

Alternative Transportation Study: **WICHITA MOUNTAINS WILDLIFE REFUGE**

August 2010



U.S. Department
of Transportation
**Federal Highway
Administration**

Prepared for:
Federal Highway Administration
Central Federal Lands Highway Division
Lakewood, CO



U.S. Fish and Wildlife Service
Refuge Roads Program Division of Visitor Services and Communications
Albuquerque, NM



U.S. Department
of Transportation
**Volpe National
Transportation
Systems Center**

Prepared by:
John A. Volpe National Transportation Systems Center
Research and Innovative Technologies Administration
U.S. Department of Transportation

ACKNOWLEDGMENTS

The U.S. Department of Transportation (USDOT) Volpe National Transportation Systems Center (Volpe Center), in coordination with the Federal Highway Administration - Central Federal Lands Highway Division and the U.S. Fish and Wildlife Service (USFWS), prepared this study with Refuge Roads Program funds. The project team included Charlotte Burger, Gabriel Lopez-Bernal, Luis Mejias, and Eric Plosky of the Volpe Center Systems Operations and Assessment Division.

The authors wish to thank the numerous organizations and individuals who graciously provided their time, knowledge and guidance in the development of this report. Those of particular note are listed below:

Jeff Rupert	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Ralph Bryant	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Bruce Booth	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Chip Kimball	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Susan Howell	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Vicki Swier	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Quinton Smith	(U.S. Fish and Wildlife Service, Wichita Mountains Wildlife Refuge)
Susan Law	(Federal Highway Administration, Central Federal Lands Highway Division)
Nathan Caldwell	(U.S. Fish and Wildlife Service)
Robert O'Brien	(U.S. Fish and Wildlife Service)
Roxanne Turley	(U.S. Fish and Wildlife Service)

In addition, several individuals and staff from the following agencies and organizations were instrumental in the development of this report:

U.S. Army, Fort Sill
City of Cache
FitKids of Southwest Oklahoma
City of Medicine Park
Lawton Metropolitan Planning Organization
Oklahoma Department of Transportation
University of Oklahoma
Comanche Nation
Lawton Planning Commission
Friends of the Wichitas
Comanche County
Comanche National Museum
Kiowa Tribe of Oklahoma
City of Lawton, Lawton Area Transit System
City of Mountain View

EXECUTIVE SUMMARY

This Wichita Mountains Alternative Transportation Study, completed by the U.S. Department of Transportation Volpe National Transportation Systems Center, in cooperation with the U.S. Fish and Wildlife Service (FWS), Central Federal Lands Highway Division, and the Wichita Mountains Wildlife Refuge (the “refuge” or “Wichita Mountains”), evaluates alternative transportation methods that encourage visitors to travel to and within the refuge by alternative modes to address refuge and community desires to accommodate additional visitors without adding to the existing footprint of the refuge. Wichita Mountains is located in southwest Oklahoma, roughly 30 miles from the City of Lawton and the U.S. Army - Fort Sill, and within walking distance of the small community of Medicine Park. The primary access route to the refuge is Interstate 44, which connects the cities of Wichita Falls, Texas, Oklahoma City and Tulsa to the refuge. Wichita Mountains receives approximately 1.6 million recreational visitors a year, the great majority of whom arrive by private vehicles.

This study follows from a request by FWS to conduct a Transportation Assistance Group (TAG) site visit to the refuge in the spring of 2009. The TAG report¹ provides a high-level outline for transportation planning goals, alternative transportation options, and partnership opportunities for transportation activities at and around the refuge. This study expands upon preliminary transportation issues the TAG report identifies and considers existing and future demographic and transportation conditions, potential regional partnership opportunities, and experiences with transportation planning at other public lands units. The preliminary research revealed several transportation “issues” facing the refuge, including the following.

The refuge lacks a comprehensive transportation plan

Long-term transportation planning in the region is lacking. Currently, the refuge does not have a transportation plan, nor does Comanche County. Only the City of Lawton, southeast of the refuge, has a transportation plan, through the Lawton Metropolitan Planning Organization (MPO) Long Range Transportation Plan. The implementation of new transportation projects depends on the demonstration of the need for improvements- for example, quantitative determination of capacity constraints, or demand for new services. Further, transportation planning requires identification of where people are and where they want to go, as well as documentation of transportation improvements that may be underway. This study begins to bring together disparate transportation planning efforts around the refuge; however, information such as traffic counts and origin-destination details for visitors on the refuge and at nearby recreational locations is necessary to better understand how the refuge and partners can serve the needs of visitors and the community. A comprehensive transportation plan would allow the refuge to define a strategy to implement transportation improvements and programs to guide the effective investment of resources into the existing transportation network.

¹ Transportation Observations, Considerations and Recommendations for Wichita Mountains Wildlife Refuge, Provided by the Interagency Transportation Assistance Group (TAG) / Paul Sarbanes Transit in the Parks Program. May 31 – June 2, 2009, Indianahoma, OK. <http://publiclands.volpe.dot.gov/projects/wichita.asp>. Accessed August 4, 2010.

The primary route through the refuge is now a National Scenic Byway

The National Scenic Byway (NSB) designation is a new development (as of October 2009) for the refuge that opens additional possibilities for regional transportation planning, joint tourism marketing efforts, and possible funding sources for transportation improvements on the refuge. The designation also presents new challenges to the refuge and regional stakeholders, as it is likely to attract more visitors to the area as advertising and promotion of the byway increases. For example, one study found that a scenic byway designation resulted in a 3.4%-20% increase in annual traffic.² Establishing a program of action that connects NSB goals with refuge and stakeholder goals represents a proactive approach to ensuring the long term success and intent of the designation.

The Fort Sill and the region will experience significant growth

Fort Sill will influence growth in Comanche County over the next few years. The Base Closure and Realignment (BRAC) will result in significant growth in the military presence at Fort Sill as well as economic growth may increase the overall Comanche County population up to 35% by the year 2030³. As population grows, demand for recreation may lead to the refuge becoming more of a regional park as well as an area of habitat and resource protection. The refuge would like to accommodate additional visitation without increasing the existing physical footprint to preserve the natural ecosystem to as much of an extent as possible. These factors combine to encourage the refuge and its stakeholders to work together to increase the availability of alternative transportation options to and through the refuge.

The refuge has institutional opportunities to improve pedestrian and bicycling facilities

Fort Sill's Morale, Wellness and Recreation (MWR) program and the Oklahoma FitKids Coalition both strive to encourage healthy lifestyles that include physical activity, in part through taking advantage of outdoor recreational opportunities. The Lake Elmer Thomas Recreation Area (LETRA), one of Fort Sill's recreational areas that has a beach, boating, and other activities, abuts the refuge and presents an opportunity to expand recreational and transportation options between the sites. Oklahoma FitKids recognizes the importance of outdoor exercise in fighting childhood obesity. Working to improve active recreational opportunities on the refuge will assist the missions of MWR and Oklahoma FitKids to promote physically active recreation and will help the refuge to encourage more visits without the use of a private automobile.

Concurrent refuge planning efforts

In 1997, Congress passed the National Wildlife Refuge System Improvement Act, which requires all FWS units to develop a long-term 15-year program or Comprehensive Conservation Plan (CCP) by 2012, which the refuge is currently completing. The CCP broadly outlines the refuge purpose, and activities for conservation and preservation of wildlife and habitat, including defining recreational opportunities on the refuge. This includes efforts to mitigate issues that "may adversely affect the populations and habitats of fish and wildlife... and opportunities for wildlife compatible recreational uses."⁴ This study offers several alternative transportation options that the refuge can incorporate into the CCP, such as trail enhancements and wayfinding improvements.

² A Review of Impact Studies Related to Scenic Byway Designation. Economic Development Research Group. March 2001. <http://www.edrgrgroup.com/pdf/sbyway-litrev-report.pdf>. Accessed June 1, 2010.

³ Lawton Metropolitan Planning Organization, 2030 LRTP. <http://www.lawtonmpo.org/uploads/documents/execsumm.pdf>, Accessed January 25, 2010.

⁴ See the full text of the National Wildlife Improvement Act of 1997 here: <http://www.refugenet.org/new-pdf-files/NWRS%20Improvement%20Act.pdf>. Accessed May 4, 2010.

Additionally, the refuge is currently working on a Refuge Visitor Information Program (RVIP) study to implement a demonstration project, part of a series of Intelligent Transportation Systems (ITS) demonstration projects, to showcase available ITS technologies, which may include electronic message signs or other systems that improve refuge and community transportation issues, like parking management. Further, the refuge is improving or building new shoulders along OK-115 and OK-49 between the Cache Gate and the Meers intersection, which has implications for accommodating bicycle and pedestrian use of the road. Finally, the refuge will be part of the National Visitor Use Monitoring Program (NVUMP) in the coming months. This effort collects information on FWS units about visitor satisfaction and use, which may help to inform future transportation planning efforts on the refuge.

This study addresses these issues by developing and justifying a conceptual framework of nine alternative transportation options for Wichita Mountains to consider. These options were presented to the refuge and area stakeholders in March 2010, where feedback was used to eliminate, add, and further refine the options into the following list of nine alternative transportation options. The following table summarizes the alternative transportation options this study analyzes, including both options that require further study and capital improvements the refuge could implement through management decisions.

Transportation Options Summary

Transportation option	Project Type	Cost range	Implementation time line considerations
1 - Traffic analysis study	Study	\$60,000- \$80,000	Near term to provide valuable information to inform subsequent transportation planning on the refuge.
2 - LETRA improvements	Capital	Total costs vary see Chapter 7.2.4 for detail.	Near term to coincide with Fort Sill and FY10 TRIP application.
3 - Roadway shoulder improvements extension	Capital	\$3.2 million	Near term, these improvements benefit all roads users. Prior to bicycle share/routes pilot program.
4 - Visitor center-EE Center and Burma Road trails	Capital	Total costs vary see Chapter 7.4.4 for detail.	Near term to coincide with Comanche County Fitness Trail improvements and shoulder improvement project on OK-115.
5 - Lake Jed Johnson parking and roadway improvements	Capital	\$300,000 for roadway improvements \$860- 1,250 for parking area improvements	Prior to or concurrent with improvements to the Lake Jed Johnson tower.
6 - Wayfinding/signage	Study/Capital	Total cost varies: \$100 application to ODOT Average cost per sign \$107	Near term; these improvements benefit all roads users. Prior to bicycle share/routes pilot program.
7 - Traveler Information System	Capital	Total TIS cost vary from \$50,000- \$200,00 plus \$10,000 per year maintenance	Near term, to coincide with NSB activities on traveler information.
8 - Bicycle share pilot program/bicycle routes	Capital	Total costs vary from \$35,000- \$50,000	After roadway shoulder improvements extension and wayfinding signage improvements; bicycle share should follow establishment of bicycle route designation(s).
9 - Transit shuttle study	Study	Total costs vary from \$50,000- \$150,000	After traffic analysis study and completion of RVIP and the National Visitor Use Monitoring Program, if deemed necessary based on the results of these efforts. Should also follow trail and bicycle route/share to complement these alternative transportation modes.

The implementation of these options would facilitate better access to and within the refuge, and provide visitors with more information about the refuge for use in planning trips. These options do not require analysis and compliance pursuant to the National Environmental Protection Act (NEPA); however, certain items may require FWS determination on NEPA requirements in subsequent planning efforts.

The framework of this study builds from the transportation goals set forth by the refuge and analyzes the alternative transportation options with respect to these goals. It does not provide specific recommendations for action. Rather, it offers information to guide the future direction of the Wichita Mountains planning efforts in relation to accommodating alternative transportation. The information in

this study provides important background for the refuge as it develops its CCP, and may be extracted or referenced for inclusion in the CCP as deemed appropriate.

This study concludes with a discussion of next steps the refuge may proceed with, including incorporating the alternative transportation options into its CCP and continuing to build regional partnerships.

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LIST OF ACRONYMS

The following terms are used in this report:

ADA	Americans with Disabilities Act
AADT	Annual Average Daily Traffic
ARAN	Automatic Road Analyzer
BRAC	Base Closure and Realignment Commission
CAC	Citizen Advisory Commission
CCP	Comprehensive Conservation Plan
MWR	Family Morale, Welfare, and Recreation
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FWS	U.S. Fish and Wildlife Service
ITS	Intelligent Transportation Systems
LATS	Lawton Area Transit System
LMPO	Lawton Metropolitan Planning Organization
LETRA	Lake Elmer Thomas Recreation Area
MPMSN	Medicine Park Museum of Natural Science
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
NSBP	National Scenic Byway Program
NWR	National Wildlife Refuge
NCA	National Conservation Area
NEPA	National Environmental Protection Act
NRA	National Recreation Area
ODOT	Oklahoma Department of Transportation
PCR	Pavement Condition Rating
PUA	Public Use Area
REMI	Regional Economic Models, Inc.
RVIP	Refuge Visitor Information Program
SUA	Special Use Area
SCA	Student Conservation Association
TAG	Transportation Assistance Group
TRIP	Paul S. Sarbanes Transit in the Parks

1.0 Introduction

The U.S. Fish and Wildlife Service (FWS) Wichita Mountains Wildlife Refuge (the “refuge” or “Wichita Mountains”) is in southwest Oklahoma, roughly 30 miles from the City of Lawton and the Fort Sill, and within walking distance of the community of Medicine Park. The refuge encompasses 59,020 acres of mixed-grass prairie and the Wichita Mountains, one of the oldest mountain ranges on earth, the formation of which began some 500 million years ago. The prairie is the largest mixed-grass prairie in the world and is a unique natural treasure in the southern Great Plains of the United States. In 1901, this tract of land was set aside from the Comanche-Kiowa-Apache Indian Reservation as a National Forest, administered by the U.S. Forest Service, and transferred to the Bureau of Biological Survey (a predecessor agency of FWS) in 1935.⁵ In 1907, President Roosevelt had 15 American bison sent to the Wichita Mountains from the Bronx Zoo to develop a herd there, as at the time there were less than 1,000 bison remaining in the U.S. The current herd of 600 at the refuge descends from the original 15.⁶ The refuge is also home to about 800 elk, 300 Texas Longhorn cattle, and numerous prairie dogs, endangered Black-capped Vireo, and several other bird species, including wild turkeys, and the Scissor-tailed Flycatcher, Oklahoma’s state bird.⁷

The primary access route to the refuge is Interstate 44, which connects Wichita Falls, Texas (about 80 miles south of the refuge), Oklahoma City (about 100 miles northeast of the refuge), Tulsa (a total of about 200 miles northeast of the refuge), and Dallas-Fort Worth, Texas (about 200 miles southeast of the refuge). Wichita Mountains receives approximately 1.6 million recreational visitors a year from around the nation, making it one of the nation’s busiest National Wildlife Refuges.⁸ The majority of visitors to the refuge come by private automobile, recreational vehicles, or to a lesser extent, on tour buses. Refuge roads provide exceptional views of the surrounding grassland prairies, and significant wildlife.

1.1. Project Background

The communities and towns surrounding the refuge are growing in population, most notably due to the addition of personnel at the Fort Sill, adjacent to the refuge. Area population growth will increase vehicular traffic on and through the refuge, as well as visitation to attractions within the refuge, and has the potential to impact existing refuge use, management, and programs. Refuge staff express a desire to accommodate additional visitors through alternative means of transportation and without adding to the existing footprint of the refuge by expanding parking areas or constructing new parking lots, unless necessary to accommodate larger vehicles or enhance handicap vehicle access.

The U.S. Department of Transportation Volpe National Transportation Systems Center, working in cooperation with FWS, the Central Federal Lands Highway Division, and the refuge, prepared this Alternative Transportation Study to address the growing transportation demands on the refuge by considering transportation options that will encourage visitors to travel to and within the refuge by alternative modes.

⁵ A Brief Refuge History, <http://www.fws.gov/SOUTHWEST/refuges/oklahoma/wichitamountains/refhist.html>, Accessed April 1, 2010.

⁶ Corridor Management Plan, 2008

⁷ Wichita Mountains Wildlife Refuge

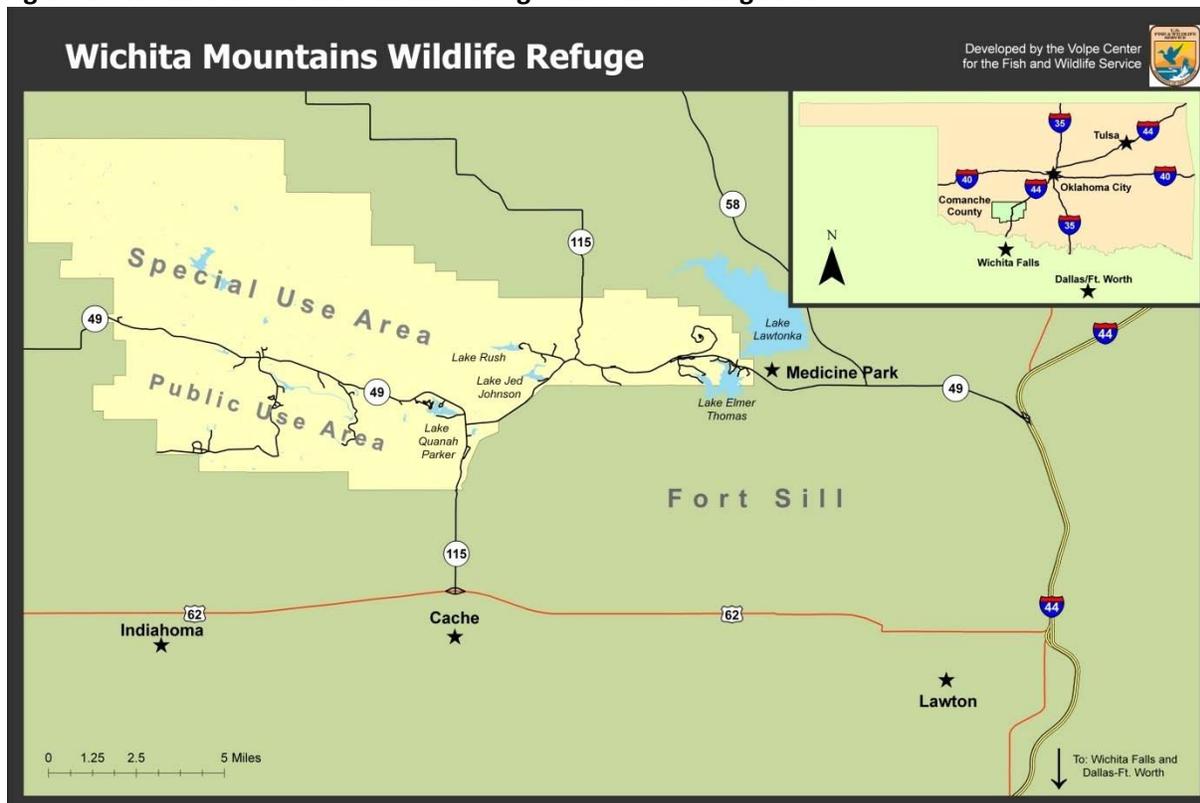
⁸ U.S. Fish and Wildlife Service, Refuge Annual Performance Plan, 2008

This study follows from a request by FWS to conduct a Transportation Assistance Group (TAG) site visit to the refuge in the spring of 2009. The TAG report provides a high-level outline for transportation planning goals, alternative transportation options, and partnership opportunities for transportation activities at and around the refuge. Concurrent with this project, the designation of primary routes through the refuge as the Wichita Mountains National Scenic Byway has occurred, and the development of the Wichita Mountains Visitor Services Study and Comprehensive Conservation Plan (CCP) are on-going. Additionally, the Refuge Visitor Information Program (RVIP), a joint program between FWS and the Federal Highway Administration (FHWA) Office of Federal Lands Highway, is evaluating the suitability of ITS technologies within six FWS Wildlife Refuges. As a result of the December 2009 FWS and FHWA staff site visit to the refuge to evaluate the refuge as part of the RVIP program, the refuge will host a demonstration parking management system project that will provide visitors with information on the availability of parking at certain areas on the refuge. Future phases will monitor and evaluate the results of the pilot project.⁹

1.2. Study Area

The adjacent Comanche County communities of Medicine Park, Cache, Fort Sill, and Lawton, in addition to the entire refuge, define the study area for this study (see Figure 1).

Figure 1 - Wichita Mountains Wildlife Refuge and Surrounding Area



Source: U.S. DOT Volpe Center

⁹ *Ibid.*

1.3. Project Purpose

This study aims to begin addressing the following issues that the 2009 TAG report outlines, focusing on providing a substantial background and justification for a set of alternative transportation options. These issues include the following:

- (1) The lack of a comprehensive transportation plan for the refuge and the region.
- (2) The designation of the primary route through the refuge as a National Scenic Byway.
- (3) The significant growth at the nearby Fort Sill.
- (4) The opportunities to improve pedestrian and bicycling facilities at the refuge.
- (5) The concurrent development of the refuge's Visitor Services Study and Comprehensive Conservation Plan.

This study does not recommend a "preferred transportation alternative," but rather provides the refuge with a set of transportation management options that it may implement. The transportation options do not require analysis and compliance pursuant to the requirements of the National Environmental Protection Act (NEPA); however, certain items may require FWS determination on NEPA requirements in subsequent planning efforts. This study is consistent with the refuge's on-going CCP process. The Volpe Center project team bases its efforts on the findings and final recommendations of the TAG report and subsequent meetings with area stakeholders.

1.4. Study Approach and Report Outline

The report has nine chapters. Chapter One introduces the project and its purpose. Chapter Two outlines overall refuge transportation goals, which are important to keep in mind since any changes the refuge makes to its transportation system need to be consistent with refuge transportation goals.

Chapter Three includes existing and future conditions. Understanding the surrounding communities is important for general context and to make sure that changes on the refuge are consistent with the needs and desires of those communities as well as the refuge. The existing transportation network influences the available opportunities to the refuge, and may limit those opportunities. The land use, development patterns, and demographics of the area around the refuge are important to consider with respect to the willingness and ability of the community to adapt to changes on the refuge. Finally, changes are occurring both on and around the refuge. Transportation planning efforts include expanding bicycle and trail amenities in surrounding towns and demographic changes are influencing population growth, for example at nearby Fort Sill.

Chapter Four is a partnership assessment that describes stakeholders in the region and their capabilities to work with the refuge. Chapter Five summarizes a peer comparison that provides an analysis to understand what other federal public land units are doing to deal with similar transportation issues as Wichita Mountains. Chapter Six summarizes the major transportation issues stemming from the research in chapters Two-Five

Chapter Seven analyzes transportation options. The selection and analysis of transportation options stems from the initial analysis in the prior chapters and discussion with refuge staff and area stakeholders, and addresses the transportation issues Chapter Six identifies. A stakeholder summit was held on March 25th, 2010 at the refuge to present an initial set of transportation options to area stakeholders. The initial

transportation options were well-received and the community was very supportive of efforts on the refuge to encourage alternative transportation. One result of the meeting was to amend some of the transportation options and the Transportation Analysis (Chapter Seven) considers this set of transportation options.

Chapter Eight includes implementation considerations as well as a risk analysis that outlines what the refuge may need to consider when and if they implement one or more of the options. Chapter Nine provides a conclusion and next steps.

2.0 Goals

Transportation goals are necessary to guide this study and provide a framework upon which to evaluate the alternative transportation options. The development of transportation goals for this analysis aligns with the mission and objectives of FWS, which is to work with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. In addition to this primary mission to protect and conserve wildlife habitat, the national refuge system manages six wildlife-dependent recreational uses: hunting, fishing, wildlife observation, photography, environmental education, and interpretation activities.¹⁰

The transportation goals that follow establish specific, measureable, and realistic objectives that help refuge managers set priorities, make better decisions about the management of the existing transportation network, and plan for future changes. The transportation analysis in Chapter Six also uses these goals to assess the transportation options. These goals are consistent with the refuge's current CCP (to the extent possible), and the refuge will further refine and incorporate them into the final CCP.

The following set of goals stems from both the agency mission and by the recreational uses above.

Wildlife and Habitat - ensure proper management, planning and design of the refuge transportation network, to preserve, restore, and maintain the natural diversity of plants and wildlife as it occurred historically on the refuge.

Visitor Services and Facilities - ensure the refuge transportation network enhances the visitor experience, supports public understanding of refuge goals for wildlife and habitat, provides safe and reliable access to and within refuge lands, and uses and promotes sustainable transportation practices.

Partners - utilize partnerships to leverage resources and to develop integrated transportation solutions that encourage the implementation of transportation programs and systems that align with the refuge mission.

¹⁰ U.S. Fish and Wildlife Service National Refuge System. U.S. Fish and Wildlife Service. <http://www.fws.gov/mission.html>. Accessed 18 Jan. 2010.

3.0 Location and Context

An analysis of transportation options for the refuge and surrounding area requires an understanding of the existing and expected future conditions with regard to transportation and land use. This chapter considers the location of the refuge and its surroundings, including demographics, land use and the economy, as well as a description of the transportation infrastructure both on and surrounding the refuge. The second section of this chapter considers future conditions and includes a summary of changes underway or that will occur that may affect the refuge.

3.1. Location

Wichita Mountains is in southwest Oklahoma and is the largest of nine National Wildlife Refuges in the state (see Figure 2). The refuge is in Comanche County, adjacent to the U.S. Army’s Fort Sill and Lawton.

Figure 2 - Oklahoma National Wildlife Refuges



Source: U.S. Fish and Wildlife Service National Refuge System

3.1.1. Comanche County

Comanche County covers about 109 square miles, and Fort Sill and the refuge are the two largest land holders in the county. Lawton is the largest city in the county, and the fourth largest in the state. The main economic driver and largest employer is Fort Sill. Smaller towns are spread throughout the county. Chapter 3.1.4 has more detail and analysis of Comanche County, Fort Sill, Lawton, and surrounding communities.

3.1.2. Wichita Mountains Wildlife Refuge

FWS manages the National Wildlife Refuge System, a classification of public lands and waterways in conservation for the protection of fish, wildlife, and plants. The Wichita Mountains Wildlife Refuge was established in 1901 as a National Forest transferred in 1935 to the Bureau of Biological Survey, one of the predecessor agencies of the present day Fish and Wildlife Service.¹¹

Wichita Mountains is the largest National Wildlife Refuge in the state and is double the average size of other Oklahoma refuges.¹² The refuge employs 38 full-time workers in the areas of refuge administration, public use administration, biological sciences, law enforcement, fire management, and maintenance. Several volunteer staff assists with the operation of the visitor center and refuge programs. The visitor center has 22,000 square feet of exhibition space, and a bookstore/gift shop that is operated by the Public Lands Interpretive Association. The visitor center hosts a revolving selection of artists' work that includes fine art, sculpture, photography, and taxidermy. Educational exhibits explain the four major habitat categories found on the refuge, which include: rock lands, aquatic, mixed-grass prairie, and cross timbers. The visitor center is open seven days a week from 8:00 am to 4:30 pm.¹³

Wichita Mountains is also the busiest refuge in Oklahoma, with a total visitation of approximately 1.6 million visitors in 2009, including roughly 150,000 visits to the visitor center - among the nation's busiest refuges¹⁴. The refuge estimates total visitation numbers from traffic counters at four entry/exit gates. Refuge staff manually count visits into the visitor center, including people participating in environmental educational programs. The refuge estimates that private automobiles, the primary mode of travel to the refuge, typically carry 2-4 passengers per vehicle.

In the last decade, total annual visitation to the refuge has increased by approximately 22% (see Figure 3) and visitor center visitation has increased by about 29% since 2005 (Figure 4). Between 2008 and 2009, total annual visitation to the refuge increased 13%, and by 21% to the visitor center. Historically, the refuge experiences high visitation over the New Year's holiday and during the early spring and early fall (Figure 5). Typically, weekend days (Friday-Sunday) experience the highest daily visitation averages of between 350-800 people per day.¹⁵ The recent Visitor Services Program Review for the refuge reveals that the primary purpose for visitation to the refuge is wildlife observation, generally by automobile sightseeing. This study considers this characteristic for the potential to facilitate non-motorized methods for wildlife viewing.

¹¹ A Brief Refuge History, <http://www.fws.gov/SOUTHWEST/refuges/oklahoma/wichitamountains/refhist.html>, Accessed April 1, 2010.

¹² U.S. Fish and Wildlife Service National Refuge System, <http://www.fws.gov/southwest/refuges/okrefuges.html>, Accessed January 18, 2010.

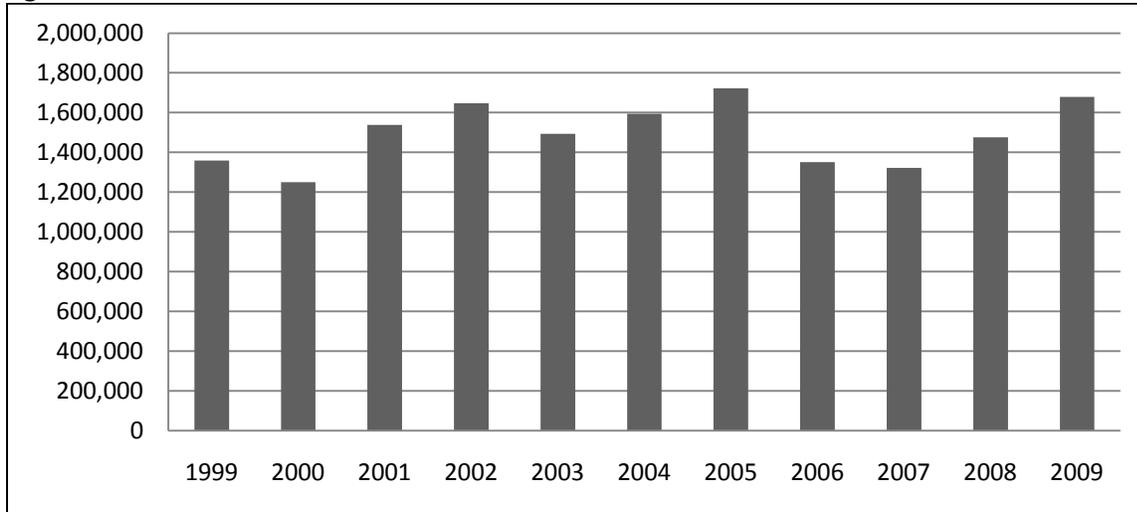
¹³ U.S. Fish and Wildlife Service National Refuge System. Wichita Mountains Wildlife Refuge.

<http://www.fws.gov/southwest/REFUGES/oklahoma/wichitamountains/visitorcenter.html>, Accessed January 18, 2010.

¹⁴ U.S. Fish and Wildlife Service, Refuge Annual Performance Plan, 2008

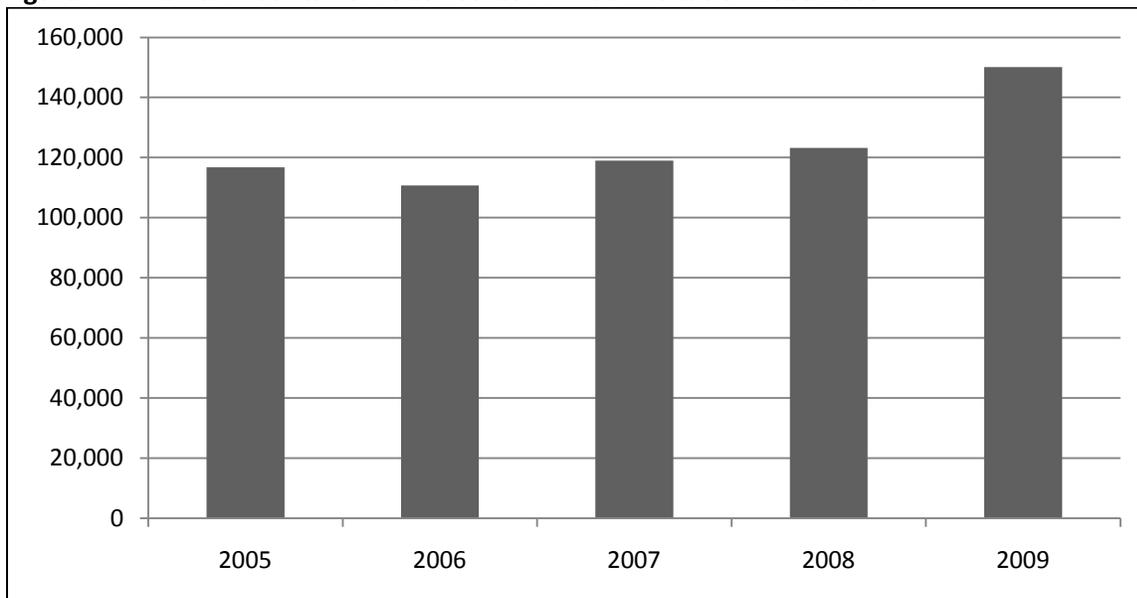
¹⁵ Wichita Mountains Wildlife Refuge staff, April, 2010.

Figure 3 – Wichita Mountains Annual Visitation 1999-2009



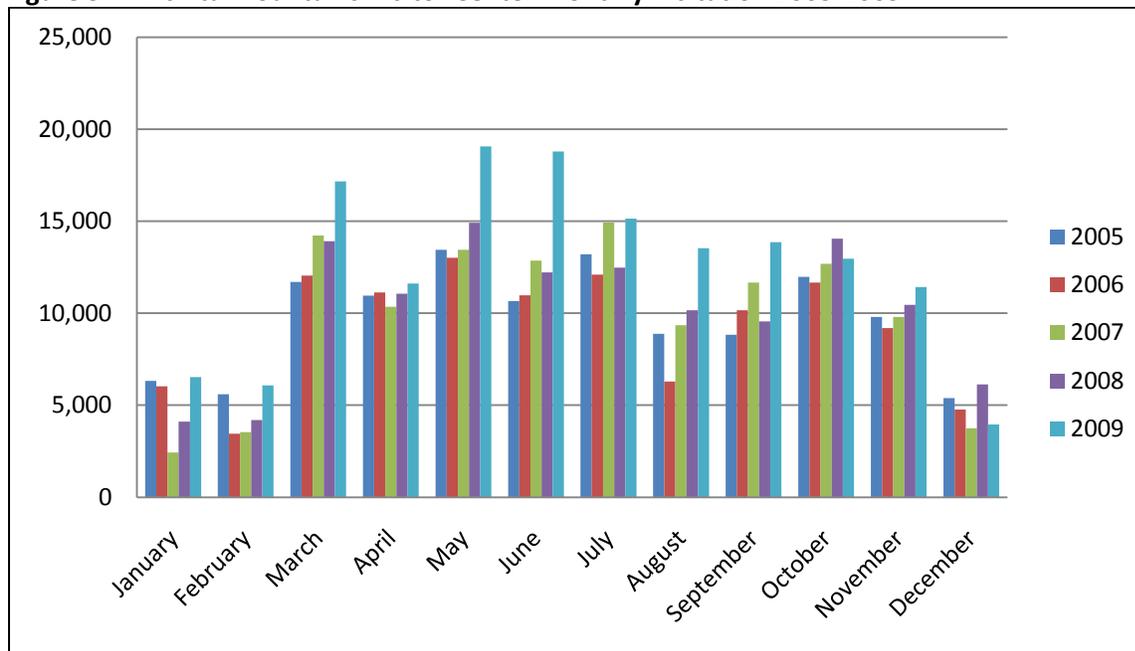
Source: Wichita Mountains Wildlife Refuge

Figure 4 - Wichita Mountains Visitor Center Annual Visitation 2005-2009



Source: Wichita Mountains Wildlife Refuge

Figure 5 – Wichita Mountains Visitor Center Monthly Visitation 2005-2009



Source: Wichita Mountains Wildlife Refuge

Public Use Area

The Public Use Area (PUA) covers over one third (22,400 out of 59,020 acres) of the refuge, including 5,723 acres of the Charon’s Gardens Wilderness Area (see Figure 6). The PUA is open year-round to the public for camping, hiking, rock climbing, hunting, observation, photography, and environmental education and interpretation.

Attractions

Several types of recreational opportunities exist at the refuge that attract thousands of visitors each year. Refuge staff manage these activities by allowing public access and recreation while maintaining the agency mission to conserve and protect wildlife habitat. These activities include hiking, bicycling, fishing, wildlife viewing, and photography. Table 1 describes additional refuge recreational opportunities and their fee structures; however, there is no fee to access the refuge.

Table 1 - Refuge Recreational Opportunities and Fees

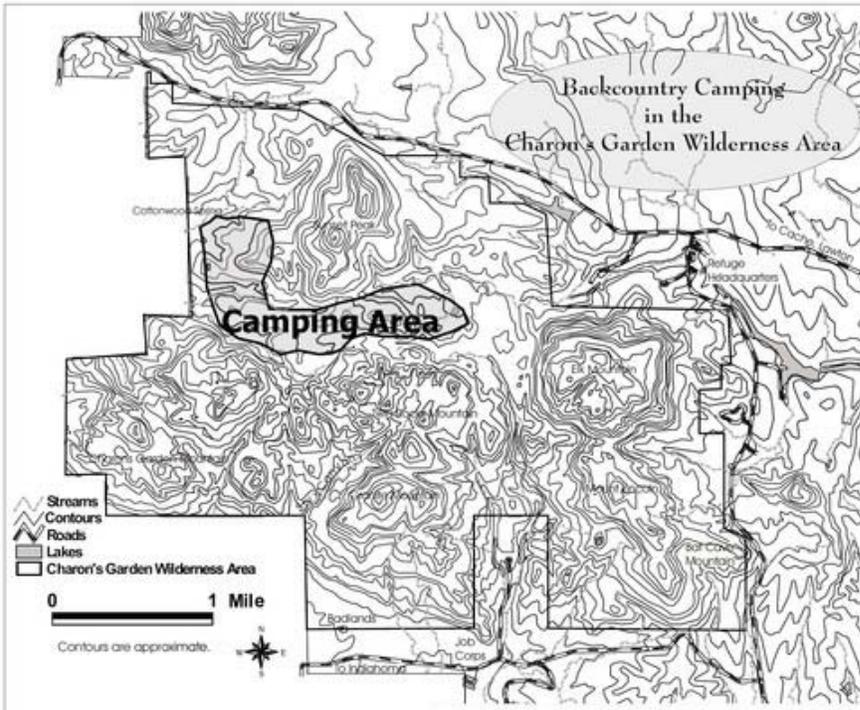
Name	Description	Fee
Doris Campground	First-come, first-serve camping area with a total of 90 sites; 23 with electric (RVs or tents), 47 non-electric (RVs or tents), and 20 walk-in sites (tents only).	\$16.00 per electric site \$8.00 per non-electric site \$6.00 per walk-in site
Fawn Creek Campground	Reserved camping area for youth groups through university aged; group sizes of 8-30 persons.	\$5.00 per group reservation for up to one week
Boulder Picnic Area	Day use only picnic area for group sizes of 20-60 persons.	\$5.00 per group reservation for the day
Back-Country Camping	Permit only camping for no more than 10 people over any three-day period (no permits issued on Thursdays).	\$2.00 per person
White Tailed Deer Hunt	Permit to participate in hunt (not including state issued hunting license)	\$20.00 per person
Elk Hunt	Permit to participate in hunt (not including state issued hunting license)	\$50.00 per person
Special Use Permit	Permit for commercial activities, e.g. scuba diving instruction, rock climbing instruction.	\$25.00 per permit
Interagency Senior Pass	Honored nationwide at all Forest Service, National Park Service, Bureau of Land Management, Bureau of Reclamation, and FWS sites charging entrance or standard amenity fees.	\$10.00 per person lifetime (seniors only)
Interagency Annual Pass	Honored nationwide at all Forest Service, National Park Service, Bureau of Land Management, Bureau of Reclamation, and FWS sites charging entrance or standard amenity fees.	\$80.00 per person annually

Source: Wichita Mountains Wildlife Refuge

Camping/Picnic

The refuge maintains the Boulder Picnic Area (a single day use picnic area) and two campgrounds: Doris Campground (a first-come, first-serve site) and Fawn Creek Campground (set aside for youth groups). A concessionaire operates Doris Campground and acts as campground host and provides a telephone, bathroom, showers, and drinking water. The refuge designates an area of Charon's Garden Wilderness for backcountry camping by permit. Figure 6 illustrates the refuge backcountry camping area.

Figure 6 - Refuge Backcountry Camping



Source: Wichita Mountains Wildlife Refuge

Hunting

The refuge hosts two annual controlled-hunts in November and December to help manage and maintain a healthy deer and elk population on the refuge. FWS and the Oklahoma Department of Wildlife Conservation administer the hunts, and choose a random, small selection of hunters who submit applications to participate in each hunt.

Rock Climbing

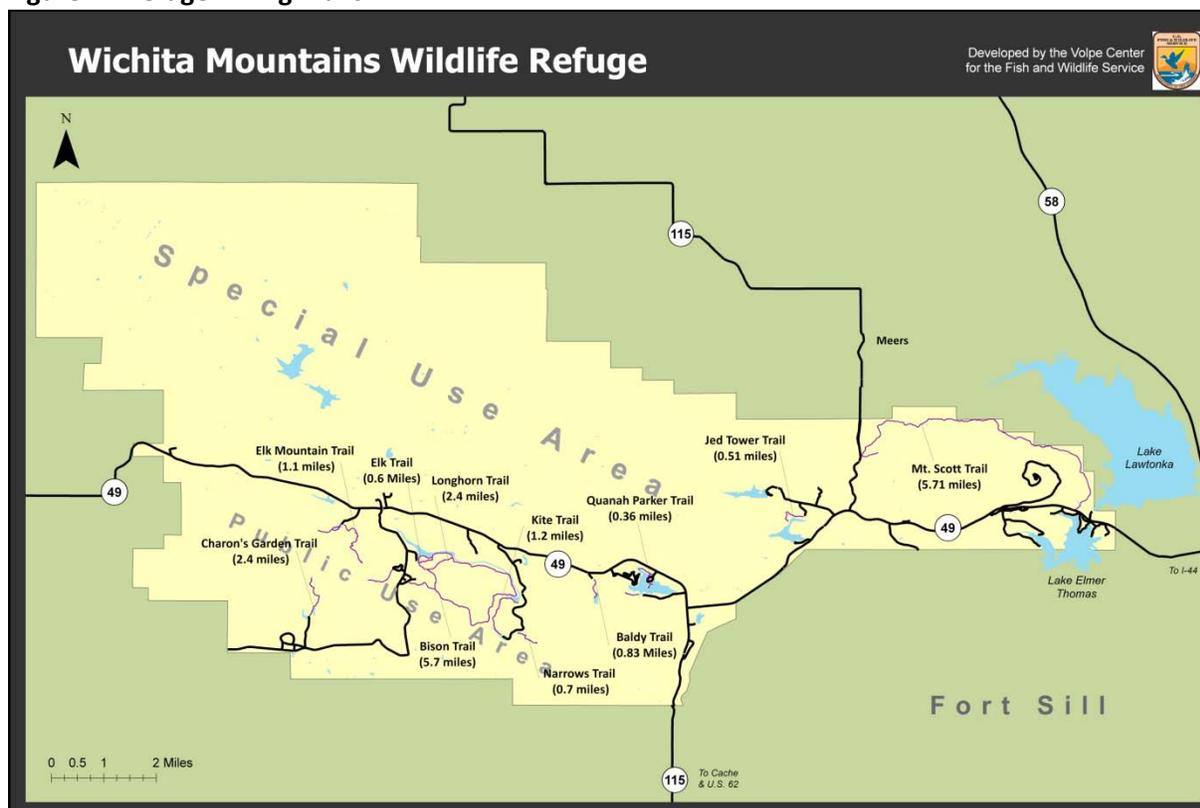
The refuge is one of a few sites in the Southern Plains that offers high-quality granite rock climbing, attracting thousands of sport climbers each year. Some popular sites include Mount Scott, the second tallest mountain on the refuge, at 2,464-feet. Other noteworthy climbing locations include the Narrows, Elk Mountain, Crab Eyes, and Lost Dome.¹⁶ The refuge allows rock climbing year round in the PUA, including at the Holy City. Refuge staff monitor climbing activities to achieve compatibility with the refuge mission and goals. Climbing management regulations require submission of an application to place any type of climbing anchors on rock face surfaces, place limitations on the total number of climbers at one time in certain locations, and continuous assessment of the impacts of rock climbing on area habitats.

Hiking

The refuge maintains nine official hiking trails, totaling approximately 15 miles, in the southwestern portion of the refuge (see Figure 7). The trails range in length from 0.36 to 5.7 miles. The refuge allows hiking throughout the PUA year round.

¹⁶ Wichita Mountains Climbers Coalition. <http://www.wichitamountains.org/wmwrclimbing.html>. Accessed January 28, 2010.

Figure 7 - Refuge Hiking Trails



Source: Wichita Mountains Wildlife Refuge, U.S. DOT Volpe Center

Other Commercial Uses

The refuge requires for-profit companies or instructional guides that charge for services (e.g. rock climbing courses, scuba diving, group tours) to purchase an annual Special Use Permit.

Special Use Area

The Special Use Area (SUA) makes up the remainder of the refuge, where the refuge restricts public access. The refuge reserves this area to facilitate the maintenance of an unencumbered habitat for resident and migrating wildlife, wildlife research, species management, including animal breeding, and species preservation activities, including efforts to protect the Black-capped Vireo. The Black-capped Vireo is recognized by the federal government as an endangered bird species generally found in Texas and Mexico, but it resides at the refuge during its breeding season.¹⁷

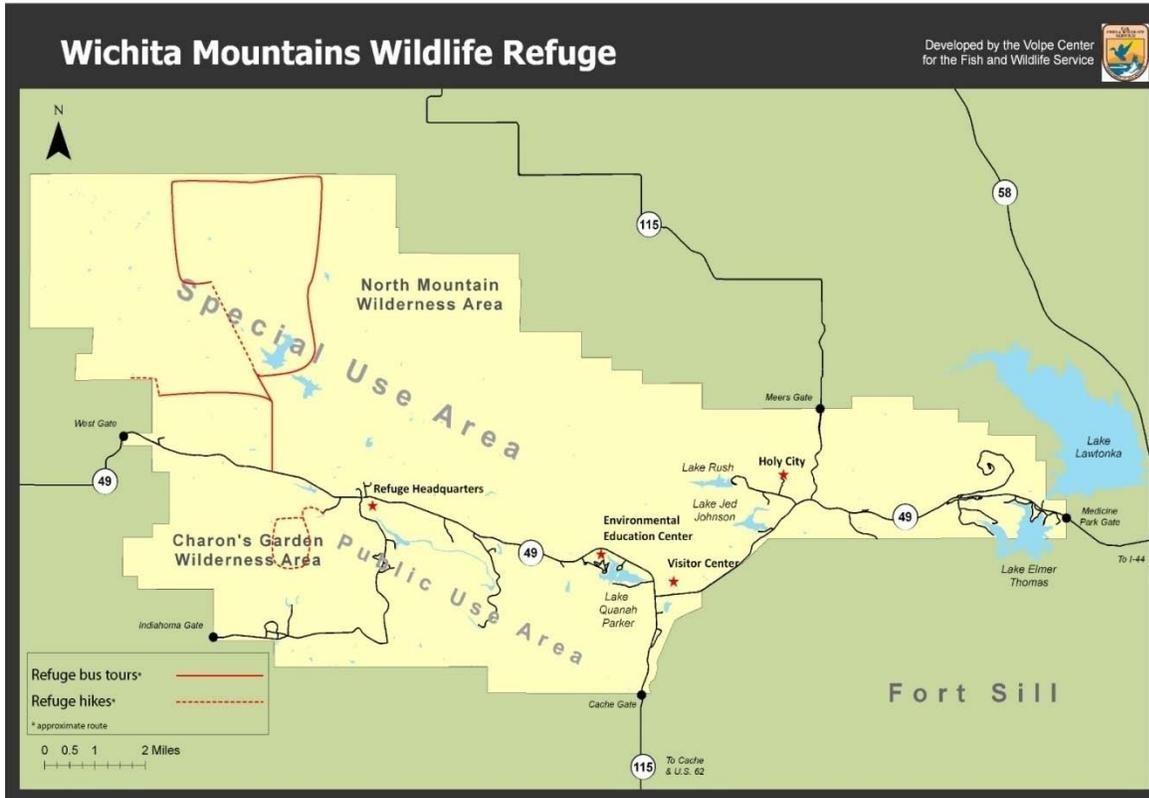
Special Use Area Bus Tour

The Association of Friends of the Wichitas (the Friends), a 501(c)(3) non-profit organization, provides interpretive tours into the SUA on a bus that the refuge owns and maintains (see Figure 8 and Figure 9). These popular 2.5 hour tours require reservations and often sell out within hours of the reservation being made available for a particular tour. The Friends charge \$5 per person for each tour. Under the terms of the Memorandum of Understanding (MOU) between the Friends and the refuge, the Friends contribute a portion of the bus tour revenues to the refuge for environmental education programs. The MOU between

¹⁷ Black-Capped Vireo Recovery Plan, U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM. 1991. http://ecos.fws.gov/docs/recovery_plan/910930h.pdf. Accessed January 19, 2010.

the Friends and the refuge expired in July of 2009, and the refuge is currently exploring future term options.

Figure 8 - Wichita Mountains Tour Map



Source: Wichita Mountains Wildlife Refuge, U.S. DOT Volpe Center

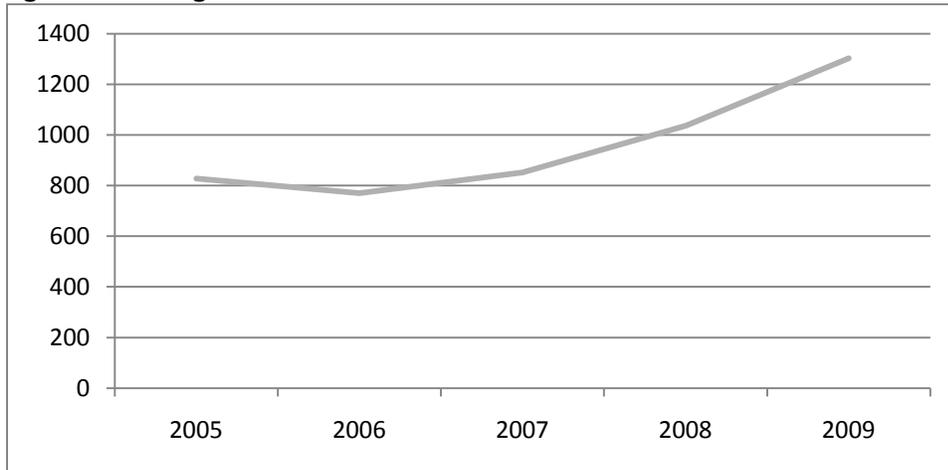
Figure 9 - Existing Refuge Tour Bus



Source: U.S. DOT Volpe Center

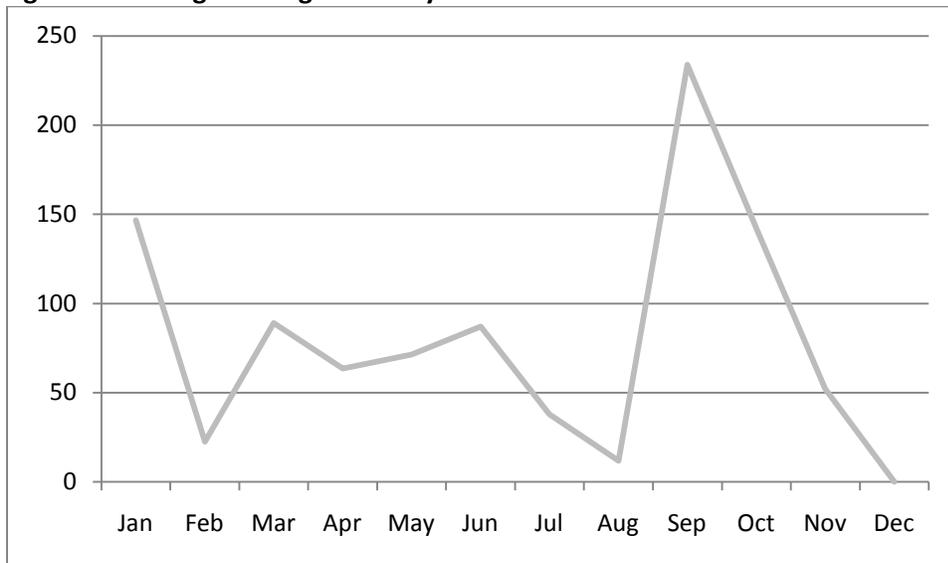
The bus tours into the SUA are increasingly popular. Total annual visitors on the tours increased more than 50% between 2005 and 2009 (see Figure 10). The high season for tours is September, October and January (see Figure 11). Fluctuation in popularity occurs because the number of tours often varies from month-to-month due to variability of ecological events and volunteer availability. For example, the tour schedule for 2010 includes up to 13 tours in September, nine in January and June, and no tours in August and December.¹⁸

Figure 10 - Refuge Annual Tour Visitors 2005-2009



Source: Wichita Mountains Wildlife Refuge

Figure 11 - Refuge Average Monthly Tour Visitors 2005-2009



Source: Wichita Mountains Wildlife Refuge

Special Activities

The refuge is an integral part of the surrounding community and often hosts special activities including auctions, events at the Holy City, and an on-site work program.

¹⁸ 2010 Tour Schedule, <http://www.fws.gov/southwest/refuges/oklahoma/wichitamountains/tours.html>, Accessed January 14, 2010.

Auctions

The refuge organizes yearly public auctions of Texas longhorn cattle and American bison as a means to maintain a healthy population within refuge lands. The refuge maintains longhorns in order to protect the genetic make-up of the species, in response to excessive crossbreeding of the animal in the 1900's. Annually, the Texas longhorn auction occurs on the third Thursday of September; and the American bison auction occurs on the fourth Thursday of October.¹⁹

Events at the Holy City

The Holy City is a 66-acre site in the northeastern portion of the refuge. The area hosts an annual Easter celebration, an 80-year annual tradition. The Holy City consists of several buildings and structures, which include gateways, towers, meeting halls, gardens, shrines, and dressing rooms (for the annual cast of actors), largely built in the mid-1930's by the Federal Works Progress Administration (see Figure 12). At its zenith in 1939, the Holy City Easter "Prince of Peace Passion Play" attracted 225,000 attendees. Currently, the performance attracts several hundred people a year. The Wallock Foundation maintains a special use permit until the year 2021 to manage and administer events at the Holy City.²⁰

Figure 12 - Holy City



Source: Wichita Mountains Wildlife Refuge

On-site Work Program

The U.S. Department of Labor and U.S. Department of Agriculture Forest Service jointly administer the Treasure Lake Job Corps education and vocational training site in the southwestern portion of the refuge. The program provides youth between the ages of 16 and 24 with academic, employment, and social skills.²¹

Other Nearby Recreation

Several additional recreational opportunities are available close to the refuge, which may supplement refuge visitation and complement refuge goals in terms of providing environmental education opportunities, and promoting the conservation and protection of area natural resources. The Lake Elmer Thomas Recreation Area, the Fort Sill Museum, Lake Lawtonka, the Museum of the Great Plains, and the

¹⁹ FWS Wichita Mountains Wildlife Refuge. <http://www.fws.gov/southwest/refuges/oklahoma/wichitamountains/auctions.html>. Accessed January 29, 2010.

²⁰ The Holy City of the Wichitas. http://www.theholycitylawton.com/about_us. Accessed January 29, 2010.

²¹ U.S. Department of Labor, Treasure Lake Job Corps. <http://treasurelake.jobcorps.gov/academics.aspx>. Accessed January 29, 2010.

forthcoming Medicine Park Museum of Natural Science each present unique activities and attractions that bring local residents and long-distance visitors to the refuge.

3.1.3. Area Demographics

Comanche County is home to not only the refuge, but to the U.S. Army’s Fort Sill and the City of Lawton, both located roughly 30 miles from the refuge. This section describes the population, demographics, and the economic trends in the county.

Population

Population growth in Comanche County over the last two decades has been limited. However, since 1990 the City of Lawton has experienced growth of roughly 12%. Approximately 80% of the population of Comanche County resides in the City of Lawton; the remainder in the surrounding towns of Cache, Elgin, Medicine Park, and elsewhere. The population density of Comanche County remained nearly unchanged from 1990 through 2000, with 104 people per square mile, and 108 people per square mile, respectively. In 2000, the population density in the City of Lawton was 1,234 people per square mile, a 13% increase from 1990 levels of 1,071 persons per square mile.²² Increases in Lawton’s population density improve the likelihood that alternative transportation strategies, like transit, pedestrian, and bicycle facilities will experience higher use. Table 2 shows population increases in Comanche County and Lawton from 1990-2008.

Table 2 - Area Population Trends 1990-2008

	1990	2000	2008	% Increase 1990-2008
Comanche County	111,486	114,996	111,772	.25%
City of Lawton	80,561	92,757	90,091	12%

Source: U.S. Census Bureau 2000, 1990, and 2008 estimate

Census data do not account for the population growth of military personnel due to the 2005 Base Closure and Realignment Commission (BRAC) initiative that estimates a 50 percent increase,²³ or approximately 10,000 more soldiers, families, and employees, at Fort Sill by 2011. The City of Lawton-Fort Sill Growth Management Plan indicates that the City of Lawton will experience approximately three-quarters of the expected growth, with the towns of Elgin and Cache receiving the remainder of the growth.²⁴ Population growth in the surrounding towns will likely increase visitation and usage at the refuge, and may provide an increase in demand that would make new transportation alternatives that this study identifies feasible.

Vehicle Ownership and Journey to Work

In 2000, there were 67,643 vehicles in Comanche County, or 1.70 vehicles per occupied dwelling unit. In Lawton there were 50,994 vehicles, or 1.61 vehicles per occupied dwelling unit. In Comanche County, 87% of workers drive to work, 84% of whom drive alone. Less than one percent of the population use transit to commute to work (see Table 3), while in Lawton 86% of workers drive to work, 84% of which

²² U.S. Census Bureau. 2000. American Fact Finder. <http://factfinder.census.gov/>. Accessed January 29, 2010.

²³ Lawton-Fort Sill Growth Management Plan. Based on an estimated population increase of approximately 10,000 new service personnel above the current population of approximately 20,000 service personnel. <http://www.lawtonmpo.org/uploads/documents/execsumm.pdf>. Accessed January 19, 2010.

²⁴ Lawton-Fort Sill Growth Management Plan. Executive Summary, P. 2-6. <http://www.lawtonmpo.org/uploads/documents/execsumm.pdf> Accessed January 19, 2010.

drive alone. Just one percent of the population use transit to commute to work.²⁵ These data reinforce the land use and development patterns above and underscore the importance of the automobile in facilitating movement and access to destinations in the region.

Table 3 –Comanche County – City of Lawton Means of Transportation to Work for Workers 16 Years and Over

Mode	Comanche County	% total	City of Lawton	% total
Car, truck, or van:	45,102	87%	35,989	86%
Drove alone	37,903		30,273	
Carpooled	7,199		5,716	
Public transportation	494	0.90%	457	1%
Motorcycle	72	0.10%	46	0.10%
Bicycle	133	0.30%	127	0.30%
Walked	3,767	7%	3,627	8%
Other means	945	2%	872	2%
Worked at home	1,171	2%	829	2%
Total	51,684		41,947	

Source: U.S. Census Bureau, 2000

3.1.4. Local Economy

Historically an agricultural, livestock, and military economy, the focus of Comanche County's economy today is largely on retail and healthcare. In addition to Fort Sill, the wind-solar energy, Native American gaming, and tourism sectors provide an important source of economic opportunities in the area. Table 4 shows the top ten employers in Comanche County.

Table 4 - Top Ten Employers - Comanche County

Employer	Employees Full Time
Fort Sill	5,092
Goodyear Tire & Rubber Company	2,400
Lawton Public Schools	2,325
Comanche County Memorial Hospital	1,801
Wal-Mart /Sam's*	1,180
City of Lawton	824
Cameron University	510
Southwestern Medical Center	552
Assurant Solutions*	530
Fort Sill National Bank	488

Source: Lawton Fort Sill Chamber of Commerce

Economic Benefits of Oklahoma National Wildlife Refuges

The 2006 FWS Banking on Nature study assesses and measures the relative economic benefits of visitation at national wildlife refuges in terms of demand, employment, and revenues in local

²⁵ U.S. Census Bureau. Census 2000 Summary File 3 (SF 3) - Sample Data, Detailed Tables P30. Means of transportation to work for workers 16+. Comanche County. http://factfinder.census.gov/servlet/DTSUBJECTSHOWTABLES?_ts=291814271024, Accessed January 20, 2010.

communities. The report analyzes use characteristics and economic data from 80 refuges around the nation. The economic profiles use data from the Fish and Wildlife Service National Survey of Fishing, Hunting, and Wildlife Associated Recreation and FWS Refuge Annual Performance Plan (RAPP) to develop the economic profiles of refuge visitation. The report estimates visitor spending in local communities on food, lodging, transportation, and other fees (i.e. equipment rentals, guide fees, etc.). To create an approximate estimate of the national impacts that refuges have on regional economies, the report extrapolates data from a sample population of refuges with more than 1,500 visitors in the lower 48 states, recognizing that numerous complex variables affect a refuge's impact on an area economy. Some of the main findings include that, of the 34.8 million visits to refuges in the sample population, spending activities generated:

- \$1.7 billion in sales tax for regional economies
- \$542.8 million in employment income
- \$185.3 million in tax revenues at the federal, state, county, and local level
- 26,798 jobs²⁶

Wichita Mountains is not a case study in this report; however, it profiles three NWR sites within Oklahoma: the Washita NWR, about 120 miles northwest of Wichita Mountains, and the two other units, Sequoyah NWR and Tishomingo NWR, both a couple of hundred miles west of Wichita Mountains. Each site has unique characteristics that attract visitors, and contextual issues that may affect visitation and the penetration of income into the local economy (e.g. the relative availability and/or desirability of hotels, restaurants, retail) create discrepancies for direct comparison to the refuge. However, the Banking on Nature report provides a source of information that helps to form a broad picture of the economic significance of the refuge on its surrounding communities.

Table 5 illustrates the total income generation of non-resident consumers of goods and services relative to visitation at the three Oklahoma refuges. The "economic area" is defined as the county areas within 30 miles of the refuge site. "Final demand" is the total spending by consumers on all goods, or the amount of money that remains in an area after accounting for economic leakages (i.e. non-spending of income allocated to savings, taxes, and imports). In 2006, Wichita Mountains had approximately 1.3 million visitors, or six times the visitation of Tishomingo NWR, fourteen times the visitation of Sequoyah NWR, and twenty-two times the visitation of Washita NWR. Extrapolating spending data at these sites leads to the estimation that Wichita Mountains Wildlife Refuge may have contributed over \$30 million towards its surrounding regional economy in the same year. With visitation steadily increasing on the refuge and the growing popularity of "eco-tourism," the refuge's importance to the local economy is certain to continue.

²⁶ Banking On Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. U.S. Fish and Wildlife Service. 2007.

Table 5 - 2006 Banking on Nature Oklahoma Area NWR Economic Impacts

Refuge	Total Visitation	Economic Area*	Final Demand** (2006 \$'s)
Tishomingo NWR	205,944	Johnston, Marshall	\$5.1 M
Sequoyah NWR	88,000	Sequoyah, Haskell, Muskogee	\$2.4 M
Washita NWR	58,582	Custer, Beckham, Roger Mills, Washita	\$965,000

* County areas within 30 miles of the refuge

** Total spending by consumers on all goods, or the amount of money that remains in an area after accounting for economic leakages (i.e. non-spending of income allocated to savings, taxes, and imports).

Source: Banking On Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. U.S. Fish and Wildlife Service. 2007.

3.1.5. Fort Sill

Fort Sill is south of the refuge and home to the U.S. Army Field Artillery Training Center, which offers basic and advanced training courses for enlisted personnel and officers (including the U.S. Marine Corps and students from more than forty countries), the U.S. Army Field Artillery School, four brigades of Third Corps artillery, and almost fifteen thousand soldiers. Fort Sill oversees 93,828 acres (146 square miles), including the Henry Post Army Air Field, Reynolds Army Community Hospital, and the Fort Sill Museum, which has the Army's largest collection of artifacts.²⁷

The 2005 BRAC adds a fifth branch to the fort, the Air Defense Artillery, and expands the Fires Center of Excellence (a combination of the field artillery and air defense artillery branches)²⁸, which will represent a significant level of growth at the base, and in the surrounding communities. In response to the BRAC, the City of Lawton and several partnering cities and counties undertook a regional planning effort to prepare the area for the growth and impacts projected to occur. Initial research indicates that the BRAC will attract several thousand new people to the area, and specifically, to the cities of Cache, Elgin and Lawton.

Lake Elmer Thomas Recreation Area

The military's Family Morale, Welfare, and Recreation (MWR) program strives to provide leisure opportunities through a network of support services that enhance the lives of soldiers (active, Reserve, and Guard), their families, civilian employees, military retirees and other eligible participants.²⁹ As part of this program, Fort Sill maintains the Lake Elmer Thomas Recreation Area (LETRA) at the junction of the refuge, Fort Sill, and Medicine Park (see Figure 13).

Fort Sill and the refuge jointly manage Lake Elmer Thomas. The northern half of the lake is on the refuge and the southern half is on Fort Sill. LETRA, which Fort Sill wholly owns and manages, is open to the public and offers camping, RV sites, miniature golf, a waterslide, and boat ramps, and a country store.

Fort Sill manages entry to LETRA through a secure gate just off of OK-49 and an entry fee gate. Entry is \$6 per car for the general public and \$5 per car for soldiers and other military affiliates (\$3 and \$2.50 per car, respectively, on Wednesdays and Thursdays). Annual events at LETRA include the Body Versus Earth Triathlon in September and the Hills of Hell Mountain Bike Race in March.

²⁷ OK State University. <http://digital.library.okstate.edu/encyclopedia/entries/F/FO038.html>. Accessed January 20, 2010.

²⁸ Fort Sill. <http://www.tradoc.army.mil/PAO/TNSArchives/June%2006/060206-2.html>. Accessed January 20, 2010.

²⁹ Fort Sill. http://www.sillmwr.com/about_us.html. Accessed January 20, 2010.

3.1.7. Comanche County

A county commission governs Comanche County and consists of a group of three elected officials that administer the county and local government in the area. Commission members serve by district in four-year, staggered terms, resulting from partisan elections.

3.1.8. Lawton Metropolitan Planning Organization

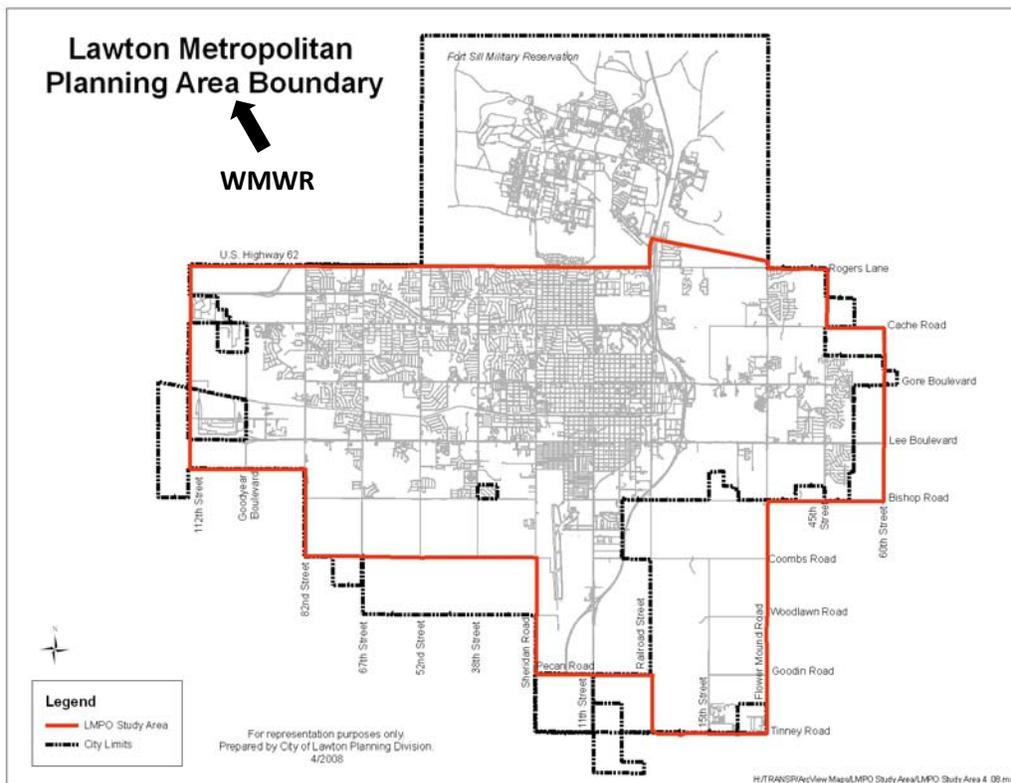
The Lawton Metropolitan Planning Organization (LMPO) is the Metropolitan Planning Organization (MPO) for the Lawton Urbanized Area. The LMPO's primary role and responsibility is to ensure that transportation planning is carried out according to federal and state regulations.³¹ The LMPO guides long-range transportation planning processes in cooperation with the Oklahoma Department of Transportation (ODOT), and other agencies, such as the Lawton Area Transit System. Figure 14 shows the Lawton Metropolitan Boundary Planning Area.

The refuge is just outside of the Lawton Metropolitan Area Transportation Study area. However, the refuge may consider transportation planning and policy actions made by the LMPO in the context of refuge goals and the transportation planning efforts that the refuge plans to implement. For example, in 2006 the Lawton City Council adopted an ordinance that requires the installation of sidewalks within areas of high density residential and commercial development, including churches and schools. Further, in May 2008 the LMPO adopted the Lawton Metropolitan Pedestrian and Bicycle Plan to “guide the development of bicycle, pedestrian, and supporting multi-modal infrastructure, including shared-use paths, trails, sidewalks, transit interfaces, and all elements that comprise a ‘complete street’ approach to transportation system implementation in Lawton, Oklahoma for the next 25 years.”³² The support and implementation of these bicycle and pedestrian policies may lead to safer, more convenient and accessible pedestrian and bicycle facilities in the Lawton area. Consequently, as people in the area begin to walk and/or cycle to fulfill recreational, fitness, shopping, or commute needs, there may be a growing expectation for these facilities outside of Lawton. The refuge may consider these guiding principles when determining their own strategies to facilitate alternative transportation options for their visitors.

³¹ Lawton Metropolitan Planning Organization. <http://www.lawtonmpo.org/uploads/documents/execsumm.pdf>, Accessed January 25, 2010.

³² Lawton Metropolitan Pedestrian and Bicycle Plan. May 2008.

Figure 14 -Lawton Metropolitan Planning Area Boundary



Source: Lawton Metropolitan Planning Organization

3.2. Transportation

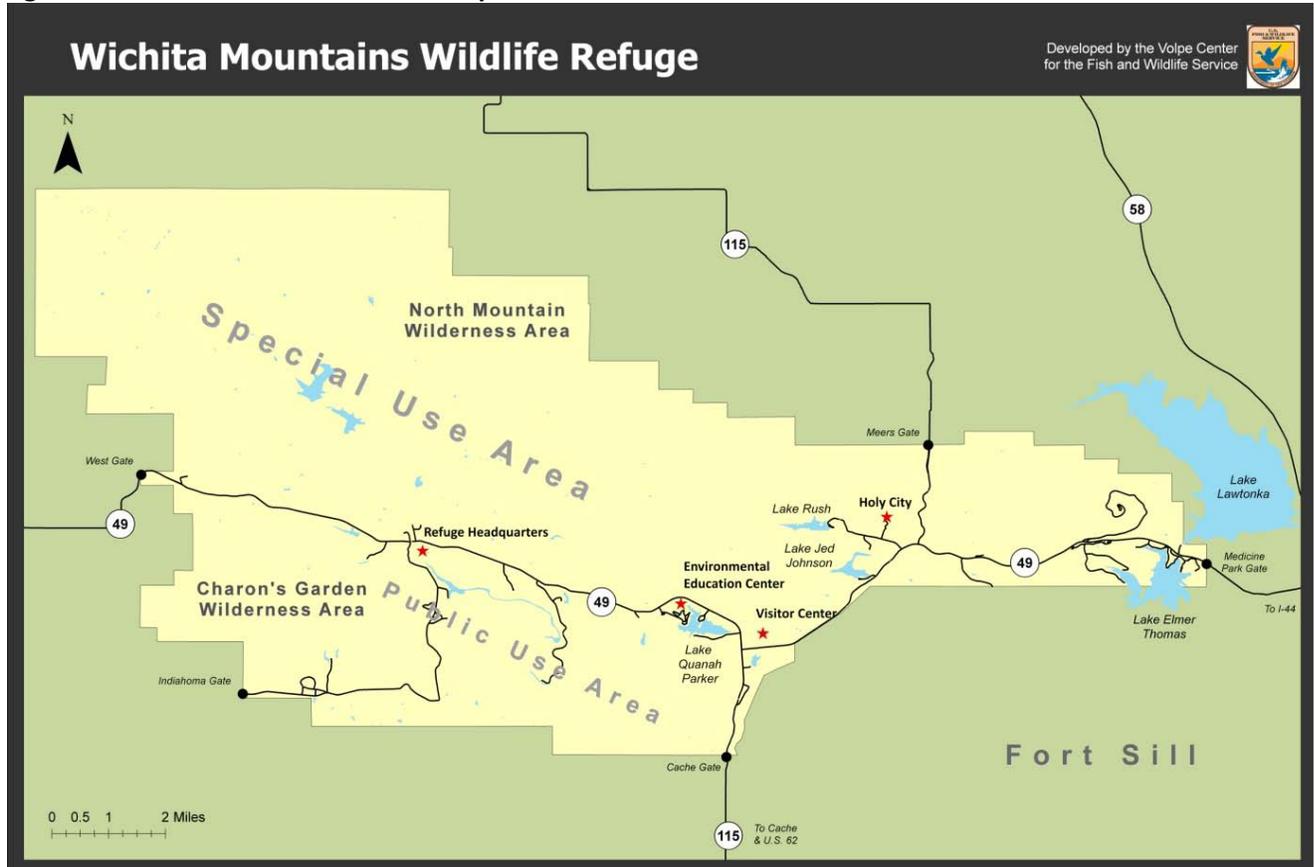
This section describes regional transportation planning, traffic and circulation, parking, and other modes of transportation on or surrounding the refuge. The transportation network and patterns of development surrounding the refuge influence how visitors access the refuge, and affect alternative modes of travel on the refuge. The discussion of transportation and traffic issues in relation to the refuge is the motivation for this study, and specific to the analysis of implementation recommendations for non-motorized and motorized transportation options to and through the refuge.

The data in this report represents the best data available at the time of writing. Field observations from refuge staff largely provide the basis for traffic and roadway safety information.

3.2.1. Roadways

The primary routes surrounding the refuge are Interstate 44 to the east, U.S. 62 to the south, and Oklahoma Routes 49, 54, 58 and 115. Both OK-49 and OK-115 pass through the refuge, while Indianhomia Road provides a fifth access point in the southwest corner of the refuge (see Figure 15). OK-49 connects the refuge to I-44 and OK-115 connects to U.S. 62. Refuge gates along these roads provide public access to the refuge and are always open. These gates include Medicine Park Gate and West Gate (OK-49), Cache Gate and Meers Gate (OK-115) and Indianhomia Gate (see Figure 15). The refuge maintains about 50 miles of public roads, primarily rural two-lane roads in the Public Use Area, and 70 miles of single lane, unpaved roadways in the Special Use Area.

Figure 15 - Wichita Mountains Area Map



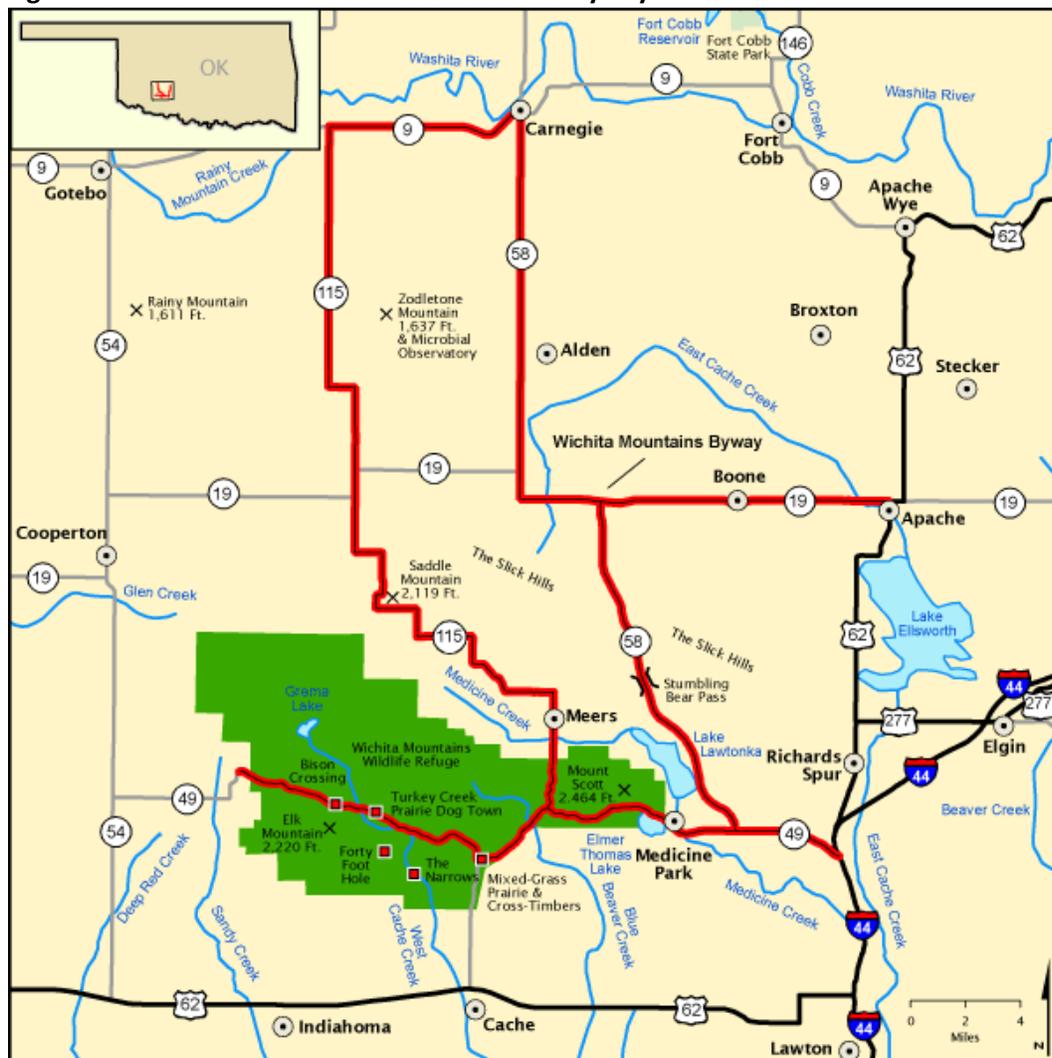
Source: U.S. DOT Volpe Center

Wichita Mountains National Scenic Byway

The Wichita Mountains Scenic Byway³³ is now an official National Scenic Byway (as of December 2009), the result of partnerships between the refuge, the State of Oklahoma, and several communities and organizations with an interest in the Wichita Mountain Byway. The Wichita Mountains National Scenic Byway is 93 miles in length, portions of which traverse OK-49 running east-west between Medicine Park and OK-54, and OK-115 running generally north-south between Meers and Cache through the refuge (see Figure 16). The byway will help to promote the educational, recreational, and commercial opportunities that exist along the corridor.

³³ The Wichita Mountains Byway is identified as beginning at Apache and extending west on OK-19 to the OK-58/OK-19 junction; the byway then proceeds north and south on OK-58 to Carnegie in the north and Medicine Park in the south; from Carnegie, the byway proceeds west on OK-9 to Mountain View and south on OK-115 to the junction of OK-49 and OK-115; from Medicine Park in the south the project extends east on OK-49 to Interstate 44 and west on OK-49 through the Wichita Mountains Wildlife Refuge to the western boundary of the Refuge.

Figure 16 - Wichita Mountains National Scenic Byway



Source: National Scenic Byways Program

Roadway Condition

As part of the Federal Highway Administration road inventory program, an Automatic Road Analyzer (ARAN) generates the roadway characteristics and conditions on the refuge. The ARAN vehicle drives all public paved routes, as well as paved and unpaved parking areas. The ARAN vehicle does not drive the roads in the SUA or five unpaved routes in the PUA that are under a half-mile in length that the refuge considers access roads.

FWS classifies roads under a uniform national system, under two main categories of public roads accessible by two-wheel drive vehicles. Class 1 roads are principal refuge roads that constitute a main access route, main auto tour route, or thoroughfare for refuge visitors.³⁴ Class 2 roads provide circulation within the refuge and access to areas of scenic, scientific, recreational, or cultural interest, such as overlooks, campgrounds, and education centers.³⁵

³⁴ FHWA. The Road Inventory of Wichita Mountains National Wildlife Refuge WIMT - 21670

³⁵ *Ibid.*

A typical roadway cross section on the refuge is a two-way, two-lane with pavement widths between 24-39 feet, travel lanes between 9-12 feet, and no shoulders.³⁶ The majority of refuge roads are well-maintained. ARAN rates about 59% of the refuge roads in good or excellent condition. Of the 13% of total roads in poor condition, less than five percent are Class 1 roads (major refuge thoroughfares). Table 6 provides the paved route miles and percentages by functional class and Pavement Condition Rating (PCR) for refuge roads.

Table 6 - Refuge Roads Pavement Condition Rating

Functional Class	Pavement Condition Rating								Total Miles
	Poor (<=60)		Fair (61-84)		Good (85-94)		Excellent (95-100)		
	Miles	%	Miles	%	Miles	%	Miles	%	
1	2.03	4.75%	6.82	15.94%	9.56	22.35%	9.56	22.3.5%	27.97
2	3.64	8.51%	5.22	12.20%	3.78	8.84%	2.17	5.07%	14.81
Totals	5.67	13.25%	12.04	28.14%	13.34	31.18%	11.73	27.42%	42.78

Source: FHWA. The Road Inventory of Wichita Mountains National Wildlife Refuge. WIMT - 21670

Mount Scott Road and Meers Road (see Figure 17) are the most significant roads in terms of vehicle circulation and recreational visitation that need maintenance attention. The condition of Mount Scott Road is mostly poor-to-fair with very small sections rated in good-to-excellent condition. Refuge visitors use the road heavily as it leads to the summit of Mount Scott. For most of its length, it is a two-way, two-lane road with variable pavement widths between 22-58 feet, and lanes widths between 9-19 feet. The overall rating of Mount Scott Road is on the lower end of the “fair” scale with an average PCR of 65. The Mount Scott Road suffers from pavement deterioration and fading lane striping. Improvements to pavement and striping provide better roadway position guidance to drivers.

Meers Road is a two-way, two-lane road with variable pavement widths between 23-34 feet, and lane widths between 10-12 feet; the overall rating of this road is on the higher end of the “fair” scale with an average PCR of 80. The Meers Road in most sections has no roadway shoulders, has minor pavement deterioration in some sections, and has areas of poor site lines, all of which may lead to dangerous circumstances for shared roadway users. Figure 17 illustrates a blind curve on the Meers Road.

Figure 17 - Mount Scott Road (left) and Meers Road (right)

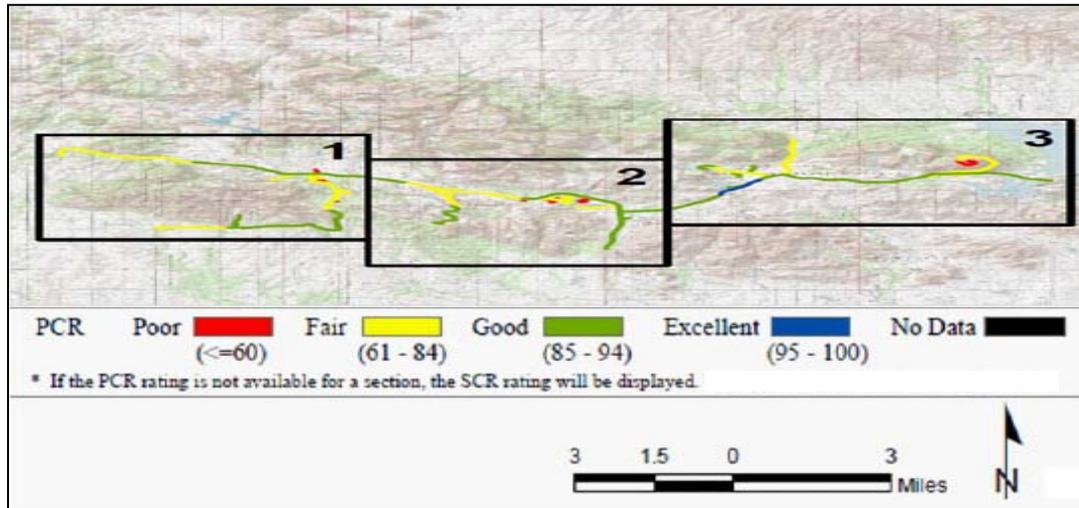


Source: Google Maps 2009

³⁶ *Ibid.*, P.5-1. Information from Highway 49 East.

The condition of roadway pavement, the widths of travel lanes, and the presence of roadway shoulders has considerable effect on the safety of automobile and bicycle traffic. These factors also affect the perceptions of comfort by motorized and non-motorized road users, especially when sharing roadway space. Figure 18 illustrates the overall route condition and pavement condition ratings of refuge roads.

Figure 18 - Refuge Roadway Condition



Source: FHWA. The Road Inventory of Wichita Mountains National Wildlife Refuge. WIMT - 21670

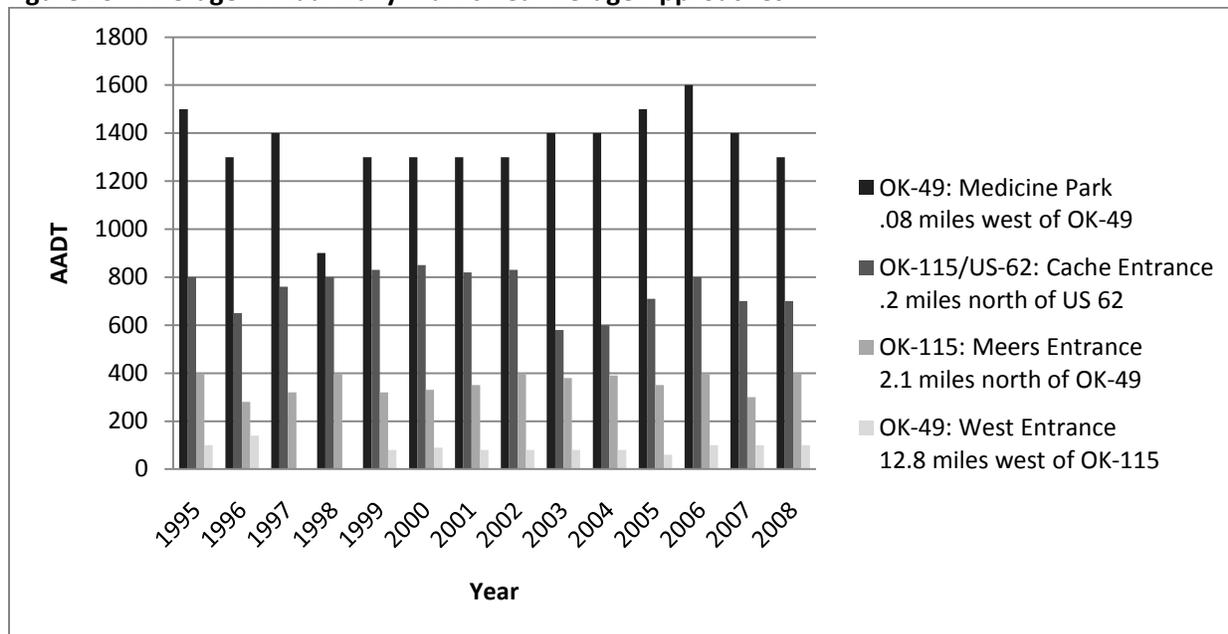
Traffic Volume

According to refuge staff, roughly 80% of visitor vehicles enter the refuge through the Cache or Medicine Park gates. The Meers gate, the West gate, and the Indianoma gate experience much lower vehicle volumes.³⁷ During peak visitation in the early spring and the fall, over 5,000 cars per day enter the refuge and at times visitors must park alongside narrow two-lane roads outside of parking areas that are at capacity. These practices can lead to roadside disturbance, safety issues, and occasional habitat damage. Major points of visitation within the refuge include LETRA, the Mount Scott summit, the visitor center, the Sunset picnic area, and the Holy City.

Traffic counts on the refuge roadway network are not available. However, ODOT provides Annual Average Daily Traffic (AADT) counts at over five hundred locations in Comanche County. AADT is a measure of the total annual volume of vehicle traffic on a road and is a straightforward measure of how busy a road is. Figure 19 illustrates the fluctuations of ODOT traffic count data from locations that are near to four of the main entrances to the refuge from 1995-2008. These data provide a proxy for the approximate amount of traffic moving through the refuge. Since 2006, traffic volumes at each location have fluctuated, declined, or stayed relatively stagnant in these count locations. These data confirm refuge staff observations that the Medicine Park and Cache entrances are the most heavily used entrance/exit points for vehicles on the refuge.

³⁷ Wichita Mountains Wildlife Refuge staff.

Figure 19 - Average Annual Daily Traffic near Refuge Approaches



Source: Oklahoma Department of Transportation; Oklahoma Traffic Count Information System (2008)

Roadway Safety

Crash data is not readily available on the refuge; however, refuge staff familiar with roadway safety issues indicate the main enforcement issues pertain to vehicular speed enforcement, illicit substance use or possession, and occasional vehicle theft or vandalism. For the purposes of this study, speeding and crash data represent areas of the most concern.

The refuge employs four law enforcement officers to enforce speed limits and other regulations on the refuge.³⁸ OK-115 and OK-49 are the busiest roads that traverse the refuge. Local commuters, tourists, and through-travelers use these two roads and the refuge prohibits commercial vehicles from traveling through the refuge. Speed limits are 45 MPH in the daylight and 35 MPH in the evening; and 30 MPH near the visitor center. However, refuge law enforcement officers indicate that actual average speeds often exceed 50 MPH. Speeding occurs at all hours of the day, though the refuge issues many violations after dark. Nighttime driving on the refuge, even at the speed limit, is particularly dangerous because refuge roads do not have street lamps (nor is it feasible to install street lamps in rural areas), animal movements across roadways are unpredictable, and in the case of bison, they are nearly impossible to see at night due to their non-reflective eyes and dark coats.

Speed violations may occur at locations throughout the refuge. However, the main areas where officers cite drivers for speeding include:

- Between the Cache intersection (near the visitors center at the intersection of OK-115 and OK-49) and the Cache gate (approximately at the intersection of OK-115 and US-62 off the refuge),
- Between the Medicine Park intersection (at the intersection of OK-115 and OK-49) and the Medicine Park gate.

³⁸ Anecdotal safety data in this study stems from conversations between U.S. DOT Volpe Staff and Wichita Mountains Wildlife Refuge law enforcement staff on February 18, 2010.

The area with the least occurrences of speeding violations is between the refuge headquarters intersection to the West gate.

Speed limit violations on refuge roadways are a major concern in terms of animal resource protection and public safety. Often motorists do not report crashes involving smaller animals, such as elk and deer. Anecdotally, according to refuge staff, commuter and through traffic speed violations (as opposed to refuge visitor traffic) lead to many animal-vehicle incidents. However, the refuge notes that visitors will also often speed out of the refuge at the end of their day trips.

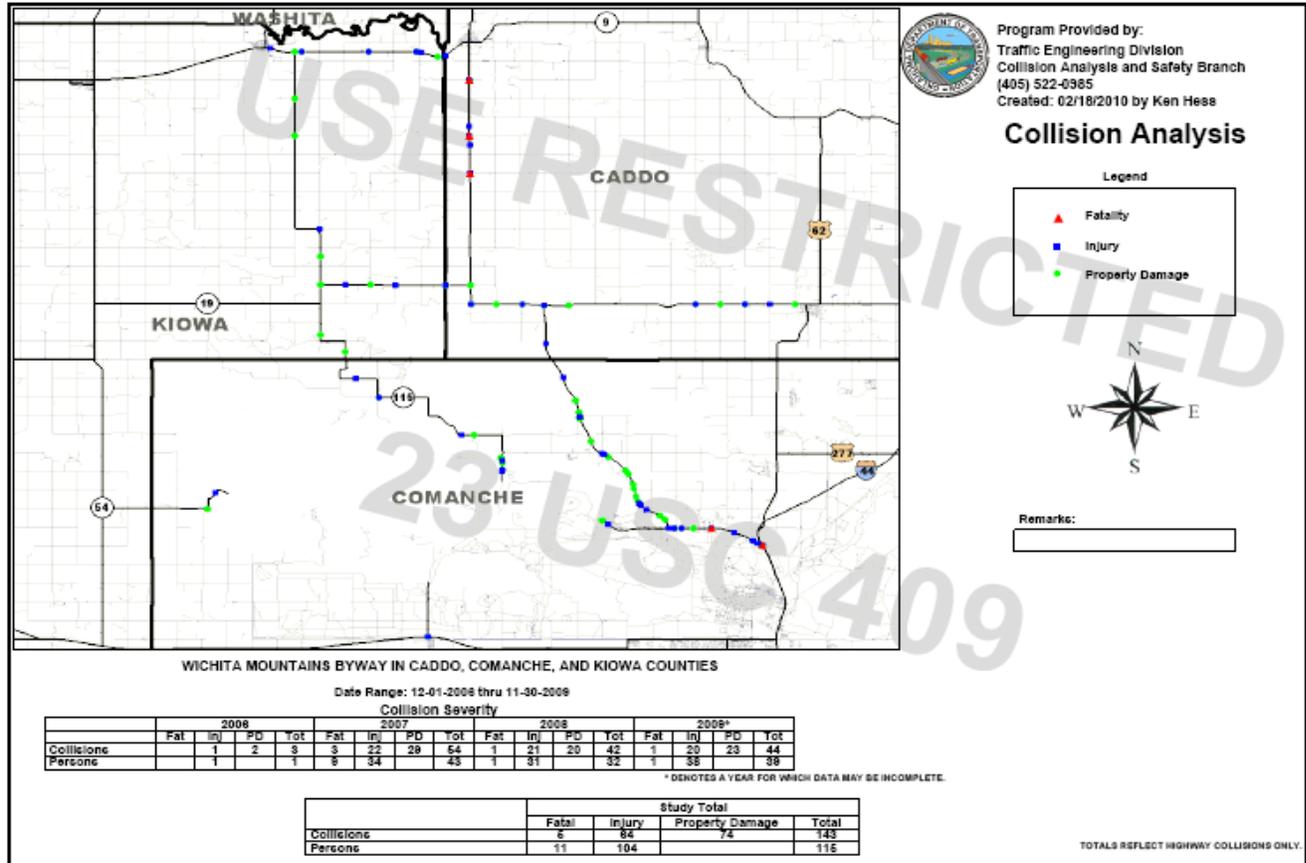
The four main areas where animal-vehicle collisions occur are:

- The headquarters hill area east of refuge headquarters to the Sunset picnic area where there is a large deer population.
- The Quanah Parker intersection to Doris Campground and near the Environmental Education Center where there is a large deer, longhorn cattle, and bison population.
- The Cache leaflet dispenser area from just south of the Cache gate to the Cache gate where longhorn cattle and deer are hit.
- The Quitone Point area on OK-49 west of Mount Scott through the Mount Scott canyon area to Lake Elmer Thomas Recreation Area where deer and bison are hit.

Of particular safety concern is the stretch of OK-115/Meers Road to Meers. This road is a FWS Class 1 road (principal main access route/thoroughfare for refuge travelers). The road runs roughly 1.8 miles from the intersection of OK-49 and OK-115, east of the Holy City to the Meers gate and is a two-way highway with a typical cross section approximately 10-12 foot travel lanes with no shoulder. The ARAN pavement condition rating is fair along this stretch of refuge roadway. Refuge enforcement staff consider this stretch of road as one of the most dangerous roads on the refuge due to heavy commute through traffic including a large percentage of tourists heading north to the Meers Store.

ODOT maintains county vehicle crash data related on the state highways and interstates outside of the refuge, but not for refuge roads. Figure 20 shows fatality, injury, and property damage incidents in Caddo, Comanche, and Kiowa counties from 2006-2009.

Figure 20 - Collision Analysis for Wichita Mountains Byway 2006-2009



Source: Oklahoma Department of Transportation, Traffic Engineering Division (2010)

3.2.2. Parking

The refuge maintains approximately 89 parking areas, ranging from pull out parking along roadsides that allow for temporary stays, to larger parking areas at major destinations on the refuge that allow for longer term stays. The parking areas total over 700,000 square feet with space for approximately 700 vehicles throughout the refuge.

Condition of Parking Areas

Table 7 summarizes the major parking areas and their characteristics on the refuge. Striped parking spaces generally denote a paved parking area, whereas barrier parking may be paved or unpaved.

Table 7 - Refuge Primary Parking Areas

Parking Area	Standard spaces	ADA spaces	RV/Bus spaces	Bicycle racks
Visitor Center	66 striped	4	9 striped	1 rack/ 14 bicycles
Mount Scott	39 concrete barriers			
Doris Campground				
Visitor parking	10 wooden barriers	1		
Restrooms	7 striped spaces	1		
Shelters	8 wooden barriers			
Group site C	8 wooden barriers			
Shelter Restroom	3 wooden barriers			
Semi primitive	13 wooden barriers			
Group Sites A&B	19 wooden barriers			
Elmer Thomas	81 striped spaces	2		
Headquarters	12 striped spaces 10 wooden barriers (staff)	1 (behind building)		
Exhibition pasture	17 concrete barriers			
Prairie Dog Town	22 striped spaces	1		
Environmental Education Center	Minimal space	1		

Source: Wichita Mountains Wildlife Refuge staff

Parking Usage

The refuge would like to encourage greater visitation through various alternative transportation methods without expanding existing or creating new parking areas. Overall, the refuge considers parking areas large enough to meet visitor demand and to accommodate varying vehicle types, with the exception of the Environmental Education Center and the Sunset picnic area. The Environmental Education Center has limited space for buses or handicap vehicles. The Sunset picnic area connects to a popular hiking loop in the Charon’s Garden Wilderness Area and during weekends, parking along the trailhead road often fills by 11:00AM. Furthermore, there is inadequate space for vehicle turnaround and tour buses may exacerbate this issue when present.³⁹ At Mount Scott, the refuge may consider parking technology options to manage inclement weather situations, roadway or parking closures.

Off-site Parking

Major parking locations outside of the refuge are useful to identify for their parking sharing or transit stop potential. The communities surrounding the refuge are generally too far from the refuge or do not have significant parking to be feasible options for these purposes. LETRA is the only existing site close to the refuge with a large supply of parking, with about 85 automobile parking spaces and 35 recreational vehicle spaces, as well as bus and motorcycle parking. The geometric configuration of the parking facility would also accommodate transit vehicle stops and turning maneuvers.

3.2.3. Signage and Wayfinding

The refuge maintains hundreds of roadway signs from regulation stop signs to directional guide signs. The refuge follows the guidance of FWS Sign Handbook for implementation guidelines for sign policy placement. The handbook describes general policies, procedures, and responsibilities for a uniform nationwide system of standard FWS signs.

³⁹ Kimely-Horn. ITS site visit notes.

Currently, signage on the refuge displays directional locations and information about major destinations such as the visitor center and Lake Elmer Thomas, as well as the surrounding towns of Cache, Meers, and Medicine Park (see Figure 21). Refuge staff recognizes that new or better wayfinding signage may benefit all modes for refuge travelers, for example specific bicycle and pedestrian signage that include direction, destination, distance, and travel time as well as context sensitive signage.

Figure 21 - Existing Refuge Signage Examples



Source: U.S. DOT Volpe Center

3.2.4. Bicycle and Pedestrian Facilities

The refuge does not designate any facilities specifically for bicycles such as bicycle lanes, separate bike paths or bicycle routes on any paved refuge roads; however it does allow cyclists to travel on all paved refuge roads. The refuge only allows off-road bicycles on the dirt trail behind Mount Scott.

Other than the prohibition of off-road bicycling on most off-road trails, the refuge does not provide formal guidance to bicyclists using refuge roads with regard to herd animals, passing vehicles, bicyclist roadway riding configurations (e.g. single-file versus two abreast or more), cattle guards, the location of emergency facilities, water, and other issues.

Bicycle and Pedestrian Facilities Usage

Bicycling on the refuge is not uncommon. Local bicycle clubs and bicycle groups often use refuge roads for recreational purposes or events. Though less common, some locals use refuge routes to commute by bicycle.⁴⁰ Refuge staff recognizes the importance and growing interest in the availability of safe cycling opportunities on the refuge.

Bicycle and Pedestrian Safety

There are no recent reports of crashes between bicycles with vehicles or bicycles with animals on the refuge. However, bicycle crashes and injuries do occur at the cattle crossing guards in a few locations across the refuge. Cattle crossing guards are subterranean grates (see Figure 22) installed in the roadway at certain locations on the refuge to prohibit bison and cattle movements. Cattle grates catch a herd animal's hoof, and therefore may also catch the wheel of bicyclist riding over the guard. Currently, the

⁴⁰ Interview with refuge law enforcement officer Kelly Moran.

refuge maintains several cattle guards across the refuge. There are no signs on the approaches to these areas to warn bicyclists of cattle guards.

Figure 22 - Cattle Guard at Cache Gate



Source: U.S. DOT Volpe Center

A recent bicycle-vehicle crash on the Fort Sill resulting in the death of the bicyclist has brought significant safety issues to the forefront of discussion on expanding bicycle use in the area. Though the circumstances of the crash are unknown, the event underscores the importance of providing safe bicycle facilities not only on the refuge, but in the surrounding communities. The consideration of safety is paramount to the implementation of any alternative transportation options on the refuge, particularly when the options promote additional user groups, such as bicyclists on the refuge or surrounding roadway network.⁴¹

3.2.5. Transit

This section considers the existing transit services in the area surrounding the refuge. These include both public and private transit providers and intercity transportation services.

Lawton Area Transit System

The Lawton Area Transit System (LATS) provides five fixed routes and paratransit services within Lawton and Fort Sill. All LATS buses are Americans with Disabilities Act (ADA)-accessible and have bicycle racks. LATS buses operate hourly 6:00 AM – 7:00 PM Monday through Friday and 9:00 AM – 9:00 PM on Saturdays, with no Sunday service.

⁴¹ The public has expressed concerns about access, perceptions of safety, desirability of travel routes, and other issues on the refuge. As part of initial CCP scoping meeting, refuge staff collected several comments on public access. Although public views are subjective and represent a small sampling of visitor experience on the refuge, they do highlight an interest in enhanced wheelchair and bicycle accommodations on the refuge. Appendix A summarizes the CCP comments received related to trail, bicycle, and wheelchair access on the refuge.

The LATS fixed-route system⁴² includes the following routes:

- Yellow: Operates generally east-west from the Downtown Transfer Center serving Cameron University and the Veterans Administration Center,
- Blue: Operates clockwise/counterclockwise service from the Downtown Transfer Center generally along Cache Road, 67th Street, Lee Boulevard and 11th Street, serving major downtown locations, Southwest Medical Center and the Great Plains Technology Center.
- Green: Operates clockwise/counterclockwise service from the Downtown Transfer Center to the northwest, serving the Museum of the Great Plains, Cameron University, Center for Creative Living, Health Department, and Fairgrounds.
- Orange: Operates clockwise/counterclockwise service from the Downtown Transfer Center to the north, serving Fort Sill, the VA Clinic, and the US Public Health Service Indian Hospital.
- Red: Operates clockwise/counterclockwise service from the Downtown Transfer Center to South Lawton, Cameron University, and Comanche County Memorial Hospital.

LATS may, without notice, delay or temporarily discontinue the Orange Route for security reasons at Fort Sill.

LATS has 14 buses and three demand response vehicles. LATS provides about 1,150 average weekday trips and slightly less on Saturdays. Much of LATS's funding is from federal sources (62%). Other sources include local funds (16%), fares (12%), state funds (5%), and "other" (5%).⁴³

LATS ridership data is available from the National Transit Database and indicates total annual unlinked-trips of 352,337. There are 1,156 unlinked trips per weekday and 1,105 unlinked-trips on Saturdays.⁴⁴

Comanche Nation

Comanche Nation Transit operates a small transit service in Lawton, Apache, Elgin, Cyril, Fletcher, Geronimo, Pumpkin Center, and Cache.⁴⁵ The Comanche Nation has been awarded \$160,000 from the Federal Transit Administration (FTA) for vehicle replacement but has not completed the grant process to date. Comanche Nation Transit is open to the public; however, customers must call to add their trips to the schedule, much like a paratransit service.

The Comanche Nation Transit has eight buses, generally cutaway vans and in 2009, there were a total of 23,270 one-way trips, representing 285,790 vehicle miles traveled.⁴⁶

Both LATS and Comanche Nation Transit offer insight into the nature of transportation in southwest Oklahoma. Transit ridership is low, consistent with the Census data in Chapter 3.1.3, and most likely serves the transit dependent (those who cannot drive due to impairment or cost). For the refuge, this implies that demand for transit will not come naturally since the population does not expect transit services and are auto-dependent. This does not mean, however, that transit will not be successful, only

⁴² The LATS, <http://www.ridelats.com/>. Accessed February 2010.

⁴³ National Transit Database, 2007.

⁴⁴ The Lawton Area Transit System, 2007 National Transit Database.

⁴⁵ Comanche Nation. <http://www.comanchenation.com/Tribal%20Services/transit.html>, Accessed June 11, 2009

⁴⁶ Comanche Nation. <http://www.comanchenation.com/transit/index.html>, Accessed February 9, 2010.

that its design and implementation must be careful. For example, the existing tours are very successful in an area where getting on a bus is not commonplace.

3.2.6. Other Transportation

Rail

The nearest Amtrak service, the Heartland Flyer, operates daily to the east of Comanche County, between Oklahoma City and Fort Worth, Texas. The nearest stop to the refuge is at Norman, about 90 miles northeast of the refuge. Amtrak and the National Park Service offers a *Trails & Rails* program, where NPS guides from the Chickasaw National Recreation Area are onboard the Heartland Flyer *and* provide educational opportunities to passengers to foster an appreciation of America's natural and cultural heritage.⁴⁷

There may be an opportunity to coordinate outreach to Amtrak passengers about the Wichita Mountains and similarly offer visitors to the refuge coordinating information on the Amtrak service.

Aviation

The Lawton-Fort Sill Regional Airport is south of the Lawton's central business area. American Eagle commuter flights are available to Dallas/Fort Worth International Airport; however, military air transport is the primary use for the facility.

3.2.7. Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) encompass a broad variety of electronic technologies that collect, process, communicate, and provide information benefitting the traveling public. Examples of ITS uses include providing travelers with traffic, weather, road construction or closures, and parking information. The effective use of ITS allows travelers to make better decisions about when, where, and how to travel to minimize both their own inconvenience, or incurring additional impacts on a strained transportation network.

Currently, the refuge owns three portable variable message signs and uses them mostly for special events like hunts and auctions. The signs require manual programming with a wired laptop connection, or a short-range wireless connection. One sign has detection radar and alerts motorists of their speed.⁴⁸

The Refuge Visitor Information Program (RVIP) joint program between FWS and FHWA Office of Federal Lands Highway is evaluating the suitability of ITS technologies within six FWS Wildlife Refuges.⁴⁹ As a result of the December 2009 FWS and FHWA staff site visit to the refuge to evaluate the refuge as part of the RVIP program, the refuge will be eligible for a demonstration project for possible deployment. Future phases will monitor and evaluate the results of the pilot projects.⁵⁰ The resulting project is a parking management system that will provide visitors with information on the availability of parking at the Sunset picnic area.

⁴⁷ Heartland Flyer, http://www.amtrak.com/servlet/ContentServer/AM_Route_C/1241245668272/1237405732511, Accessed January 5, 2010.

⁴⁸ Kimely-Horn. ITS site visit notes.

⁴⁹ *Ibid.*

⁵⁰ *Ibid.*

3.3. Future Conditions

This section describes projections of future population growth, local development, and transportation improvements at the refuge and the surrounding communities. The nature or feasibility of some of the efforts below may change in the future. However, it is important to recognize that these developments are forecast because they represent opportunities to leverage resources or create potential partnerships among various stakeholder groups and to ensure that the refuge considers regional changes in their transportation planning efforts.

3.3.1. Comanche County

This section considers population growth in Comanche County including Lawton and the communities surrounding the refuge. The Lawton Fort Sill Growth Management Plan details the following population projection estimates using the Regional Economic Models, Inc. (REMI) methodology. The Oklahoma Department of Transportation 2030 Long Range Transportation Plan (LRTP) and in the Fort Sill Growth management Plan include projections for the 2030 LRTP study area, including the city limits of Lawton, with the majority of the land area and population within the City of Lawton (see Table 8).⁵¹

Table 8 -Lawton Fort Sill 2030 Population Projections

	US Census 2000	2030 Projection	Change 2000-2030	% Change	Fort Sill % of Total 2000	Fort Sill % of total 2030
Comanche County⁽¹⁾	114,996	154,627	39,631	34%	100%	100%
Lawton City⁽²⁾	92,757	130,000	37,214	40%	81%	84%
Fort Sill⁽³⁾	11,357	20,000	8,643	76%	10%	13%
Study Area⁽⁴⁾	81,429	110,000	28,571	35%	71%	71%
Balance of population	22,239	24,627	2,388	11%	19%	16%

Population estimates below County level were made the Transportation Modeling Consultant.

- (1) REMI projection based on Fort Sill population increase of 10,445.
- (2) Includes Lawton and Fort Sill population.
- (3) Fort Sill estimate of 20,005 population living on base by 2011 rounded to 20,000.
- (4) SA is approximately the same as the Lawton City Limits excluding Fort Sill.

Source: OKDOT LRTP/Art Pendergraft, Transportation Modeling Consultant

Table 8 shows that:

- During 2000-2030, the percent change in population of Comanche County will increase 34% from 114,996 to 154,627.
- Fort Sill estimates that the 2000-2030 change in population at Fort Sill will increase 76% from 11,357 to 20,005. This represents an increase from 10% to 13% of Fort Sill’s share of the county population.

Due to Fort Sill’s increase in population, during 2000-2030, the City of Lawton's share of the county’s population will increase from 81% to 84%, increasing population from 92,757 to an estimated 130,000 persons.

⁵¹ Lawton Metropolitan Planning Organization, 2030 LRTP. <http://www.lawtonmpo.org/uploads/documents/execsumm.pdf>, Accessed January 25, 2010.

Demographics

The Lawton MPO Long Range Transportation Plan forecasts population and other demographic changes to the year 2030 (see Table 9). Between 2000 and 2030, the population may grow 35% in the LRTP study area, including Lawton. Subsequently, employment and the number of automobiles will also increase by 35%. This is important for the refuge to consider because as population in the surrounding region increases, visitation and through automobile traffic on the refuge will also likely increase, underscoring the importance of proactive transportation planning on the refuge.

Table 9 - Long-Range Transportation Planning Metrics

Category	Census 2000	2030 Forecast	Change 2000-2030	Percent change
Population	81,429	110,000	28,571	35%
Employment	34,848	47,000	12,152	35%
Automobiles	48,824	66,000	17,176	35%

Source: Lawton Metropolitan Planning Organization, 2030 Long Range Transportation Plan

Economy

Employment in Comanche County is generally growing at a faster pace than most of the counties that surround it. Trends in economic growth coupled with population increases will likely ensure an increase in the public use of refuge resources. Table 10 compares employment growth rates in Comanche County with the U.S., as a whole, Oklahoma, and the surrounding counties – Tillman, Stephens, Cotton, and Caddo. Private nonfarm employment data account for the largest sampling data on employment trends (where farming sector jobs only form a fraction of the overall labor market).

Table 10 - Comanche County Employment Trends vs. National, State and Regional

County	Private nonfarm employment, % change 2000-2007
Comanche County	15.4%
Cotton County	171.5%
Caddo County	5.3%
Stephens County	1.8%
Tillman County	-7.8%
Oklahoma	8.8%
United States	5.7%

Source: U.S. Census

Comanche County employment growth from 2000-2007 is greater than the rate of growth nationally and in the state. Comanche employment growth has surpassed other regions except Cotton County, an outlier in the area, where there has been a large shift from the agricultural sector to public service providers including the area hospital, school system, and county government.⁵²

According to the Lawton-Fort Sill Growth Management Plan, the Lawton area has limited economic growth opportunities, and Fort Sill remains the premier source for economic development, which the BRAC will help to achieve. The plan proposes that over the course of the BRAC initiative, the high-level economic benefits will provide \$21.2 million to the State of Oklahoma, \$12.2 million to the City of

⁵² University of Oklahoma. <http://www.ohfa.org/hdt/MarketStudy/Cotton%20County.pdf>, Accessed February 23, 2010.

Lawton, and \$1.8 million to Comanche County in cumulative incomes tax revenues and sales tax receipts.⁵³

The population and economic growth in the Lawton-Fort Sill area will likely result in higher visitation at the refuge. Additionally, there is greater awareness of the need for recreational activity and a growing desire to seek out and explore the nation's public lands' treasures. The refuge's CCP will detail the refuge's plan to accommodate more visitors while protecting the natural resources.

3.3.2. Fort Sill - Base Realignment and Closure

Changes at Fort Sill primarily focus on the near term implementation of the BRAC and the decision to relocate the security gate at LETRA. Currently, the residential population of U.S. Army personnel and their families is approximately 20,000 people. The Lawton-Fort Sill Growth Management Plan, written as a means to prepare for the 2005 BRAC initiative, forecasts an increase of the Fort Sill population by approximately 10,000 people based on authorized positions at the Fort through 2012. Such positions include soldiers, military students, military family members, and civilian employees.⁵⁴ Due to the BRAC, the Fort Sill campus will accommodate a 50% percent increase in its working population over the next few years. The additional individuals and families that move into the surrounding communities of Lawton, Cache, Medicine Park, and Elgin will be in search of local recreational and educational opportunities. Refuge amenities including fishing lakes, hiking trails, and environmental programming will provide a valuable outlet for existing and new area residents.

3.3.3. Medicine Park Museum of Natural Science

The Medicine Park Museum of Natural Science (MPMSN) is a new project to build a "living museum" on a 12-acre site, northeast of the refuge. The museum will overlook Mount Scott and feature educational programming on the natural plants and animals found in the area. Transportation planning for the museum includes trails and walkway elements throughout the museum complex. Construction may begin at the end of 2010, with opening possible in the spring of 2012.⁵⁵ The museum will provide a significant local attraction and destination for tourists and the local community.

3.3.4. Transportation Planning

This section describes transportation planning efforts currently underway or that may be in place in the near future, including those on the refuge and in surrounding areas.

Wichita Mountains Wildlife Refuge

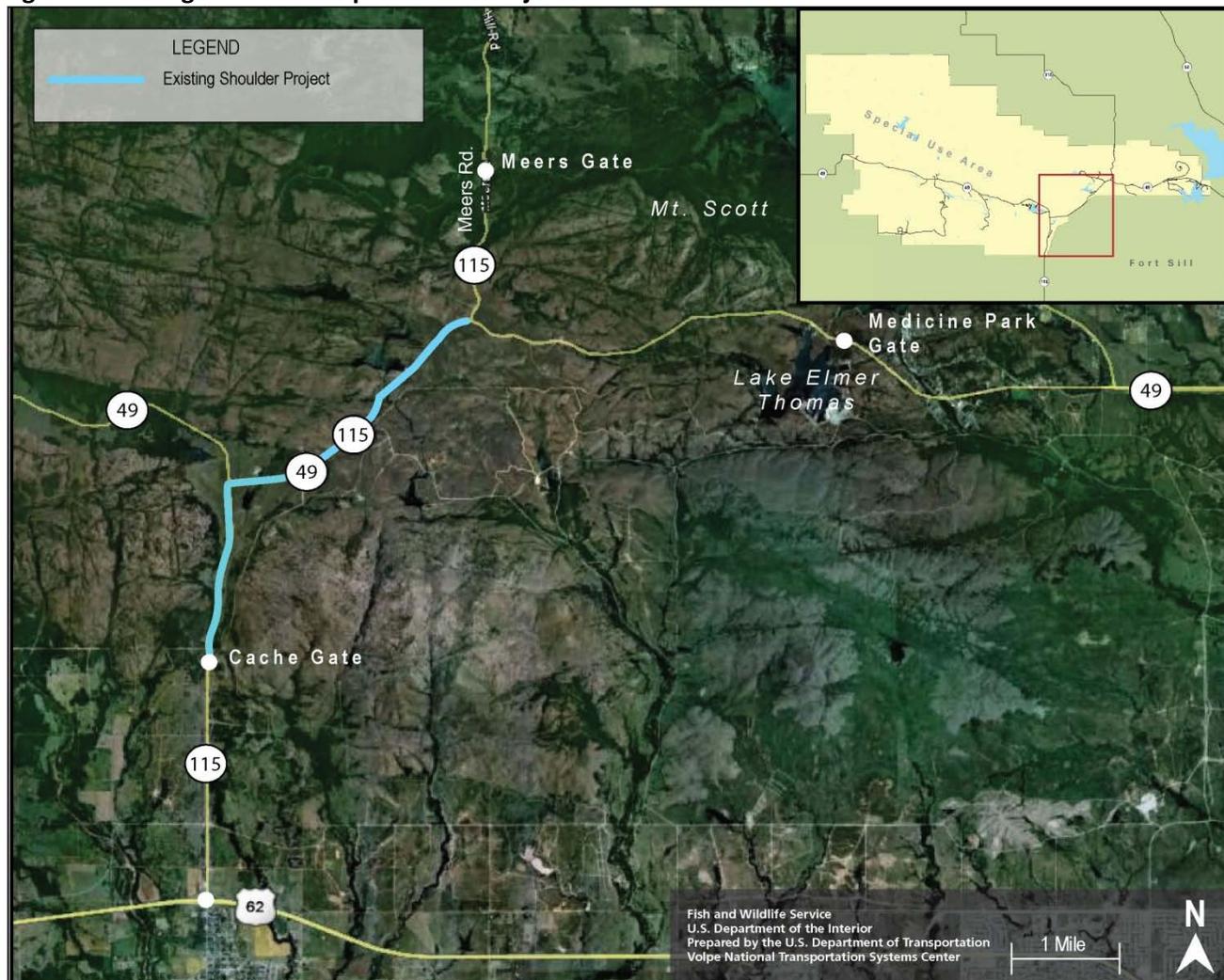
Roadway shoulder expansions on the refuge will create additional 6-8-foot shoulders along OK- 49 and OK-115 through the refuge (see Figure 23). When complete, the roadway sections will be safer for pedestrians, bicycles, and vehicles to pull off the roadway in case of emergencies, and to view wildlife. These improvements may also provide the impetus to implement broader shoulder improvements throughout the refuge to enhance the operating environment for motorized and non-motorized vehicles.

⁵³ Lawton-Fort Sill Growth Management Plan. Executive Summary, P. 2-6. <<http://www.lawtonmpo.org/uploads/documents/execsumm.pdf>> Accessed January 19, 2010.

⁵⁴ *Ibid.*

⁵⁵ KSWO-TV News. <http://www.ksw.com/Global/story.asp?S=11855503>, Accessed January 29, 2010.

Figure 23 - Refuge Shoulder Improvement Project



Source: U.S. DOT Volpe Center

The refuge is also receiving a grant through the Fiscal Year 2010 Paul S. Sarbanes Transit in the Parks (TRIP) program to replace the aging bus that the refuge uses to provide tours into the Special Use Area.

Fort Sill - LETRA

Fort Sill has an active interest in exploring recreational linkages between the refuge and LETRA as part of the MWR program. Fort Sill's 5-year plan considers moving the LETRA entry gate, currently on secure government property, to facilitate greater public access to the site and better connections between LETRA, the refuge, and the nearby community of Medicine Park. Connections between the three areas may offer additional access to physical fitness, recreational, and educational opportunities for the local communities, including soldiers and their families.

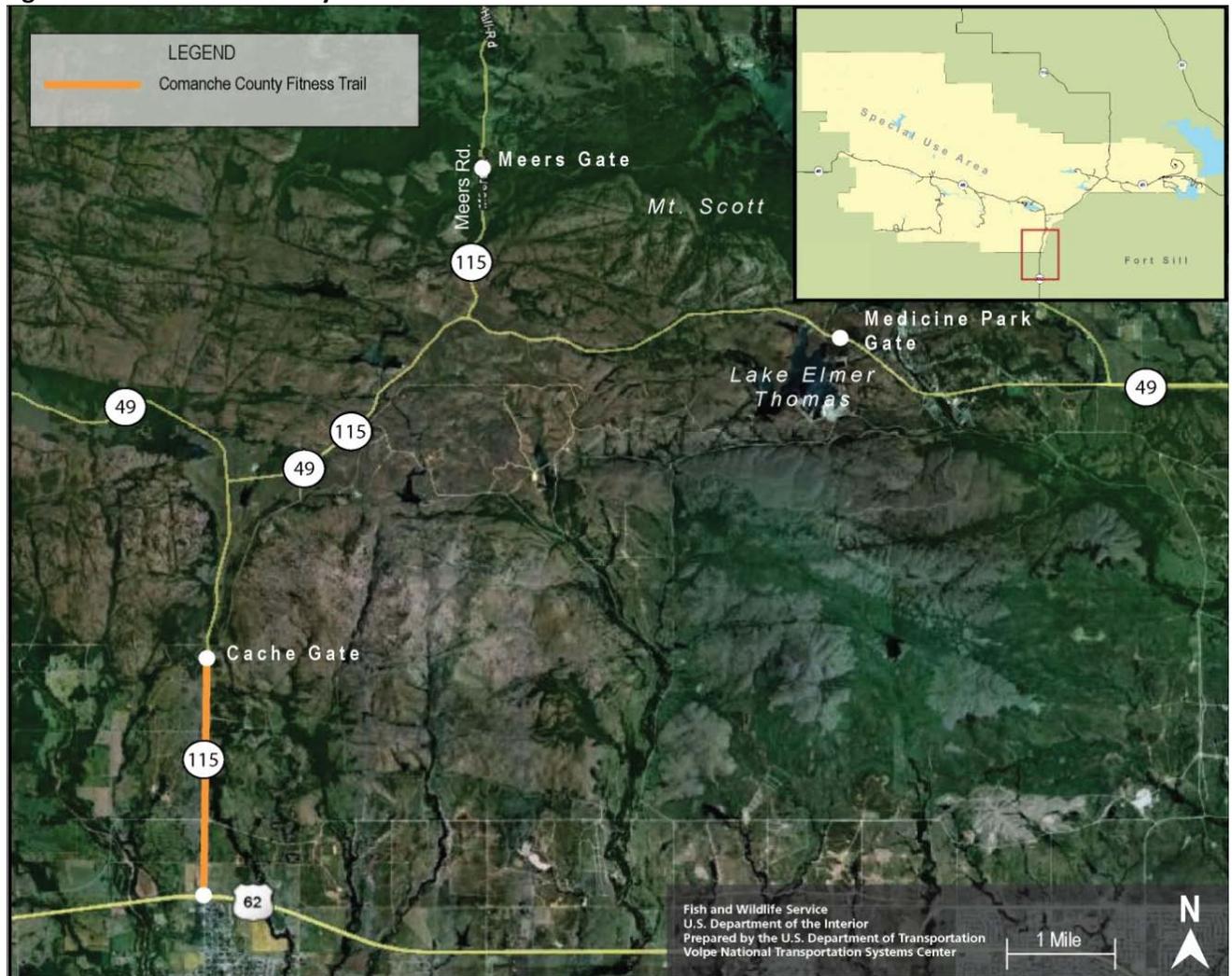
Lawton - Bicycle and Pedestrian Planning

In June 2008, the Lawton City Council accepted the Lawton Metropolitan Bicycle and Pedestrian Plan, an effort funded by the LMPO. The plan is a comprehensive document outlining a system of bicycle networks. Lawton City Council members and city planners are currently in the process of establishing implementation priorities or issues and identifying funding.

Cache - Comanche County Fitness Trail

Comanche County is in the planning stages to extend the Comanche County Fitness Trail, adding a 4-foot shoulder on each side of OK-115 from Cache/US-62 in Cache to the refuge (see Figure 24). The project is funded by \$150,000 from the Comanche County Industrial Development Authority and \$600,000 from a grant from the Oklahoma Department of Transportation (ODOT). ODOT will overlay the existing roadway and the new bike path. Additionally, Cache is working to secure funding to connect the trail to the city's park trails. The completion of the Fitness Trail project will connect the city of Cache to the entrance of the refuge, and will provide an important recreational and active transportation link to the refuge and surrounding roadways.

Figure 24 - Comanche County Fitness Trail



Source: U.S. DOT Volpe Center

ITS Parking Management

In December 2009, FWS and Federal Highway Administration (FHWA) staff made a site visit to Wichita Mountains, as part of the Refuge Visitor Information Program (RVIP).⁵⁶ As a result of this site visit, FHWA will implement an information system on the availability of parking, or the location additional parking locations for the Sunset picnic area. The pilot project will likely include a parking management system and traveler information component with implementation in 2010. The success and evaluation of these initial ITS deployments may position the refuge to implement broader ITS solutions in the future.

Refuge Planning

The refuge currently is working on its CCP, a 15-year long-term management plan. The refuge is in the first and second phases of the project, which includes public scoping and plan formulation. In the winter of 2009, several meetings were held to provide communities with an opportunity to learn about the process, ask questions, voice concerns, and talk with refuge employees. The five distinct phases of the CCP include: scoping, plan formulation, writing of draft plan, revision of draft plan (based on public comment), and the finalization and implementation of the plan.⁵⁷ This study will help guide the CCPs transportation elements.

3.4. Summary

This chapter presents information on context of location both in the present and projections for the future. The major issues that the refuge is contending with include the following:

- (1) The lack of a comprehensive transportation plan for the refuge and the region.

The refuge does not currently have a transportation plan, nor does Comanche County. The implementation of new transportation projects depends on the demonstration of the need for improvements, for instance quantitative determination of capacity constraints or demand for new services. Further, transportation planning requires knowing where people are and where they want to go, as well as documentation of what transportation improvements are currently in process. This study begins to bring together disparate transportation planning efforts around the refuge, however basic information such as traffic counts and origin-destination details for visitors on the refuge and at nearby recreational locations is necessary to better understand how the refuge and partners can serve the needs of visitors and the community.

- (2) The designation of the primary route through the refuge as a National Scenic Byway.

The National Scenic Byway (NSB) designation opens up new possibility for regional transportation planning and tourism marketing efforts as well as potential funding sources. The designation also presents new challenges to the refuge and regional stakeholders as it is likely to attract more visitors to the region.

- (3) The significant growth at the nearby Fort Sill and in the surrounding communities.

⁵⁶ *Ibid.*

⁵⁷ Wichita Mountains Wildlife Refuge. Comprehensive Conservation Plan.

<http://www.fws.gov/southwest/refuges/oklahoma/wichitamountains/ccp.html>, Accessed February 15, 2010.

Fort Sill will influence growth in Comanche County over the next few years. The Base Relocation and Closure program as well as natural economic and population growth may increase population by 35% by 2030. The refuge would also like to increase capacity to handle additional visitation without increasing the existing physical footprint. These combine to encourage the refuge and stakeholders to work together to increase the availability of alternative transportation methods.

- (4) Increasing awareness of nature and recreation and the opportunities to improve pedestrian and bicycling facilities at the refuge.

Fort Sill's Morale, Wellness and Recreation (MWR) program and Oklahoma FitKids both strive to encourage greater outdoor and physical activity. Fort Sill's Lake Elmer Thomas Recreation Area (LETRA) abuts the refuge and presents a unique opportunity to expand recreational and transportation options between the sites. Oklahoma FitKids recognizes the importance in outdoor activity in fighting childhood obesity, and together, the Army and FitKids desire to increase outdoor activity and recreation mesh well with the refuge's desire to encourage more visitation without private automobile use.

- (5) The concurrent development of the refuge's Visitor Services Study and Comprehensive Conservation Plan, the implementation of the ITS demonstration project at Sunset Campground, and the shoulder improvement program underway.

The refuge is completing a Visitor Services Study resulting from a visitor survey that focuses on visitor use and needs of refuge facilities. The Comprehensive Conservation Plan broadly outlines the refuge's path for the future. This study focuses on several components that the CCP may include, such as trail enhancements and wayfinding improvements. The FHWA is implementing an ITS demonstration project for parking availability at the Sunset picnic area. This project will likely include a parking management system and traveler information component with implementation in 2010. The project may also consider a parking information system at Mount Scott. Finally, the refuge is adding and improving shoulders between the Cache Gate and OK-115/OK-49 at the Meers T on the refuge. This opens additional bicycling opportunities; however the refuge should consider safety implications of shared bicycle use along roadway shoulders.

These issues and opportunities factor largely in this study's consideration of transportation improvements. The transportation analysis in Chapter Six will analyze transportation related options for the refuge to consider, partially in terms of these issues.

4.0 Partnership Assessment

Several area entities have cooperative relationships with, or interest in, the refuge. The Friends of the Wichitas, Fort Sill, Medicine Park, area groups and neighboring cities and towns all hold specific interest in the management and future of the refuge. The following information is not an exhaustive list of potential partnerships, but rather provides an overview of the opportunities for collaboration that may exist to promote mutually beneficial relationships between the refuge and partners.

4.1. Friends of the Wichitas

The Friends of the Wichitas is a volunteer-operated, non-profit organization that supports environmental education activities for the refuge. The Friends provide volunteer staff in the visitor center and interpretive narration on refuge bus tours. The Friends contribute to the operation of refuge programs through the donation of funds and equipment to the visitor center and other refuge programs; they also publish a monthly newsletter, and supply information for volunteer programs. In addition, the Friends sponsor an annual Educational Field Trip Grant program available for youth groups to help underwrite the costs of transportation (e.g. fuel, bus driver, insurance) to the refuge. They provide up to \$2,000 (40 awards of \$50 each) per year to facilitate youth group visitation to the refuge as a means to enhance educational opportunities, and to teach school-aged children about the unique resources on the refuge.

4.2. Fort Sill

Fort Sill spans the entire southern border of the refuge and continues east. The Fort Sill residential population is growing and the maintenance of quality of life for soldiers and their families is important. Fort Sill has an active interest in exploring recreational linkages between the refuge and LETRA as part of the Army's Morale, Wellness, and Recreation program.

4.3. Medicine Park

The town of Medicine Park is adjacent to the refuge along OK-49 and is a popular stop for visitors to the area. Outdoor activities in this town of approximately 400 include the Medicine Park Trail, a pedestrian trail along Medicine Creek, swimming, and trout fishing. The town is also home to a number of popular businesses including several restaurants that cater to tourists.⁵⁸ Medicine Park's government strongly advocates for trail connections to the refuge and LETRA.

4.4. Medicine Park Museum of Natural Science

The creation of the MPMNS offers an exciting opportunity for collaboration between the refuge and the museum. The MPMNS will provide hands on, in depth learning experiences about the wildlife and ecosystems present in the area. This experience will introduce visitors to the importance and benefits that result from the protection and conservation of the significant natural resources that exist at the refuge. This message will help to bolster the management techniques of the refuge without impact to its existing resources. Potential opportunities exist to coordinate complementary programming between the refuge and the museum by using the extensive knowledge of refuge staff to create or supplement programming, provide ecologically focused tours between the sites (perhaps even with some emphasis on the concept of alternative transportation), and cross market each site by highlighting the unique activities offered by each

⁵⁸ Medicine Park. <http://www.medicinepark.com/attractions.php>, Accessed February 15, 2010.

entity. Potential also exists to capitalize on the concept of “eco-tours” between the museum and the refuge as a means to expand upon and improve visitor experience.

4.5. Cache

The completion of the Comanche County Fitness Trail along OK-115 from U.S. 62 in Cache to the refuge boundary offers partnership opportunities that promote, enhance, or expand the trail and its purpose and goals, while offering an alternative to automobile travel to the refuge.

4.6. Oklahoma Department of Transportation

The Oklahoma Department of Transportation was an integral partner in the development of the Wichita Mountains Byway Corridor Management Plan (2008) leading to the National Scenic Byway designation. ODOT will remain an important resource to the refuge regarding the ongoing management decisions and promotion of the byway (e.g., collaboration on the creation of a seamless signage plan to the refuge, and coordination with the implementation of signage on the refuge). ODOT will also be an important resource for information regarding roadway improvements outside of refuge boundaries that will facilitate increased access to the refuge.

4.7. Oklahoma FitKids Coalition

The Oklahoma FitKids Coalition has a vision to “be the change agent for improving the health environment and behaviors of children and youth.” FitKids’ primary mission is to reduce childhood obesity by improving health and well being of youth and families. The organization seeks to create positive solutions to childhood obesity that educate, advocate, and create legislative changes that ensure a healthy future for Oklahoma’s children.⁵⁹ To these ends, partnerships exist with the refuge to create and promote active recreation and transportation options to and through the refuge.

4.8. Conclusion

There are many potential partnership opportunities between the refuge and local stakeholders. Table 11 summarizes some of these opportunities and the transportation analysis in Chapter Seven will assess these opportunities in relation to the alternative transportation options.

Table 11 - Partnership Assessment Summary

Group	Key partnership opportunity
Friends of the Wichitas	Expanded tours, education, and interpretation
Fort Sill	Increased public access to LETRA
Medicine Park	Tourism and public access via Medicine Park trail
Medicine Park Museum of Natural Science	Complementary programming, “eco-tours”
Cache	Increased public access via the Comanche County Fitness Trail
Oklahoma Department of Transportation	Coordination with the National Scenic Byway
Oklahoma FitKids Coalition	Active recreation and transportation programming or sponsorship

⁵⁹ Oklahoma FitKids Coalition. <http://www.integrilifespan.com/fitkids.html>, Accessed January 20, 2010.

5.0 Peer Comparison and Lessons Learned

Federal land units often face similar challenges when balancing the management of sensitive resources and facilitating public access. A peer analysis compares other federal land units that have similar characteristics to Wichita Mountains Wildlife Refuge in relation to transportation issues and lessons learned. The refuge experiences unique challenges and opportunities, yet other locations in the U.S. provide important learning experiences to draw upon. Peer information also helps inform the alternative transportation options this study presents.

5.1. Criteria and Framework for Assessment

The peer comparison includes federal land units that share similar characteristics with the refuge and that have implementation, management or experience with shared-use roads, special event management, parking management systems, and the development of successful partnerships that incorporate aspects of alternative transportation management. This review includes a selection of federal land units outside FWS. These units may have different missions and directives and varying requirements for access and use of lands, as well as different methodologies to determine how public activities comply with agency goals and objectives. Still, these lands often experience similar public use demands and ensuing issues that may include transportation concerns, whether at national parks, wildlife refuges, or other federal land units.

5.2. Identification and Selection of Peer Sites

The selection of peer sites follows from conversations with refuge staff and development of a set of criteria (see Appendix B for more information on the peer selection process). The selected sites include the following:

- Wind Cave National Park, National Park Service
Hot Springs, South Dakota
- Delaware Water Gap National Recreation Area, National Park Service
Pennsylvania and New Jersey
- Red Rock Canyon National Conservation Area, Bureau of Land Management
Las Vegas, Nevada
- Bosque del Apache National Wildlife Refuge, Fish and Wildlife Service
Albuquerque, New Mexico

5.3. Lessons Learned Summary

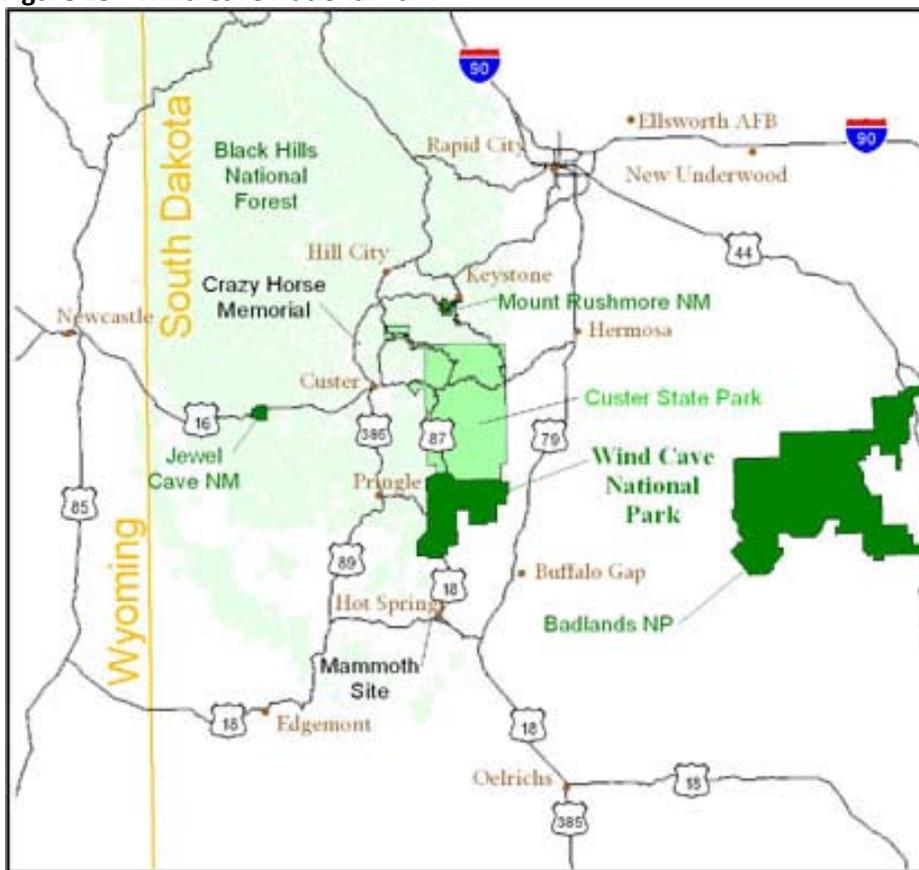
This section includes a site description of locations with issues and lessons useful for Wichita Mountains, including highlights of best lessons-learned in the following categories: non motorized transportation, safety management, transit, tours, special events (in terms of traffic/parking management), and partnerships. The last category, though not a traditional transportation issue, recognizes the importance of partnerships in advocating, facilitating, or supporting public lands management decisions, and specifically how these partnerships may concern transportation issues or lead to the successful implementation of transportation strategies at the public land unit.

5.4. Wind Cave National Park, National Park Service

(Hot Springs, South Dakota)

Wind Cave National Park, one of the world's longest and most complex caves, is among 28,295 acres of mixed-grass prairie, ponderosa pine forest, and diverse wildlife. The park's mixed-grass prairie is one of the few remaining and is home to native wildlife such as bison, elk, pronghorn, mule deer, coyotes, and prairie dogs. In 2008, total visitation at the park was over 570,000. The park is adjacent to U.S. 385, a major north-south route between Custer and Hot Springs, and U.S. 87 (see Figure 25). Peak season is during the months of June, July, and August. Wind Cave is a good peer for this study because its similar ecological resources are comparable to Wichita Mountains, as is its experience with safety management issues and with bicycle use through the park.

Figure 25 - Wind Cave National Park



Source: National Park Service

Safety Management

Wind Cave is a particularly popular destination for its cave tours that may run every 30 minutes throughout the day during the summer. The speed limit in the park is 45 MPH; however, the actual average speed may be closer to 65 MPH. Congestion may occur when visitors stop along the roadside, or in the road to view bison herds. High traffic volumes due to tours along with potential bottlenecks to view bison, as well as high speeds can create an unsafe roadway-driving environment, regardless of the efforts of the law enforcement staff that monitor park roads. Park staff indicates that each year between 5

and 15 bison are hit along park roads. As a result the park is taking steps to mitigate unsafe driver behavior, for example the recent installation of highly reflective roadway signage and flashing radar signs at the north and south end of the park (see Figure 26). These signs display speed limits and animal warnings. The park is also considering the installation of a street lamp in a location with a high incidence of bison/ vehicle collisions.

Park staff made an effort to consider the size and design of the signage to fit appropriately within the natural environment of the park, while still providing an impact on roadway users. The context sensitive implementation of these signs provides a useful example for Wichita Mountains as they too seek to control speeds and roadway user awareness on the refuge.

Figure 26 - Reflective Sign (left) and Advanced Speed Limit Sign (right)



Source: Wind Cave National Park

Additionally, the lack of cell phone coverage in the park presents some concern. Installation of a cell phone booster antenna by the park increases the availability of cell phone coverage within 150 feet of its visitor center. Outside of this area, the park considers frequent traffic and park patrols adequate for roadway crashes or other incidents.

Wichita Mountains also has sparse cell phone coverage throughout the refuge, which the refuge does not presently deem a major issue. However, there are inextricable links between communications and transportation networks when it comes to safety and response times. Wind Cave's solution to expanding coverage is relevant to Wichita Mountains, and a surge in visitation that may also accompany a visitor demand for more cellular coverage.

Non-motorized Transportation

Bicyclists use park roads during special events and as a means to visit the area. In recent years, park staff note an increase in the popularity of bicycle tours through the park. The park requires a special use permit for fundraising events or commercial activities if the event requires staging areas, such as water stations or registration areas on park lands; otherwise, there are no restrictions on bicycling through the park. In addition to special events, many bicyclists ride to and through the park from the neighboring towns of Custer or Hot Springs. The main roads bicyclists use from the Hot Springs area are U.S. 71 and U.S. 385. Both roads run through the park and have wide shoulders (see Figure 27), which bicyclists often use. Park

staff considers these roads very safe for bicyclists because of the ample shoulders but do not plan to formalize the shoulders with bicycle specific markings or signage because bicycle incidents have been rare, and there are additional maintenance costs due to striping and signage.

Wind Cave's experience with bicycle use on broad shoulders supports current planning efforts at Wichita Mountains to widen existing roadway shoulders on OK-115 and OK-49. This consideration is also a factor in the alternative transportation options this study analyzes, which seek to allow provisions for bicyclists, while mitigating potential safety hazards that multiple road users on shared roadways may create.

Figure 27 - Wide Shoulders at Wind Cave National Park



Source: Google Maps 2009

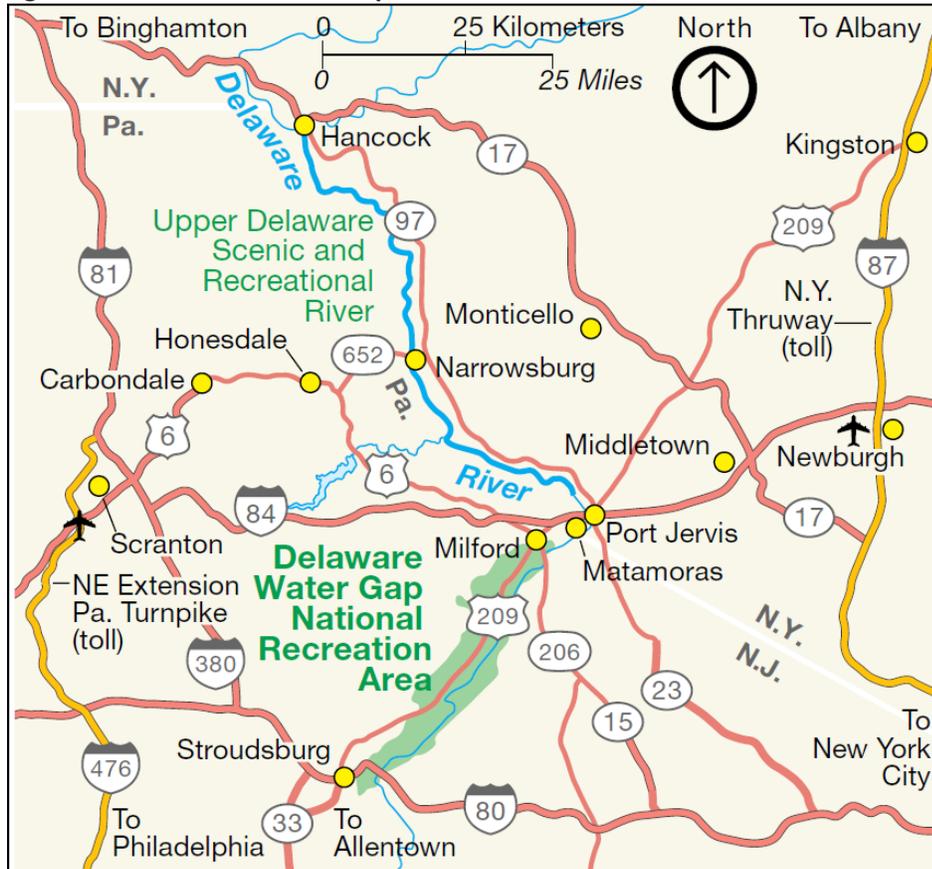
5.5. Delaware Water Gap National Recreation Area, National Park Service *(Pennsylvania and New Jersey)*

Delaware Water Gap National Recreation Area (NRA) is in both New Jersey and Pennsylvania, along 37 miles of the Delaware River (see Figure 28), and receives over five million annual visitors. The park covers 269 acres and includes over 100 miles of trails along streams, ridges, and mountains, 27 miles of the Appalachian Trail, and over 200 miles of scenic roads. A portion of U.S. 209 runs through the park with a speed limit between 35 and 45 MPH. On the section of the route that traverses the park, there are restrictions to commercial traffic (between Bushkill, PA and Milford, PA). There, the park has the authority to collect fees for the management, operation, maintenance, and construction of the road. A fee booth at each end of the route regulates approximately 100 to 120 commercial vehicles that travel through the park daily. Two major roadways also border the park: Interstate 84 to the north, and Interstate 80 to the south.

Delaware Water Gap NRA has some striking differences to Wichita Mountains, including roughly five times the annual visitation and proximity to major urban areas in Pennsylvania, New Jersey, and New

York. However, it offers a potential future perspective for the refuge regarding how a public land unit manages transportation issues under significant visitation and surrounding development. As a peer comparison site, Delaware Water Gap provides useful information regarding experience with transit, analysis of traffic safety, the implementation of multi-use trails through the park, and working with community groups.

Figure 28 - Delaware Water Gap National Recreation Area



Source: National Park Service

Transit

Bus service between New York City and Scranton, Wilkes-Barre, and the town of Delaware Water Gap, PA pass through the Delaware Water Gap NRA. The Delaware Water Gap/Martz bus terminal is one-and-one-half and three miles from two trailhead spurs of the Appalachian Trail. On its website, the park provides public transit and walking directions from the Delaware Water Gap NRA bus terminal to these trailheads and other park sites to facilitate car-free travel to the area. Monroe County Transit Authority also provides weekend bus service to the Delaware Water Gap/Martz terminal. Buses have bicycle racks that allow park visitors to travel by bus and then bicycle or walk from the bus station to the park. Though Delaware Water Gap is not responsible for providing transit to the park, it communicates to potential visitors how to visit the park without the use of a car, which many visitors may not otherwise realize is feasible.

Safety Management

According to FHWA road conditions and crash history data, Delaware Water Gap has some of the most dangerous roadways in the NPS system. As a result, in 2008, Delaware Water Gap conducted a traffic safety study to assess traffic issues. The study includes crash analysis and traffic volume data on parks roads and intersections to identify major transportation patterns or safety issues. The study provides park management with a specific set of improvements to address roadway safety issues. As a result, implementation of transportation solutions at Delaware Water Gap includes:

- \$8 million to overlay 22 miles of U.S. 209 including centerline rumble strips, where the majority of vehicle lane departure crashes occur.
- Consideration of shoulder rumble strips to address roadway departure crashes.
- Addition of a left turn lane at U.S. 209/Bushkill Falls Road
- A deer alert system at two locations that utilize fencing to create wildlife crossings with detection mechanisms that trigger flashing lights to alert drivers of crossing animals

Non-motorized Transportation

According to park staff, there is frequent bicycle use of the roads in the park, especially on the New Jersey side of the river. In recognition of the increase in bicycling, and the desire to accommodate additional bicycling, the park is attempting to increase multi-use and bicycle-specific trails throughout the park. Park staff would like to create 100-150 miles of on-and off-road bicycling trails, with up to 20% being multi-use trails to facilitate and encourage non-motorized uses in and through the area.

In addition to encouraging visitors to bicycle at Delaware Water Gap NRA, the park maintains a volunteer bicycle patrol that works with park staff in designated areas. Patrol members assist park rangers by providing information, offering basic first aid, alerting park staff to potential issues or problems, and communicating visitor concerns to park staff. The park provides basic training to the volunteers in First Aid/Emergency Medical Services, radio communications, and bicycle maintenance. Bicycle patrol units supplant the need for additional park vehicles, maintenance and fuel, and help to encourage bicycling at the park for transportation purposes.

Delaware Water Gap's policies that provide recreational visitors with bicycling opportunities along with their bicycle patrol program illustrate a broader perspective on the utility of alternative vehicles at parks. By encouraging the use of bicycles by park staff, Delaware Water Gap is helping to legitimize bicycle use as a socially acceptable mode of transportation.

Partnerships

Though Delaware Water Gap receives several million visitors a year, the surrounding communities and states fragment its constituent base. Because of this, community coordination and area representation are particularly important. The park makes an effort to utilize a variety of groups to assist with the management of the area. The Friends of the Delaware Water Gap is a volunteer not-for-profit organization whose activities include historical preservation and restoration, educational and cultural programs and acquisitions, and the management of artifacts of historical importance⁶⁰. The park also has a strong relationship with the Student Conservation Association (SCA), which provides a reliable

⁶⁰Friends of Delaware Water Gap. <http://www.friendsofdewa.org>. Accessed February 4, 2010.

volunteer source for various projects during the summer season. The Appalachian Mountain Club assists the park in off-road trail maintenance, and the club maintains Camp Mohegan, a facility they use in the park. In addition to these groups, Congress established a voluntary Citizen Advisory Commission (CAC) to guide the Delaware Water Gap. The CAC is an 11 member, appointed group representing regional interests in the area that acts as an advisory body to the Secretary of the Interior regarding the management and operation of the recreation area, and on other issues that affect its surrounding communities.

The volunteer efforts and guidance of these groups helps reduce demand on park resources and staff time. Additionally, having a reliable volunteer base ready to assist with specific duties can help leverage funding opportunities that rely on labor hours for implementation. For example, Delaware Water Gap has secured nearly \$8 million in flood damage funding for the cleanup and restoration of park grounds by the SCA.

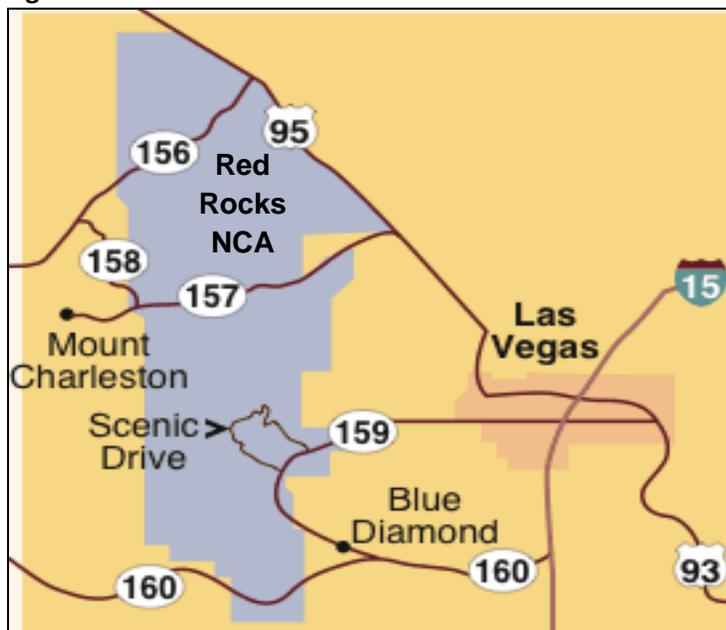
Wichita Mountains has several area partnerships they can draw upon, including its current Friends of the Wichitas volunteer group, the Town of Medicine Park, the forth-coming Medicine Park Natural Science Museum, Fort Sill and others. With the consideration of improving transportation to and through the refuge, there are significant opportunities to strengthen existing and form new relationships that help to further the refuge transportation goals and the goals of area partners.

5.6. Red Rock Canyon National Conservation Area, Bureau of Land Management

(Las Vegas, Nevada)

Red Rock Canyon National Conservation Area (NCA), Nevada's first National Conservation Area, is 17 miles west of Las Vegas on State Route 159 (see Figure 29). Red Rock Canyon NCA comprises 195,819 acres and receives more than 1 million annual visitors. Red Rock Canyon NCA has a 13-mile scenic drive, more than 30 miles of hiking trails, picnic areas, and a visitor center with exhibit rooms and a book store. The area provides opportunities for rock climbing, horseback riding, mountain biking, and road biking as well as nature observing. Red Rock Canyon NCA is a good peer comparison site to Wichita Mountains because of its special event management and its relationship with Nellis Air Force Base.

Figure 29 - Red Rock National Conservation Area



Source: Bureau of Land Management

Parking Management

Red Rock Canyon NCA hosts a number of special events throughout the year and has annual high visitation days when it must coordinate transportation to the area and manage parking. The day after Thanksgiving is traditionally a high visitation day. To manage the increase in automobile traffic, staff organize volunteers to direct vehicles to parking areas with available space, report on traffic issues, assist travelers with questions about the area, and if necessary, allow for the passage of emergency vehicles. Red Rock outfits volunteers with reflective safety vests and radios to communicate parking lot conditions or other issues. Staff indicate that previous use of variable message signs in advance of parking lot entrances to indicate when parking lots were full no longer continues because drivers did not heed the signs and would still drive to the parking area in search of an available space. The use of volunteers proves a more effective method of successfully handling traffic.

Make a Difference Day at Red Rock is an annual event that attracts several hundred visitors to participate in graffiti removal and trail maintenance activities. In order to accommodate these visitors, Red Rock provides shuttle services from the Red Rock campground to the work sites. Additionally, Public Lands Day attracts many visitors to the area. For each event, Red Rock staff uses shuttles that they borrow from neighboring federal agencies to transport visitors between sites. The arrangement of shuttle use is informal and provides Red Rock with a flexible way to manage the events without the need to maintain or store vehicles.

Currently, similar to Red Rock, Wichita Mountains uses rangers to monitor parking availability at the two locations where parking congestion typically occurs: the summit of Mount Scott and the Sunset Picnic area trailhead. Implementing an ITS solution at these area (e.g. variable message signs that indicate the availability of parking) may be most useful if there is an overflow parking lot location to direct traffic to, lest a portion of visitors bypass the sign and continue to seek parking where none exists. The “low tech”

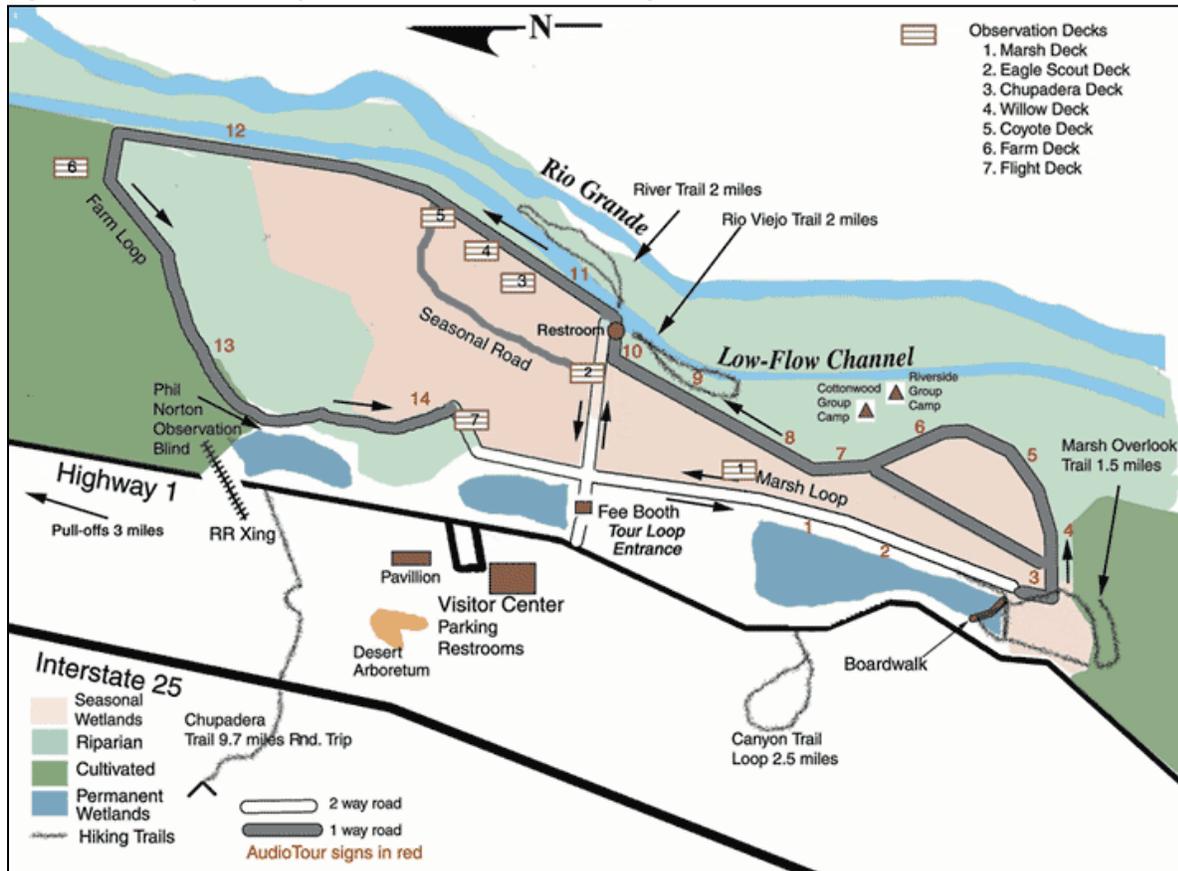
method of ranger monitoring may prove the best option for managing parking in these areas, short of constructing larger or additional parking, or providing shuttle service to these areas.

5.7. Bosque del Apache National Wildlife Refuge, Fish and Wildlife Service

(Albuquerque, New Mexico)

Bosque Del Apache National Wildlife Refuge (NWR) is approximately 20 miles south of Socorro, New Mexico (see Figure 30) and is 57,191 acres of moist bottomlands, farmlands, riparian forests, arid foothills, and mesas. Most of these desert lands are wilderness areas with the goal of refuge management to provide habitat and protection for migratory birds and endangered species and provide the public with a high quality wildlife and educational experience.⁶¹ State Highway 1 runs through the refuge and Interstate 25 forms the western border of the refuge. Bosque Del Apache maintains a 12-mile wildlife tour loop (16-miles during peak season) that passes through farm areas with cornfields popular with migratory birds. The refuge is an interesting peer comparison for its provisions for bicyclists, the success of its annual Festival of the Cranes, and its experience with alternative fuel vehicles.

Figure 30 - Bosque del Apache National Wildlife Refuge



Source: U.S. Fish and Wildlife Service

Bicycle Provisions

⁶¹ USFWS. <http://www.fws.gov/southwest/refuges/newmex/bosque/index.html>. Accessed February 5, 2010

Bosque staff indicate there is concern about the effects of bicyclists on wildlife, though there are no impact studies to date. Bosque staff experiences with bicycle use on the refuge underscores the importance of systematic evaluation of new policies that add uses, like bicycling to public lands.

Currently, Wichita Mountains permits bicycling on all paved roads throughout the refuge, and there are not many issues with bicycle-vehicle conflicts. Yet, the refuge should monitor programs, policies, or infrastructure improvements that may encourage more bicycling to determine that new uses do not create negative or unintentional consequences on surrounding habitats or conservation efforts.

Alternative Fuel Vehicles

Bosque del Apache NWR holds a series of two-hour guided tours on Saturdays and Sundays in December, January and February. In general, the tours fill to about 20 people for a 35 person capacity bus. In 2008, Bosque Del Apache NWR was awarded a grant through the Paul S. Sarbanes Transit in Parks Program (TRIP) to replace its tour bus and procure additional vehicles. Considerations for the procurement of an alternative fuel vehicle include:

- Location of the nearest fueling station. In the Bosque area there are only two places that provide alternative fuel stations: Albuquerque, roughly 86 miles away, and in Socorro, about 10 miles away, where bio-fuel products are sold.
- Growing concerns over the unintended effects of bio-fuel production on deforestation, rising food prices, increased carbon emissions, etc.
- Availability of area skilled mechanics to work on alternative fuel or hybrid electric vehicles.

Recently, Bosque has procured two new alternative fuel vehicles to add to its fleet, a hybrid Ford Escape and a propane tour bus.⁶²

Wichita Mountains was recently awarded TRIP funding to replace their aging diesel tour bus. Bosque's considerations above help to form a basis of questions and concerns for Wichita Mountains as they seek to procure an appropriate tour bus replacement.

5.8. Solutions for Wichita Mountains

The summaries of the lessons learned at the peer sites above form the basis of several opportunities that the refuge may consider. These lessons or practices, where applicable are factored into the development of the transportation analysis options described later in this report. Relevant lessons include:

⁶² Bosque del Apache. Habitat. Volume 16, Number 1, 2010. P.10.

Table 12 - Peer Comparison/Lessons Learned Summary

Category	Issue/peer
Non- motorized	Provision of bicycle facilities, and experience with wide roadway shoulders to facilitate bicycling (Bosque and Wind Cave)
Safety	Use of highly reflective signage, and radar signage (Wind Cave) Traffic Safety Analysis (Delaware Water Gap)
Transit	Experience with transit services to the unit (Delaware Water Gap)
Tours	Experience with alternative vehicles (Bosque)
Parking management	Special events/high visitation day parking management (Red Rock)
Partnerships	Coordination with several types of partnership/stakeholder organizations (Delaware Water Gap)

6.0 Summary of Major Transportation Issues

The preceding sections describe and analyze transportation and planning efforts on and around the refuge, detailing the existing conditions, projects underway that will affect the transportation system on the refuge and in the surrounding community, and demographic and economic changes in the region, as well as identifying ways in which similar public land units address complex transportation issues. Analysis of the information in the earlier sections leads to the identification of several issues that impact transportation operations of the refuge. Five major issue areas have implications for the physical transportation network on the refuge and imply a need for a comprehensive management approach to transportation planning and programs on the refuge. The transportation alternatives in Chapter Seven respond to the primary transportation issues that follow.

The refuge lacks a comprehensive transportation plan

Long-term transportation planning in the region is lacking. Currently, the refuge does not have a transportation plan, nor does Comanche County. Only the City of Lawton, southeast of the refuge, has a transportation plan, through the Lawton Metropolitan Planning Organization (MPO) Long Range Transportation Plan (see Chapter 3.1). The implementation of new transportation projects depends on the demonstration of the need for improvements- for example, quantitative determination of capacity constraints, or demand for new services. Further, transportation planning requires identification of where people are and where they want to go, as well as documentation of transportation improvements that may be underway. This study begins to bring together disparate transportation planning efforts around the refuge; however, information such as traffic counts and origin-destination details for visitors on the refuge and at nearby recreational locations is necessary to better understand how the refuge and partners can serve the needs of visitors and the community. A comprehensive transportation plan would allow the refuge to define a strategy to implement transportation improvements and programs to guide the effective investment of resources into the existing transportation network.

The primary route through the refuge is now a National Scenic Byway

The National Scenic Byway (NSB) designation is a new development for the refuge that opens additional possibilities for regional transportation planning, joint tourism marketing efforts, and possible funding sources for transportation improvements on the refuge. The designation also presents new challenges to the refuge and regional stakeholders as it is likely to attract more visitors to the area as advertising and promotion of the byway increases. For example, one study found that a scenic byway designation resulted in a 3.4%-20% increase in annual traffic.⁶³ Establishing a program of action that connects NSB goals with refuge and stakeholder goals represents a proactive approach to ensuring the long term success and intent of the designation.

The Fort Sill and the region will experience significant growth

Fort Sill will influence growth in Comanche County over the next few years. The Base Closure and Realignment (BRAC) will result in significant growth in the military presence at Fort Sill as well as economic growth may increase the overall Comanche County population up to 35% by the year 2030⁶⁴. As population grows, demand for recreation may lead to the refuge becoming more of a regional park as

⁶³ A Review of Impact Studies Related to Scenic Byway Designation. Economic Development Research Group. March 2001. <http://www.edrgroup.com/pdf/sbyway-litrev-report.pdf>. Accessed June 1, 2010.

⁶⁴ Lawton Metropolitan Planning Organization, 2030 LRTP. <http://www.lawtonmpo.org/uploads/documents/execsumm.pdf>, Accessed January 25, 2010.

well as an area of habitat and resource protection. The refuge would like to accommodate additional visitation without increasing the existing physical footprint to preserve the natural ecosystem to as much of an extent as possible. These factors combine to encourage the refuge and its stakeholders to work together to increase the availability of alternative transportation options to and through the refuge.

The refuge has institutional opportunities to improve pedestrian and bicycling facilities

Fort Sill's Morale, Wellness and Recreation (MWR) program and the Oklahoma FitKids Coalition both strive to encourage healthy lifestyles that include physical activity, in part through taking advantage of outdoor recreational opportunities. Fort Sill's LETRA abuts the refuge and presents an opportunity to expand recreational and transportation options between the sites. Oklahoma FitKids recognizes the importance of outdoor exercise in fighting childhood obesity. Working to improve active recreational opportunities on the refuge will assist the missions of MWR and Oklahoma FitKids to promote physically active recreation and will help the refuge to encourage more visits without the use of a private automobile.

Concurrent refuge planning efforts

In 1997, Congress passed the National Wildlife Refuge System Improvement Act (Refuge Improvement Act). The Act requires all FWS units to develop a long-term 15-year program or Comprehensive Conservation Plan (CCP) by 2012. The CCP broadly outlines the refuge purpose, and activities for conservation and preservation of wildlife and habitat, including defining recreational opportunities on the refuge. This includes describing mitigation efforts of issues that "may adversely affect the populations and habitats of fish and wildlife... and opportunities for wildlife compatible recreational uses."⁶⁵ This study offers several alternative transportation options that could be incorporated into the CCP, such as trail enhancements and wayfinding improvements.

Additionally, the refuge is currently working on a Refuge Visitor Information Program (RVIP) study to implement a demonstration project, part of a series of Intelligent Transportation Systems (ITS) demonstration projects, to showcase available ITS technologies, which may include electronic message signs or other systems that improve refuge and community transportation issues, like parking management. Further, the refuge is improving or building new shoulders along OK-115 and OK-49 between the Cache Gate and the Meers intersection, which has implications for accommodating bicycle and pedestrian use of the road. Finally, the refuge will be part of the National Visitor Use Monitoring Program (NVUMP) in the coming months. This effort collects information on FWS units about visitor satisfaction and use, which may help to inform future transportation planning efforts on the refuge.

⁶⁵ See the full text of the National Wildlife Improvement Act of 1997 here: <http://www.refugenet.org/new-pdf-files/NWRS%20Improvement%20Act.pdf>. Accessed May 4, 2010.

7.0 Transportation Analysis

This chapter assesses nine transportation options that the refuge may consider implementing to address its transportation issues and that meet the goals set forth in Chapter Two. The refuge could consider these transportation options in the context of the CCP in development, to provide a path toward implementation on a number of initiatives that the refuge and area stakeholders find desirable. This analysis presents the options in relation to the major transportation issues (see Chapter Six) refuge transportation goals, potential partnerships (see Chapter Four) costs, and implementation considerations. The options are not generally comparable against each other in terms of preference; however, some may rely on the implementation of others. For example, bicycle sharing depends on the implementation of bicycle wayfinding and routing on the refuge.

The transportation options below also draw on discussions with refuge and FWS staff and area stakeholders at the TAG meeting in May 2009 and the stakeholder meeting in March 2010. Many of the options build upon ongoing or upcoming transportation improvements on or near the refuge, which this chapter also addresses.

One way to consider transportation improvements is in terms of category: for instance, roadway improvements or pedestrian improvements. The transportation options in this analysis have components that fall into multiple categories, including roadway, parking, pedestrian, bicycle, intelligent transportation systems (ITS), and wayfinding. The analysis also considers the transportation options in terms of how they respond to refuge transportation goals. Table 13 lists the nine transportation options by transportation category and the transportation goal that relates to each option. The following sections of this report describe the relationship between the various transportation options, refuge transportation goals, and other related issues.

Table 13 - Alternative Transportation Options by Category and Transportation Goal

Transportation Option	Transportation Category					Transportation Goal		
	Roadway	Parking	Bicycle/ pedestrian	Transit	ITS	Wildlife and Habitat Protection	Visitor Services and Facilities	Partners
1 - Traffic analysis study	✓	✓	✓	✓		✓	✓	✓
2 - LETRA improvements			✓				✓	✓
3 - Shoulder improvements	✓		✓			✓	✓	
4 - Trail Improvements - Visitor center to Environmental Education Center - Burma Road			✓ ✓			✓ ✓	✓ ✓	
5 - Lake Jed Johnson improvements	✓	✓	✓	✓		✓	✓	
6 - Wayfinding/signage	✓		✓		✓		✓	✓
7 - Traveler Information System	✓	✓	✓	✓	✓		✓	✓
8 - Bicycle routes and share	✓		✓	✓	✓	✓	✓	✓
9 - Transit study	✓	✓	✓	✓	✓	✓	✓	✓

The following table summarizes the nine transportation options this study presents, including whether the option is a study or capital improvement, implementation considerations, and a cost estimate range.

Table 14 - Transportation Options Summary

Transportation option	Project Type	Cost range	Implementation time line considerations
1 - Traffic analysis study	Study	\$60,000- \$80,000	Near term to provide valuable information to inform subsequent transportation planning on the refuge.
2 - LETRA improvements	Capital	Total costs vary (see Chapter 7.2.4 for detail)	Near term to coincide with Fort Sill and potential FY11 TRIP application.
3 - Roadway shoulder improvements extension	Capital	\$3.2 million	Near term, these improvements benefit all roads users. Prior to bicycle share/routes pilot program.
4 - Visitor center-EE Center and Burma Road trails	Capital	Total costs vary (see Chapter 7.4.4 for detail)	Near term to coincide with Comanche County Fitness Trail improvements and shoulder improvement project on OK-115.
5 - Lake Jed Johnson parking and roadway improvements	Capital	\$300,000 for roadway \$860- 1,250/space for parking area improvements	Prior to or concurrent with improvements to the Lake Jed Johnson tower.
6 - Wayfinding/signage	Study/Capital	Total cost varies: \$100 application to ODOT Average cost per sign \$107	Near term; these improvements benefit all roads users. Prior to bicycle share/routes pilot program.
7 - Traveler Information System	Capital	Total TIS cost vary from \$50,000- \$200,000 plus \$10,000 per year maintenance	Near term, to coincide with NSB activities on traveler information.
8 - Bicycle share pilot program/bicycle routes	Capital	Total costs vary from \$35,000- \$50,000	After roadway shoulder improvements extension and wayfinding signage improvements; bicycle share should follow establishment of bicycle route designation(s).
9 - Transit shuttle study	Study	Total costs vary from \$50,000- \$150,000	After traffic analysis study and completion of RVIP and the National Visitor Use Monitoring Program, if deemed necessary based on the results of these efforts. Should also follow trail and bicycle route/share to complement these alternative transportation modes.

7.1. Option 1: Traffic Analysis

A traffic analysis study could provide valuable information for making transportation management and investment decisions. It may consider origin and destination data of visitors to and through the refuge to provide an understanding of transportation issues and needs on the refuge. The study could help the refuge plan transportation systems that have a basis in existing demand patterns and may allow the refuge to ask visitors what additional transportation services they would consider using in the future. It may also consider recreational destinations outside the refuge, including LETRA, Medicine Park, and Lawton, in order to provide a measure of demand for services between those destinations and the refuge.

The following may be components of a traffic analysis study:

- Roadway inventory and capacity assessments to determine baseline roadway conditions
- Traffic counts and level of service analysis to identify baseline conditions and locations of congestion
- Vehicle-occupancy as a means to determine the need for transit, or additional parking
- Origin-destination surveys to inform long-term transportation planning issues; for example, the need to modify circulation patterns
- Roadway safety audits to identify hazardous areas
- Parking capacity analysis at major destinations, including the duration of stay and visitor origin
- Special events analysis to better understand seasonal, or intermittent, transportation needs

7.1.1. Purpose

The refuge currently lacks a long-range transportation plan and many existing projects are the result of obvious and immediate need. Both short-term and long-term transportation planning require significant analysis of the existing transportation system on the refuge. While the refuge collects traffic counter data to determine visitation, the data do not provide information about where visitors go on the refuge, whether they are recreational visitors or commuters, or how long they stay on the refuge. A traffic analysis study could address many of these issues, and provide the refuge with data to justify and implement transportation projects, including many of those in this analysis. With this effort, along with the other transportation options in this study and the upcoming CCP, the refuge will have the components of a long-range transportation plan.

A traffic analysis study will help the refuge quantify parking and roadway capacity constraints and needs. For example, the refuge cites parking capacity to be a constraint at Mount Scott and the Sunset Picnic Area; however, the refuge does not have data on the peak times that visitors experience parking constraints or occupancy data (i.e. the duration of time vehicles are in a parking space). The refuge can also obtain road-segment-specific volumes to help justify safety and other traffic control measures.

The recent designation of the primary refuge roads as a NSB may result in a significant increase in traffic through the refuge. A traffic analysis study will help the refuge quantify the impact of this designation, particularly if the refuge conducts follow up traffic studies, potentially helping them to obtain funding to mitigate transportation issues that may arise. Analysis of current traffic issues on the refuge also could inform the potential creation of a refuge transportation plan by identifying infrastructure needs as a way to target future transportation investments.

7.1.2. Goals

A traffic analysis study could help the refuge meet all of its transportation goals. It could allow the refuge to properly plan for and manage the transportation network, meet the needs of visitors, encourage alternatives to private automobiles, and build upon existing partnerships. The data that a traffic study can provide will enable the refuge to plan alternative transportation infrastructure such as bicycle or transit facilities on the refuge and between nearby recreation destinations. Working with area partners, the refuge could conduct the study to be regionally inclusive, while encouraging stakeholder support for further transportation planning efforts.

Proactively planning for subsequent transportation investments on the refuge depends on quantifiable data pertaining to the kind of information a traffic study will produce. Further, such a study should provide preliminary information to support many of the transportation options that follow in this section. The refuge can evaluate reasons for collecting information, how to maintain it, and how it influences management decisions against current refuge goals for wildlife and habitat, visitor services and facilities, and partners. This enables the refuge to make better resource management decisions regarding the provision or maintenance of parking facilities, allows for better understanding on how people use the refuge, where they go, and how long they stay, as a means of targeting investment in those areas, or encouraging use in other areas.

7.1.3. Partners

Partners in a traffic study could include neighboring recreational areas, particularly Fort Sill at LETRA, Medicine Park, planners for the new Medicine Park Museum of Natural Science (MPMNS), as well as Cache and Lawton. A traffic analysis study may include surveys and data collection at nearby attractions to help gauge common and potential visitors for the refuge. The NSB program is another potential partner as the primary roads through the refuge are on the NSB and data (e.g. safety issues)⁶⁶ could provide the basis for funding for enhancements through the program.

7.1.4. Cost

Cost estimates for a traffic analysis study may vary depending on the scope of the project and the methodologies to collect information. For example, an origin and destination study that employs intercept surveys of individual visitors will increase costs significantly. Alternatively, a less expensive means to collect similar information may be attainable through a representative sampling of license plate data and vehicle registration records. However, the refuge can tailor a traffic analysis study to fit specific priorities and needs by prioritizing the necessary information to make key transportation management decisions.

A broad cost estimate for traffic study that includes traffic data collection, a parking analysis, a road safety audit, and a final report is \$60,000-80,000. An origin and destination component would increase the amount by \$20,000.

⁶⁶ According to the NSB program, safety improvements are eligible funding activities “to the extent that the improvements are necessary to accommodate increased traffic and changes in the types of vehicles using the highway as a result of the designation as a State scenic byway.” National Scenic Byways Program Legislation. http://www.bywaysonline.org/program/us_code.html, Accessed May 4, 2010.

7.1.5. Implementation Considerations

The upcoming NVUMP will collect visitor origin and destination information on the refuge. The NVUMP will also collect a sub-set of information relevant to the implementation of transportation management technology on the refuge. A traffic analysis study should complement, not duplicate, existing efforts, and may focus on the collection of roadway safety information that specifically supports alternative transportation interventions, like bicycling and walking, since the protection of these user groups are significant for refuge staff and area stakeholders. The refuge should consider conducting a traffic analysis study in the near-term, as many of the transportation options this study recommends relies upon the quantitative data a traffic analysis study would produce. Further, the successful implementation of transportation improvements such as bicycle sharing or transit depends upon the knowledge of where visitors currently go and the demand for such services.

7.2. Option 2: LETRA Improvements

This option supports the adjustment of the Fort Sill cantonment area (re-delineation of the secure area), including the removal of the security gate on North Boundary Road by Fort Sill, which would permit “open” access to LETRA for all visitors. In addition to the gate removal, both Fort Sill and the refuge support the re-establishment of a multi-use trail between LETRA and the refuge to facilitate non-motorized travel between the sites, with a potential connection to the future MPMNS and Medicine Park by way of the shoulder on OK-49.

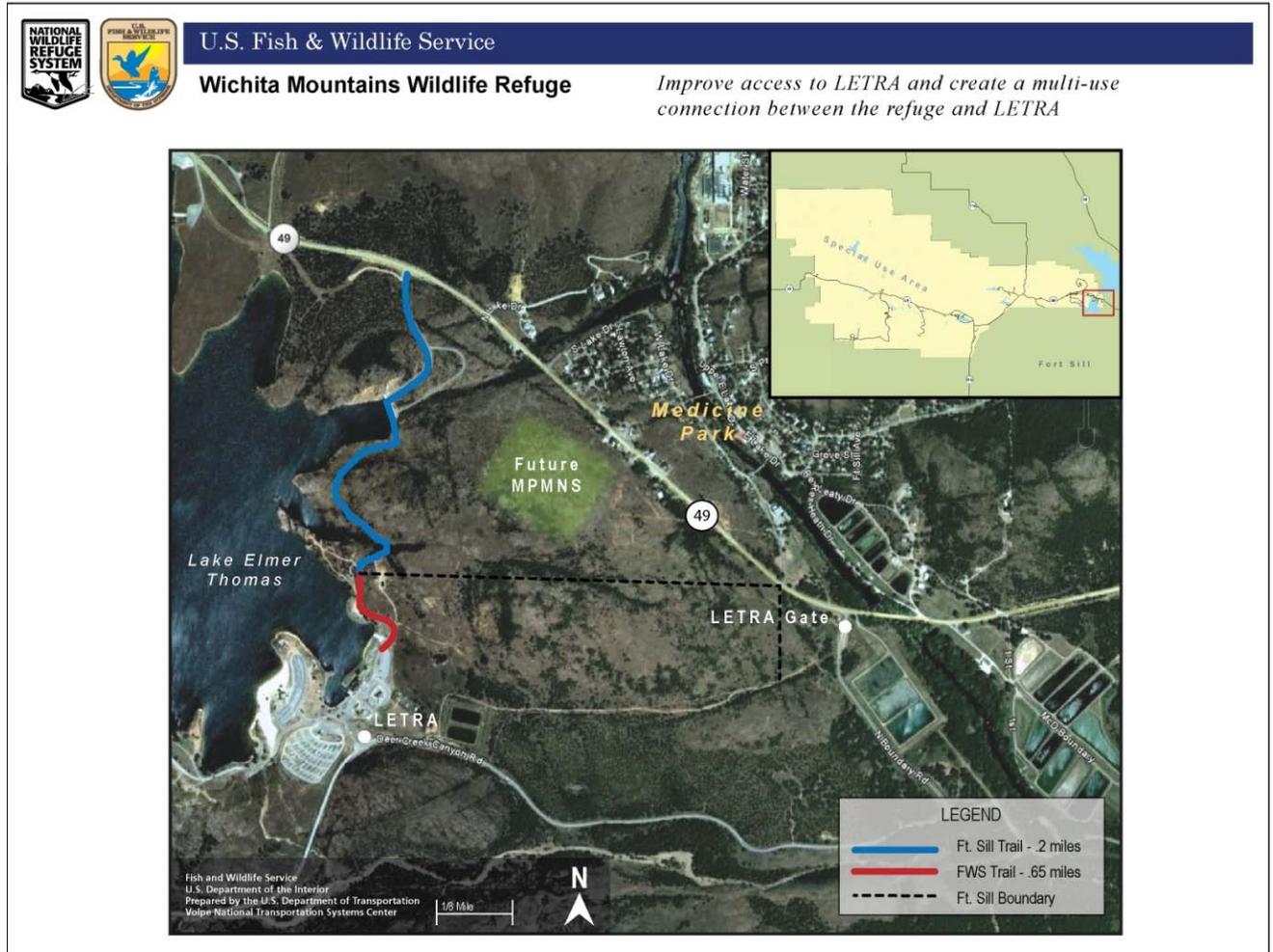
LETRA-Refuge Trail

This option re-establishes an existing right-of-way (approximately 0.65 miles) between Fort Sill and the refuge at OK-49, continuing to LETRA (approximately 0.20 miles). The existing shoulders along OK-49 provide further opportunity to connect with trails in Medicine Park and to the site of the future MPMNS (see Figure 31). Re-establishing the trail enables visitors to the refuge, MPMNS, LETRA, and Medicine Park to walk or bicycle between the sites, possibly eliminating automobile trips onto the refuge and to other sites.

Gate Removal

After September 11th, 2001, security measures, including the positioning of the current security gate where none had existed before, caused LETRA usage to drop significantly. LETRA’s visitation occurs primarily from Memorial Day to Labor Day; during this time Fort Sill receives approximately 80,000 family members who typically visit for 1-2 days. In addition, Fort Sill is developing a bicycle trail between Lawton and Apache Gate. Enhancements to accessing LETRA and provisions of trails between LETRA and the refuge complement this effort, and have the potential to attract hundreds of trail users through the peak period visitation months. Concurrent with improvements to the trail between LETRA and the refuge is the removal of the Fort Sill security gate. Fort Sill proposes to remove the gate, allowing unrestricted access to LETRA from OK-49. This would remove security restrictions for general access to LETRA, including for those who may come via the multi-use trail. For example, many users originating at LETRA may choose to park and walk or ride a bicycle along the trail to access the refuge or travel to the Medicine Park area.

Figure 31 - LETRA to Refuge Multi-use Trail



Source: U.S. DOT Volpe Center

7.2.1. Purpose

This project addresses several of the transportation issues this study identifies, including accommodating increases in visitation as a result of growth at Fort Sill, improving pedestrian and bicycle access on and to the refuge, and increasing the availability of active recreation opportunities. Removing the Fort Sill security gate removes not only a physical barrier, but also a psychological barrier for visitors accessing LETRA, especially among new visitors or those unfamiliar with the area who may view LETRA as being off-limits or who may be apprehensive to pass through a military check-point. Creating more open access to LETRA not only enables visitors to drive into LETRA, but the realignment of the “secure area” to not include LETRA enables non-motorized users to travel to LETRA freely. Currently, the existing trail between the refuge and LETRA is closed by a gate at the refuge-Fort Sill border. By realigning the secure area, Fort Sill will allow visitors traveling by foot or bicycle between the refuge and LETRA. Growth at Fort Sill and in the region may increase the demand for recreational opportunity, and the removal of a security barrier creates a more welcoming entry to LETRA for all users.

7.2.2. Goals

This project satisfies the refuge goals of enhancing visitor access by providing a safe, reliable connection between the refuge and LETRA, and potentially Medicine Park and the MPMNS. The use of existing alignments to create a non-motorized link between the refuge and LETRA promotes a sustainable form of transportation without disruption to the surrounding areas. Refuge cooperation with Fort Sill to combine available resources to implement the trail and security adjustments promotes a partnership between Fort Sill and the refuge that benefits visitors that choose to use the trail, and may enhance the transportation operations on the refuge and at LETRA by reducing the number of vehicles to the sites.

7.2.3. Partners

The primary partner for this project is Fort Sill. Fort Sill would be responsible for the removal of the security gate and re-delineation of the army boundary gate. The refuge could work with Fort Sill engineers/planners to maintain a seamless trail between the two properties. Further, cooperation with Medicine Park, MPMNS, the NSB, and ODOT could help establish OK-49 as a multi-use route to existing trails in Medicine Park as well as the MPMNS, as they are all within close proximity to the multi-use trail between LETRA and the refuge.

7.2.4. Cost

The cost of a multi-use trail between the refuge and Fort Sill may vary because of changes in the cost of construction materials, such as asphalt. Additionally, trail construction between the refuge and Fort Sill may be a combination of new trail re-construction and upgrading or maintenance to an existing trail. Costs are difficult to generalize and depend on variables such as trail surface, width, location, necessary structures, signage, and other amenities that affect the total construction cost.

The refuge will need an up-to-date local cost estimate for materials (e.g., asphalt or concrete) and labor if they choose to implement this trail. Table 15 provides a general survey for per mile cost estimates for trails around the country. These costs assume no major trail alignment or clearance problems, no major water crossings or elevated crossings, no major drainage issues, and do not include standard pavement marking, signage, or lighting. In addition to construction costs, the refuge would need to consider annual maintenance costs ranging from \$1,000 to \$2,000 per year, per mile.

Table 15 - Trail Cost Estimate

Trail feature	Cost range (per mile)	Project Cost (0.85 miles)
12-foot multi-use: concrete	\$279,800 to 406,500	\$237,830 to 345,525
6-foot multi-use: concrete	\$140,000 to 200,000	\$119,000 to 170,000
12-foot multi-use: macadam	\$138,000 to 228,000	\$117,300 to 193,800
6-foot multi-use: macadam	\$69,000 to 114,000	\$58,650 to 96,900
12-foot multi-use: cinder	\$59,000 to 111,000	\$50,150 to 94,350
6-foot multi-use: cinder	\$30,000 to 56,000	\$25,500 to 47,600
10-foot multi-use: asphalt	\$150,000 to 175,000	\$127,500 to 148,750

Source: American Trails, <http://www.americantrails.org/resources/ManageMaintain/MilwMaintcost.html>.

Accessed June 1, 2010 and Montgomery County, PA Estimates for Constructing Trail Surfaces (2005).

7.2.5. Implementation Considerations

Fort Sill indicates that the removal of the LETRA security gate is included in its five-year work plan and could potentially be complete within one year. Designs are complete for redefining the Fort Sill cantonment area boundary. Therefore, the refuge could consider working with Fort Sill to schedule and coordinate gate removal in conjunction with trail improvements on refuge Fort Sill property. Working together on trail design will decrease long-term maintenance costs and would protect natural and cultural resources. The refuge and Fort Sill could consider current and potential trip origins and destinations to understand how trail connections can fulfill the needs of the surrounding communities.

Multi-use trails often function as a recreational amenity that serves a wide range of users, including bicyclists, walkers, joggers, equestrians, children, hikers, wildlife viewers, and people using wheelchairs. The refuge should include all Americans with Disability Act (ADA) standards for multi-use trail facilities.⁶⁷ Accessibility guidelines apply to the trails used as non-motorized transportation facilities for bicyclists, pedestrians, and other users. The AASHTO Guide for the Development of Bicycle Facilities⁶⁸ is the main guidebook for bicycle and pedestrian facilities built with federal transportation funds. This guide generally provides a higher degree of accessibility than the ADA trail guidelines and engineers/planners should consult these guidelines during the design phase.

7.3. Option 3: Roadway Shoulder Improvements and Extensions

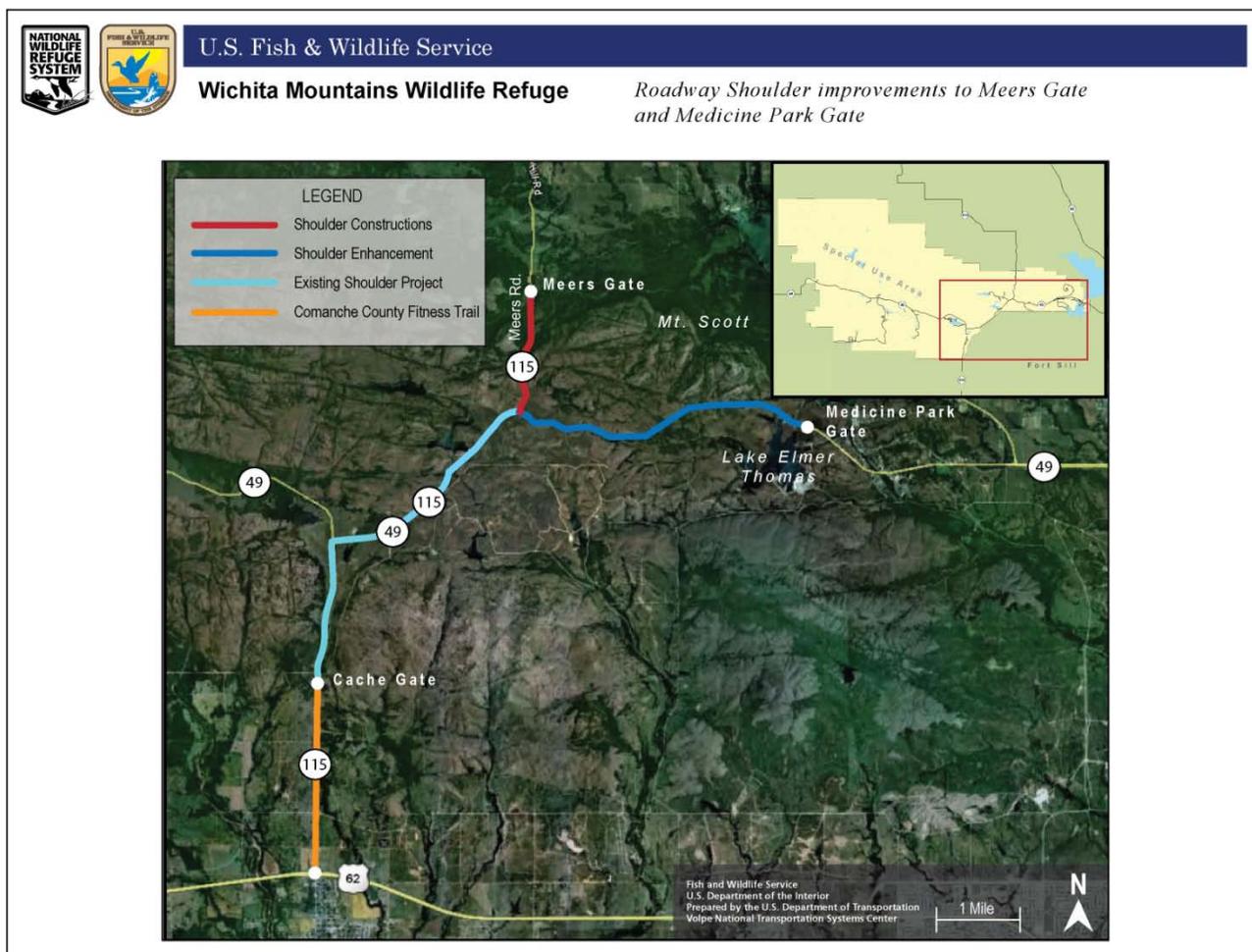
This option extends or improves the roadway shoulders on two segments of road, on OK-115 from the Meers intersection north to the Meers gate, approximately 2 miles, and on OK-49 from the Meers T intersection to the Medicine Park gate, approximately 4.6 miles (see Figure 32). Currently, there is a shoulder from the Medicine Park Gate to the Meers T intersection, but no shoulder along OK-115 north to Meers Gate. OK-115 (Meers Road) north from the intersection of OK-49/OK-115 is a hazardous road due to several blind curves (see Figure 17 above in Chapter 3.2.1). Refuge staff consider this segment as one of the most dangerous segments on the refuge.

This option is consistent with and builds upon the existing refuge project to extend and improve the roadway shoulders along OK-115 and OK-49/OK-115 from the Cache Gate to Meers T intersection (end of OK-49/OK-115; see Chapter 3.3.4). This section of road begins at the northern boundary of the Fort Sill (Cache Gate) and proceeds approximately north for 1.9 miles to the intersection with OK-49/OK-115. The road is roughly 40 feet wide, constructed of asphalt, with a posted speed limit of 45 MPH, 35 MPH after dark. The project would construct eight-foot shoulders on each side of the roadway.

⁶⁷ For more information on ADA accessibility requirements see, www.access-board.gov/PUBS/outdoor-rec-rpt.htm

⁶⁸ Download the AASHTO Guide for the Development of Bicycle Facilities. (1999) here: http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf

Figure 32 - Shoulder Improvements



Source: U.S. DOT, Volpe Center

7.3.1. Purpose

Wider roadway shoulders benefit all road users. According to refuge staff, recreational vehicles, trailers, and buses travel refuge roads, in addition to automobiles. Additional roadway space would allow for safer bicycling, provide a breakdown area for vehicles, decrease road departure crashes by providing more space for vehicular drifting or operational errors, and facilitate wildlife viewing and photography by all roadway users.

These roadway improvements address the need to support sustainable alternative means of transportation on and through the refuge by accommodating bicyclists and pedestrians. Improvements could support the introduction of bicycle routes to promote bicycling as a means of active transportation on the refuge. Roadways with wider shoulders are appropriate as bicycle routes for use by the public, or for bicycle tours on the refuge. Accommodating these activities also has the potential to supplant travel by private vehicle to visit refuge attractions. Lastly, providing safe areas for refuge visitors to bicycle or walk promotes and facilitates non-motorized travel, while reducing automobile emissions and parking demand and congestion, as a result improving the environment for all refuge users and wildlife.

7.3.2. Goals

The expansion of roadway shoulders to facilitate alternative travel enables the refuge transportation network to accommodate modes other than the automobile. Continuous exposure to vehicular noise and pollution may adversely affect wildlife and habitat protection, and this option helps to reduce this exposure. This option also enhances visitor experience and safety by providing an opportunity to explore the refuge in a sustainable manner.

7.3.3. Partners

Potential partners for this option include Comanche County, Meers, Medicine Park, Wichita Mountains NSB, ODOT, and Friends of the Wichitas. The expansion of the roadway shoulders to the refuge gates at Meers and Medicine Park provides an opportunity to promote connections between these communities and the refuge to benefit residents and visitors as well as to the Comanche County Fitness Trail to Cache. Neighboring towns, in cooperation with ODOT, may explore similar improvements on county roads leading to the refuge.

7.3.4. Cost

Actual project costs will vary by the treatment necessary on the roadway shoulder. To improve an existing shoulder is less expensive than constructing a new shoulder. The current cost estimate for the shoulder improvement program on the refuge on OK-49 and OK-115 is \$900,000 per mile to construct new shoulders and \$300,000 per mile to mill and overlay roads with existing shoulders. An approximate estimate for this option is \$3.2 million for seven miles of improvements that include two miles to Meers gate (no shoulders) and 4.6 miles to Medicine Park gate (mill-and-overlay existing shoulders).

7.3.5. Implementation Considerations

Construction for the current roadway shoulder improvements project is to begin in the summer of 2010. Coordinating any additional roadway shoulder improvements with the existing project would reduce overall project costs. If such coordination is not possible, the refuge could consider additional roadway shoulder improvements for project submission to the Refuge Roads Program for the next available fiscal year under the conditions of maintenance and improvements specific to bicycle/pedestrian facilities.

The objectives of the roadway shoulder improvements are to improve roadway safety operations and to facilitate pedestrian and bicycle travel through the refuge. The safety of all road users is a primary concern of the refuge. Because of the wildlife that lives on the refuge and the number of vehicles traveling on refuge roads, there is potential for vehicle, pedestrian, and animal conflicts. In anticipation of the increase in roadway use by bicyclists and pedestrians as a result of the improvements, the refuge could consider other amenities that increase roadway safety. For example, the refuge may consider increasing education, signage, or patrols as a means to communicate changes in the patterns of roadway use. Updates to the refuge website or print materials might remind drivers to expect bicyclists and pedestrians on the roadway, and provide pedestrians and bicyclists with general rules and safety regulations regarding wildlife and other issues. Signage helps to communicate the need for caution, especially for bicyclists approaching the numerous cattle crossings throughout the refuge road network. Lastly, refuge patrol staff can help reinforce the need for safe travel by reminding motorists they could expect to encounter not only wildlife, but bicyclists and pedestrians on the roadways.

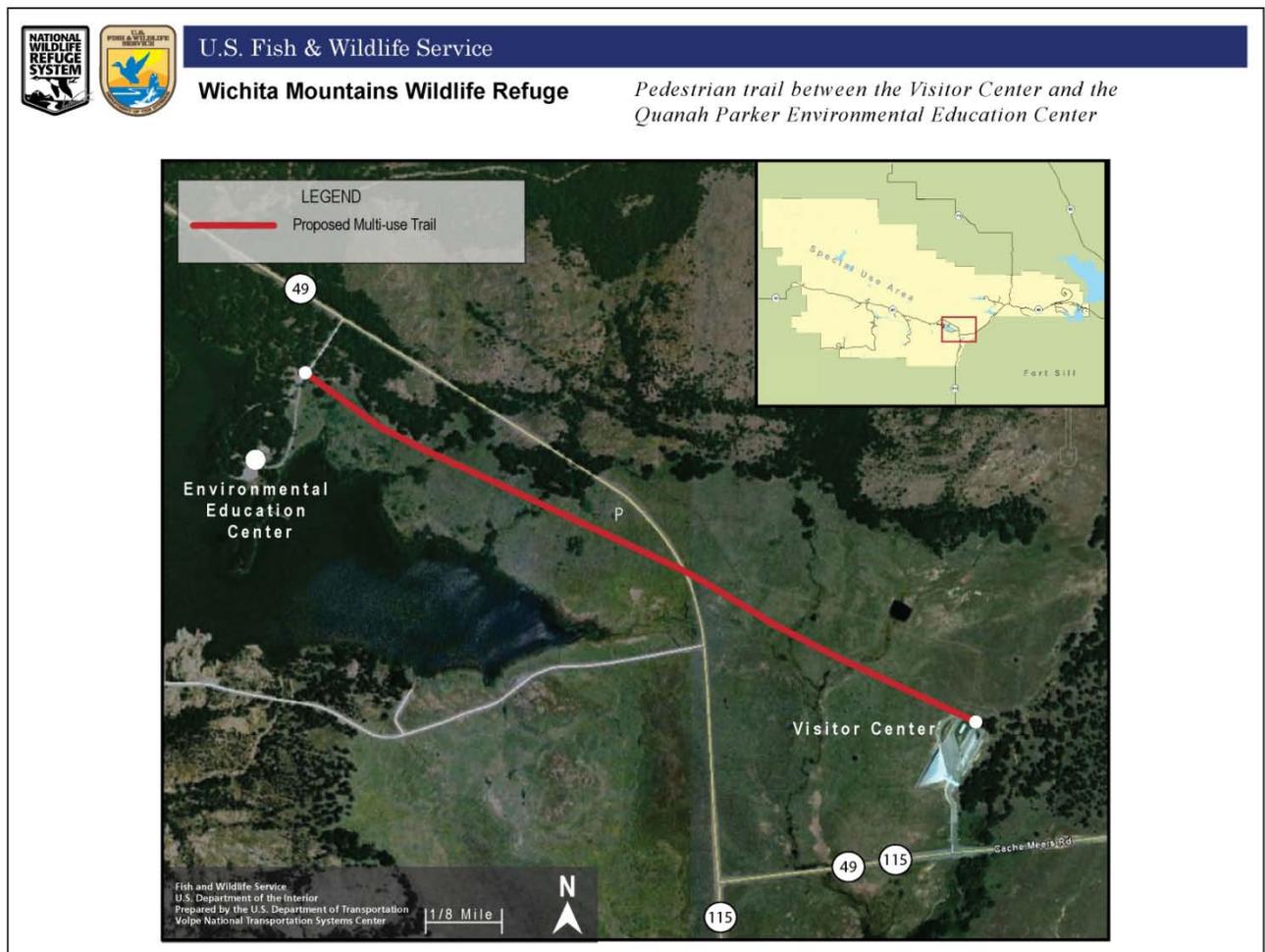
7.4. Option 4: Trails

Two trail options provide a means to increase non-motorized access to, and between, sites on the refuge; one is between the visitor center and Environmental Education Center (EE Center) and the other is along Burma Road. Both trails utilize existing right of ways (ROWs). The first would create a pedestrian trail between the visitor center and the EE Center. The second would locate a multi-use trail along Burma Road along the southern boundary of the refuge west of Cache Gate.

Visitor Center to EE Center Trail

The refuge could develop an existing underground utility ROW, between the refuge visitor center and the EE Center, into a pedestrian trail approximately 1/2-mile long (see Figure 33). The refuge currently hosts popular environmental education programs at the EE Center. The refuge youth program at the EE center alone attracts thousands of school-aged children from the surrounding region.⁶⁹ The provision of a trail connection between the visitor center and the EE Center would create a safe and efficient means to walk between the two locations, and could supplant the need to drive groups between the sites.

Figure 33 – Refuge visitor Center to Environmental Education Center Trail



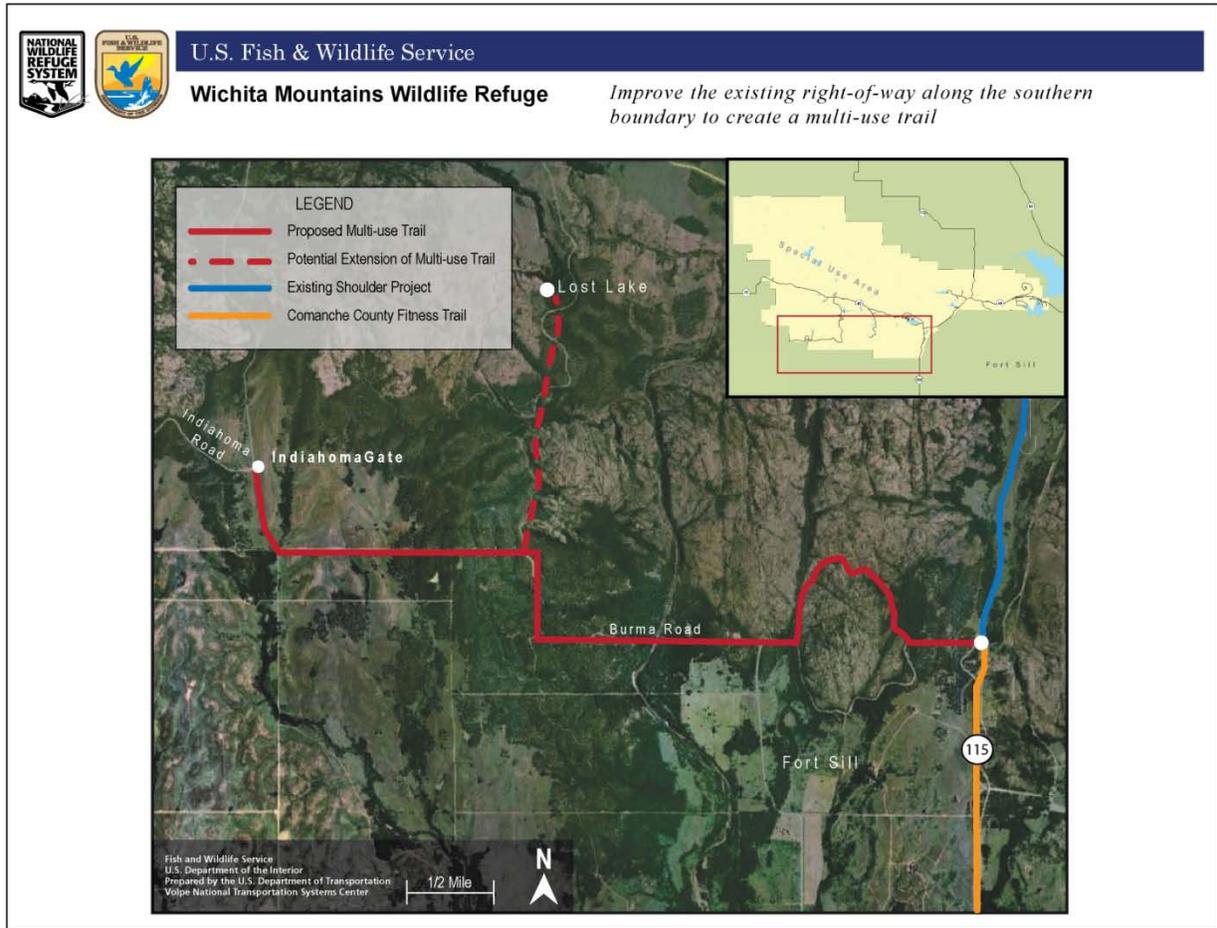
Source: U.S. DOT, Volpe Center

⁶⁹ Wichita Mountains Wildlife Refuge. <http://www.fws.gov/southwest/refuges/oklahoma/wichitamountains/ee.html>, Accessed May 4, 2010.

Burma Road Trail

The Burma Road trail would be along an existing ROW on the southern boundary of the refuge between the Cache Gate and Indianhoma Gate (see Figure 34). This option establishes the trail as an official hiking and off-road bicycle multi-use trail, for a distance of approximately 4 ½ to 5 miles. An additional leg to the trail could connect to another existing ROW (less than one mile in length) that leads to Lost Lake.

Figure 34 - Burma Road Multi-use Trail



Source: U.S. DOT, Volpe Center

7.4.1. Purpose

The purpose of these trail options is to begin to create a safe, efficient network of non-motorized access to popular sites on the refuge. These trails focus use where the refuge has existing infrastructure that can accommodate a high degree of visitation, in terms of people and automobiles. The EE Center has less parking availability than the visitor center. Providing a method for individuals and groups to travel between the sites without the use of an automobile reduces the need to accommodate vehicles at the EE Center, and instead maintains them at the visitor center where parking space, especially for larger vehicles such as tour buses, is sufficient. The Burma Road trail leverages the opportunity to enlarge the non-motorized trail network that exists from the Comanche County Fitness Trail that officially ends at the Cache gate but will continue in a de facto manner on the refuge roadway shoulders north along OK-115. The Burma Road trail could intersect with the shoulders to create an even larger non-motorized connection to refuge areas like Lost Lake and Indianhoma Road.

7.4.2. Goals

By utilizing existing ROWs between the visitor center and the EE Center and along Burma Road, the refuge could pursue transportation management options that reduce the impacts of travel on the refuge while not increasing the footprint of the refuge. Additionally, both trail options enhance visitor experience by providing additional outlets for recreation and access to refuge sites using an active and sustainable mode of travel.

7.4.3. Partners

These trail projects are entirely on refuge land, making them refuge-specific projects. However, the refuge could explore potential partnerships to assist with trail creation or capital construction funding. Trail design or maintenance resources may be available from area groups like the Treasure Lake Job Corps program or Fort Sill that may have design capabilities (e.g. the Army Corps of Engineers) or reserves of labor power. In addition, Comanche County and the Oklahoma FitKids may be partner sources for capital improvement funds as a means to complement the Comanche County Fitness Trail.

7.4.4. Cost

The discussion of costs in Chapter 7.2.4 includes a variety of trail cost estimates that may be appropriate for the improvements in this option.

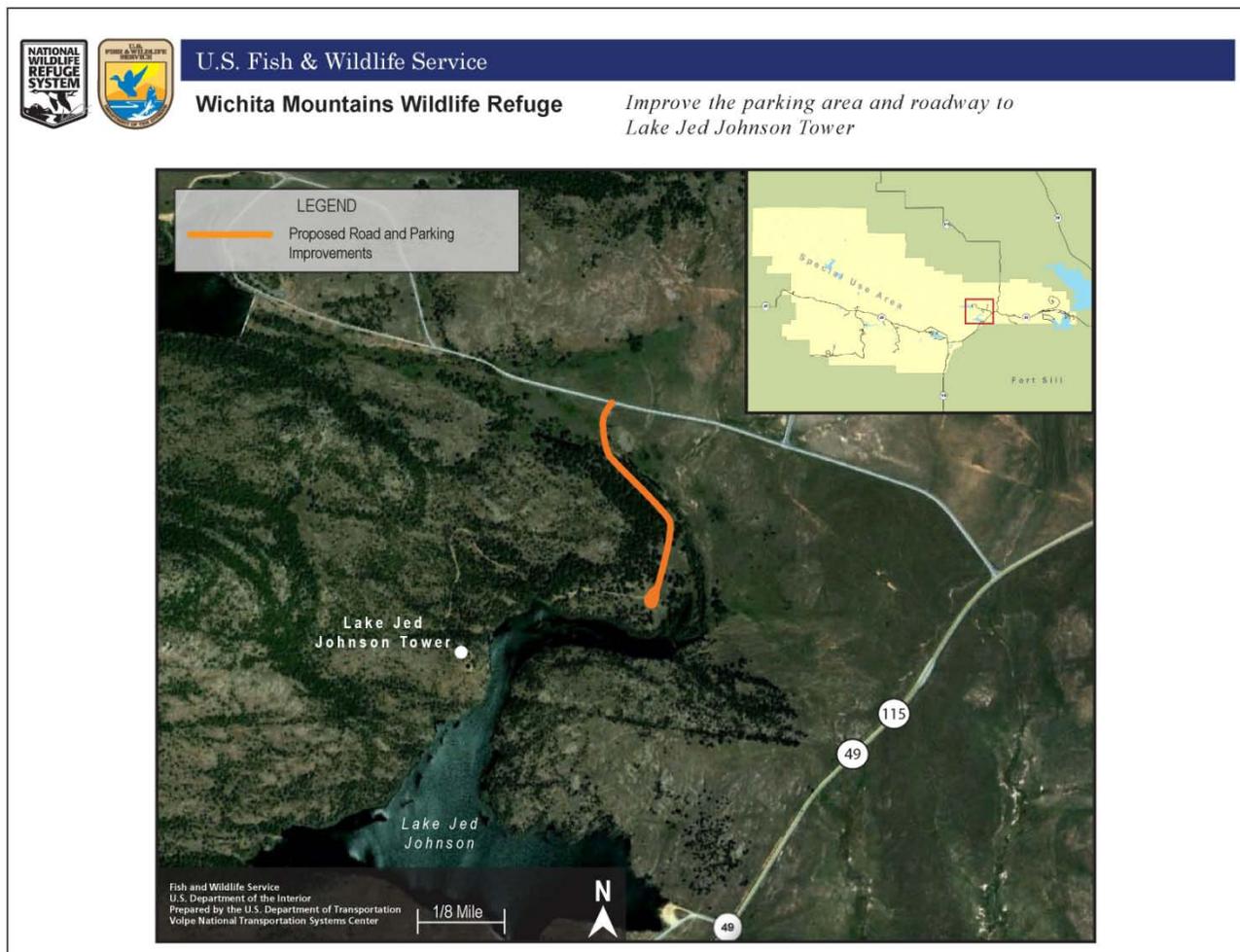
7.4.5. Implementation Considerations

In addition to the implementation considerations (see Chapter 7.2.5), this trail project could leverage the community momentum that the Comanche County Fitness Trail creates. Coordinating improvements on the refuge with the timeline of completion for the fitness trail provides the opportunity for joint marketing activities, and promotion to the benefit of the refuge and the surrounding communities.

7.5. Option 5: Lake Jed Johnson parking and roadway improvements

Lake Jed Johnson is one of the largest reservoirs on the refuge. It is near OK-115/OK-49 (see Figure 35) and offers recreational boating, fishing, and hiking opportunities. The Lake Jed Johnson Tower, a Works Progress Administration project built in the 1930s, is also on the site. The tower is not currently open; however, the refuge is considering rehabilitating it for climbing, viewing, and photography activities, but would need to improve the approaching roadway and parking area to accommodate pedestrians, bicycles, and larger vehicles. Transportation improvements to the area may include resurfacing the roadway from OK-115/OK-49, striping the parking area, and installation of wayfinding signage, as well as configuring the roadway to better accommodate larger vehicles, such as buses.

Figure 35 - Lake Jed Johnson Parking and Road Improvements



Source: U.S. DOT, Volpe Center

7.5.1. Purpose

Access improvements at Lake Jed Johnson would help to facilitate and promote the area as a unique and desirable attraction on the refuge. According to refuge staff, there has been an increase in interest from commercial tour operators to make regular visits to sites throughout the refuge and parking and turnaround areas at Lake Jed Johnson are not adequate. This results in an inefficient use of the parking area, and potential conflicts for buses or large vehicles needing to maneuver through the parking area. The refuge is responsible for providing recreational and educational opportunities to a broad group of users, and must balance these responsibilities with refuge resource protection needs and goals. Visitor enhancements to the Lake Jed Johnson area provide a way to manage individual and group tour visitation consistent with refuge objectives.

7.5.2. Goals

The refuge indicates a desire to shift usage of the refuge from areas of heavy use, such as Doris Campground and the prairie dog town, to areas of the refuge that experience less usage. The Lake Jed Johnson area is a logical place to direct visitation because it is an existing "hardened" area, with no need to construct new roads or major facilities. This option supports the objective of managing the

transportation network to preserve the existing natural resources on the refuge, and improves visitor opportunities to experience the refuge without a large impact on these resources. Better management of the area to accommodate larger groups and enhance opportunities for activities and educational interpretation at the site supports the objective of providing the public with an understanding of refuge goals for preservation and conservation of natural resources, while increasing access to less ecologically-sensitive areas on the refuge.

7.5.3. Partners

This project is entirely on refuge land and the infrastructure improvements to the area are refuge-specific. However, enhancements to the area that increase recreational or interpretive activities provide opportunities to partner with groups like Friends of the Wichitas or private commercial tour operators to make Lake Jed Johnson a more popular amenity and destination for visitors.

7.5.4. Cost

The access roadway to Lake Jed Johnson is 0.30 miles long and roughly 20 feet wide, creating two 10-foot travel lanes. Improvements to the roadway should accommodate multiple road users and large vehicles, suggesting that the refuge should increase the width of roadway shoulders by at least four feet on each side.⁷⁰ Using the cost estimate for the current roadway shoulder improvement project, the cost would be approximately \$300,000.

In addition to roadway improvements, the refuge may consider striping the parking lot at Lake Jed Johnson to facilitate efficient use of the area as visits to the area increase. The parking area at Lake Jed Johnson is approximately 8,200 square feet. Comparing this parking lot to the visitor center parking area that is similar in size, the Jed Johnson Lake parking lot could accommodate between 60 and 70 parking stalls. The average cost of parking lot striping paint is \$0.24-\$0.34 per foot, plus equipment and labor costs.⁷¹ The average length of parking stalls that meet ADA requirements are 16-18 feet. Table 16 provides striping cost estimates from local companies that perform parking lot maintenance and striping. Labor and equipment costs increase cost by approximately \$400.

Table 16 - Parking Lot Striping Cost Estimate

Parking stalls (16'-18')	Cost
60 stalls	\$460.00 to \$520.00
70 stalls	\$530.00 to \$850.00

7.5.5. Implementation Considerations

Implementation of this project relies on additional refuge actions for accommodating increasing visitation at Lake Jed Johnson. Improving the approaching roadway and parking area is only a part of the potential overall site needs. The refuge is considering refurbishing the Lake Jed Johnson Tower to allow for climbing, providing additional interpretive opportunities and trail signage, and making enhancements to the existing trail. Therefore, the refuge can implement roadway and parking improvements any time prior to the other site enhancements. The design and striping of the parking area should comply with the requirements of ADA guidelines for accessible parking facilities.

⁷⁰ AASHTO Guide recommends a minimum of 4-foot paved shoulders for shared roadways with speeds less than 50 mph. AASHTO Guide for the Development of Bicycle Facilities. 1999. P.16 http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf, Accessed May 25, 2010.

⁷¹ Averages obtained from: Precision Striping Oklahoma <http://precisionstripingusa.com/>, Accessed June 2, 2010. Professional Parking Lot Services, Oklahoma City, OK, (405) 728-0244; and A-Line Striping, Inc., Oklahoma City, OK, (405) 225-6773.

7.6. Option 6: Wayfinding and Signage

Enhancing the roadway⁷² wayfinding system of information and signage suitable for motorists, bicyclists, and pedestrians would help visitors find their location and navigate to and through the refuge. Elements of a comprehensive wayfinding system consider sign location, the types of signs used in terms of dimensions, height, and aesthetics, and the information given. For example, a system of signs can provide clear information on direction, destination, distance, route or road names, and issues relevant to visitor needs for restroom facilities, water, telephone services, viewing, photography, or hiking opportunities, among others.

7.6.1. Purpose

Improvements to the refuge wayfinding signage system will improve refuge awareness, increase visibility to travelers in the region, and attract more visitors. Signage improvements will benefit the visitor arrival experience and could help ensure that visitors new to the region find the refuge more easily. New signage will help to encourage alternative transportation, aid motor vehicle traffic, and will strengthen the identity of the refuge and its surrounding communities. Providing information that considers bicycle or pedestrian travel, for instance, by using smaller increments for distances (quarter miles, instead of whole miles) (see Figure 36), provides recognition that other modes use refuge roads. This encourages more bicycle and pedestrian visits to the refuge, supporting the need to improve access and accommodation for these modes of travel.

Enhancing signage also provides an opportunity to brand the refuge and the adjacent communities. For example, a more strategic use of FWS specific logos and graphics on refuge signs helps to communicate and remind visitors of the unique nature of the surrounding landscape. In addition, revamping the current wayfinding and signage system presents opportunities to coordinate with installing NSB signage.

Figure 36 - Example of Bicycle-and Pedestrian-specific Signage



Source: City of Gresham, Oregon (left), Fort Stanwix National Monument (right)

⁷² This option only considers roadway specific wayfinding needs and does not take into consideration information and signage specific to hiking trails or interpretive signage needs.

7.6.2. Goals

Improvements to the roadway wayfinding and signage system can improve the visitor experience, make better use of refuge sites, and strengthen community partnerships. Signage that considers the informational needs of all road users helps to facilitate bicycling and walking on the refuge. Providing options for alternative travel on the refuge helps to manage increasing visitation when visitors choose not to drive onto the refuge. Refuge signage that incorporates information on area communities, such as Medicine Park, Cache, Meers, and Fort Sill, creates collaborative partnerships between the refuge and these areas, which are often destinations for visitors before or after their trip to the refuge.

7.6.3. Partners

Partners for this option could include the NSB program and neighboring towns (see above) that want to provide direction to recreational sites or attractions off the refuge. The NSB designation presents the opportunity for the refuge and surrounding communities to “brand” the byway and surrounding attractions, while bicycle and pedestrian improvements could build upon this branding to promote alternative modes of travel between nearby sites and the refuge, such as between Fort Sill (LETRA), Medicine Park, the new MPMNS, and the refuge. Coordination among partners strengthens funding opportunities while reducing the potential for wayfinding confusion.

7.6.4. Cost

New refuge signage on state highways requires an application with ODOT. ODOT, in consultation with the refuge, considers the size, dimension, and information on the signage and provides a cost estimate. ODOT costs reflect materials, handling, and labor for installing. Sign costs are calculations that include per square feet of signage, linear square feet of post, and steel and concrete used in the signage footing. According to ODOT, the typical supplemental guide signs, (brown signs) located through the refuge that are roughly 14- feet by 7-feet cost \$4,000 per sign, including concrete, fitting, and labor for installation. If replacement signs are the same size, the existing concrete and footings can be re-used, which reduces the costs. Additionally, tourist oriented directional signage (small blue signs) often located at highway interchanges cost \$200 per sign including installation. The addition of graphics to signage does not increase cost, unless the square footage of the sign increases to accommodate the graphic.

7.6.5. Implementation Considerations

The refuge could complete a signage plan for all roadway users for the travel routes on and surrounding the refuge. Many U.S. cities have models of bicycle and pedestrian specific wayfinding systems that orient signage and information towards walkers and bicyclists on sidewalks, paths, or in other public areas and are distinct from motor vehicle signage. Considering the context and composition of the refuge road network and along multi-use trails, the distinction between the two wayfinding systems is not necessary, but may be desirable. Currently, the refuge only allows bicyclists on one off-road trail that runs behind Mount Scott. Therefore, the majority of bicyclists traveling through the refuge share the road with vehicles. However, the refuge should consider appropriate signage as it improves conditions for bicycle and pedestrian use along existing roads and trails, such as those improvements included in this report: the shoulder improvement project, Burma Road, and the LETRA multi-use trail. Designing a system appropriate to all road users would be the most cost effective and efficient way to implement such a system.

A signage plan should identify the location of existing signs, locations appropriate for new signs, and consider the number, color, size, material, and font of new signs, and should coordinate with the placement of NSB-specific signs. Further, any sign plan will need to coordinate with other refuge operations like the Holy City and the Treasure Lake Job Corps site to create consistency and meet the information communication need of these sites. The plan should be consistent with FWS Sign Handbook guidance for sign policy and placement. New refuge signs should comply with the Manual of Uniform Traffic Control Devices (MUTCD). The FHWA publishes the MUTCD and defines the standards that road managers use for the installation and maintenance of traffic control devices on all public roads and highways.

7.7. Option 7: Traveler Information System

A regional Traveler Information System (TIS) could benefit the refuge and its visitors by providing better traveler information to existing visitors and helps attract new visitors. A TIS may include a visitor-oriented website or could display information at physical locations like visitor centers or highway rest stops. A TIS provides travelers with information to facilitate decisions about route choice, departure time, trip delay, parking availability, and multi-modal transportation options. Such a system could also provide information on refuge special events like annual hunts, auctions, and activities at the Holy City, and on area events and attractions at places such as Medicine Park, LETRA, the annual Tour de Meers, and the future MPMNS, thereby strengthening the regional identity for visitors to the Lawton-Fort Sill area and the refuge. Figure 37 illustrates an example of a TIS, the Schuylkill River National and State Heritage Area (Pennsylvania) trip planner, which provides user-specific approach to determining site destinations.

Figure 37 - Schuylkill River National and State Heritage Area Online Trip Planner



Source: Schuylkill River National and State Historic Area. <http://www.schuylkillriver.org/>. Accessed March 15, 2010.

7.7.1. Purpose

This option addresses the need to accommodate increases in visitation, and leverages opportunities that the NSB designation of the main routes through the refuge presents. A TIS provides information about regional travel issues specific to the refuge and neighboring sites, as well as through marketing and “branding” opportunities, improves regional identity. The demand for information about how to reach the refuge and the availability of recreational, cultural, and historic opportunities will grow as visitation increases. Additionally, University of Oklahoma (UO) Outreach in partnership with ODOT promotes state byways through a website (<http://www.okscenicbyways.org/>) for all of Oklahoma’s scenic byways. The FHWA also maintains a national website that provides similar information on the Wichita Mountains NSB (<http://www.byways.org/explore/byways/6334/>). The creation of a coordinated TIS would draw upon existing area partner websites and planning efforts surrounding the recent designation of the byway.

7.7.2. Goals

Providing better information to visitors enhances the visitor experience when travelers can access valuable information about the refuge and surrounding communities in advance of their visit. A TIS could also help to support a greater public understanding of refuge goals for wildlife and habitat by communicating information about refuge-specific concerns - for example, rules for buffalo viewing. Additionally, this option could allow the refuge to use area partnerships as a means to combine resources to implement a system that would benefit all participants.

7.7.3. Partners

Potential partners in the creation of a TIS include Fort Sill, Medicine Park, Comanche County, Meers, the Lawton-Fort Sill Chamber of Commerce, and the Wichita Mountains NSB. These and other groups could coordinate marketing and traveler information, using a consistent theme for wayfinding, wayshowing⁷³, or wayside interpretation. The refuge could coordinate at the state level with OU and at the national level with the NSB program to provide additional traveler information on each website. Currently, the Lawton-Fort Sill Chamber of Commerce website provides some refuge information; however, it could provide more specific traveler information for the refuge, such as peak visitation times at Mount Scott and the Sunset picnic area. The TIS could include information on refuge and regional activities and coordinate information in various venues to assist with joint tourism and marketing efforts.

7.7.4. Cost

The cost of developing a TIS depends on the overall structure of the site, its graphics design, database development, programming specifications, software requirements, and deployment. Development of a standalone, visitor-oriented website is highly variable, and might range from \$50,000 to \$200,000. The actual costs depend on the level of functionality and interaction that the site provides. For example, the creation of a website that processes user transactions (e.g. purchases), or provides user specific outputs (e.g. tailored itineraries), will be more expensive. In addition to development costs, a TIS would require regular maintenance and updates. The cost of basic maintenance is estimated at \$10,000 per year, but may vary depending on the final design of the site.

7.7.5. Implementation Considerations

A TIS should meet the communication and internet needs of the refuge. Maintaining and updating a website should not significantly add to the workload of refuge staff. The TIS must be flexible enough to accommodate the potential limitation of time and resources available for its development and maintenance at the refuge level. The development of a TIS in coordination with area partners that already provide recreation and destination based information, such as the Lawton-Fort Sill Chamber of Commerce, or the OU Scenic Byways website, may increase the efficiency of providing traveler information by limiting redundancy of efforts. The provision of traveler information should be sensitive to refuge-specific needs and the needs of area partners. For example, the refuge may want to promote resource conservation through “low-impact” visits, while a partner may want to highlight available commercial activities. The methods of providing traveler information under a partnership model should be flexible enough to accommodate the needs of the refuge while also unifying the identity for the Wichita Mountains region and its partners. The design of any internet-based system should comply with the ADA guidelines⁷⁴.

7.8. Option 8: Bicycle Share Pilot Program and Bicycle Route Identification

Bicycle share programs are becoming increasingly popular in cities, towns, colleges and universities, and at private companies across the country. These systems make bicycles available for shared-use by individuals may not own bicycles, or who would choose to use them if available at specific locations. Bicycle share models are numerous and can vary from simple programs to complex high-technology programs. The former model may simply provide drop-off and pick-up stations for bicycles within a

⁷³ Assisting visitors in finding their way. Source: <http://www.bywaysresourcecenter.org/topics/visitor-experience/wayshowing/>. Accessed June 3, 2010.

⁷⁴ U.S. Department of Interior – Accessibility, <http://www.doi.gov/accessibility.cfm>. Accessed June 3, 2010.

given area, or could provide low-cost or free bicycles at locations without staff to monitor the program. These systems are similar to standard bicycle rental programs and are relatively low-cost to provide. The latter system may involve the use of credit card or smart card readers that allow for the rental of secured-bicycles at unstaffed locations. Members of this type of program pay a monthly and hourly fee for the use of the system, as in the case of the Velib program in Paris. These systems are considerably more expensive because they often incorporate the use of complex technology, proprietary or specialized bicycles and locking mechanisms, on-line payment /reservation systems, and docking stations that increase capital costs and operations and maintenance costs.

Current bicycle share programs at federal land management agencies have generally been for employee use only. In January of 2009, the National Park Service (NPS) in the District of Columbia launched a one-year pilot program to provide bicycles at three NPS locations: the National Capital Region headquarters, the National Mall & Memorial Parks headquarters, and the National Capital Parks-East headquarters. According to NPS, the program will allow approximately 300 employees to use bicycles instead of government vehicles to travel between park sites as a means to promote alternative transportation and reduced automobile emissions.⁷⁵

Bicycle share programs for visitor use on federal lands are few; however interest in the use of these systems on public lands is growing. A current joint research effort by the Office of Federal Lands Highway and the Western Transportation Institute⁷⁶ is analyzing the issues and challenges that federal land agencies face in implementing bicycle share programs. The project, ending in 2011, will provide valuable information on current bicycle share models, liability and risk management issues, and a synthesis of best practices as a means transfer this knowledge and recommendations to agencies that have interest in exploring bicycle sharing programs. Figure 38 illustrates examples of visitor-oriented bicycle share programs at Texas state parks.

Figure 38 - Bicycle Sharing at Texas State Parks



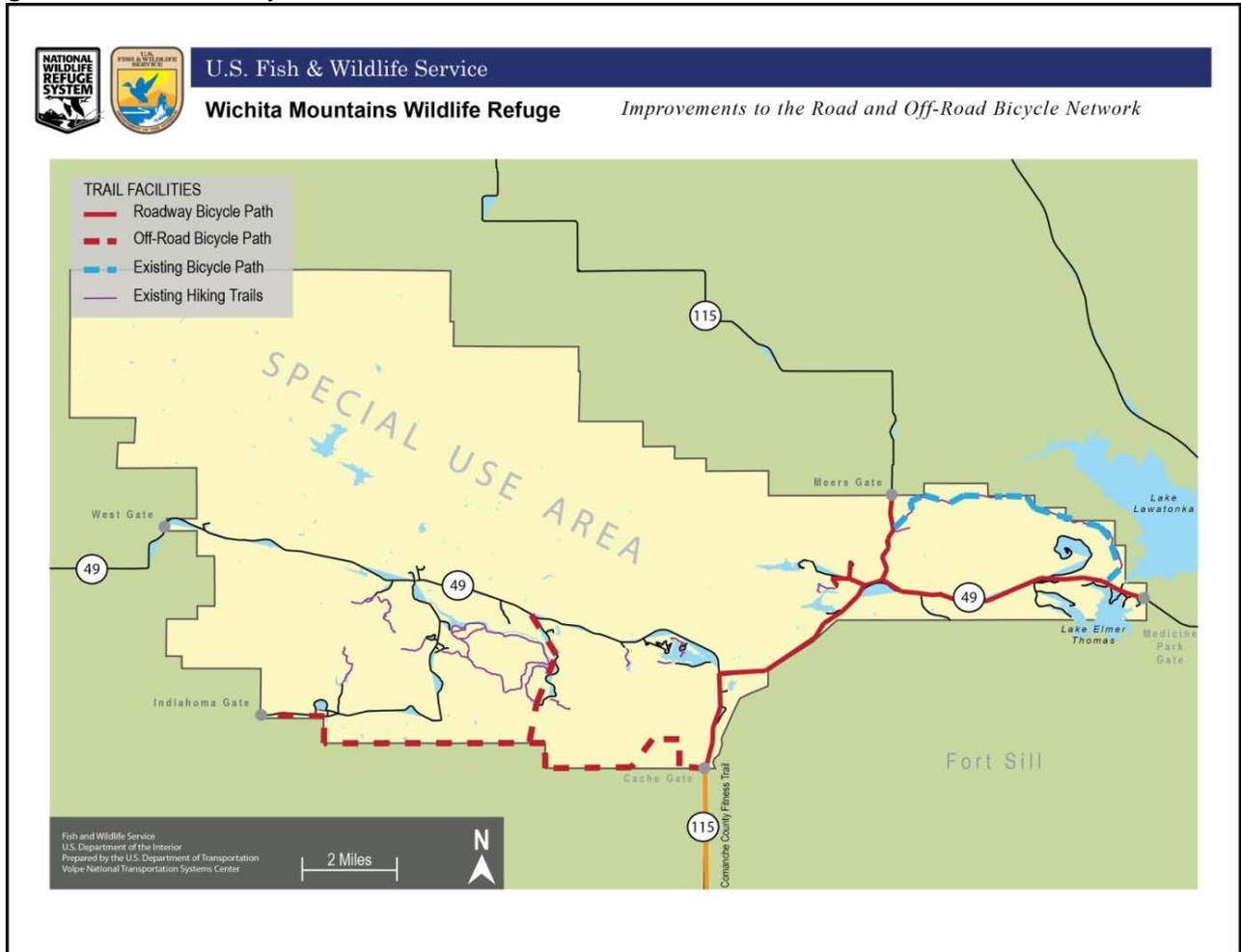
Source: U.S. DOT, Volpe Center, at Old Hidalgo Pumphouse (left) and Bentsen – Rio Grande Valley State Park (right); Texas

⁷⁵ NPS Digest. <http://home.nps.gov/applications/digest/printheadline.cfm?type=Announcements&id=7237>, Accessed May 18, 2010.

⁷⁶ Conversation with Susan Law, project manager at Federal Highway Administration, Central Federal Lands Highway Division. For more information see, <http://www.westerntransportationinstitute.org/research/4w2774.aspx>.

A bicycle share program depends on safe, convenient bicycle facilities. Currently, the refuge allows bicycles on one off-road trail behind Mount Scott and along refuge roads. The refuge is beginning to improve shoulders along certain refuge roads, and this study analyzes several areas to further improve and/or add shoulders or establish new multi-use trails (e.g., LETRA and Burma Road). If the refuge seeks to make these improvements, a bicycle route network will begin to take shape tying into efforts off the refuge such as the Comanche County Fitness Trail. Figure 39 shows a potential bicycle path network, complete with maps and signage indicating to both bicycles and other road users that bicycles may be present.

Figure 39 - Potential Bicycle Path Network



Source: U.S. DOT, Volpe Center

7.8.1. Purpose

Establishing a bicycle share pilot program at major attractions on the refuge and destinations outside of the refuge along with the identification or creation of safe bicycle routes would accommodate increases in visitation, while facilitating active and sustainable means to access and experience the refuge. This option could help to manage automobile traffic on the refuge if visitors choose to either ride to the refuge from a surrounding bicycle share location, or park at the refuge and use a bicycle to tour the refuge. In addition, it facilitates active recreational opportunities and introduces visitors new to bicycling, or that choose not to bring bicycles, to a way to experience the refuge and its surroundings.

7.8.2. Goals

A bicycle share program on the refuge improves visitor experience, helps to diversify the existing transportation network by providing sustainable and safe bicycle accommodations, and improves the natural environment of the refuge. The promotion of bicycling on the refuge could provide an additional means of interpretation and communication to visitors regarding resource protection and bicycle safety. A bicycle share program also helps to manage congestion, demands on parking, and the noise and pollution that results from motorized travel. By providing a non-motorized means of travel on the refuge, both automobile travel and emissions are reduced.

7.8.3. Partners

Establishing a bicycle share pilot program and complementary bicycle routes provides an opportunity for the refuge to partner with any number of stakeholder groups to manage program operations, or to provide additional services like bicycle tours. Refuge bicycle tours have eco-tourism potential that may be attractive to groups like the friends group, the future MPMNS, Fort Sill, Oklahoma FitKids, or local private concessionaires.

7.8.4. Cost

A low-technology bicycle share pilot program on the refuge could utilize a simple business model approach to keep initial start up costs low. Implementation and operation costs depend upon several factors including, the length of the pilot program (e.g. peak season months or longer), number and type of bicycles procured, the number of bicycle station locations, labor to staff stations, maintenance of bicycles, insurance requirements, development of communications materials, the procurement of items like helmets, locks, and bicycle lights, and program evaluation costs. A pilot program could be run by the refuge with a partner, such as the Friends of the Wichitas, or run by a private vendor by contract or permit, with refuge oversight. Implementation by a private vendor could decrease the refuge's own capital and operation costs if the vendor maintains a bicycle fleet, associated items, and maintenance tools. Contracting such a service to a private entity may also simplify some of the refuge's administrative and liability responsibilities. Another possibility is for partners to solicit interest in operating a bicycle share program that originates off the refuge, for example in Medicine Park.

The cost estimate for a bicycle share pilot program varies, and best estimates range from \$35,000 - \$50,000. The refuge and/or partners can consider methods of off-setting the cost of implementation, operation, and maintenance by considering a fee for bicycle rentals, for example per hour and/or for a day.

7.8.5. Implementation Considerations

Providing safe and accessible bicycle facilities on the refuge for travel or recreation is an important way to link major sites like the visitor center, campgrounds, and trailheads with local attractions and communities. Additionally, non-motorized networks positively affect the health of visitors, their experience, and the environment of the refuge. However, safety considerations and the dominance of the automobile as the main way to experience the refuge may affect the implementation of a bicycle share pilot program. Concerns for user safety and refuge liability are vital.

Increasing the number of bicyclists on the roads to and through the refuge should be met with improvements to the current road system, as the options above detail in relation to roadway shoulder and multi-use trail improvements and enhancements to signage. Further, in 2004, the last year that counts are available, there were 25,770 bicyclist visits at the refuge, representing just slightly over 1% of the total visits to the refuge.⁷⁷ The traffic analysis study (option 1) can address bicycle use and assess feasibility new bicycle improvements. Though refuge staff indicates a growing presence of bicycling on the refuge, there needs to be a perception by visitors that such activities are both safe and desirable. Visitors who see other bicyclists on refuge roads, and amenities like signage, and who receive refuge-specific bicycle education, are more likely to encourage them to try it themselves.

7.9. Option 9: Transit Shuttle Feasibility Analysis⁷⁸

Growth in the surrounding communities will impact visitation and traffic through the refuge. The refuge and its partners could consider conducting a transit shuttle feasibility study as a means to offset increases in vehicle visitation to the refuge.⁷⁹ A shuttle route through the Public Use Area (PUA) of the refuge, with potential connections to area communities, could enable some visitors to park at a specific location and use transit to access the most popular areas of the refuge, helping to reduce traffic and demand at parking lots with capacity limits. A shuttle route could connect all of the main attractions throughout the refuge and neighboring communities, including Mount Scott, the visitor center, trailheads, parking and recreation areas, campgrounds, and the communities of Medicine Park and Fort Sill. Alternatively, a shorter route could link the visitor center with the summit of Mount Scott, one of the most popular destinations on the refuge.

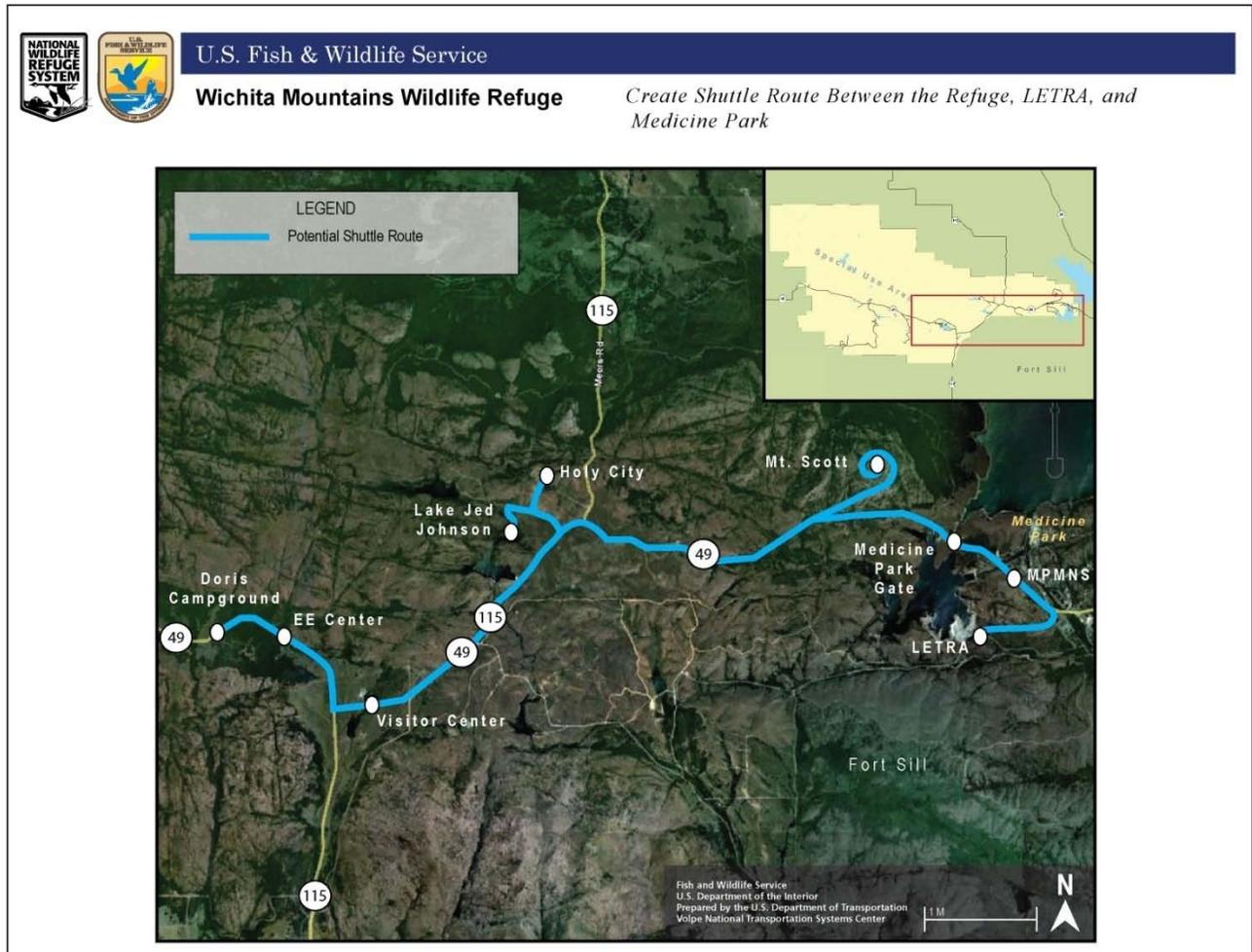
A transit feasibility study would determine the demand for transit and the appropriate scale of a system, its composition, and operations. It would define transit system requirements, system operations, route alternatives, and provide final recommendations, including the funding options for transit on federal lands. Transit system requirements include parking locations, fee collection, transit shelters, vehicle storage and maintenance facilities, fueling options, and transit fleet characteristics. Transit system operations include information about potential partnerships, operation seasons, times of operation, acceptable vehicle headways (the time between shuttles, which indicate how long visitors wait), vehicle ownership, and operations. Transit route alternatives would consider varying route alternatives and the associated operational costs of each option. Lastly, recommendations would provide the refuge with guidance to determine the best transit shuttle option about partnership opportunities, existing needs, and priorities for accommodating visitation. Figure 40 illustrates a potential transit route connecting the major destinations on the refuge.

⁷⁷ *Ibid.* P.57

⁷⁸ Initially, the scope of this study included an in depth analysis of transit ridership estimates and costs. However, because little data exists on the origin or destination of refuge visitors, length of stay, or the attractions visited, this study calls for a traffic analysis study (option 1) to determine these factors prior to implementing any transit initiative. The transit feasibility analysis described herein would determine specific transit demand and cost estimates based, in part, on the information provided from the traffic analysis.

⁷⁹ The Paul S. Sarbanes Transit in Parks (TRIP) program (FY 09) awarded the refuge funding to replace the current shuttle bus in use for tours into the Special Use Area. A transit feasibility study would not focus on this service, but could consider it in terms of a desired connection to a service through the PUA roads.

Figure 40 – Potential Refuge Transit Service Route



Source: U.S. DOT, Volpe Center

7.9.1. Purpose

A transit feasibility study provides an opportunity for the refuge to study coherent future transportation planning decisions regarding how to best accommodate visitation increases on the refuge. A feasibility study objectively considers the requirements of a shuttle system and the costs to maintain and operate it. It is not a foregone conclusion to implement a transit solution; instead, it provides the necessary baseline information to determine the potential functioning and viability of the system. This information can be valuable for making long-term management decisions about the refuge transportation network, especially as visitor trends change over time.

7.9.2. Goals

Conducting a transit shuttle feasibility study is consistent with refuge goals of enhancing visitor services, providing sustainable transportation options, and building partnership opportunities. Considering the potential of transit on the refuge represents a desire to maintain access for visitors to resources without increasing the human footprint and human impact to wildlife and habitat resources. By supplanting vehicle travel, or reducing it, transit options present a sustainable form of travel through the refuge. Such a study could also determine appropriate levels of collaboration by area stakeholders. For example, a partnership agreement might stipulate that the refuge provides the capital expenditure to procure the transit vehicles, while another entity maintains and operates the service.

7.9.3. Partners

Partners in a transit feasibility study could include all the major stakeholders in the surrounding communities of the refuge, including the Lawton Area Transit System (LATS), Medicine Park, MPMNS, Fort Sill, as well as potential local private concessionaires.

7.9.4. Cost

The cost to conduct a transit feasibility study depends on the level of detail the refuge requires. A conceptual study might range from \$25,000 to \$40,000. A study to analyze a more complete shuttle analysis, including operational considerations and vehicle selection can vary between \$50,000 and \$150,000, which includes simple, previously identified routes at the lower end of the scale and an analysis of multiple potential routes towards the higher end.

7.9.5. Implementation Considerations

A transit feasibility study can provide useful information to inform future transportation planning on and surrounding the refuge, and the traffic study option can influence the design of the study. However, prior to commencing such a study, the refuge could informally survey partners like LATS or MPMNS to determine the feasibility of creating a partnership business model for providing such a service. The operational costs of a transit system can be substantial and the refuge may not be able to sustain such costs. As such, a partnership model may be the best alternative for providing a shuttle system service at the refuge.

The traffic analysis study should precede a transit study, particularly in determining origin-destination information and how much time visitors spend at particular attractions on the refuge and nearby. Through the traffic study, the NVUMP, and/or other studies, the refuge should consider transit options particularly with regard to visitor preferences regarding transportation on the refuge (i.e. the refuge should take advantage of opportunities to ask visitors their desire for alternative transportation services). Finally, the refuge should consider implementing transit concurrent with or after implementing other transportation improvements. For example, improvements at Lake Jed Johnson should occur prior to implementation of transit service, as that option includes provisions that allow transit vehicles to access the site. Further, transit complements bicycle and pedestrian improvements by providing a “way home” for those who leave their private cars behind. As such, the refuge might consider implementing bicycle sharing prior to or concurrent with transit service.

Major shuttle systems are in use on numerous public lands facilities, notably at several National Park Service locations, including Acadia National Park, Zion National Park, and Glacier National Park.

Smaller systems also exist elsewhere, such as the U.S. Department of Agriculture (USDA) Forest Service shuttles at Sabino Canyon Recreational Area (AZ) and Grand Island National Recreation Area (MI). The success of these systems in many cases relies on transportation characteristics and issues that the refuge may not currently experience, related to roadway network composition, visitation characteristics, and parking constraints. For example, Sabino Canyon Recreational Area has a single two-way road that leads through the foothills of the Santa Catalina Mountains, which completely prohibits automobiles. Zion has 2.7 million annual visitors and runs a mandatory summer shuttle system, while restricting parking on its Scenic Drive. The system was implemented in 2000, as a means to mitigate severe congestion issues. These systems are successful in large part because of the constraints placed on available parking and automobile travel. Unless the refuge limits parking or vehicle access to specific sites, a transit shuttle may not attract a visitor demand that makes its operations sustainable. Alternatively, a partnership model for a transit shuttle connection among local sites with a concentration of potential riders, like Medicine Park or the future MPMNS, may be a practical option.

8.0 CCP and Implementation Considerations

Currently, the refuge is in the initial phases of the CCP, the planning process that defines the long-term management of biological resources on the refuge. As part of the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act), all national wildlife refuges are required to develop a CCP as a document that provides a framework for guiding refuge management decisions to be complete by 2012.⁸⁰ According to the Refuge Improvement Act the primary mission of the Refuge System is to “to administer a national network of lands, and waters for the conservation, management and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of America.”⁸¹ The Act does not specifically address the inclusion of transportation planning activities, but recognizes the need to address “significant problems that may adversely affect wildlife and habitat.” Transportation activities play a role in environmental degradation, including negative effects on air, water, and soil quality, the destruction of ecosystems and wildlife, and global climate change. Therefore, the inclusion of the transportation issues outlined in this report in the long range refuge planning process is imperative.

Refuge staff are defining potential alternative management approaches to a range of issues that face the refuge. The CCP will evaluate alternatives under the requirements of the National Environmental Policy Act. Preliminary issues the refuge identifies that comply with the definitions set forth by the Refuge Improvement Act for inclusion in the CCP include: habitat management, wildlife management, invasive species management, visitor services and facilities, and partners.⁸² Transportation issues affects each of these areas, thus the refuge should incorporate specific transportation planning activities into its long-range planning activities. This study and its proposed alternative transportation options provide a framework for refuge staff to consider transportation management decisions within the context of each of the identified issue areas and refuge planning goals.

⁸⁰ National Wildlife Refuge Association. <http://www.refugenet.org/New-issues/ccp.html> Accessed May 4, 2010.

⁸¹ National Wildlife Improvement Act of 1997: <http://www.refugenet.org/new-pdf-files/NWRS%20Improvement%20Act.pdf>, Accessed May 4, 2010.

⁸² Wichita Mountains Wildlife Refuge to develop a Comprehensive Conservation Plan. http://www.fws.gov/southwest/refuges/oklahoma/wichitamountains/pdf_files/WebWMWRscopingletter.pdf, Accessed May 4, 2010.

9.0 Next Steps and Conclusion

9.1. Next steps

This study proposes several actions the refuge can pursue moving forward. Most, if not all, of these actions should follow the next steps, including:

9.1.1. Define objectives related to refuge transportation goals and include in the CCP

This study stems from transportation goals the refuge defines. These goals are general statements that communicate the overall intention of refuge actions related to transportation planning. In contrast, objectives are specific and define precise actions or methods to accomplish a related goal. The refuge can use the information in this report, specifically, the transportation options, to create measurable objectives related to these refuge transportation goals. The refuge can also use information on cost and implementation considerations for each option to prioritize the actions to take that increase alternative transportation to and through the refuge. Through this process, tangible objectives will define refuge activities. For example, the refuge transportation goal related to *Visitor Services and Facilities to ensure the refuge transportation network enhances the visitor experience supports public understanding of refuge goals for wildlife and habitat, provides safe and reliable access to and within refuge lands, and uses and promotes sustainable transportation practices* may have a related objective of *the creation of a network of safe and efficient bicycle paths and facilities throughout the refuge*. Identifying specific actions that support refuge transportation goals increases the likelihood that the refuge will address potential transportation related problems, and meet the needs of refuge wildlife, habitat, and visitors.

9.1.2. Engage partners in the implementation of alternative transportation activities

After the refuge prioritizes specific actions by creating objectives for meeting its transportation goals, it can engage area stakeholders to support the implementation of the various strategies. Though the refuge could pursue many of transportation options in this report alone, some, like the provision of transit service would benefit from cooperation and partnership with area stakeholders. The recent designation of the primary roadways through the refuge as the Wichita Mountains NSB, in addition to transportation projects on and around the refuge, present unique partnership and coordination opportunities for the refuge and surrounding communities. Further, community stakeholders express support for on-going coordination with the refuge and among themselves. The refuge can build upon the positive community feedback and momentum of this study to further transportation planning efforts and activities.

9.2. Conclusion

This study follows from a request by FWS to conduct a Transportation Assistance Group (TAG) site visit to the refuge in the spring of 2009. The TAG report provides a high-level outline for transportation planning goals, alternative transportation options, and partnership opportunities for transportation activities at and around the refuge. The purpose of this study is to address preliminary transportation issues from the TAG including the lack of a comprehensive transportation plan for the refuge and the region, the designation of the primary route through the refuge as a National Scenic Byway, the significant growth at the nearby Fort Sill, opportunities to improve pedestrian and bicycling facilities at the refuge, and the concurrent development of the refuge's Visitor Services Study and Comprehensive Conservation Plan (CCP).

Building from the 2009 TAG, this study addresses the issues that the TAG report outlines, focusing on providing a substantial background and justification for a conceptual framework of alternative transportation options for Wichita Mountains to consider when addressing transportation needs and issues specific to the refuge. FWS could follow these options to facilitate better access to, and information about the refuge. These options do not require analysis and compliance pursuant the National Environmental Protection Act (NEPA); however, certain items may require FWS determination on NEPA requirements in subsequent planning efforts. In addition, this study considers area partnerships for the ability to add to the success of the transportation options, and a peer comparison of transportation related solutions on similar public land units as a means to share notable transportation related management practices.

The framework of this study builds from the transportation goals set forth by the refuge. It does not provide specific recommendations for action. Rather, it offers information to guide the future direction of the Wichita Mountains planning efforts in relation to accommodating alternative transportation. The information in this study provides important background for the refuge as it develops the CCP, and may be extracted or referenced for inclusion in the CCP as deemed appropriate.

APPENDIX A – Location and Context

The following table summarizes the CCP comments received related to trail, bicycle, and wheelchair access on the refuge.

CCP Scoping Comments on Accessibility

Issue Category	Comment
General Access	Paved multiuse trails, areas of the roads marked off for bicyclists, and share the road signs.
Handicap/Wheelchair	Access for visitors that are disabled or in wheelchairs to picnic areas, such as designate a parking and some sidewalks with shorter distances.
	More handicap accessible ramps in all areas.
Bicycle	A new proposed bike area using the west portion of Burma Road would complement the Mount Scott area on the east side.
	Create a bike area using Ketch Road, the boundary fence, and the Mount Scott picnic area.

APPENDIX B – Partnership Assessment

Partnership Assessment Background

This memo summarizes the selection of comparable “peer” sites and outlines a set of questions that we will ask during telephone interviews with representatives from the sites. The purpose of the peer comparison is to collect data about transportation solutions at federal land units that have characteristics in common with Wichita Mountains. While the refuge experiences its own unique challenges and opportunities, there are several federal land units throughout the U.S. that can share valuable learning experiences and ideas comparable to specific transportation needs and opportunities. The information we gather through the peer comparison can help guide the development of potential transportation alternatives.

We will carry out this task in four stages:

- I. Criteria Selection:** Determine, in coordination with refuge staff and partners, appropriate criteria for selecting peers.
- II. Peer Selection:** Select the peers for inclusion in the comparison and share with study partners.
- III. Research:** Prepare an interview guide and conduct interviews by phone or through email, depending on the availability of staff at peer areas. The Volpe Center will also gather information about peers’ issues and solutions from existing reports, web sites, and other literature.
- IV. Analysis:** Synthesize the transportation solutions at peer units, and produce a chapter of the final report with key findings and recommendations for making use of the peer comparison.

Peer Criteria

The lists below describe the criteria for selecting peer locations, which focus on site characteristics and transportation issues. For example, a useful peer comparison might be between another federal lands agency that manages herd animals, or hosts major annual events.

Peer Characteristics

- Federal lands (e.g. National Park Service, Forest Service)
- Seasonal visitation
- Total annual visitation
- Local community coordination
- Maintain herd animals
- National Scenic Byway designation
- Limited parking
- Multi-modal access (e.g. bicycle, pedestrian, transit)
- Proximity to military installations with significant populations
- Annual, or other special events
- Maintain Intelligent Transportation Systems
- Similar recreational activities (e.g. biking, hunting, camping, etc.)

Peer Issues

- Parking management
- Economic or other impact on the surrounding community
- Emergency management / incident management

- Pedestrian / bicycle accommodation and safety measures
- Regional and community cooperation
- Shuttle / tram tour services
- Satellite parking options
- Managing growing visitation / special events
- Increasing multimodal access

Peers

A list of potential comparable peers stems from conversations with FWS and Volpe Center staff. The four peer sites below are the result of the initial analysis of thirteen sites. Further analysis will focus on only the most significant characteristics and issues. The list below identifies four peer locations that share some of the selection criteria above with the refuge. These peer locations will form the basis of deeper research. The Volpe Center will interview staff to gather information about specific transportation solutions at these sites. Internet research and the review of relevant planning documents will supplement this material.

Peer Sites

- Delaware Water Gap National Recreation Area, National Park Service (PA, NJ, NY)
- Wind Cave National Park, National Park Service (SD)
- Bosque Del Apache National Wildlife Refuge, Fish and Wildlife Service (NM)
- Red Rock Canyon National Conservation Area, Bureau of Land Management (NV)

Framework for Assessment

The primary focus of the comparison is to learn the experience of these peer sites dealing with a variety of transportation issues to help direct transportation planning at Wichita Mountains. Peers may have considered or implemented many innovative solutions; interviews and research will examine the following solutions:

Potential Peer Solutions to Assess

- I. Innovative traffic management
 - a. Managing special event traffic
 - b. Real-time roadway condition information
 - c. Advanced information on weather/approaching storms
- II. Satellite parking facilities
- III. “Alternative vehicles” use for tours
- IV. “Car-free” visitation alternatives
- V. Emergency travel management
 - a. Evacuation procedures
 - b. Emergency shelters
 - c. Incident management
 - d. Coordination of state, county and local emergency services providers
- VI. Innovative parking management
 - a. Real time parking availability
 - b. Directing parking traffic and managing capacity
- VII. Alternative mode solutions to address increasing access to site
 - a. Pedestrian and bicycle
- VIII. Transit/Shuttle services to site, or within site

- a. Subsidized transit
 - b. Special event shuttle service
 - c. Coordination of parking arrivals and transit/shuttle services
- IX. Traveler and tourism services
- a. Coordinated marketing and transportation options to site

Peer Assessment Discussion Guide

General discussion questions:

- Describe traffic congestion in the vicinity of your (national park / wildlife refuge / conservation area) and any innovative traffic management strategies that have been implemented to address congestion. Have these strategies been successful?
- Describe parking problems in your (national park/ wildlife refuge/ conservation area), e.g., parking capacity limitations, proximity to destinations, and any parking management systems that have been implemented.
- Is there satellite parking at or near your site? Describe its use/management.
- Do your site use technology elements like variable message signs, or real time information alerts to manage transportation issues like congestion, parking etc.?
- How do you handle emergencies affecting transportation in your area, e.g., weather-related road closures, major crashes, hazardous material spills? Are state, county and local emergency services providers coordinated? Does your community have an emergency evacuation plan?
- Describe transit and/or shuttle service provided to/from your site. Any plans for expansion or changes?
- Describe shuttle/tour services within your site. Does it incorporate alternative vehicle technology or alternative fuels? Any plans for expansion or changes?
- Describe any inclement weather strategies that are implemented. What happens to the system/users in a major weather event (e.g., thunderstorm)?
- Describe facilities for non-motorized transportation (e.g. bicycle and pedestrian) on your site. How is bicycle and pedestrian safety accommodated?
- Is the local economy/tourism impacted by transportation issues?
- Does your site fall within a designated National Scenic Byway? Has this impacted your visitation numbers or impacted transportation issues at your site?
- Describe any special events held at your site. How is the increase in vehicular traffic managed?

Question Regarding Implementation:

- Describe funding sources your site has used for transportation projects (Federal/state/local/private).
- How much time is devoted to successfully addressing the above issues? How long does it typically take to achieve results?
- Does your facility have staff (paid or volunteer) dedicated to transportation? Do you use the services of local planning staff?
- Do you partner with others (local governments, including tribal governments, military institutions, nonprofits, businesses) to address transportation issues?
- Do you share your plans to improve transportation with the public? Have you received positive or negative feedback?
- Describe any strategies that you use to educate the public on transit operations. Do you have any successful specific incentives in encouraging public to use transit?

REPORT DOCUMENTATION PAGE

*Form Approved
OMB No. 0704-0188*

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1. REPORT DATE (DD-MM-YYYY) 31-08-2010	2. REPORT TYPE Study	3. DATES COVERED (From - To) August 2009-August 2010
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4. TITLE AND SUBTITLE Alternative Transportation Study: Wichita Mountains Wildlife Refuge	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S) Charlotte Burger Luis Mejias Eric Plosky	5d. PROJECT NUMBER DTFH68-09-E-00104
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) The Volpe National Transportation Systems Center U.S. Department of Transportation 55 Broadway Cambridge, MA 02142	8. PERFORMING ORGANIZATION REPORT NUMBER DOT VNTSC FWS-10-03
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Department of Transportation Federal Highway Administration Central Federal Lands Highway Division 12300 West Dakota Avenue, Suite 370 Lakewood, CO 80228	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Public distribution/availability.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
This report provides an assessment of historic and current visitation, infrastructure, and transportation conditions at the Wichita Mountains Wildlife Refuge and surrounding areas in southwest Oklahoma. The study defines transportation-related goals for the refuge, current issues, and identifies ten potential solutions that focus on alternative transportation, including pedestrian, bicycle, wayfinding and information, and transit. The analysis supports the development of the Wichita Mountains Comprehensive Conservation Plan.

15. SUBJECT TERMS
wildlife refuge; alternative transportation; transportation, bicycle, pedestrian, trails

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT NA	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Nathan Caldwell
a. REPORT None	b. ABSTRACT None	c. THIS PAGE None			19b. TELEPHONE NUMBER (Include area code) (703) 358-2205

