of the observed uses for the area was as a canoe launch location for a private outfitter. A local outfitter (Blue Hole) has access to the river from private property, but also utilizes Bicentennial.

The property can be gated, although it is questionable as to whether closing and securing the gate would limit access. Several off-road trails do lead into the area and vehicles have driven around the gate.

A second property, Josephine Smith, is grouped as part of the Grand Lake State Park at Spring River Canoe Trails. Josephine Smith is down river from Bicentennial and is most easily accessed along Highway 10 southeast of Quapaw. Josephine Smith is much less developed and less maintained than is true of Bicentennial. It is also officially for day-use only.
Access to the Spring River at Josephine Smith is provided by a steep, gravel road. The area is utilized locally by anglers and boaters. As shown in Figure 3.7, there are former campsites established and marked, although other former campsites are overgrown and unusable. These former campsites can now be utilized as picnic sites or day-use parking areas. Due to the remote location and poor signage, Josephine Smith receives primarily local use.

**Grand Lake State Park at Twin Bridges**

South along the Spring River at the point where the Spring River joins the Neosho River, a visitor will come to Grand Lake State Park at Twin Bridges. Twin Bridges is located between Fairland and Wyandotte along U.S. Highway 60 and is also served by Oklahoma Highway 137. Twin Bridges is approximately six miles northeast of Fairland, Oklahoma, and about 11 miles southeast of Miami, Oklahoma. Twin Bridges is situated at the confluence of the Spring and Neosho Rivers forming the northern reaches of Grand Lake o’ the Cherokees. Twin Bridges Area is approximately nine miles from U.S. Interstate 44, making it a relatively easily accessible area for guests from many miles away.

The Twin Bridges Area is approximately 63 acres conveyed from GRDA to OTRD, and is a hub for anglers, as the park sits on the confluence of the Spring and Neosho Rivers. Twin Bridge offers boat ramps, courtesy docks, heated and enclosed fishing dock, marina amenities, and a fish cleaning station. Other amenities include a playground, horseshoe pits, five shelters, semi-modern and unimproved campsites, lake huts, volleyball court, and open areas for recreation.

In 2012, the Oklahoma Department of Wildlife Conservation (ODWC) operated a Paddlefish Research and Processing Center on park property along Highway 137. The ODWC operates the center to collect important research data related to this unique population of fish. Following the 2012 completion of the RMP, ODWC moved the Center to a location four miles north of Twin Bridges area and the on-site facilities have been removed.
Twin Bridges is located on a ridge permitting panoramic views of the two river valleys, with the Spring River on the east and the Neosho River on the west. State Highway 137 bisects the park and extends to the south down a fairly steep incline to intersect with federal Highway 60. The “twin bridges” are located on Highway 60.

At the north end of the park, along Highway 137, the property includes a park office and maintenance facility as shown in Figure 3.9.
Highway 137 separates the elevated portion of the property into two campground areas: Eagle Bluff to the west and Echo Hollow to the east. Immediately south of the park office and maintenance area is the first overnight area for park visitors. Twin Bridges offers five lake huts, a specialized lodging accommodation among the facilities in Oklahoma State Parks. These lake huts are octagon-shaped, approximately 19’ in diameter, with screened windows and ceiling fans.
Eagle Bluff includes three distinct “nodes” for campers, each of which provides semi-modern camping in shaded sites. Picnic pavilions are distributed one per node and are utilized by campers and day visitors alike. Comfort stations are also associated with these camping areas and with the picnic pavilions, although some of the comfort stations are older and not in full compliance with ADA requirements. Playgroups, volleyball, and horseshoes are also distributed throughout Eagle Bluff to encourage active recreation.

On the east side of Highway 137, Echo Hollow parallels the roadway and provides an overlook toward the Spring River. Echo Hollow is designed for occasional day use, but not to the extent that is supported in Eagle Bluff. Most of the activity at Echo Hollow is associated with campers.

At the north end of Echo Hollow, a portion of the property was utilized by ODWC for the Paddlefish Research and Processing Center through preparation of the RMP. A campground host is also located in this area, adjacent to several modern campsites. The park road then leads south, past a side road that leads down to the Spring River at a location that once served as a river access. The park road then continues south to a larger, more structured semi-modern
The only restroom in Echo Hollow serves the more northern of the two campground nodes. A short interpretive trail extends from Echo Hollow along the ridge and through the wooded environment.

Figure 3.12 – Facilities in Echo Hollow area
On the west side of Highway 137 and on the southern end of Eagle Bluff, there is a park residence. This location is quite visible from the highway and is incorporated into the Eagle Bluff campground. However, signs indicate the restricted access and clearly separate the residence from the remainder of the park. Road access is limited, requiring employees to use park roads for access and egress.

The third portion of the property at Twin Bridges is below the hill and south of Highway 60. This location is designated as Angler’s Paradise; the tip of the peninsula between the two rivers and at the northern reaches of Grand Lake may flood once or twice annually. Angler’s Paradise includes a private concessionaire on the east side of the property; parking on the south end of the property; boat ramp facilities on the west side of the property; and camping and day use in the center. A new CXT comfort station was added in 2012 as shown in Figure 3.14. Angler’s Paradise, popular on summer holidays and weekends, hosts a mixture of day and overnight use.
In summary, Grand Lake State Park at Twin Bridges offers multiple recreation opportunities, essentially presenting two differing experiences. For those individuals seeking a river and lake experience, Angler’s Paradise offers the opportunity to be on the water. For those individuals seeking a quiet, forest environment, Echo Hollow and Eagle Bluff offer the opportunity to be away from crowds and traffic. Table 3.1 summarizes the amenities in the various campgrounds at Twin Bridges.

**Table 3.1 – Campground Detail for Grand Lake State Park at Twin Bridges**

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Eagle Bluff</th>
<th>Echo Hollow</th>
<th>Angler’s Paradise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern campsite (Water, sewer, electricity)</td>
<td>33 sites</td>
<td>16 sites</td>
<td>16 sites</td>
</tr>
<tr>
<td>Semi-modern campsite (Water, electricity)</td>
<td>unspecified</td>
<td>unspecified</td>
<td>unspecified</td>
</tr>
<tr>
<td>Unimproved (no utilities)</td>
<td>unspecified</td>
<td>unspecified</td>
<td>unspecified</td>
</tr>
<tr>
<td>Pavilion</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Trail</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Boat Ramp</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Grand Lake State Park at Bernice**

Continuing to the southwest in the Grand River corridor, Grand Lake State Park at Bernice is located just west of Bernice, Oklahoma on Highway 85A on northwestern Grand Lake o’ the Cherokees. The Bernice area consists of 88 acres owned by OTRD. As a park on the open waters of Grand Lake, Bernice is popular for family recreation and fishing. The Bernice Area offers a boat ramp and courtesy dock, making it a popular destination for boaters of all kinds. The Bernice area also has shallow swimming areas with fine pebbles and rocks, making it an ideal place for swimming and family water recreation.

Highway access around Grand Lake relies almost entirely on two-lane roads. Many of these are winding, indirect routes from one location to another. That is the situation for access to Grand Lake State Park at Bernice, although the park is located in reasonable proximity to Monkey Island – one of the most developed residential and recreational areas on Grand Lake.

Figure 3.16 on the following page shows the location of Bernice and its relationship to locations of other properties in Grand Lake State Park. In that Bernice is on the northwest portion of Grand Lake, this property is the primary state park on the western side of Grand Lake. The entry to Bernice from Highway 85A is gated and can be closed. This is necessary due to the occasional flooding of the area – usually once or twice each year.

![Figure 3.15 – Entry sign to Grand Lake State Park at Bernice](image)
Upon initial entry into Bernice as shown on the detailed map on the following page, the visitor enters a broad, flat lakeside landscape. There are two boat ramps with parking located adjacent to the entry drive. Access to the boat ramps can occur even if the gate is closed to the main body of the park. The newer boat ramp is shown in Figure 3.16, whereas the older boat ramp is marginal in its utility.

A feature at Bernice is a fishing pier on the south side of the Highway 85A bridge. While this fishing pier is not within the park boundaries, it is accessible from within Bernice area. A short trail along the roadway leads to the cantilevered pier from which anglers have access to open water.
Passing the anglers’ area at the entrance to Bernice, a visitor would enter the main portion of the park. The initial impression is of a relatively flat, open campground. Multiple signs direct the visitor to preferred routing through the park, although visitors tend to drive where they please. Figure 3.19 shows the contrast between the empty campground and the fully occupied area.
A significant feature of Bernice is the shallow, sloping waterfront providing opportunities for swimming. The area is open to southerly winds, a frequent occurrence during the summer months. However, swimming and water activities are common recreational pursuits for many of the visitors at Bernice.

The main campground at Bernice is supported with other facilities and amenities including a pavilion for picnics, two playgroups, two restrooms, and a sanitary dump station. Several of these are shown in Figure 3.21.
Toward the eastern end of the campground the sites are not defined. This area is identified as a “tent area” and allows campers to set up camp as they choose. As a result, campers drive where they choose, establish their own campsites, and disperse throughout the area.

The eastern end of the campground serves as a tent area, but has also been developed with a nature center. The nature center is the building that appears in the background in Figure 3.22. As a result of the proximity of the camping to the nature center, day use and overnight use are intermingled at Bernice. This also occurs in the main portion of the campground between campers and swimmers, campers and boaters, and campers and picnickers at the pavilion.

The nature center includes the structure housing offices, restrooms, and display space, in addition to exterior fenced areas for birds and animals as part of the interpretive programs. In addition, a parking lot with eight spaces serves the nature center and the trailhead leading to the nature trail extending further to the eastern portion of the park.
To the east of the nature center, a trailhead provides access to the less developed eastern portion of Grand Lake State Park at Bernice. The trail winds through the wooded environment providing access to wildlife feeding locations, viewing areas, and the lakeshore environment. The eastern terminus of the trail is a paved parking area along County Road 550 and E270 Road. This parking lot provides a second entrance by foot into the park. It also serves as a linkage between Bernice and private properties, including Grand Country Lakeside RV Park immediately adjacent to the eastern trailhead.

Additional support amenities at Bernice include a residential and maintenance area. This location is to the north of the main campground and adjacent to Highway 85A. A separate access road allows entry to the area without going through the main body of the park. This access road also allows entry to a power line easement parallel to Highway 85A extending to the eastern boundary of Grand Lake State Park at Bernice.
The summary of the amenities and facilities associated with the campground in Grand Lake State Park at Bernice is indicated in the following table. The number of tent sites and unimproved sites is an estimate in that these locations are not designed nor specified in any manner.

### Table 3.2 – Campground Detail for Grand Lake State Park at Bernice

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Bernice area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern campsite (Water, sewer, electricity)</td>
<td>33 sites + host site</td>
</tr>
<tr>
<td>Semi-modern campsite (Water, electricity)</td>
<td>150 unimproved sites</td>
</tr>
<tr>
<td>Unimproved (no utilities)</td>
<td></td>
</tr>
<tr>
<td>Pavilion</td>
<td>1, capacity 150</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>2</td>
</tr>
<tr>
<td>Trail</td>
<td>1</td>
</tr>
<tr>
<td>Boat Ramp</td>
<td>2</td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td>1</td>
</tr>
<tr>
<td>Beach</td>
<td>1</td>
</tr>
</tbody>
</table>
Grand Lake State Park at Honey Creek

Continuing southward in the Grand River corridor, the next property to be considered is Grand Lake State Park at Honey Creek. The Honey Creek arm joins the main body of Grand Lake in Grove, Oklahoma, and provides the setting for this portion of Grand Lake State Park on the eastern side of the lake. Visitors may access the Honey Creek Area from Oklahoma Highway 10/ U.S. Highway 59 via State Park Road in Grove. The Honey Creek area is approximately one mile from Grove on State Park Road, which continues through residential areas from the highway to the state park.

Honey Creek is approximately 30 acres, acquired by OTRD from GRDA, and provides a wide range of amenities. Two acres were acquired from the Public Service Company of Oklahoma (Appendix D). Honey Creek is situated on the shores of Grand Lake o’ the Cherokees, and provides boating, fishing, and swimming access to the lake. In that the Honey Creek Area is close proximity to the city of Grove, Oklahoma, park guests have easy access to a multitude of dining, convenience, and larger store options. Information from OTRD records asserts “over 90% of the visitors to this park are retirees.” The composition of park visitors may have changed over the years, but proximity to Grove and the services available in the community does influence the type of visitor attracted to Grand Lake State Park at Honey Creek.
As stated, access into Honey Creek is along a residential road (State Park Road) and provides access to the park and several private homes along the south boundary of the property. As a result park visitors and local residents utilize the same access route. The roadway leading to the private residences is signed to indicate limited access.

Upon entry into Honey Creek, a visitor sees the park office. This is a convenient location for campers to interact with park personnel, but most visitors do not actually stop at the office. There is advantage in this location for a sense of security and control of the park. However, traffic flow around the office is occasionally congested.
Immediately northeast (to the right of the entry drive), there is a maintenance area visible to park visitors. However, the maintenance area is somewhat screened by vegetation and is orderly in appearance (Figure 3.28).

The main body of Honey Creek is divided into three areas designated as “Area A,” “Area B,” and “Area C.” Area A is designed as a densely compacted campground focused on large recreational vehicles. Area A is on a fairly flat terrace to the southwest of the park office. Several of the campsites in Area A are identified clearly as “preferred sites.” As shown in Figure 3.30, it is common for multiple vehicles and camping units to be associated with one site.

Congestion in Area A on summer weekends and holidays makes it difficult to move through the area. Emergency vehicles would have a very difficult time gaining access to or through Area A.
In addition to the campsites, Area A (referenced as Raccoon Ridge in some OTRD literature) includes other amenities. A campground host is located near the entry to the area. A comfort station and sanitary dump station are located along the exit drive. A playgroup (visible in Figure 3.30 on the previous page) is located on the southern edge of the area, fairly close to a swimming pool.

Area B in Grand Lake State Park at Honey Creek is referenced as Squirrel Hollow in some OTRD literature. Area B is located on a smaller terrace just north of Area A. Area B is also designed to accommodate recreational vehicles and offers pull-through sites and 50 amp electrical service. Area B also includes a picnic pavilion utilized by campers and day visitors, plus an additional restroom. A restroom on the outer loop of Area B was closed throughout preparation of the RMP.
Area B includes some features that are not associated with recreational use. This area includes structures and operations associated with the water supply and treatment system for the City of Grove, as well as a sand filter for the comfort station in the state park. These facilities are typically marked with signage to inform people of limited access and potential dangers.

The third section of Honey Creek, Area C is also referenced as Deer Run in some OTRD literature. Area C is on the northeastern portion of Honey Creek and includes a mixture of overnight and day use. This portion of the park is quite hilly making it difficult for large vehicles to move through the area. However, Area C is the primary location within Grand Lake State Park at Honey Creek for individuals to access Grand Lake. Area C includes a tent campground which is frequently closed. In addition, Area C includes a boat ramp, fishing pier, courtesy dock, and fish cleaning station. The restroom in Area C was closed during much of the preparation of the RMP.
Table 3.3 provides a summary of the campground facilities and amenities available at Grand Lake State Park at Honey Creek. While these numbers reflect existing facilities, some of the facilities are not presently open to the public – for example, two of the restrooms have been closed during the past year. In addition, OTRD literature indicates approximately 250 unimproved sites in Honey Creek. Such sites would be dispersed throughout the park, but occupancy at that level would exceed the capacity of the property and supporting waste management.

Table 3.3 – Campground Detail for Grand Lake State Park at Honey Creek

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Area A Raccoon Ridge</th>
<th>Area B Squirrel Hollow</th>
<th>Area C Deer Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern campsite</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Water, sewer, electricity)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi-modern campsite</td>
<td>34</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>(Water, electricity)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unimproved (no utilities)</td>
<td></td>
<td>Unspecified</td>
<td>5</td>
</tr>
<tr>
<td>Pavilion</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Comfort stations</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Trail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boat Ramp</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beach</td>
<td></td>
<td></td>
<td>Pool</td>
</tr>
</tbody>
</table>

The remaining components of Grand Lake State Park in the immediate Grand Lake vicinity are clustered on the southern end of the lake, associated with the impoundment at Pensacola Dam or below the spillway. These properties are quite small in area individually, but each offers some unique characteristics. As a result, each of these properties is presented individually.

To properly discuss the properties on south Grand Lake, it is necessary to understand the surrounding environment. Pensacola Dam has three spillways for which water releases are controlled by Tainter gates. Because of high water, flood potential, and normal water flows, the area below Pensacola Dam has been modified greatly from its natural form. To the north of Pensacola Dam, Grand Lake o’ the Cherokees extends upstream. To the south of Pensacola Dam, the Grand River has been changed.

Figure 3.35 – Grand River channel below Pensacola Dam
dramatically. A portion of that change includes scouring of the river channel resulting in exposure of bare rock (Figure 3.35 on the previous page). Little to no soil remains in these channels, although water does accumulate and remain temporarily. These areas have become locations for off-road-vehicle enthusiasts. Although outside of the Grand Lake State Park boundaries, these areas attract visitors who are drawn to south Grand Lake for the off-road experience and utilize Grand Lake State Park properties for camping and staging.

**Grand Lake State Park at Disney**

Grand Lake State Park at Disney is located in Disney, Oklahoma, along Highway 28. Highway 28 follows the crest of the Pensacola Dam impoundment and bridgework. Disney is a community of fewer than 300 residents. The property associated with Grand Lake State Park at Disney is approximately 20 acres, conveyed from GRDA and owned by OTRD.

Figure 3.37 presents a visual overview of the location of three properties in close proximity to each other: Grand Lake State Park at Disney, Grand Lake State Park at Little Blue, and Grand Lake State Park at Cherokee.
The Disney property is divided north and south by Highway 28, with some facilities on each side of the roadway. The northern portion of the property features several picnic tables for day use, a boat ramp, lighted dock, and large area for parking for boaters. On the southern portion of the Disney property there is a comfort station, picnic shelter, and several unimproved camping sites available for use. OTRD literature indicates as many as 45 unimproved sites, but that would exceed the capacity of the area.

Grand Lake State Park at Disney receives considerable use on the north side of Highway 28 from boaters and anglers. However, it is rare to see the restrooms on the south side (Figure 3.38) open. These restrooms are not ADA compliant. It is also rare to see campers in the campground on the south side of the road as shown in Figure 3.38 from Memorial Day weekend 2012.

On the north side of Highway 28, Grand Lake State Park at Disney is essentially a parking lot with minimal amenities in the surrounding area. The parking lot includes turning lanes for a two-lane boat ramp. Three of the picnic tables distributed in the area include individual shelters. Upon occasion visitors do establish campsites on the north side of Disney (Figure 3.39).
In summary, Grand Lake State Park at Disney is a small, lakeside access location that receives mixed use of day visitors and occasional overnight campers. It is primarily a point of access for boaters and anglers to get to the open waters of Grand Lake.

**Table 3.4 – Campground Detail for Grand Lake State Park at Disney**

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Disney</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>28 unimproved sites</td>
</tr>
<tr>
<td>Pavilion</td>
<td>1 group, 4 individual</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1</td>
</tr>
<tr>
<td>Boat Ramp</td>
<td>1</td>
</tr>
</tbody>
</table>
**Grand Lake State Park at Little Blue**

In the same Disney vicinity, Grand Lake State Park at Little Blue is shown on the map in Figure 3.37. The Little Blue area (12.4 acres) is situated along County Road 449, accessible on the south side of Highway 28 in east Disney and is downstream from the eastern spillway for Grand Lake. The Little Blue area sits below the eastern spillway that allows flow to form the Grand River on the west and a small clear cold-water creek on the north side of the property. There are two vault toilets on property, and a number of unimproved campsites. The area features access to a popular fishing area, a large natural pool filled and stocked from various releases from upstream.

Use of Grand Lake State Park at Little Blue is heavily local in origin. For much of the year, Little Blue serves as the local swimming hole. However, it is increasingly popular as a point of access to the ORV activity in the rocky terrain of the Grand River corridor below the dam. While the ORV area is outside the boundaries of the park, access routes are evident over a hill on the west side of Little Blue leading to potential for erosion.

---

*Figure 3.40 – Grand Lake State Park at Little Blue*
During preparation of the RMP, research staff spoke with local law enforcement personnel and with campground hosts at other state park properties near Little Blue. They frequently expressed concern related to the behaviors of visitors at Little Blue, particularly citing use of controlled substances and drug transactions. On at least one occasion, research staff observed the distinctive odor of marijuana in the park on a holiday weekend.

Table 3.5 – Campground Detail for Grand Lake State Park at Little Blue

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Little Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>10 tables</td>
</tr>
<tr>
<td></td>
<td>35 unimproved (estimate)</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1 vault</td>
</tr>
</tbody>
</table>

Grand Lake State Park at Cherokee

The Cherokee area of Grand Lake State Park consists of several different areas located above and below the Pensacola Dam in the area of Langley and Disney, Oklahoma. The Cherokee Area, with all properties included, is about 43 acres. These locations have been termed differently, depending on the information resource and date. In past years, these three separated properties were known as Cherokee III, Cherokee II and Cherokee I. Recently these area names have been titled Cherokee Grandview, Cherokee Lakeside, and Cherokee Riverside respectively. These current names are used in the following conversation and information.

Figure 3.42 on the following page provides a detailed map of the multiple properties associated with Grand Lake State Park in the Pensacola Dam area.

Grand Lake State Park at Cherokee Grandview is located on the north side of Highway 28, just west of the Disney property. This area houses a maintenance area, large group shelter, comfort station, fishing lake access, picnic tables, and several unimproved campsites. Several of these campsites offer views overlooking the lake. There are two access routes entering Cherokee Grandview off Highway 28, although neither of these routes has a curb cut. As a result, there is a significant “bump” for vehicles entering or leaving the property. Each road continues through park property into private development.

Figure 3.41 – Signage in Cherokee Grandview area
As shown in Figure 3.42, there are two access roads into Grand Lake State Park at Cherokee Grandview. The western loop of the entry road circles along a hillside toward the maintenance area. This includes a “park office” for Grand Lake State Park in the Pensacola Dam area. The central loop enters past three campsites with electricity and past a pavilion, and then extends uphill around a restroom before returning to the highway grade and exiting the property.

Private access roads exit the property toward the north, including gated driveways as shown in Figure 3.43. Since access to these private properties requires passage through Cherokee Grandview area, the property receives traffic that is not necessarily related to true park visitation.

Figure 3.43 also reveals the type of use at Grand Lake State Park at Cherokee Grandview. As with the properties at Disney, Little Blue, and Cherokee Lakeside, this property has become a staging area for individuals with ATVs. Some of the ATVs are street-legal; others are not, but are driven on park roads.
Figure 3.43 – Views in Cherokee Grandview area
Note: ATVs among campers above; gated private access road below

Table 3.6 – Campground Detail for Grand Lake State Park at Cherokee Grandview

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Cherokee Grandview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>3 semi-modern</td>
</tr>
<tr>
<td></td>
<td>12 unimproved (estimate)</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1</td>
</tr>
<tr>
<td>Pavilion</td>
<td>1</td>
</tr>
</tbody>
</table>
**Grand Lake State Park at Cherokee Lakeside**

Continuing to the west on Highway 28, the next property associated with Grand Lake State Park is Grand Lake State Park at Cherokee Lakeside. Visitors may access Cherokee Lakeside from Highway 28, adjacent to the central spillway on Pensacola Dam. This area offers a group shelter, swim beach, boat ramp with parking for about 20 vehicles, comfort station, and several semi-modern and unimproved campsites. As with the several other properties near Pensacola Dam, OTRD acquired this area from GRDA. The property, 2.5 acres, is a somewhat hilly peninsula surrounded on the north and east by private development.

Access to Grand Lake State Park at Cherokee Lakeside can be quite congested since the access road is just east of the bridge across Pensacola Dam. Vehicles turning left often include boat trailers and ATVs leading to traffic jams on weekends and holidays.

On the Memorial Day weekend 2012, some conflict was apparent between the varying recreational visitors to Grand Lake State Park. At this location, that conflict occurred between boaters needing access to the boat ramp and adjacent parking and ATV operators who were using the parking lot for their trailers and unloading their ATVs.

---

**Figure 3.44 – Views in Cherokee Lakeside area**

Note: ATVs among campers
Grand Lake State Park at Cherokee Lakeside includes a popular swimming beach located between the boat ramp and the Pensacola Dam impoundment. In this location the beach is somewhat sheltered from prevailing south winds. A courtesy dock had once been located near the boat ramp, but the damaged courtesy dock remained stored adjacent to the boat ramp throughout the preparation of the RMP. An ADA compliant restroom with pay showers has been installed at Cherokee Lakeside.

![Figure 3.45 – Amenities in Cherokee Lakeside area](image)

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Cherokee Lakeside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>12 semi-modern, 20 unimproved</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1</td>
</tr>
<tr>
<td>Playgroup</td>
<td>1</td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td>1</td>
</tr>
<tr>
<td>Boat ramp</td>
<td>1</td>
</tr>
<tr>
<td>Picnic pavilion</td>
<td>1</td>
</tr>
</tbody>
</table>
Grand Lake State Park at Cherokee Riverside

Grand Lake State Park at Cherokee Riverside is located below the Pensacola Dam, on the west side of the Grand River. Cherokee Riverside is accessible from County Road 4475 (also known as River Road), from Highway 28 just east of the Pensacola Dam. Cherokee Riverside borders the west bank of the re-routed Grand River, continuing flow as the Pensacola Dam releases water. Cherokee Riverside is prone to flooding due to large water releases from the Pensacola Dam, and thus features only moderate amenities. This area features a boat ramp, two comfort stations, a group shelter, and numerous unimproved and semi-modern RV and tent campsites. In total, Cherokee Riverside is 25.85 acres owned by OTRD.

The entry corridor along River Road is bordered by residential structures in Langley. Many of these structures are quite dilapidated giving an undesirable aesthetic for visitors entering the area. River Road begins a descent into the Grand River valley before making a sharp turn to the east. This area of River Road is bordered by agricultural lands and is quite attractive.

Once beyond the private property and into the GRDA managed river corridor, the environment shifts to a forested river valley. Trees line the roadway and overhang the drive.

Access into Cherokee Riverside requires a turn back to the north to a plateau below the elevation of the roadway. As stated, this area is subject to flooding. Warning sirens at Pensacola Dam are noted in signage throughout the area indicating that sounding of the sirens is a warning of release of water.
As is evident in Figure 3.46, Cherokee Riverside also serves as a staging area for ATV activity. However, it also is popular with boaters and anglers due to direct access to the Grand River. It is further evident that visitors to Cherokee Riverside camp in any open space – regardless of definition of a particular site. It is also common to drive on grassy areas. These behaviors are common in most state parks in Oklahoma.

A campground host has been well-established in Cherokee Riverside. The property includes two restrooms: one near the entry to the property is small and not compliant with ADA requirements, whereas a larger ADA accessible restroom with showers is near the north end of the campground. During preparation of the RMP, numerous large cottonwood trees were being removed from the site.

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Cherokee Riverside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>18 semi-modern</td>
</tr>
<tr>
<td></td>
<td>50 unimproved</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>2</td>
</tr>
<tr>
<td>Boat ramp</td>
<td>1</td>
</tr>
<tr>
<td>Picnic pavilion</td>
<td>1</td>
</tr>
</tbody>
</table>
Grand Lake State Park at Grand Cherokee

Directly across the Grand River to the east is a campground as part of Grand Lake State Park at Grand Cherokee. This campground is much newer in design than the western portion of the property and is truly developed for larger recreational vehicles. Although not prone to flooding in this area, the campground has been developed with removable utility pedestals. This area is served by a lagoon and includes a restroom at the north end of the campground loop.

Grand Cherokee campground has been designed with eight pull-through sites and five easy parallel access sites. Two sites have been closed due to erosion. In addition, there is a sanitary dump station located near the entrance/exit from the campground for easy access by visitors.

Table 3.9 – Campground Detail for Grand Lake State Park at Grand Cherokee

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Grand Cherokee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>13</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1</td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td>1</td>
</tr>
<tr>
<td>Picnic pavilion</td>
<td>1</td>
</tr>
</tbody>
</table>
Immediately east of the Grand Cherokee campground is Grand Cherokee Golf Course. The golf course offers a unique golf setting below the multi-arch Pensacola Dam. The Pro Shop, located on the golf course property in a double-wide portable building, serves as the park office for Grand Lake State Park in the Pensacola Dam area as well as hosting typical Pro Shop offerings for about 40,000 rounds of golf yearly.

Grand Cherokee Golf Course is a nine-hole layout measuring 6,236 yards from the longest tees for a par-72 design. The course rating is 70.1 with a slope rating of 117 on Bermuda grass. Originally designed by Tripp Davis and opened in 1999, Grand Cherokee Golf Course is the only public course in the south Grand Lake area. In addition, Grand Cherokee Golf Course includes a driving range located west of the main course. Grand Cherokee Golf Course was designed in such a way that nine additional holes could be added and the existing holes be renumbered to create an 18-hole course.

The property, 144.9 acres, associated with Grand Cherokee Golf Course and campground is leased to OTRD by GRDA. As shown in Figure 3.49, golf carts are parked in the open, although there is a shelter on property. The parking lot can accommodate approximately 30 vehicles, limiting the potential for tournaments. At present, there are three or four tournaments annually.

---

**Grand Lake State Park at Spavinaw**

Continuing southwesterly in the Grand River corridor, the next property associated with Grand Lake State Park is located on Spavinaw Creek. Spavinaw Creek flows into the Grand River. Visitors may access the Spavinaw area from Highway 82/20, about a half mile south of Spavinaw, Oklahoma.

Spavinaw features a clear stream landscape below the dam and spillway of Spavinaw Lake. Spavinaw offers two group shelters, a comfort station, unimproved and semi-modern campsites for RVs and tents, fishing above and below the dam, swimming in the stream, and many open
areas for recreation. Spavinaw is about 35 acres in size and is situated along Spavinaw Creek. This property is owned by OTRD.

For the past several years, Spavinaw has been operated seasonally in cooperation with the city of Spavinaw. The entry gates may be closed, limiting access to the park. The detailed map on the following page shows two points of access and egress into the property. Only the road on the western end of the property is presently in use. The second entrance going north has been gated for several years.

The park property is at a lower elevation than the grade of the roadbed for Highway 20. This property is relatively flat, with a slight downward slope toward Spavinaw Creek. The eastern end of the property is wetlands with large trees. To the south, the rocky outcropping of sedimentary formations provides a visual backdrop for Spavinaw Creek in the foreground as shown to the left.
Figure 3.51 – Detail of Grand Lake State Park at Spavinaw

Figure 3.52 – Recreation at Grand Lake State Park at Spavinaw
During preparation of the RMP, a new restroom and shower facility was installed at Grand Lake State Park at Spavinaw. Portable facilities had been utilized for much of the year and were still in use during Memorial Day weekend 2012.

As shown in Figure 3.53, there is a well-established campground host at Spavinaw. In addition, there is a maintenance storage area on property.

Table 3.10 – Campground Detail for Grand Lake State Park at Spavinaw

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Spavinaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>26 semi-modern</td>
</tr>
<tr>
<td></td>
<td>60 unimproved</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1 with showers</td>
</tr>
<tr>
<td></td>
<td>1 without showers</td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td>1</td>
</tr>
<tr>
<td>Picnic pavilion</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 3.53 – Amenities at Grand Lake State Park at Spavinaw

As shown in Figure 3.53, there is a well-established campground host at Spavinaw. In addition, there is a maintenance storage area on property.
Grand Lake State Park at Snowdale

Continuing to the southwest along the Grand River corridor along Highway 20, the impounded Grand River becomes Lake Hudson. The final property in the Grand Lake State Park grouping is Grand Lake State Park at Snowdale. The Snowdale Area is located off Highway 20 one mile west of Salina, Oklahoma, immediately across the bridge over Lake Hudson. Snowdale is situated on the west side of Lake Hudson and offers access to all lake recreation activities. The Snowdale Area features a group shelter, a lighted boat ramp with a courtesy dock, bathhouse, swim beach, playground, semi-modern and unimproved RV and tent campsites, day use areas, and open recreation areas. Snowdale is about 15 acres in size leased from GRDA. The lease for Snowdale expires in 2019. The boat ramp and courtesy dock are open year round, while the rest of the park is seasonal in hours and operation.

The property is fenced along the east and south sides, with a cable extending along the western edge. The detailed map in Figure 3.55 presents the property in the current configuration as of 2013. Changes in the shoreline are common due to erosion and changes in water level. Additional changes in amenities and facilities have also occurred over recent years.

Figure 3.54 – Grand Lake State Park at Snowdale
Figure 3.55 – Detail of Grand Lake State Park at Snowdale
The entry to Grand Lake State Park at Snowdale passes a convenience store that is sporadically open. Most of the area is agricultural in nature. However, the area to the east of the property is developed as recreational residential property with some commercial activity.

The detailed map of Grand Lake State Park at Snowdale shows four defined areas marked alphabetically. The following presents these areas in their alphabetical order.

Area A is undefined and has undergone several natural changes. The eastern boundary fence separates the former road and courtesy dock from the park property. Installation of the fence aided in defining the property line. A private courtesy dock has been removed and placed outside the park boundary. During the latter preparation of the RMP, a private marina was under construction changing the view from the park to the northeast.

Area B contains the main body of the park with most of the development. This area includes several defined and many undefined campsites. In addition, there is a park office and maintenance area, a sanitary dump station, a restroom, and a pavilion. Recreational activity is encouraged with a playgroup and a volleyball court. The playgroup is not in compliance with ADA requirements, nor is the restroom.

Area C is undefined, intended for tent camping, and borders the cabled roadway.

Area D remains open even if the remainder of the property is gated. Area D includes a pavilion, a parking lot, and a boat ramp. The boat ramp is two-lane, supported with a courtesy dock and lighting. The parking lot can accommodate approximately 10 vehicles with trailers and was overloaded on several occasions.

*Figure 3.56 – Signs and scenes in Grand Lake State Park at Snowdale*
Grand Lake State Park at Snowdale is sporadic in visitation. On summer holidays and some weekends, the property can be very crowded. On most days the property will be empty. Most of the visitors who utilize Snowdale are interested in aquatic recreation through boating, swimming, or fishing.
A summary of Grand Lake State Park at Snowdale shows that there is demand, especially on summer weekends and holidays. On those occasions, the visitors to Snowdale practice behaviors similar to those demonstrated at other properties: they park on the grass; they camp in areas whether intended for camping or not; they utilize multiple vehicles and multiple units on individual sites.

During the Memorial Day 2012 weekend, portable toilet units were in place throughout the park to supplement the regular restrooms. In addition, the traffic was highly congested at the boat ramp as people attempted to gain access to Lake Hudson.

### Table 3.11 – Campground Detail for Grand Lake State Park at Snowdale

<table>
<thead>
<tr>
<th>Campground amenity</th>
<th>Snowdale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsites</td>
<td>18 semi-modern</td>
</tr>
<tr>
<td></td>
<td>66 unimproved</td>
</tr>
<tr>
<td>Comfort stations</td>
<td>1</td>
</tr>
<tr>
<td>Beach</td>
<td>1</td>
</tr>
<tr>
<td>Boat ramp</td>
<td>1</td>
</tr>
<tr>
<td>Sanitary dump station</td>
<td>1</td>
</tr>
<tr>
<td>Picnic pavilion</td>
<td>2</td>
</tr>
</tbody>
</table>

### Hiking/Walking/Riding Trails

Grand Lake State Park in its various locations includes relatively few trails. Those that are in place are intended for hiking and walking. There is a hard-surface nature trail at the Bernice property, including a wildlife feeding and viewing area. Two trailheads with parking areas support this trail.

A second short nature trail is in place at the Twin Bridges property in the Echo Hollow area. This trail includes interpretive signs and a number of bird houses.

![Figure 3.59 – Trail amenities in Grand Lake State Park at Twin Bridges](image)
Public Access and Entry Aesthetics

Comments regarding the public access and entry aesthetics for the various properties in Grand Lake State Park were included in the foregoing discussion. A brief summary of these comments by property indicates:

- Grand Lake State Park at Spring River Canoe Trails – accessible via two lane county roads through agricultural areas; poorly signed and marked;
- Grand Lake State Park at Twin Bridges – directly accessible from State Highway 137 and Federal Highway 60; properly and clearly signed;
- Grand Lake State Park at Bernice – directly accessible from State Highway 85A; surrounding area is a mixture of residential and commercial property with marginal aesthetic qualities; adequately signed;
- Grand Lake State Park at Honey Creek – directly accessible on a residential city street, well-marked as State Park Road in Grove; entry road is lined with residential and commercial properties;
- Grand Lake State Park at Disney, Cherokee Grandview, and Cherokee Lakeside – directly accessible on State Highway 28 along the roadway between the communities of Langley and Disney; the highway is lined with residential and commercial properties including some that are very well maintained and others that are marginal in quality; properties are marked with distinctive signs;
- Grand Lake State Park at Little Blue – accessed on side road from State Highway 28 through marginally maintained residential properties; the access road is poorly marked for directions;
- Grand Lake State Park at Cherokee Riverside and Grand Cherokee area – accessed on county road from State Highway 28 in Langley; signs are in place along the highway; adjoining properties are dilapidated and poorly maintained until out of the Langley city limits and into the agricultural area and the river valley;
- Grand Lake State Park at Spavinaw – directly accessible from State Highway 20 in Spavinaw; the surrounding area is primarily residential and can be aesthetically pleasing;
- Grand Lake State Park at Snowdale – accessed from a side road leading from State Highway 20 at the west end of the bridge leading to Salina; this portion of Highway 20 is four-lane; the surrounding properties are residential and commercial.

Park Visitation

Attendance records have been kept since the opening days of the park. It should be noted that counting park visitors is an inaccurate process. Technically, every person entering any portion of Grand Lake State Park is a park visitor – but not all of those visitors are recreational visitors. For example, since Highway 60 and Highway 137 pass through Grand Lake State Park at Twin Bridges, every driver and passenger in vehicles passing through the park boundaries is a park visitor. However, these are not necessarily included in official counts for the park. At Grand Lake State Park a certain percentage of the visitors recorded in the park would include park staff, vendors, and members of the general public entering the park to utilize the restroom or for other purposes. Other aspects of park visitation can be calculated more accurately. This would include those situations in which there is an exchange of a fee for a specific service. As a result, the
following discussion reports total visitation to Grand Lake State Park and specific usage of particular areas within the park.

For clarity in understanding of visitation patterns, total park visitation is presented in the following discussion. This would include campers and day visitors, as well as lake hut guests and golfers. However, the Grand Cherokee Golf Course is presented separately.

Recreational Use of Park Facilities

Visitation for Grand Lake State Park has increased significantly from the first reported levels of use during the 1930s at Spavinaw Hills State Park. Presently, an estimated 600,000 or more people visit Grand Lake State Park annually. The number includes day visitors and overnight visitors. The day visitors include pass-through sightseers, golfers, anglers, equestrian visitors, picnickers, trail hikers, boaters, and many other recreational visitors lodging at locations other than within the park. Overnight visitors include campers who spend one or more nights within Grand Lake State Park.

Determining the number of campers is more accurate than is the calculation of total visitors to the park. Total visitors are calculated based on traffic counters and a proxy variable for number of occupants in vehicles passing entry points into the park. Total number of visitors should not be interpreted as “individuals” in that numerous individuals are repeat visitors to the park on a daily, weekly, monthly, or annual basis. In addition, with multiple entries into Grand Lake State Park, it is possible that a single individual may be counted on multiple occasions entering different portions of the park.

Table 3.12 – Camping and Total Visitation

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Overnight Guests</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>612,075</td>
<td>153,144</td>
<td>765,219</td>
</tr>
<tr>
<td>2008</td>
<td>484,933</td>
<td>118,536</td>
<td>603,469</td>
</tr>
<tr>
<td>2009</td>
<td>421,997</td>
<td>110,524</td>
<td>532,521</td>
</tr>
<tr>
<td>2010</td>
<td>568,704</td>
<td>149,238</td>
<td>717,942</td>
</tr>
<tr>
<td>2011</td>
<td>500,715</td>
<td>121,094</td>
<td>621,809</td>
</tr>
</tbody>
</table>

Based on the figures in Table 3.12, it is apparent that visitation during the recent five-year period declined sharply into 2009 before rebounding slightly. In all likelihood, the decline in visitation is a reflection of economic conditions during the past few years and the price of gasoline. However, visitation at Grand Lake State Park is significantly influenced by other factors including temperature, high water, and algae warnings.

It is difficult to identify exactly how many campers, cabin guests, or lodge guests are individually associated with a registration. In the campgrounds, records are maintained of the number of campsites rented. As demonstrated in the photographs presented it is fairly common for one campsite rental to include a recreational vehicle and one or more tents. In addition, it is common for multiple motorized vehicles to be associated with a single campsite rental. Logically, group size associated with a single campsite rental can vary greatly.

Table 3.13 on the following page presents the campsite rentals for the past five years. These sites are defined as improved or unimproved, for which the category of improved sites include
modern and semi-modern site design. It should be noted that more than half of all visitation at Grand Lake State Park originates at the Twin Bridges property. Honey Creek is the second most visited site on the lake and Bernice is the third most visited. Camping and visitation numbers are not available for Little Blue and Disney since there is not a traffic counter at those properties. Camping numbers were not available for this report.

The heat of summer reduces the attractiveness of unimproved campsites since they do not have electricity. However, there probably are other factors influencing the reduction in rental of unimproved sites at Grand Lake State Park. This may include changes in behavior of visitors and provision of private options that include electricity and other amenities. It may also be a reflection of the condition of state park properties.

Grand Lake State Park at Twin Bridges offers another option for an overnight experience. The lake huts at Twin Bridges are distinctive and rare in the Oklahoma State Park system and appear to be particularly attractive to out-of-state visitors as shown in Table 3.15. Approximately four times as many out-of-state guests utilize the lake huts as in-state guests. These lake huts provide lodging accommodations with fewer amenities than cabins. As noted in the earlier profile of the

### Table 3.13 – Camping at Grand Lake State Park (North)

<table>
<thead>
<tr>
<th>Grand Lake State Park at Twin Bridges</th>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Improved campsites rented</th>
<th>Unimproved campsites rented</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>370,899</td>
<td>3,848</td>
<td>1,098</td>
<td>463,749</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>309,150</td>
<td>3,988</td>
<td>808</td>
<td>386,437</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>255,536</td>
<td>3,996</td>
<td>676</td>
<td>319,420</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>347,484</td>
<td>4,050</td>
<td>948</td>
<td>434,356</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>297,920</td>
<td>3,119</td>
<td>615</td>
<td>369,285</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grand Lake State Park at Bernice</th>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Improved campsites rented</th>
<th>Unimproved campsites rented</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>74,276</td>
<td>2,158</td>
<td>960</td>
<td>92,548</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>28,007</td>
<td>1,120</td>
<td>428</td>
<td>64,294</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>39,053</td>
<td>1,522</td>
<td>1,125</td>
<td>49,721</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>79,980</td>
<td>2,308</td>
<td>812</td>
<td>103,305</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>60,943</td>
<td>1,071</td>
<td>927</td>
<td>76,009</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grand Lake State Park at Honey Creek</th>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Improved campsites rented</th>
<th>Unimproved campsites rented</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>110,293</td>
<td>3,321</td>
<td>815</td>
<td>137,866</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>93,216</td>
<td>2,933</td>
<td>1,921</td>
<td>114,538</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>83,920</td>
<td>2,905</td>
<td>927</td>
<td>108,232</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>111,097</td>
<td>2,613</td>
<td>750</td>
<td>142,602</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>107,484</td>
<td>2,299</td>
<td>554</td>
<td>134,554</td>
</tr>
</tbody>
</table>
property, it is common to see lake hut occupants who also have tents or recreational vehicles on site. Frequently, the lake hut also attracts larger groups than do individual campsites.

**Table 3.14 – Lake Hut rentals**

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Total Lake guests</th>
<th>In-state Lake Hut guests</th>
<th>Out-of-state Lake Hut guests</th>
<th>Percent Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>1,315</td>
<td>263</td>
<td>1,052</td>
<td>App. 42%</td>
</tr>
<tr>
<td>2008</td>
<td>1,960</td>
<td>392</td>
<td>1,568</td>
<td>App. 51%</td>
</tr>
<tr>
<td>2009</td>
<td>1,860</td>
<td>372</td>
<td>1,488</td>
<td>App. 48%</td>
</tr>
<tr>
<td>2010</td>
<td>1,565</td>
<td>313</td>
<td>1,252</td>
<td>App. 46%</td>
</tr>
<tr>
<td>2011</td>
<td>1,485</td>
<td>297</td>
<td>1,188</td>
<td>App. 45%</td>
</tr>
</tbody>
</table>

**Table 3.15 – Camping at Grand Lake State Park (South)**

**Grand Lake State Park at Spavinaw**

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Improved campsites rented</th>
<th>Unimproved campsites rented</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>8,132</td>
<td>3,217</td>
<td>328</td>
<td>10,165</td>
</tr>
<tr>
<td>2008</td>
<td>10,029</td>
<td>2,688</td>
<td>487</td>
<td>12,536</td>
</tr>
<tr>
<td>2009</td>
<td>6,283</td>
<td>2,546</td>
<td>639</td>
<td>7,854</td>
</tr>
<tr>
<td>2010</td>
<td>9,340</td>
<td>2,380</td>
<td>494</td>
<td>11,675</td>
</tr>
<tr>
<td>2011</td>
<td>10,111</td>
<td>1,537</td>
<td>200</td>
<td>12,639</td>
</tr>
</tbody>
</table>

**Grand Lake State Park at Snowdale**

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Improved campsites rented</th>
<th>Unimproved campsites rented</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>7,031</td>
<td>3,209</td>
<td>434</td>
<td>8,789</td>
</tr>
<tr>
<td>2008</td>
<td>6,218</td>
<td>2,457</td>
<td>633</td>
<td>7,773</td>
</tr>
<tr>
<td>2009</td>
<td>6,509</td>
<td>2,422</td>
<td>342</td>
<td>8,136</td>
</tr>
<tr>
<td>2010</td>
<td>6,568</td>
<td>1,412</td>
<td>243</td>
<td>8,210</td>
</tr>
<tr>
<td>2011</td>
<td>6,870</td>
<td>1,092</td>
<td>209</td>
<td>8,588</td>
</tr>
</tbody>
</table>

**Grand Lake State Park at Cherokee**

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Day visitors</th>
<th>Improved campsites rented</th>
<th>Unimproved campsites rented</th>
<th>Total Visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>41,444</td>
<td>3,886</td>
<td>1,427</td>
<td>51,805</td>
</tr>
<tr>
<td>2008</td>
<td>38,313</td>
<td>3,553</td>
<td>1,599</td>
<td>47,891</td>
</tr>
<tr>
<td>2009</td>
<td>31,326</td>
<td>4,121</td>
<td>1,656</td>
<td>39,158</td>
</tr>
<tr>
<td>2010</td>
<td>14,235</td>
<td>2,732</td>
<td>674</td>
<td>17,794</td>
</tr>
<tr>
<td>2011</td>
<td>17,387</td>
<td>2,340</td>
<td>514</td>
<td>21,734</td>
</tr>
</tbody>
</table>
For all the properties, total visitation is an estimate based upon number of vehicles entering the park and a formula for occupancy of vehicles. This calculation has been adjusted over the years since number and size of vehicles has increased, while occupancy of vehicles has decreased.

**Recreational Use of the Grand Cherokee Golf Course**

Visitors to the Grand Cherokee Golf Course may include individuals who are also camping in one of the state park properties. However, golfers may also include individuals who participate in a round of golf without visiting any other portion of Grand Lake State Park. To some extent, the number of golfers is dependent upon visitation at the park. For others, the golf experience is the only contact with Grand Lake State Park as other aspects of the visit depend upon privately provided services. In visitor surveys from past years, many golfers have found the state park to be incidental to their choice of playing golf at Grand Cherokee Golf Course.

Grand Cherokee Golf Course hosts three or four tournaments each year and has sustained a reported 40,000 rounds of golf annually. The actual number of golfers playing Grand Cherokee between 2007 and 2010 is reported in Table 3.16.

**Table 3.16 – Number of Golfers at Grand Cherokee Golf Course**

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>18 hole green fees</th>
<th>9 hole green fees</th>
<th>Tournament fees</th>
<th>Annual green fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>6,394</td>
<td>2,390</td>
<td>292</td>
<td>2,972</td>
</tr>
<tr>
<td>2008</td>
<td>5,534</td>
<td>2,073</td>
<td>335</td>
<td>2,573</td>
</tr>
<tr>
<td>2009</td>
<td>5,344</td>
<td>2,356</td>
<td>212</td>
<td>1,882</td>
</tr>
<tr>
<td>2010</td>
<td>4,090</td>
<td>2,181</td>
<td>191</td>
<td>1,966</td>
</tr>
</tbody>
</table>

**Public Perception of Grand Lake State Park**

At the time of preparation of this resource management plan, the authors reviewed numerous websites and marketing sources related to Grand Lake State Park, which were provided by private sources. Further, private citizens and visitors to Grand Lake State Park maintain personal “blogs” and social networking sites that address their experiences and visits to the park. These blogs often were associated with activities such as hiking the various trails, riding in the ATV area, or boating on Grand Lake or one of the other lakes in the area, but addressed Grand Lake State Park in some manner.

While some errors in property identification, numbers or misperceptions in management are noted in these various sites, the overall tone regarding Grand Lake is highly positive. There is clearly a misperception among visitors in terms of which properties are part of Grand Lake State Park. Specifically, Spavinaw and Snowdale are not associated with Grand Lake in the minds of visitors. Additional information was found in sites maintained through chambers of commerce or other local businesses.

Visitor reviews on the web were collected and assessed. Visitors’ ratings for Grand Lake State Park covered a great range. The majority of recent comment focused on blue-green algae during the summer 2011 and the warnings related to recreational activity in the waters of Grand Lake. These comments ranged from decisions to avoid Grand Lake until the warnings were removed, to decisions to ignore the warnings and take personal chances at the Lake.
During preparation of the RMP, research staff stayed in the Grand Lake area and spoke with visitors and residents alike. There is a difference of opinion regarding the south Grand Lake properties from that expressed about the north Grand Lake properties. The south Grand Lake properties, with the exception of Grand Cherokee Golf Course, are frequently characterized as (1) hang-outs for illegal activity, (2) places to avoid, and (3) not managed by Oklahoma State Parks. In contrast, the properties around north Grand Lake are characterized as (1) good places to go with a family, (2) vacation destinations, and (3) inexpensive recreation locations.

**User Evaluations of Grand Lake State Park**

The most formal and scientific evaluations for Grand Lake State Park were generated during the 2003 park visitor survey (Caneday & Jordan, 2003). These evaluations were the result of on-site interviews with park visitors contacted at various locations throughout the park. The analysis of the data from these interviews was reported by category of type of visitor depending upon the facilities available at the individual park: day visitor, camper, cabin guest, or lodge guest.

Although dated, this visitor survey is the most recent thorough analysis of attitudes and opinions represented by visitors to Oklahoma state parks. Since contacts were made at public locations throughout the park, the determining factor for classification of the visitors was their respective place of lodging during the visit on which they were contacted.

Respondents to the visitor survey in 2003 indicated general satisfaction with the properties. The major point of dissatisfaction was related to restrooms, but most of those have been improved since the 2003 study. Other improvements have included upgrades of several campgrounds and new playgroups.

At each of the properties, the visitors tended to be very familiar with the respective properties. Bernice had the lowest repeat visitation with about two-thirds of its visitors being repeat guests. At Bernice, these visitors went to the park about six times per year. All of the other properties reported higher levels of repeat visitation and greater frequencies of visits. Campers tended to visit about five or six times per years, whereas day visitors at Little Blue and Disney reported visiting those properties about 14 times per year.

Grand Lake State Park showed considerable diversity among those people visiting the properties. At Little Blue, 40% of the visitors were Native American, while the smallest percentage (25%) of Native Americans was present at Honey Creek.

Distance traveled by visitors at these various properties also provides some indication of the origin of the park visitors. While there were occasional visitors who traveled long distances, Honey Creek showed the highest median distance at 75 miles for campers. Snowdale, Little Blue, and Disney showed day users who traveled less than 10 miles to visit those parks. As a result, it can be concluded that Snowdale, Little Blue, and Disney serve a heavily local population.

**Park Management**

Over the years of operation, the management structure for Grand Lake State Park has changed at the direction of leadership within OTRD from Oklahoma City. At various times, OTRD administration has managed the various nodes and properties as separate entities or parks. At present, all properties are considered as a single park, Grand Lake State Park.
Grand Lake State Park is currently included in the Northeast Region of Oklahoma State Parks. This intermediate management structure allows park management to work with regional oversight as an intermediary or in direct contact with the Oklahoma City office. As with all state parks in Oklahoma, personnel, purchasing, contracting, and all other aspects of operation are governed by Oklahoma state statutes, policies, and procedures.

**Staffing**

To properly understand the complexity of operation of Grand Lake State Park, the staffing is separated for the Park and the Golf Course. These divisions are reflected in the following discussion and tables.

Staffing for the park portion of Grand Lake State Park has declined over the past four years, particularly related to permanent salaried staff. While the Oklahoma State Park system has experienced reductions in force, this decline of 33% is greater than that experienced at other parks. Reductions in force of this magnitude have adverse impacts on management, maintenance, and morale. Table 3.17 documents the staffing pattern for Grand Lake State Park in recent years.

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Permanent salaried staff</th>
<th>Seasonal staff Park</th>
<th>Total park staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>21</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>2008</td>
<td>21</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>2009</td>
<td>21</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>2010</td>
<td>20</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>2011</td>
<td>14</td>
<td>7</td>
<td>21</td>
</tr>
</tbody>
</table>

The same budgetary pattern and resulting staffing pattern has been seen at the Grand Cherokee Golf Course except that the decline in employment has occurred with seasonal staff. These numbers are shown in Table 3.18. Permanent staff numbers have remained consistent over the four years reported in this table, but seasonal staff has been reduced in numbers and in hours worked.

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Permanent salaried staff</th>
<th>Seasonal staff</th>
<th>Total golf course staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>2008</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>2009</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>2010</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

Detail related to rangers as a subset of the park staff is provided in later discussion.
Revenue and Expenses

Data related to revenue and expense at Grand Lake State Park was provided by local staff and augmented with material from the central OTRD office. Table 3.19 reports this revenue and expense data for the past several years. This table reports the expenses for the operation of the park separated from the operation of the golf course. In addition, fiscal years 2009 – 2011 include all the properties discussed in this RMP. Prior to that time, the reported expenses figures only covered Honey Creek, Bernice, and Twin Bridges. It should also be noted that capital expenses are not reported in this table and are not included in the RMP.

Table 3.19 – Expense at Grand Lake State Park

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Grand Lake State Park</th>
<th>Grand Cherokee Golf Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Total(^{(\text{Note})})</td>
<td>(\text{Personnel Expense}) $623,663</td>
<td>(\text{Operating Expense}) $180,329</td>
</tr>
<tr>
<td>2008 Total(^{(\text{Note})})</td>
<td>(\text{Personnel Expense}) $686,211</td>
<td>(\text{Operating Expense}) $199,559</td>
</tr>
<tr>
<td>2009 Total</td>
<td>(\text{Personnel Expense}) $1,011,819</td>
<td>(\text{Operating Expense}) $189,271</td>
</tr>
<tr>
<td>2010 Total</td>
<td>(\text{Personnel Expense}) $1,025,703</td>
<td>(\text{Operating Expense}) $154,938</td>
</tr>
<tr>
<td>2011 Total</td>
<td>(\text{Personnel Expense}) $1,031,527</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note: Fiscal 2007 and 2008 included only Honey Creek, Bernice, and Twin Bridges.

Table 3.20 – Revenue at Grand Lake State Park

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Grand Lake State Park</th>
<th>Grand Cherokee Golf Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Revenue</td>
<td>$292,994</td>
<td>$293,460</td>
</tr>
<tr>
<td>2008 Revenue</td>
<td>$299,444</td>
<td>$254,956</td>
</tr>
<tr>
<td>2009 Revenue</td>
<td>$318,936</td>
<td>$245,244</td>
</tr>
<tr>
<td>2010 Revenue</td>
<td>$311,149</td>
<td>$221,411</td>
</tr>
<tr>
<td>2011 Revenue</td>
<td>$313,872</td>
<td>NA</td>
</tr>
</tbody>
</table>

In comparing revenue to expense, it is apparent that operation of Grand Lake State Park requires approximately $1 million annually in appropriated state funds beyond revenue earned on site. Similarly, Grand Cherokee Golf Course requires an infusion of state appropriations of approximately $70,000 to $100,000 annually.
Table 3.21 – Other Revenue Streams at Grand Cherokee Golf Course

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Driving range</th>
<th>Daily cart rental</th>
<th>Annual cart lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>$8,053</td>
<td>$87,906</td>
<td>$12,875</td>
</tr>
<tr>
<td>2008</td>
<td>$6,090</td>
<td>$78,140</td>
<td>$9,717</td>
</tr>
<tr>
<td>2009</td>
<td>$6,958</td>
<td>$76,643</td>
<td>$8,216</td>
</tr>
<tr>
<td>2010</td>
<td>$6,456</td>
<td>$64,658</td>
<td>$8,984</td>
</tr>
</tbody>
</table>

Grand Cherokee Golf Course has a number of revenue streams beyond memberships, tournament fees, and green fees. These entrepreneurial revenue streams are reported in Table 3.21.

Hazards Analysis – Natural and Operational

Any recreational activity includes the exposure to hazards, and the probability of specific risks may increase in many outdoor settings. In most current discussions related to hazard and risk, hazards are defined as conditions or events. Risk is the likelihood of injury resulting from a given hazard and is typically defined as a probability of adverse effects from those conditions or events. Everything people do exposes them to hazards. It is how people conduct themselves that determines the risk. An agency or site risk management plan addresses potential loss from anticipated hazards.

Natural Hazards

As with all natural areas, Grand Lake State Park includes a number of hazards. Some of those hazards are natural and related to such things as topography, flora, and fauna. Some of the hazards are structural or related to design; other hazards are operational in nature.

Natural hazards in Grand Lake State Park include the water environment, occasional steep terrain, flora and fauna, as well as a number of other natural conditions or events. In addition, the development of facilities encourages visitors to interact with the natural environment, encouraging people to participate in recreation in an outdoor setting. Quite commonly, the visitor is not informed of the various hazards and is not prepared for the risks involved in their interactions. In general, Grand Lake State Park does not present an environment for risk recreation. Boating, swimming, and other aquatic activity present greater risks for most visitors.

Among the natural hazards present in the park are those associated with weather events. The National Climatic Data Center reports a variety of such hazards by county over several years. These hazards include hail, floods, thunderstorms with accompanying wind and lightning, tornadoes, heavy snow, ice, excessive heat, and drought. Staff members are prepared to notify park visitors in the event of severe weather, but appropriate shelter is limited. At the present time, neither signage nor printed visitor materials provide severe weather information to park visitors.

Other natural hazards are related to life forms in the natural environment. Any time people are hiking and recreating in an outdoor environment, a chance exists that they will inadvertently encounter such wildlife; this is the case in Grand Lake State Park. The park and forest encompasses an environment suitable for venomous snakes including the copperhead, rattlesnake, and water moccasin. Park staff reported occasional sightings of venomous snakes,
but there are no recent records of any adverse encounters between people and snakes within the park.

A number of mammals common to the park are subject to rabies. They include raccoons, armadillos, opossums, skunks, badgers, and bats.

The forest and grassland environment in and around Grand Lake State Park is home to mosquitoes, ticks, and spiders—all of which may be hazards or present hazards to recreational visitors. The Brown Recluse spider and the Black Widow are native to northeast Oklahoma counties. Both spiders have produced adverse effects for humans in recreational settings (and other environments). Both types of spiders were observed in cabins in the three group camps. In addition, ticks are known carriers of a number of serious diseases in humans.

The 2002 Statewide Comprehensive Outdoor Recreation Plan (Caneday, 2002) stated:

An “environmental problem” of increasing occurrence in Oklahoma in recent years is related to ticks and tick-transmitted diseases. Although there are a number of tick-transmitted diseases, the most frequent occurrence is shown by Rocky Mountain spotted fever, Lyme disease, and Tularemia. A number of factors are related to this increased occurrence of disease including demographics, living preferences, and recreational behavior. Oklahoma has experienced significant increases in tick-transmitted diseases over the past decade. While most of these diseases can be treated, the diseases can also be life threatening. Participants in outdoor recreation are among those who encounter the ticks and who contract the tick-transmitted diseases. A concerted, unified effort is necessary to educate the recreational visitor regarding the results of recreational behaviors.

At the time of the writing of the 2002 SCORP, the author contacted the Centers for Disease Control (CDC) in Atlanta regarding rumors (at that time) of a mosquito borne virus – West Nile virus. The CDC assured Caneday that Oklahoma would not experience West Nile virus within the five-year period covered by the 2002 SCORP (2002-2007). However, by summer 2003, Oklahoma was experiencing cases of West Nile virus among horses and humans. Often these resulted from outdoor recreation activity, and that pattern is continuing.

Some plants are also hazardous to some individuals and the risk varies by degree of exposure and response to that exposure. Poison ivy is among those potentially hazardous plants at Grand Lake State Park. The photograph included in Figure 3.60 documents poison ivy along a roadway.

![Figure 3.60 – Poison Ivy near Cherokee area](image)

Another potential natural hazard in a recreation environment is waterborne disease. As stated in the 2002 Statewide Outdoor Recreation Plan (SCORP) for Oklahoma (Caneday, 2002):
Since 1971, Federal agencies (CDC and EPA) have maintained a collaborative surveillance system for collecting and reporting data related to occurrences and causes of waterborne-disease outbreaks (WBDOs). As an environmental hazard, waterborne diseases have always been present in the United States; however, outbreaks linked to drinking water have steadily declined since 1989. By contrast, the number of outbreaks linked to recreation activity has increased (Center for Disease Control). It is not clear whether this is due to increased outdoor recreation activity, larger numbers of people involved in outdoor recreation, or greater hazard present in the water environment. CDC reports for 1995 – 1996 have shown that the exposure to the disease occurred in lakes in 59% of waterborne-disease outbreaks of gastroenteritis associated with recreational water. Equal percentages (27%) of Cryptosporidium parvum and Escherichia coli as the etiologic agent were reported during that period.

Grand Lake State Park receives its potable water from approved public water supplies. As with all water supplies, there is the potential to be a host for waterborne disease through the drinking water provided on-site. Such a risk is no greater for a park visitor than would be true in a private residence. By contrast, surface waters in Grand Lake, in streams, and in ponds have a greater chance of being a source of a waterborne-disease.

That became very apparent during the summer 2011 with the blooming of blue-green algae and the resulting warnings regarding adverse health effects from cyanobacteria. The quality and quantity of surface water will continue to be important considerations for the recreational viability of the Grand River corridor.

**Operational Hazards**

Operational hazards include those vulnerabilities to park staff, the park system, or the state of Oklahoma that exist as a result of management or operation of the resource and application of policy. Management and operational decisions are made on a daily basis and are affected by budgets, prioritization within the state park system, staffing patterns, local and state politics, and other external influences.

At present, emergency fire service and other emergency services are provided by various local and volunteer fire departments. Because Grand Lake State Park includes properties in multiple jurisdictions, the following brief summary identifies fire and emergency services.

- Grand Lake State Park at Bernice: medical services available in Grove; fire response from Bernice with about an 8 minute response time; waste management through Grand Lake Public Works
- Grand Lake State Park at Honey Creek: medical services available in Grove; fire response from Grove
- Grand Lake State Park at Snowdale: medical services available in Pryor; fire response from Salina
- Grand Lake State Park at Spavinaw: medical services available in Pryor or Grove with urgent care in Langley; fire response from volunteer service in Spavinaw
- Grand Lake State Park at Twin Bridges: medical services available in Miami; fire response from Wyandotte

140
- Grand Lake State Park properties near Pensacola Dam: medical services available in Pryor or Grove with urgent care in Langley; fire response from Langley and Disney

As part of the data collection for the development of this RMP, the researchers conducted several on-site visits to Grand Lake State Park. Common issues that could be dangerous for visitors include play structures which utilize a variety of surfacing materials; several such areas are showing a good deal of wear. Areas under swings are deeply eroded, and multiple tripping hazards are found in the immediate vicinity of the playgroups. A thorough examination of the play structures and the applicable surface materials for compliance with Consumer Product Safety Commission guidelines for public playgrounds is warranted at this time. Trails throughout Grand Lake State Park show severe erosion and tripping hazards.

Further, weather-related events (e.g., ice storms, strong winds) in Oklahoma often result in tree and limb damage throughout the park. The locations in which downed trees and limbs have immediate impact on visitors include the camping areas, trails, and day use areas. Currently, Grand Lake State Park does not have a formal limb management or tree replacement program; this is common throughout the state park system. Park staff members attend to downed trees and limbs as they discover them and/or are notified of the hazard.

**Law Enforcement**

The CLEET certified rangers and reserve-CLEET certified rangers are responsible for primary activity related to law enforcement within the boundaries of the park. At present under the staffing and management provided through Grand Lake State Park, there are three CLEET certified rangers available for Grand Lake State Park, although all three of those rangers are permanent employees. It is common for law enforcement units to have mutual aid agreements with other law enforcement agencies. As a result, enforcement of applicable laws at Grand Lake State Park relies on the support and cooperation of county sheriffs, American Indian nations, and municipal law enforcement in the appropriate jurisdiction.

**Table 3.22 – Ranger Staff at Grand Lake State Park**

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>CLEET Certified</th>
<th>Reserve CLEET</th>
<th>Total ranger staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>2008</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2010</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2011</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Citation records were not available specifically for Grand Lake State Park. However, conversations indicated that the incidents and citations ranged from drug and alcohol related situations, to vehicular accidents and traffic incidents, to domestic difficulties, and conflict between park visitors. These same situations were common in other parks. RMP staff also identified dogs loose in the park as being a significant factor in potential conflicts. At the extreme, boating accidents and death by drowning show the tragedies that can occur in a recreation setting. Due to the popularity of Grand Lake State Park, the presence of state highways through the park, and the range of activities offered within the park, Grand Lake State...
Park experiences a greater variety and intensity of problems with visitors than do most other state parks. In spite of these experiences, Grand Lake State Park is a safe, secure environment for the recreational visitor.

It should be noted that these three rangers at Grand Lake State Park cover a territory ranging from the Kansas border (Spring River Canoe Trails) to Highway 20 (Snowdale). A trip from north to south may take two hours.

**Policy-Related Exposures**

Some aspects of management of hazard risk are incorporated into law enforcement. Park rangers are the law enforcement personnel for the Oklahoma Tourism and Recreation Department, although they frequently have cooperative (mutual aid) agreements with county sheriffs and the Oklahoma Highway Patrol. Law enforcement authority for Oklahoma State Park Rangers is authorized by state statute as follows (Title 74 § 2216, 2005):

> Park rangers, when commissioned, shall have all the powers of peace officers except the serving or execution of civil process, and shall have in all parts of the state the same powers with respect to criminal matters and enforcement of the laws relating thereto as sheriffs, highway patrolmen [sic] and police officers in their respective jurisdictions and shall possess all immunities and matters of defense now available or hereafter made available to sheriffs, highway patrolmen, and police officers in any suit brought against them in consequence of acts done in the course of their employment, provided, however, they shall comply with the provisions of Section 3311 of Title 70 of the Oklahoma Statutes.

In parks with CLEET certified or reserve certified personnel, written logs are maintained by park staff to document incidents. In addition to the regular log, staff members complete incident reports when notified of property damage or personal injury to visitors or staff. While the incident reporting form requires information regarding personal injury or property damage, the process does not appear to require follow-up with the reporting party.

In terms of wildlife, while a formal management plan does not exist, staff operates under an agreed-upon plan approved by the Oklahoma Division of Wildlife Conservation (ODWC). As an important natural resource in the park, the vulnerable and endangered species in the area lack a management plan other than classification by ODWC.

Perhaps one of the most essential operational hazards related to the public is the concern that cell phones and radios have limited to sporadic service in rural areas, and possibly within the park. During the preparation of the RMP, research staff members were able to acquire and maintain cell phone signals throughout Grand Lake State Park. Thus, in case of injury, illness, fire, or other emergency, park visitors with personal cell phones should be able to contact necessary emergency services. Those without personal cell phones or with inadequate signals must use a landline based telephone to call emergency personnel.

**Waste Management**

The relatively large and distributed area of development at Grand Lake State Park requires multiple programs in waste management. There are two primary concerns related to waste management within the park: solid waste and liquid waste.
Solid waste at all properties except Snowdale is transported off-site under contract with a waste management company in Bernice. At Snowdale, the solid waste is removed under contract with Salina. Dumpsters have been located at strategic points within the park properties. Visitors are expected to dispose of waste properly in these dumpsters.

Liquid waste is managed on-site at the various properties through several septic systems, lagoons and municipal waste treatment. While the septic systems tend to be concentrated on a single structure, the lagoons serve multiple buildings. These lagoons also require lift stations to transport liquid wastes to the respective lagoons.

Park management did not express any concerns or problems with waste management at Grand Lake State Park. As with any area that is utilized by the public, some trash and litter is present within the park. This solid waste presents a visual detraction, but presents limited problems other than clean-up of the area.
Figure 3.61 – Views at Grand Lake State Park
Above: Grand Lake State Park at Honey Creek
Below: Grand Lake State Park at Twin Bridges
Chapter 4 – Alternatives and Preferred Plans

Overview and Summary

In this Resource Management Plan, background is provided related to Grand Lake State Park. When analyzed, this information raises several issues for consideration. These issues are presented in the following discussion with alternatives for management to consider. In each case, based on the available information a preferred alternative is identified.

Issues and Alternatives

Issue Statement 1: Qualification and branding as a state park

One of the central issues for consideration related to each of the properties being reviewed during the Resource Management Plan project is qualification and branding as a state park. That question is more apparent for Grand Lake State Park than for several other high profile properties largely because of the small, scattered locations that make up Grand Lake State Park.

What is a state park? Jordan and Caneday addressed this question in earlier reports for OTRD as a part of the state park visitor study in 2003 (Caneday and Jordan). As stated in that report –

The research team believes that the term “state park” should mean something specific. The term, “state park,” should identify a property distinctively through management practices, quality of experience and appearance to the public. The research team believes that visitors to Oklahoma “state parks” should know immediately that they are in a State Park because of the distinctive “branding” apparent to the visitor and deliberately intended by management. The research team believes that the Oklahoma Tourism and Recreation Department must jealously guard the use of the term “state park” in much the same manner as companies protect symbols of intellectual property.

An example of resource qualifications for specific classifications can best be demonstrated through the National Park Service. For a property to be classified as a National Park there must be (1) evidence of national significance for a natural, cultural, or recreational resource, (2) management of the property must be feasible, and (3) the property must be suitable within the mission, purpose, and system of the National Park Service.

By contrast, other classifications of National Park Service properties include National Monuments, National Recreation Areas, and National Preserves. National monuments must be significant natural, cultural, or recreational resources, but may be managed by entities other than the National Park Service. National preserves are limited to significant environmental resources and may vary in ownership and management of the resource. National recreation areas, including Chickasaw National Recreation Area in south-central Oklahoma, are managed for more intensive recreation in outdoor settings.
OTRD policy related to acquisition of property uses some of this language, thereby establishing a general pattern of resource qualification. These criteria include (1) state-wide significance for natural beauty, uniqueness, or other recreational and resource preservation purposes, and (2) sites which will improve the overall availability of public recreation facilities to the recreating public while possessing resource significance (Oklahoma Tourism and Recreation Commission, 1988).

In addition, branding and classification of properties within the Department has varied over the years. Minutes of the Oklahoma Planning and Resource Board (a precursor to the Oklahoma Tourism and Recreation Commission) from September 18, 1953 record the passing of a motion defining state parks, state recreation areas, state memorials, and state monuments. That variation in descriptive classification was changed by legislation during the 1980s.

Applying the national concepts to state parks in Oklahoma and utilizing the earlier definitions in Oklahoma, it could be concluded that a state park must (1) have a significant statewide natural, cultural, or recreation resource, (2) be feasible to manage by the agency, and (3) be suitable within the mission, purpose, and statewide system of state parks. If this set of qualifications is applied of Grand Lake State Park, it could be concluded that:

1. Grand Lake o’ the Cherokees is a significant statewide recreation resource, but the individual properties do not have statewide significance except for the public access to Grand Lake.
2. Grand Lake State Park is feasible to manage within the agency and fits within the mission of Oklahoma State Parks. The larger component properties of Grand Lake State Park receive the most visible management. This includes Grand Lake State Park at Twin Bridges, Grand Lake State Park at Bernice, Grand Lake State Park at Honey Creek, and Grand Cherokee. The remaining properties are feasible to manage, but receive less attention.
3. Grand Lake State Park property fits within the mission of OTRD as public access to a premier resource – Grand Lake.

Applying the national concepts to state parks in Oklahoma and utilizing the earlier definitions in Oklahoma, it could be concluded that a state park must (1) have a significant statewide natural, cultural, or recreation resource, (2) be feasible to manage by the agency, and (3) be suitable within the mission, purpose, and statewide system of state parks. If this set of qualifications is applied to various areas of Grand Lake State Park, other possibilities remain. The following addresses individual components of Grand Lake State Park.

Grand Lake State Park at Spring River Canoe Trails

1. Grand Lake State Park at Spring River Canoe Trails offers recreational access to Oklahoma’s only designated canoe trail. Beyond this, Spring River Canoe Trails does not offer environmental resources of statewide significance. Spring River Canoe Trails is not large enough to include significant statewide natural resources. Spring River Canoe Trails does encompass historic and cultural resources with some localized value. Spring River Canoe Trails does not offer a broad range of recreation opportunities in a location that allows service to a large and growing population.
2. Grand Lake State Park at Spring River Canoe Trails is apparently not feasible to manage within the agency, nor does it fit within the mission of Oklahoma State Parks, especially with limited budgets.
3. Grand Lake State Park at Spring River Canoe Trails fits within only a portion of the mission of OTRD and the park’s stated purpose. The actual resource of significance is the Spring River, whereas the properties designated as a portion of Grand Lake State Park serve only as access points to the Spring River.

Should Grand Lake State Park at Spring River Canoe Trails continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Spring River Canoe Trails as a property within the state park system, transferring management of the area to another group or organization.

B. Keep Grand Lake State Park at Spring River Canoe Trails as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.

C. Keep Grand Lake State Park at Spring River Canoe Trails as a property within the state park system, re-brand the property for specific usage, and remove unnecessary development.

D. No change – continue management as it is.

Preferred alternative:

Alternative A: Remove Grand Lake State Park at Spring River Canoe Trails as a property within the state park system, transferring management of the area to another group or organization.

Grand Lake State Park at Twin Bridges

1. Grand Lake State Park at Twin Bridges offers recreational access and environmental resources of statewide significance. Twin Bridges is the only park area located on the confluence of two major rivers in Oklahoma. This area provides a recreation area that is significant and specialized. With immediate access to various highways, Twin Bridges offers a broad range of recreation opportunities in a location that allows service to a large population.

2. Grand Lake State Park at Twin Bridges is feasible to manage within the agency and fits within the mission of Oklahoma State Parks. Twin Bridges has onsite maintenance operations and was formerly an independent state park.

3. The Grand Lake State Park at Twin Bridges property fits within the mission of OTRD and the park’s stated purpose as a pre-eminent property with natural, cultural, historic, and recreational resources deserving of protection and management for the present and future generations. Twin Bridges is one of the few public outdoor recreation properties in far northeast Oklahoma and provides access to prominent recreation resources – Grand Lake, the Neosho River, and the Spring River.

Should Grand Lake State Park at Twin Bridges continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Twin Bridges as a property within the state park system, transferring management of the area to another group or organization.

B. Keep Grand Lake State Park at Twin Bridges as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.
C. Keep Grand Lake State Park at Twin Bridges as a property within the state park system, re-brand the property for specific usage, and remove unnecessary development.
D. No change – continue management as it is.

Preferred alternative:

Alternative B: Keep Grand Lake State Park at Twin Bridges as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.

Grand Lake State Park at Bernice

1. Grand Lake State Park at Bernice offers recreational access and environmental resources of statewide significance. Bernice is located on open water of Grand Lake in northeast Oklahoma. This area provides a recreation area that is significant and specialized. This property offers immediate access to various highways and the local community of Bernice, Oklahoma. Bernice offers specific activities not found at other properties in the area, such as a paved nature trail, a nature center, and a large swimming area on the lake.
2. It is feasible to manage Grand Lake State Park at Bernice within the agency and within the mission of Oklahoma State Parks. Bernice has limited onsite maintenance operations and is a smaller property with fewer maintenance needs. Presently, staff on-site is limited which has limited the open hours of the nature center. Bernice was formerly an independent state park.
3. The Grand Lake State Park at Bernice property does not fit within the mission of OTRD and the park’s stated purpose as a pre-eminent property with natural, cultural, and historic resources deserving of protection and management for the present and future generations. However, the recreation value of Bernice is significant. The Bernice area is frequently used during the warmer months as a place for larger family gatherings.

Should Grand Lake State Park at Bernice continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Bernice as a property within the state park system, transferring ownership and/or management of the area to another group or organization.
B. Keep Grand Lake State Park at Bernice as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.
C. Keep Grand Lake State Park at Bernice as a property within the state park system, re-brand the property for specific usage, consider seasonal hours, and remove unnecessary development.
D. No change – continue management as it is.

Preferred alternative:

Alternative C: Keep Grand Lake State Park at Bernice as a property within the state park system, re-brand the property for specific usage, consider seasonal hours, and remove unnecessary development.

Grand Lake State Park at Honey Creek

1. Grand Lake State Park at Honey Creek offers recreational access and environmental resources of statewide significance. Honey Creek is located on the northeast corner of
Grand Lake in northeast Oklahoma. This area provides a recreation area that is significant and specialized. This property offers immediate access to various highways and the growing community of Grove, Oklahoma. Honey Creek offers a broad range of recreation opportunities in a location that allows service to a large and growing population.

2. Grand Lake State Park at Honey Creek is feasible to manage within the agency and fits within the mission of Oklahoma State Parks. Honey Creek has onsite maintenance operations and was formerly an independent state park.

3. The Grand Lake State Park at Honey Creek property fits within the mission of OTRD and the park’s stated purpose as a pre-eminent property with natural, cultural, historic, and recreational resources deserving of protection and management for the present and future generations. Honey Creek is one of the few public outdoor recreation properties that resides adjacent to an Oklahoma town or community.

Should Grand Lake State Park at Honey Creek continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Honey Creek as a property within the state park system, transferring ownership and/or management of the area to another group or organization.

B. Keep Grand Lake State Park at Honey Creek as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.

C. Keep Grand Lake State Park at Honey Creek as a property within the state park system, re-brand the property for specific usage, and remove unnecessary development.

D. No change – continue management as it is.

Preferred alternative:

Alternative C: Keep Grand Lake State Park at Honey Creek as a property within the state park system, re-brand the property for specific usage, and remove unnecessary development.

Grand Lake State Park at Disney & Little Blue

1. The Grand Lake State Park at Disney and Little Blue areas do not offer recreational access and environmental resources of statewide significance. These areas do not provide recreation settings that are significant and specialized. With immediate access only to one state highway, this property may be difficult to access. The Disney and Little Blue properties do not offer a broad range of recreation opportunities; the resource is limited in what offerings are possible. Little Blue does encompasses an interesting environment, but that environment has been seriously and adversely impacted by human activity. Disney is simply an access point to Grand Lake.

2. The Grand Lake State Park at Disney and Little Blue properties are difficult to manage within the agency and do not fit within the mission or standards of Oklahoma State Parks. Disney and Little Blue appear to be lower priorities for maintenance operations and receive limited attention; however, both properties are smaller parks with limited maintenance and upkeep needs. These properties present behavior and law enforcement concerns undesirable in a state park setting.
3. The Grand Lake State Park at Disney and Little Blue properties may not fit within the mission of OTRD or the park’s stated purpose as a pre-eminent property with natural, cultural, historic, and recreational resources deserving of protection and management for the present and future generations.

Should Grand Lake State Park at Disney and Little Blue areas continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Disney and Little Blue areas as a property within the state park system, transferring management of the area to another group or organization.
B. Keep Grand Lake State Park at Disney and Little Blue areas as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.
C. Keep Grand Lake State Park at Disney and Little Blue areas as a property within the state park system, re-brand the property for specific usage, and remove unnecessary development.
D. No change – continue management as it is.

Preferred alternative:

Alternative A: Remove the Grand Lake State Park at Disney and Little Blue properties from the state park system, transferring management of the area to another group or organization.

Grand Lake State Park at Cherokee properties

1. The Grand Lake State Park at Cherokee properties offer recreational access of statewide significance because of Grand Lake and the Grand River below the Pensacola Dam. This area provides recreation access that is significant and specialized. With immediate access only to two state highways, this property may be accessed through a variety of routes. The Cherokee properties offer a broad range of recreation opportunities; however the resource is limited in what offerings are possible.

2. The Grand Lake State Park at Cherokee properties are feasible to manage within the agency and fit within the mission of Oklahoma State Parks. Cherokee properties have some onsite maintenance operations but all nodes of this area are smaller parks with limited maintenance and upkeep needs.

3. The Grand Lake State Park at Cherokee properties may not fit within the mission of OTRD and the park’s stated purpose as pre-eminent properties with cultural and historic resources, but the properties offer significant recreational resources. Areas of these properties are deserving of protection and management for the present and future generations.

Should Grand Lake State Park at Cherokee areas continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Cherokee properties as properties within the state park system, transferring ownership and/or management of the area to another group or organization.
B. Remove certain areas of the Grand Lake State Park at Cherokee properties, retaining the Cherokee properties located below the Pensacola Dam and Cherokee Lakeside.
C. Keep all of the Grand Lake State Park at Cherokee properties within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.

D. Re-brand the Grand Lake State Park at Cherokee properties for specific usage, and remove unnecessary development.

E. No change – continue management as it is.

Preferred alternative:

Alternative B & D: Remove certain areas of the Grand Lake State Park at Cherokee properties, retaining the Grand Lake State Park at Cherokee properties located below the Pensacola Dam and Cherokee Lakeside. Re-brand the Cherokee properties for specific usage, and remove unnecessary development.

Grand Lake State Park at Spavinaw

1. Grand Lake State Park at Spavinaw offers recreational access and environmental resources of localized value, with limited statewide significance in its present form. This area does not provide recreation area that is truly significant and specialized beyond its local attraction. With immediate access only to one state highway, this property may be difficult to access. The Spavinaw property does not offer a broad range of recreation opportunities; the resource is limited in what offerings are possible. This property is very close to the town of Spavinaw, a smaller community and is not a location that allows service to a large population.

2. The Grand Lake State Park at Spavinaw property is apparently difficult to manage within the agency in that it receives limited attention and has been seasonal in operation. Spavinaw has limited onsite maintenance operations and is a smaller park with limited maintenance and upkeep needs.

3. The Grand Lake State Park at Spavinaw property may not fit within the mission of OTRD and the park’s stated purpose as a pre-eminent property with natural, cultural, historic, and recreational resources deserving of protection and management for the present and future generations. Spavinaw does have some cultural and historical value, but the park has moved from the original location that may be specifically attributed to these values.

Should Grand Lake State Park at Spavinaw continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Spavinaw as a property within the state park system, transferring ownership and/or management of the area to another group or organization.

B. Keep Grand Lake State Park at Spavinaw as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.

C. Keep Grand Lake State Park at Spavinaw as a property within the state park system, rebrand the property for specific usage, and remove unnecessary development.

D. No change – continue management as it is.
Preferred alternative:

Alternative A: Remove Grand Lake State Park at Spavinaw as a property within the state park system, transferring ownership and/or management of the area to another group or organization.

Grand Lake State Park at Snowdale

1. Grand Lake State Park at Snowdale offers recreational access and environmental resources comparable to numerous other properties in eastern Oklahoma, especially those managed by the U.S. Army Corps of Engineers. There is nothing unique or of statewide significant about Snowdale. The Snowdale property does not offer a broad range of recreation opportunities; the resource is limited in what offerings are possible. The property has importance to a localized population desiring public access to Lake Hudson.

2. The Grand Lake State Park at Snowdale property is apparently difficult to manage within the state park system in that it receives limited attention and is seasonal in operation. Snowdale has limited onsite maintenance operations and is a smaller park with limited maintenance and upkeep needs.

3. The Grand Lake State Park at Snowdale property may not fit within the mission of OTRD and the park’s stated purpose as a pre-eminent property with natural, cultural, historic, and recreational resources deserving of protection and management for the present and future generations.

Should Grand Lake State Park at Snowdale continue as a state park property?

Alternatives

A. Remove Grand Lake State Park at Snowdale as a property within the state park system, transferring management of the area to another group or organization.

B. Keep Grand Lake State Park at Snowdale as a property within the state park system and create a strengthened marketing and publicity plan to increase visitor use and opportunities at the state park property.

C. Keep Grand Lake State Park at Snowdale as a property within the state park system, re-brand the property for specific usage, and remove unnecessary development.

D. No change – continue management as it is.

Preferred alternative:

Alternative A: Remove Grand Lake State Park at Snowdale as a property within the state park system, transferring management of the area to another group or organization.

Issue Statement 2: Capacity of the property for visitors

Every property has a capacity for use. In park management, capacity has been defined as a function of resource characteristics, type and amount of use, visitor perspective, and management goals. The purpose of Grand Lake State Park has been determined to be “the protection and public enjoyment of the scenic and recreational values that exist in the diverse state park properties near Grand Lake o’ the Cherokees extending through the Grand River watershed offering a tourist destination designed and developed to attract and serve visitors, to provide opportunities for visitors to enjoy the scenery, to instill an appreciation of those scenic,
recreation, and environmental values supplemented by a built and modified park environment, and to stimulate the local economy.”

Resource characteristics and management goals are presently at odds with the type and amount of use and visitor perspective. Type of use is clearly causing damage to the resource in some areas of Grand Lake State Park. This is most apparent at the Disney, Little Blue and Cherokee areas. Lack of maintenance, limited law enforcement, undesirable recreation behaviors of users, combined with continued ATV use of these areas, has led to serious deterioration of portions of the resource.

Amount of use also conflicts with the resource at particular times and in particular places. Grand Lake State Park at Bernice, Cherokee Grandview, Little Blue, Disney, and Snowdale are the most egregious examples of exceeding the capacity of the resource on summer holidays and weekends, particularly in unimproved and undesignated camping areas. In addition, campground design in Honey Creek and Spavinaw indicates less concern for the quality of the recreation experience than for opportunity to increase numbers and revenue. This same pattern occurs in other locations throughout Grand Lake State Park.

Alternatives

A. Develop and implement policies, including reduced capacity, to emphasize quality of the recreation experience at Grand Lake State Park;
B. Encourage additional development to expand numbers of visitors;
C. No change – continue management as it is.

Preferred alternative:

Alternative A: Develop and implement policies, including reduced capacity, to emphasize quality of the recreation experience at Grand Lake State Park.

Issue Statement 3: Staffing and personnel for the future

Efficiencies in operation are necessitated by budgetary conditions and demanded by good management practices. Grand Lake State Park has operated over the past several years with a declining number of staff members. With the reduction in staff, there has been a reduction in service. This situation is not unique to Grand Lake State Park since similar patterns are present at all of the parks. However, Grand Lake State Park is a premier set of properties, highly visible to the visiting public.

Among the services that have been reduced at Grand Lake State Park are proper maintenance of historic structures, maintenance of tent and RV campsites, and interpretive activity throughout the park. Properly qualified staff members could be achieved through utilization of collegiate interns. Properly qualified interns could be employed for relatively low wage levels in roles such as: (1) basic park maintenance; (2) natural, cultural, and historic interpretation; (3) office management; (4) out-reach; and (5) other necessary duties. Interns would require supervision and oversight – to be provided by an appropriate staff member. Interns would require housing – which could be available on property at Grand Lake State Park.

Cooperative education agreements and internships could be arranged for persons in a variety of disciplines, including (1) recreation, park, and leisure studies; (2) forestry; (3) botany, zoology,
or other natural science; (4) environmental science or environmental education; and (5) other disciplines as appropriate. OTRD and Oklahoma State Parks would benefit greatly from such agreements, as would participants in the internship experience.

Alternatives

A. Develop and sustain agreements for qualified internships;
B. No change – continue management as it is.

Preferred alternative:
Alternative A: Develop and sustain agreements for qualified internships.

**Issue Statement 4: Reconsideration of campground experience and design**

Campground design, atmosphere, and the resulting experience for visitors vary greatly from location to location within Grand Lake State Park. As indicated in earlier discussion, several of the campgrounds offer little privacy, limited shade, crowded campsites, and little more than a paved surface for a recreation vehicle or a plot of ground for a tent. In addition, policies have permitted multiple vehicles and camping units at single sites, increasing the density of occupancy. The experience offered belies the expectations of a visit to a state park. This is particularly true at (1) Honey Creek, (2) Snowdale, (3) Cherokee, (4) Bernice, (5) Little Blue, and (6) Disney.

The impression given to a visitor in these locations is that the campsites were developed to provide revenue generation opportunities on high capacity days. Little thought appears to have been given to carrying capacity of the resource or quality of experience for the guest. Now, it is true that some visitors prefer these locations and have accepted the design and experience. However, other visitors have been displaced because of dissatisfaction with the experience and the design.

There should be discussion and determination of the desired experience for campers at an Oklahoma State Park with deliberate planning and design of campsites and campgrounds that can achieve that desired experience. A variety of experiences – and associated designs – may be desirable. However, that should be deliberately planned and marketed to the respective audiences.

Alternatives

A. Review the design of each campground and determine the desired recreation experience for the location and that audience; then seek to provide that design and experience;
B. Ignore the relationship between design of a campground and the experience offered;
C. No change – continue management as it is.

Preferred alternative:
Alternative A: Review the design of each campground and determine the desired recreation experience for the location and that audience; then seek to provide that design and experience.
**Issue Statement 5: Green practices related to energy and conservation**

Within the past few years Americans have begun to take conservation practices seriously. On behalf of citizens and as a representative of the park and recreation profession – a field with a strong connection to the environment – Oklahoma State Parks has initiated several practices that are intended to conserve energy and other resources. This has been initiated with energy efficient lighting in the lodge and office structures, and needs to be expanded to other management practices.

Among the many possible areas that would benefit from conservation practices are: (1) park policies related to mowing, maintenance, debris removal, and waste disposal; and (2) recycling opportunities for the entire operation and its guests.

At present, state laws do not encourage a state agency to recycle waste or trash products, especially when private citizens generate (and thereby ‘own’) those materials. Inventory management and accounting procedures prevent the sale of, or revenue production from, recycled materials. However, volunteer groups such as a possible “Friends of Grand Lake State Park” are permitted to serve as an agent for the collection and sale of recyclable materials. Another challenge to the establishment of a recycling program is the difficulty in finding a consistent market for the various products that might easily be recycled: glass, aluminum, and paper. These challenges do not lessen the desirability of establishing a recycling program in the state park system.

Grand Lake State Park can have a significant role in modeling and educating other managers and guests regarding best management practices. The events surrounding the blue-green algae warnings in 2011 provide an excellent “teachable opportunity” for increasing educational efforts related to green practices. One state park in Oklahoma – Keystone State Park – has been eco-certified. Grand Lake State Park should be a leader in this effort as well.

**Alternatives**

A. Seek to change state accounting regulations to permit operation of the recycling program by park staff;
B. Encourage the development of a “Friends of Grand Lake State Park” to create, implement, and evaluate a comprehensive recycling program throughout the park;
C. No change – continue management as it is.

Preferred alternative:

Alternative B: Encourage the development of a “Friends of Grand Lake State Park” to create, implement, and evaluate a comprehensive recycling program throughout the park.

---

**Issue Statement 6: Designated Swim Areas at Grand Lake State Park**

At present there are several designated swimming areas at Grand Lake State Park: Twin Bridges, Bernice, Cherokee-Lakeside, Little Blue, Snowdale, and Spavinaw. Visitors commonly swim at many other locations throughout the parks. Swimming areas are difficult to maintain on artificially impounded lakes due to fluctuation in water levels. It is also rare that natural features provide a proper beach environment in those lakes. At Grand Lake and Lake Hudson, both
situations are accurate. Swimming areas at these lakes tend to be shallow and muddy. A few of
the designated swim areas have a rocky base.

Swimming areas require adequate water circulation to permit aeration of the water without
hazardous currents. A few swimming areas at Grand Lake and Lake Hudson present little to no
current; it presents limited oxygenation in the water (Snowdale, Bernice). The blue-green algae
warnings that occurred in 2011 and 2012 are likely to become a common occurrence for the
foreseeable future.

Swimming in non-designated locations around Grand Lake and Lake Hudson will continue
purely through visitor decisions. Each presents a certain amount of risk as demonstrated by
accidents, injuries, and occasional deaths. However, it is impossible to monitor all these
locations or the behavior of all park visitors. Swimming is part of the experience desired by
many during a visit to Grand Lake State Park.

Alternatives

A. Improve the quality of the existing beaches at Grand Lake;
B. Develop additional beaches at Grand Lake;
C. No change – continue management as it is.

Preferred alternative:

Alternative C: No change – continue management as it is.

**Issue Statement 7: Pricing for instate and out-of-state guests**

Presently OTRD operates under a policy of pricing a given good or service similarly for all
guests. There is no distinction in pricing of goods and services between in-state residents who
visit an Oklahoma State Park and out-of-state residents who visit and enjoy the same facilities
and events. There is a distinction in that the in-state residents pay a significant tax burden which
then subsidizes OTRD and the state parks. As a result, the in-state residents subsidize the
recreation experience of out-of-state guests. It is readily acknowledged that the out-of-state
guests benefit the local economy with their expenditures. However, if a guest at a local park
resides outside the extent of the local economy, the dollars spent by a resident or an out-of-state
guest have equal economic impact in direct measures, indirect measures, and induced measures.

Just as is common at all state parks in Oklahoma, Grand Lake State Park enjoys visitation by a
significant number of guests from a variety of states, as well as those from within Oklahoma.
This pattern of visitation is likely to occur at a number of other state parks near the interstate
borders and for parks that offer attractions differing from what is available outside of the state of
origin for the guests.

Many states have instituted a pricing differential to benefit in-state residents. For example, Texas
requires vehicle permits for all vehicles entering its parks. Texas residents pay a lower price for
the vehicle permits than do out-of-state residents – including Oklahomans who visit Texas.

Tourism is a business that includes intriguing interactions between the host community and its
guests. OTRD must sustain a positive relationship between its parks, the staff in those parks, the
surrounding community, in-state taxpayers, and guests – some of whom come from out of state.
Pricing of goods and services is a sensitive variable in that relationship.
Alternatives

A. Review the pricing of lodging and camping provided by Oklahoma State Parks with consideration for state of residence as a factor in establishment of those prices;
B. Consider implementing entry fees at other premium locations within Grand Lake State Park for all guests utilizing those locations;
C. No change – continue management as it is.

Preferred alternatives:

Alternative A: Review the pricing of lodging and camping provided by Oklahoma State Parks with consideration for state of residence as a factor in establishment of those prices.

Issue Statement 8: Interpretive services at Grand Lake State Park

Currently there is only one Nature Center within the Grand Lake State Park properties, at Bernice although there is an excellent interpretive center at GRDA headquarters in Langley. Grand Lake State Park has a unique history that should be interpreted throughout the park properties. That story cannot simply be told from a nature center. It should be told at each location, from north to south Grand Lake. The interpretive message of Grand Lake State Park should be told on property and off, to any interested audience, and to audiences yet uninformed.

Some of this is occurring at present through the Nature Center at Bernice. However, limited staff presents problems with scheduling open hours at the Nature Center within the park.

Interpretive services are variously defined depending upon the source or the agency involved. The classic definition of interpretation was given by Freeman Tilden (1977) as “An educational activity that attempts to reveal meaning and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than to simply communicate factual information.”

William E. Brown (1971), in *Islands of Hope*, presented the role of parks in the interpretive process. His definition of interpretation encompassed technology as well as process, as he stated that interpretation is “That body of communications, devices and facilities that conveys environmental knowledge, stimulates discourse on environmental problems and results in environmental reform.” Brown also indicated that interpretation has a distinct purpose, especially in a sensitive natural environment. Brown argued that “Environmental interpretation not only informs, it motivates to action – sometimes it is action. Even at the informing level, it ceases to be innocent nature study or whitewashed history. It questions value systems, folk heroes, and conventional wisdom.”

The National Association for Interpretation (2008) has developed a professional, contemporary definition of interpretation that incorporates the theory from Tilden, the purpose from Brown, and the mission of the agency delivering the service. “Interpretation is a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource.”

Grand Lake State Park offers several resources with inherent meaning and interest for the audience, allowing for forging of emotional and intellectual connections. The story includes the
people, the place, the organizations, the events, the habitat, the wildlife residents, and much more.

Properly developed and delivered programming could be presented on a fee-for-service basis. These programs could and should be delivered on-site and off-site. These programs become the educational foundation and outreach for Grand Lake State Park and the state park system more broadly. This would require staff at a time when finances are limited for employing personnel.

Grand Lake State Park could host one or two collegiate interns continually to create and deliver interpretive messages. This would accomplish several goals for Grand Lake State Park: (1) it would bring creative and energetic personnel into the park system; (2) it would achieve an educational goal for the park and the park system; (3) it would provide a link between the park system and the formal college and university education system; and (4) it would provide a message that Oklahoma’s state parks serve an educational role as well as a recreational role.

Alternatives

A. When finances permit, expand the interpretive programming within and beyond the nature center;
B. Encourage the development of internship agreements focused on interpretive services;
C. No change – continue management as it is.

Preferred alternatives:

Alternative A and B: When finances permit, expand the interpretive programming within and beyond the nature center; encourage the development of internship agreements focused on interpretive services.

**Issue Statement 9: Cabins at Grand Lake State Park at Twin Bridges**

Currently there are no cabins within any of the properties associated with Grand Lake State Park. There are lake huts available at Grand Lake State Park at Twin Bridges. Cabins are available in the private market throughout the Grand Lake region. There is some indication from visitors to Grand Lake State Park of a desire for cabins. In other parks within the Oklahoma State Park system, cabins are in high demand. It is likely that such a market would exist at Grand Lake. Staff reported that visitors do ask about the opportunity for cabins.

It is not necessary to develop cabins in locations around Grand Lake where existing supply through the private sector meets the demand. However, at the north end of Grand Lake, Twin Bridges is in a location that may have adequate demand and offer an opportunity to meet that demand in a premier park location.

Alternatives

A. When finances permit, conduct a needs assessment for cabin lodging in the Grand Lake area;
B. Consider the possibility of developing cabins at Grand Lake State Park at Twin Bridges;
C. No change – continue management as it is.
Preferred alternatives:

Alternative A and B: When finances permit, conduct a needs assessment for cabin lodging in the Grand Lake area; consider the possibility of developing cabins at Grand Lake State Park at Twin Bridges.

Recommendations beyond the Issues

Recommendation 1: Continuity of Signage throughout Grand Lake State Park

In its present configuration by name and management, several properties have been organized into a single state park, Grand Lake State Park. This reorganization was completed to aid in better management of natural resources, better communication between properties with similar focus, visitation, and amenities, and to improve overall operations. While this reorganization benefits the state park system in a number of ways, there are some issues related to this transition and communication.

As of the updating of the RMP, most properties that are included in the reorganization forming Grand Lake State Park still have signage from the previous designation. Grand Lake State Park at Bernice was updated in signage in 2012. Upon speaking with park staff, many staff members understand the reorganization, but still feel as though their park properties retain the “essence” of former titles. Only in a few instances was the title Grand Lake State Park used on distributed information, and in few places has the title Grand Lake State Park been used on signage. Furthermore, information online is even more misleading. While OTRD has updated information on their website, other highly trafficked websites have not updated information. While such updates are difficult to manage in that they are not the responsibility of administration, such misinformation and dated information speaks volumes about the confusion current in the state park after the name change.

If OTRD does not have accurate continuity in their naming, branding, and signage of the park, it cannot be expected that other sources will do so either. State park administration and management needs to develop a plan to provide accurate information and signage throughout Grand Lake State Park. This requires updated information and materials that is provide to the public and guests, as well as renovation and updates to all signage and branding throughout the Grand Lake State Park properties.

Recommendation 2: Grand Lake State Park Management Office

Currently, there is no official park office for Grand Lake State Park. Several properties have physical offices on property (Grand Lake State Park at Twin Bridges, Grand Lake State Park at Honey Creek, and Grand Cherokee) but none serve as the primary office for the entire park. Following the preparation of the original 2012 RMP, Grand Lake State Park was organized into two management units: north Grand Lake State Park and south Grand Lake State Park. Each of these units as a manager with designated oversight for specific properties in the larger Grand Lake State Park. This structure should aid in management of a diverse and widely-distributed state park.
Recommendation 3: Dogs in Grand Lake State Park

During meetings with park personnel, problems with dogs at Grand Lake State Park were mentioned on several occasions. In addition, dogs are identified in several incident reports. Probably the most visible incidents occurred as RMP staff encountered dogs running loose on state park property on almost every visit. Occasionally the loose pet was associated with a campground host. Clearly dogs have increased in social acceptance in recent years in park environments, becoming personal companions for many park visitors. OTRD has policies in place to address dogs and other pets within the park.

Dogs have also become common with employees, camp hosts, and volunteers on-site. While policies regarding dogs in the park are in place, regulation and policing of these policies has not yielded significant results.

It would be possible to designate one campground as a “no pet” location to see if it would be attractive to a meaningful portion of the population.

Recommendation 4: Use of the term “handicapped”

The term “handicapped” occurs in park brochures, marketing materials, and signage at Grand Lake State Park – and across the state park system. The term “handicapped” has connotations that are undesirable among informed citizens. With an increasing percentage of the population dealing with one or more disabling conditions, many of which are not “handicaps”, society is changing to a more positive terminology. OTRD has made significant advances in design of facilities, installation of accessible playgroups and comfort stations, improvements in communication regarding accessible services and facilities. OTRD is commended for these efforts and should continue with the effort to replace outdated signage and materials.

Recommendation 5: Improvements and Developments for Leased Areas

Some of the property included in Grand Lake State Park is currently leased to OTRD from various organizations. While certain improvements and developments are warranted and may be necessary, it is important to consider long-term issues at various properties. Certain properties or portions of properties at Grand Lake State Park are among those that are leased rather than owned by OTRD. This situation demands management consideration as improvements and developments are scheduled for areas that are leased. As improvements and developments are warranted and necessary, state park administration and management should secure long-term leases or purchase properties before significant improvements are made to any park or park property.

Recommendation 6: ATV and ORV Usage

Below Pensacola Dam at Grand Lake is a popular site for ATV and ORV use. Visitors from across the United States visit south Grand Lake to experience the unique environment in their ATVs and ORVs. The rocky terrain below the dam has little to no topsoil due to water releases at several dikes on the south end of Grand Lake. This provides a rocky surface and an environment that is durable for ATV and ORV use. Further, the unique structure of the rocky surface, with steep grades, crevices, and terrain difficult to navigate in vehicles, makes it a year-round attraction.
Visitors and tourists come to the towns of Langley and Disney in such large numbers that it is typical to wait for camping, restrooms, and for dining at local establishments. It is during large rallies or gatherings that the state park properties in the area are over-capacity. These properties include Grand Lake State Park at Little Blue, Disney, Cherokee Grandview, Cherokee Lakeside, and Cherokee Riverside.

ATV and ORV users also drive these vehicles on roads and highways that are not designated for certain ATV or ORV use. It is common, when gatherings happen, for ATVs and ORVs to be present on all roads in state parks, county roads, and highways in and throughout the entire south Grand Lake area.

Allowing park properties to be booked over capacity and permitting non-highway compliant vehicles in and throughout state park properties presents safety concerns that need to be addressed. OTRD should work in cooperation with the Grand River Dam Authority and local law enforcement to develop better plans to suit the needs and address the issues that arise when these user groups are present. If these properties continue to be operated as part of Grand Lake State Park, it will be essential that ATV and ORV operations be addressed.

ATV and ORV user groups provide economic stimulus to the local economies, boost revenue for state parks, and increase state park visibility. The durability of the local landscape and unique environment provide an ideal place for ORV and ATV users to enjoy this specific activity. OTRD should embrace these user groups as a viable and continuing part of the visitation to Oklahoma’s state parks. As with any user group, caution and thoughtful consideration should be taken when making changes for safety of all state parks visitors and the sustainability of the environment.

**Recommendation 7: Safety & Security**

The present level of staffing related to law enforcement at Grand Lake State Park has adversely affected the atmosphere of safety and security that is necessary for a comfortable visit to a state park. Several of properties “close” at a designated time, an effort intended to curb use of the park by unwanted guests. Unfortunately this has only exacerbated the undesirable behaviors of some park visitors. Some portions of Grand Lake State Park have developed reputations for particular activity, thereby increasing the attractiveness of those locations for continuance of those undesirable behaviors. Some of the activities are illegal; some are simply not family-friendly or park-friendly.

It will be necessary to increase patrols by various policing agencies to reduce the undesirable activity and regain a reputation for safety and security. However, such action is essential to sustain Grand Lake State Park.

**Recommendation 8: Removal of Unnecessary Objects**

Throughout the various properties that comprise Grand Lake State Park, numerous items need to be removed from the property. This includes, but is not limited to, dilapidated and unused structures, concrete pads, broken or disabled picnic tables, old and broken signs, and various pipes and metals that are out of use and out of place. Many of these items pose threats and are attractive nuisances for children. They are safety concerns and aesthetically unpleasing. Removal of these items would increase safety throughout the park, increase the pleasurable scenery of the
park, and perhaps provide management maintenance staff with less work or more efficient operation.

**Recommendation 9: Vegetation Control Plan**

Grand Lake State Park includes a variety of properties with many unique challenges in management and control of vegetation. While the staff maintains current levels of landscape maintenance, there are several instances throughout the park properties where a defined vegetation control plan may aid in decision making related to maintenance, aesthetic value, and safety. Currently, state park staff operates on a philosophy of taking care of issues as they arise, appearing not to have a plan for vegetation throughout the park areas. A vegetation control plan would provide direction for all related decisions and reduce safety issues and improperly managed vegetation.

**Recommendation 10: Risk Management Plan**

Currently there is no risk management plan for Grand Lake State Park. Managing risk and risk reduction are important aspects of providing a safe environment for employees and guests. Investing resources to develop a risk management and emergency management plan would provide proper understanding of what risk is present and how to manage that risk. The risks range from those associated with water recreation, to impounded water and flooding, to weather related exposure, animal (including dogs) and human interaction, limb management, and more. Grand Lake State Park should invest the resources needed to develop a risk management plan and an emergency management plan.
References


Appendix A – Documents related to Bernice

1. Deed of transfer from GRDA to OTRD
2. Warranty deed of transfer from Condley Family Trust to OTRD
WHEREAS, the following described land in Delaware County, Oklahoma, to wit:

All that part of the NW\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\), the N\(\frac{1}{4}\) NE\(\frac{1}{4}\) NW\(\frac{1}{4}\) of Section 25, Township 25 North, Range 22 East lying easterly of Oklahoma State Highway 85A (formerly K.C. & G. Railroad right-of-way), more particularly described as follows, to wit:

Beginning at the northeast corner of said NW\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\), thence westerly along the north boundary of said NW\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\), NE\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\) NW\(\frac{1}{4}\) to a point in the north boundary of said N\(\frac{1}{4}\) NE\(\frac{1}{4}\) NW\(\frac{1}{4}\) where it intersects said State Highway right-of-way, thence southwesterly along said highway right-of-way to the west boundary of said N\(\frac{1}{4}\) NE\(\frac{1}{4}\) NW\(\frac{1}{4}\), thence N 80° 57' E 400 feet, thence N 82° 51' E 570.0 feet, thence S 74° 35' E 259.4 feet, thence N 43° 24' E 509.8 feet, thence S 19° 08' E 343.9 feet, thence N 50° 14' E 418.0 feet to a point in the east boundary of said NW\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\), thence northerly along said east boundary a distance of 68.5 feet to the point of beginning,

AND

All that part of the NE\(\frac{1}{4}\) NE\(\frac{1}{4}\), E\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\) of Section 25, Township 25 North, Range 22 East, more particularly described as follows, to wit:

Beginning at the northeast corner of said NE\(\frac{1}{4}\) NE\(\frac{1}{4}\), thence westerly along the north boundary of said NE\(\frac{1}{4}\) NE\(\frac{1}{4}\), E\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\) to the northwest corner of said E\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\), thence southerly along the west boundary of said E\(\frac{1}{4}\) NW\(\frac{1}{4}\) NE\(\frac{1}{4}\) a distance of 68.5 feet to a point 1,252.6 feet from the southwest corner thereof, thence N 50° 14' E 73.0 feet, thence S 28° 44' E 535.1 feet, thence S 78° 17' E 562.1 feet, thence S 86° 30' E 577.0 feet, thence N 40° 01' E 321.0 feet, thence S 54° 35' E 395.3 feet, thence S 28° 03' E 32.6 feet to a point in the east boundary of said NE\(\frac{1}{4}\) NE\(\frac{1}{4}\), thence northerly along said east boundary a distance of 699.0 feet to the point of beginning,

is owned by the Grand River Dam Authority; and

WHEREAS, the Oklahoma Industrial Development and Park Department of the State of Oklahoma desires to utilize the above described land for park purposes in accordance with the provisions of Title 82, Section 875, O.S. 1961, and the policy and plans of the Oklahoma Industrial Development and Park Department of the State of Oklahoma; and

WHEREAS, the Board of Directors of the Grand River Dam Authority, by an affirmative vote of five members of the Authority, has determined the aforesaid land to be not necessary or convenient to the business of said Authority and that property and interests of the Authority in an aggregate value
of $50,000 have not been sold or disposed of within the year; and

WHEREAS, the Oklahoma Industrial Development and Park
Department of the State of Oklahoma has requested the Grand River
Dam Authority to assign and convey the above described land to the
State of Oklahoma, pursuant to Title 82, Section 875, O.S. 1961; and

WHEREAS, the Grand River Dam Authority has agreed to assign
and convey the above described to the State of Oklahoma, pursuant
to Title 82, Section 875, O.S. 1961, subject to the exceptions and
reservations hereinafter set forth.

NOW, THEREFORE, THIS INDENTURE, made this 16th day of
March, 1970, by and between the Grand River Dam Authority, a public
corporation of the State of Oklahoma, as party of the first part, and
the State of Oklahoma, as party of the second part,

WITNESSETH:

That the party of the first part, in consideration of the sum of
One Dollar ($1.00) to it in hand paid, and of the covenants and conditions
herein set forth, has assigned, granted, and conveyed, and by these
presents does hereby grant, assign and convey to the aforesaid party
of the second part, the State of Oklahoma, the following described land
lying and situate in the County of Delaware, State of Oklahoma, to-wit:

All that part of the NW 1/4 NW 1/4 NE 1/4, the N 1/2 NE 1/4 NW 1/4 of
Section 25, Township 25 North, Range 22 East lying easterly
of Oklahoma State Highway 85A (formerly K.O.&G. Railroad
right-of-way), more particularly described as follows, to-wit:

Beginning at the northeast corner of said NW 1/4 NW 1/4 NE 1/4,
thence westerly along the north boundary of said NW 1/4 NW 1/4
NE 1/4, N 1/2 NE 1/4 NW 1/4 to a point in the north boundary of said
N 1/2 NE 1/4 NW 1/4 where it intersects said State Highway
right-of-way, thence southwesterly along said highway
right-of-way to the west boundary of said N 1/2 NE 1/4 NW 1/4,
thence S 80° 57' E 400 feet, thence N 82° 51' E 570.0 feet,
thence S 74° 35' E 259.4 feet, thence N 43° 24' E 509.8
feet, thence S 19° 06' E 343.9 feet, thence N 50° 14' E
418.0 feet to a point in the east boundary of said NW 1/4 NW 1/4 NE 1/4,
thence northerly along said east boundary a distance of 68.5
feet to the point of beginning,

AND

All that part of the NE 1/4 NE 1/4, E 1/2 NW 1/4 NE 1/4 of Section 25,
Township 25 North, Range 22 East, more particularly
described as follows, to-wit:

Beginning at the northeast corner of said NE 1/4 NE 1/4, thence
westerly along the north boundary of said NE 1/4 NE 1/4, E 1/2
NW 1/4 NE 1/4 to the northwest corner of said E 1/2 NW 1/4 NE 1/4,
thence southerly along the west boundary of said E 1/2 NW 1/4
NE 1/4 a distance of 68.5 feet to a point 1,252.6 feet from the
southwest corner thereof, thence N 50° 14' E 73.0 feet,
thence S 28° 44' E 535.1 feet, thence S 79° 17' E 562.1 feet, thence S 86° 39' E 577.0 feet, thence N 40° 01' E 321.0 feet, thence S 54° 35' E 395.3 feet, thence S 28° 03' E 32.6 feet to a point in the east boundary of said NE 4 NE 1, thence northerly along said east boundary a distance of 599.0 feet to the point of beginning, subject to State Highway and Public Service Company easements for rights-of-way, (a sketch showing the area covered by this deed is hereto attached and made a part hereof).

TO HAVE AND TO HOLD THE SAME, together with all tenements, hereditaments and appurtenances thereto belonging, and all the right, title and interest of the party of the first part, Grand River Dam Authority, a public corporation of the State of Oklahoma, subject to the following reservations, exceptions and conditions, to-wit:

1. Reserving to the Grand River Dam Authority and the United States of America the full and complete right of flowage and such use thereof as may be necessary for the construction, maintenance and operation of the Pensacola Dam and Reservoir Project.

2. In the event the State of Oklahoma and the Oklahoma Industrial Development and Park Department of the State of Oklahoma fails to develop and use the land or any of said site, for park purposes on or before the 1st day of September, 1971, or abandon the use of said land or any of said site for park purposes, then the title to said land shall revert to the Grand River Dam Authority, free and clear of any claim, right, title or interest from and of the State of Oklahoma and the Oklahoma Industrial Development and Park Department of the State of Oklahoma. It being the intention of the parties that if the State of Oklahoma does not develop and use, or abandons the land, or any of said site for park purposes, then the site not developed, used, or abandoned will revert to the Grand River Dam Authority.

3. That the said State of Oklahoma and the Oklahoma Industrial Development and Park Department of the State of Oklahoma shall not sell, convey, or in any manner whatsoever dispose of said land, and shall use said land only for the purposes and in the manner as provided by Title 82, Section 875, O.S. 1961.

IN WITNESS WHEREOF, the party of the first part has caused the execution of these presents, in its name and behalf, by the Chairman of its Board of Directors, the day and year above written.

GRAND RIVER DAM AUTHORITY

By: ___________________________
Chairman, Board of Directors

ATTEST:
______________________________
Secretary

171
STATE OF OKLAHOMA

County of Craig

Before me, the undersigned, a Notary Public, within and for said County and State, on this 16th day of March, 1970, personally appeared BEN T. OWENS, to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its Chairman of the Board of Directors, and acknowledged to me that he executed the same as his free and voluntary act and deed, and as the free and voluntary act and deed of such public corporation for the uses and purposes therein set forth.

WITNESS my hand and official seal the day and year last above written.

My commission expires:
February 10, 1972

Notary Public
GENERAL WARRANTY DEED

08 68 Section 3202.11

This indenture, made this 7th day of May, 2009, between George Douglas Condley and Rowena Condley, Trustees of the CONDLEY FAMILY TRUST, dated July 1, 2006, Grantors, and STATE OF OKLAHOMA by and through the Oklahoma Tourism and Recreation Department, Grantee.

WITNESSETH, that said Grantors, in consideration of the sum of Ten Dollars ($10.00), and other good and valuable consideration, the receipt of which is hereby acknowledged does hereby grant, bargain, sell and convey to Grantees, all of the right, title, claim, interest and estate of Grantors, both at law and equity of, in and to the following described real property, situated in the County of Delaware, State of Oklahoma, to-wit:

All that part of the SW¼ of the SE¼ and all that part of the SE¼ of the SW¼ of Section 24, Township 25 North, Range 22 East of the I.B.M., in Delaware County, Oklahoma, lying South of Oklahoma State Highway 85A containing 12 acres, more or less.

Together with all and singular the hereditaments and appurtenances thereunto belonging, to have and to hold the above granted premises unto said Grantees.

And that the said Grantors, and for their successors, grantees, executors, and administrators, does hereby covenant and agree to and with the said Grantees that, at the delivery of these presents, they are lawfully seized of an absolute and indefeasible estate of inheritance in fee simple, of and in, all and singular, the above granted and described premises, with appurtenances; that the same are free, clear and discharged and unencumbered of and from all former and other grants, titles, charges, judgments, estate, taxes, assessments and encumbrances of whatsoever nature and kind, EXCEPT: easements and building restrictions of record and special assessments not yet due; NONE OTHER and that parties Grantors will WARRANT AND FOREVER DEFEND the same unto said Grantees, their heirs and assigns against said Grantors, their successors and assigns, and all and every person or persons whomsoever lawfully claiming, or to claim the same.

IN WITNESS WHEREOF, Grantors have executed or caused to be executed, this instrument the day and year first above written.

George Douglas Condley, Trustee
Rowena Condley, Trustee of the CONDLEY FAMILY TRUST, dated July 1, 2006

Rowena Condley, Trustee of the CONDLEY FAMILY TRUST, dated July 1, 2006
STATE OF OKLAHOMA

County of Delaware

BEFORE ME, a Notary Public in and for said County and State, on this 17th day of May, 2009, personally appeared George Douglas Condley and Rowena Condley, Trustees of the CONDLEY FAMILY TRUST, dated July 1, 2006, to me known to be the identical persons who executed the within and foregoing instrument and acknowledged to me that they executed the same as their free and voluntary act and deed for the uses and purposes therein setforth.

GIVEN under my hand and seal of office the day and year above written.

My Commission Expires: 07/17/2011

(SEAL)
Appendix B – Documents related to Grand Cherokee

1. 1997 ease of 144.90 acres for Grand Cherokee Area
LEASE

THIS AGREEMENT, made by and between the GRAND RIVER DAM AUTHORITY, an agency of the State of Oklahoma, created and existing under 82 O.S.A. Section 861 et seq., Lessor, (hereinafter referred to as "GRDA") and the OKLAHOMA TOURISM AND RECREATION DEPARTMENT, an agency of the State of Oklahoma, Lessee, (hereinafter referred to as "DEPARTMENT").

WHEREAS, during the 1995 First Regular Session of the 45th Legislature, the Oklahoma Legislature enacted Senate Bill No. 538 (codified in 73 O.S. Section 178) authorizing the Oklahoma Capitol Improvement Authority to provide funding to the DEPARTMENT for the purpose of performing various repairs, refurbishments and improvements; and

WHEREAS, GRDA desires to put to use certain lands owned by it for public recreational purposes.

WITNESSETH:

GRDA, in consideration of the sum of One Dollar ($1.00) to it in hand paid and of the covenants and conditions herein set forth, hereby grants a lease to DEPARTMENT over lands described in Exhibit B hereto attached.

The term of this lease shall be for fifty (50) years, beginning January 31, 1997 and ending until January 30, 2047, and shall cover all lands described in Exhibit B (hereinafter referred to as "Leased Premises"). GRDA shall give DEPARTMENT at least two (2) years written notice prior to the termination of said Lease if GRDA does not extend the term of the Lease for a mutually agreeable period of time. DEPARTMENT agrees that at the expiration or sooner termination of this Lease, it will deliver to GRDA the Leased Premises in the same condition as it was at the inception of this Lease, normal wear and tear excepted.

The Department agrees to create and develop upon the Leased Premises those relevant public projects set forth in the above-referenced Senate Bill and to comply with all applicable state and federal laws, rules and regulations relating to the construction, operation and maintenance of such projects.

DEPARTMENT agrees, at its sole cost and expense, to provide adequate security to protect the Leased Premises, any improvements thereon, or any personnel using such lands, from any damages howsoever caused, and to the extent permitted by State law and State Constitutional provisions, DEPARTMENT releases GRDA from
any and all damages or claims for damages of whatsoever nature and howsoever caused arising out of its use and occupancy of the Leased Premises and agrees to save and hold GRDA harmless from any claim or action of third parties arising out of construction, maintenance and operation of the projects enumerated in the above-referenced Senate Bill, to the extent permitted by State law.

DEPARTMENT further releases GRDA, to the extent permitted by State law, from any and all damages or claims for damages of whatsoever nature and howsoever caused to its projects and project facilities constructed, operated and maintained upon the Leased Premises arising out of GRDA’s operation of the Pensacola Dam project, including, but not limited to, Acts of God and nature and operational directives, mandates or requirements of the United States Army Corps of Engineers and the Federal Energy Regulatory Commission.

DEPARTMENT may enter into agreements or arrangements with other parties for the construction, operation and maintenance of its projects and project facilities upon the Leased Premises, provided DEPARTMENT shall not be released from any of its obligations under this Lease. This Lease shall not be assigned by DEPARTMENT without prior written consent of GRDA.

DEPARTMENT agrees to cause itself and its employees, contractors, subcontractors, agents, etc., to comply at all times with all applicable federal, state and local laws, including environmental laws and regulations, and to avoid using the Leased Premises in any manner that would constitute waste or a nuisance.

GRDA does not represent that the Leased Premises have in existence an adequate supply of utilities or services as consisting of those utilities normally required for private or commercial operations to include, but not be limited to, gas, electricity, water and sewage. Furthermore, the Leased Premises are leased in their current condition as is and where is, and GRDA makes no warranty whatsoever, whether express, implied, or otherwise, to the condition of the Leased Premises.

DEPARTMENT agrees that as often as it is requested to do so by GRDA, it will execute and deliver certificates or other equivalent documents acknowledging, if such be the case, that the Lease is in full force and effect, that no defaults exist on the part of DEPARTMENT (except if default does exist, such default shall be disclosed and enumerated), and that there are no modifications to this Lease.

DEPARTMENT shall provide sufficient and adequate ingress and egress to the Leased Premises to GRDA’s satisfaction and shall assure such ingress and egress prior to the removal of any existing roadways upon the Leased Premises. Such ingress and egress shall be sufficient for GRDA to manage and operate its hydro and other electrical related facilities as well as for inspection purposes of the Leased Premises.
GRDA shall have the absolute right to declare the Leased Premises temporarily closed, and vacate personnel, if necessary, as a result of any emergency, threat to the Leased Premises or its occupants, or request made by any governmental agency. GRDA agrees to use its best efforts to only enforce this provision based on public safety or related concerns.

In the event the State of Oklahoma or DEPARTMENT fails to commence use of, including the commencement of construction activity, or use the Leased Premises for the public purposes set forth in the above-referenced Senate Bill on or before June 1, 1998, or if DEPARTMENT abandons the use of the Leased Premises or if DEPARTMENT fails or neglects to maintain the Leased Premises for use by the entire public, GRDA shall have the right to terminate the Lease unilaterally and take possession and control of the Leased Premises after providing Department notice of the noncompliance and sixty (60) days within which to remedy the noncompliance.

DEPARTMENT agrees that before any construction of its projects upon the Leased Premises is commenced, it will furnish GRDA with the plans showing the type and location of such projects’ accompanying facilities, for GRDA’s approval. It is further agreed that GRDA shall have the right to conduct a physical inspection of the Leased Premises at any time.

Any improvements placed upon the Leased Premises by DEPARTMENT shall remain the property of DEPARTMENT, provided upon either the expiration of the Lease or the termination of the Lease for whatever reason, DEPARTMENT, at its sole cost and at the option of GRDA, shall remove such improvements from said premises within a reasonable time. Upon the failure to remove such improvements, when same is directed by GRDA, such improvements shall become the property of GRDA, and DEPARTMENT agrees to immediately reimburse GRDA for any removal and/or related damage expense it incurs should it desire to remove such improvements.

Neither the State of Oklahoma nor DEPARTMENT will assign any of its rights accruing under the terms of this Lease without the prior written approval of GRDA, nor will they take any action whatsoever which would absolutely deprive the public of access to and use of the Leased Premises. This, however, does not preclude a firm privilege for the DEPARTMENT to transfer this Lease to another state governmental agency, subject to GRDA’s approval, and thereby relieving DEPARTMENT of any further responsibility.

Any notices to be given under the covenants of this lease shall be provided to the parties at the addresses noted below:

Grand River Dam Authority
226 West Daniel Willis Avenue
P.O. Box 409
Vinita, OK 74301-0409

Oklahoma Tourism & Recreation Department
The Colcord Building
15 N. Robinson, Suite 100
Oklahoma City, OK 73102-5403

IN WITNESS WHEREOF, the parties have caused the execution of this Lease in the name of and on behalf of their respective organizations this 1st day of October, 1997.

GRAND RIVER DAM AUTHORITY

By: John M. Turner, Chairman
Board of Directors

ATTEST

By: Donna M. Davenport
Secretary

(SEAL)

OKLAHOMA TOURISM AND RECREATION DEPARTMENT

By: Edward H. Cook, Executive Director

ATTEST

Janet Craven
Secretary

APPROVAL:

OKLAHOMA CAPITOL IMPROVEMENT AUTHORITY

By: Barbara M. Warren
Secretary

Date 12-3-97

180
EXHIBIT B

TRACT NO. 1-GR-M-32:

A tract of land situated in the County of Mayes, State of Oklahoma, described as follows, to wit:

E/2 SE/4 SW/4 and SW/4 SE/4 and E/2 NW/4 SE/4 of Section 14, and Lot 1 and NW/4 NE/4 of Section 23, all in Township 23 North, Range 21 East, of the Indian Base and Meridian, containing 144.90 acres, more or less.
ORDER APPROVING NON-PROJECT USE OF PROJECT LANDS

On April 2, 1997, Grand River Dam Authority (licensee) filed an application with the Commission for approval of non-project use of project lands at the Pensacola Project. The licensee proposes to issue a 50-year lease, for approximately 145 acres of project lands, to the Commerce Department and Recreation Department (OTRD). The leased area will be developed by OTRD into a 9-hole golf course facility. The parcel to be leased is located immediately below the Pensacola Dam in Oketo County, Oklahoma.

The April 2 filing states the golf course is to be constructed pursuant to the requirements of State Senate Bill No. 59. This document establishes procedures and revenue bonds for the development of recreation and tourism facilities in the State of Oklahoma. The Act establishing State Senate Bill No. 59 was approved by the Governor of the state of Oklahoma on June 8, 1997.

By letter dated May 8, 1997, Commission staff informed the licensee that additional information would be necessary to complete an environmental assessment of the proposed action. Supplemental information was therefore filed by the licensee on June 27, 1997. In addition, the licensee filed a revised lease for the parcel on July 31, 1997.

AGENCY CONSULTATION AND PUBLIC NOTICE

The licensee consulted with the U.S. Fish and Wildlife Service, Oklahoma Department of Wildlife, Oklahoma Department of Environmental Quality, and the Oklahoma Water Resources Board, on the proposed action. No comments were received from these agencies.

In addition to the above, the licensee also consulted with the Oklahoma Historical Society (OHS), Oklahoma Archeological Survey (OAS), and the Corps of Engineers (Corps). OHS and OAS primarily filed the same comments. These agencies indicated there were no known historic properties or archeological sites at the designated parcel, but that it would be possible that such resources may be uncovered during construction of the golf course. Both agencies therefore requested that they be contacted in the event that any resources are uncovered during construction. Comments filed by the Corps indicate the proposed lease is not subject to Section 404 of the Clean Water Act. The Corps reminded the licensee, however, that Section 404 review may be necessary if any modifications are made to the proposed lease which involve construction work within a jurisdictional water body.

Commission staff publicly noticed the application on July 7, 1997. By letter dated August 27, 1997, the Oklahoma Department of Wildlife Conservation (ODWC) filed comments on the proposed action, informing Commission staff that they had previously commented on the application. ODWC’s letter states fishing access to the tailwater area and drainage channels below the spillway gates should not be restricted because of the golf course. Further, ODWC states appropriate measures should be undertaken to ensure these same waters are not polluted by golf course operations.

ENVIRONMENTAL ANALYSIS

An environmental assessment (EA) was completed by Commission staff for the proposed lease in September 1997. A copy of this document is attached to this order. In the EA, a No-Action Alternative was considered in conjunction with the Proposed Action. Under the No-Action Alternative, the lease would not be approved and the construction of the golf course would not be permitted on project lands. The licensee and OTRD would therefore have to identify an alternate site for complying with State Senate Bill No. 59.

In summary, the EA concludes the proposed action will not constitute a major federal action significantly affecting the quality of the human environment. The EA further concludes the environmental impacts of golf course pesticides have been evaluated by the Environmental Protection Agency (EPA) and that the application of such pesticides is regulated by Federal guidelines and standards. With regard to cultural resources, the EA requires the incorporation of a “stop action” clause in the conveyance instrument. This “stop action” requirement pertains to the comments letters received from OHS and OAS, and the need to protect any cultural resources that are discovered during construction. A “stop action” requirement would ensure that OHS and OAS have the opportunity to evaluate any resources found during construction of the golf course and its related facilities. This “stop action” requirement would further enable the licensees to meet its responsibilities under article 409 of the project license. Article 409 requires the licensees to consult with the State Historic Preservation Office (i.e. OHS) when previously unidentified resources are found during the course of construction.

1/ Environmental Assessment, Non-Project Use of Project Lands Lease For Golf Course, Pensacola Project, FERC No. 1494-139.
DISCUSSION

With the conclusions of the EA, Commission staff believes an additional stipulation should be attached to the terms and conditions of the conveyance instrument for the golf course parcel. This stipulation will require that all construction in the vicinity of the site be immediately stopped upon the discovery of any archaeological, historical, or cultural resources. OPR should also not be permitted to resume construction until all appropriate consultation is conducted by the licensee under article 409 of the project license. With this, the licensee is reminded that a cultural resource management plan may also be required to be filed for Commission approval. This plan will specifically identify how any discovered resources will be protected.

With the requirements of article 409 and the "stop action" conveyance requirement, Commission staff concludes there are appropriate provisions for the protection of historic properties at the project. We further conclude the proposed lease will enhance recreational opportunities in the project area without diminishing the scenic and environmental qualities of the site, or restricting access to existing fishing areas. The proposed lease should therefore be approved with the "stop action" stipulation identified above.

The Director orders:

(f) The licensee's request to lease approximately 145 acres of project lands to the Oklahoma Tourism and Recreation Department, for a 9-hole golf course facility, filed on April 7, 1997, as modified by ordering paragraph (b), is approved.

(f) Prior to issuing the lease for the golf course facility, the licensee shall include a condition in the lease which requires the licensee to halt all construction activity if cultural resources are discovered during construction. This provision should include a requirement for the licensee to immediately notify the licensee when construction activities are stopped for this purpose.

In conjunction with the cultural resource provision, we further remind the licensee of the requirements of article 409 of the project license. If cultural resources are identified during construction of the golf course facility, all construction activity should immediately be stopped and the licensee should consult with the State Historic Preservation Officer and the commission, as stipulated in article 409.
ENVIRONMENTAL ASSESSMENT
APPLICATION FOR NON-PROJECT USE OF PROJECT LANDS

Project Name: Pensacola Project
FERC Project No. 1494-139

A. APPLICATION
1. Application Type: Non-Project Use of Project Lands
2. Date Filed With Commission: April 2, 1997
3. Applicant: Grand River Dam Authority
4. Water Body: Neosho River
5. Nearest City or Town: Langley and Disney
6. County and State: Mayes County, Oklahoma

B. PURPOSE AND NEED FOR ACTION

On April 2, 1997, Grand River Dam Authority (licensee), filed an application to issue a lease for non-project use of project lands. This application requests the Federal Energy Regulatory Commission (Commission) approve the licensee's proposal to issue a lease to the Oklahoma Tourism and Recreation Department (OTRD) for the purpose of constructing a 9-hole golf course and clubhouse. The golf course and pertinent facilities will be constructed on approximately 145 acres of project lands immediately below the Pensacola Dam, on the Neosho River. The golf course is to be constructed pursuant to the requirements of State Senate Bill No. 538. 1/

By letter dated May 8, 1997, Commission staff requested additional information regarding the application. Supplemental information was filed by the licensee on June 27, 1997. A copy of a revised lease for the parcel was filed on July 31, 1997.

C. PROPOSED ACTION AND ALTERNATIVES

1. Proposed Action

The licensee proposes to issue a 50-year lease to OTRD for the development of a golf course facility required by State Senate Bill No. 538 (see Footnote 1). The parcel to be leased will consist of approximately 145 acres of project lands immediately below the Pensacola Dam.

1/ An Act establishing procedures and revenue bonds for the development of recreation and tourism facilities in the State of Oklahoma. Approved by the Governor of the State of Oklahoma on June 8, 1995.
The golf course facility will consist of 9 fairways, a driving range, clubhouse, and parking area. The fairways will range in length from 460 yards to 170 yards and will cover the northeast quarter of the parcel. The driving range will be located on the western side of the main access road and will be approximately 1,050 feet long by 500 feet wide. A 3,602-square-foot clubhouse will be constructed near the middle of the site. The clubhouse building will have a mixed cedar siding and stone veneer exterior and will be located adjacent to a 43-car parking area. A cart path will be constructed to connect the clubhouse, fairways, and driving range, and three small lakes will be constructed within the site.

There will be land clearing and grading activities associated with the proposed action. Approximately 56 acres of the parcel will be disturbed during construction of the facilities. A total of 24 acres of woodland will be cleared. The application states disturbed areas will be reseeded with Bent Grass, Bermuda sod, Bermuda sprigs, or native grasses. Bent Grass is the species to be used primarily on the course greens. Drawings included with the application indicate no soil cuts greater than 2 feet in depth will occur within the site, except for three lakes to be constructed as part of the course. In addition, the application states standard silt fences and hay bales will be used for erosion control during construction. These structures are to keep sediment from entering the river and the spillway area. Silt fences will be maintained after construction until such time there is sufficient vegetation to eliminate the need for these structures.

2. Alternative to the Proposed Action

No alternatives to the proposed action were identified.

3. No-Action Alternative

Under the No-Action Alternative the Commission would not approve the application, and the golf course and related amenities would not be permitted to be constructed on project land. With this, OTEC would not be able to fulfill the sections of State Senate Bill No. 538 which pertain to the golf course. OTEC would then be required to seek an alternate site for this development and/or an amendment to Senate Bill No. 538.

D. CONSULTATION

The licensee consulted with numerous state and Federal resource agencies prior to filing the subject application. There were no responses from the U.S. Fish and Wildlife Service, Oklahoma Department of Wildlife Conservation, Oklahoma Department of Environmental Quality, or the Oklahoma Water Resources Board included in the application. Comments from the following agencies were included in the April 2 and June 27 filings:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Date of Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oklahoma Historical Society (OHS)</td>
<td>December 18, 1996</td>
</tr>
<tr>
<td>Oklahoma Archeological Survey (OAS)</td>
<td>December 9, 1996</td>
</tr>
<tr>
<td>Corps of Engineers (Corps)</td>
<td>April 21, 1997</td>
</tr>
</tbody>
</table>

Comments filed by OHS state there are no historic properties within the project area which "meet the criteria for listing on the National Register of Historic Places." The letter from OAS indicates, however, that the site may be required to be surveyed by the OAS to determine the presence of prehistoric sites. In addition, OAS reminded the licensee that they should be contacted if any cultural resources are discovered during construction.

The OAS letter states there are no [archaeological] sites listed as occurring within the project area" and that no sites are expected to be encountered. The letter also concludes an archaeological field inspection is not considered necessary because of the topographic and hydrologic setting of the site. In this letter, however, OAS acknowledges that certain materials may be exposed during construction activities. Like OHS, OAS requests that the licensee contact them in the event such resources are encountered.

The response filed by the Corps indicates the proposed lease is not subject to Section 404 of the Clean Water Act given the proposed action does not involve the placement excavation or fill material within any waters of the United States. The letter reminds the licensee the project will be subject to Section 404 review if any modifications are made that involve construction work within a jurisdictional water body.

A public notice of the proposed lease was issued on July 7, 1997, with a comment deadline of September 3, 1997. By letter dated August 27, 1997, the Oklahoma Department of Wildlife Conservation (ODWC) filed comments on the proposed action. ODWC’s letter states fishing access to the tailwater area and drainage channels below the spillway gates should not be restricted because of the golf course. Further, ODWC states appropriate measures should be undertaken to ensure these same waters are not polluted by operation of the golf course.
E. AFFECTED ENVIRONMENT

1. Location

The proposed lease area is located within the Pecanola Project boundary immediately below the Pecanola Dam. The parcel, consisting of approximately 145 acres, is triangular in shape and is bordered by the dam, Neosho River, and the main spillway channel. The spillway channel and Neosho River converge at the southern tip of the site.

The Pecanola Dam at the north of the site is the world's longest multiple arch dam at 1-1/4 miles. The dam has 51 arches and 21 spillways, and rises 150 feet above the riverbed. Highway 28 passes along the top of the dam, and connects the Towns of Langley and Disney, in Mayes County, Oklahoma.

2. Land Use

The parcel is currently used by the licensee for access to the project's power station and dam. The parcel is accessed by a bridge over the Neosho River from the Town of Langley. The main gravel roadway bisects the parcel and extends from the bridge to the power station at the far northwest corner of the site. Another roadway loops around the east and northeast sides of the parcel, from the bridge to a 1-intersection with the main roadway.

Other than the existing power uses the site has never been developed. The site was previously used for cattle grazing purposes, but no grazing activity currently occurs. Primary disturbances to the site occurred when the dam and spillway channel were constructed in 1939.

3. Topography/Soils

The proposed project site is relatively flat with slopes ranging from 0 to 5 percent. Soil types within the parcel range from silty loam to silty clay loam. A 15-acre section in the northeast corner of the site was used as a fill site during excavation of the spillway channel and, as such, the topography in this area was previously disturbed. The northeast corner of the site now has slopes between 5 and 10 percent. Because of the fill material placed in this area the soil types range from sandy loam to rock.

4. Terrestrial Resources

Terrestrial resources at the site are typical of northeastern Oklahoma. Approximately 50% of the site is covered by trees. The canopy vegetation is nearly all deciduous and consists mainly of oaks and elms. Understory vegetation is native grassland. There are sections of Bermuda grass in areas which were previously planted for grazing purposes.

The Pecanola Project area is used by migrating and wintering waterfowl, such as gadwall, teal, northern shovelers, and lesser scaup, during different portions of the year. Other species, such as Canada goose, wood duck, and mallard occur throughout the year. No threatened or endangered plant, bird, or wildlife species are known to exist on the site.

5. Aquatic Resources

Predominant fish species in the Neosho River include black crappie, white crappie, white bass (sand bass), and channel, flathead, and blue catfish. None of these species are listed as Federally or state threatened or endangered.

There is a "wet well" in the northeast corner of the site. The licensee has been given approval by the appropriate state/local agencies to use this well as an irrigation source. The well is supplied by a naturally occurring lake located within the project's spillway channel and is outside the proposed area of construction. Other than the above, there are no wetlands within the proposed lease area which are identified on the National Wetlands Inventory Map.

6. Recreational Resources

Recreational use of the proposed lease area is currently considered to be "light." There are no formal recreational facilities provided on this parcel. The recreational use that occurs primarily consists of anglers using the site to access the banks of the Neosho River and the drainage area below the spillway.

Grand Lake, which is created by the Pecanola dam, is one of Oklahoma's more popular recreation areas for boating and fishing. The lake hosts numerous fishing tournaments each summer and there are currently over 3,500 private docks and 120 commercial marinas on the lake. Little Blue State Park is located to the east of the proposed lease area and has facilities for camping and picnicking. The Towns of Disney and Langley also provide community-based recreational facilities, such as parks, recreational fields, and swimming facilities, but there are currently no golfing facilities in either town.
7. Cultural Resources

The OHS and OAS reviewed the application prior to it being filed with the commission. OHS determined there are no historic properties within the project area that are listed or eligible for inclusion in the National Register of Historic Places. OAS determined there are no archaeological sites within the project area and that an archaeological field inspection was not necessary. Based on the topographic and hydrologic setting, the agencies agreed it was unlikely that any historic properties will be uncovered during construction. The agencies reminded the licensees, however, that they should be contacted in the event resources are identified during construction so that any such resources can be properly protected.

8. Environmental Impacts

1. Proposed Action

a. Topography and Soils. The topography of the site will be impacted by the construction of the golf course and clubhouse as these areas will need to be graded and leveled. Such topographic impacts are considered minor, however, given that there will be no cuts greater than 3 feet in depth (with the exception of the three lakes) and all areas will be redeeded with appropriate vegetation. Further, only 56 acres of the 145-acre parcel are to be impacted by construction of the proposed facilities. With this, approximately two-thirds of the site will remain undisturbed.

b. Terrestrial Resources. The clearing of 24 acres of woodland will result in long-term terrestrial impacts. This impact is considered minor, however, given that no threatened or endangered plant or animal species will be impacted by this clearing. In addition, animal species that are displaced by the clearing and/or construction at the site will likely find suitable habitat on the remaining portions of the site or nearby undeveloped lands. After construction is completed, there will be a minor loss of habitat for species dependent on woodlands.

c. Aquatic Resources. There are no aquatic impacts associated with the proposed action. The filled material contains appropriate provisions to control erosion and sedimentation during construction. In addition, no construction is proposed within 200 feet of the river or the lake that exists in the spillway channel.

Commission staff acknowledges that pesticides are likely to be used in the maintenance of the fairways and greens, but does not believe this will adversely impact water quality or other resources at the site. Golf course pesticides are approved for use by the Environmental Protection Agency (EPA) and are to be applied in accordance with Federal guidelines and standards. Since the EPA has developed specific limits and restrictions for the use of pesticides for golf course maintenance, we conclude the environmental impacts of these pesticides have already been evaluated. In addition, we note the lease agreement contains language which stipulates it is OHRD’s (and their agents’) responsibility to comply with all applicable federal, state, and local laws, including environmental laws. With this, we further believe OHRD (and their agents) have been sufficiently informed that they are subject to any penalties resulting from the misuse or misapplication of pesticides at the leased parcel.

Aquatic resources at the site could further be enhanced by the construction of the golf course, given that this facility will include the construction of three small lakes. After construction the lakes are likely to provide suitable habitat for such animal species as frogs, toads, and salamanders.

4. Recreational Resources. The recreational resources of the area and the parcel will be improved by the proposed action. The golf course will provide additional recreational facilities for the Towns of Langley and Disney, as well as visitors to the area. The construction of the golf course will improve access to the area below the project dam and could, inadvertently, also improve access for anglers. There is nothing in the proposal to indicate that fishing access will be restricted because of the development of the golf course.

5. Cultural Resources. OHS and OAS concur that it is unlikely that any historic properties will be affected by the proposed action. The agencies did note, however, that construction activities could expose previously undiscovered archaeological or historic resources. To ensure the agencies have the opportunity to evaluate any archaeological or historic resources that may be found during construction of the golf course and its related facilities, Commission staff recommends the licensees include a specific requirement in the conveyance document to address this issue. As such, the conveyance document should be redrafted to require the permittee to immediately halt construction and contact the licensees, if cultural resources are discovered during construction.

In the event resources are discovered, the project licensees, if further reminded of their responsibilities under article 409 of the project license. Under this article, the licensees are responsible for consulting with the State Historic Preservation Officer (i.e. OHS) when previously unidentified archaeological resources are found during the course of construction. The licensees are further required to file, for Commission approval, a cultural resource management plan which identifies how any discovered resources will be protected. With article 409 and the
above conveyance requirement, there are appropriate provisions for the protection of historic properties at the project.

2. No-Action Alternative

Under the No-Action Alternative, the proposed lease would not be approved and the construction of the golf course would not be permitted. There would be no impacts associated with this alternative given that site conditions and use would remain as is.

G. CONCLUSION

We evaluated the environmental effects of the Proposed Action and the No-Action Alternative. With the recommendation for consultation with OHS in the event cultural resources are discovered during construction, we conclude approval of the proposed lease (Proposed Action) would not constitute a major federal action significantly affecting the quality of the human environment.

H. PREPARERS

Patti Fakhala -- Outdoor Recreation Planner
Heather Campbell -- Outdoor Recreation Planner
Appendix C – Documents related to Property Transfer

1. 1954 transfer of GRDA properties to OTRD
2. 1956 transfer of Cherokee II (Lakeside) to OTRD
WHEREAS, the following described lands in Mayes County, Oklahoma, to-wit:

**Tract No. 1**

The whole of Lot 4 and Lot 7, Section 23, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, containing 26.96 acres.

(Ref: Ry-3 21)

**Tract No. 2**

A. The S\(^\frac{1}{4}\) SW\(^2\) W\(^2\) S\(^\frac{1}{2}\) less the west 18 rods thereof of Section 12, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, containing 2.75 acres more or less.

(Ref: 2 GR-M 97)

B. All that part of the S\(^\frac{1}{4}\) SW\(^2\) W\(^2\) S\(^\frac{1}{2}\) lying above elevation 750 in Section 12, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, subject to a flowage easement held by the United States of America between elevations 750 m.s.l. and 757 m.s.l.

(Ref: 2 GR-M 96B 2 GR-M 97)

C. All that part of the N\(^\frac{1}{4}\) W\(^\frac{1}{2}\) NW\(^2\) NE\(^2\) lying north of State Highway No. 28 in Section 13, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma.

(Ref: 1 GR-M 86 1 GR-M 87)

D. All that part of the N\(^\frac{1}{4}\) NE\(^\frac{1}{2}\) NW\(^2\) NE\(^2\) lying north of State Highway No. 28 and above elevation 750 in Section 13, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, subject to a flowage easement held by the United States of America between elevations 753 m.s.l. and 757 m.s.l.

(Ref: 1 GR-M 86B 1 GR-M 87B)

and the following described lands in Delaware County, Oklahoma, to-wit:

All those parts of the N\(^\frac{1}{4}\) NE\(^\frac{1}{2}\) S\(^\frac{1}{2}\), the SE\(^\frac{1}{2}\) NW\(^2\), the NW\(^\frac{1}{4}\) SW\(^2\) and the East 20.0 acres of Lot 3, all in Section 7, T 24 N, R 26 E of the Indian Base and Meridian in Delaware County, more particularly described as follows, to-wit:

Beginning at the southeast corner of said N\(^\frac{1}{4}\) NE\(^\frac{1}{2}\) S\(^\frac{1}{2}\), thence northerly along the east boundary of said N\(^\frac{1}{4}\) NE\(^\frac{1}{2}\) S\(^\frac{1}{2}\) to the northeast corner thereof, thence easterly along the south boundary of said W\(^\frac{1}{4}\) SW\(^2\) W\(^2\) to the southeast corner thereof, thence northerly along the east boundary of said W\(^\frac{1}{4}\) SW\(^2\) W\(^2\) a distance of 274.3 feet, thence 27° 55′ W 91.5 feet, thence S 74° 16′ W 91.5 feet, thence N 79° 02′ W 243.6 feet, thence S 76° 49′ W 243.6 feet, thence N 20° 06′ W 202.7 feet, thence N 51° 18′ W 74.3 feet.
feet, thence N 80° 36' 40" W 37.0 feet, thence S 67° 30' 19" W 133.0 feet, thence S 40° 24' 8" W 113.0 feet, thence N 3° 55' 9" W 53.7 feet, thence N 69° 17' 4" E 122.0 feet, thence N 82° 01' 3" E 112.0 feet, thence S 82° 20' 15" E 124.0 feet, thence S 64° 38' 7" E 362.5 feet, thence S 45° 34' 20" W 210.3 feet, thence S 41° 29' 18" W 103.0 feet, thence S 27° 13' 3" E 381.6 feet to a point in the north right-of-way of the County road, thence S 70° 30' 1" W, 0.00 feet, thence to right along said right-of-way line on a curve of radius 759.49 feet a distance of 374.7 feet to a point in the west boundary of said NE\4 SW\4 a distance of 248.5 feet north of the southwest corner thereof, thence N 88° 52' 11" W 124.0 feet, thence S 6° 35' 3" E 72.0 feet, thence S 62° 29' 1" E 128.7 feet, to a point in the east boundary of said Lot 3 786.5 feet north of the southeast corner thereof, thence S 62° 29' 1" E 73.3 feet, thence S 57° 49' 15" E 184.2 feet to a point in the south boundary of said NE\4 SW\4, thence easterly along the south boundary of said NE\4 SW\4 a distance of 1120.8 feet to the point of beginning.

(Ref: 28 GR-D 1515
28 GR-D 1517)

The above described tract is subject to the following easements, to-wit:

1. Easement for transmission line and pipe line held by the Public Service Company of Oklahoma.

2. Easement for road purposes held by Delaware County, State of Oklahoma.

3. Flowage easement held by the United States of America between elevations 750 m.s.l. and 758 m.s.l.

and the following described lands in Ottawa County, Oklahoma, to-wit:

Tract A

All those parts of the NE\4 SW\4, Lot 5, Lot 6, and Lot 7 of Section 19, T 27 N, R 24 E of the Indian Base and Meridian, Quapaw Survey, Ottawa County, Oklahoma, more particularly described as follows, to-wit:

Beginning at a point in the north boundary of said Lot 5, 452.1 feet east of the northwest corner thereof, thence S 45° 28' 4" W 41.5 feet; thence west 13.5 feet; thence S 20° 49' 5" W 401.5 feet; thence S 41° 40' 5" W 144.0 feet; thence S 59° 05' 4" E 129.5 feet; thence S 47° 51' 1" E 135.0 feet; thence S 44° 58' 1" E 228.0 feet; thence S 43° 20' 5" E 277.0 feet; thence S 42° 31' 0" E 354.8 feet; thence N 67° 45' 3" E 39.4 feet; thence S 9° 29' 5" E 80.0 feet; thence S 37° 34' 3" E 300.0 feet; thence S 34° 55' 0" E 234.0 feet; thence S 31° 40' 1" E 253.0 feet; thence S 23° 52' 1" E 149.5 feet; thence S 26° 59' 0" E 206.0 feet; thence S 32° 36' 1" E 129.0 feet; thence N 50° 04' 0" E 366.0 feet; thence S 69° 59' 5" E 95.0 feet; thence S 5° 37' 1" W 113.4 feet; thence S 57° 31' 5" W 6.8 feet to a point in the south boundary of said Lot 5 773.0 feet west of the southeast corner thereof; thence easterly along said south boundary a distance of 113.8 feet; thence N 0° 09' E 17.5 feet; thence N 56° 32' 4" E 555.5 feet; thence N 48° 20' 3" E 527.8 feet; thence N 48° 54' 1" E 103.7 feet; thence N 3° 29' 2" W 105.5 feet; thence N 14° 22' 1" W 180.7 feet; thence N 19° 35' 1" W 277.0 feet; thence S 22° 59' W 157.7 feet; thence N 24° 33' W 213.6 feet; thence N 21° 19' W 522.3 feet; thence N 32° 48' W 144.4 feet; thence N 28° 33' W 137.3 feet; thence
N 17° 33' W 197.6 feet; thence N 10° 37' W 411.2 feet; thence N 24° 32' E 25.9 feet to a point in the north boundary of said NE 32; 265.8 feet east of the northwest corner thereof; thence westerly along the north boundaries of said NE 32 and Lot 5 a distance of 1121.7 feet to the point of beginning.

(Ref: 49 GR-O 473
48 GR-O 473X
49 GR-O 474)

Tract B

All that part of Lot 1 in Section 30, T 27 N, R 24 E of the Indian Base and Meridian, Quapaw Survey in Ottawa County, Oklahoma, particularly described as follows, to-wit:

Beginning at a point in the north boundary of said Lot 1, 778.0 feet west of the northeast corner thereof; thence S 57° 31' E 75.5 feet; thence N 65° 27' E 56.9 feet; thence N 0° 09' E 15.5 feet to a point in the north boundary of said Lot 1; thence westerly along said north boundary a distance of 1121.7 feet to the point of beginning, subject to a easement easement held by the United States of America.

(Ref: 48 GR-O 432
48 HW-2207)

The above tracts are subject to the following easements, to-wit:

1. Easement for road purposes held by the State of Oklahoma (U. S. Highway No. 60).

2. A easement easement held by the United States of America between elevations 750 m.s.l. and 760 m.s.l.

are owned by the Grand River Dam Authority; and

WHEREAS, the Oklahoma Planning and Resources Board of the State of Oklahoma desires to utilize the above described lands for park purposes in accordance with the provisions of Title 52, Section 876, O. S. 1951, and the policy and plans of the Oklahoma Planning and Resources Board of the State of Oklahoma; and

WHEREAS, the Board of Directors of the Grand River Dam Authority, by an affirmative vote of four members of the Authority, have determined the aforesaid lands to be not necessary or convenient to the business of said Authority and that property and interests of the Authority in an aggregate value of $50,000.00 have not been sold or disposed of within the year; and

WHEREAS, the Oklahoma Planning and Resources Board of the State of Oklahoma has requested the Grand River Dam Authority to assign and convey the above described lands to the State of Oklahoma, pursuant to Title 52, Section 876, O. S. 1951; and

WHEREAS, the Grand River Dam Authority has agreed to assign and convey said above described lands to the State of Oklahoma, pursuant to Title 52, Section 876, O. S. 1951, subject to the exceptions and reservations herein-after set forth.

NOW, THEREFORE, THIS INDENTURE, made this 17th day of May, 1954, by and between the Grand River Dam Authority, a public corporation of the State of Oklahoma, as party of the first part, and the State of Oklahoma, as party of the second part,
WITNESSES:

That the party of the first part, in consideration of the sum of One Dollar ($1.00) to it in hand paid, and of the covenants and conditions herein set forth, has assigned, granted, and conveyed, and by these presents does hereby grant, assign and convey to the aforesaid party of the second part, the State of Oklahoma, the following described lands lying and situate in the County of Mayes, State of Oklahoma, to-wit:

Tract No. 1

The whole of Lot 4 and Lot 7, Section 23, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, containing 22.85 acres.

(Ref: Ry-S 21)

Tract No. 2

A. The S E 1/4 SW 1/4 SE 3/4 less the west 18 rods thereof of Section 24, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, containing 2.75 acres more or less.

(Ref: 2 GR-M 87)

B. All that part of the S E 1/4 SW 1/4 SE 3/4 lying above elevation 750 in Section 25, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, subject to a flowage easement held by the United States of America between elevations 750 m.s.l. and 767 m.s.l.

(Ref: 2 GR-M 86B 2 GR-M 87B)

C. All that part of the N SE 1/4 NW 1/4 NE 1/4 lying north of State Highway No. 26 in Section 25, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma.

(Ref: 1 GR-M 86)

D. All that part of the N E 1/4 NW 1/4 NE 1/4 lying north of State Highway No. 26 and above elevation 750 in Section 25, T 23 N, R 21 E of the Indian Base and Meridian in Mayes County, Oklahoma, subject to a flowage easement held by the United States of America between elevations 750 m.s.l. and 767 m.s.l.

(Ref: 1 GR-M 86B 1 GR-M 87B)

and the following described lands in Delaware County, Oklahoma, to-wit:

All those parts of the N W 1/4 SW 1/4, the S E 1/4 NW 1/4, the W 1/2 SW 1/4 NE 1/4 and the East 20.0 acres of Lot 3, all in Section 7, T 24 N, R 24 E of the Indian Base and Meridian in Delaware County, more particularly described as follows, to-wit:

Beginning at the southeast corner of said N W 1/4 SW 1/4, thence northerly along the east boundary of said N W 1/4 SW 1/4 to the northeast corner thereof, thence easterly along the south boundary of said W 1/2 NE 1/4 to the southeast corner thereof, thence westerly along the east boundary of said W 1/2 NE 1/4 a distance of 374.5 feet, thence S 77° 52’ W 91.5 feet, thence S 74° 02’ W 245.0 feet, thence S 0° 21’ W 188.5 feet, thence N 28° 05’ W 202.7 feet, thence N 51° 16’ W 74.5
foot, thence N 80° 36' W 87.0 feet, thence S 67° 37' W 133.0 feet, thence S 40° 24' W 113.0 feet, thence N 3° 55' W 63.7 feet, thence N 69° 17' W 105.0 feet, thence N 62° 01' W 112.0 feet, thence S 52° 20' W 124.0 feet, thence S 54° 38' W 562.5 feet, thence S 56° 42' W 210.5 feet, thence S 41° 29' W 152.0 feet, thence S 27° 12' E 351.5 feet to a point in the north right-of-way of the County road, thence S 72° 30' N 0.00 feet, thence to right along said right-of-way line on a curve of radius 759.49 feet a distance of 374.7 feet to a point in the west boundary of said N W 1/4 E S 1/4 248.5 feet north of the southwest corner thereof, thence N 88° 52' W 124.0 feet, thence S 8° 33' E 72.0 feet, thence S 62° 29' W 128.7 feet, to a point in the east boundary of said Lot S 785.5 feet north of the southeast corner thereof, thence S 62° 29' W 73.5 feet, thence S 57° 49' E 164.2 feet to a point in the south boundary of said N W 1/4 E S 1/4, thence easterly along the south boundary of said N W 1/4 E S 1/4 a distance of 1120.6 feet to the point of beginning.

(Ref: 28 GR-D 1518
28 GR-D 1517)

The above described tract is subject to the following easements, to-wit:

1. Easement for transmission line and pipe line held by the Public Service Company of Oklahoma.
2. Easement for road purposes held by Delaware County, State of Oklahoma.
3. Flooding easement held by the United States of America between elevations 750 m.s.l. and 788 m.s.l.

and the following described lands in Ottawa County, Oklahoma, to-wit:

Tract A

All those parts of the N W 1/4 E S 1/4, Lot 5, Lot 6, Lot 7 of Section 19, T 27 N, R 24 E of the Indian Base and Meridian, Quapaw Survey, Ottawa County, Oklahoma, more particularly described as follows, to-wit:

Beginning at a point in the north boundary of said Lot 5, 452.1 feet east of the northeast corner thereof, thence S 43° 28' E 41.55 feet; thence west 138.5 feet; thence S 20° 49' W 401.2 feet; thence S 41° 40' W 142.0 feet; thence E 58° 05' E 329.2 feet; thence S 47° 51' E 156.0 feet; thence S 44° 58' E 122.0 feet; thence S 45° 50' E 277.0 feet; thence S 31° 31' E 335.6 feet; thence N 67° 45' E 35.4 feet; thence S 9° 29' E 360.0 feet; thence S 27° 54' E 300.8 feet; thence S 34° 55' E 283.0 feet; thence S 51° 40' E 251.0 feet; thence S 49° 52' E 159.6 feet; thence S 26° 59' E 506.0 feet; thence S 39° 36' E 129.0 feet; thence N 80° 44' E 85.0 feet; thence S 5° 57' S 51' E 93.0 feet; thence S 5° 37' W 114.4 feet; thence S 67° 31' E 5.8 feet to a point in the south boundary of said Lot 6 778.0 feet west of the northeast corner thereof; thence easterly along said south boundary a distance of 112.8 feet; thence N 4° 55' E 316.6 feet; thence N 55° 58' E 388.6 feet; thence N 45° 50' E 95.0 feet; thence N 6° 34' E 102.7 feet; thence N 2° 20' W 105.6 feet; thence N 14° 22' W 160.7 feet; thence N 17° 35' W 272.0 feet; thence N 22° 59' W 170.7 feet; thence N 24° 36' W 135.5 feet; thence N 21° 13' W 162.8 feet; thence N 52° 46' W 144.4 feet; thence N 28° 32' W 197.3 feet; thence
N 17° 33' W 197.6 feet; thence N 10° 37' W 411.2 feet; thence N 24° 32' E 25.9 feet to a point in the north boundary of said NE^2 SW^2; thence 253.8 feet east of the northwest corner thereof; thence westerly along the north boundaries of said NE^2 SW^2 and Lot 5 a distance of 1121.7 feet to the point of beginning.

(Ref: 49 GR-O 472
49 GR-O 473X
49 GR-O 474)

Tract B

All that part of Lot 1 in Section 30, T 27 N., R 24 E of the Indian Base and Meridian, Quapaw Survey in Ottawa County, Oklahoma, particularly described as follows, to-wit:

Beginning at a point in the north boundary of said Lot 1, 778.0 feet west of the northeast corner thereof; thence S 57° 31' E 75.5 feet; thence N 63° 51' W 55.0 feet; thence N 0° 09' E 15.3 feet to a point in the north boundary of said Lot 1; thence westerly along said north boundary a distance of 1121.8 feet to the point of beginning, subject to a flowage easement held by the United States of America.

(Ref: 48 GR-O 432
48 NW 2207)

The above tracts are subject to the following easements, to-wit:

1. Easement for road purposes held by the State of Oklahoma (U. S. Highway No. 60).

2. A flowage easement held by the United States of America between elevations 750 m.s.l. and 760 m.s.l.

TO HAVE AND TO HOLD THE SAME, together with all tenements, hereditaments and appurtenances thereunto belonging, and all the right, title and interest of the party of the first part, Grand River Dam Authority, a public corporation of the State of Oklahoma, subject to the easements and the rights hereinabove set forth, and reserving and excepting the following rights and interests, to-wit:

1. Reserving to the Grand River Dam Authority the full and complete right of flowage and such use thereof as may be necessary for the construction, maintenance and operation of the Grand River Dam Authority.

2. In the event the State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma fails to develop and use the lands, or any of said sites, for park purposes or before the 1st day of July, 1965, or abandon the use of said lands or any of said sites for park purposes, then the title to said lands shall revert to the Grand River Dam Authority, free and clear of any claim, right, title or interest from and of the State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma. It being the intention of the parties that if the State of Oklahoma does not develop and use, or abandons the lands, or any of said sites for park purposes, then those sites not developed, used, or abandoned will revert to the Grand River Dam Authority.
3. That the said State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma shall not sell, convey, or in any manner whatsoever dispose of said lands, and shall use said lands only for the purposes and in the manner as provided by Title 82, Section 876, O. S. 1961.

IN WITNESS WHEREOF, the party of the first part has caused the execution of these presents, in its name and behalf, by the Chairman of its Board of Directors, the day and year above written.

GRAND RIVER DAM AUTHORITY

BY

Chairman, Board of Directors

ATTEST:

Secretary

STATE OF OKLAHOMA

COUNTY OF CRAIG

BEFORE ME, the undersigned, a Notary Public, within and for said County and State, on this 17th day of May, 1954, personally appeared W. R. Green, to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its Chairman of the Board of Directors, and acknowledged to me that he executed the same as his free and voluntary act and deed and as the free and voluntary act and deed of such public corporation, for the uses and purposes therein set forth.

WITNESS my hand and official seal the day and year last above written.

My commission expires:

[signature]

Notary Public

Jul. 29, 1956
RESOLUTION OF THE BOARD OF DIRECTORS OF THE GRAND RIVER DAM AUTHORITY AUTHORIZING THE CONVEYANCE OF CERTAIN LANDS TO THE STATE OF OKLAHOMA FOR PARK PURPOSES PURSUANT TO TITLE 82, SECTION 875, O. S. 1961 AND AUTHORIZING THE PROPER OFFICERS OF THE AUTHORITY TO EXECUTE THE CONVEYANCE.

WHEREAS, the Grand River Dam Authority has acquired and is now the owner of certain lands in Mayes, Delaware and Ottawa Counties which are suitable for development for park purposes; and

WHEREAS, Title 82, Section 875, O. S. 1961, provides:

"... The District may acquire by purchase, condemnation, or otherwise, lands suitable for park purposes or roadways along the shores of said lakes. After acquiring such lands the Grand River Dam Authority may, but shall not be required to, assign the same to the State of Oklahoma for park or road purposes and if such assignment is made the same shall be under the supervision and control of the Oklahoma Planning and Resources Board, which shall keep said lands so assigned open to the public without charge so that the public in general may have access to the lakes."

and

WHEREAS, the State of Oklahoma, through the Oklahoma Planning and Resources Board, has requested the Authority to assign and convey to it three (3) tracts or sites for park purposes, which tracts or sites have been designated:

Site No. 1 - Cherokee Recreational Area, being approximately 56 acres in Mayes County, lying below the Pensacola Dam.

Site No. 2 - Honey Creek Recreational Area, containing approximately 28 acres near the Grove Water Intake in Delaware County, Oklahoma.

Site No. 3 - Twin Bridges Recreational Area, containing approximately 63 acres in Ottawa County, Oklahoma, and located at the confluence of the Neosho and Spring Rivers.

and

WHEREAS, the Board of Directors of the Grand River Dam Authority is of the opinion that said tracts of land or sites should be assigned, transferred
and conveyed to the State of Oklahoma for park purposes in accordance with the provisions of said Title 82, Section 875, O. S. 1951, subject to the following reservations:

1. Reserving to the Grand River Dam Authority the full and complete right of flowage and such use thereof as may be necessary for the construction, maintenance and operation of the Grand River Dam Authority.

2. In the event the State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma fails to develop and use the lands, or any of said sites, for park purposes on or before the 1st day of July, 1965, or abandon the use of said lands or any of said sites for park purposes, then the title to said lands shall revert to the Grand River Dam Authority, free and clear of any claim, right, title or interest from and of the State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma. It being the intention of the parties that if the State of Oklahoma does not develop and use, or abandons the lands, or any of said sites for park purposes, then those sites not developed, used, or abandoned will revert to the Grand River Dam Authority.

3. That the said State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma shall not sell, convey, or in any manner whatsoever dispose of said lands, and shall use said lands only for the purposes and in the manner as provided by Title 82, Section 875, O. S. 1951.

WHEREAS, There has been presented to the Board of Directors a form of conveyance from the Authority to the State of Oklahoma proposing to convey said lands for park purposes, which form of conveyance has been approved as to form and legality by the Authority's General Counsel, and its approval and execution has been recommended by the Authority's General Manager.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE GRAND RIVER DAM AUTHORITY, That said form of conveyance be, and the same is hereby approved.

BE IT FURTHER RESOLVED, That said conveyance be executed by the Chairman of the Board of Directors of the Grand River Dam Authority and attested by its Secretary for and in the name of the Authority.
CERTIFICATE

I, ANDREW RÖHMILLER, Secretary of the Grand River Dam Authority, a conservation and reclamation District and a public corporation organized and existing under the laws of the State of Oklahoma, do hereby certify that the foregoing is a true and correct copy of Resolution No. 3422, adopted by the Board of Directors of the Grand River Dam Authority at a regular meeting of the Board of Directors held on the 17th day of May, 1954, at which meeting a quorum of the Board was at all times present and acting.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the corporate seal this 17th day of May, 1954.

[Signature]

Secretary
WHEREAS, The following described land in Mayes County, Oklahoma, to wit:

All that part of the following described tract of land lying north of the northernmost boundary of Oklahoma State Highway No. 28, in the NE ¼ SW ¼ NW ¼ of Section 13, T 33 N, R 21 E of the Indian Base and Meridian, in Mayes County, Oklahoma:

Beginning at the NE corner of said NE ¼ SW ¼ NW ¼, thence southerly along the east boundary of said NE ¼ SW ¼ NW ¼ to a point 300 feet north of the SE corner of said NE ¼ SW ¼ NW ¼, thence in a southerly direction on a straight line to a point in the south boundary of said NE ¼ SW ¼ NW ¼, 330 feet west of the SE corner thereof, thence westerly along the south boundary of said NE ¼ SW ¼ NW ¼ to the SW corner thereof; thence northerly along the west boundary of said NW ¼ SW ¼ NE ¼, 517.2 feet to a point on the 750 foot taking line of the Grand River Dam Authority, thence on and along said taking line, N 30° 32' E 159.1 feet, thence E 29° 10' E 165.1 feet, thence N 27° 25' E 331.6 feet to a point in the north boundary of said NW ¼ SW ¼ NE ¼, thence easterly along said north boundary to the point of beginning, except that portion contained in an existing roadway described as follows:

Beginning at a point in the northernmost boundary of said State Highway No. 28 and approximately 310 feet east of the west boundary of said NW ¼ SW ¼ NE ¼, thence in a northerly direction a distance of approximately 100 feet to a point in the north boundary of said NW ¼ SW ¼ NE ¼ approximately 300 feet east of the northwest corner thereof.

is owned by the Grand River Dam Authority; and

WHEREAS, The Oklahoma Planning and Resources Board of the State of Oklahoma desires to utilize the above described land for park purposes in accordance with the provisions of Title 82, Section 975, O. S. 1951, and the policy and plans of the Oklahoma Planning and Resources Board of the State of Oklahoma; and

WHEREAS, The Board of Directors of the Grand River Dam Authority, by an affirmative vote of five members of the Authority, has determined the aforesaid land to be not necessary or convenient to the business of said Authority and that property and interests of the Authority in an aggregate value of $250,000.00 have not been sold or disposed of within the year; and

WHEREAS, The Oklahoma Planning and Resources Board of the State of Oklahoma has requested the Grand River Dam Authority to assign and convey the above described land to the State of Oklahoma, pursuant to Title 82, Section 975, O. S. 1951; and

WHEREAS, The Grand River Dam Authority has agreed to assign and convey said above described land to the State of Oklahoma, pursuant to Title 82, Section 875, O. S. 1961, subject to the exceptions and reservations herein-after set forth.

NOW, THEREFORE, THIS INDEMNITY, made this 24th day of February, 1956, by and between the Grand River Dam Authority, a public corporation of the State of Oklahoma, as party of the first part, and the State of Oklahoma, as party of the second part,
That the party of the first part, in consideration of the sum of One Dollar ($1.00) to it in hand paid, and of the covenants and conditions hereinafter set forth, has assigned, granted, and conveyed, and by these presents does hereby grant, assign and convey to the aforesaid party of the second part, the State of Oklahoma, the following described land lying and situate in the County of Mayes, State of Oklahoma, to-wit:

All that part of the following described tract of land lying north of the northernmost boundary of Oklahoma State Highway No. 28 in the NW ¼ SW ¼ NW ¼ of Section 13, T 23 N, R 21 E of the Indian Base and Meridian, in Mayes County, Oklahoma:

Beginning at the NW corner of said NW ¼ SW ¼ NW ¼, thence southerly along the east boundary of said NW ¼ SW ¼ NW ¼ to a point 200 feet north of the SE corner of said NW ¼ SW ¼ NW ¼, thence in a southwesterly direction on a straight line to a point in the south boundary of said NW ¼ SW ¼ NW ¼, 330 feet west of the SE corner thereof, thence westerly along the south boundary of said NW ¼ SW ¼ NW ¼ to the SW corner thereof; thence northerly along the west boundary of said NW ¼ SW ¼ NW ¼, 517.2 feet to a point on the 750 foot taking line of the Grand River Dam Authority, thence on and along said taking line, N 36° 32' E 65.7 feet, thence S 80° 10' E 165.1 feet, thence N 27° 25' E 131.6 feet to a point in the north boundary of said NW ¼ SW ¼ NW ¼, thence easterly along said north boundary to the point of beginning, except that portion contained in an existing roadway described as follows:

Beginning at a point in the northernmost boundary of said State Highway No. 28 and approximately 330 feet east of the west boundary of said NW ¼ SW ¼ NW ¼, thence in a northerly direction a distance of approximately 135 feet to a point in the north boundary of said NW ¼ SW ¼ NW ¼ approximately 300 feet east of the northwestern corner thereof.

TO HAVE AND TO HOLD THE SAME, together with all tenements, hereditaments and appurtenances thereunto belonging, and all the right, title and interest of the party of the first part, Grand River Dam Authority, a public corporation of the State of Oklahoma, subject to the following reservations, exceptions and conditions, to-wit:

1. A flowage easement held by the United States of America below elevation 787 m.s.l.

2. Reserving to the Grand River Dam Authority the full and complete right of flowage and such use thereof as may be necessary for the construction, maintenance and operation of the Grand River Dam Authority.

3. In the event the State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma fails to develop and use the land, or any of said site, for park purposes on or before the 31st day of December, 1958, or abandon the use of said land or any of said site for park purposes, then the title to said land shall revert to the Grand River Dam Authority, free and clear of any claim, right, title or interest from and of the State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma. It being the intention of the parties that if the State of Oklahoma does not develop and use, or abandon the land, or any of said site for park purposes, then the site not developed, used, or abandoned will revert to the Grand River Dam Authority.
4. That the said State of Oklahoma and/or the Oklahoma Planning and Resources Board of the State of Oklahoma shall not sell, convey, or in any manner whatsoever dispose of said land, and shall use said land only for the purposes and in the manner as provided by Title 82, Section 875, O. S. 1951.

IN WITNESS WHEREOF, the party of the first part has caused the execution of these presents, in its name and behalf, by the Chairman of its Board of Directors, the day and year above written.

GRAND RIVER DAM AUTHORITY

BY

Chairman, Board of Directors

ATTEST:

Secretary
STATE OF OKLAHOMA  
) SS.
COUNTY OF CRAIG   
)

BEFORE ME, the undersigned, a Notary Public, within and for said County and State, on this 24th day of February, 1956, personally appeared Fred P. Branson, to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its Chairman of the Board of Directors, and acknowledged to me that he executed the same as his free and voluntary act and deed, and as the free and voluntary act and deed of such public corporation, for the uses and purposes therein set forth.

WITNESS my hand and official seal the day and year last above written.

[Signature]
Notary Public

My commission expires:

February 28, 1956
Appendix D – Documents related to Honey Creek

1. 1967 quit claim deed from Public Service Company of Oklahoma for two acres
QUIT-CLAIM DEED

(CORPORATION FORM)

THIS INDENTURE, Made this 5th day of September, 1967,

between PUBLIC SERVICE COMPANY OF OKLAHOMA,

a corporation, organized under the laws of the State of Oklahoma,

of the County of Tulsa, State of Oklahoma, party of the first part,

and STATE OF OKLAHOMA,

of the second part.

WITNESSETH: That said party of the first part, in consideration of the sum of

TEN and no/100 DOLLARS, TO HAVE AND TO HOLD TO

to them duly paid, receipt of which is hereby acknowledged, do hereby quit-claim, grant, bargain, sell and convey unto the said party of the second part and to its assigns forever, all their right, title, interest and estate, both at law and in equity, of, in and to the following described real estate, situate in the County of Delaware and State of Oklahoma, to-wit:

All that part of the NW¼ of the NE¼ of the SW¼ and the East 10.0 acres of Lot 3 of Section 7, Township 24 North, Range 24 East of the Indian Base and Meridian, particularly described as follows: Beginning at a point in the West boundary of said NE¼ of the SW¼ and 248.5 feet North of the Southeast corner thereof and 413.5 feet South of the Northwest corner thereof; thence North 90 degrees 52 minutes West 124.0 feet; thence North 38 degrees 30 minutes East 108.0 feet; thence North 47 degrees 47 minutes East 179.3 feet; thence North 40 degrees 28 minutes East 204.0 feet; thence South 27 degrees 12 minutes East 351.5 feet to a point in the North right-of-way line of a proposed road; thence South 70 degrees 30 minutes West 6.00 feet; thence to the right along said right-of-way line on a curve of radius 739.49 feet, a distance of 374.7 feet to the point of beginning, containing 2.0 acres, more or less.

To have and to hold the above described premises unto the said party of the second part, its assigns forever.

IN WITNESS WHEREOF, the said party of the first part has hereunto set its hand and caused its corporate seal to be affixed the day and year first above written.

By J. W. Smith, Secretary.

[Seal]

PUBLIC SERVICE COMPANY OF OKLAHOMA

Name of Corporation.

By Howard Cowan, Vice President.

STATE OF OKLAHOMA

County of Tulsa

Before me, the undersigned, a Notary Public, in and for said County and State, on this 5th day of September 1967, personally appeared Howard Cowan.


STATE OF OKLAHOMA,

County of ____________________________

(Corporation Acknowledgment)

Before me, the undersigned, a Notary Public, in and for said County and State, on this ______________ day of ________, 19_____, personally appeared ____________________________,

and

to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its ____________________________,

and acknowledged to me that he executed the same as free and voluntary act and deed and as the free and voluntary act and deed of such corporation, for the uses and purposes therein set forth.

Given under my hand and seal of office the day and year last above written.

My commission expires ____________________________

(Commissioner)

Notary Public

[Form for Quit-Claim Deed]

No. ____________________________

Date of Deed: ________________

County of ____________________________

This instrument was filed for record on the ______________ day of ________, 19_____, in the office of the Clerk of the District Court for the County of ____________________________.

[Signature]

Deputy Clerk

[Signature]

Recorder of Deeds
Appendix E – Documents related to Snowdale

- 1969 lease of property by OTRD from GRDA (50 years)
- 1991 sewage line agreement with City of Salina
- 1997 water line easement
Mr. Tye Bledsoe, Director
Division of State Parks
Will Rogers Memorial Building
Oklahoma City, Oklahoma 73105

Re: Lease Tract 3 MF 4

Dear Mr. Bledsoe:

I am enclosing the original and one fully executed copy of your Department's lease on the above referenced property.

If we may be of further service to you in this matter, please feel free to contact us.

Sincerely yours

James R. Tourtellotte
General Counsel

JRT:jg

encls. 2
LEASE

WHEREAS, the following described land in Mayes County, State of Oklahoma, to-wit:

A tract of land in the SW$_3^4$ NW$_7^4$ NW$_5^4$ and in the W$_7^2$ SW$_3^4$ NW$_3^4$ of Section 16, T 21 N, R 20 E of the Indian Base and Meridian, in Mayes County, Oklahoma, more particularly described as follows, to-wit:

Beginning at a point on the West line of Section 16, a distance of 1,528 feet North of the SW corner of the NW$_3^4$ of Section 16; thence Southeasterly to a point 44 feet East and 1,300 feet North of the said SW corner of the NW$_3^4$; thence Southeasterly to a point 415 feet East and 895 feet North of the said SW corner; thence Southwesterly to a point 230 feet East and 480 feet North of the said SW corner; thence Northwesterly to a point 510 feet East and 700 feet North of the said SW corner; thence Northwesterly to a point 620 feet East and 830 feet North of the said SW corner; thence Northwesterly to a point on the East line of the W$_3^4$ SW$_3^4$ NW$_3^4$, a distance of 1,075 feet North of the SW corner of the said NW$_3^4$; thence South a distance of 1,075 feet to the SE corner of the W$_3^4$ SW$_3^4$ NW$_3^4$; thence West 660 feet to the SW corner of the NW$_3^4$; thence North a distance of 1,528 feet to the point of beginning, said tract containing 15.44 acres.

is owned by the Grand River Dam Authority; and

WHEREAS, the Oklahoma Industrial Development and Park Department desires to utilize the above described land for public use area purposes in accordance with the provisions of Title 82, Section 875, O.S. 1951, and in accordance with the policies and plans of the Oklahoma Industrial Development and Park Department of the State of Oklahoma; and

WHEREAS, both parties are desirous of the above described land being put to use for public use area purposes.

NOW, THEREFORE, THIS INDENTURE, made this the 7th day of April, 1969, by and between the Grand River Dam Authority, a public corporation, of the State of Oklahoma, hereinafter referred to as "Authority", and the Oklahoma Industrial Development and Park Department, an agency of the State of Oklahoma, hereinafter referred to as the "Department",

WITNESSETH:

That the Authority, in consideration of the sum of One Dollar ($1.00) to it in hand paid, and of the covenants and conditions herein set forth, hereby grants a lease and use permit to the Department over the land described above.

The term of this lease shall be fifty (50) years and shall cover all lands lying above the high water mark as such land may be situated in the property described above.

210
A land use permit is given to run concurrent with this lease on all lands lying below the high water mark in the property described hereinabove.

This lease and use permit is subject to the following reservations, exceptions and conditions, to-wit:

1. The Authority retains the right to a flowage easement on all of the lands hereinabove described.

2. The Authority retains the right to terminate this lease and use permit if such termination is necessary to the maintenance and operation of the Authority.

3. The Department agrees to create and develop upon said land a free public use area with camping facilities, shelters, picnic facilities and boat launching facilities to the extent that monies are appropriated therefor by the State Legislature.

4. The Department agrees that before any of the facilities herein referred to are constructed, it will furnish to the Authority the plans showing the type and location of such facilities, and the Department shall comply with all requirements, rules and regulations of the State Department of Public Health in connection with the construction, operation and maintenance of these facilities.

5. In the event the State of Oklahoma or the Department fails to use the land for public use area purposes on or before June 1, 1970, or if the Department abandons the use of said land for public use area purposes or if the Department fails or neglects to maintain this property as a public use area for use by the entire public, the Authority shall have the right to terminate the lease unilaterally and take possession and control of the lands in question.

6. The Department may enter into agreements or arrangements with other parties for the construction, operation and maintenance of these facilities, provided that the Department shall not be released from any of its obligations under this lease.

7. (a) The Department hereby releases the Authority from any and all damages or claims for damages of whatsoever nature arising out of its use and occupancy of said premises and shall have no right of action for injury to or destruction of any property of the Department placed on said premises.

(b) The Department agrees to save and hold the Authority harmless from any claim or action of third parties arising out of the use and occupancy of the construction, maintenance and operation of the facilities herein referred to.
8. Any improvements placed upon said premises by the Department shall remain the property of the Department, provided that upon the termination or cancellation of this lease, the Department shall remove such improvements from said premises within a reasonable time, upon failure to do so then such improvements shall become the property of the Authority.

9. That neither the State of Oklahoma nor the Department will assign any of its rights accruing under the terms of this lease and use permit without prior written approval of the Authority nor will they take any action whatsoever which would deprive the public of free access and use of these lands as a public use area. This does not preclude a firm privilege for the Department to transfer this lease to another governmental agency, subject to the Authority's approval and thereby relieve the Department of all further responsibility.

IN WITNESS WHEREOF, the parties have caused the execution of this lease in the names and on behalf of their respective organizations the day and year above written.

GRAND RIVER DAM AUTHORITY

By
Chairman, Board of Directors

ATTEST:
Secretary

OKLAHOMA INDUSTRIAL DEVELOPMENT AND PARK DEPARTMENT

By

ATTEST:
Agreement

This Agreement entered into this 5th day of February 1991, between the State of Oklahoma by and through the Oklahoma Tourism and Recreation Department, an agency of state government with its principal office located at 500 Will Rogers Building, Oklahoma City, Oklahoma 73105, hereinafter referred to as Department; and the Town of Salina, an Oklahoma municipal corporation with an address of P.O. Box 276, Salina, Oklahoma 74365, hereinafter referred to as Salina, witnesseth:

WHEREAS, Department operates Snowdale State Park which is located on Lake Hudson, west of Salina, and

WHEREAS, Snowdale State Park has experienced increased usage by the public which requires the expansion of facilities within the park and,

WHEREAS, improved and expanded sewage treatment capabilities are necessary to serve the existing and future facilities at Snowdale State Park, and

WHEREAS, Salina owns and operates a sewage treatment system which has sufficient capacity to meet the sewage treatment needs of Snowdale State Park,

NOW, THEREFORE, in consideration of the covenants and agreements hereinafter set forth, it is mutually agreed between the parties as follows:

Department agrees to install all sewer lines necessary for connecting Snowdale State Park with Salina's sewage system. All expenses associated with this line installation will be borne by Department.

Department agrees to comply with all Health Department and other applicable regulations and shall obtain all permits as required for the performance of the sewer line installation work.

Department shall be responsible for the operation and maintenance of the sewer lines up to that point where Salina sewer system ownership begins.

Salina agrees to provide Department a sewer tap for connecting to the Salina sewage treatment system.

Salina agrees to operate and maintain the sewage treatment system in compliance with all applicable state and federal regulations.

Page 1 of 3
It is mutually agreed between the parties that Department shall pay a one-time sewer tap or service commencement fee to Salina in the amount of TWO THOUSAND dollars ($2,000.00).

Department shall pay to Salina a monthly charge of TWO HUNDRED dollars ($200.00) as consideration for Salina's providing sewage transport and treatment services as specified in this agreement.

The term of this agreement shall extend from the date first mentioned in this agreement to April 6, 2019.

Both parties agree that the monthly charge specified in this agreement shall not be adjusted except for substantial changes having occurred. Substantial changes may include but are not limited to marked increase in facilities or improvements at Snowdale State Park, or marked increase in cost of operation of Salina's sewage treatment facilities. All adjustments to the monthly charge shall be negotiated and mutually agreed to by the parties in writing.

Department and Salina agree that at such time as Salina expands and agrees to accept dedication of additional sewer lines within Salina's treatment system, the Department shall dedicate its interest in all sewer lines extending from Snowdale State Park to Salina's current ownership. Upon accepting dedication of said sewer lines, Salina further agrees to accept operations and maintenance responsibility for the lines.

This agreement shall be binding upon the assigns, successors or administrators of the respective parties.

In Witness Whereof, the parties have set their hands the day and year first above written.

Janet K. Kinic
Witness

J.B. Bennett, Executive Director
OK Tourism and Recreation Dept.

State of Oklahoma)

County of Oklahoma)

This instrument was acknowledged before me this 26 day of February, 1991, by J.B. Bennett as Executive Director for the Oklahoma Tourism and Recreation Department.

8-24-92 Patricia Gray
My commission expires Notary Public

Page 2 of 3
Witness: John D. Woodard

Helen M. Gurney, Mayor
Town of Salina

State of Oklahoma )
County of Oklahoma )ss

This instrument was acknowledged before me this 5 day of February, 1951, by Helen Gurney as Mayor of the Town of Salina.

My commission expires November 15, 1954

Notary Public

Charlene Ketcher
RIGHT-OF-WAY EASEMENT

Rural Water District No. 6, Mayes County

KNOW ALL MEN BY THESE PRESENTS:

That C.E. Holliday a.k.a Clifford E. Holliday, trustee of the Clifford E. Holliday Trust, under trust indenture dated October 13, 1994, filed for record in Book 866; Page 327, Mayes County Court House hereinafter called Grantor (whether one or more) in consideration of the operation of the District and other good and valuable considerations paid by Rural Water District No. 6, Mayes County, Oklahoma, hereinafter called the Grantee, the receipt and sufficiency of which consideration is hereby acknowledged, does hereby grant, bargain, sell, transfer and convey unto said Grantee, its successors and assigns, a perpetual easement with the right to erect, construct, install, lay, remove and replace therefor use, operate, inspect, repair, maintain, replace and remove a possible water transmission and distribution line or lines over and across the following described lands owned by the Grantor in the State of Oklahoma, to-wit:

A strip, piece or parcel of land 10.00 feet in width situate along the easterly side and contiguous to an existing 20.00 foot easement in favor of the State of Oklahoma, filed for record in Book 730, Page 473 the centerline of which being 30.00 feet from and parallel with the westerly boundary of Lakeland Addition 1, a subdivision in Mayes County Oklahoma according to the duly recorded plat thereof, both documents filed for record in the Mayes County Clerks office, Pryor, Oklahoma. All in the W2, of Section 16, T21N, R20E, Mayes County, Oklahoma. The centerline of which being more particularly described as follows:...

Commencing at the west 1/4 corner of said Section 16; THENCE S89-51-40E along the east-west 1/4 section line a distance of 663.04 feet to the westerly boundary of said Lakeland Addition 1; THENCE N89-54-43E along the westerly boundary of said Lakeland Addition 1 a distance of 28.00 feet to the point of beginning; THENCE S50-00-17E a distance of 30.00 feet from an parallel with the westerly boundary of said Lakeland Addition 1 a distance of 356.98 feet to a point in the centerline projection of Lakeland Drive in accordance with said duly recorded plat terminating said strip, piece or parcel of land, THENCE N76-40E along the centerline projection of Lakeland Drive a distance of 31.73 feet to the southwest corner of said Lakeland Addition 1.

together with the right of ingress and egress over Grantor's lands adjacent thereto and situated between the above described tract and the nearest public roadway for the purposes for which the above mentioned right are granted.

The above described consideration shall constitute full payment for all damages sustained by Grantor by reason of the installation of the structures referred to herein, and the Grantee will maintain such easement in a state of good repair and efficiency so that no unreasonable damages will result from same to Grantor's premises. This agreement together with all other provisions of this grant shall constitute a convenant running with the land for the benefit of the Grantor, its successors and assigns. Grantor covenants that he is the owner of the above described lands free and clear of all encumbrances and liens except:

IN WITNESS WHEREOF, this easement is granted and executed this 18th day of

STATE OF OKLAHOMA
OKLAHOMA COUNTY

ACKNOWLEDGMENT

Before me, the undersigned Notary Public within and for said county and state, on this

personally appeared

to me known to be the identical person who executed the within and foregoing instrument, and acknowledged to me that he executed the same as free and voluntary act and deed for the uses and purposes therein set forth.

Witness my hand and seal the day and year last above set forth.

My commission expires: 10-26-78

216
Appendix F – Documents related to Spavinaw

- 1958 warranty deed E.M. Knight to State of Oklahoma
- 1965 easement from City of Tulsa to Oklahoma State Parks
- Not included – annual off-season access agreement with City of Spavinaw
This indenture made the 8th day of September, 1946 between E. M. Knight of Pottawatomie County, Oklahoma, party of the first part, hereinafter called grantor, and the State of Oklahoma, party of the second part, grantee.

WITNESSETH, That in consideration of One Dollar and other good and valuable consideration, receipt of which is hereby acknowledged, said grantor, E. M. Knight, doth by these presents grant, bargain sell and convey to said grantee, the State of Oklahoma, for public park purposes, all of the following described real estate, situate in the County of Pottawatomie, State of Oklahoma, to wit:

A tract or parcel of land lying in the Southwest Quarter of Section Fifteen, Township Twenty Two North, Range Twenty One East (33d 12', 22b, 21r) and being a part of the unplatted portion of Block 11 in Pottawatomie, containing 35 acres, more or less, and more particularly described as follows: Beginning at a point 115.5 ft. South of the Center of Section 15; thence South 90 ft.; thence South 58 degrees 20 min. West 200 ft.; thence North 66 degrees 00 min. East 200 ft.; thence North 57 degrees 50 min. West 100 feet; thence North 56 degrees 00 min. West 200 ft.; thence North 55 degrees 45 min. West 212 ft.; thence North 22 degrees 45 min. West 150 ft.; thence North 22 degrees 45 min. West 150 ft.; thence North 16 degrees 45 min. West 150 ft.; thence North 27 degrees 30 min. West 150 ft.; thence North 22 degrees 45 min. West 100 ft.; thence North 23 degrees 30 min. West 200 ft.; thence North 67 degrees 45 min. West 200 ft.; thence North 0 degrees 00 min. West 57 ft.; thence North 78 degrees 50 min. West 100 ft.; more or less, to a point on the North line of the said Southwest Quarter of Section 15; thence East 500 feet along said North line to the West line of the Spavinaw Water Line; thence Southerly on a curve 1481 feet; thence North 30 degrees, 22 min. East 365 feet; thence Southerly on a curve (Radii) 1582.7 feet a distance of 766.8 feet; thence South 60 degrees 17 min. East 405 feet; thence North 115 feet to point of beginning.

To have and to hold the same, together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in any wise appertaining so long as grantor, the State of Oklahoma, shall use, maintain and operate said premises for public park purposes; provided, however, that the State of Oklahoma, if the said premises are abandoned for park purposes, the grantor does hereby give, grant, bargain and sell said premises, and the remainder thereof, to the Town of Spavinaw, Oklahoma, and the Spavinaw Sportsmen's Club, a corporation, of Spavinaw, Oklahoma.

IN WITNESS WHEREOF, the said grantor has hereunto set his hand and the day and year first above written.

State of Oklahoma
Pottawatomie County

Before me, the undersigned, a Notary Public in and for the aforesaid county and state, on this 8th day of September, 1946, personally appeared E. M. Knight to me known to be the identical person who executed the above and foregoing instrument, and acknowledged to me that he executed the same as his free and voluntary act and deed for the use and purposes therein set forth. Given under my hand and seal of office the day and year above written.

Notary Public
Spavinaw, Okla.
Tract No. 6 NE 61, PE
Owner: State of Oklahoma

Total Acreage in Ownership - 35.0

Acres to be patented:
- Wooded area - 35.0
- Cleared area - 0.0
- Total Basement - 35.0

The following described land situated in Mayes County, Oklahoma, to-wit:
A tract or parcel of land lying in the Southwest Quarter of Sec 15, T 22 N, R 21 E (SW 1/4 15, 22R, 21E) and being a part of the unplatted portion of Block 11 in Pine Forest, containing 35 acres, more or less, and more particularly described as follows: Beginning at a point 116.5 feet south of the center of Sec 15; thence south 950 feet; thence south 84°20' west 200 feet; thence north 77°31' west 115 feet; thence north 64°00' west 206 feet; thence north 67°30' west 100 feet; thence north 69°45' west 100 feet; thence north 56°30' west 200 feet; thence north 45°30' west 212 feet; thence north 25°45' west 150 feet; thence north 25°45' west 115 feet; thence north 21°30' west 105 feet; thence north 23°15' west 156 feet; thence north 22°00' west 60 feet; thence north 27°30' west 152 feet; thence north 22°45' west 100 feet; thence north 22°45' west 200 feet; thence north 23°30' west 500 feet; thence north 90°00' west 200 feet; thence north 61°20' west 200 feet; thence north 90°00' west 57 feet; thence north 78°30' west 100 feet, more or less, to a point on the north line of the said southwest quarter of Sec 15; thence east 800 feet along said north line to the west line of the Sapinew water line; thence southeasterly on a curve 180 feet; thence south 30°32' east 365 feet; thence southeasterly on a curve (Radii) 3132.7 feet a distance of 769.5 feet; thence south 60°17' east 605 feet; thence north 115 feet to point of beginning.

CERTIFICATE: We the undersigned hereby certify that the above is a true and correct description of a tract of land necessary for theNickman Perry Project of the Grand River Dam Authority.

W. R. HOLMAY and ASSOCIATES, INC.
Construction Engineer

Date: April 30, 1963
The Lease, made and entered into as of the 25th day of May, 1965, by and between the City of Tulsa, a municipal corporation, Lessor, and the Oklahoma Planning and Resources Board of the State of Oklahoma, as Lessee:

WITNESSETH: That, said Lessor, in consideration of the covenants and agreements hereinafter set forth, does by these presents demise, lease and let unto the Lessee the following described property in the County of Mayes, State of Oklahoma, to wit:

That parcel of land lying between the west edge of Spavinaw Dam Spillway and the east boundary of the State Park, known as Spavinaw Recreational Area, the south boundary being a line twenty feet (20') above the Spavinaw Creek bed and parallel to Spavinaw Creek, the north boundary being the City of Tulsa fence just on top of the north bank of Spavinaw Creek, running from the north and east of the Spillway to the State Park, all being located in the west one-half (W1/2) of the west one-half (W1/2) of the southeast quarter (SE1/4) of Section 15, Township 22 North, Range 21 East, of the Indian Land and Necessity County of Osage, State of Oklahoma.

To have and to hold the same unto the Lessee from the 25th day of May, 1965, until the 28th day of May, 1970, for public park purposes only, and to the extent that such use shall not interfere with the use of Lessor in connection with the operation and maintenance of its waterworks. It is understood that the premises are subject to inundation from time to time in connection with the operation of said waterworks.

Lessee agrees to improve, use and maintain said property for park purposes during the term of this Lease.

It is further agreed that at the end of this Lease the Lessee shall give possession of the premises to the Lessor in as good a condition as they are now, the usual wear and tear and damage by the elements alone excepted. All improvements made upon said premises by the Lessee shall remain thereon and become the property of the Lessor at the expiration of this Lease.

In the event Lessor shall determine that said property is needed by Lessor for any public purpose, Lessor may, on thirty days' notice in writing to Lessee terminate this Lease. In such event Lessor shall forthwith deliver possession thereof to Lessee.
Appendix G – Documents related to Twin Bridges

- 1959 agreement between Oklahoma Historical Society and OTRD pertaining to the Wyandotte Monument
AGREEMENT

TWIN BRIDGES RECREATION AREA - GRAND LAKE

THIS AGREEMENT, Made and entered into on this 22nd day of April, 1959, by and between the Oklahoma Planning and Resources Board, party of the first part, and the Oklahoma Historical Society, party of the second part; WITNESSETH:

WHEREAS, the Oklahoma Planning and Resources Board is owner, by deed, of certain property on Grand Lake, more specifically called Twin Bridges Recreation Area; and

WHEREAS, the Oklahoma Historical Society is desirous of securing permission to erected a Monument to the Wyandotte Indians on certain of these lands; and

WHEREAS, a survey has been made of the property in question and is as follows, to-wit:

Beginning at a point 295 feet south and 704 feet east of the northwest corner of lot 6; thence N36° 16′W 200 feet; thence S53° 44′W 200 feet; thence S36° 16′E 200 feet; thence N53° 44′E 200 feet to the point of beginning, in Lot 6, Section 19, Township 27 North, Range 24 East of the Indian Base and Meridian, Ottawa County, Oklahoma, and containing 0.92 acres, more or less.

The Oklahoma Planning and Resources Board fully well recognizes the value of this improvement and the enhancement to the property involved.
The Oklahoma Planning and Resources Board by issuance of this Agreement has caused to be set aside the above described lands, for use of the Oklahoma Historical Society in erecting a Monument to the Wyandotte Indians. It being understood all maintenance of the grounds and Monument is the full responsibility of the Oklahoma Historical Society.

Executed this ___ day of May, 1959.

(SEAL)

CHAIRMAN
OKLAHOMA PLANNING AND RESOURCES BOARD

(SEAL)

SECRETARY
OKLAHOMA PLANNING AND RESOURCES BOARD

Agreement Accepted:

DIRECTOR
OKLAHOMA HISTORICAL SOCIETY
Appendix H – Soil Reports for Grand Lake State Park
Bernice Area

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>EdB</td>
<td>Eldorado silt loam, 1 to 3 percent slopes</td>
<td>17.3</td>
<td>28.0%</td>
</tr>
<tr>
<td>EID</td>
<td>Eldorado stony silt loam, 3 to 12 percent slopes</td>
<td>40.0</td>
<td>64.7%</td>
</tr>
<tr>
<td>SgB</td>
<td>Britwater gravelly silt loam, 1 to 3 percent slopes</td>
<td>0.8</td>
<td>1.3%</td>
</tr>
<tr>
<td>SgD</td>
<td>Britwater gravelly silt loam, 3 to 8 percent slopes</td>
<td>3.7</td>
<td>6.0%</td>
</tr>
</tbody>
</table>

Totals for Area of Interest | 61.8 | 100.0%
### Cherokee Area

![Map of Cherokee Area](image)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClkD</td>
<td>Clarksville gravelly silt loam, 1 to 8 percent slopes</td>
<td>3.7</td>
<td>34.6%</td>
</tr>
<tr>
<td>ClkF</td>
<td>Clarksville silt loam, 20 to 50 percent slopes</td>
<td>6.7</td>
<td>63.3%</td>
</tr>
<tr>
<td>Vs</td>
<td>Verdigris silty clay loam, 0 to 1 percent slopes, frequently flooded</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>0.2</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>10.6</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
### Mayes County, Oklahoma (OK097)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIF</td>
<td>Clarksville stony silt loam, 20 to 50 percent slopes</td>
<td>7.7</td>
<td>99.3%</td>
</tr>
<tr>
<td>Vs</td>
<td>Verdigris silty clay loam, 0 to 1 percent slopes, frequently flooded</td>
<td>0.1</td>
<td>0.7%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>7.7</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Mayes County, Oklahoma (OK097)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKD</td>
<td>Clarksville gravelly silt loam, 1 to 5 percent slopes</td>
<td>31.5</td>
<td>13.9%</td>
</tr>
<tr>
<td>DAM</td>
<td>Large dam</td>
<td>0.8</td>
<td>0.3%</td>
</tr>
<tr>
<td>Ve</td>
<td>Verdigris silty clay loam, 0 to 1 percent slopes, occasionally flooded</td>
<td>161.8</td>
<td>71.7%</td>
</tr>
<tr>
<td>Vs</td>
<td>Verdigris silty clay loam, 0 to 1 percent slopes, frequently flooded</td>
<td>30.3</td>
<td>13.4%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>1.5</td>
<td>0.6%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>225.8</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Honey Creek Area

Delaware County, Oklahoma (OK041)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CkD</td>
<td>Clarksville very gravelly silt loam, 1 to 5 percent slopes</td>
<td>9.6</td>
<td>34.4%</td>
</tr>
<tr>
<td>CIE</td>
<td>Clarksville stony silt loam, 5 to 20 percent slopes</td>
<td>15.0</td>
<td>53.5%</td>
</tr>
<tr>
<td>CIF</td>
<td>Clarksville stony silt loam, 20 to 50 percent slopes</td>
<td>2.2</td>
<td>8.0%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>1.1</td>
<td>4.1%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>28.0</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Josephine Smith unit of Spring River Canoe Trails Area

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>BoE</td>
<td>Clarksville sandy silt loam, 12 to 30 percent slopes</td>
<td>1.5</td>
<td>25.8%</td>
</tr>
<tr>
<td>E1A</td>
<td>Britwater silt loam, 0 to 3 percent slopes</td>
<td>2.8</td>
<td>47.9%</td>
</tr>
<tr>
<td>M1</td>
<td>Kanima gravelly clay loam, 1 to 30 percent slopes</td>
<td>1.4</td>
<td>23.1%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>0.2</td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>5.9</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
### Delaware County, Oklahoma (OK041)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CrD</td>
<td>Clarksville very gravelly silt loam, 1 to 6 percent slopes</td>
<td>4.0</td>
<td>15.4%</td>
</tr>
<tr>
<td>ClF</td>
<td>Clarksville stony silt loam, 20 to 50 percent slopes</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>StB</td>
<td>B reun silt loam, 1 to 3 percent slopes</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>SgD</td>
<td>B reun gravelly silt loam, 3 to 8 percent slopes</td>
<td>0.3</td>
<td>1.1%</td>
</tr>
<tr>
<td>Sn</td>
<td>Razor gravelly loam, 0 to 3 percent slopes, occasionally flooded</td>
<td>7.9</td>
<td>30.5%</td>
</tr>
<tr>
<td><strong>Subtotals for Soil Survey Area</strong></td>
<td></td>
<td><strong>12.2</strong></td>
<td><strong>47.1%</strong></td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>25.8</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

### Mayes County, Oklahoma (OK097)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca</td>
<td>Razor gravelly loam, 0 to 1 percent slopes, occasionally flooded</td>
<td>1.4</td>
<td>5.5%</td>
</tr>
<tr>
<td>CrD</td>
<td>Clarksville gravelly silt loam, 1 to 8 percent slopes</td>
<td>10.0</td>
<td>38.6%</td>
</tr>
<tr>
<td>Vs</td>
<td>Verdigris silty clay loam, 0 to 1 percent slopes, frequently flooded</td>
<td>2.3</td>
<td>8.8%</td>
</tr>
<tr>
<td><strong>Subtotals for Soil Survey Area</strong></td>
<td></td>
<td><strong>13.7</strong></td>
<td><strong>52.8%</strong></td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>25.8</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Bicentennial unit of Spring River Canoe Trails Area

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>EhD</td>
<td>Waben gravelly silt loam, 3 to 8 percent slopes</td>
<td>0.3</td>
<td>1.3%</td>
</tr>
<tr>
<td>Hg</td>
<td>Razort gravelly silt loam, 0 to 1 percent slopes; frequently flooded</td>
<td>18.3</td>
<td>98.2%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>0.5</td>
<td>2.5%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>18.1</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>