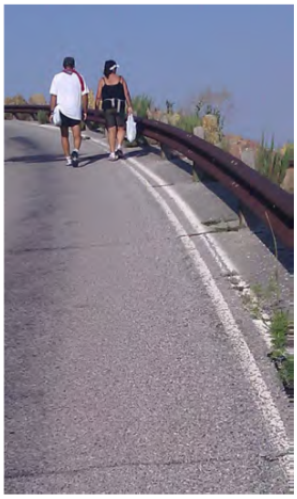
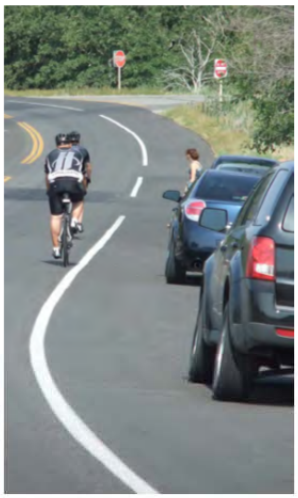
Public Lands Transportation Scholar Final Report

Stacked Loops and Partners: Enhancing Bicycling, Walking, and Accessibility at Wichita Mountains Wildlife Refuge



June 2013

Paul S. Sarbanes Transit In Parks Technical Assistance Center

UNDERSTANDING RESOURCES SOLUTIONS

This document was prepared for the Federal Transit Administration by the Paul S. Sarbanes Transit in Parks Technical Assistance Center

DISCLAIMER

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof. The United States Government does not endorse products of manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the objective of this report.

AUTHOR

This document was authored by Heidi Beierle, Public Lands Transportation Scholar for the Paul S. Sarbanes Transit in Parks Technical Assistance Center (TRIPTAC) stationed at the Wichita Mountains Wildlife Refuge.

Acknowledgements

This project was made possible through funds and support from the Paul S. Sarbanes Transit in the Parks program, U.S. Fish and Wildlife Service, Federal Transit Administration, and Eno Transportation Foundation.

The following people from U.S. Fish and Wildlife Service were instrumental in the Transportation Scholar's success:

Nathan Caldwell, Transit and Trails Coordinator
U.S. Fish and Wildlife Service

Susan Howell, Visitor Services Manager
Wichita Mountains Wildlife Refuge
U.S. Fish and Wildlife Service

Robert O'Brien, Regional Refuge Roads Coordinator
U.S. Fish and Wildlife Service, Region 2

Jeff Holm, Regional Refuge Roads Coordinator
U.S. Fish and Wildlife Service, Region 1

In addition, support from the Paul S. Sarbanes Transit in the Parks Technical Assistance Center and the Western Transportation Institute at Montana State University provided critical assistance for project advancement and completion:

Rebecca Gleason, Research Engineer
Western Transportation Institute

Brandy Murray, Business Manager
Paul S. Sarbanes Transit in the Parks Technical Assistance Center

Jenni West, Manager
Paul S. Sarbanes Transit in the Parks Technical Assistance Center

Phil Shapiro, Deputy Director
Paul S. Sarbanes Transit in the Parks Technical Assistance Center

Table of Contents

Abstract

Over an eleven-month period in 2012 and 2013, Public Lands Transportation Scholar Heidi Beierle advanced planning at Wichita Mountains Wildlife Refuge for three non-motorized trails on the Refuge's east side. The Scholar's primary focus was to develop project proposals to help conduct environmental analysis (NEPA) for two high-priority trails targeted for use by youth, people who use mobility aids, active seniors/retirees, and casual recreationalists. The trails address a variety of transportation, environmental, and social problems in the region, including high rates of motor vehicle use, pollution, and sedentary lifestyles.

A secondary focus was to develop a technical memorandum for a third project that explores the opportunities for non-motorized travel in the Meers Road corridor.

An approach that includes the Refuge's east side and adjacent jurisdictions and that examines the three trail areas as part of a complete alternative transportation system will assist Refuge decision-making going forward. A stacked-loop trail system provides a variety of non-motorized trail experiences for all types of visitors. Neighboring partners are essential to the effectiveness and success of this approach.

Introduction

Wichita Mountains Wildlife Refuge (the Refuge) encompasses nearly 60,000 acres and conserves the largest remnant of undisturbed mixed-grass prairie in the world. The Refuge is home to 50 mammal, 240 bird, 64 reptile and amphibian, 36 fish, and 806 plant species, including one endangered bird species.

Approximately 1.7 million annual visitors engage in wildlife-dependent recreation and enjoy the scenic views. Ninety percent of these visitors arrive in private vehicles, which leads to negative auto-related effects including speeding, animal-vehicle collisions, parking congestion, habitat degradation, and pollution.

The Refuge began work in 2009 with a Transportation Assistance Group (TAG) to provide visitors with more options to experience the abundant natural and cultural resources through non-motorized means. Three high-priority trail projects identified during the 2009 TAG meeting were advanced through the Transportation Scholar's efforts. Two trails and a parking lot were developed to a National Environmental Policy Act (NEPA)-ready state. A third trail advanced in a scoping process.

The trail projects are designed to create opportunities for families with children, people using wheelchairs, and casual recreationalists to experience the Refuge through active modes. Where feasible, trails will meet accessibility standards and provide separation from vehicular traffic.

In addition to reducing the negative effects from automobiles, the trails aim to increase regional health in a state that ranks 48 out of 50 in health-related outcomes. Consequently, a significant element of this active transportation project employs partnerships to leverage regional health and activity strategies, particularly for the region's youth, and to interconnect existing facilities managed by multiple agencies.

Five main tasks comprise the project: outreach, trail area documentation, preliminary design, value analysis, and pre-NEPA project proposals.

Issues

Situated in an auto-dependent and auto-oriented rural landscape and as one of the most visited refuges in the National Wildlife Refuge System, the Refuge faces substantial management challenges related to visitation and transportation. Unlike other Federal Land Management Agency units, U.S. Fish and Wildlife Service units conserve, protect, and enhance fish, wildlife, and their habitats for the continuing benefit of the American people. Ongoing debates occur within the U.S. Fish and Wildlife Service regarding the balance of natural resource protection with public access to these resources. Consequently, planning for visitor facilities must be responsive to natural resource concerns.

To understand the public use perspective relevant to the Refuge and recreational trail facilities, extensive outreach was conducted with diverse groups, including more than 60 youth. Similarly, the "conserve, protect, enhance" perspective was acquired through conversation with Refuge staff, Friends of the Wichitas, public meetings, and other research.

The many issues related to the Refuge's visitation and transportation and trail systems follow:

- Motor-vehicle speeding.
- Wildlife collisions and fatalities.
- Parking congestion.
- Habitat degradation.
- Pollution.
- Limited pullouts for wildlife viewing.
- Blind curves.
- High road maintenance costs.
- Large carbon footprint.
- No regional transportation coordination.
- Auto-dependent development patterns.
- Poor statewide health (sedentary lifestyles, obesity).
- Disconnected public, especially youth.
- Few accessible facilities.
- Overuse of Wilderness Area.
- Littering.

Project Scope of Work

The project scope of work matched the original project statement fairly well. One of the most substantial changes to the original project statement involved the level of detail sought for design work. "Construction-ready" project proposals were scaled back to "NEPA-ready." NEPA assessment requires an evaluation of alternative designs before construction can begin.

Projects outside the scope of work were also completed, including development of funding proposals, system analysis of the entire east side of the Refuge and adjacent land, project support for implementation of the Refuge's 2011 Transit in the Parks (TRIP) Grant, project development assistance for a Road Safety Audit, project support for implementation of an Intelligent Transportation System, and some technical assistance provided to the surrounding communities.

Methodology

The work plan included five tasks – community outreach, trail area documentation, value analysis, preliminary design documents, and NEPA-ready project proposals – with individual methods for accomplishing the respective tasks.

Community Outreach

Data collection for community outreach involved focus groups, a community open house, and individual interviews. Two focus group meetings involved analysis of the assets, needs, opportunities, and challenges and input on scenic byway sign and gateway design. Other focus group meetings examined trail design preferences by target trail user groups and employed an input sheet to collect data (See Appendix D, Meers Road Trail, Appendix B, Outreach Summary). The public open house targeted a broader audience than the focus groups and employed the same methodology for collecting trail design preferences. Individual interviews supplemented the trail design focus groups and open house. Input sheets were also used in the interviews.

Trail Area Documentation

All project areas were researched through a variety of means: reading existing plans, reports, and studies, site visits, discussion with Refuge staff and community members, internet research, GPS and field measurements with a laser level, and comparative analysis of photographs, historical images, and digital maps. Document maps and graphics were created in InDesign. (See Appendix A, Two Trails and a Parking Lot, Appendix A and B, LETRA Connection Trail and Jed Johnson Tower Trail; and Appendix C, Meers Road Trail)

Value Analysis

Based on assessment criteria, which were developed prior to the trail design outreach process, a value analysis was conducted with Refuge staff to narrow the many possible trail designs into a manageable number of alternatives. Following the outreach process, a range of trail design options were created, based on trail design standards, Refuge management priorities, and public preferences. Each trail design option was rated in four categories based on how each option met the category advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable). Scores were based on input from Refuge staff and the public. Each option was totaled in each of the four categories and then cumulatively totaled. (See Appendix D, Trail Design Options Assessment)

Preliminary Design

Designs for the NEPA-ready project proposal were produced by a professional landscape architecture and engineering team. (See Appendix B, Two Trails and a Parking Lot)

NEPA-ready Project Proposals

Alternatives were shaped based on Refuge staff input during the value analysis. Tables and diagrams indicating how well the alternatives address the issues consider data collected during community outreach, trail design research, and the value analysis process. (See Appendix B, Two Trails and a Parking Lot)

Constituencies

Groups affected by the issues being addressed are far-ranging and include specialized, non-technical, and public audiences.

- **Public at large**
  All Refuge road users (motorized, transit, and non-motorized modes), people who might use Refuge roads but do not because they are concerned for safety, all Refuge visitors, all potential Refuge visitors, all people who want to park, all visitors who want to access an area served by congested parking, parents, youth, schools, all families touring the Refuge in automobiles, visitors with disabilities, people who accompany visitors with disabilities, visitors who do not come to the Refuge because of a lack of accessible facilities and or choices, anyone who might use accessible facilities, Wilderness Area visitors, hikers, backpackers, businesses neighboring the Refuge, neighboring communities, environmentally oriented groups, conservation-oriented people, Wichita Mountains National Scenic Byway Committee.

- **Refuge or specialized staff**
  Law enforcers, emergency responders, Refuge biology staff, Refuge law enforcement staff, Refuge visitor services team, Refuge maintenance staff, Refuge volunteers, tribes, Oklahoma Department of Transportation, Comanche County government, Lawton Metropolitan Planning Organization, chambers of commerce and/or destination marketing organizations.

Roles these different constituencies played in supporting the effort to address the project problems were and are being accomplished by project partners, the Refuge, and other Refuge-supporting entities.

- **Community at large**
  Provided input on the Wichita Mountains Wildlife Refuge Draft Comprehensive Conservation Plan 2012, trail design, and visitor services and facilities.

- **Project partners**
  Supported marketing or promotion of the developing trails by sharing information within their groups or by broadcasting information about the developing trails to their respective audiences, assisted the trail development process in other ways, described below.

  Fit Kids of Southwest Oklahoma
  Coordinating with partners, marketing, branding design elements for regional trails, developing a regional trail map, advocating for infrastructure development on the Refuge that increases choices for visitors to engage in active recreation.

  Friends of the Wichitas
  Supporting Refuge education and outreach efforts, providing input on programmatic aspects of trail development, coordinating current, supportive, volunteer activities on the Refuge, providing input on developing bike tours as part of planned trail programming.

  Fort Sill Army Base

Collaborating with the Refuge on access strategies that link together LETRA (its parking areas, lodging options, water, and visitor services facilities) with the Refuge and that facilitate use of Fort Sill roads and mountain biking trails for active recreation.

Medicine Park Museum of Natural Science
Collaborating with the Refuge on access strategies and mutually beneficial marketing that links together the Museum (and its parking areas, water, visitor attractions, and educational opportunities) with the Refuge.

Town of Medicine Park
Promoting Refuge resources with local economic development, recreation, and entertainment activities.

City of Lawton Parks and Recreation Department
Collaborating with the Refuge to manage Lake Lawtonka trail access and to develop and market supportive recreation facilities, including providing and installing a trailhead kiosk located on the Refuge and advancing development of a mountain bike challenge park located on City of Lawton property that would be accessed from the Lake Lawtonka trailhead on the Refuge.

Lawton Public Schools
Partnering with the Refuge to provide input from a broad representation of parents, students, teachers, and administrators across the Lawton Public School system, using the Refuge (Mt. Scott bike trail) as a classroom to teach elementary school students bicycle safety and mountain biking skills (Park Lane Elementary School).

Local mountain biking community
Collaborating with City of Lawton Parks and Recreation and the Town of Medicine Park to develop mountain biking trails east of the Refuge boundary, supporting stewardship and responsible trail use among peers, advocating for trail development on the Refuge that increases choices for visitors to engage in active recreation.

City of Lawton Planning Department
Supporting regional activity and health initiatives through transportation programs (bicycle-friendly community strategies) and coordination with Oklahoma Department of Transportation and the Lawton Metropolitan Planning Organization (for increased funding opportunities).

- **Wichita Mountains Wildlife Refuge**
  Provided input on trail design, transportation-related wildlife impacts, wildlife kill awareness strategies, projected visitation for east side trails, transportation-related habitat degradation and invasive vegetation proliferation challenges, non-leaching road/trail construction materials, aesthetically compatible construction materials, long-term trail maintenance, public motor-vehicle access closure options.

  Law Enforcement
  Provided input on emergency response, data collection regarding speeding and wildlife collisions and fatalities, the prevalence of littering and ticketing with fines.

Maintenance

Collaborated with City of Lawton Parks and Recreation Department to build new, safer and easier to use stiles that access the Lake Lawtonka trails, provided input on trash and recycling collection and frequency.

Visitor Services

Provided input on marketing and encouragement strategies designed to redirect visitors to east side resources, developed through volunteer assistance an east side birding guide.

- **Public Lands Transportation Scholar**
  Established and maintained partnerships and relationships; conducted community outreach; participated in monthly Fit Kids partner meetings; participated in informal task meetings with communities; attended, presented at, and promoted non-motorized travel initiatives and opportunities on the Refuge and in southwest Oklahoma at conferences; modeled active transportation for work and recreation purposes; recommended funding opportunities and sought funding for a variety of projects; facilitated discussions regarding wildlife, health, recreation, nature play, youth engagement, trail design and development, and non-motorized trail interconnectivity; researched and developed technical memos and proposals that detail trail design, trailhead enhancements, and supportive programming.

- **Volpe National Transportation Systems Center**
  Developing recommendations on comprehensive alternative transportation strategies for the Refuge, wayfinding, transit opportunities, redirecting visitation from the Wilderness Area to the east side; collecting data and providing analysis to offer a picture of existing transportation patterns on the Refuge.

- **Federal Lands Highway Division**
  Implementing an Intelligent Transportation System (ITS) demonstration project designed to count Refuge visitors and alert staff when parking lots begin to reach maximum capacity (Eastern Federal Lands Highway Division), coordinating implementation of the ITS demonstration project with engineering consultant (Central Federal Lands Highway Division), conducting a Road Safety Audit of principal Refuge roads to assist prioritization of transportation system maintenance and enhancement projects (Central Federal Lands Highway Division).

Recommendations

Opportunities to improve alternative transportation choices on the Refuge involve: active modes travel, facility design, promotion, marketing, and education, and Refuge management and operations. The following recommendations address the assigned east side projects in a general way and, in some instances, could apply to other projects or areas of the Refuge.

A detailed and qualitative examination of the project issues and their relationship to the proposed actions can be found in Appendices D, E, and F of "Two Trails and a Parking Lot: A Compilation of NEPA-Ready Project Proposals" included here as Appendix B.

Active Modes Travel

- Increase non-motorized travel connectivity options on the east side – within and beyond Refuge boundaries.
- Develop a stacked loop trail system on the east side with adjacent partners and that includes walking/hiking, wheelchairing, pushing strollers, running, and bicycling opportunities.
- Use the Lake Elmer Thomas fishing pier as the primary trailhead for visitors wishing to access the new trails from within the Refuge.
- Encourage visitors to park once on or off the Refuge and explore the resources using bicycles, or pedestrian means (off-site parking can be found in Medicine Park, at the Medicine Park Museum, at LETRA and in Cache – north of OK-62).
- Encourage visitors to park at sites off the Refuge (Medicine Park, Medicine Park Museum, LETRA, Cache) and use non-motorized modes to explore Refuge resources.
- Encourage development of wildlife bicycle tours with Friends of the Wichitas or other interested groups.

Recommendations beyond scope of work:

- Add bicycle parking at significant Refuge destinations (Sunset Picnic Area, Dog Run Hollow, Prairie Dog Town, etc.).
- Add sharrows to Meers Road to increase bicycling visitors' comfort cycling on the road.

Facility Design

- Maintain narrow and/or curvy motor-vehicle travel lanes and/or road space to keep motor-vehicle speeds low.
- Incorporate stormwater management strategies into parking lots.
- Design trails that offer active, natural experiences separated from motor-vehicle traffic.
- Use natural and locally sourced materials in facility construction.
- Provide needed and conveniently spaced services, such as restrooms and water, on the east side along non-motorized travel routes.
- Consider east side Refuge trail development as pilot projects for national scenic byway design strategies.

- Close the Lake Elmer Thomas dam road to public motor-vehicle access and create a facility that prioritizes non-motorized modes for enjoying Refuge resources.
- Provide spaces for youth to experience nature and the outdoors (nature play).
- Design trails that people of all abilities can access.
- Add accessibility information to the LETRA connection and Jed Johnson Tower trails as specified in the Access Recreation guidelines (AccessRecreation.org)
- Enhance the Lake Elmer Thomas fishing pier trailhead.
- Enhance the Lake Lawtonka trails access and trailhead.
- Provide wildlife-resistant, easy-to-open trash and recycling receptacles at trailheads.
- Add information about littering and trash/recycling receptacle locations to trailhead kiosks.

Promotion, Marketing and Education

- Promote options for visitors to explore the Refuge using non-motorized modes.
- Coordinate with project partners, such as Fit Kids, to promote and advance use of non-motorized travel options on the Refuge.
- Promote and reinforce to visitors, staff, and volunteers the wide variety of wildlife on the Refuge, most of which are best seen on foot, by bike, or otherwise outside of an automobile.
- Promote diverse wildlife experiences on the Refuge (birds, reptiles, plants, etc. and not just large mammals, which can be rather big, scary and make people feel vulnerable).
- Create marketing strategies and provide signage that inform visitors of the facilities, recreational opportunities, off-Refuge parking areas and non- motorized facilities that connect into the Refuge on the east side.

Recommendations beyond scope of work:

- Partner with Lawton Public Schools or community organizations that serve youth to increase youth engagement and participation in conservation, outdoor recreation, and natural resources appreciation.
- Develop an east side trails walking and bicycling guide(s) that include(s) birds, reptiles, invertebrates, flowers, plants, tracks, scat, nests (or homes), fish, rocks, and clouds.

Refuge Management and Operations

- Explore parking strategies at the Wilderness Area with the ITS demonstration project and the Volpe project.
- Collect wildlife collision and fatality data to include hit locations (along with type of animal, severity of collision, date, and time of collision).
- Maintain planned trails – once built – to prolong their useful life and to minimize long-term maintenance costs.
- Maintain project partnerships.
- Collaborate with Fit Kids, Fort Sill, Medicine Park Museum, Medicine Park, and City of Lawton Parks and Recreation on non-motorized travel options and trail development.

    - Support Park Lane Elementary School bicycle safety and mountain biking skills classes on the Mt. Scott bike trail.
    - Support development of a mountain bike challenge park on City of Lawton property on the south side of Lake Lawtonka.
    - Support development of bicycling infrastructure and bicycle friendly practices within the region.
- Follow guidance from the planned Road Safety Audit for improving non-motorized travel throughout the Refuge and for maintaining the scenic character of the Wichita Mountains National Scenic Byway.
- Help develop the National Scenic Byway Committee and its capacity to support and enhance the Byway.

Recommendations beyond scope of work:

- Include the Mt. Scott hiking trail in the new CCP.
- Institute a "No Idle" policy on the Refuge (for staff and visitors).
- Model healthy, active lifestyles and support others' efforts to make active lifestyle changes.

Next Steps and Implementation

For the scope of work, there are distinct next steps to advance these trails toward and into implementation. While fundraising occurred during the project to assist implementation, more funds are needed to complete the implementation that is ready to occur and to advance further planning for those aspects of the project that are not yet ready to undergo NEPA-assessment. Some policy and operational changes could support development of the alternative transportation system and possibly help leverage existing funds. The Refuge has been in the process of establishing transportation system data collection for several years. Performance measures rely on various forms of data collection, and some possible performance measures are included at the end of this section that could help the Refuge compete for additional transportation system improvement funds.

Next Steps and Funding

In order to move forward toward trail construction, the Refuge must first conduct a NEPA assessment. Funds secured through a FY 2012 TRIP Grant provide $60,000 to conduct this NEPA assessment. Opportunities exist to conduct NEPA work with Refuge staff, U.S. Fish and Wildlife staff based in the Region 2 office, and with Volpe National Transportation Systems Center. Other NEPA consultants could be considered.

Second, Construction Design documents will be needed. Given the challenges encountered arranging preliminary design work for these projects, the Refuge should work with Region 2 office staff and Central Federal Lands Highway Division in the sort term to identify a timeframe for developing the drawings and ensuring that appropriate staff are available during the target timeframe. At least one site visit will be needed to develop the documents. Funds secured through a FY 2012 TRIP Grant could likely cover the cost of creating these drawings for the LETRA connection trail.

With Construction Design documents, the Refuge will be able to arrange for contracting and construction. Like the other work, the Refuge may want to pursue options for completing this work. Local Refuge Maintenance staff may be able to build the trails and associated facilities. Central Federal Lands Highway Division may have interest in building the trails although for a relatively small project, such as the LETRA connection trail presents, it may be more suitable to use local talent. Funds for construction of the LETRA connection trail were also secured through a FY 2012 TRIP Grant. More funds to support construction of the LETRA connection trail could come from the Recreational Trails Program, Federal Lands Transportation Program, Transportation Alternatives, Congestion Mitigation and Air Quality, and Bikes Belong.

Funding for Construction Design documents and construction of the Jed Johnson Tower trail was not awarded in the FY 2012 TRIP Grant. Consequently, funds for this trail must be sought through other sources. Likely sources include the Recreational Trails Program, Transportation Alternatives, and the Federal Lands Transportation Program. Other grant opportunities might be found through agencies or organizations that support accessibility, youth in the outdoors and/or fitness, Wounded Warriors, or active senior programs.

The Meers Road trail requires more planning to understand fully what kind of facilities or improvements meet Refuge and proposed user needs and consequently what funding opportunities exist. In addition to all of the mentioned funding sources here, several others might apply, including TIGER grants (for

multi-modal improvements), funds from the Surface Transportation Program (for bridge repair) or the National Highway Performance Program. Funding programs for wildlife crossing and monitoring might also be applicable here. Fund seeking for the Meers Road trail project should include programs that fund planning in addition to implementation.

For further development of any transportation system projects, the Refuge should consider partnership with the tribes. The Tribal Transportation Program might be a good source for transportation system improvements. Based on work conducted by Volpe Center regarding transit facilities, the Refuge may also qualify for funding through Formula Grants for Rural Areas (5311) or Formula Grants for Enhanced Mobility of Seniors and People with Disabilities (5310).

In many cases, it may be necessary for the Refuge to partner with the County, a tribe, a non-profit organization, or another regional entity to access state-administered funds.

Projects outside Refuge boundaries that connect to the Refuge could be eligible for funds through the Federal Lands Access Program. Eligible entities include Town of Medicine Park, City of Lawton, Town of Cache, Comanche County (including Meers), possibly areas around LETRA managed by Fort Sill's "Friends" group, and communities along the Wichita Mountains National Scenic Byway.

Possible Changes to Management Policies and/or Unit Operations

Several changes would support improved functionality of the alternative transportation system on the Refuge.

- Manage the transportation system for mobility rather than for motor vehicles.
- Increase data collection and analysis functions among staff in Law Enforcement, Biology, Maintenance, and Visitor Services staff.
- Consider closure of the Lake Elmer Thomas dam road to public motor-vehicle access. Consider a compensatory special use permitting process for SCUBA access via motor vehicle at Lake Elmer Thomas dam.

In support of an enhanced alternative transportation system, there are changes the Refuge could make internally that would demonstrate unit-level commitment to healthy Refuge ecosystems and a healthy, engaged public. Encouragement of particular behaviors the Refuge would like to see begins with Refuge staff modeling those behaviors they would like the public to make. This is already evident in staff attention to posted speed limits.

- Reduce fossil fuel consumption and increase fuel efficiency across all Refuge operational and service functions.
- Encourage/promote health/fitness targets for all staff.

Participation by Refuge staff in both these areas would bring perspective to and help improve the alternative transportation system across the entire Refuge. Similarly, supporting staff health and fitness targets makes it easier for the Refuge to be a place where people and wildlife are healthy. Supporting both together would highlight the interdependent relationship of fossil fuels to human health.

Performance Measures

Trail counters were included in estimated construction costs for the LETRA connection trail. Installation of trail counters is an integral part to developing the east side trail system. If it is possible to set up the

counters during development of the Construction Design documents (or earlier), the Refuge will have a much better picture of how improvements to the different trail areas affect visitation patterns. Demonstration of increase in use will help the Refuge develop trails identified in the CCP at other sites, including the Meers Road trail area. Data on trail usage will also support the Refuge in seeking funds for future alternative transportation projects.

The following are possible performance measures for the three east-side trails and their promotion.

- Install [X number] of data collectors and establish data collection and analysis for bicycle and pedestrian use. Report monthly on and annually analyze bicycle and pedestrian use.
- Establish data collection procedures and analysis of wildlife collisions and fatalities that records where the collision occurred, the date, the time (if possible), what kind of animal, direction of animal travel, severity of injury, date of death (if animal does not recover), type of vehicle involved (if possible), direction and speed of vehicle prior to collision (if possible), light level at time of collision (if possible). Report quarterly on and annually analyze wildlife collisions and fatalities.
- Establish parking lot and hiking trail use counts in the Wilderness Area to determine if development, implementation, and marketing of east side facilities has any effect on Wilderness Area use/overuse. Report monthly on and annually analyze parking lot and hiking trail use counts in the Wilderness Area.
- 495,000 annual visitors using the new trails (LETRA connection, Jed Johnson Tower, and Meers Road) when completed.
- 4 fewer wildlife collisions per year upon completion of the news trails (LETRA connection, Jed Johnson Tower, and Meers Road).
- [X weight] of invasive plants removed from new trailsides. Report monthly. Analyze annually.
- [X number] of native plant colonies established on new trailsides and disturbed areas. Report quarterly. Analyze annually.
- [X number] of invasive plant outreach events and weeding events (including youth involvement) with [X number] of participants – cooperative endeavor with the Refuge's new Pulling Together program and existing invasive removal conducted by Friends of the Wichitas.
- [X number] of trail clean up events with [number] of participants and [weight/quantity] of litter collected (in partnerships with Friends of the Wichitas).
- Maintenance log for new trails (exact performance measures to be crafted following NEPA assessment and determination of trail design and corresponding maintenance needs).
- Number and type of marketing of new trails and by whom.
- Number of school groups and number of students in those groups that visit the new trails.
- Number of guided tours conducted on the new trails and number of participants in each tour.
- Number of pounds/tons of Carbon not released into the atmosphere based on the number of non-motorized users on the Refuge, calculated annually.
- List of project partners and annual reporting on their involvement in any of the activities measured by these performance measures.

Connection to Wider Transportation Community

The transportation context for the Refuge exists mainly at the state, regional, and local level. The Refuge's transportation and visitation context is fairly unique among other public lands and similar geographic areas conducting comparable alternative transportation work. As a result, case studies used to inform this project could provide insight only to certain aspects.

Transportation Context

The Refuge exclusively manages all roads and trails within its boundaries even though principal roads through the Refuge are state highways. A number of jurisdictions abut the Refuge. The Metropolitan Planning Organization (MPO) boundary is contiguous with the City of Lawton and consequently does not serve regional transportation planning strategies. In lieu of a regionally functional MPO, Comanche County government provides transportation planning. The County Commissioners are responsible for deciding which transportation projects advance and when, and once they make a project decision, the project goes to bid (no in-house work). Comanche County, however, does not make transportation planning decisions for areas within the Refuge boundary. Additionally, the Comanche, Kiowa, and Apache tribes all overlap in their interests in the area. The Refuge conducts outreach with these tribes, but they are not currently engaged in transportation projects.

Oklahoma Department of Transportation (ODOT) maintains jurisdiction of the state highways immediately outside of the Refuge boundaries (OK-49 and OK-115), and they have a project underway north of the Refuge near Meers. ODOT may be contacted through the Regional Engineer, Bob Rose (based in Duncan), or through the Special Projects Manager in Oklahoma City. ODOT will become involved in projects that reach 30% design, if their input is solicited. They also manage the scenic byway program through Special Projects. Apart from managing funds for the scenic byway program, ODOT has been uninvolved in other aspects of the byway program. With the dissolution of the scenic byway program at the national level, the byway program is no longer administered in partnership with other state agencies and is exclusively within the purview of ODOT Special Projects. The regional ODOT Commissioner, Brad Burgess, lives in Lawton, OK, and is involved with and supportive of alternative transportation projects on the Refuge. The best route for maintaining contact with the Commissioner is through partnership with Fit Kids.

Lawton Area Transit System is a fairly new operation that serves the city of Lawton and Fort Sill. People in the Lawton area are not accustomed to using public transit, and the system has low ridership. However, LATS does provide needed transportation for many Lawton and Fort Sill residents and is expected to continue operating into the foreseeable future.

The Comanche Nation also operates a transit system that serves Lawton, Apache, Elgin, Cyril, Fletcher, and Cache. They have eight buses and serve over 28,000 riders annually.

Non-motorized travel options, primarily for recreation and fitness are developing in the region.

- The **City of Lawton** has been developing a system of trails and sidewalks that are being initiated through initiatives to make the city more accessible. A local group, Friends of Trails, has been involved in organizing benefit rides to help grow the trail system and advocate for their development. The City also manages recreational areas at and around Lake Lawtonka,

bordering the Refuge on the west side and Medicine Park on the south side. In the southwesterly corner of this property is the access to single track mountain biking trails (that people also use for trail running). This access is from the Refuge. In this same corner of City property is a site where development of a mountain bike challenge park may occur.

- On **Fort Sill**, the Transportation Planning team has been developing shared use paths in cooperation with the Morale, Wellness, and Recreation program. Fort Sill has a broad network of trails planned with only a few currently built. Fort Sill hosts an annual mountain bike ride in the hills west of LETRA, Mountains of Mayhem, and the trails are open to ride other times of year but require riders participate in a range artillery class (once only) before riding the trails. Bicycles for youth and adults are available for rent at LETRA.

- **Medicine Park**, an involved partner in east side Refuge projects, has interest in adding shoulders to OK-49 where it meets the Refuge continuing east to the intersection with OK-58. The town has developed a trail plan that includes bicycling and walking options from the town center to outlying destinations, such as the Medicine Park Museum of Natural Science, which also will connect to the Refuge via a shared use path. The community supports mountain biking and a number of residents advocate for trails, build trails, and organize mountain biking related events and activities.

- **Cache** has been very involved in connecting the town to the Refuge, and the Comanche County Fitness Trail south of the Refuge on OK-115 to OK-62 is a facility much used by the community. They are interested in extending the trail into the Town of Cache itself where currently most cyclists bypass the community.

When considering this project as a case study here are some characteristics of it that may inform its utility:

- Rural setting with a larger community nearby (Lawton is 25 miles away with a population of approximately 90,000 and a transit system)
- Bicycling and walking trails developed for a national wildlife refuge
- Average annual visitation of 1.7 million
- Regional area is interested in developing a trail network
- National Scenic Byway goes through the Refuge and extends north and east beyond Refuge boundaries
- Trail development project improves choices for biking, walking, and accessible facilities
- Trails target casual recreationalists: youth, families with kids, active seniors/retirees, people who use mobility aids, and others
- Partnership based project with strong partners in public health working to reduce childhood obesity
- Regional trail system could also include mountain biking, road biking, and hiking options
- Approach to redirecting visitation from a heavily used and environmentally sensitive area to one that can handle higher use and in a less sensitive environment.

Some examples from other public land units that may provide relevant insight include:

- Rocky Mountain National Park. They have been developing some similar trail plans that include bicycling, walking, and parking management. Their trail projects also connect into the gateway community of Estes Park.
- U.S. Fish and Wildlife has been developing trails and connecting its units to urban areas, such as at the San Francisco Bay National Wildlife Refuge Complex. Bicycling is not typically allowed on National Wildlife Refuge trails.
- Sleeping Bear Dunes National Lakeshore. This is an excellent example of partnership projects in a rural area that involve bicycle and pedestrian trails.
- Salmon Area Trails Plan.

Other Transportation Scholars have worked in areas that integrate bicycle and pedestrian trails with rural communities:

- Cape Cod National Seashore
- North Moab Recreation Area

Many examples of trails plans, active transportation partnerships, and projects that integrate health and activity can be found. A short list follows of some examples:

- Regional trail systems: King County, WA; Metro Portland, OR; Boulder County, CO
- Project for Public Spaces
- Rails to Trails and the Partnership for Active Transportation
- IMBA and regional mountain biking organizations
- Albuquerque, NM prescription trails
- Upper Valley Trails Alliance in Vermont
- Walk with the Doc

The Public Lands Transportation Landscape

Transportation planning in a Federal public lands setting poses many challenges. Some of those challenges include few transportation specialists employed by individual Federal Land Management Agencies (FLMAs), units with little transportation system expertise, and unclear paths to finding transportation funding. For this Scholar project, these challenges were addressed by establishing and maintaining partnerships, communicating, and seeking help from multiple sources.

Public Lands Transportation Environment

Transportation is a derived demand – people need transportation because they are doing something that requires them to get somewhere. The focus of FLMA financial and human resources is on 'destination demand' rather than on transportation. For example, FLMAs are focused on the experiences at units, such as seeing the Grand Canyon, listening to elk bugling at Wichita Mountains Wildlife Refuge, mountain biking in the North Moab Recreation Area, or walking among the ancient trees in Inyo National Forest. Yet, all visitors must use some form of transportation to arrive at these sites and then, oftentimes, to engage in an activity at the unit. As fundamental as transportation is to FLMAs, comparatively little effort and/or resource is dedicated to this important unit function. Depending on the FLMA, there may be an extensive road inventory (as is often the case with the Bureau of Land Management or Forest Service), there may be jurisdictional agreements that can both facilitate and impede transportation projects, or there may be other situations, such as differing unit-level priorities or lack of funding, that can present obstacles to transportation planning and maintenance. For U.S. Fish and Wildlife, one of the principal challenges is planning for wildlife and habitat first.

Few FLMA units have staff who focus even a portion of time to transportation. Often, transportation functions are coordinated or collaborative activities that occur between FLMA regional staff and FLHD staff, some of whom may have never visited the unit. At the unit level, transportation projects are often managed by agency staff as an accessory activity to primary job duties and may not be an area in which they have much or any technical background. Unit budgets may also not include transportation line items, taxing the transportation system, limited staff time, and limited budgets. Backlogged transportation system maintenance projects can also curtail advancement of future projects and endanger funding opportunities.

One of the benefits of a modest transportation program at FLMAs is that one can quickly become familiar with who, within the agency, works on transportation. Another benefit is that FLMAs and units must partner with other agencies and organizations to accomplish transportation system maintenance and enhancements, ensuring that expertise and other resources are leveraged to support transportation programs on public lands.

How transportation projects get funded appears to differ among agencies and the skills of different transportation coordinators for working within their respective political environments (regionally). The Federal Lands Highway Division administers financial resources to FLMAs and contracts services for transportation projects at units. The relationship between FLMAs and FLHD can work smoothly, and it can sometimes create barriers or delays to projects. Likewise, anytime funds move across federal agencies, as is often the case with grant funds, it adds time to projects.

Strategies for Overcoming Challenges

Two of the big challenges for this trails project entailed 1) understanding how U.S. Fish and Wildlife Service transportation projects move from concept to implementation and 2) learning how transportation projects receive funding. With the new transportation bill, MAP-21, trails became an eligible project type in program areas where before they had not been. At the Refuge, the proposed trails are primarily along previously disturbed areas that were also functional roads or highways in the past. After asking many people many questions, I understood that the estimated project cost and its projected timeline for implementation has more bearing on who will work on a project rather than if the project is a road, was a road, or is a trail. However, trail projects tend to be considerably less expensive than road projects, so they are more likely to be worked on within the agency rather than outside of it. This general direction may not hold true in all cases and could change as more trail projects are proposed. Determining who will work on a project greatly affects which areas of resource could potentially fund efforts. For this particular project, preliminary design work became a key project need and research task.

In the absence of a manual or handbook to navigate transportation planning on the Refuge, three main strategies assisted the learning process: researching relevant knowledge, skills, and abilities of unit staff and volunteers; establishing, maintaining, and leveraging partnerships; being a good communicator and listener; and establishing relationships and asking for help from other agency staff and experts.

Refuge staff provided valuable information about the transportation system, the unique perspectives particular positions have regarding the transportation system, and relevant information about the Refuge and its cultural setting. Volunteers offered visitor experiences, resources to support outreach activities, and perspective on the interface of volunteer organizations with the federal entity.

The Refuge has strong, existing partnerships. Having a presence at regular partner organization meetings and investing time in informal meetings and communications helped solidify mutual support. Particularly with outreach, partners generously gave time and helped supply other resources – demonstrating interest in and commitment to the projects.

Good communication was vital to overcoming project challenges, and flexibility and adaptability paramount to ensuring it. Sometimes communication breakdown occurred quite literally in the physical communication systems, which meant creativity, agility, and switching among communication modes or locations was a necessity. Tailoring communications for specific audiences and being open to ideas and other perspectives helped advance many discussions. Halfway through the project, regular communications among the Transportation Scholar, the Refuge, Transit in the Parks Technical Assistance Center (TRIPTAC) staff, and the Transportation Scholar mentor identified an opportunity to fund design work needed to complete the project. This approach probably would not have surfaced in the absence of the weekly update calls.

As part of the communication and relationship-building strategy, communicating with regional experts, the unit's FLHD contact, and other specialists within the Department of Transportation and Department of the Interior helped overcome project challenges immeasurably. Communication with the regional transportation coordinator provided valuable insight into funding for transportation projects and also demonstrated that a close relationship exists between FLMA transportation funds and FLHD. To learn more about transportation planning and funding within the U.S. Fish and Wildlife regions, I attended monthly calls among U.S. Fish and Wildlife transportation coordinators and headquarters staff.

Case Study for Future Public Lands Transportation Scholars

The Transportation Scholar experience, for me, is an experience that keeps giving and that gives in oftentimes, unexpected ways.

During orientation, I felt I had a clear understanding that I would work on three trails and that I would have ample time to further develop the non-motorized transportation system. I expected opportunities to work with U.S. Department of Transportation divisions. I heard the cautions expressed during orientation about the ambitious schedule of work, but I felt confident that concept planning for three trails would be realistic for a 10-month assignment.

What I did not know during orientation was what I did not know. I did not know how to get or find elevation data for the trails. I did not know what was uncertain about the trails. I did not know what questions to ask the public. I did not know how little money the Refuge had and what that meant for materials or equipment that were available to conduct my work. I did not know how long it would take to produce design work for my projects. I did not know how hot it would be in Oklahoma. I did not know there would be brown recluse spiders and that they scurry about indoors on the floor at night. I did not know how remote the Refuge is and that it would be difficult to call home. All of these unknowns, and there were many more, taught me I would need to be agile and adaptable all the time, in my personal life and in my work life. And when I was awakened at 4 a.m. by a live mouse caught in a trap the morning of my first stakeholder meeting, I learned that 'all the time' really meant 24 hours a day and 7 days a week…and that I had to kill the mouse.

I did not expect that being a Transportation Scholar would give me the kind of first experiences that it did. Because so much of my work on the Refuge was a 'first' of some kind, I did not know how long my projects would take. I realize now that I took on an ambitious workload. I find it difficult to say if I would have done anything differently to help manage my efforts. Working as a Transportation Scholar, I expected, would give me professional development opportunities that I could gain no other way. I had those opportunities during my tenure, and I said yes to them. As a cohort of Scholars, we were regularly counseled to be selfish with our time and say "no" to extra projects. It is difficult to say no, and it is especially difficult to say no when you do not know how long what you are expected to do will take.

My Scholar experience gives and gives – successes, challenges, helpers – and incredible learning experiences. On the whole, my experience is quite mixed but definitely positive. Of note, I lived and worked on the Refuge for five months and then worked remotely from a U.S. Fish and Wildlife Regional office for the remainder of my tenure (with one, three-week residential working visit to the Refuge).

Successes

- Establishing a regular weekly meeting time with my supervisor and discussing the best method(s) for being in touch with her.
- Freedom to explore the project.
- Knowing what I was expected to produce by the end of the project.
- Being on the unit to understand the human resource, budgetary, and political environments, plus exploring the natural and cultural resources and how they are valued on the unit.
- Working with groups I would not otherwise have opportunities to interact with: military, tribes.

- Having an opportunity to observe the regional political landscape and what people emphasized when arguing for trails.
- Outreach – I consider the public meetings, open house, and target audience outreach (particularly to students) all extremely successful for the number of people reached and the kind and quality of information received. I always had wonderful success connecting with people when I went out on my bike (particularly on weekends).
- Access to (and face-to-face encounters with) NPS staff, FWS staff, DOT staff and others who were genuinely interested in helping the project along.
- Having a mentor who was available to provide feedback, talk through ideas, successes and challenges, come visit, and just generally be someone who I could call and not feel like I was doing things alone.
- Having a supervisor who I got along with well, who could appreciate the difficulty of getting my work done given the challenges I faced and encountered, who enjoyed my capability, and who appreciated my contributions.
- Meeting and forming relationships with the other Transportation Scholars, having monthly calls as a group, gathering at TRB and presenting posters collectively (developed camaraderie among us rather than competition).
- Helping with awarded grant projects.
- Being given ownership of transportation-related projects and ideas on the Refuge and facilitating development of projects not within my scope of work.
- Participation in the monthly FWS Transportation Coordinator calls.
- Learning more about how transportation projects get funded (within FWS, through FLHD, grant programs, etc.)
- Experience working at a regional office, where transportation projects are less of an anomaly in terms of the planning process than they are at the unit level; understanding more about how transportation projects move through the organizational system.
- Having access to Western Federal Lands in addition to a FWS regional office and learning more about how those two relate.
- Accomplishing deliverables and being pleased with them.

Challenges and how approached

- Delay getting computer access and fws.gov email (used personal computer, borrowed FWS system access, delayed setting meetings until I had access, used COE email or personal gmail until up and running,
- Remoteness of location (use of Refuge vehicle for supply runs to town, personal bike on site for long recreational rides, made a friend who offered rides to event rides and OKC and company during event rides, online shopping with delivery to the unit)
- Unreliable telecommunication system (when the system was broken, I could not do anything to change the situation, but I could work on other tasks that did not require telecommunications; usually at least one of the land line, cell service, or internet/email would work, and I adapted according to what was working; go to town. Using personal cell phone for work while at the Refuge wasn't a good option because I had very little service on most of the Refuge and was protecting my minutes for personal calls. On the subject of email, internet unreliability was

uncomplicated for me at work when DOI switched over to Bison Connect – I couldn't easily check my email remotely beforehand because I do not have ready access to Internet Explorer.)

- Distance from R2 specialists who could help me get my work done (I received some support from the R2 landscape architect, but her project timelines and availability did not coincide very well with the Scholar project timeline – moving my activities to the R1 office enabled me to work closely with a FWS landscape architect to work on the problem and also facilitated work with TRIPTAC technical assistance from David Evans and Associates who are also based in Portland.)
- Concurrent housing and office relocation (brainstormed with unit supervisor all available options – the best option for where I was in the project was to telework from home. I wanted to continue learning opportunity with daily FWS contact and advocated for and arranged workspace at R1 office. One result of this was losing my work phone number, but since I had less need to protect minutes on my cell plan for personal use, I didn't mind using my personal cell number. All things considered, it would have been nice to have one consistent phone number the entire time.)
- Navigating different values related to the project (used carefully chosen language)
- High security at FWS R1 office (barring application for high security building access with background check which would not have necessarily been granted in the time I was at the location, I followed security rules for building users with no security clearance – daily airport-type security inspection and personal escort to and from my work floor.)
- No working/reliable computer available for me at R1 (borrowed a laptop from a staff member in Fire and borrowed someone else's McAfee login to use it. Laptop used mainly for internet usage, and personal computer used mainly for development of work products.)
- Not linked in with R1 happenings (established relationships with people I encountered on my floor and other staff I encountered through different problem solving activities – such as Jacob in IT)
- Maintaining distance relationships (used phone and email to stay in touch with supervisor and partners, and this worked fairly well but was a little more difficult with partners.)

Assistance that contributed to success

- Local WMWR partners: Fit Kids (primarily Dr. Ben Cooper and Kyle Rogers), City of Lawton (Richard Rogalski, Kim Shahan, Jim Bonnarens), Lawton Public Schools (Billy Davis, Ken Gray), Lawton Family YMCA (Yolanda Allen), Run Hers (Lori Cummins), Lawton Area Girl Scouts (Princess Behrens), Cache (Jim Kurth, Jr., Karol Haney), Medicine Park (Dwight Cope, Mark Ellis, Clark Brown, Doug Kemper, Chad Everett, Alex Canada), Fort Sill (Brenda Spencer-Ragland, Bill Barwick, Kevin Jackson), Friends of the Wichitas (Donna Phillips, Bobby Williamson, Jim Stone, Helen Riley), mountain bikers (Brent Hulen)
- Mobility advocates in Portland, OR: Jan Campbell, Chuck Frayer (USFS), Georgena Moran, Joe and Pam VanderVeer, Nicholas Johnson
- FWS staff: Rob O'Brien (a variety of technical support, facilitating invitation to the FWS Transportation Coordinators calls), Juli Niemann and Alex Schwartz (landscape architecture design expertise, documents, and tools), Jeff Holm (providing workspace and guidance in R1 office), Nathan Caldwell (input on Sarbanes grant and 2013 Transportation Scholar project ideas, supporting presentation at Preserving the Historic Road 2012 conference),

- Western Transportation Institute staff: Rebecca Gleason (mentoring, project input and feedback, providing appropriate resources), Brandy Murray (proposing technical assistance through David Evans and Associates to help me complete my project, professional development opportunity by attending Association of Partners for Public Lands convention), Phil Shapiro (providing input on project problems and improvements to TRB poster), Jenni West (supporting my ambassadorial skills to attend APPL convention)
- David Evans and Associates: Gill Williams (site drawings), Tobin Guthrie (GIS and maps)
- Volpe National Transportation Systems Center: Marla Engel (NEPA assessment estimate), Luis Mejias (cooperation with our mutually supportive projects), David Daddio (environmental assessment processes), Eric Plosky (mentoring)
- FLHD staff: Laurie Miskimins, CFL (Scholar mentoring support and networking opportunities, coordination with ITS demonstration project, coordination and response regarding Road Safety Audit), Susan Law, Roxanne Bash, Peter Field and Matt Joerin, WFL (Scholar mentoring and orientation to WFL planning and programming)
- NPS staff support in locating or getting access to different resources: Dennis Nagao (transportation guidelines, other relevant staff), Deb Frye (ROMO trail feasibility study), NPS DSC archivist (design guidelines and plans related to scenic byways on NPS lands and Blue Ridge Parkway), and Rich Turk (value analysis)

Professional Development

Before my Scholar assignment, my career objective was to obtain career-level work in transportation or a recreation-related field that connects people to rural areas, public lands, natural resources, or cultural resources through multi-modal travel options -- especially options that involve bicycling and other forms of active transportation. At the conclusion of my Scholar assignment, my interest in this career objective deepened, and I gained new clarity regarding the kind of work that would feel most suitable to me. The assignment helped me grow professionally with new work experiences and by providing networking opportunities, supporting professional development through conference participation, and enhancing my job competitiveness.

I added 11 months of paid experience to my resume that includes working with the NEPA process, value analysis, trail design, accessibility, youth engagement, funding identification and solicitation, facilitating a concept and schematic design process, budget development, and developing scopes of work and work plans. Through this process, I gained a better understanding of working as a consultant, particularly as it relates to project timelines, budget, and delivery. My project allowed me to work with new groups and engaged partners. Outreach strategies and programs received positive response from participants and the media.

Networking opportunities allowed me to interact with transportation professionals during projects and enabled me to observe how different kinds of work contribute to transportation project advancement. I also spoke with transportation professionals about their own career trajectories, which has helped me identify what kinds of positions I would like to pursue. (Many of these network opportunities came from FLHD, Volpe, FWS (R1 and R2), FTA; other Scholars (Susan Law, Laurie Miskimins, Krista Sherwood, 2012 cohort); everyone at TRIPTAC; NPS staff)

I felt fortunate to present at Preserving the Historic Road 2012 and to continue sharing my expertise on bicycle tourism and the match between bicycles and heritage resources with a national audience. Attending this conference also helped me with research methods to identify possible historic road alignments for my project in the Meers Road corridor. The Transportation Research Board Annual Meeting provided a valuable opportunity to share my work with a national audience, cultivate new research ideas, and network with transportation professionals face-to-face, many of whom I had met via conference call but not in person. I was also able to attend an in-person job interview during the conference and network with staff at that organization.

Many of my project contacts and TIPTAC staff provided considerable support for the USAJobs application process. Practicing early and often with the process provided me with a better understanding of federal hiring processes and how to assess my education, skills, and experience in terms of salary or wage grade and qualifications. I feel more competitive as an applicant for jobs, federal and others, having been a Transportation Scholar.

The connections I made as a Scholar certainly continue beyond assignment end. I have been working with FWS contacts in Region offices and at Headquarters to identify volunteer projects that will continue my professional development process while providing needed agency assistance. Some of these volunteer opportunities also involve collaborative efforts with FLHD, giving both the agencies and me opportunities to learn more about each other through professional activities.

Appendix A: Bibliography

Alternative Transportation Study: Wichita Mountains Wildlife Refuge (August 2010) Prepared by John A. Volpe National Transportation Systems Center, U.S. Department of Transportation. Accessed 6/13/12 from www.triptac.org.

America's Great Outdoors: A Promise to Future Generations (February 2011) Council on Environmental Quality, Department of Agriculture, Department of the Interior, Environmental Protection Agency.

Architectural Barriers Act (ABA) Accessibility Guidelines for Outdoor Developed Areas (June 20, 2007) Federal Register Vol. 72, No. 118, Proposed Rules. Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1195. Accessed from www.access-board.gov/outdoor/nprm.pdf 7/3/12.

Conserving the Future: Wildlife Refuges and the Next Generation (October 2011) U.S. Fish and Wildlife Service.

Design Principles for Nature Play Space in Nature Centers and Other Natural Areas (2012) Green Hearts INC. Accessed from www.greenheartsinc.org February 2013.

Forman, Richard T. T, Daniel Sperling, John A. Bissonette, Anthony P. Clevenger, Carol D. Cutshall, Virginia H. Dale, Lenore Fahrig, Robert France, Charles R. Goldman, Keven Heanue, Julia A. Jones, Frederick K. Swanson, Thomas Turrentine, and Thomas C. Winter. (2003) *Road Ecology: Science and Solutions*. Island Press, Washington, DC.

Guide for the Development of Bicycle Facilities 4th ed. (2012) American Association of State Highway and Transportation Officials, Washington, DC.

Guidelines for Providing Trail Information to People with Disabilities (January 2013) Available at accessrecreation.org/Trail_Guidelines/Inside_title_page.html.

Habitat Management Plan (August 1985) Surface Water and Drainage Patterns Exhibit 12, Wichita Mountains Wildlife Refuge, U.S. Fish and Wildlife Service.

Webber, Pete. Ed. *Managing Mountain Biking: IMBA's Guide to Providing Great Riding* (2007) International Mountain Biking Association, Boulder, CO.

Parker, Troy Scott (2004) *Natural Surface Trails by Design: Physical and Human Design Essentials of Sustainable, Enjoyable Trails.* Natureshape, Boulder, CO.

Planning Trails with Wildlife in Mind: A Handbook for Trial Planners (September 1998) Trails and Wildlife Task Force, Colorado State Parks, and Hellmund Associates. Accessed from www.dnr.state.co.us/parks/ July 2012.

Roadway Design Guidelines (August 2012) U.S. Fish and Wildlife Service. Prepared by FWS Pacific

Region, NWRS Branch of Transportation, Alex Schwartz, Portland, OR.

Rocky Mountain Park: Multi-Use Trail Feasibility Study (November 2009) Prepared by National Park Service, Rocky Mountain National Park, Bryce Lloyd and EDAW/AECOM, Fort Collins, CO.

Sexton, N.R., Dietsch, A.M., Don Carlos, A.W., Koontz, L.M., Solomon, A.N. and Miller, H.M. (2012) *National wildlife refuge visitor survey 2010/2011—Individual refuge results for Wichita Mountains Wildlife Refuge*: U.S. Geological Survey Data Series 643.

Soil Survey: Comanche County, Oklahoma (August 1967).

Steinfeld, David E., Scott A. Riley, Kim M. Wilkinson, Thomas D. Landis, and Lee E. Riley (October 2007) *A Manager's Guide to Roadside Revegetation Using Native Plants.* Technology Deployment Program, Western Federal Lands Highway Division, Federal Highway Administration, U.S. Department of Transportation, Vancouver, WA. Report Number: FHWA-WFL/TD-07-006.

The Trail Inventory of Wichita Mountains NWR, (April 2012). Central Federal Lands Highway Division

The Road Inventory of Wichita Mountains National Wildlife Refuge, (January 2005) Central Federal Lands Highway Division.

Trail Solutions: IMBA's Guide to Building Sweet Single Track. (2004) International Mountain Bicycling Association. IMBA, Boulder, CO.

Trails Design and Management Handbook (January 1994) Pitkin County Open Space and Trails, Aspen, CO. Prepared by Troy Scott Parker, Cimarron Design.

Transportation Observations, Considerations and Recommendations for Wichita Mountains Wildlife Refuge (May 31 – June 2, 2009) Provided by the Interagency Transportation Assistance Group (TAG) / Paul Sarbanes Transit in the Parks Program, Indiahoma, OK.

U.S. Fish and Wildlife Service Region 2 Long Range Transportation Plan. Data Collection Report. (June 2012) Central Federal Lands Highway Division.

Wichita Mountains Wildlife Refuge Comprehensive Conservation Plan 2012, (November 2012) U.S. Fish and Wildlife Service.

Wichita Mountains Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. (August 2012) U.S. Fish and Wildlife Service.

Wichita Mountains Wildlife Refuge

Two Trails and a Parking Lot:

A Compilation of NEPA-Ready Project Proposals

April 2013

Prepared for:

U.S. Fish and Wildlife Service
Wichita Mountains Wildlife Refuge

Paul S. Sarbanes Transit in the Parks
Technical Assistance Center

Prepared by:

Heidi Beierle
Public Lands Transportation Scholar
Wichita Mountains Wildlife Refuge

Table of Contents

Introduction

Two proposed trail projects at Wichita Mountains Wildlife Refuge have undergone planning and schematic design in preparation for National Environmental Policy Act (NEPA) assessment. These two trails include the Lake Elmer Thomas Recreation Area (LETRA) connection trail and the Jed Johnson Tower trail. Both trails are situated on the Refuge's east side and share borders with three jurisdictional neighbors and project partners – Fort Sill Army Base, the Town of Medicine Park, and City of Lawton (through the Parks and Recreation Department). In addition to these two trails, improvements are proposed to a parking lot that serves the Jed Johnson Tower trail.

The purpose of this project proposal is to provide the Refuge or consulting parties with necessary materials to conduct a NEPA assessment of these trails and the parking lot.

Endangered species research, cultural resources research, and supporting documentation for these two trail projects may be found in "LETRA Connection Trail Existing Conditions" technical memo (Appendix A) and "Jed Johnson Tower Trail and Parking Lot Existing Conditions" technical memo (Appendix B). A third document, "Trail Design Options Assessment" assembles the information and process used to develop the Design Criteria and Alternatives sections here. Site Plans and Profile Views for the two trails were developed using a working draft of the Alternatives. Cost Estimates were generated from the schematic design documents.

Project History

These trail projects and potential parking lot improvements were developed through the efforts of a 2012 Public Lands Transportation Scholar. The trails are identified in the 2012 Wichita Mountains Wildlife Draft Comprehensive Conservation Plan and Environmental Assessment for the Refuge and have been undergoing some level of planning since a 2009.[1] Other details regarding the project history may be found in the two "Existing Conditions" memos.

Issues

The two proposed trail projects respond to a number of transportation, ecological, and social issues. These issues were identified through discussions with Refuge staff and project partners and in the 2010 Alternative Transportation Study conducted by Volpe National Transportation Systems Center.[2] To understand the public use perspective relevant to these issues, extensive outreach was conducted with diverse groups, including more than 60 youth.[3]

- Motor-vehicle speeding.
- No regional transportation coordination.

[1] A Transportation Assistance Group met on the Refuge to discuss alternative transportation options and transportation-related resource management strategies. *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, Indiahoma, OK.

[2] *Alternative Transportation Study: Wichita Mountains Wildlife Refuge*. Prepared by John A. Volpe National Transportation Systems Center, U.S. Department of Transportation. August 2010. Accessed 6/13/12 from www.triptac.org.

[3] *Wichita Mountains Wildlife Refuge Outreach Summary*. Prepared by Heidi Beierle for Wichita Mountains Wildlife Refuge and the Paul S. Sarbanes Transit in the Parks Technical Assistance Center. January 2013.

- Wildlife collisions and fatalities.
- Parking congestion.
- Habitat degradation.
- Pollution.
- Limited pullouts for wildlife viewing.
- High road maintenance costs.
- Large carbon footprint.
- Auto-dependent development patterns
- Poor statewide health (sedentary lifestyles, obesity).
- Few accessible facilities.
- Public disconnected from nature, especially youth.
- Overuse of Wilderness Area.
- Littering.

Design Criteria

Trail design criteria included four main categories that are consistent with the Refuge mission and goals.

1. **Environmentally Sensitive Design.**
   Prevent resource loss and maintain or improve conditions of resources.

2. **Wildlife Observation Experience.**
   Encourage wildlife and resource discovery through facility design.

3. **Safety.**
   Protect public safety, health, and welfare.

4. **Cost-Effective, Environmentally Responsible, and Otherwise Beneficial Development for U.S. Fish and Wildlife Service.**
   Provide for low long-term facility maintenance needs and costs, improve green infrastructure, and other considerations.

Development of advantages for different design criteria categories derived from asking questions of each design option element and location.

- How does the design option maintain ecological integrity of the surrounding environment, including considerations for wildlife collisions, stormwater management, noise effects, and air quality?
- How does the design option maintain visual and aesthetic continuity of the surrounding environment?
- How does the design option enhance access to, appreciation of, and understanding of natural resources for children and other target trail users?
- How does the design option enhance access to, appreciation of, and understanding of cultural resources for children and other target trail users?
- How does the design option provide a facility that children will want to use?
- How does the design option provide a facility that people who use mobility aids will be able to use and interested in using?
- How does the design option meet children's and other target trail users' needs for a safe and enjoyable to use facility?
- How does the design option encourage wildlife and natural resource discovery?

- How does the design option provide an observation experience on the facility that will encourage return visits and development of Refuge advocates?
- How does the design option encourage motor-vehicle speeds of 20 m.p.h. or slower?
- How does the design option provide for safe shared use between motor vehicles and non-motorized transportation trail users?
- How does the design option provide for safe shared use among non-motorized transportation trail users?
- How does the design option provide a facility that the target trail users feel safe and comfortable using?

The issues addressed with these two trails and the parking lot are embedded in the above questions and were asked of different design options during project scoping with Refuge managers. The "Trail Design Options Assessment" documents this scoping process.

Alternatives

Following a scoping process conducted with Refuge managers in February 2013,

- four alternatives including the "No Build" alternative were identified for the LETRA connection trail,
- four alternatives including the "No Build" alternative were identified for the Jed Johnson Tower trail, and
- two alternatives including the "No Build" alternative were identified for the Jed Johnson Tower trail parking lot.

Development of these east side trail facilities as represented by these two trail proposals and the parking lot proposal address:

1. Regional and Refuge needs to provide more alternative transportation options,
2. Refuge habitat conservation management strategies, namely redirecting visitation from the west side Wilderness Area to east side destinations,
3. Safety improvements, and
4. Usability and attractiveness of east side visitor facilities.

Alternative Transportation Options

The Refuge attracts approximately 1.7 million visitors annually. Over ninety percent of these visitors arrive in personal automobiles. People and operating automobiles significantly contribute to the scale of the above-mentioned issues, and the number of people driving automobiles on the Refuge and within the region compounds the effects the issues have on Refuge resources. Development of individual, accessible trails for biking and walking that connect to other trails and destinations would contribute to the Refuge's inventory of alternative transportation facilities and provide visitors more non-motorized travel options to explore Refuge resources.

Habitat Conservation

Development of individual trails on the east side, however, may not provide enough destination appeal to affect visitation patterns on the west side. Yet, seen as components of a larger east side trail system with complementary programming, these trails may function as key elements of an attractive east side trail system that people will want to explore through non-motorized means. One concept for this type of larger trail network is a stacked loop trail system on the Refuge's east side, a system that extends beyond the Refuge

boundary. (See Appendix C for a description of a stacked loop trail system and its applicability to the Refuge's east side.) If a destination trail system, such as the stacked loop system, can be established on the east side, then Refuge management could succeed in lessening human impacts in the ecologically sensitive west side Wilderness Area by accommodating higher visitation or more intense public use on the less ecologically sensitive east side.

Safety

In order for target visitors to feel comfortable using east side trails, rather than visiting the ecologically sensitive west side or exploring the Refuge through exclusively automotive means, they must feel assured that their personal safety is considered and provided for. For the target visitors of the two proposed trails – youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists – safe trail facilities are situated far from motor-vehicle traffic. If trails cannot be separated from automobile traffic, then they should, at minimum, be separated from motor-vehicle areas with a barrier. The slower that automobiles travel adjacent to the trail barrier, the safer trail users feel.

Useable and Attractive Facilities

A trail that meets the public's expressed needs for safety will not necessarily become a well used trail. A technically safe trail may not take trail users to the places or sites where they want to go, nor could the same trail provide the social opportunities families or friends seek when recreating. If a technically safe trail has not been designed to accommodate people who use mobility aids, many visitors will be excluded. Through the outreach process, target visitors expressed a desire to use trails that allow them to recreate side by side, that are smooth, that blend in with the surrounding environment, and that offer them great places to stop and appreciate their surroundings. Smooth and maintained trails eliminate tripping hazards and tread obstacles. Trails wide enough to accommodate bicyclists, walkers, and people in wheelchairs ensure that people using the trails have enough room to avoid bumping into one another. Trails situated away from main roads eliminate concerns and feelings of vulnerability in the presence of speeding automobiles and/or distracted drivers. And trails designed to accommodate people with mobility impairments communicate welcome for everyone.

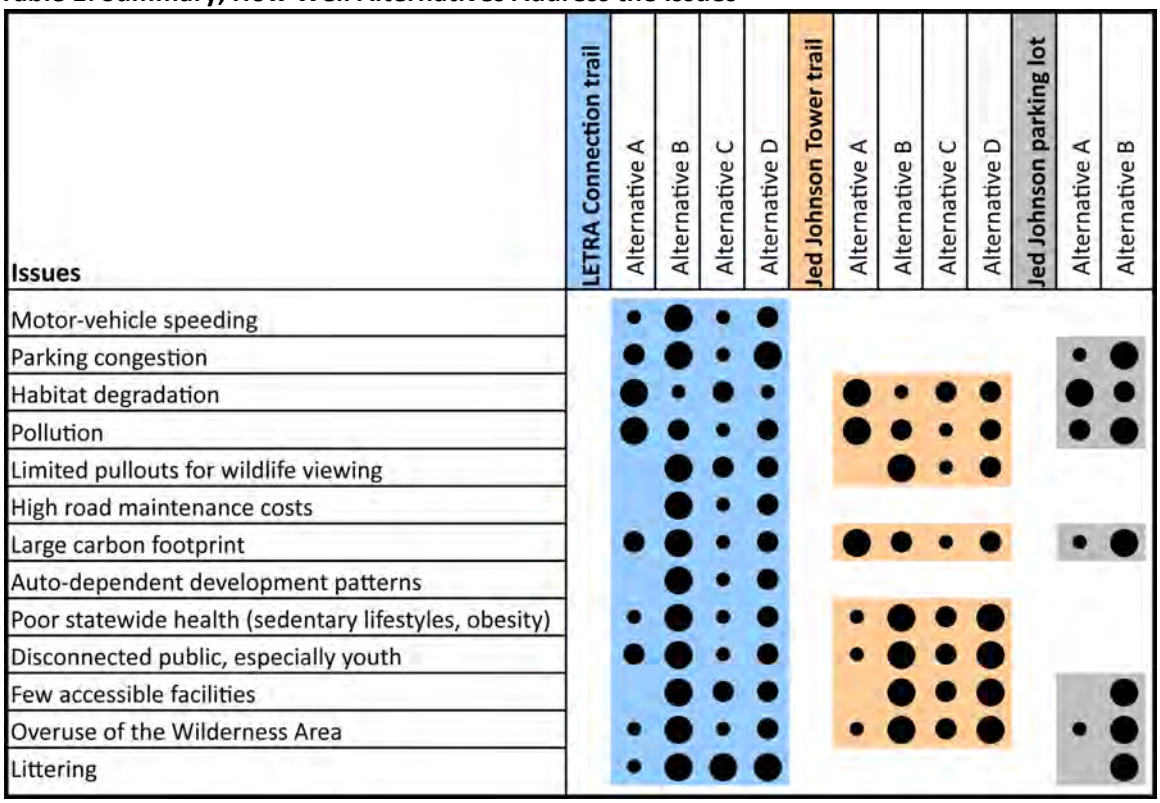
Despite the benefits the trails would bring to residents within the region and to Refuge visitors, these proposed projects exemplify ongoing debates within the U.S. Fish and Wildlife Service (FWS) regarding the balance of natural resource protection with public access to these resources. The design alternatives included in this proposal address a range of approaches that reflect the FWS challenge of preserving and protecting habitat – which includes designated Wilderness – and wildlife while presenting the public with opportunities to appreciate the value of these conservation efforts and the resources themselves.[4]

[4] America's Great Outdoors initiative (February 2011) strongly reinforces the need to increase participation in outdoor recreation and to attract new participants to the conservation effort, particularly youth (CCP 2012). *Conserving the Future*, the October 2011 U.S. Fish and Wildlife Service's vision document, acknowledges that "strategic, collaborative, scientific-based landscape conservation – along with effective public outreach, education and environmental awareness – is the only path forward to conserve America's wildlife and wild places" (14-15).

Particularly for this refuge, creating safe, useable, and attractive east side trail facilities supports the high priority and high value habitat conservation effort. East side trails that visitors feel are safe, that they can use, and that provide the kind of amenities that help them to have wonderful experiences on the Refuge set the stage for a shift in visitation patterns away from the ecologically sensitive west side Wilderness Area.

Table 1, below, illustrates that habitat conservation is at cross-purposes with the other three Refuge goals associated with the proposed projects. The table summarizes how well the issues are addressed by each of the Alternatives. In the table, all of the issues are not necessarily relevant to all three projects. Where an issue does not apply to a project, the row related to the issue for that project is uncolored. The bigger the dot, the better the alternative addresses the issue compared to the other project alternatives: ⬤ = best; ● = reasonably well; • = minimally. Colored areas with no dot indicate that the alternative does not address the issue.

Table 1: Summary, How Well Alternatives Address the Issues[5]



Apart from facility design, programmatic activities can enhance the beneficial effects of these projects on Refuge habitat, the regional social environment, and the transportation system. These programmatic activities do not necessarily have direct bearing on the NEPA assessment. They are, however, critical to these projects' long-term success and include activities such as marketing, promotion, passive interpretation, guided walks or bicycle rides, and a trail ambassador program, to name a few. Positive trail experiences translate into repeat visits and the development of Refuge volunteers, partners, donors, and stewards.

[5] For summaries that provide more detail regarding the ranking of alternatives for their respective projects, see Appendices D, E, and F.

LETRA connection trail

The LETRA connection trail includes a mix of conditions along its entire 1.85-mile length, including a .25-mile segment of previously undisturbed habitat and a .37-mile long segment of road that experiences public motor vehicle use. To clarify the features of these mixed conditions, the proposed trail is discussed in five segments:

- Segment 1: Lake Elmer Thomas dam south to Fort Sill gate
- Segment 2: Lake Elmer Thomas dam north to the gateway arch
- Segment 3: Gateway arch to Lake Elmer Thomas fishing pier
- Segment 4: Medicine Park Museum spur trail
- Segment 5: Accessible viewpoints spur trail

Alternatives

The LETRA connection trail design options underwent analysis in the Trail Design Options Assessment study. The narrative of that study identifies advantages that apply to all design options by segment, and accompanying tables compare advantages that differ among design options by segment.

The following descriptions summarize the salient features of the LETRA connection trail Alternatives. Alternative A is substantially different than any other alternatives. Table 2 shows common features to Alternatives B, C, and D and their associated segment location. Table 3 describes how Alternatives B, C, and D differ.

Alternative A

No conditions would change with this alternative. Segment 1 has an unstriped, 20-foot wide asphalt surface, providing administrative-only motor vehicle use. Segment 2 includes unpaved dirt road between 17- and 27-feet wide that currently experiences administrative and two-way public motor vehicle use. Segments 3 and 5 follow unsigned vegetated landscape features, such as the Lake Elmer Thomas dike. Segment 4 does not exist; it crosses undisturbed habitat.

Alternative B

This alternative proposes a dedicated non-motorized recreation trail with a 15-foot wide asphalt surface for Segment 1 and most of Segment 2, and a 10-foot wide asphalt surface for the other trail segments. Limited public motor vehicle access could be considered on most of Segment 2 to allow SCUBA divers to access parking at Lake Elmer Thomas dam. If this access were to occur with this alternative, it would be handled administratively through a permit process. This alternative gives priority to people on bikes and walking by limiting motor vehicle access and by creating a consistent asphalt surface and similar trail widths for all five segments.

Alternative C

This alternative roughly follows the existing surfacing types with the exception of surfacing Segment 2 with asphalt. Consequently, it has a mix of asphalt and natural surface trail segments. Trail widths vary; however, Segments 4 and 5 would be 8 feet wide. Segment 3 includes a different routing option that joins the trail with Highway 49 for .25 mile. This alternative proposes no changes to existing public motor vehicle use along certain trail lengths. A barrier would be added in locations where the trail

parallels public motor vehicle use areas. This alternative prioritizes minimal habitat disturbance and maintains existing visitor access for SCUBA diving.

Alternative D

This alternative follows Alternative C but proposes different options for Segment 2 and follows Alternative B routing for Segment 3. The Segment 2 options include reducing the space for public motor-vehicle access from two travel lanes to one travel lane with the addition of pullouts and closing the road to the arch to public motor-vehicle access. This alternative gives more priority to bicycle riders and walkers than Alternative C and maintains existing visitor access for SCUBA diving.

Table 2 indicates with a box (■) actions that apply to Alternatives B, C, and D and their respective segment(s). Cells with no dot indicate which actions do not apply to particular segments.

Table 2: Actions Common to LETRA connection trail Alternatives B, C, and D

Actions Common to LETRA Connection Trail Alternatives B, C, and D	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
Administrative motor-vehicle access.	■	■			
Add resting areas w/benches.	■	■	■	■	■
Add nature play area(s).			■	■	■
Pave with asphalt, use local rock.	■	■			
Add trash and recycling receptacle and shade structure to gravel parking area at Lake Elmer Thomas dam.		■			
Design facility w/in existing road footprint, 27'-wide.		■			
Gravel parking area at Lake Elmer Thomas dam for SCUBA and fishing use.		■			
Add bicycle parking in a relatively shady area near S end of trail. Locking bicycles at parking area is not a requirement.					■

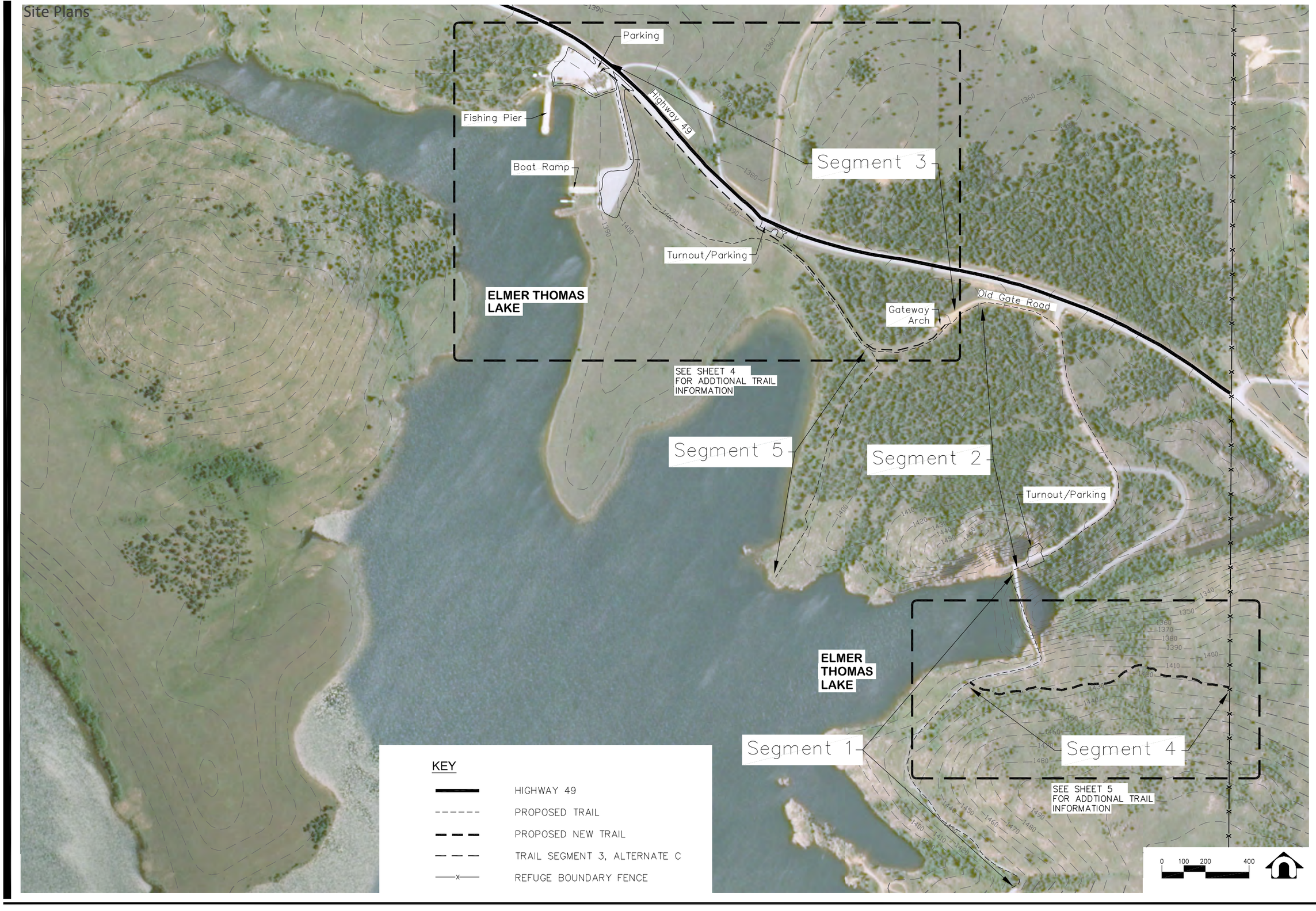
Table 3 describes actions that differ among Alternatives B, C, and D for the respective segments.

Table 3: LETRA Connection Trail Alternatives

	Alternative B	**Alternative C**	**Alternative D**
Segment 1: Lake Elmer Thomas dam south to Fort Sill gate	• Repave road w/ asphalt,* no striping. • 15' wide pavement.	• Repave road w/ asphalt,* no striping. • 12' wide pavement.	• Same as Alternative C.
Segment 2: Lake Elmer Thomas dam north to gateway arch	• Close road to public MV access. • Pave road w/ asphalt,* no striping. • 15'wide pavement from N end of Lake Elmer Thomas dam to junction w/ Hwy 49. • Add parking on N side of gate where Lake Elmer Thomas dam road meets Hwy 49. • 10' wide pavement from Lake Elmer Thomas dam road to gateway arch.	• Two-way public MV access. • Pave road w/ asphalt* and stripe. • 8'-wide MV travel lanes. • 10'-wide nm path adjacent to MV travel lanes on N side of road. • Construct concrete barrier between nm path and MV travel lanes. • Gravel parking and turn around area at gateway arch.	• One 10' wide lane for public MV access w/ pullouts. • Pave road w/ asphalt.* • 10' to 12'-wide nm path on N side of road adjacent to MV travel lane. • Construct barrier between nm path and MV travel lane w/ boulders from Refuge. • Close road to arch from intersection w/ Lake Elmer Thomas dam road to public MV traffic. For road/trail to arch, follow design for Alt. B (10'wide path).
Segment 3: Gateway arch to Lake Elmer Thomas fishing pier	• Asphalt trail, 10' wide, no striping.* • Cross Lake Elmer Thomas boat launch access road N of intersection w/ parking lot. Parallel access road N, along W side of road to fishing pier parking lot. Skirt S end of parking lot to fishing pier. • Construct barrier between nm shared use path and MV travel lanes.	• Crushed gravel trail 8' wide.** • Where Lake Elmer Thomas dike closely approaches Hwy 49 at MV pullouts (see attached map), connect nm shared use path to S shoulder on Hwy 49. • Construct a barrier between nm shared use path on Hwy 49 and MV travel lanes.	• Same as Alternative C, except change routing. Follow routing as described in Alternative B (follow dike to boat launch, access road to fishing pier, construct barrier between nm shared use path and MV travel lanes).
Segment 4: Medicine Park Museum spur trail	• Asphalt trail 10' wide.*	• Crushed gravel trail 8' wide.**	• Same as Alternative C.
Segment 5: Accessible viewpoints spur trail	• Asphalt trail, no striping, 10' wide.*	• Crushed gravel trail 8' wide.**	• Same as Alternative C.

MV – motor-vehicle nm – non-motorized *All asphalt paving and repaving would use local rock.

**All crushed gravel surfaces would use local rock. With crushed gravel, using a natural material soil stabilizer, such as Road Oyl or EMC^2, to harden surface could be considered.



ELMER THOMAS LAKE TRAILS
WICHITA MOUNTAINS
WILDLIFE REFUGE

LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS: APPD.

DATE: 4-11-13
DESIGN: RGW
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

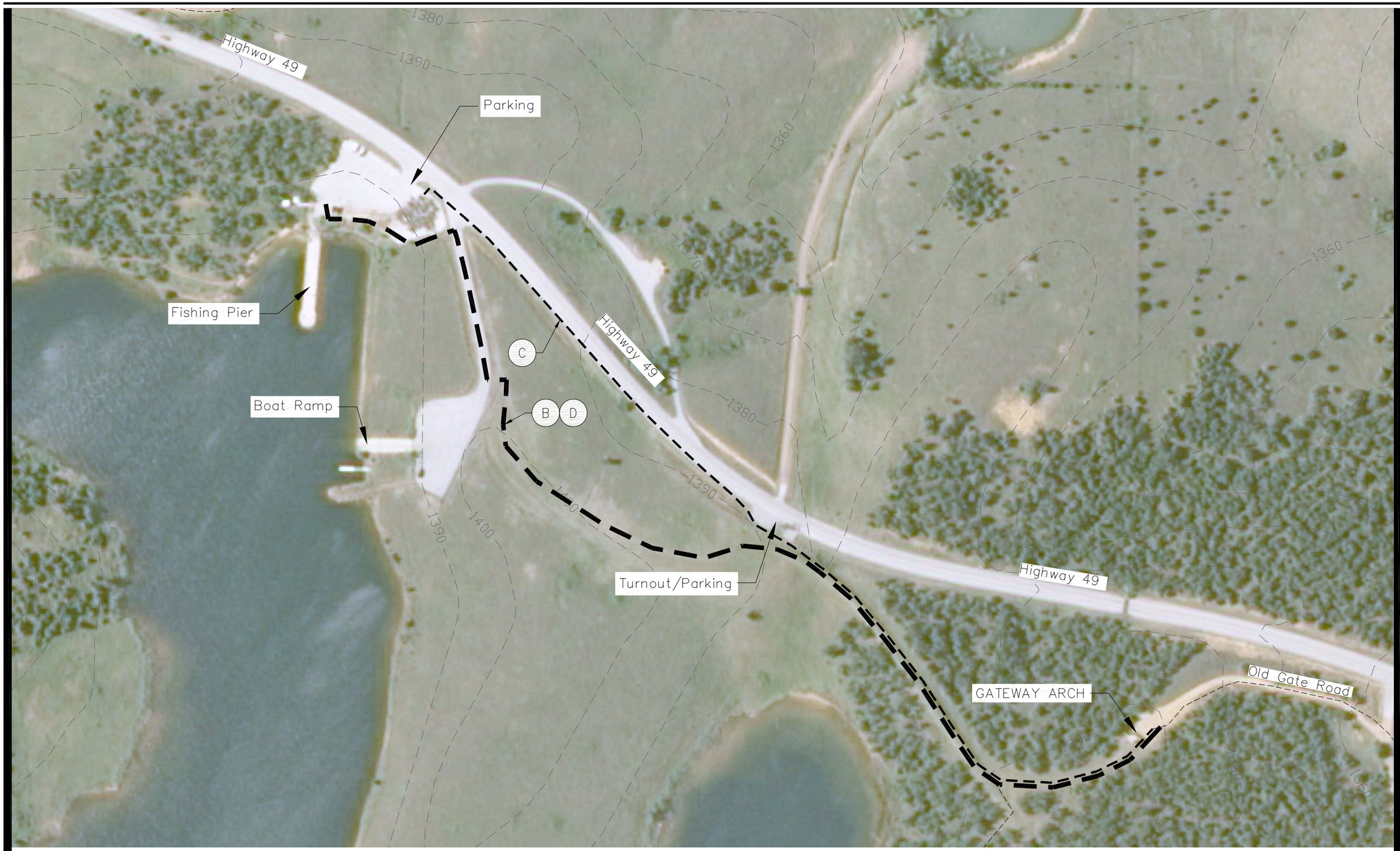
SCALE: NA

PROJECT NUMBER:
MSUN00000002

DRAWING FILE:
C003-ELMER THOMAS LAKE.c

SHEET NO.
3
OF 10

P:\W\MSUN00000002\04000CAD\DWG\Sheets\Wichita Mtn\C003-ELMER THOMAS LAKE.dwg Jul 03, 2013 - 11:12am



KEY

A – NO ACTION

C – ALIGNMENT

B AND D – ALIGNMENT

PROPOSED TRAIL SEGMENTS 2 AND 5

SEGMENT 3 TRAIL FEATURES

SCALE: 1" = 100'

0 50 100 200

ELMER THOMAS LAKE - TRAIL SEGMENT 3
WICHITA MOUNTAINS
WILDLIFE REFUGE
LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS: APPD.

DATE: 4-11-13
DESIGN: RGW
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

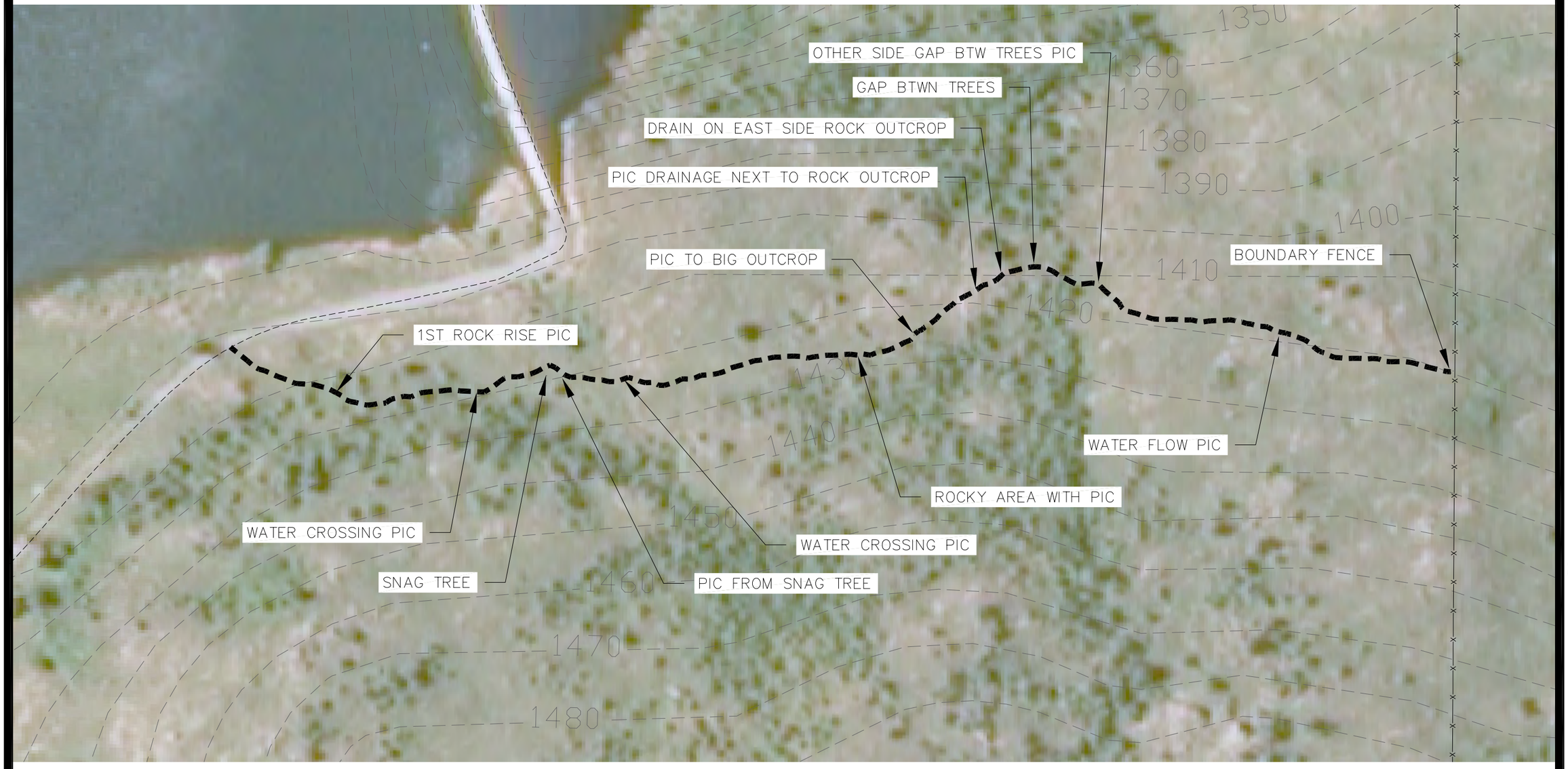
SCALE: NA

PROJECT NUMBER:
MSUN00000002

DRAWING FILE:
C004-ELMER THOMAS LAKE.c

SHEET NO.
4
OF 10

P:\M\MSUN00000002\D400CAD\DWG\Sheets\Wichita Mtn\C004-ELMER THOMAS LAKE.dwg Jul 03, 2013 - 11:22am



KEY

------ PROPOSED TRAIL

— — — PROPOSED NEW TRAIL

——x—— REFUGE BOUNDARY FENCE

SEGMENT 4 TRAIL FEATURES

SCALE: 1" = 50'

0 25 50 100

ELMER THOMAS LAKE - TRAIL SEGMENT 4
WICHITA MOUNTAINS
WILDLIFE REFUGE
LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS:	APPD.

DATE: 4-11-13
DESIGN: RGW
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER:
MSUN00000002

DRAWING FILE:
C005-ELMER THOMAS LAKE.c

SHEET NO.
5
OF 10
-13

P:\M\MSUN00000002\04000CAD\DWG\Sheets\Wichita Mtn\C005-ELMER THOMAS LAKE.dwg Jul 02, 2013 - 11:11am

Jed Johnson Tower trail

The proposed Jed Johnson Tower trail follows an existing .5-mile long rugged and rocky natural surface trail. Rock outcroppings, large granite cobbles, and exposed granite bedrock intrude on the trail tread. The trail crosses two drainage areas, both of which contain eroded soils from higher elevations, and the trail tread is severely eroded. Differences among the alternatives include potential alignments to provide an accessible experience, repair the steep slopes, and manage erosion.

Alternatives

The Jed Johnson Tower trail went through scoping in the Trail Design Options Assessment study. Design options for the trail were narrowed to alternatives based on discussion of the LETRA connection trail design options, specific questions related to this trail's alignment, and discussion regarding the level of accessibility the Refuge wanted to provide on this trail. In addition, strong public support to maintain the natural character of this trail along with professional design opinions echoing the same approach eliminated asphalt as a potential surfacing type.

The following descriptions summarize the salient features of the Jed Johnson Tower trail Alternatives.

Alternative A

No actions are proposed with this alternative, even to improve drainage, erosion, slope, or accessibility. Consequently, conditions for Alternative A exist as is. The trail follows an old Civilian Conservation Corps (CCC) road to Jed Johnson Tower. The trail includes sections of relatively flat terrain, crosses two draws, and has eroded sections of trail with slopes between 9% and 12%. Eroded trail areas contain exposed bedrock and large granite cobbles.

Alternative B

This alternative creates an 8-feet wide crushed gravel trail that follows a routing option that reduces the average trail slope by following landscape contours and adding length to the trail in order to meet recommendations in Guidelines for Outdoor Developed Areas. This alternative creates a fully accessible trail that will result in lower long-term maintenance costs.

Alternative C

This alternative follows the existing trail alignment and creates a crushed gravel trail 8-feet wide. Without adding length to this trail, accessibility is improved by building up the trail tread to achieve a more consistent surface. This option may require more ongoing maintenance to address runoff on steeper slopes. The length of the 10% slopes in this alternative may exceed recommendations presented in the Guidelines for Outdoor Developed Areas; however, the Refuge intends to provide information at the trailhead and online that describes the conditions and difficulty of the trail. This alternative prioritizes no new habitat disturbance to create a trail that meets many, but not all of the accessible trail guidelines for Outdoor Developed Areas.

Alternative D

This alternative follows Alternative C strategies and further reduces trail slope and tread obstacles in particular locations to meet accessible trail recommendations in the Guidelines for Outdoor Developed Areas by creating short bypasses from the existing trail alignment. This alternative allows some habitat disturbance to create a fully accessible trail.

Alternatives B, C, and D share common actions but have distinct alignments from each other. A summary of the common actions follows.

Alternatives B, C, and D all propose 8-feet wide crushed gravel surfacing along the trail's entire length. Like the LETRA connection trail, all rock used should be local or match the color of the Refuge's distinct orange and yellow granite. Using a natural material soil stabilizer, such as Road Oyl or EMC^2, to harden the crushed gravel surface could be considered. These three alternatives also propose adding resting and/or interpretive areas with benches and adding nature play areas.

All three alternatives also include recommendations to provide information at the trailhead and online that describes the conditions and difficulty of the trail. This action is identified as a differing action in Alternative C because it would be required to meet recommendations for an accessible facility. For Alternatives B and D this information piece enhances accessibility, but based on design would not be a requirement.

The following actions differ among Alternatives B, C, and D.

Alternative B

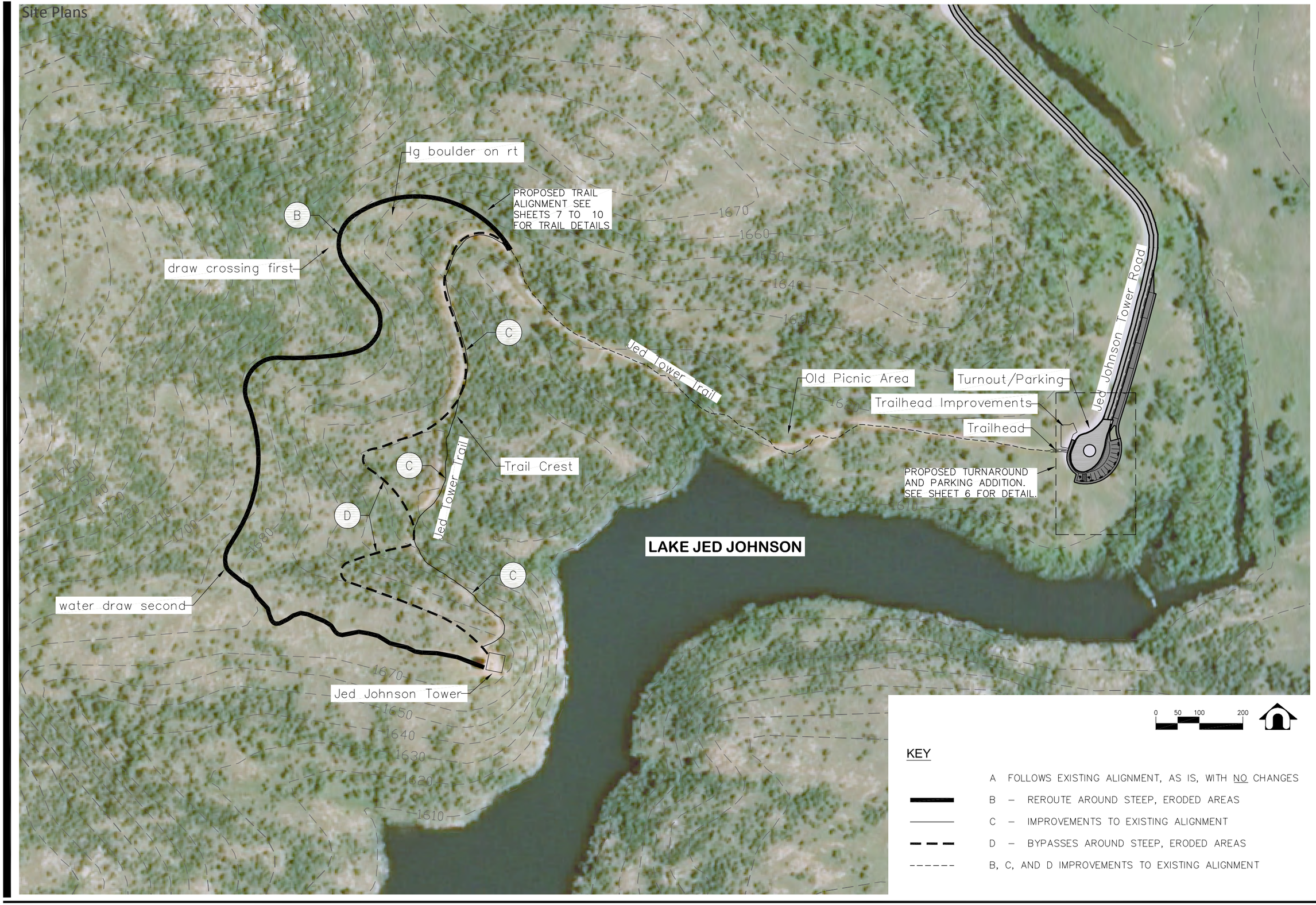
- Reroute the trail as illustrated in Figure x.
- Maintain trail slopes of 10% or less, per Guidelines for Outdoor Developed Areas.
- Restore bypassed trail alignment.

Alternative C

- Same as Alternative B, except follow existing trail alignment (see Figure x). In areas where the trail cannot feasibly meet slope formulas outlined in the Guidelines for Outdoor Developed Areas, rehabilitate trail to 10% slopes or less by building up the trail tread.
- Provide information at the trailhead and online that describes the conditions and difficulty of the trail.

Alternative D

- Same as Alternative C, except allow trail bypass areas (see map) to attain trail slopes of 10% or less, per Guidelines for Outdoor Developed Areas.
- Restore bypassed trail alignments.



KEY

	A FOLLOWS EXISTING ALIGNMENT, AS IS, WITH NO CHANGES
━━━	B – REROUTE AROUND STEEP, ERODED AREAS
———	C – IMPROVEMENTS TO EXISTING ALIGNMENT
- - -	D – BYPASSES AROUND STEEP, ERODED AREAS
------	B, C, AND D IMPROVEMENTS TO EXISTING ALIGNMENT

LAKE JED JOHNSON
WICHITA MOUNTAINS
WILDLIFE REFUGE

LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS: APPD.

DATE: 06/25/13
DESIGN: RGW
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER: MSUN00000002

DRAWING FILE: C002–LAKE JED JOHNSON.dw

SHEET NO. 2 OF 10

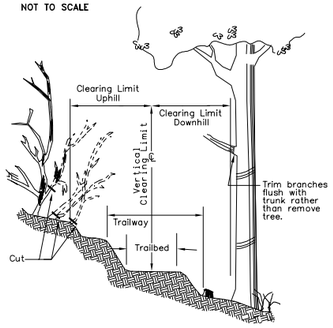
P:\MSUN00000002\0400CAD\DWG\Sheets\Wichita Mtn\C002–LAKE JED JOHNSON.dwg Jul 03, 2013 – 10:50am

CLEARING LIMITS

NOT TO SCALE

Clearing Limits

trail type	Uphill	Downhill	Height
PEDESTRIAN	5'	5'	10'
BICYCLIST	5'	5'	10'



Do not remove trees over 18" diameter if they are over 5' from the edge of trail (both sides).

Remove all trees 12" or less in diameter if they are within 3' of edge of trail (both sides).

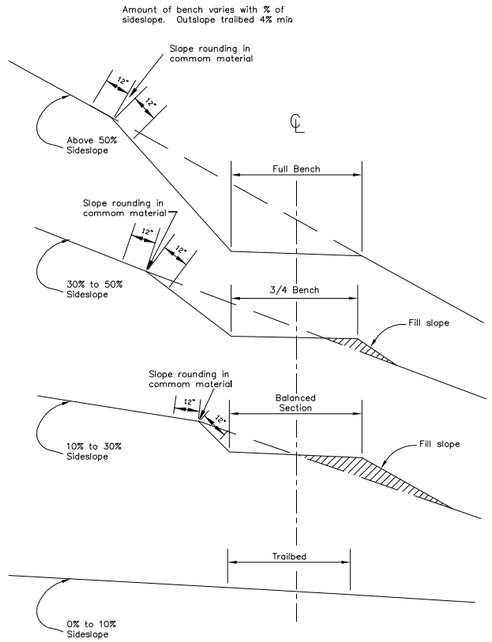
Stump Height Requirements* (FEET)

Stump Position	Side Slope	Uphill	Downhill
Stumps between the trailway and clearing limits.	Side slope less than or=to 10%		
	Side slope over 10%		
Stumps outside the clearing limits	Side slope less than or=to 10%		
	Side slope over 10%		

*All heights measured on uphill side of stumps.

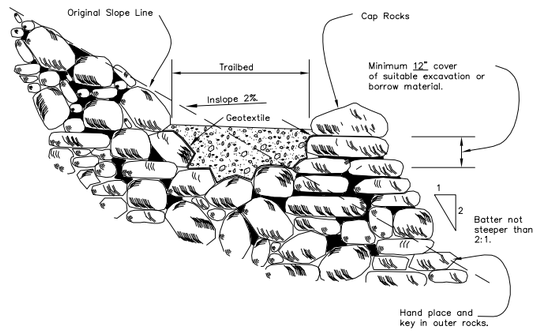
TYPICAL TRAIL CROSS SECTIONS

NOT TO SCALE



TALUS AND RUBBLE ROCK SECTION

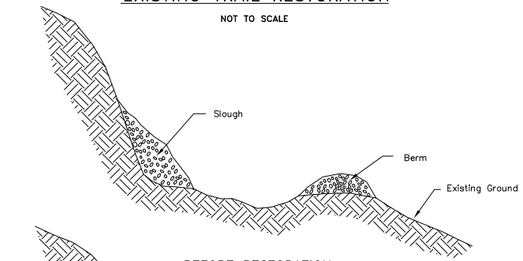
NOT TO SCALE



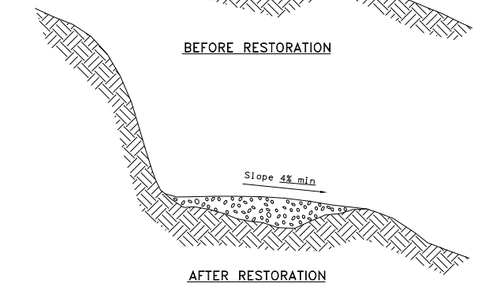
4/96 912-3

EXISTING TRAIL RESTORATION

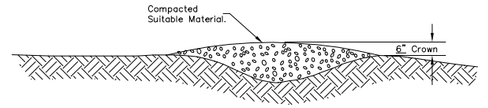
NOT TO SCALE



BEFORE RESTORATION



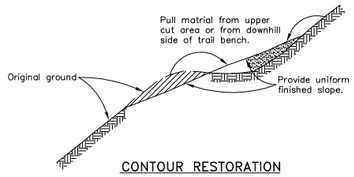
AFTER RESTORATION



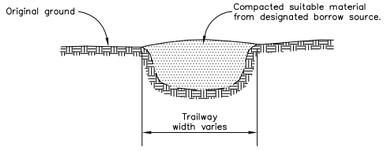
FLAT SLOPES

TRAIL OBLITERATION

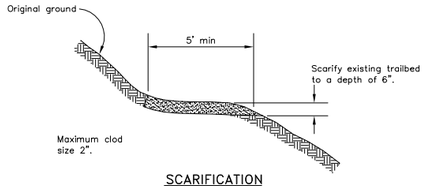
NOT TO SCALE



CONTOUR RESTORATION



TRENCH BACKFILL

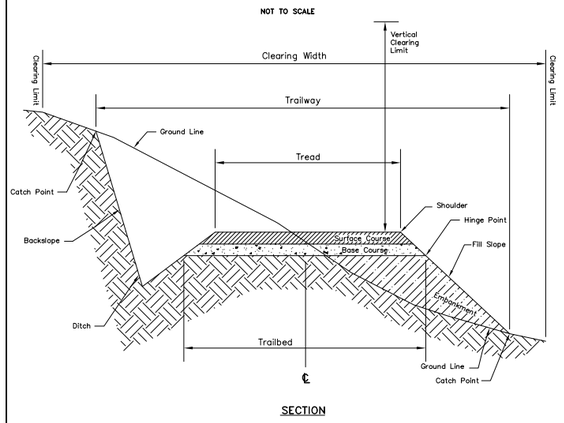


SCARIFICATION

6/96 954-1

ILLUSTRATION OF TRAIL STRUCTURE TERMS

NOT TO SCALE

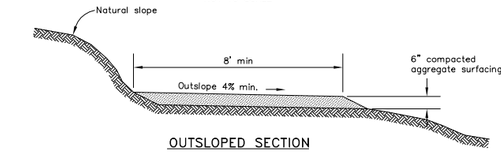


SECTION

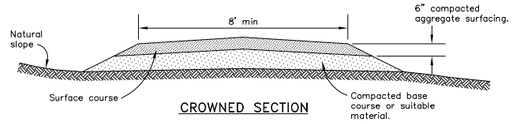
3/97

AGGREGATE SURFACING

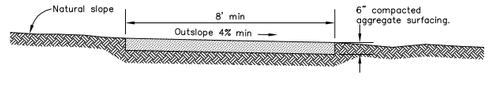
NOT TO SCALE



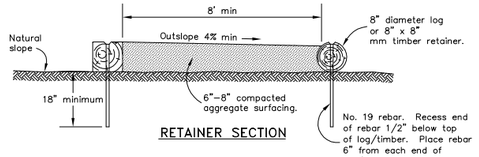
OUTSLOPED SECTION



CROWNED SECTION



EXCAVATED SECTION

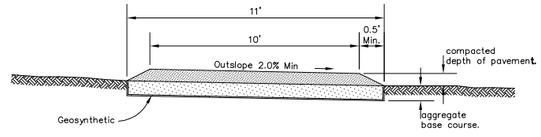


RETAINER SECTION

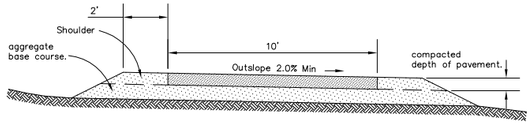
No. 19 rebar. Recess end of rebar 1/2" below top of log/timber. Place rebar 6" from each end of log/timber with maximum rebar spacing of 3'.

BITUMINOUS SURFACING

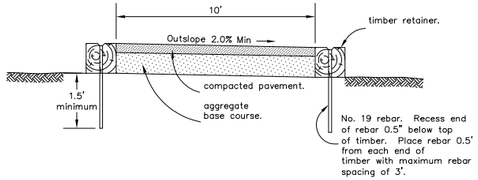
NOT TO SCALE



BITUMINOUS SURFACING – NO SHOULDERS



BITUMINOUS SURFACING WITH SHOULDERS



BITUMINOUS SURFACING WITH RETAINERS

RETAINER NOTES:

LOCATION	MATERIAL	SPECIES	SIZE	TYPE OF TREATMENT	MINIMUM RETENTION

3/97 942-1

US FOREST SERVICE STD DETAILS
WICHITA MOUNTAINS WILDLIFE REFUGE
LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS:	APPD.

DATE: 4-11-13
DESIGN: RGWI
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER: MSUN00000002

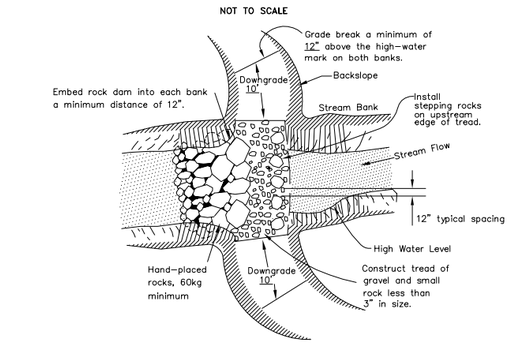
DRAWING FILE: C007-TYPICAL DETAILS - 01

SHEET NO. 7 OF 10

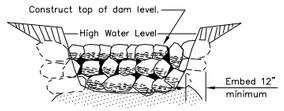
P:\MSUN00000002\0400CAD\DWG\Sheets\Wichita Mtn\C007-TYPICAL DETAILS - 01.dwg Jul 02, 2013 - 11:08am

SHALLOW STREAM FORD AND GULLY CROSSING ROCK STRUCTURE

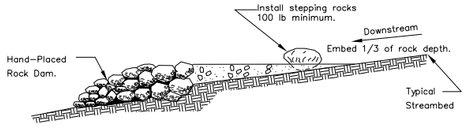
NOT TO SCALE



PLAN VIEW



PROFILE – ROCK DAM

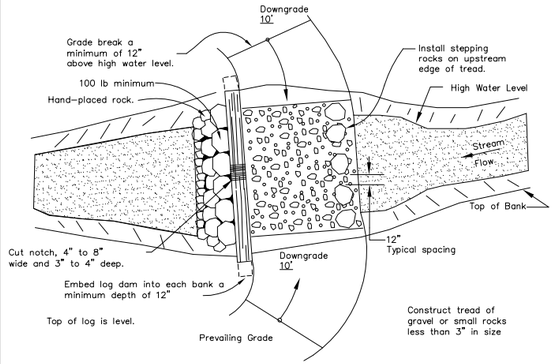


CROSS SECTION

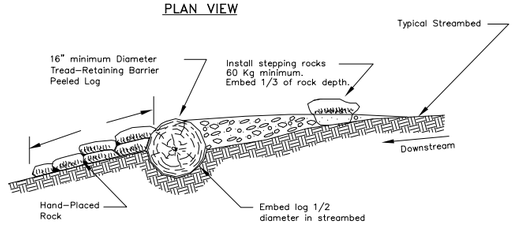
4/96 | 912-7

SHALLOW STREAM FORD OR GULLY CROSSING LOG STRUCTURE

NOT TO SCALE



PLAN VIEW

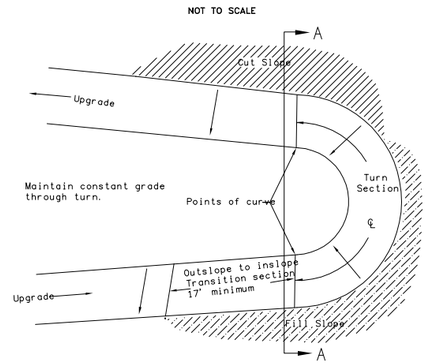


CROSS SECTION

4/96 | 912-8

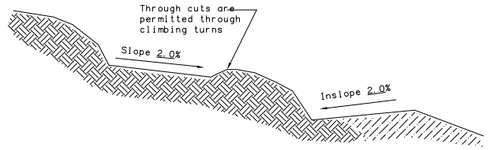
INSLOPED CLIMBING TURN

NOT TO SCALE



Centerline of climbing turn will be FLAGGED or STAKED ON THE GROUND.

PLAN VIEW

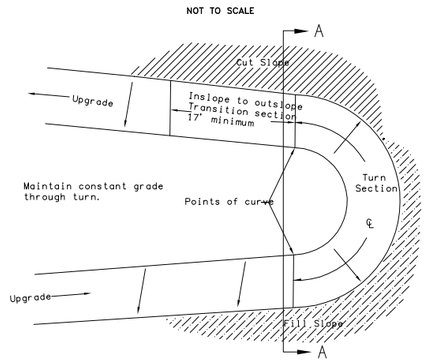


SECTION A–A

4/96 | 912-9

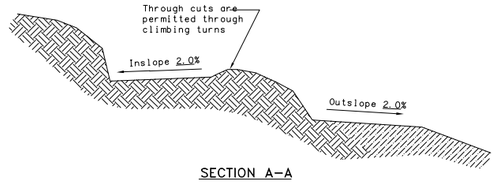
OUTSLOPED CLIMBING TURN

NOT TO SCALE



Centerline of climbing tur will be FLAGGED or STAKED ON THE GROUND.

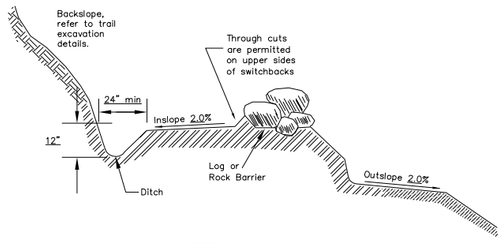
PLAN VIEW



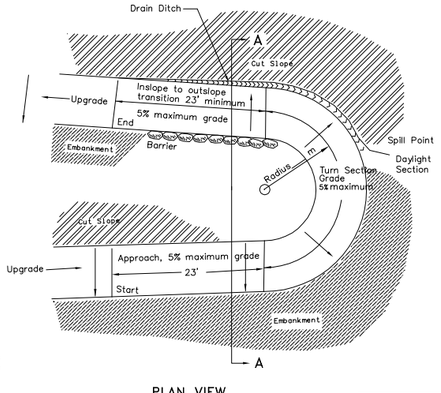
SECTION A–A

SWITCHBACK – TYPE I

NOT TO SCALE



SECTION A–A



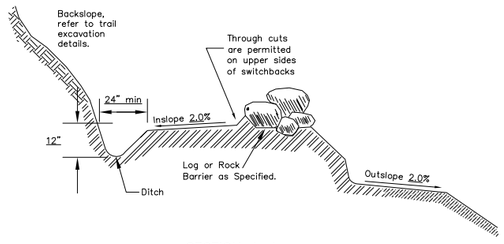
Radius point is staked at each individual site.

PLAN VIEW

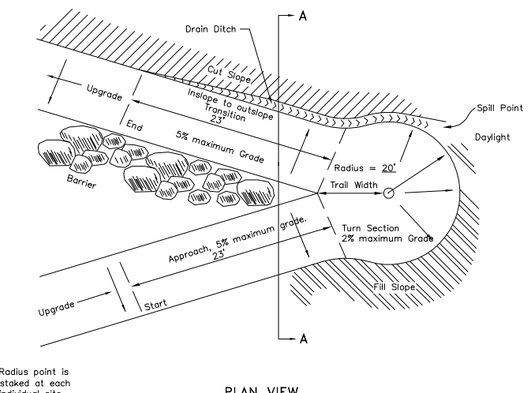
4/96 | 914-1

SWITCHBACK – TYPE II

NOT TO SCALE



SECTION A–A



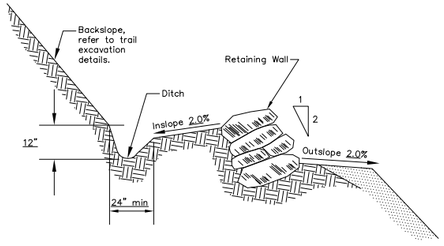
Radius point is staked at each individual site.

PLAN VIEW

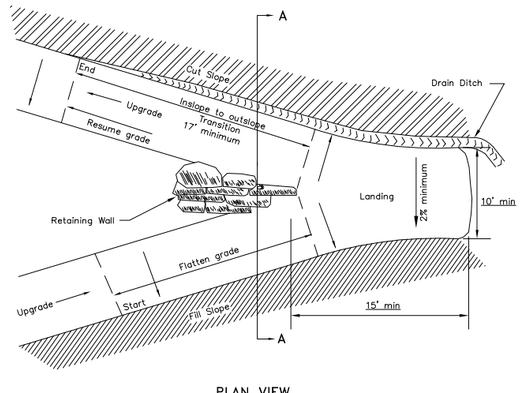
4/96 | 914-2

SWITCHBACK – TYPE III

NOT TO SCALE



SECTION A–A

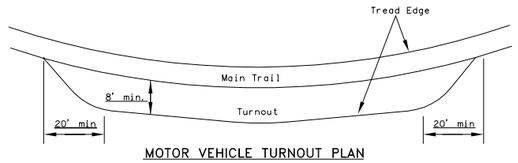


PLAN VIEW

3/97 | 914-3

TURNOUTS

NOT TO SCALE



MOTOR VEHICLE TURNOUT PLAN

US FOREST SERVICE STD DETAILS
WICHITA MOUNTAINS WILDLIFE REFUGE
LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS:	APPD.

DATE: 4–11–13
DESIGN: RGWI
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER: MSUN00000002

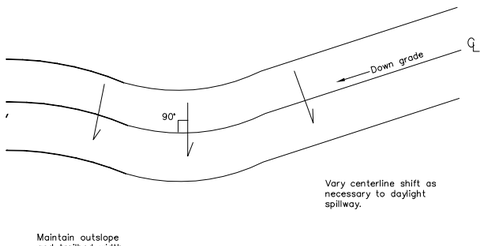
DRAWING FILE: C007–TYPICAL DETAILS – 01

SHEET NO. 8 OF 18

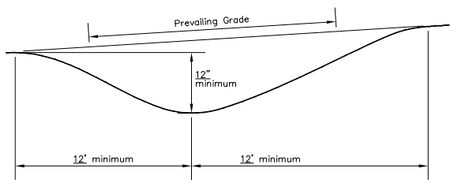
P:\MSUN00000002\0400CAD\DWG\Sheets\Wichita Mtn\C007-TYPICAL DETAILS - 01.dwg Jul 02, 2013 - 11:08am

GRADE DIP

NOT TO SCALE



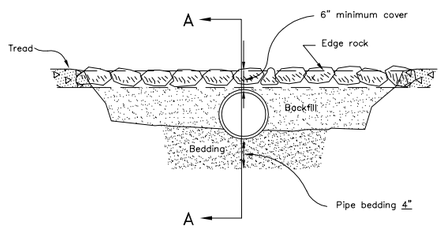
PLAN VIEW



PROFILE

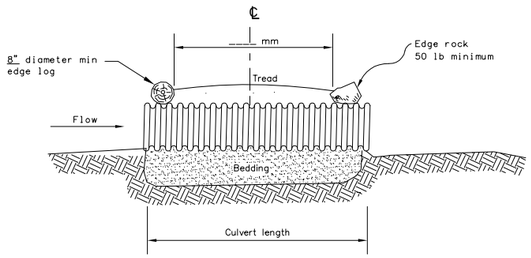
CULVERT WITHOUT HEADWALLS

NOT TO SCALE



END VIEW

Headwall rocks:
50 lb minimum
50% larger than 75 lb

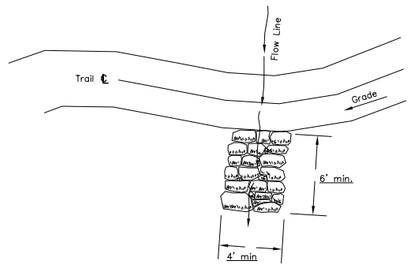


SECTION A–A

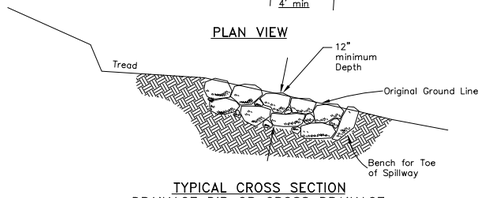
4/96 | 921–2

ROCK SPILLWAY

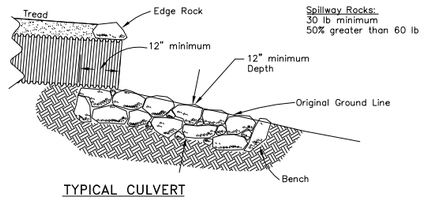
NOT TO SCALE



PLAN VIEW



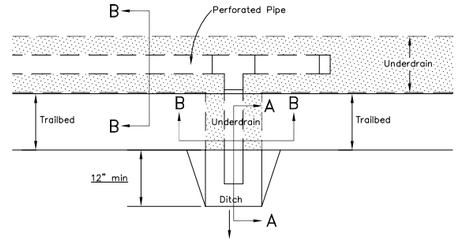
TYPICAL CROSS SECTION
DRAINAGE DIP OR CROSS DRAINAGE



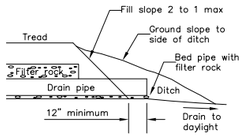
TYPICAL CULVERT
CROSS SECTION

UNDERDRAIN

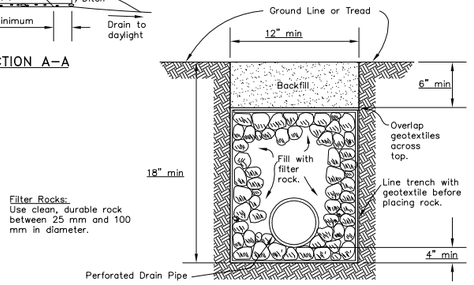
NOT TO SCALE



PLAN VIEW



SECTION A–A



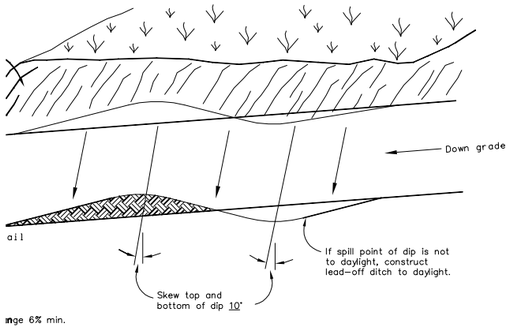
Filter Rocks:
Use clean, durable rock between 25 mm and 100 mm in diameter.

SECTION B–B

3/97 | 924–1

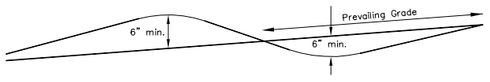
ROLLING DIP

NOT TO SCALE



nge 6% min.

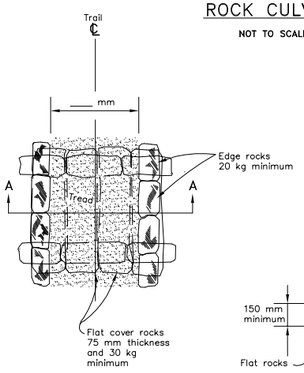
PLAN VIEW



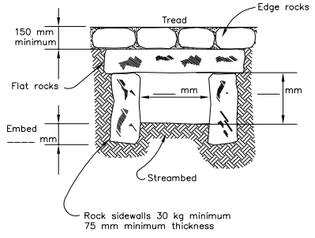
PROFILE

ROCK CULVERT

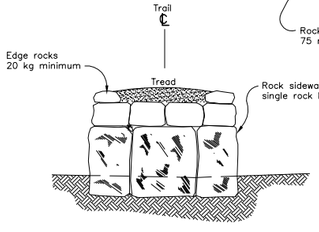
NOT TO SCALE



PLAN VIEW



SIDE VIEW

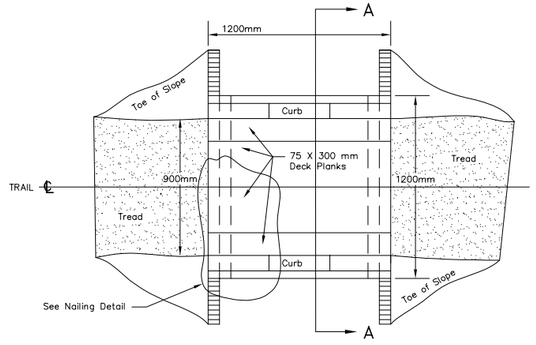


SECTION A–A

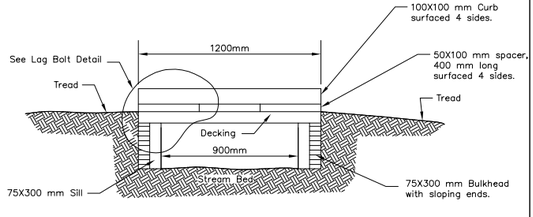
4/96 | 921–3

TREATED TIMBER BOX CULVERT

NOT TO SCALE



PLAN VIEW

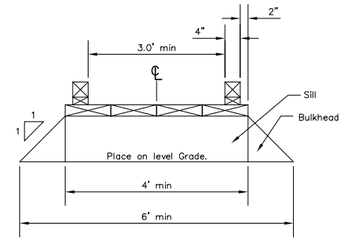


END VIEW

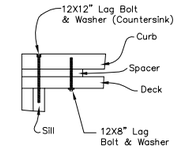
4/96 | 921–4a

TREATED TIMBER BOX CULVERT DETAILS

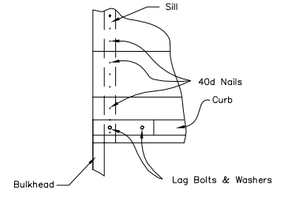
NOT TO SCALE



SECTION A–A



LAG BOLT DETAIL



NAILING DETAIL

NAILING PATTERN:

Sill To Bulkhead – 30d nails in two 6" staggered rows, 2" minimum from edges of sills.
Deck To Sill – Three 40d nails through each deck plank into sills, on both ends of plank, 2" minimum from sides of deck.

PRESERVATIVE TREATMENT:

_____ Net Retention _____ kg/m³
Lumber rough sawn except as noted.

4/96 | 921–4b

US FOREST SERVICE STD DETAILS
WICHITA MOUNTAINS
WILDLIFE REFUGE
LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS:	APPD.

DATE: 4–11–13
DESIGN: RGWI
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER:
MSUN00000002

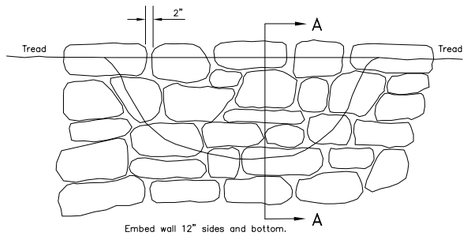
DRAWING FILE:
C007–TYPICAL DETAILS – 01

SHEET NO.
9

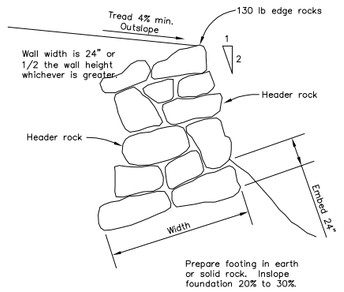
P:\MSUN00000002\0400CAD\DWG\Sheets\Wichita Mtn\C007–TYPICAL DETAILS – 01.dwg Jul 02, 2013 – 11:08am

ROCK RETAINING WALL

NOT TO SCALE



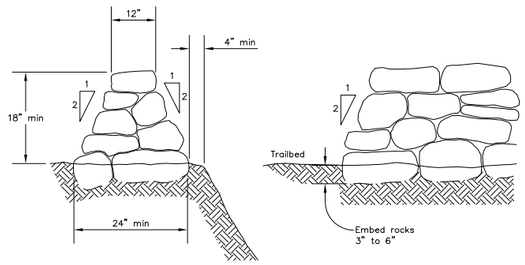
FRONT VIEW



SECTION A–A

ROCK BARRIER

NOT TO SCALE



END VIEW

FRONT VIEW

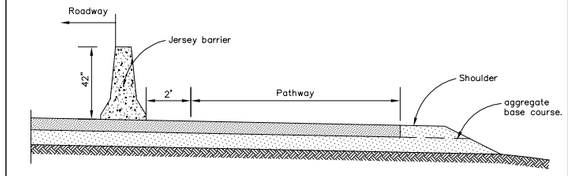
Note:
Use rocks of general rectangular shape between 50 lb and 150 lb. Place larger rocks on bottom.

LOCATIONS

6/96 953–5

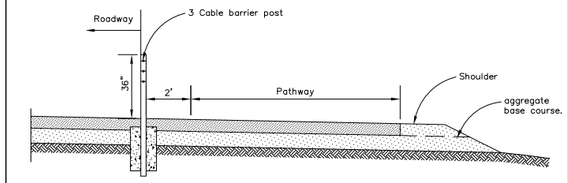
BARRIERS

NOT TO SCALE



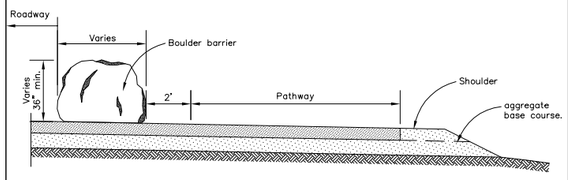
JERSEY BARRIER

ROADWAY DESIGN SPEEDS OF 35 MPH OR HIGHER
(NOT WILDLIFE FRIENDLY)



3 CABLE BARRIER

ROADWAY DESIGN SPEEDS OF BETWEEN 25 TO 35 MPH



BOULDER BARRIER

ROADWAY DESIGN SPEEDS OF LESS THAN 25 MPH

US FOREST SERVICE STD DETAILS
WICHITA MOUNTAINS
WILDLIFE REFUGE

LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS:	APPD.

DATE: 4–11–13
DESIGN: RGWI
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER:
MSUN00000002

DRAWING FILE:
C007–TYPICAL DETAILS – 01

SHEET NO.
10
of 10

P:\M\MSUN00000002\0400CAD\DWG\Sheets\Wichita Mtn\C007–TYPICAL DETAILS – 01.dwg Jul 02, 2013 – 11:05am

Jed Johnson Tower trail parking lot

Planned use for the Jed Johnson Tower trail includes visits from groups and people seeking accessible facilities. Improvements to the 7274 square foot parking lot consider turning radii for buses and accessible parking.

Alternatives

The following alternatives resulted from analysis of the existing parking lot and the feasibility of turning a tour bus. Professional engineers and landscape architects produced alternative parking lot designs. Design assumptions that guide alternative designs came from Refuge management.

The following narrative descriptions summarize the salient features, similarities, and differences of the Jed Johnson Tower parking lot alternatives.

Alternative A

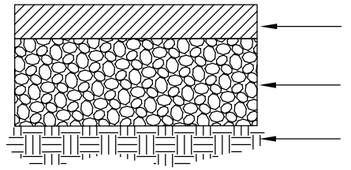
This alternative allows the Refuge to make minimal improvements to the existing parking lot, such as striping, to enhance the lot for planned use.

- Maintain existing parking lot without changes to the lot footprint.
- Stripe the parking lot and add signage to facilitate efficient parking and to delineate bus-turning areas.

Alternative B

This alternative provides for changes that allow buses to use the parking lot as a turnaround location. Other improvements enhance the trailhead to accommodate visitation by groups and people who use mobility aids.

- Expand, redesign, and stripe parking lot as illustrated in Figure X to provide bus turning, handicapped parking spaces, and efficient motor-vehicle parking.
- Add bicycle parking, trailhead kiosk, and toilet facilities.



IMPERVIOUS PAVEMENT SECTION

PARKING AREA AT JED JOHNSON TURNAROUND

SCALE: 1" = 10'

0 5 10 20

LAKE JED JOHNSON PARKING
WICHITA MOUNTAINS WILDLIFE REFUGE
LAWTON, OKLAHOMA

DAVID EVANS AND ASSOCIATES INC.

REVISIONS:	APPD.

DATE: 06/25/13
DESIGN: RGW
DRAWN: JSE
CHECKED:
REVISION NUMBER: 0

SCALE: NA

PROJECT NUMBER: MSUN00000002

DRAWING FILE: C006-LAKE JED JOHNSON P

SHEET NO. 6 OF 10

P:\M\MSUN00000002\04000CAD\DWG\Sheets\Wichita Mtn\C006-LAKE JED JOHNSON PARKING.dwg Jul 02, 2013 - 11:10am

PROJECT: **Witchita Mountain**

ESTIMATE NO.: **1**

LOCATION: Lawton, Oklahoma

ESTIMATOR: DEA

CONSULTANT: David Evans and Associates, Inc

DATE: 7/2/2013

SUBJECT: **Preliminary Cost Estimate**

	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	COST ESTIMATE	SUBTOTAL ESTIMATE
LETRA Connection Trail						
Segment 1: Asphalt Trail (15' wide AC, over exist. AC in poor condition)						$37,752
	Surface preparation	3,432	S.Y.	$0.18	$618	
	AC tack coat emulsion (0.1 gal per sq. yd.)	3,432	S.Y.	$1.07	$3,672	
	Asphalt paving overlay (2" thick)	3,432	S.Y.	$9.75	$33,462	
Segment 2: Alternative B (15' wide AC, over exist. Dirt road)						$92,470
	Surface preparation and roll subgrade	3,256	S.Y.	$1.20	$3,907	
	3/4-inch crushed aggregate base coarse (6" thick)	3,256	S.Y.	$13.20	$42,979	
	Asphalt paving (3" thick)	3,256	S.Y.	$14.00	$45,584	
Segment 2: Alternative C (17' and 27' wide AC, over exist. dirt road)						$266,617
	Surface preparation and roll subgrade	5,433	S.Y.	$1.20	$6,520	
	3/4-inch crushed aggregate base coarse (6" thick)	5,433	S.Y.	$13.20	$71,716	
	Asphalt paving (3" thick)	5,433	S.Y.	$14.00	$76,062	
	Separating barrier (10' long x 30" high Jersey Barrier)	195	EA.	$576	$112,320	
Segment 3: Alternative B (10' wide AC, over exist. reveg road bed and disturbed roadside/drainage area)						$96,236
	Surface preparation and roll subgrade	2,699	S.Y.	$1.20	$3,239	
	3/4-inch crushed aggregate base coarse (6" thick)	2,699	S.Y.	$13.20	$35,627	
	Asphalt paving (3" thick)	2,699	S.Y.	$14.00	$37,786	
	Separating barrier (10' long x 30" high Jersey Barrier)	34	EA.	$576	$19,584	
Segment 3: Alternative C (10' AC & 8' gravel, over exist. reveg road bed and roadside/drainage area)						$111,320
	Surface preparation and roll subgrade	1,232	S.Y.	$1.20	$1,478	
	Gravel Surface: 3/4-inch crushed aggregate base coarse (6" thick)	939	S.Y.	$13.20	$12,395	
	AC Paving Surface: 3/4-inch crushed aggregate base coarse (6" thick)	1,232	S.Y.	$13.20	$16,262	
	Asphalt paving (3" thick)	1,232	S.Y.	$14.00	$17,248	

PROJECT: **Witchita Mountain**

ESTIMATE NO.: **1**

LOCATION: Lawton, Oklahoma

ESTIMATOR: DEA

CONSULTANT: David Evans and Associates, Inc

DATE: 7/2/2013

SUBJECT: **Preliminary Cost Estimate**

	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	COST ESTIMATE	SUBTOTAL ESTIMATE
	Separating barrier (10' long x 30" high Jersey Barrier)	111	EA.	$576	$63,936	
Segment 3: Alternative D (10' wide AC & 8' wide gravel, over exist. revegetated road bed and disturbed roadside/drainage area)						$61,346
	Surface preparation and roll subgrade	646	S.Y.	$1.20	$775	
	Gravel Surface: 3/4-inch crushed aggregate base coarse (6" thick)	1,643	S.Y.	$13.20	$21,688	
	AC Paving Surface: 3/4-inch crushed aggregate base coarse (6" thick)	646	S.Y.	$13.20	$8,527	
	Asphalt paving (3" thick)	646	S.Y.	$14.00	$9,044	
	Separating barrier (10' long x 30" high Jersey Barrier)	37	EA.	$576	$21,312	
Segment 4: Alternative B (10' wide AC, new trail construction)						$41,663
	Surface preparation and roll subgrade	1,467	S.Y.	$1.20	$1,760	
	3/4-inch crushed aggregate base coarse (6" thick)	1,467	S.Y.	$13.20	$19,364	
	Asphalt paving (3" thick)	1,467	S.Y.	$14.00	$20,538	
Segment 4: Alternatives C & D (8' wide gravel, new trail construction)						$15,497
	3/4-inch crushed aggregate base coarse (6" thick)	1,174	S.Y.	$13.20	$15,497	
Segment 5: Alternative B (10' wide AC, over revegetated road bed)						$40,166
	Surface preparation	1,467	S.Y.	$0.18	$264	
	3/4-inch crushed aggregate base coarse (6" thick)	1,467	S.Y.	$13.20	$19,364	
	Asphalt paving (3" thick)	1,467	S.Y.	$14.00	$20,538	
Segment 5: Alternatives C & D (8' wide gravel, over revegetated road bed)						$15,497
	3/4-inch crushed aggregate base coarse (6" thick)	1,174	S.Y.	$13.20	$15,497	

PROJECT: **Witchita Mountain**

ESTIMATE NO.: **1**

LOCATION: Lawton, Oklahoma

ESTIMATOR: DEA

CONSULTANT: David Evans and Associates, Inc

DATE: 7/2/2013

SUBJECT: **Preliminary Cost Estimate**

	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	COST ESTIMATE	SUBTOTAL ESTIMATE
Jed Johnson Tower Trail						
Alternative B: Gravel Trail (8' wide gravel, new & resurfaced/rehabilitated nat'l surface trail construction)						$43,996
	3/4-inch crushed aggregate base coarse (6" thick)	3,333	S.Y.	$13.20	$43,996	
Alternative C: Gravel Trail (8' wide gravel, resurfaced/rehabilitated nat'l surface trail construction)						$30,980
	3/4-inch crushed aggregate base coarse (6" thick)	2,347	S.Y.	$13.20	$30,980	
	(assume retaining wall construction cost will range between $4-$6/square face foot)					
Jed Johnson Tower Trail Parking Lot						
11 standard and 2 ADA-space asphalt parking lot with wheel stops and walkway						$22,704
	Sawcut AC paving	308	L.F.	$2.50	$770	
	Demo and remove AC paving	1,056	S.F.	$0.75	$792	
	Surface preparation and roll subgrade	607	S.Y.	$1.20	$728	
	3/4-inch crushed aggregate base coarse (6" thick)	607	S.Y.	$13.20	$8,012	
	Asphalt paving (3" thick)	607	S.Y.	$14.00	$8,498	
	Pavement Striping Tape	530	L.F.	$1.50	$795	
	Pavement Legend: Symbol	2	EA.	$275	$550	
	ADA Signage	2	EA.	$275	$550	
	Precast concrete wheel stop	7	EA.	$200	$1,400	
	Topsoil (6" thick)	12	C.Y.	$25	$300	
	Landscaping	616	S.F.	$0.50	$308	

This estimate does not include any costs associated with vegetation removal, clearing and grubbing, or earth moving activities. This estimate of probable construction cost is based on preliminary data and was developed utilizing various sources including the RS Means construction cost data estimating guide, input from suppliers and manufactuers, prior bid tabs and professional experience. This estimate should in no way be construed to represent a guarantee, expressed or implied, as to the actual costs of construction. The estimate may be substantially affected by conditions beyond our control such as, but not limited to, bidding climate, availability of materials, availability of general contractors and subcontracting trades, schedule accelerations, and work plan restrictions imposed by the Client or Pemit Agencies. The estimate of probable construction costs provided represents currently indicated project work contained in the current documents. The costs of permits or consultant support during construction were not included in this estimate.

Conclusion

The Refuge has an opportunity with these proposed trails to reduce negative environmental effects from automobile use. These effects relate to Refuge-wide ecology, regional health and social equity, and local and regional economies. These trails assist the Refuge in accomplishing management goals as outlined in the CCP, relieving visitation pressure on the sensitive Wilderness Area, providing active recreation opportunities that engage youth and families with children, and offering accessible facilities for people with mobility impairments. The Refuge likewise advances agency-wide and national initiatives that call for renewed engagement from the American people by collaborating with partners and engaging new and/or under-represented audiences in conservation activities.

Through development of non-motorized trails, the Refuge provides opportunities to engage visitors – new and returning alike – in wildlife-dependent recreation that does not require the use of a personal automobile. Visitors, consequently, will be able to interact with Refuge resources making smaller overall environmental impacts and realizing objectives that enhance Refuge-wide health.

References

America's Great Outdoors: A Promise to Future Generations. February 2011. Council on Environmental Quality, Department of Agriculture, Department of the Interior, Environmental Protection Agency.

Wichita Mountains Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. August 2012. U.S. Fish and Wildlife Service.

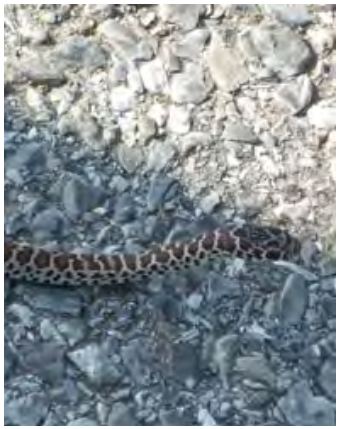
Conserving the Future: Wildlife Refuges and the Next Generation. October 2011. U.S. Fish and Wildlife Service.

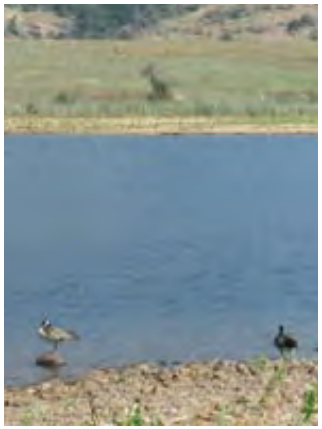
Wichita Mountains Wildlife Refuge

Lake Elmer Thomas Recreation Area (LETRA) Connection Trail

Existing Conditions

January 2013






Prepared for:

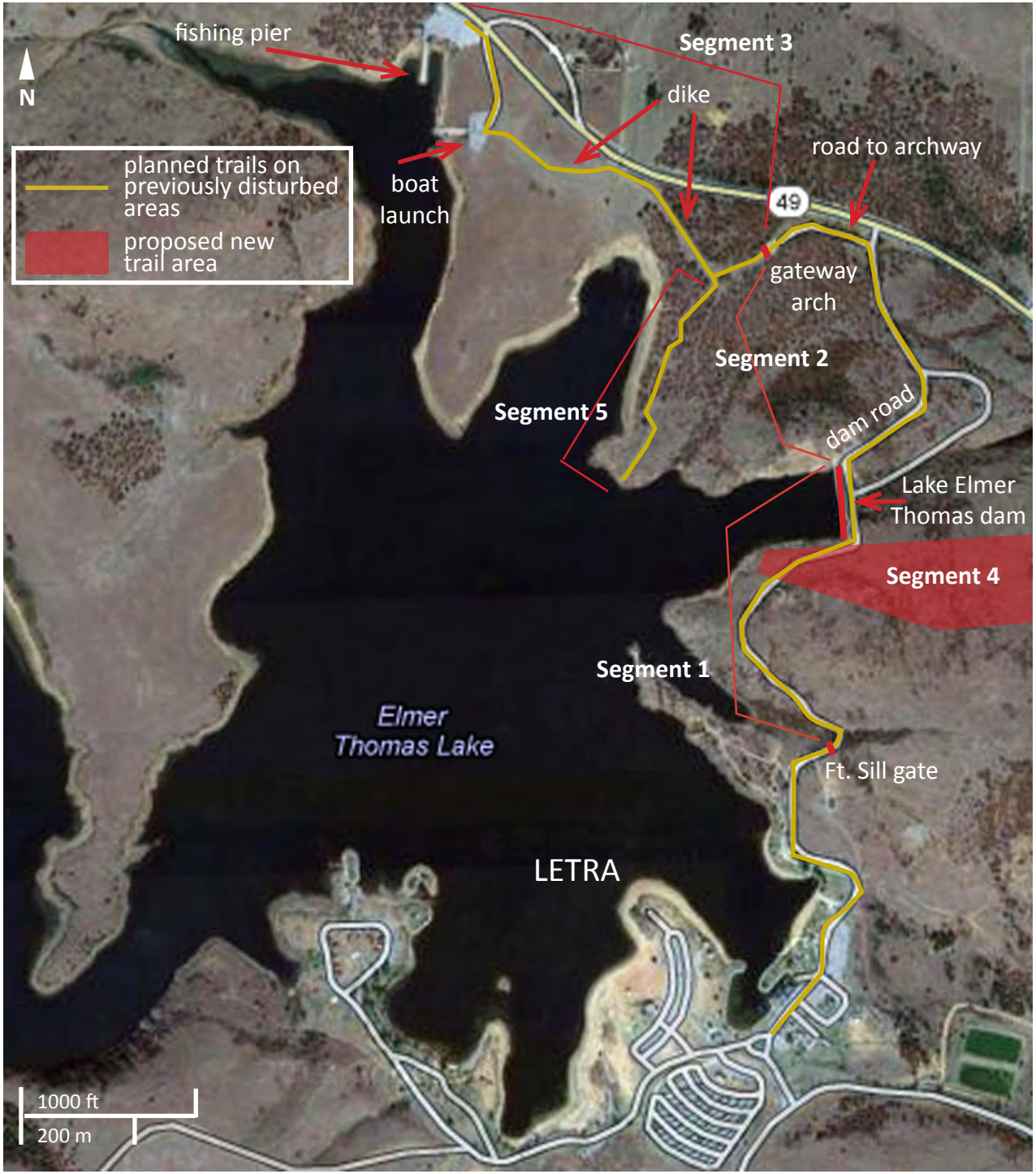
U.S. Fish and Wildlife Service
Wichita Mountains Wildlife Refuge

Paul S. Sarbanes Transit in the Parks
Technical Assistance Center

Prepared by:

Heidi Beierle
Public Lands Transportation Scholar

Contents



Introduction

Approximately 1.7 million annual visitors engage in wildlife-dependent recreation and enjoy the scenic views at Wichita Mountains Wildlife Refuge. Ninety percent of these visitors arrive in private automobiles, which leads to negative auto-related effects: speeding, animal-vehicle collisions and fatalities, parking congestion, habitat degradation, pollution, large Carbon footprint, high road maintenance costs, and a disconnected public. The Lake Elmer Thomas Recreation Area (LETRA) connection trail's purpose is to provide non-motorized travel options for visitors and residents to access the Refuge and its neighbors across jurisdictional boundaries.

The Refuge supports six wildlife-dependent recreation activities: hunting, fishing, wildlife observation, photography, interpretation, and environmental education. Supportive recreation includes bicycling, boating, camping, hiking, picnicking, rock sports, and SCUBA diving. While most wildlife-dependent recreation occurs from a private automobile, it could also happen by foot, bicycle, or mobility device. Facilities for active transportation may improve wildlife-dependent recreation on the Refuge for these three modes.

The LETRA connection trail is being designed to create opportunities for families with children, people using wheelchairs, and casual recreationalists to experience the Refuge through active modes. The trail incorporates Architectural Barriers Act (ABA) guidelines for outdoor developed areas and provides separation from highway motor-vehicle traffic. In addition to reducing the negative effects from automobiles, the trail aims to facilitate an increase in regional health.

Given the above-mentioned target audience, which includes tour bus groups, school groups, church groups, other groups, families, and individuals, the trail will be designed to accommodate walking speeds and/or casual bicycling speeds. Trail widths will be determined based on environmental conditions, trail segment function, the mix of different target audience trail users, target audience comfort levels using the facility, and anticipated demographic character of trail users. Trail surfacing will be determined by environmental character, trail segment function, anticipated group and individual use, implementation cost, and long-term maintenance cost.

The 1.73-mile long LETRA connection trail joins the Refuge with its neighbors – Fort Sill and Medicine Park. Fort Sill borders the Refuge to the south and maintains a recreation facility that includes camping, fishing, and archery along with other recreational activities and amenities. Medicine Park borders the Refuge to the east and provides lodging, dining, shopping, entertainment, and events. Under construction in the community is the Medicine Park Museum of Natural Science, which borders a section of the Refuge boundary fence on the east side. Non-motorized access to these destinations would allow visitors an option to park and then walk or bicycle along the trail, reducing environmental effects, enhancing their experience, and promoting regional quality of life.

Project History

The Refuge's east side, zoned for high-density public use in the Comprehensive Conservation Plan (CCP) 2012, provides a number of attractive destinations where visitors can engage in wildlife-dependent recreation. This eastern area of the Refuge shares borders with three other jurisdictions: Fort Sill, an Army base with resident population of approximately 53,000 people; the town of Medicine Park, a gateway and resort community; and Lawton, a city of 96,000 people.

As identified in the 2010 Alternative Transportation Study, a non-motorized facility that connects Lake Elmer Thomas Recreation Area (LETRA) on Fort Sill property to the Refuge and the planned Medicine Park Museum of Natural Science on Medicine Park property would provide opportunities to lessen negative effects of automobile use on Refuge environments and facilities. Visitors could park at LETRA or the Museum and use active modes to access Refuge resources.

Directing visitors to a trail designed for active modes on the east side of the Refuge will enable the Refuge to maintain its overarching environmental stewardship goals while encouraging visitors to put their feet on the ground, connect with nature, and engage in wildlife-dependent recreation.

The Refuge submitted a 2011 Paul S. Sarbanes Transit in the Parks grant proposal to fund three projects: transportation data collection, trail planning design and development, and a Comprehensive Alternative Transportation Plan (CATP). The Volpe Center is conducting the data collection and creating the CATP. The unfunded second project for pre-NEPA planning of the LETRA connection trail is being advanced through the efforts of a 2012 Public Lands Transportation Scholar.

Medicine Park and LETRA both currently provide a number of attractive visitor destinations, which will grow when the Museum opens. These factors contribute to the Refuge being one of the most highly visited refuges in the National Wildlife Refuge System and lead to its role as a regional recreational destination. This destination appeal allows the Refuge to connect large numbers of people with the outdoors through education, volunteerism, and recreation. Developing this trail will allow the Refuge to redirect visitation to non-motorized modes and concentrate visitors in the high-density public use area.

Existing Conditions

The majority (1.48 miles) of the 1.73-mile long LETRA connection trail will be constructed on a variety of already hardened and disturbed areas to enhance non-motorized public access opportunities to natural and cultural resources on the Refuge's east side. Trail segment 4 (.25 miles long) connecting to the Museum does not yet exist.

Relevant information gained from the following documents and sources provides the basis of the technical information in this document. Soil types are referred to by name in the trail segment descriptions, and complete details of the soil types is included in this section for ease of reference.

- **CCP 2012**
- **The Trail Inventory of Wichita Mountains NWR, April 2012, Central Federal Lands Highway Division**
- **The Road Inventory of Wichita Mountains National Wildlife Refuge, January 2005, Central Federal Lands Highway Division**
- **Soil Survey 1967** (See below for details)
- **Surface Water and Drainage Patterns, Wichita Mountains Wildlife Refuge, August 1985**
- **Section 106 research at Oklahoma Historical Society, July 2012**
  Some evidence of nearby archaeological sites exists, but Oklahoma Archaeology has not yet been contacted.
- **Wichita Mountains Wildlife Refuge Management, Biology, Law Enforcement, Maintenance, Fire Management, and Visitor Services Staff**
- **Field Measurements and Observations**
  In the absence of available site-level information, survey points were taken every 50' along proposed routes with a laser level, and trail or road widths were measured with a tape. Drainage areas were visually inspected for culverts, other drainage infrastructure, and erosion.
- **Historical, GIS, and Google maps Comparative Analysis**

According to *Soil Survey: Comanche County, Oklahoma* (August 1967), the LETRA connection trail area includes three soil types: granite cobbly land, stony rock land, and granite outcrop.

- Granite cobbly land (Gc) consists of rolling to steep areas on dissected hills and ridges on uplands. The slope is 5 to 40 percent. Granite cobblestones make up 25 to 70 percent of each area. The rest consists of deep, brown to reddish-brown loams to clay loams that contain an appreciable amount of gravel. There are a few scattered boulders. Included in mapping were spots of alluvial soils, less than 200 feet wide, and small areas where the depth to bedrock is 1 to 4 feet. It is excessively drained and has excessive runoff. Permeability is moderate. The vegetation consists of mid and tall grasses. Scrub oak is common in some areas (9).
- Stony rock land (St) is hilly to very steep. It is 15 to 50 percent Granite outcrop, 10 to 30 percent very shallow soils over granite, and 15 to 70 percent deep stony soils. The slope range is 15 to 50 percent. Stony rock land is associated with the mapping units Granite outcrop and Rock land. It has a smaller percentage of outcrops than Granite outcrop and a larger percentage of deep stony soils than Rock land. The vegetation is sparse cover of short and mid grasses on the very shallow soils and tall grasses and scrub oak on the deep stony soils (14).
- Granite outcrop (Go) consists of barren, granitic mountain peaks, cliffs, and escarpments. At least 90 percent of it is exposed bedrock. Included in mapping were small areas of Rock land and Stony rock land. The only vegetation is on the small included areas of other land types (9).

Segments

The LETRA connection trail can be segmented into five parts:

- Segment 1: Road south of Lake Elmer Thomas dam to the Fort Sill gate.
- Segment 2: Road north of Lake Elmer Thomas dam to the gateway arch.
- Segment 3: Gateway arch to Lake Elmer Thomas fishing pier.
- Segment 4: Medicine Park Museum spur.
- Segment 5: Accessible viewpoints spur.

Details regarding segment characteristics, features, function, and wildlife-dependent recreation opportunities follow.

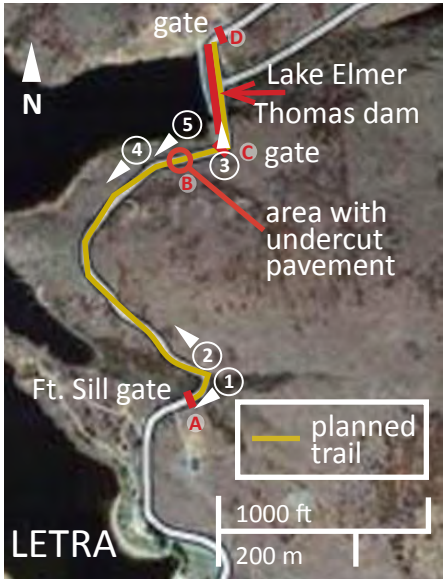
All segments will be designed to accommodate people using wheelchairs, families with children, active seniors/retirees, and casual recreationalists.

Segment 1: Road south of Lake Elmer Thomas Dam to Fort Sill gate

A .39-mile long segment, this planned trail section follows an existing road from Fort Sill and across Lake Elmer Thomas dam to the north end of the dam.

The segment would connect the Refuge to Fort Sill, provide access to the planned spur trail that would connect to the Medicine Park Museum of Natural Science, and provide visitors with opportunities to view wildlife and scenery. The road receives infrequent motor-vehicle use for official purposes only. The road also experiences infrequent use by people bicycling, walking, and running.

Small vertebrates and invertebrates can be found on and adjacent to this seldom-used road. Birds, reptiles, and a multitude of exoskeletoned creatures are common sights.



Surfacing, Condition, Width, Slope, and Drainage

This trail segment has existing asphalt in poor repair and a roadbed measuring 20' with an average slope of 3.5%. Plants have been growing through the pavement, and the road edges have crumbled and washed away. In some places the road is severely eroded, with undercut pavement in one location. One culvert drains water from the facility.

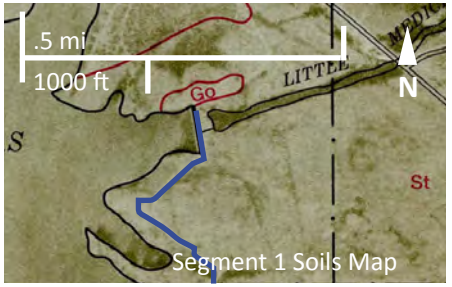
The road is closed to motor vehicle traffic although it receives occasional use for administrative and maintenance purposes. At the Refuge-Fort Sill boundary, a gate bars entry and exit. On both sides of the gate, a fence extends into the terrain. At the south end of Lake Elmer Thomas dam, another gate limits motor-vehicle traffic to official use, and the road surface is maintained with large, crushed gravel.

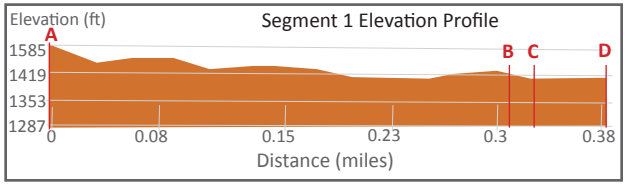
Lake Elmer Thomas dam, constructed of concrete, is in good repair, has an 18' wide travel area, and has concrete parapet walls 4' high on both sides.

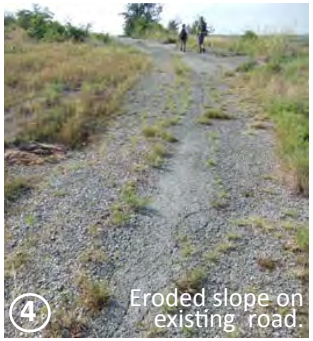
The north side of Lake Elmer Thomas dam also has a gate, limiting vehicle passage to official use only.

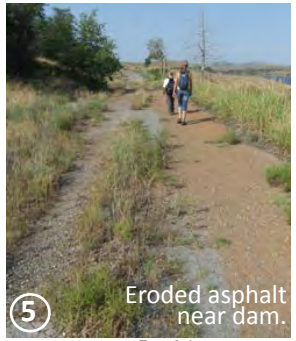
Soils

South of the Lake Elmer Thomas dam the entire area consists of stony rock land (St).









Segment 2: Road north of Lake Elmer Thomas Dam

This .37-mile long segment follows the existing road from the north end of Lake Elmer Thomas dam, almost to Highway 49, and uphill to the historic gateway arch. From Lake Elmer Thomas dam north to the gateway arch, the road accommodates low volume motor-vehicle traffic.

This segment's planned design would collect non-motorized trail users and deliver them to other trail segments (segments 1 or 3), Highway 49, and the gateway arch. This segment experiences low volume motor-vehicle traffic and occasional use from pedestrians and bicycle riders.

Wildlife observation occurs from this facility; however, existing motor-vehicle use makes this segment a less desirable area to deliberate and observe wildlife.

Surfacing, Condition, Width, Slope, and Drainage

East of the access gate on the north side of Lake Elmer Thomas dam, a parking lot (5871 ft^2) surfaced with crushed gravel provides visitors with access to fishing and SCUBA diving opportunities. The road leading to the parking lot and gate is surfaced with large crushed gravel. Gravel gives way to a combination of crusher fines and large gravel, and the road measures between 24' and 27' wide, hard packed and washboarded on the steeper section. Near the Highway 49 entrance, large gravel is replaced by crushed asphalt. Average slope of the road from the north end of the dam to Highway 49 measures 3.1%. The road appears to drain well. A box culvert allows water to cross under the road and continue downhill.

The road to the archway is a combination of old, intact asphalt and crushed asphalt measuring 17' wide with an average slope of 6.5%. The old Refuge boundary fence extends on either side of the gateway arch, and a cattle guard extends the full span underneath the arch. Large boulders on the west side of the arch block motor-vehicle passage.

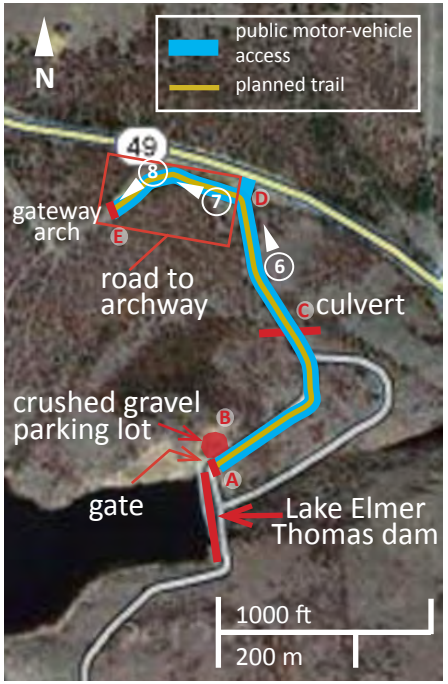
Soils

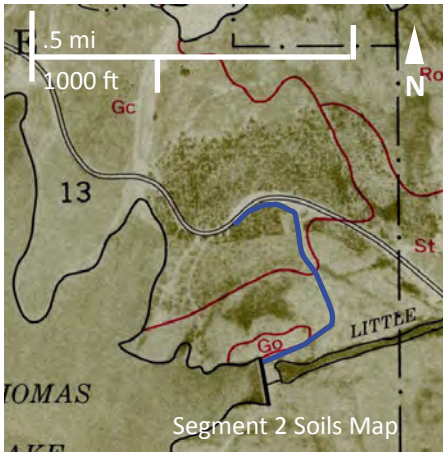
This trail segment traverses three soil types: stony rock land (St), granite outcrop (Go), and granite cobbly land (Gc). Just north of and perpendicular to Lake Elmer Thomas dam is a small section of granite outcrop. North of the dam to the culvert, the soils are stony rock land. North of the culvert up to the gateway arch, the soils are granite cobbly land.

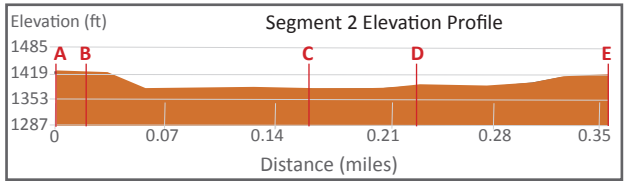
Recently rehabilitated Civilian Conservation Corps era arch (1930s).

Road to the archway.

Gravel road between Hwy 49 and Lake Elmer Thomas dam.







Segment 3: Arch to Lake Elmer Thomas fishing pier

This .47-mile long segment follows old road right-of-way that has been naturalized with native plants. The segment begins at the historic gateway arch, meets the Lake Elmer Thomas dike, and follows the dike to the Lake Elmer Thomas boat launch. At the boat launch, Option A parallels the boat launch access road along disturbed borrow pit, and meets the Lake Elmer Thomas fishing pier at Highway 49. Option B crosses the boat launch access road at the parking lot entry, parallels the parking lot along disturbed area, and continues west to the lakeside trail that connects the boat launch to the fishing pier. This area currently receives occasional foot traffic.

Both Options of the proposed trail would deliver target trail users to destinations, such as the Lake Elmer Thomas fishing pier, viewpoints along Segment 4, the gateway arch, and wildlife-dependent recreation activities accessed by Segment 2 and/or Segment 1.

Mammals, reptiles, birds, fish, flowers, and the gateway arch may interest visitors to this trail segment.

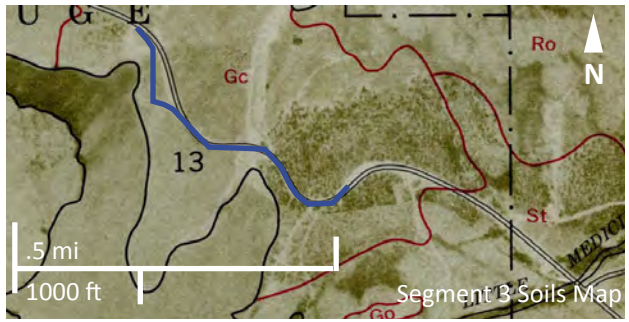
Surfacing, Condition, Width, Slope, and Drainage

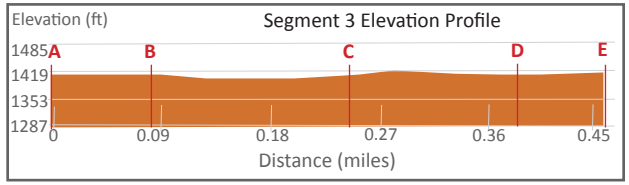
West of the gateway arch, the terrain is relatively flat. The average segment slope measures 1.3% and the span between trees where a trail may be located measures 35'. The dike emerges abruptly from this flat area, the principal elevational feature of this segment. The same plants that grow on the old road bed grow on the sides and top of the dike. The top of the dike is also relatively flat and approximately 14' wide (edge to edge) its entire length. As the dike curves into an open meadow, it loses definition and merges into the natural land contours. The dike ends at the eastern edge of the Lake Elmer Thomas boat launch parking lot.

The boat launch access road measures 21' wide. The drainage ditch on the east side of the access road to the line of boulders measures 18' wide. The drainage ditch on the west side of the access road to the line of boulders measures 18' wide. The disturbed area north of the boat launch parking area measures 4' wide to the boulders, and the existing lakeside trail measures 10' wide. The dike sheds water into the surrounding landscape and shows little to no evidence of erosion. At the boat launch, drainage is managed with borrow pit ditches adjacent to the paved areas.

Soils

West of the gateway arch and along the dike to the Lake Elmer Thomas fishing pier, soils for Options A and B are characterized as granite cobbly land. The soils map, published in 1967, shows the historic road alignment, which the present-day dike follows.





Segment 4: Medicine Park Museum spur

This proposed trail segment will be approximately .25-miles long and cross undisturbed habitat, which includes the edges of black-capped vireo nesting habitat, the Refuge's endangered bird species. The proposed spur trail will meet a planned trail from the Medicine Park Museum of Natural Science at the Refuge boundary fence and traverse the rocky hillside to a point where it will meet Segment 1 south of Lake Elmer Thomas dam.

As the link between the Museum and the Refuge's connecting trail from LETRA, this proposed spur will provide opportunities for visitors to access, appreciate, and engage natural resources. The proposed spur trail would provide access to these natural resource education opportunities for people with physical disabilities and all other target audiences.

In addition to observing the black-capped vireo, visitors to this proposed trail would be able to observe other birds, reptiles, invertebrates, and small mammals. The terrain also provides excellent habitat for the Refuge's unique barrel cactus that thrives on the shallow, granitic soils.

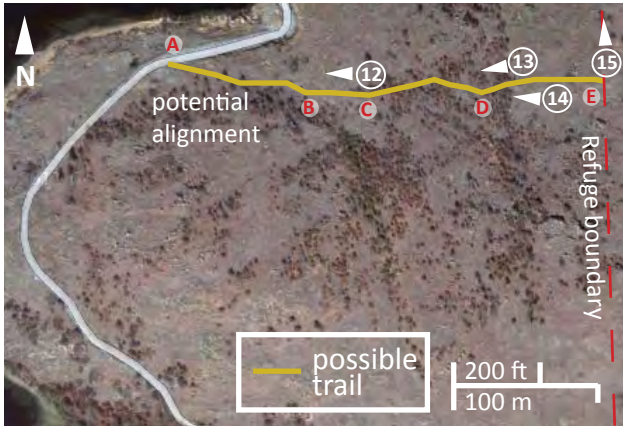
Surfacing, Condition, Width, Slope, and Drainage

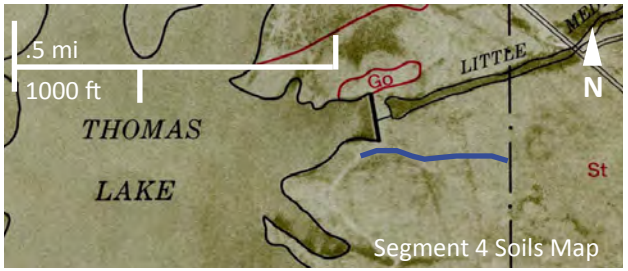
This proposed spur trail will cross rocky terrain with outcroppings and shallow soil. Average trail slope will depend on trail alignment and location. Trail grades may vary considerably given the uneven terrain and rock outcroppings. The general area of the trail will traverse the hillside, allowing for natural water drainage. Trail alignment will follow areas with least disturbance to black-capped vireo habitat and will meet accessible slope guidelines.

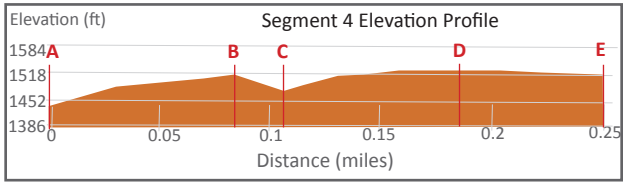
Soils

The entire area of the Medicine Park Museum spur trail is classified as stony rock land.

In the images below, the dotted yellow lines show approximate trail alignment.







Segment 5: Accessible viewpoints spur

This .25-mile segment follows old roadbed that has been naturalized with native plants. The planned spur begins where the old roadbed on Segment 3 intersects the Lake Elmer Thomas dike. From this intersection, the spur trail heads south along the western side of the point. The trail approaches a small cove with panoramic views of Mt. Scott. From the cove, the trail crosses through a gate at the old Refuge boundary fence and continues across an open area to the end of the point. The trail receives occasional foot traffic.

This site was originally developed as a Forest Service camping and picnicking area, and while the facilities have been removed, rock walls and water drainage structures still exist. Along with the remnant Forest Service facilities, this area of Lake Elmer Thomas possesses archaeological resources, including American Indian campsites and Civilian Conservation Corps campsites.

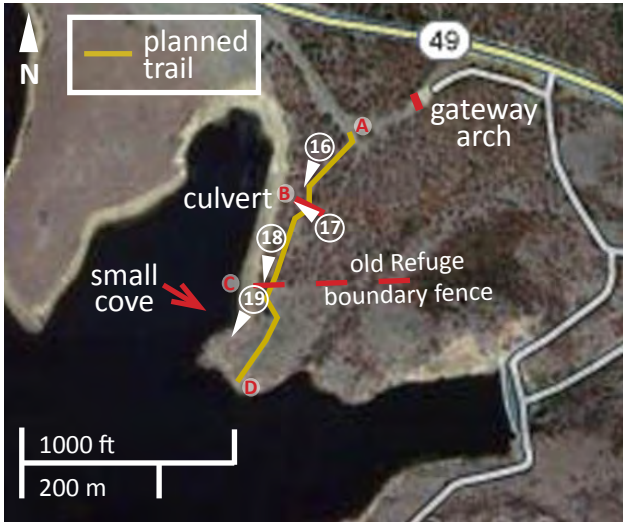
In addition to the cultural and historic resources in the area, this out-and-back spur trail meets a need for an accessible destination where visitors may fish, observe wildlife, take photographs, and appreciate the Refuge's natural resources. The small cove offers waterfowl observation opportunities, and large mammals, reptiles, insects, songbirds, and blooming plants populate the area.

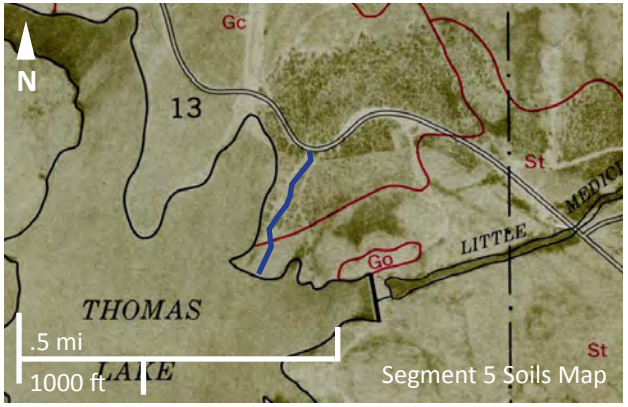
Surfacing, Condition, Width, Slope, and Drainage

The spur trail to accessible viewpoints follows a vegetated and hardened earth road measuring 20' wide with an average slope of 1.5%. The surface appears to drain well, and an existing culvert drains water across the roadbed.

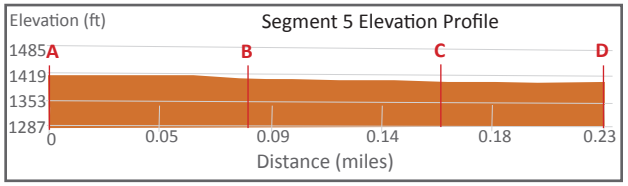
Soils

The spur trail to accessible viewpoints includes granite cobbly land for nearly the entire length. The tip of the point, about where the old Refuge fence stands, is classified as stony rock land.





Segment 5 Soils Map




16 A light trail in the grass follows the 20' wide opening between trees.


17 Culvert.


18 Small cove, looking west.


19 Gate in the old Refuge boundary fence.

Conclusion

This memorandum provides a description of the LETRA connection trail area and collects information that will inform the next part of the planning process. Reviewing the physical conditions of the proposed trail area for existing infrastructure, materials, slopes, drainage, and soils provides valuable information for scoping design options.

With the assessment criteria, one or more preferred design options will advance for further consideration as the Refuge perpares alternatives to conduct National Environmental Policy Act (NEPA) analysis.

The trail design options will undergo further refinement as the Refuge clarifies -- through internal discussion informed with community input -- what level of potential effect on wildlife and habitat is allowable, what the target audiences' needs for trails are, how many people or what size groups the trail segments should be sized to accommodate, how the proposed trail will meet accessibility guidelines, and what resources the Refuge can draw upon to help maintain its investment in non-motorized transportation facilities.

Community outreach for the trails has been on-going through the CCP process and Transportation Scholar efforts. The Refuge's strong community partners have been instrumental in gathering people and input. These partners include:

- Fort Sill Army Base.
- Medicine Park Museum of Natural Science.
- Town of Medicine Park.
- City of Lawton Parks and Recreation Department.
- Fit Kids of Southwest Oklahoma.
- Friends of the Wichitas.
- Lawton Public Schools.

Results from this outreach process provide data to help the Refuge assess the design options and develop recommended alternatives.

References

Habitat Management Plan, Surface Water and Drainage Patterns Exhibit 12, Wichita Mountains Wildlife Refuge, U.S. Fish and Wildlife Service (August 1985).

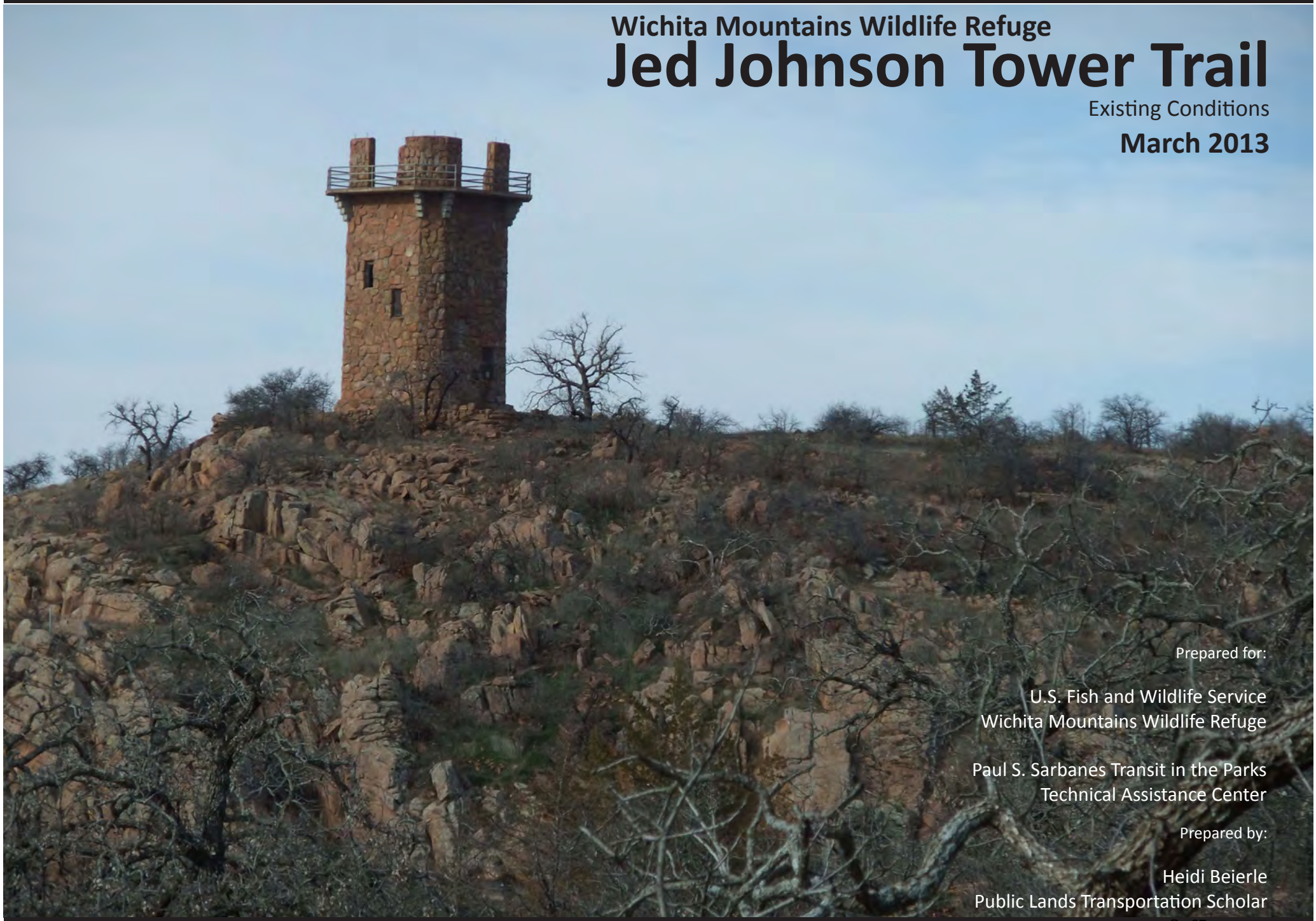
Soil Survey: Comanche County, Oklahoma (August 1967).

The Trail Inventory of Wichita Mountains NWR, Central Federal Lands Highway Division (April 2012).

The Road Inventory of Wichita Mountains National Wildlife Refuge, Central Federal Lands Highway Division (January 2005).

Wichita Mountains Wildlife Refuge Comprehensive Conservation Plan 2012, U.S. Fish and Wildlife Service (November 2012).

View of the LETRA connection trail area from the top of Mt. Scott.



Wichita Mountains Wildlife Refuge

Jed Johnson Tower Trail

Existing Conditions

March 2013

Prepared for:

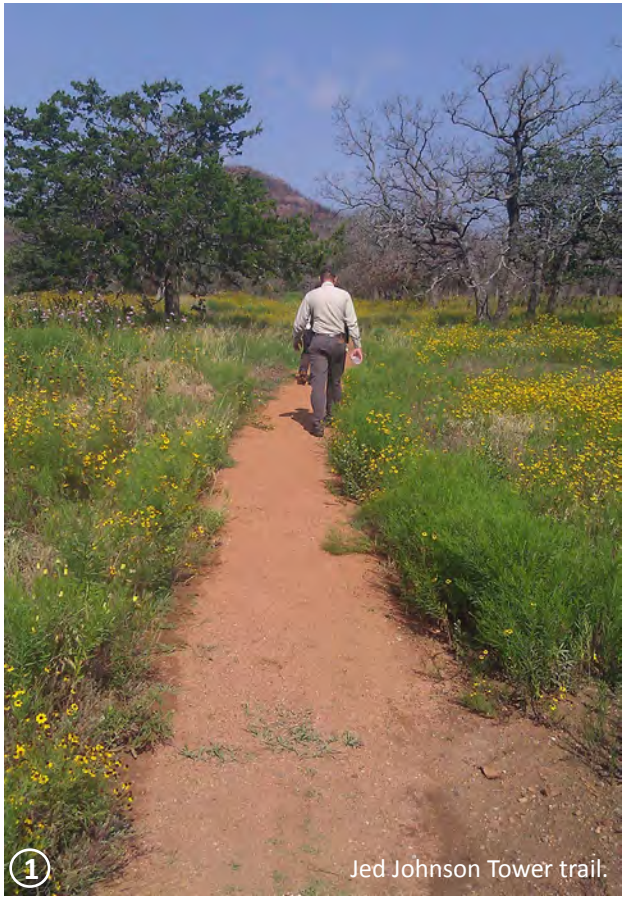
U.S. Fish and Wildlife Service
Wichita Mountains Wildlife Refuge

Paul S. Sarbanes Transit in the Parks
Technical Assistance Center

Prepared by:

Heidi Beierle
Public Lands Transportation Scholar

Contents



1 Jed Johnson Tower trail.

Introduction

Approximately 1.7 million annual visitors engage in wildlife-dependent recreation and enjoy the scenic views at Wichita Mountains Wildlife Refuge. Ninety percent of these visitors arrive in private automobiles, which leads to negative auto-related effects: speeding, animal-vehicle collisions and fatalities, parking congestion, habitat degradation, pollution, large carbon footprint, high road maintenance costs, and a disconnected public.

The Refuge supports six wildlife-dependent recreation activities: hunting, fishing, wildlife observation, photography, interpretation, and environmental education. Supportive recreation includes bicycling, boating, camping, hiking, picnicking, rock sports, and SCUBA diving. While most wildlife-dependent recreation occurs from a private automobile, it could also happen by foot, bicycle, or with the assistance of a mobility device. Facilities for active transportation may improve wildlife-dependent recreation on the Refuge for these three modes.

The Jed Johnson Tower trail is being designed to create opportunities for families with children, people using wheelchairs, and casual recreationalists to experience the Refuge through active modes. In particular, the Jed Johnson Tower trail has been identified as a suitable location to direct visitors touring in groups and is likewise identified in the 2012 Draft Comprehensive Conservation Plan (CCP) for fully accessible wildlife-dependent recreation experiences. The trail design will incorporate Architectural Barriers Act (ABA) guidelines for outdoor developed areas and will follow guidelines for information and signing as developed in Access Recreation: Guidelines for Providing Trail Information to People with Disabilities. Parking lot improvements will follow Americans with Disabilities Act (ADA) guidelines for accessible parking lot design.

Given the above-mentioned target audience and the Refuge's interest in being able to accommodate large groups at this site, the trail will be designed to serve regular occurrences of peak use. Trail widths will be determined based on environmental conditions, trail segment function, the mix of different target audience trail users, target audience comfort levels using the facility, and anticipated demographic character of trail users. Trail surfacing will be determined by environmental character, trail segment function, anticipated group and individual use, implementation cost, and long-term maintenance cost.

The Jed Johnson Tower trail sits on the west side of the Refuge's planned high-density public use zone. Separated from the main Refuge driving routes, the trail currently provides a natural and rugged experience for visitors. At the base of Jed Johnson Tower, vistas reward hikers. The Tower is currently closed for public use; however, the Refuge expects to renovate the Tower in the future and open it to the public. The Refuge anticipates that opening the Tower for public access will considerably increase interest in and popularity of the Jed Johnson Tower trail. This destination appeal will allow the Refuge to connect large numbers of people with the outdoors through education and recreation.

In the CCP, the Jed Johnson Tower trail is identified as a Refuge location to provide accessible hiking and improved wildlife viewing and photography opportunities. The trail currently experiences regular use by families and small groups. Included within the Refuge's high-density public use zone, this area could support large groups. Large groups could include people arriving in motor coach, tour bus, school bus, 15-passenger van, or private automobile and could include groups of seniors/retirees, school groups, church groups, scouting groups, other groups, and families. Consequently, the trail will need to accommodate large group use for a full range of abilities.

Improving the Jed Johnson Tower trail to accommodate large groups enables the Refuge to redirect groups to locations comparable to what they might encounter in the Wilderness Area while minimizing the amount of people and their associated impacts in the sensitive, west-side wilderness environment. Directing visitors to a trail designed for active modes on the east side of the Refuge will enable the Refuge to maintain its overarching environmental stewardship goals while encouraging visitors to put their feet on the ground and connect with nature.

To accommodate planned use, a reroute of the trail

just north of the Tower must occur to meet accessible grades, and the parking area could require expansion or modification to allow tour buses to turn.

② Red-eared slider turtle.

Project History

The Jed Johnson Tower trail project comprises a component of a series of transportation studies and work that began on the Refuge in 2009. The 2009 effort included a Transportation Assistance Group meeting at the Refuge where an alternative transportation trajectory was charted.[1] Following this meeting and in tandem with other efforts, the Refuge advanced planning efforts and grant seeking to improve alternative transportation at one of the most visited refuges in the National Wildlife Refuge System.

The 2010 Alternative Transportation Study[2] references improvements for the Jed Johnson Tower trail parking lot and access road. These improvements anticipate increased visitation to the trail and area resulting from rehabilitation of Jed Johnson Tower. While the trail itself does not receive individual attention in this Study, enhancements to the trail are mentioned as a component of overall site improvements that would contribute to Refuge actions aimed at increasing overall visitation to Lake Jed Johnson.

The Refuge submitted a 2011 Paul S. Sarbanes Transit in the Parks grant proposal to fund three projects: transportation data collection, trail planning design and development, and a Comprehensive Alternative Transportation Plan (CATP). The Volpe National Transportation Systems Center is conducting the data collection and creating the CATP (project work began February 2013 and will conclude in early 2014). The unfunded portion of that grant proposal for trail planning design and development, which includes improvements to the Jed Johnson Tower trail and parking lot, is being advanced through the efforts of a 2012 Public Lands Transportation Scholar.

Most of the projects that appeared in the 2010 Alternative Transportation Study are also included in the Refuge's newly updated CCP (scheduled for final approval in early 2013).

③ Jed Johnson Tower.

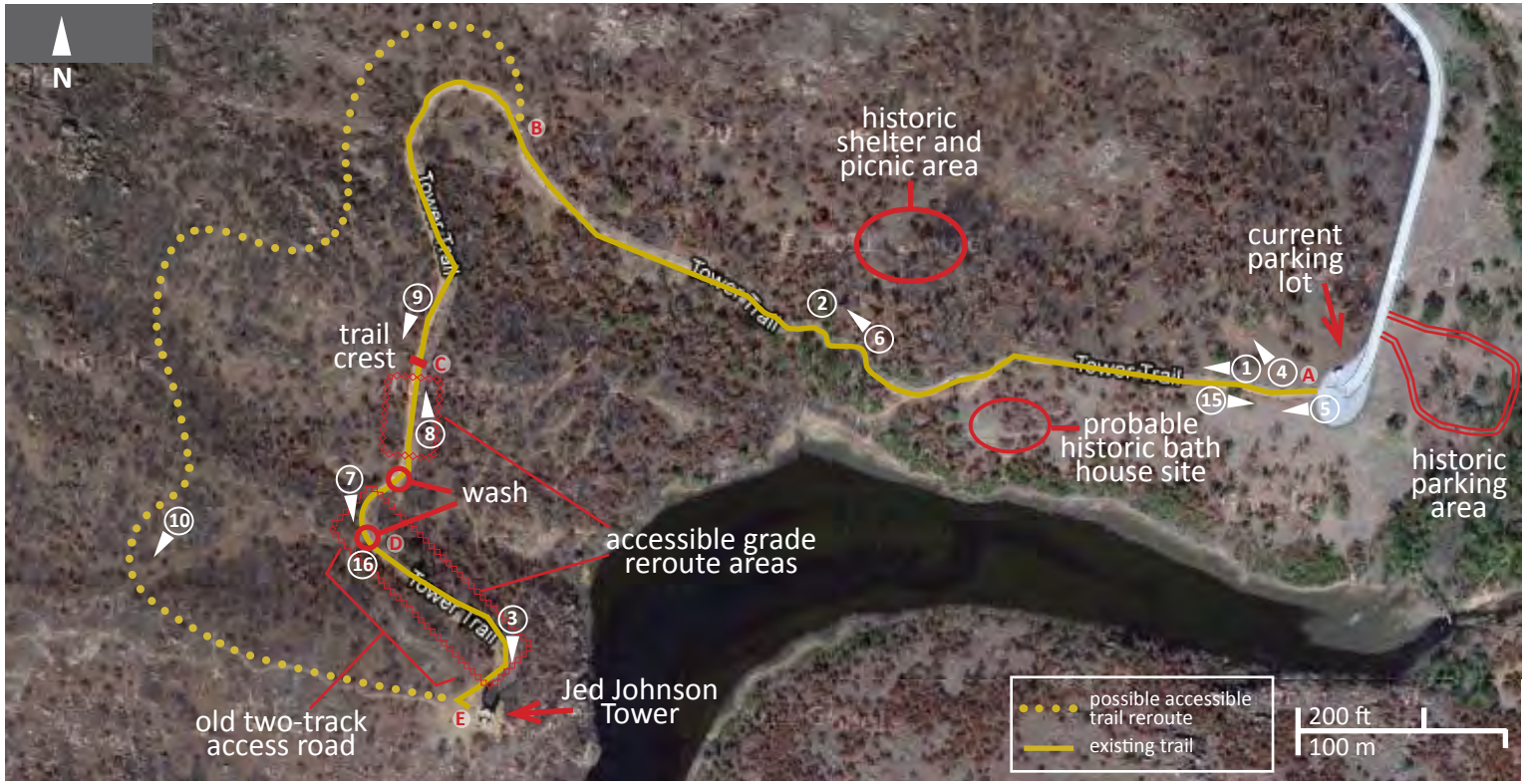
Research

Relevant information gained from the following documents and sources provides the basis of the technical information in this document. Complete details for the trail and parking lot soil types are included in this section for ease of reference.

- **Wichita Mountains Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment**, August 2012. U.S. Fish and Wildlife Service.
- **The Trail Inventory of Wichita Mountains NWR**, April 2012, Central Federal Lands Highway Division.
- **The Road Inventory of Wichita Mountains National Wildlife Refuge**, January 2005, Central Federal Lands Highway Division.
- **Soil Survey:** Comanche County, Oklahoma, August 1967 .
- **Surface Water and Drainage Patterns**, Wichita Mountains Wildlife Refuge, August 1985.
- **Section 106 research at Oklahoma Historical Society**, July 2012.
- **Wichita Mountains Wildlife Refuge Management, Biology, Law Enforcement, Maintenance, Fire Management, and Visitor Services Staff**
- **Field Measurements and Observation**s (taken from June 2012 to February 2013). In the absence of available site-level information, survey points were taken every 50 feet along the trail and proposed alignment alternatives with a laser level and GPS unit, and trail widths were measured with a tape. Drainage areas were visually inspected for culverts, other drainage infrastructure, and erosion.
- **Historical, GIS, and Google maps Comparative Analysis.**

According to Soil Survey: Comanche County, Oklahoma (August 1967), the Jed Johnson Tower trail area includes one soil type: stony rock land.

Stony rock land (St) is hilly to very steep. It is 15 to 50 percent Granite outcrop, 10 to 30 percent very shallow soils over granite, and 15 to 70 percent deep stony soils. The slope range is 15 to 50 percent. Stony rock land is associated with the mapping units Granite outcrop and Rock land. It has a smaller percentage of outcrops than Granite outcrop and a larger percentage of deep stony soils than Rock land. The vegetation is sparse cover of short and mid grasses on the very shallow soils and tall grasses and scrub oak on the deep stony soils (14).



The existing parking lot sits at the edge of a different soil type: Lawton loam, 1 to 3 percent slopes. If and where expansion of the parking lot occurs, this soil type influences design decisions. The definition of this soil type from the Soil Survey follows.

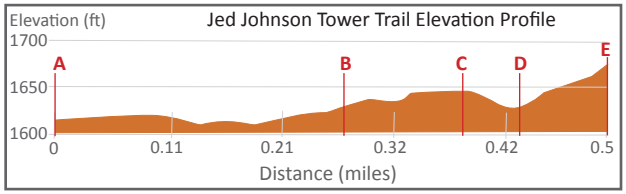
> Lawton loam, 1 to 3 percent slopes (LaB). Most of this soil is cultivated; the rest is used as range [the latter being the case at the Refuge]. All crops grown in the area are suitable, but small grain and cotton are the main crops. All crops respond well to fertilization and good management. Water erosion is a moderate hazard. Terraces and a soil-conserving cropping system are needed (10).

Existing Conditions, trail

The .5-mile long Jed Johnson Tower trail follows a Civilian Conservation Corps (CCC) road from a bulb parking area on the northeast end of Lake Jed Johnson around the north side of the lake to the Jed Johnson Tower on the northwest side of the lake. Jed Johnson Tower, constructed by the CCC, is currently closed to public access; however, the Refuge plans to rehabilitate the structure for future public use.

Visitors may see bison, longhorn cattle, and other large mammals on and around the trail. Smaller wildlife such as reptiles and birds abound along the trail, and a variety of native plants and wildflowers complement the biological diversity hikers encounter. The trail provides many opportunities to appreciate historic resources with the Jed Johnson Tower, the CCC-built road that leads to the tower, remains of historic picnicking facilities, and even the historic CCC-constructed trail.

In many places beyond the first 400 feet of the trail, rock outcroppings, large granite cobbles, and exposed granite bedrock intrude on the trail tread. A brief hill rises from the terrain on the south side of the trail's hairpin turn. The trail crosses two drainage areas that flank this hill, both of which contain eroded soils from higher elevations. The trail itself is severely eroded on both sides of the hill crest. South of the second drainage area, the trail crosses steep,



rocky terrain ascending to the base of Jed Johnson Tower.


5 Departing trailhead for Jed Johnson Tower.

The trail passes through an oak grove where some rock wall evidence remains north of the trail of an early Forest Service picnicking area. West of the oak grove, the trail climbs through a more open area with scrub oak. A fire in September 2011 burned the entire hillside through which the Jed Johnson Tower trail passes. While burned, the oaks show healthy signs of regrowth; however, five years may pass before the area again provides optimal habitat for nesting black-capped vireos, an endangered songbird.

The trail averages a 5.22% overall slope. The first third of the trail maintains a fairly flat slope and undulates some before climbing steeply to the Tower – from 3% to over 11% slope (9.1% average). The trail width begins at 3-feet wide for approximately 100 feet to 200 feet at which point it widens to 6-feet wide. At the hairpin turn, the trail widens to 9 feet. Trail widening along the trail most likely results from erosion and hikers avoiding trail tread obstacles.


6 Remnant picnicking area, adjacent to trail.

Drainage

Water from higher elevations flows down and across the trail into Lake Jed Johnson. Rain typically arrives in short bursts. The extensive granite slabs just below the hardened soil surface limit infiltration, and water rushes quickly across the landscape in scouring, erosive flows. Drainage and erosion present the most significant challenges for trail design and long-term maintenance.

The trail is severely eroded in places, and steep sections of the trail do not appear to shed water from the trail tread but channel water down its length. A combination of trail design and inadequate maintenance over time likely led to the erosion.


7 Wash area.


8 Eroded trail with exposed cobbles.

The Refuge is in a severe drought cycle, which has hardened the soil more than average dry spells. The hard, rocky soil combined with large quantities of fast-moving water and sometimes hail – from the short and intense precipitation events in the region

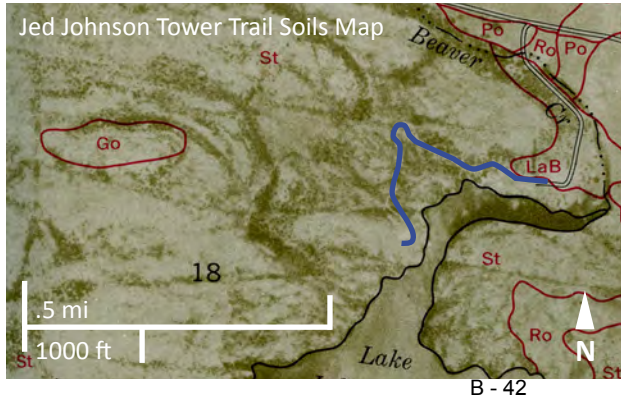

9 Exposed bedrock near trail crest.

– scour the trail tread, removing the soil, natural granite gravel, and smaller rocks. Just west of the oak grove, drainage improvements are needed to direct water off the trail where it collects at a low spot. Two washes, indicated on the map, collect water and sediment moving perpendicularly across the tread from uphill terrain and also from water and sediment moving along the length of the tread from the steep sections of trail.


10 Extremely rocky area along potential reroute.

Soils

Stony rock land comprises the soil type of the entire trail area.



Existing Conditions, parking lot

The existing parking lot that serves the Jed Johnson Tower trail experiences some use but rarely holds more than five vehicles at a time, even on busy weekends. Under the current visitation levels, it sufficiently serves visitor parking needs.

As the Refuge advances plans to improve the Jed Johnson Tower trail and rehabilitate Jed Johnson Tower, visitation to this trail will likely increase. Additionally, the Refuge would like to direct large groups and visitors seeking accessible recreation opportunities to the Jed Johnson Tower trail. Given this type of projected visitation to the trail, the parking lot requires some redesign to accommodate turning buses and accessible parking.

The 7274 square foot parking lot is surfaced with asphalt in good condition. The lot has no striping or designated accessible parking spaces. Large boulders ring the parking lot. Native soils and vegetation meet the asphalt edge. Mowing between the boulders and the pavement edge does not occur.

Drainage

The parking lot appears to shed water well. Higher elevations are to the north and west of the parking lot with drainage occurring south and east of the pavement, toward Lake Jed Johnson. There are no visible swales or stormwater management areas around the parking lot.

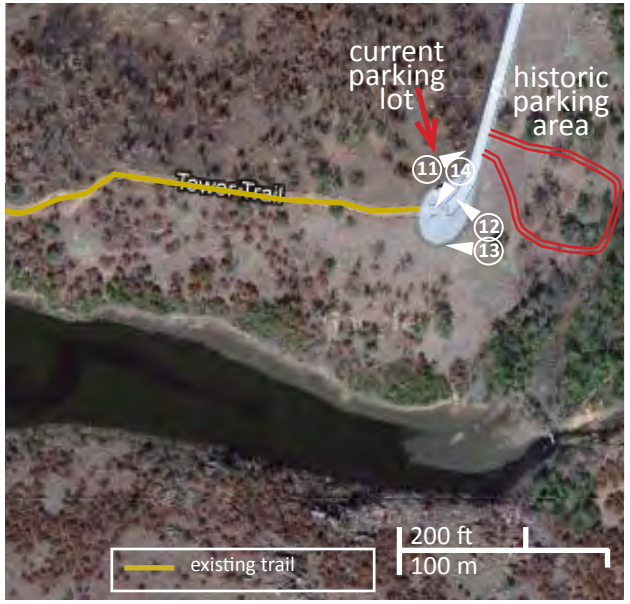
Soils

The soil type surrounding the parking lot is Lawton loam, 1 to 3 percent slope. The southern end of the parking lot may extend into Stony rock land soil type.

The trailhead itself is essentially unimproved. The only visitor amenity to the trail is the parking lot. There are no signs, toilet facilities, trash receptacles, etc. Litter abounds around the parking area. Two trails exit the parking lot, one on the west side – the Jed Johnson Tower trail – and one on the south side, a fainter desire line or game trail that accesses the lake.

Historically, the Jed Johnson parking lot and trail area were more developed areas with picnicking facilities, a bathhouse, and swimming in Lake Jed Johnson. These facilities underwent demolition and deconstruction in the early 1980s. The present day parking lot is an expansion of the original road that accessed this area. Additionally, the historic parking area, probably a two-track drive-through configuration, extended in a loop from the east side of the present day parking lot, circling some trees and returning to the east side of the present day parking lot.

Wildlife frequent the area, and the black-capped vireo nests in the shrubby trees near the parking lot (mainly to the west of the parking lot).



15 Family starting on a hike.

Conclusion

This memorandum provides a description of the Jed Johnson Tower trail and parking lot area and collects information that informs the next part of the planning process. Reviewing the physical conditions of the proposed trail area for existing infrastructure, materials, slopes, drainage, and soils provides valuable information for scoping design options.

Using assessment criteria developed with the Refuge and project partners, one or more preferred design options will advance for further consideration as the Refuge prepares alternatives to conduct National Environmental Policy Act (NEPA) analysis.

The trail design options will undergo further refinement as the Refuge clarifies -- through internal discussion informed with community input -- what level of potential effect on wildlife and habitat is allowable, what the target audiences' needs for trails are, how many people or what size groups the trail should be sized to accommodate, how the proposed trail will meet accessibility guidelines, and what resources the Refuge can draw upon to help maintain its investment in non-motorized transportation facilities.

Community outreach for the trails has been on-going through the CCP process and Transportation Scholar efforts. The Refuge's strong community partners have been instrumental in gathering people and input. These partners include:

- Fort Sill Army Base.
- Medicine Park Museum of Natural Science.
- Town of Medicine Park.
- City of Lawton Parks and Recreation Dept
- Fit Kids of Southwest Oklahoma.
- Friends of the Wichitas.
- Lawton Public Schools.

Results from this outreach process provide data to help the Refuge assess the design options and develop recommended alternatives.

Notes

[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, Indiahoma, OK. Available from www.triptac.org.

[2] Alternative Transportation Study: Wichita Mountains Wildlife Refuge. Prepared by John A. Volpe National Transportation Systems Center, U.S. Department of Transportation. August 2010. Accessed 6/13/12 from www.triptac.org.

References

Habitat Management Plan, Surface Water and Drainage Patterns Exhibit 12, Wichita Mountains Wildlife Refuge, U.S. Fish and Wildlife Service (August 1985).

Soil Survey: Comanche County, Oklahoma (August 1967).

The Trail Inventory of Wichita Mountains NWR, Central Federal Lands Highway Division (April 2012).

The Road Inventory of Wichita Mountains National Wildlife Refuge, Central Federal Lands Highway Division (January 2005).

Wichita Mountains Wildlife Refuge Comprehensive Conservation Plan 2012, U.S. Fish and Wildlife Service (November 2012).

16 Young collared lizard.

Appendix C: Stacked Loop Trail System

A stacked loop trail system acknowledges that trail systems attract recreationalists interested in different types of activities and who present a range of skill levels. No single trail design can accommodate this range of activities or skills. Instead, well-designed trails that serve an array of trail user skills and needs assemble a variety of trail experiences in an area, creating an interconnected system.

Figure 1: Stacked Loop Trail System Concept Diagram

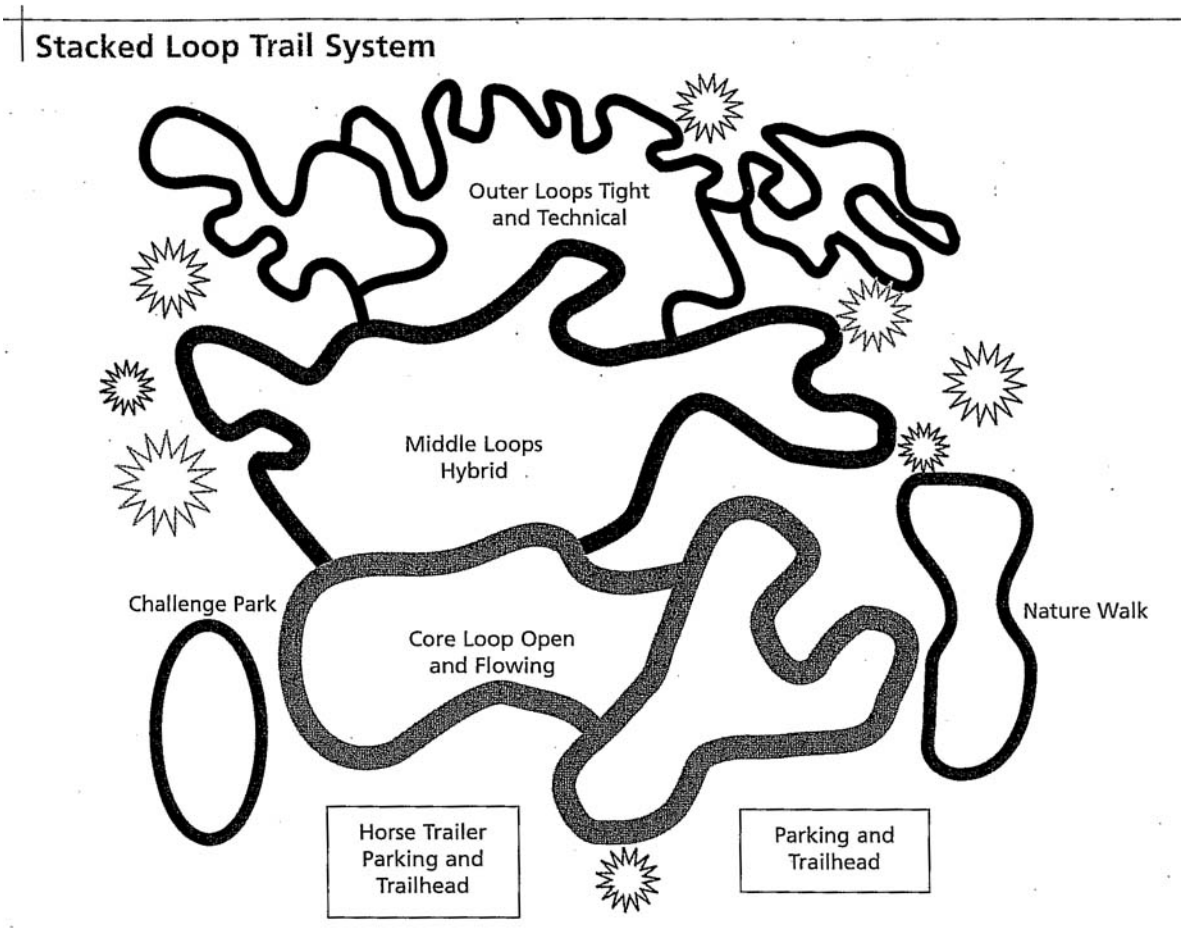


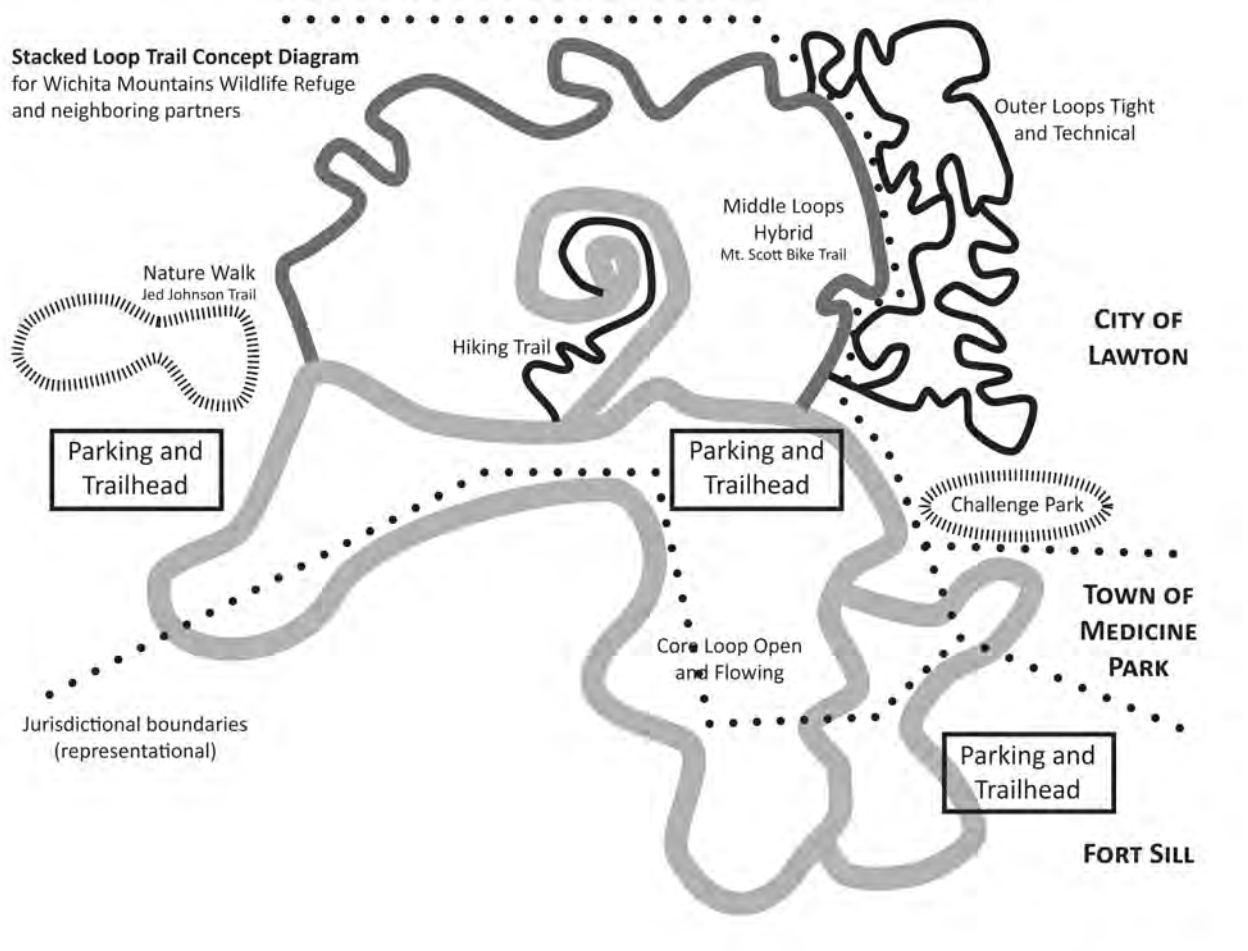
Figure 1 from the International Mountain Bicycling Association's resource guide for trail development, *Trail Solutions*, highlights some essential characteristics of a stacked loop trail system. The system organizes trail users based on abilities. The easiest and busiest trails are close to parking and trailhead facilities. The further away from parking, the more difficult and technical the trails become. Another feature of this system is in the interconnectivity of the different loops which allows trail users to vary their routes and enables them to create long or short distance trail experiences within a relatively contained area.

Near to parking and near the trail system but not necessarily connected to it are two destination areas that attract different types of trail users – a challenge park and a nature walk. Both of these spaces are all-ages all-abilities areas, one for bicycles and skill development and the other for walking and interpretation. Both of these areas might be single destinations for trail visitors, but they could also serve as areas that enhance self-guided visitor experiences within the interconnected trail system.

The Refuge's east side, when viewed beyond its boundaries to include the jurisdictions of City of Lawton, Town of Medicine Park and Fort Sill, offers a nascent structure for a stacked loop trail system. Within Refuge boundaries, the parking and trailheads exist along with potential core loops, an existing middle/hybrid loop, and nature walks.

Figure 2 illustrates a concept for a stacked loop trail system situated on the Refuge's east side. The dotted lines indicate jurisdictional boundaries to illustrate that the trails on the Refuge link to other non-motorized trails outside the Refuge. The diagram suggests elements of this east side stacked loop trail concept that do not currently exist, such as the challenge park and hiking trail. The challenge park would be situated on City of Lawton property, adjacent to the Town of Medicine Park, and accessed from the Refuge at the Lake Lawtonka trailhead. The hiking trail would approximately follow the road up Mt. Scott but would be entirely separate from it, offering hikers and trail runners a challenging, rugged, and lengthy journey to the peak and its rewarding vistas.

Figure 2: Stacked Loop Trail Concept Diagram for Wichita Mountains Wildlife Refuge



The core loops that connect to parking and the trailhead should be wide and smooth to appeal to a variety of trail users and to allow visitors to travel side by side and socialize at the start. Visitors access the rest of the system from the core loops. Consequently, this type of trail in the system receives the most use. This type of trail also provides direct routes for destination-oriented trail users and accommodates a variety of trail user speeds.

The LETRA connection trail has the potential to provide this kind of core loop experience. Main parking areas on the Refuge (Lake Elmer Thomas fishing pier) and at neighboring properties (LETRA and the Medicine Park Museum) connect to this trail. From the Lake Elmer Thomas fishing pier parking lot, visitors can access the Refuge's middle/hybrid loop – the Mt. Scott Bike Trail – or access the City of Medicine Park Lake Lawtonka technical trails (and proposed challenge park) at the on-Refuge trailhead. Other technical trails on Fort Sill can be accessed from LETRA.

The Jed Johnson Tower trail provides an ideal nature walk as part of this stacked loop system. Future trail planning or enhancements could also include the Mt. Scott Picnic Area trail as a second nature walk (identified in the CCP for this purpose) that complements the stacked loop trail system.

Reference

Trail Solutions: IMBA's Guide to Building Sweet Single Track. 2004. International Mountain Bicycling Association. IMBA, Boulder, CO.

Appendix D: Issues, Strategies, and Proposed Action Summaries for LETRA Connection Trail

Table 4 summarizes the relationship of the issues to strategies that address them. Table 5 summarizes the most suitable alternatives. In Table 4, a box (■) indicates if a strategy addresses an issue. Proposed actions for each alternative implement the strategies and are described in the project proposal narrative in "Alternatives." The table that illustrates how well the alternatives address the issues (as seen in Table 1) appears underneath the strategies here.

Table 4: LETRA Connection Trail Issues and Strategies Relationship

Strategies	Issues: MV speeding	parking congestion	habitat degradation	pollution	limited pullouts for wildlife viewing	high road maintenance costs	large carbon footprint	auto-dependent development patterns	poor statewide health	disconnected public, youth	few accessible facilities	overuse of the Wilderness Area	littering
Maintain narrow MV travel lanes and sense of road enclosure.	■					■	■	■					
Direct visitors to east side destinations and away from congested west side parking areas.		■	■	■			■					■	
Redesign east side parking lots and/or trailheads for efficient parking.		■	■	■			■					■	
Design trails along previously disturbed areas.			■										
Use narrow trail width to minimize habitat disturbance.			■	■			■						
Size and site trails appropriately for target trail users.			■		■	■		■	■	■	■	■	
Deliver complementary programmatic activities.	■	■	■	■					■	■	■	■	■
Increase choices for visitors to explore the Refuge through nm means.		■	■	■	■	■	■	■	■	■	■	■	
Reduce automobile use on the Refuge.		■	■	■		■	■		■	■			
Minimize erosion and slow runoff through stormwater management.			■	■									
Use natural and locally sourced materials to reduce pollution generated from materials transport and to minimize visual pollution.				■			■						
Develop alternative transportation facilities.		■	■	■	■	■	■	■	■		■		
Interconnect nm trails and facilities within the region.		■	■	■	■	■	■	■	■	■	■	■	
Develop nm travel opportunities separated from MV traffic.					■			■	■	■	■	■	
Design trails that incorporate unstructured play spaces.									■	■		■	
Design trails that people of all abilities can access.					■			■	■	■	■		
Provide access to and develop east side recreational destinations that provide a full range of experiences that visitors with a tolerance for social outdoor experiences seek.		■	■		■				■	■	■	■	
Improve trailhead and parking areas with amenities, such as easy-to-open wildlife-resistant trash and recycling receptacles, information kiosks, bicycle parking, and toilets.		■	■	■	■						■	■	■

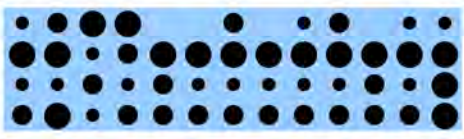
Alternative A	
Alternative B	
Alternative C	
Alternative D	

Table 5 summarizes the effects of proposed actions – several apply to each strategy – that most suitably treat the issue. The large dot (●) relates to the alternatives ranking in the alternatives summary table above (at the bottom of Table 4) or in Table 1. For example, the large dot in 'motor-vehicle speeding' below relates to the large dot in the 'motor-vehicle speeding' column in Table 4 above, Alternative B.

Table 5: LETRA Connection Trail – Alternatives Suitability for Addressing Issues

Issues		Proposed Action Effects
Motor-vehicle speeding	●	No MVs to speed, roads currently open to public MV use would close and be open to the public only for nm use.
Parking congestion	●	Most efficient parking. Signage and promotion directs visitors to east side lots connected to facilities they feel most safe and comfortable using.
Habitat degradation	●	Creates no new habitat disturbance. While this is a best case scenario for habitat, it contradicts the goals for developing trails in this area -- increasing visitation where habitat is already somewhat disturbed and where habitat is less sensitive than in other areas of the Refuge, such as the Wilderness Area.
Pollution	●	No new materials brought in = no new pollution.
Limited pullouts for wildlife viewing	●	Creates safest and most comfortable space for visitors to view wildlife through nm means.
High road maintenance costs	●	Longest road lengths closed to public MVs.
Large carbon footprint	●	Reduces MV use by providing nm options, closes longest length of road to public MV access.
Auto-dependent development patterns	●	Creates most nm-only travel spaces and destinations.
Poor statewide health	●	Provides safe and comfortable to use nm facilities for widest range of ages and abilities.
Disconnected public, youth	●	Longest length without MV interactions.
Few accessible facilities	●	Consistent, smooth surface with greatest separation from high-speed MV traffic.
Overuse of the Wilderness Area	●	Provides an experience without MV interactions and caters to the widest range of ages and abilities -- increases visitation at this location.
Littering	●	Easy-to-open wildlife-resistant receptacles located at both parking areas.

Appendix E: Issues, Strategies, and Proposed Action Summaries for Jed Johnson Tower Trail

Table 6 summarizes the relationship of the issues to strategies that address them. Table 7 summarizes the most suitable alternatives. In Table 6, a box (■) indicates if a strategy addresses an issue. Proposed actions for each alternative implement the strategies and are described in the project proposal narrative in "Alternatives." The table that illustrates how well the alternatives address the issues (as seen in Table 1) appears underneath the strategies here.

Table 6: Jed Johnson Tower Trail Issues and Strategies Relationship

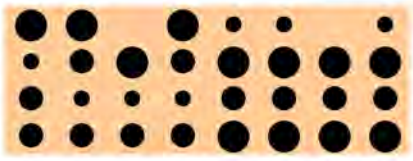
	Issues							
Strategies	habitat degradation	pollution	limited pullouts for wildlife viewing	large carbon footprint	poor statewide health	disconnected public, youth	few accessible facilities	overuse of the Wilderness Area
Design trails along previously disturbed areas.	■							
Use narrow trail width to minimize habitat disturbance.	■	■		■				
Site and size trails appropriately for planned group use.	■		■		■	■	■	■
Filter and slow runoff with stormwater management facilities.	■	■						
Use natural and locally sourced materials to reduce pollution generated from materials transport and to minimize visual pollution.		■		■				
Increase choices for visitors to explore the Refuge through nm means.		■	■	■	■	■	■	■
Reduce carbon emissions from MVs and fossil fuel-powered machinery.		■		■	■	■		
Develop nm travel opportunities separated from MV traffic.			■		■	■	■	■
Design trails that incorporate unstructured play spaces.					■	■		■
Design trails that people of all abilities can access.			■		■	■	■	
Provide access to and develop east side recreational destinations that offer wilderness-like experiences for groups.					■	■		■
Maintain natural and rugged trail experience.						■		■
Alternative A								
Alternative B								
Alternative C								
Alternative D								

Table 7 summarizes the effects of proposed actions – several apply to each strategy – that most suitably treat the issue. The large dot (●) relates to the alternatives ranking in the alternatives summary table above (at the bottom of Table 6) or in Table 1. For example, the large dot in 'Habitat degradation' below relates to the large dot in the 'habitat degradation' column in Table 6 above, Alternative A.

Table 7: Jed Johnson Tower Trail – Alternatives Suitability for Addressing Issues

Issues		Proposed Action Effects
Habitat degradation	●	Creates no new habitat disturbance. While this is a best case scenario for habitat, it contradicts the goals for developing trails in this area -- increasing visitation where habitat is already somewhat disturbed and where habitat is less sensitive than in other areas of the Refuge, such as the Wilderness Area.
Pollution	●	No pollution generated from materials transport -- no new materials brought in.
Limited pullouts for wildlife viewing	●	Creates most interesting and accessible space for visitors to view wildlife through nm means.
Large carbon footprint	●	The different alternatives all require varying levels of fossil fuel-powered machinery to assist with construction and maintenance. The most suitable option would most likely be the alternative that requires the least amount of long-term maintenance, Alternative B. The addition of trail length ensures the best fix for erosion, drainage, and accessibility.
Poor statewide health	●	Accessible to widest range of ages and abilities.
Disconnected public, youth	●	Accessible to widest range of ages and abilities.
Few accessible facilities	●	Meets Guidelines for Outdoor Developed Areas. Alternative B may provide a more scenic and interesting trail experience, and it adds length to the trail. Alternative D provides a shorter distance to Jed Johnson Tower than Alternative B and may be more accessible to some visitors for that reason.
Overuse of the Wilderness Area	●	Provides the most rugged trail experience while still being accessible to the widest range of ages and abilities.

Appendix F: Issues, Strategies, and Proposed Action Summaries for Jed Johnson Tower Trail Parking Lot

Table 8 summarizes the relationship of the issues to strategies that address them. Table 9 summarizes the most suitable alternatives. In Table 8, a box (■) indicates if a strategy addresses an issue. Proposed actions for each alternative implement the strategies and are described in the project proposal narrative in "Alternatives." The table that illustrates how well the alternatives address the issues (as seen in Table 1) appears underneath the strategies here.

Table 8: Jed Johnson Tower Trail Parking Lot Issues and Strategies Relationship

	Issues						
Strategies	parking congestion	habitat degradation	pollution	large carbon footprint	few accessible facilities	overuse of the Wilderness Area	littering
Direct visitors to east side destinations and away from congested west side parking areas.	■	■	■			■	
Redesign parking lot and trailhead to improve parking efficiency and access for turning tour buses.	■	■	■			■	
Minimize habitat disturbance.		■		■			
Minimize erosion and slow runoff through stormwater management.		■	■				
Deliver complementary programming.		■					■
Minimize visual pollution.			■				■
Encourage alternative transportation for groups.	■	■	■	■			
Reduce or minimize carbon emissions during materials transport and construction.			■	■			
Plan for long-term facility durability and low long-term carbon-based maintenance.			■	■			
Design fully accessible facilities.					■		
Direct groups seeking wilderness-type experiences to the Jed Johnson Tower trail.	■	■				■	
Improve trailhead with easy-to-open wildlife-resistant trash and recycling receptacle, information kiosk, bicycle parking, and toilets.		■	■		■	■	■
Alternative A	●	●	●	●		●	
Alternative B	●	●	●	●	●	●	●

Table 9 summarizes the effects of proposed actions – several apply to each strategy – that most suitably treat the issue. A large dot (●) indicates the most suitable slate of proposed actions for the issue. The dot

size relates to the alternatives ranking in the alternatives summary table above (at the bottom of Table 8) or in Table 1. For example, the large dot in 'Parking congestion' below relates to the large dot in the 'parking congestion' column in Table 8 above, Alternative B.

Table 9: Jed Johnson Tower Trail Parking Lot – Alternatives Suitability for Addressing Issues

Issues		Proposed Action Effects
Parking congestion	●	Parking lot redesigned to accommodate planned use.
Habitat degradation	●	No habitat disturbed.
Pollution	●	Provides facilities appropriate to group visitation -- buses can turn, toilets -- minimizing accumulation of environmental pollutants at the trailhead over time.
Large carbon footprint	●	Minimizes carbon emissions per visitor by providing facilities appropriate to group visitation via alternative transportation.
Few accessible facilities	●	Provides accessible parking and other trailhead elements that support trail accessibility.
Overuse of the Wilderness Area	●	Parking lot redesign provides groups with access to Refuge experiences and reduces group use in the Wilderness Area -- provides non-Wilderness Area group destination.
Littering	●	Provides easy-to-open wildlife-resistant trash and recycling receptacle.

Wichita Mountains Wildlife Refuge

Meers Road Trail

Existing Conditions, Trail Design Concepts, and Assessment Criteria

May 2013

Prepared for:

U.S. Fish and Wildlife Service
Wichita Mountains Wildlife Refuge

Paul S. Sarbanes Transit in the Parks
Technical Assistance Center

Prepared by:

Heidi Beierle
Public Lands Transportation Scholar
Wichita Mountains Wildlife Refuge

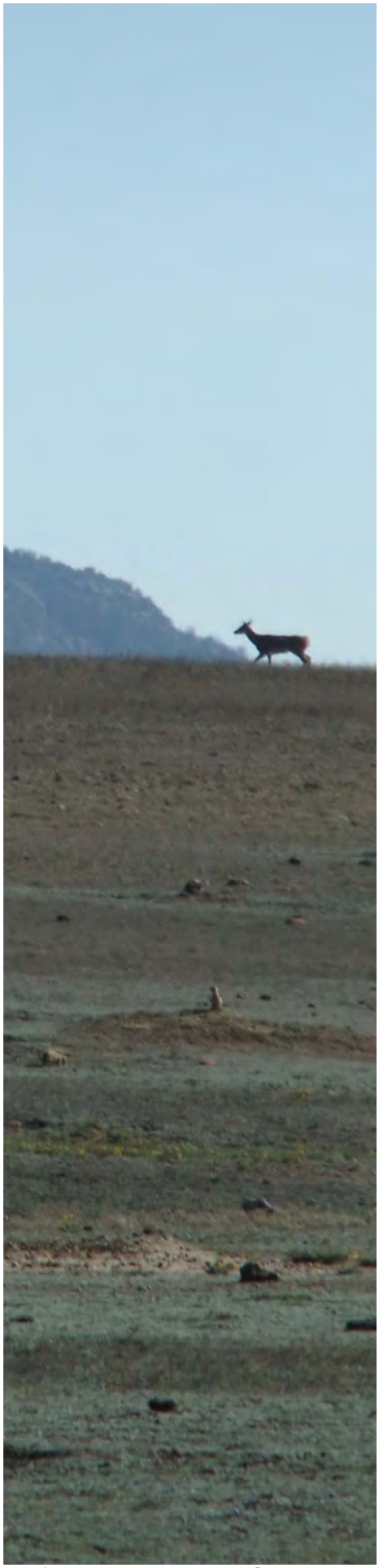
Table of Contents

Introduction

Approximately 1.7 million annual visitors engage in wildlife-dependent recreation and enjoy the scenic views at Wichita Mountains Wildlife Refuge. Ninety percent of these visitors arrive in private automobiles, which leads to negative auto-related effects: speeding, animal-vehicle collisions and fatalities, parking congestion, habitat degradation, pollution, large Carbon footprint, high road maintenance costs, and a disconnected public.

The Refuge supports six wildlife-dependent recreation activities: hunting, fishing, wildlife observation, photography, interpretation, and environmental education. Supportive recreation includes bicycling, boating, camping, hiking, picnicking, rock sports, and SCUBA diving. While most wildlife-dependent recreation occurs from a private automobile, it could also happen by foot, bicycle, or with the assistance of a mobility device. Facilities for active transportation may improve wildlife-dependent recreation on the Refuge for these three modes.

The Meers Road trail is under consideration to create opportunities for visitors to experience the Refuge through active modes. In particular, the Meers Road trail is identified in the Comprehensive Conservation Plan (CCP) 2012 as a location that would connect existing walking and biking routes on the east side and that would improve east side wildlife-dependent recreation experiences.



Project History

The Meers Road trail project appears in a series of transportation studies and work that began on the Refuge in 2009. The 2009 effort included a Transportation Assistance Group meeting at the Refuge where an alternative transportation trajectory was charted.[1] Following this meeting and in tandem with other efforts, the Refuge advanced planning efforts and grant seeking to improve alternative transportation at one of the most visited refuges in the National Wildlife Refuge System.

The 2010 Alternative Transportation Study[2] references improvements for the Meers Road trail, then identified as a potential shoulder construction project. Meers Road improvements anticipate increased non-motorized visitation and active recreation to and at east side destinations and address existing needs to connect the two ends of the Mt. Scott Bike Trail with continuous and designated bicycle and pedestrian space.

The Refuge submitted a 2011 Paul S. Sarbanes Transit in the Parks grant proposal to fund three projects: transportation data collection, trail planning design and development, and a Comprehensive Alternative Transportation Plan (CATP). The Volpe National Transportation Systems Center is conducting the data collection and creating the CATP (project work began February 2013 and will conclude in early 2014). The unfunded portion of that grant proposal for trail planning design and development, which includes concept level planning for the Meers Road trail is being advanced through the efforts of a 2012 Public Lands Transportation Scholar.

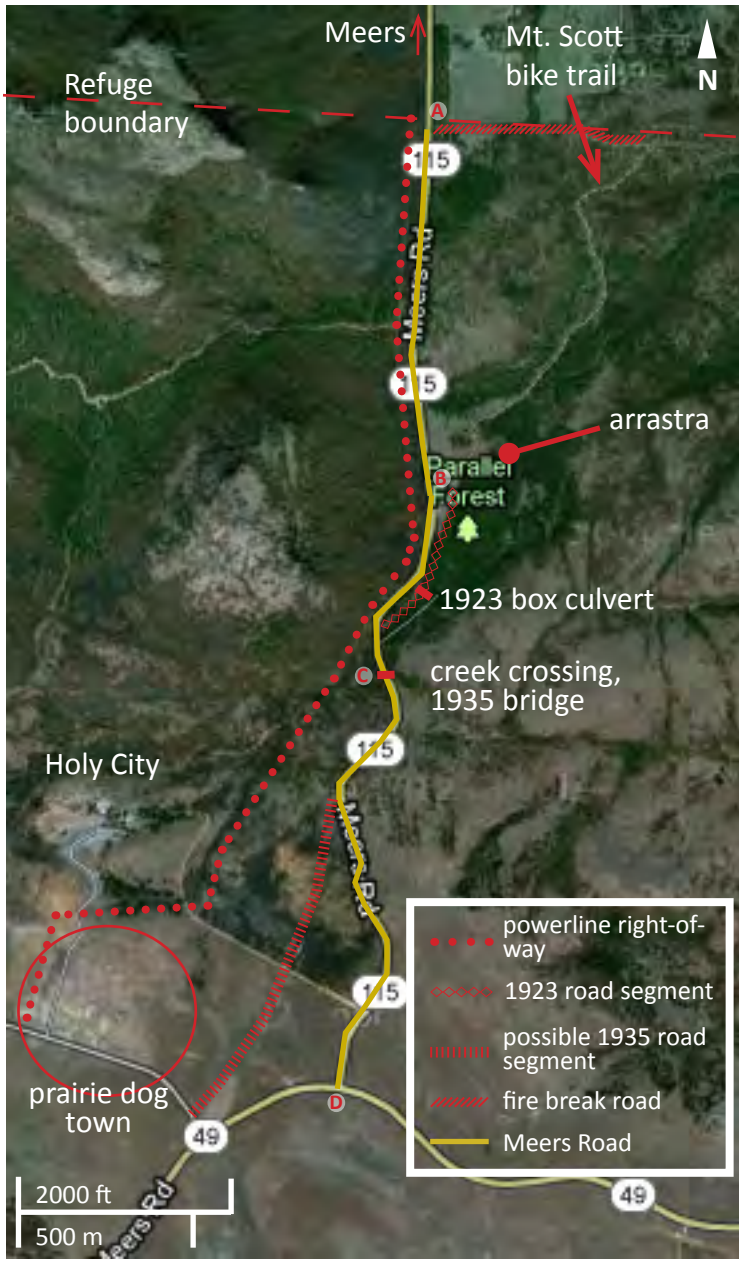
Most of the projects that appeared in the 2010 Alternative Transportation Study are also included in the Refuge's newly updated CCP (scheduled for final approval in early 2013).

Research

Relevant information gained from the following documents and sources provides the basis of the technical information in this document.

- **Wichita Mountains Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment.** August 2012. U.S. Fish and Wildlife Service.
- **The Trail Inventory of Wichita Mountains NWR**, April 2012, Central Federal Lands Highway Division
- **The Road Inventory of Wichita Mountains National Wildlife Refuge**, January 2005, Central Federal Lands Highway Division
- **Soil Survey** Comanche County, Oklahoma, 1967 (See Appendix A for details)
- **Surface Water and Drainage Patterns**, Wichita Mountains Wildlife Refuge, August 1985
- **Section 106 research at Oklahoma Historical Society**, July 2012
- **Wichita Mountains Wildlife Refuge Management, Biology, Law Enforcement, Maintenance, Fire Management, and Visitor Services Staff**
- **National Wildlife Refuge Visitor Survey 2010/2011: Individual Refuge Results for Wichita Mountains Wildlife Refuge.** U.S. Geological Data Series 643.
- **Field Measurements and Observations** (taken from June 2012 to February 2013)
  Drainage areas were inspected for culverts, other drainage infrastructure, and erosion.
- **Historical, GIS, and Google maps Comparative Analysis**

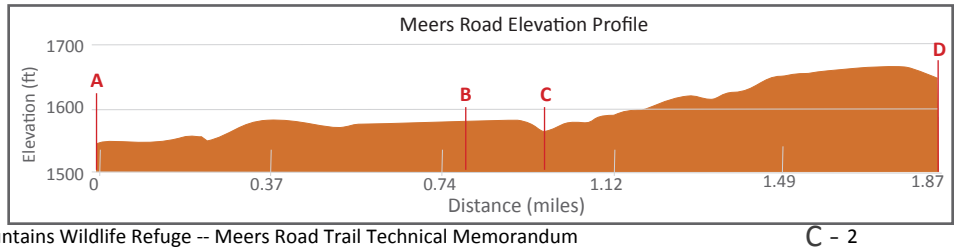
Figure 1: *Meers Road corridor features.*



Existing Conditions

Part of the designated Wichita Mountains National Scenic Byway, Highway 115 (the Meers Road) extends 1.87 miles from the intersection at Highway 49 (the Meers T) north towards the town of Meers, ending at the Refuge's northern boundary (the north gate).

North from the Meers T, the Meers Road corridor crosses open grassland and descends into an area wooded with oaks. The road makes three curves, traversing the slope and winding around granite outcroppings. At the bottom of this forested grade, Cedar Creek flows west to east, and the 1935 bridge carries the road back up hill and around another curve. Right at this hillside curve, a 3,230 square foot paved pullout extends on the east side of the road. An old road segment (the 1923 remnant) can be seen at the southeast end of the pullout, and large boulders in the grass next to the pullout bar automobile access beyond the pavement. Continuing north, a 4,374 square foot paved parking area on the east side of the road provides access to the Mt. Scott Bike Trail and pedestrian-based activities in the Parallel Forest. At the north end of the Parallel Forest, an old ore grinding



structure – arrastra – is a popular destination for visitors. Further north along Meers Road, the trees give way to grass, and the road straightens and levels. On the west side of the road, a paved pull-through can be accessed by south-bound vehicles. Just inside the north gate on the west side of the road, a 971 square foot paved pullout parking area exists amid oaks that grow close to the road. On the east side of the road, an old fire-break road extends east along the south side of the boundary fence to its intersection with the Mt. Scott Bike Trail. The north gate is fenced to the road edge, and a cattle guard constructed of round pipe extends the full 21 feet of the road width. All pavement is in fair to good condition.


Raptor in prairie dog town.

Potential Resource Concerns

The Meers Road corridor presents a variety of potential resource concerns, mostly oriented around historic resources. The Parallel Forest, for example, presents a potential historic resource concern because its significance relates to its association with the U.S. Forest Service and its function as a long-standing landscape feature (culturally modified land area).


White-tailed deer.

The Meers Road corridor is the historic pass through the Wichita Mountains. Originally, travelers through the Mountains were American Indians. Later, prospectors used mule trains and wagons to assist their search for riches. During the modern era, design for automobiles shaped the landscape. Now in contemporary times, this same corridor is being studied to accommodate both motorized and non-motorized travel modes.

The alignment of the Meers Road has changed little over time – excepting the Meers T intersection and the alignment at the north gate – and the facility itself looks much as it did in the late 1920s and early 1930s when the road was constructed. Automobiles were much smaller in the 1920s and 1930s when driving served principally recreational purposes rather than as a daily commuter necessity. Consequently, roads were designed for slow, sight-seeing speeds, alignments that accentuated natural landscape features and sensitivity to the scenic environment.


Rattlesnake maker.

Natural

Automobile size and speed have a direct effect on Refuge resources. High road maintenance costs, pollution, and wildlife collisions and fatalities include some of the issues associated with today's large automobiles and daily commuters' needs to cross the Refuge quickly. Potential negative effects to natural resources – such as increased wildlife collisions – should be considered when weighing the costs of potential expansion of the existing roadway or construction of non-motorized facilities in the Meers Road corridor.


Road kill rattlesnake.

Habitat disturbance leads to new areas with invasive vegetation – first through disturbance and second through seed transport from human travel. Proposals that create new disturbance should consider the near-term certainty of managing these areas of invasive vegetation and should balance needs for ground cover and forage with compensatory needs to reduce erosion.

Historic

The historic integrity of the Meers Road and its slow, scenic character remains today with 10.5-foot wide travel lanes, curves, enclosure of the 21-foot wide paved road, the 1935 bridge over Cedar Creek, and the several intact historic culverts. While neither the Meers Road nor its contributing features

is listed in the National Register of Historic Places, any or all of the facility may require mitigation if altered. In addition, two separate historic segments have been identified in the Meers Road corridor that could potentially accommodate non-motorized facility options – a 1923 segment with culvert and a possible 1935 segment. Use of either of these segments could likely require mitigation if altered (see Figure 1 for locations).

Proposals that reengineer or build on or around the roadway should consider the scenic and historic character of the Wichita Mountains National Scenic Byway and its economic value to the region.

The Parallel Forest is a remnant cedar planting from when the Wichita Mountains were managed by the Forest Service (1901 to 1937). The planting appears on early maps, and the trees were to be used for fence posts and other forest product needs. The Forest is a popular destination area with kids and families and could easily be considered an existing nature play space on the Refuge.

At the north end of the Parallel Forest, an old ore grinder stands. This arrastra is made of stone and a mule or donkey harnessed to a central pole would have powered the grinding mechanism by walking around the outside of the structure. This feature of the area's prospecting history is not listed on the National Register of Historic Places, but it is eligible.

The Parallel Forest and arrastra together present management challenges for Refuge staff. As an unimproved space without interpretation, visitors have constructed their own stories about the cedar planting and arrastra. Consequently, the area attracts visitors who are drawn to its "creepiness" and who use the arrastra as an "altar" for various rituals, weddings among them. Local lore reports that sacrifices and human corpses have been found at the arrastra.

Cultural

Tribal input should be sought to understand better the role Meers Road corridor played for the tribes. Any design strategies should consider the stories of all people who have lived in and traveled through the Wichitas.

Additionally, further archaeological research should be conducted to determine if any known archeological resources exist in the Meers Road corridor.

Culvert along abandoned road, 1923.

Historic box culvert, see above.

Arrastra.[5]

Cedar Creek crossing and 1935 bridge.

Drainage

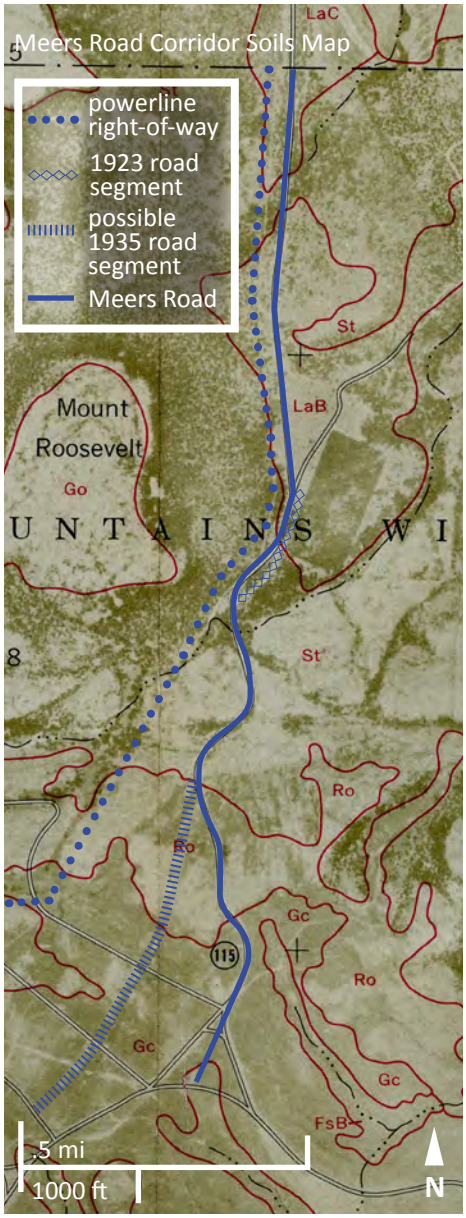
The primary drainage feature in the Meers Road corridor is Cedar Creek that crosses underneath Meers Road .25-mile south of the Parallel Forest parking area. The road has drainage ditches on either side when it traverses relatively flat areas. At the curves, the road skirts granite outcrop areas, and in these locations, drainage ditches are only present on the uphill side of the road. At the crossing with Cedar Creek, a 1935 bridge spans 6.7 meters across the creek bed, and measures 24.5 feet wide.[3] Ten culverts assist drainage underneath the road.[4]

Along the section of abandoned 1923 road that closely follows the existing road .25-mile from the Parallel Forest south to Cedar Creek, one culvert still provides drainage across the road from higher elevations. The road has not been maintained for some time, presumably since the existing alignment was completed.

The possible 1935 road alignment south of the curves has not yet been thoroughly field inspected for features. Evidence from aerial images shows a line of drainage and/or erosion along the possible alignment. It also appears that the buried telephone line follows this same alignment, and it is uncertain whether the erosion evident in the images is disturbance related to the phone line, evidence of failed drainage structures along the historic road segment, or other erosion unrelated to disturbance.

Soils

At the southern end of the potential trail area and at the higher elevations surrounding the Meers T, granite cobbly land predominates. To the north and where slopes steepen, rock land predominates heading into the tight road curves and creek crossing. Stony rock land constitutes the creek area and the land on either side of the road curves. A tongue of Lawton loam 1 to 3 percent slopes encompasses the entire cedar planting and extends all but a quarter mile along the existing road toward the north Refuge gate. A narrow band of stony rock land intrudes across the Lawton loam along the roadway. This soil type extends widely along both sides of the road, yet Lawton loam is the main soil type upon which the road is constructed. North of this narrow band of stony rock land, Lawton Loam 3 to 5 percent slopes extends along both sides of the road and fans out at the north Refuge gate.



Trail Design Concepts

Trail design concepts for non-motorized travel in the Meers Road corridor explore active modes access and non-motorized network design, separation from or shared use with motor-vehicle traffic, and routing or alignment.

The purpose of providing active modes travel choices along the Meers Road remains unsettled. As part of the Transportation Scholar's research, extensive outreach was conducted to understand the opportunities and challenges of providing active modes access along the Meers Road. This outreach included Refuge staff, the public, and Friends of the Wichita Mountains. See Appendix B for details regarding the outreach process. Results of the outreach and work conducted to date suggests that further research and scoping are needed to determine a course of action going forward. Some of the questions of purpose include:

- Should the non-motorized travel connection provided by the Meers Road trail serve to link the ends of the Mt. Scott Bike Trail to one another via dedicated non-motorized routes?
- Should the Meers Road trail be designed to primarily serve users of the Mt. Scott Bike Trail?
- Should the Meers Road trail be designed to serve the target users of the proposed LETRA connection and Jed Johnson Tower trails (families with children, youth, people who use mobility aids, active seniors/retirees, and casual recreationalists)?
- Should the Meers Road trail be designed to provide non-motorized connections to/from the Holy City and Jed Johnson Tower trail?
- Given Refuge staff's management concerns for the Parallel Forest, how much improvement of the Parallel Forest trailhead/parking area is recommended? Would a trailhead kiosk, signage, toilets, bicycle parking, and trash and recycling receptacles be suitable enhancements to the trailhead?
- Would connecting the Mt. Scott Bike Trail (at the Parallel Forest) to the Holy City to provide visitors with water be appropriate?

Mountain biking on the Mt. Scott Bike Trail.

Parallel Forest trailhead.

- Should the Meers Road trail connect the Refuge to the community of Meers?

A popular local destination, Meers Store.

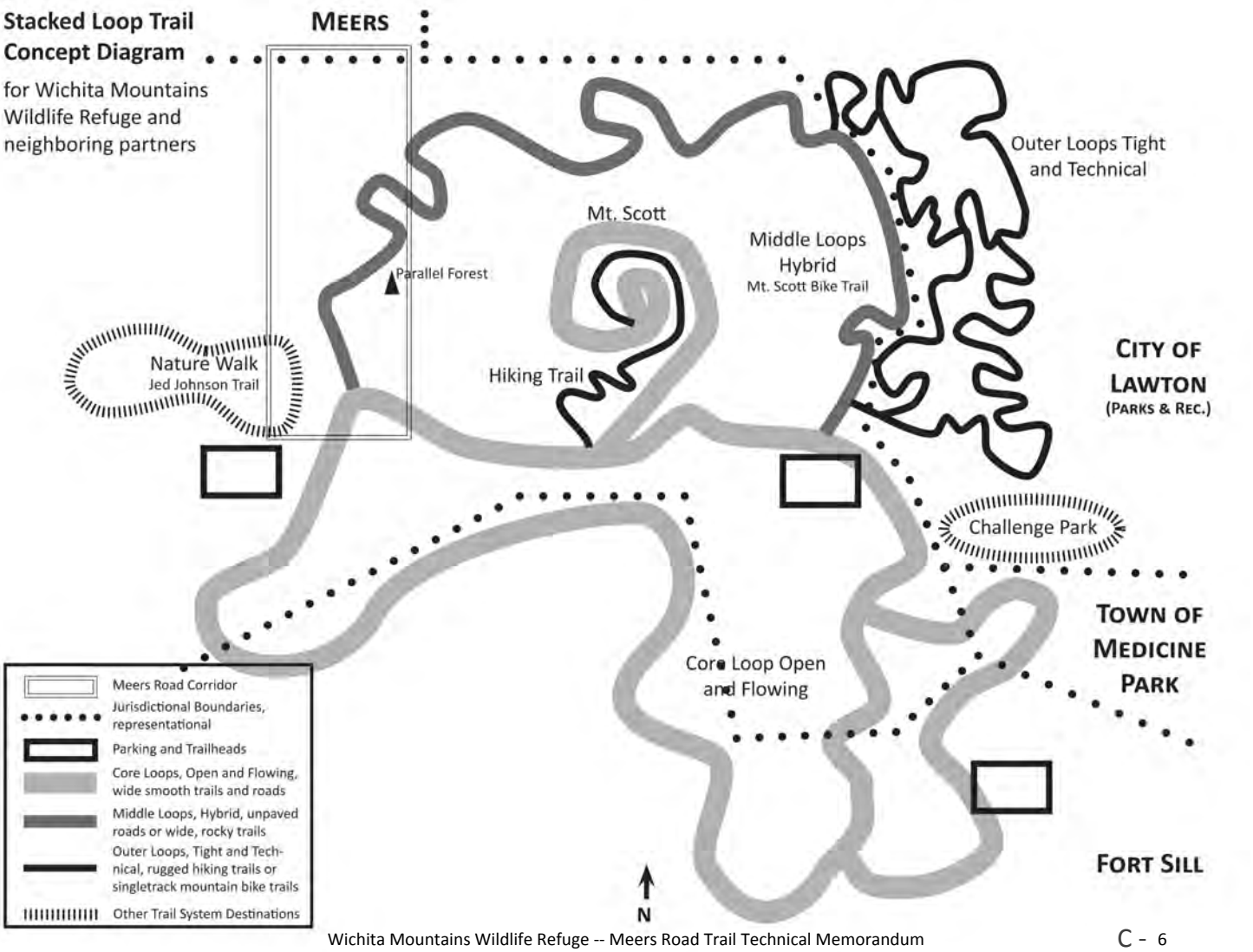
Examining the Meers Road corridor as a facility unrelated to other non-motorized facilities can lead to confusion regarding its potential purpose. Non-motorized options in the Meers Road corridor are identified with other east side non-motorized projects. The other non-motorized east side projects aim to:

1. Provide more alternative transportation options,
2. Redirect visitation from the west side Wilderness Area to east side destinations,
3. Improve safety, and
4. Provide usable and attractive east side visitor facilities.

The Meers Road trail also supports these goals. Consequently, the Meers Road corridor should be considered in relation to these other trail projects, as a connection supporting the larger east side non-motorized trail system. One concept for this type of larger trail network is a stacked loop trail system on the Refuge's east side, a system that extends beyond the Refuge boundary. (See Appendix C for a description of a stacked loop trail system and its applicability to the Refuge's east side.)

Having only developed at a concept level, the Meers Road corridor appears on the Stacked Loop Trail Concept Diagram only as a middle-hybrid loop connecting area, see Figure 2. It may be that this is the most suitable purpose for this

Figure 2: *Stacked Loop Trail System Concept Diagram.*



connecting area, but further scoping will help determine the Meers Road trail role.

Meers Road currently experiences some non-motorized use. Important to consider also are those visitors who do not already use the Meers Road for bicycling and pedestrian modes. A few fearless cyclists and runners do use the Meers Road. Some Refuge visitors will use the Meers Road to connect to the shoulders on Highway 49 and return to vehicles parked at either end of the Mt. Scott Bike Trail. And some visitors will not take the safety risk to travel on Meers Road by foot or bicycle. By examining first the road, then a possible trail separated from the road, and finally a possible trail adjacent to the road, all three of these existing and potential active modes user types will be considered. See Appendix D for additional details regarding trail design.

Minor Roadway Improvements

People who already use road for active travel will likely continue to do so, even if improvements are not made. However, some minor improvements may provide more multi-modal functionality of this facility and enhance safety for non-motorized modes on the road, such as adding sharrows to the pavement and considering the addition of signage that alerts motorists to potential presence of bicyclists and pedestrians on the roadway. Regardless of any other changes that could occur along the Meers Road corridor, the people who currently use non-motorized modes on the road would likely continue to use the road even if separated bicycle and pedestrian facilities were constructed.

Path Separated from Motor-Vehicle Traffic

Fearless cyclists and runners aside, demand is high from visitors to provide more opportunities to walk and ride a bike on the Refuge, especially for youth and people who feel unsafe on the road with automobiles. Visitors are especially interested in trails for walking and bicycling that are separate from motor-vehicle traffic by a distance of 10 feet or more.

A few opportunities exist to consider dedicated non-motorized trails along previously disturbed areas within the Meers Road corridor. One opportunity follows existing power line right of way. Another opportunity incorporates a segment of abandoned 1923 road between the Parallel Forest and Cedar Creek. A third opportunity explores a possible segment of 1935 road that the present day underground phone line follows. Several potential trail combinations could be created from these various opportunities, especially when including the Mt. Scott Bike Trail and the north gate fire-break road.

Providing a shared use path completely separated from motor-vehicle traffic and that also stays entirely within previously disturbed areas would require context sensitive solutions.

Considerations for a shared use path separated from motor-vehicle traffic that does not follow previously disturbed areas have not been explored.

Before any of these solutions can or should be developed, knowing who the target trail users and what their needs are will go a long way to identifying those solutions that are suitable to the ecological and visitation environments.

North of the Meers T, looking south.

Downhill from the Meers T, looking south.

One of the Meers curves, looking south.

Parallel Forest trailhead entrance, looking south down Meers Road.

View of Meers Road to the north from Parallel Forest trailhead entrance.

Shared Use Path Adjacent to Motor-Vehicle Traffic

The 2010 Alternative Transportation Study proposed shoulder construction as a way to provide bicycle and pedestrian access. Given existing and planned use by and for non-motorized modes along Meers Road, shoulders would not appreciably add to the visitor experience and could likely exacerbate existing problems with wildlife collisions, speeding, pollution, historic resource damage, and safety and vulnerability concerns for non-motorized users.

The existing road could potentially be reengineered to provide protected non-motorized space adjacent to motor-vehicle traffic. Context sensitive solutions would be warranted. These solutions would explore ways to protect the scenic and historic character of the road and limit motor-vehicle speeding, minimizing wildlife collisions and unsafe and uncomfortable conditions for non-motorized trail users.

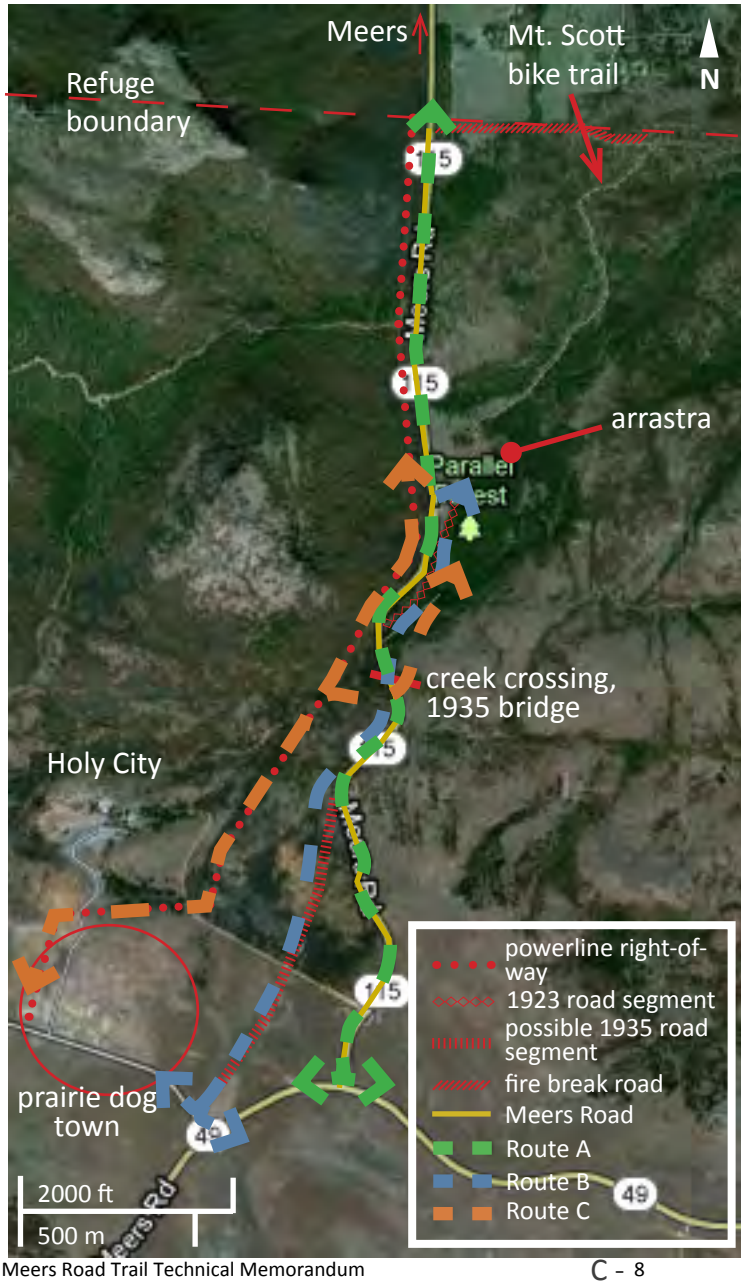
Rock outcroppings at Cedar Creek along powerline right-of-way, view to southwest.

Routing

For ease of discussing alignment options, the Meers Road corridor can be considered as:

- The existing road – all 1.87 miles from south to north.
- Segment 1 – Meers T to the Parallel Forest, 1.15 miles.
- Segment 2 – Parallel Forest to the north gate, .72 miles.

Figure 3: *Routes A, B, and C.*



Route A: Meers Road

This route option would follow the existing road. Destinations would not change by adding a protected shared use path adjacent to the road. Consequently, target trail users would be the same for either configuration.

- **Target trail users:** Faster cyclists, runners, people on mountain bikes connecting ends of the Mt. Scott Bike Trail
- **Destinations:** Meers, Hwy 49 shoulders, Parallel Forest parking area, Mt. Scott Bike Trail at Parallel Forest

Route B: Segment 1, Historic routes to Parallel Forest

This route segment would begin on the Rush Lake road and follow the phone line and possible 1935 road to the Meers Road curves. Possible routing of the trail at the curves is unknown. The trail would cross Meers Road at Cedar Creek and follow the 1923 road segment to the Parallel Forest parking area.

- **Target trail users:** families with children, people who use mobility aids, active seniors/retirees, casual recreationalists, runners, and cyclists not comfortable riding with motor-vehicle traffic on roads with no shoulder, mountain bikers (maybe)
- **Destinations:** Jed Johnson Tower Trail, Prairie dog town, Holy City (water and restrooms), Parallel Forest, Mt. Scott Bike Trail, Hwy 49 shoulders

Route C: Segment 1, Power line right of way

The power line right of way enters Holy City from the

east and north and meets the Rush Lake road at the Holy City entrance and prairie dog town. This routing option could follow the possible 1935 road, join the administrative road to Holy City where it intersects the power line right of way and then follow the right of way to Cedar Creek. At Cedar Creek, the alignment could cross Meers Road and join the 1923 road segment or continue north on the west side of Meers road, following the right of way. The power line right of way crosses a rock outcropping cliff at Cedar Creek. Some bypass or bridge would be needed to make this crossing. If it remained steep, it could exclude many of the potential target trail users.

- **Target trail users:** families with children, people who use mobility aids (maybe), active seniors/retirees, casual recreationalists, runners, and cyclists not comfortable riding with motor-vehicle traffic on roads with no shoulder, mountain bikers (maybe)
- **Destinations:** Jed Johnson Tower Trail, Prairie dog town, Holy City (water and restrooms), Parallel Forest, Mt. Scott Bike Trail, Hwy 49 shoulders

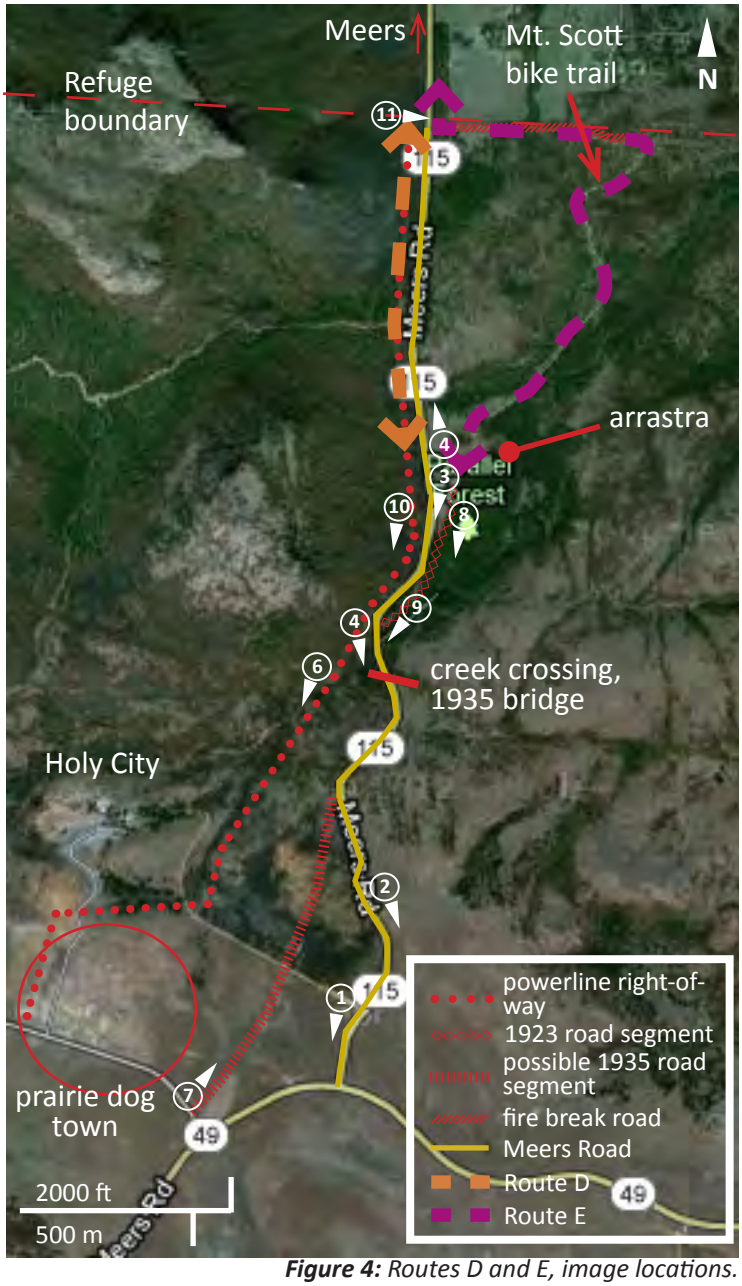


Figure 4: *Routes D and E, image locations.*

Route D: Segment 2, Power line right of way

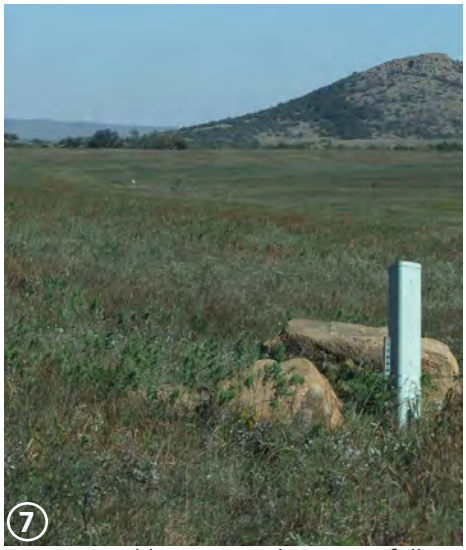
This segment would match Route C with the power line right of way trail remaining on the west side of Meers Road. The right of way continues north across Cedar Creek along the west side of Meers Road and the east side of the Special Use Area boundary fence. It follows the road directly to the north gate.

- **Target trail users:** runners, cyclists not comfortable riding with motor-vehicle traffic on roads with no shoulder, mountain bikers
- **Destinations:** Meers, north gate parking area, Mt. Scott Bike Trail, Parallel Forest parking area (not especially convenient or would require a mid-road crossing), Segment 1 and associated destinations

Route E: Segment 2, Mt. Scott Bike Trail

This segment would connect Segment 1 routes with a terminus at the Parallel Forest parking area. From the parking area, the segment would follow the Mt. Scott Bike Trail to the north gate fire-break road. The trail would then follow the fire-break road west along the south side of the Refuge's north boundary fence to the north gate. With few new destinations associated with this segment, most non-motorized travelers served would be coming from the north.

- **Target trail users:** cyclists not comfortable riding with motor-vehicle traffic on roads with no shoulder, runners coming from Meers, mountain bikers coming from Meers
- **Destinations:** Meers, north gate parking area, Mt. Scott Bike Trail (from the north), Parallel Forest parking area (from the north), Segment 1 and associated destinations



Possible 1935 road segment follows phone utility line.

Assessment Criteria

During development of design alternatives assessment criteria for the LETRA Connection and Jed Johnson Tower trails, criteria for the Meers Road corridor

were also developed. Trail design criteria include four main categories that are consistent with the Refuge mission and goals.

Environmentally Sensitive Design.
Prevent resource loss and maintain or improve conditions of resources.

Wildlife Observation Experience.
Encourage wildlife and resource discovery through facility design.

Safety.
Protect public safety, health, and welfare.

Cost-Effective, Environmentally Responsible, and Otherwise Beneficial Development for U.S. Fish and Wildlife Service.
Provide for low long-term facility maintenance needs and costs, improve green infrastructure, and other considerations.

Development of advantages for different design option categories should ask the following questions of the design option elements and alignments. Some of the questions may not be relevant following decisions about the target trail users and the purpose of non-motorized activity in the Meers Road corridor.

- How does the design option maintain ecological integrity of the surrounding environment, including considerations for wildlife collisions, stormwater management, noise effects, and air quality?
- How does the design option maintain visual and aesthetic continuity of the surrounding environment?
- How does the design option enhance access to, appreciation of, and understanding of natural resources for children and other target trail users?
- How does the design option enhance access to, appreciation of, and understanding of cultural resources for children and other target trail users?
- How does the design option provide a facility that children will want to use?
- How does the design option provide a facility that people who use mobility aids will be able to use and interested in using?
- How does the design option meet children's and other target trail users' needs for a safe and enjoyable to use facility?
- How does the design option encourage wildlife and natural resource discovery?
- How does the design option provide an observation experience on the facility that will encourage return visits and development of Refuge advocates?
- How does the design option encourage motor-vehicle speeds of 25 m.p.h. or slower?
- How does the design option provide for safe shared use between motor vehicles and non-motorized transportation trail users?
- How does the design option provide for safe shared use among non-motorized transportation trail users?
- How does the design option provide a facility that the target trail users feel safe and comfortable using?

Abandoned 1923 road segment near Parallel Forest trailhead.

Abandoned 1923 road segment near Meers Road pullout.

Powerline right-of-way, across Meers Road from the Parallel Forest trailhead.

Firebreak road along the Refuge's north boundary fence.

Conclusion

This memorandum provides a description of the Meers Road corridor and collects information that informs the next part of the planning process. Reviewing the physical conditions of the potential trail alignments for existing infrastruc-

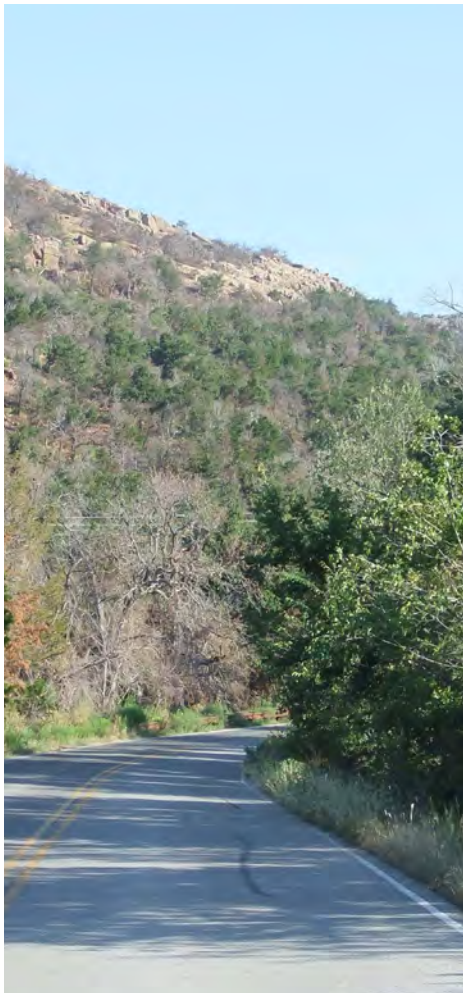
ture, materials, slopes, drainage, and soils provides valuable information for a next phase to scope options for schematic design. Review and further research of the potential resource concerns provides information relevant to conducting NEPA assessment once the concepts have advanced through further scoping.

The trail design options will undergo further refinement as the Refuge clarifies -- through internal discussion informed with community input -- what level of potential effect on wildlife and habitat is allowable, what the target audiences' needs are for a trail along the Meers Road corridor, how many people or what size groups the trail should be sized to accommodate, how the potential trail will meet accessibility guidelines – if at all, and what resources the Refuge can draw upon to help maintain its investment in non-motorized transportation facilities.

Community outreach for the trails has been on-going through the CCP process and Transportation Scholar efforts. The Refuge's strong community partners have been instrumental in gathering people and input. These partners include:

- Fort Sill Army Base.
- Medicine Park Museum of Natural Science.
- Town of Medicine Park.
- City of Lawton Parks and Recreation Department.
- Fit Kids of Southwest Oklahoma.
- Friends of the Wichitas.
- Lawton Public Schools.

Results from this outreach process provide data to help the Refuge consider potential options and project purpose. When the time comes, this information will facilitate project scoping, schematic design development, and alternatives shaping.



References

Habitat Management Plan, Surface Water and Drainage Patterns Exhibit 12, Wichita Mountains Wildlife Refuge, U.S. Fish and Wildlife Service (August 1985).

Soil Survey: Comanche County, Oklahoma (August 1967).

The Trail Inventory of Wichita Mountains NWR, Central Federal Lands Highway Division (April 2012).

The Road Inventory of Wichita Mountains National Wildlife Refuge, Central Federal Lands Highway Division (January 2005).

U.S. Fish and Wildlife Service Region 2 Long Range Transportation Plan. Data Collection Report. Central Federal Lands Highway Division (June 2012).

Wichita Mountains Wildlife Refuge Comprehensive Conservation Plan 2012, U.S. Fish and Wildlife Service (November 2012).

Notes

[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, Indiahoma, OK.

[2] *Alternative Transportation Study: Wichita Mountains Wildlife Refuge*. Prepared by John A. Volpe National Transportation Systems Center, U.S. Department of Transportation. August 2010. Accessed 6/13/12 from www.triptac.org.

[3] *U.S. Fish and Wildlife Service Region 2 Long Range Transportation Plan*. Data Collection Report. Central Federal Lands Highway Division. June 2012.

[4] *The Road Inventory of Wichita Mts National Wildlife Refuge, Indiahoma, OK*. Federal Highway Administration, Central Federal Lands Highway Division. December 2009.

[5] *The Trail Inventory of Wichita Mountains NWR*, April 2012, Central Federal Lands Highway Division.

Appendix A: Soil Types Details

According to *Soil Survey: Comanche County, Oklahoma* (August 1967), the Meers Road corridor includes five soil types: granite cobbly land, rock land, stony rock land, Lawton loam 1-3% slopes, and Lawton loam 3-5% slopes.

Granite cobbly land (Gc) consists of rolling to steep areas on dissected hills and ridges on uplands. The slope is 5 to 40 percent. Granite cobblestones make up 25 to 70 percent of each area. Thee rest consists of deep, brown to reddish-brown loams to clay loams that contain an appreciable amount of gravel. There are a few scattered boulders. Included in mapping were spots of alluvial soils, less than 200 feet wide, and small areas where the depth to bedrock is 1 to 4 feet. It is excessively drained and has excessive runoff. Permeability is moderate. The vegetation consists of mid and tall grasses. Scrub oak is common in some areas (9).

Rock land (Ro) is 35 to 90 percent Granite outcrop and 10 to 50 percent gently sloping to moderately steep soils that are very shallow over granite bedrock. Included in mapping were deeper soils, which make up 10 to 12 percent of the acreage of this land type. Rock land is associated with Granite outcrop and Stony rock land. It has a smaller percentage of rock outcrops than Granite outcrop and a smaller percentage of deep stony soils than Stony rocky land. Rock land is suitable for use as range and as a wildlife habitat. The vegetation is a sparse cover of short and mid grasses. Control of grazing and protection from fire are the main management requirements (14).

Stony rock land (St) is hilly to very steep. It is 15 to 50 percent Granite outcrop, 10 to 30 percent very shallow soils over granite, and 15 to 70 percent deep stony soils. The slope range is 15 to 50 percent. Stony rock land is associated with the mapping units Granite outcrop and Rock land. It has a smaller percentage of outcrops than Granite outcrop and a larger percentage of deep stony soils than Rock land. The vegetation is sparse cover of short and mid grasses on the very shallow soils and tall grasses and scrub oak on the deep stony soils (14).

Lawton loam, 1 to 3 percent slopes (LaB). Most of this soil is cultivated; the rest is used as range [the latter being the case at the Refuge]. All crops grown in the area are suitable, but small grain and cotton are the main crops. All crops respond well to fertilization and good management. Water erosion is a moderate hazard. Terraces and a soil-conserving cropping system are needed (10).

Lawton loam, 3 to 5 percent slopes (LaC) This soil is on uplands, along former drainageways in the western part of the county. It has a 6- to 12-inch surface layer. It is suitable for cultivation, but most of it is in pasture. Management should include terraces, contour farming, or similar practices that conserve moisture and protect the soil from erosion (10).

Wichita Mountains Wildlife Refuge

Outreach Summary

January 23, 2013

Kyle Rogers/Fit Kids Coalition

Kyle Rogers/Fit Kids Coalition

Prepared for:

U.S. Fish and Wildlife Service
Wichita Mountains Wildlife Refuge

Paul S. Sarbanes Transit in the Parks
Technical Assistance Center

Prepared by:

Heidi Beierle
Public Lands Transportation Scholar
Wichita Mountains Wildlife Refuge

Kyle Rogers/Fit Kids Coalition

Table of Contents

Executive Summary

Public outreach to develop bicycling, walking, and accessible trails at Wichita Mountains Wildlife Refuge occurred principally during late October through mid-November 2012. Outreach activities introduced target trail audiences to planned trails and collected input on trail design preferences. Target trail audiences include families with children, youth, people with physical disabilities, active seniors/retirees, and casual recreationalists.

Findings from the outreach process indicate that target trail users prefer paths separated from motor vehicle traffic by a barrier or by a distance from the road 10 feet or greater. Outreach participants most prefer natural or asphalt surfacing, and their preferred trail widths vary depending on activity. Overall, natural surface walking trails 6-feet wide or narrower and shared use asphalt trails approximately 10-feet wide would meet most target audiences' needs for non-motorized transportation options on the Refuge.

In addition to the trails themselves, target audiences seek a variety of support facilities or services to enhance their experiences on the Refuge. Safety is a key factor in target audiences' interest in using trails. Visitors want to be safe from motor vehicles and large mammals. They also need to know how or where to recruit help for emergencies. Trailhead facilities and services such as restrooms, information, shade, and water all enhance the experience. Presence of these facilities could make the difference for visitors choosing to stop at one location over another without them. Target visitors would like their wildlife-dependent recreational activities to have a social dimension, and trails should have enough room for visitors to recreate side by side. Variety makes for a dynamic, engaging environment rich with opportunity to explore and discover. Trail experiences that change and include different habitat types encourage visitors to rediscover a trail during every visit. Nature play areas located along trails enhance trail safety and provide places for children and youth to discover the Refuge's treasures.

While youth and people who use wheelchairs prefer somewhat different facilities or services than all outreach participants, these other interests are reflected in the overall summary findings. In short, facilities that provide varied experiences and that are designed with youth and people who use wheelchairs in mind will meet the public's expectation of safe and enjoyable trail experiences that provide opportunities to engage in wildlife-dependent recreation.

Introduction

The 2012 Public Lands Transportation Scholar collected input from Wichita Mountains Wildlife Refuge staff, project partners, and the public to develop three accessible trails for biking and walking on the east side of Refuge. Early input helped shape the Scholar's understanding of the project's assets, needs, opportunities, and constraints. The substance of this early understanding assisted the Scholar in developing assessment criteria to facilitate decision-making among the different trail design options.

With three categories of design elements as the building blocks for trail design options, the Scholar conducted a series of targeted public outreach meetings culminating in a well-attended public open house in Lawton on November 14, 2012. These outreach meetings and the open house provided an opportunity for the public to express their preferences for trail design across different kinds of activities: bicycling, walking, running, wheelchair use, and pushing strollers.

The results of the public outreach process follow. The questions asked during the outreach process derive from the early input process with Refuge staff, project partners, and the public and subsequent development of the assessment criteria.

The Outreach Summary is intended as a tool to inform Refuge staff, project advisors, and community partners about different trail audience preferences for trail design. This summary, likewise, provides documentation of the outreach process for future assessments.

Methods

Early Input Process

The early input process consisted of informal conversations with individuals or small groups, two organized stakeholder meetings, and regular attendance and outreach during Fit Kids monthly meetings and Friends of the Wichitas board meetings. Additional informal outreach occurred during field research by the Scholar and her encounters with Refuge visitors during this activity.

Refuge

Early input from Refuge staff involved individual conversation with department managers and some departmental staff and include: Biology, Law Enforcement, Maintenance, Visitor Services, Fire, and Management. Conversations with Biology, Maintenance, and Law Enforcement also included meeting notes. Other input was integrated in Refuge work products, such as a project poster developed for the Comprehensive Conservation Plan (CCP) public open house (August 13 & 14, 2012), and categorized visually in different project maps.

The questions asked of Refuge staff followed no script but were intended to orient the Scholar to how the department interfaces with transportation projects and what the major concerns or issues might be related to transportation facilities or developing trails.

Stakeholder Meetings

The Refuge hosted two stakeholder meetings with community members, one on July 31, 2012 in Medicine Park, OK, titled Bicycle and Pedestrian Interconnectivity, and the other on August 2, 2012 in Apache, OK, titled Byway Design and Community Opportunity. Both meetings asked participants to identify community and/or regional assets, needs, opportunities, and constraints. Both meetings also provided opportunity for participants to rate their preferences for byway signage and byway gateways. Additionally, the meeting in Medicine Park asked participants to identify facility users for roads and trails on the Refuge's east side and on adjoining property.

Invitations for these stakeholder meetings were distributed through phone calls, email, and mail. A list of byway participants served as the foundational list of people to contact. After initial contact, some of the stakeholders suggested other people who should be invited to the meetings.

Public Outreach

The Public Outreach process consisted of an October and November 2012 series of targeted outreach meetings to groups who represent the target audiences for the Refuge trails project: families with children, youth, people who use wheel chairs or other mobility aids, active seniors/retirees, and casual recreationalists. These meetings culminated in a mid-November public open house where all interested parties could provide input on the trails planning process.

The outreach meetings and public open house were announced through existing partner channels and through newspaper stories. Fit Kids coalition members were invited to co-host outreach meetings with their constituents. A poster and brief presentation at the October Fit Kids meeting provided members with information about the outreach goals and process. Additional outreach to coalition members occurred through email and phone communications. Lawton Public Schools came forward following the October Fit Kids meeting to co-host the public open house. An announcement at the November Fit Kids meeting informed coalition members of the upcoming open house, encouraging them and their constituents to attend. Select project partners who would provide additional information at the open house were contacted via phone, email, and in person and were encouraged to announce the open house among their community contacts and stakeholders. Lawton Public Schools recruited participants internally to attend the open house. A newspaper story in the *Lawton Constitution* announced the

event on Sunday, November 11, 2012. A story in the *Constitution* reporting on the open house published Thursday, November 15, 2012 attracted input from a property owner who had not previously heard about the open house or trails planning activity.

The outreach meetings, called "like-storms," provided target trail audiences with an opportunity to share their individual preferences (or "likes) for the trail design elements. Both the like-storms and the open house presented participants with an overview of the planned trails and described the different design elements. Participants responded to questions about what they like to do at the Refuge, what's important to them when planning a trip to a place like the Refuge, and what they think would be fun to do while visiting the Refuge. Following the design elements description, participants filled out an input sheet to indicate their personal preferences for design elements – surfacing, trail width, and shared use or separation from motor vehicles – for different activities: bicycling, walking, running, wheelchairing or mobility aids, and pushing strollers (the like-storm input sheet is included as Appendix A). The outreach meeting with Friends of the Wichitas involved a different format than subsequent like-storms, and attendees at that outreach meeting did not fill out an input sheet.

Responses from the input sheets were recorded in spreadsheets. A "1" was used for a positive response. In some instances, respondents marked more than one design element per category. For multiple replies, a "1" was used for all positive responses. Some respondents ranked dual preferences. In this case, "1" indicates primary preference, and ".5" indicates secondary preference.

Responses were aggregated based on target audience types: families, youth, people who use wheelchairs or other mobility aids, and the community at large – a mix of parents, children, casual recreationalists, community leaders, and active recreation enthusiasts. Each audience type data collection was reviewed to assess how well participants understood the concepts. While there were some questionable responses, the data collections as a whole reflected understanding audiences.

All collections were further aggregated into a single set of preferences for each activity type. See Table 2 for this single set of aggregated preferences.

Following the November public open house and initial analysis of the outreach results, targeted outreach to people who use wheelchairs and other mobility aids supplemented the data collection effort. This outreach, conducted with wheelchair, scooter, and cane users in Portland, Oregon, confirmed that the able-bodied respondents perceive trail design preferences for people who use wheelchairs differently than people who use mobility aids do. While the sample from people who use mobility aids is considerably smaller than the other samples, the results are recorded as an independent group to clarify this target audience's preferences. This data set is also aggregated in the complete data collection.

Data

Data gathered during the outreach process includes a project partners list, the number of attendees at outreach events, and design element preferences for different target audiences.

Project Partners

- Fort Sill Army Base
- Medicine Park Museum of Natural Science
- Town of Medicine Park
- City of Lawton Parks and Recreation Department
- Fit Kids of Southwest Oklahoma
- Friends of the Wichitas
- Lawton Public Schools

Table 1: Outreach Events

Event	Date	Group/Organization	# Attendees
Stakeholder Meeting	July 31, 2012	Medicine Park – Interconnectivity	27
Stakeholder Meeting	August 2, 2012	Apache – Byway Design	13
Outreach Meeting	October 20, 2012	Friends of the Wichitas	6
Like-storm	October 24, 2012	Run Hers	13
Like-storm	October 29, 2012	Lawton Family YMCA	8
Like-storm	October 31, 2012	Lawton Public Schools PE teachers	17
Like-storm	November 5, 2012	Park Lane Elementary 4th and 5th grade students	64
Like-storm	November 5, 2012	Town of Cache	7
Like-storm	November 6, 2012	Lawton Area Girl Scouts Leaders	21
Refuge Trails Open House	November 14, 2012	Public at large	147
Like-storm*	December 15, 2012	Mobility advocates	6
Total Event Attendees			**329**

* Outreach with mobility advocates occurred as a series of one- and two-person meetings between December 10, 2012 and January 23, 2012 in Portland, Oregon.

Design Element Preferences

The following charts and tables summarize responses to the input sheets received during the like-storms and the open house.

Figure 1 reflects an aggregated total preference for shared use or separation from motor vehicle traffic without distinguishing among different activities. All activities rated similarly in the proportion of preference they received across activities. Table 2 shows the differences among activities in this category, and discussion of these results occurs in the "Analysis" section under "Shared Use and Separation."

Figure 2 and 3 reflect data aggregated for all activities for surfacing type and trail width. In these figures, preferences for wheelchair use reflect all responses for wheelchair use as represented in Table 2.

Figure 2: Trail Surfacing Preferences

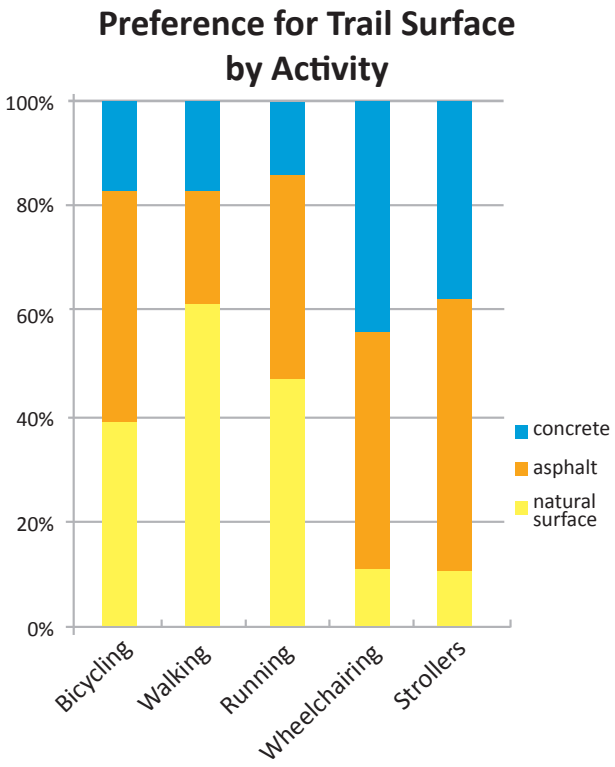


Figure 1: Averaged Preference for Shared Use or Separation from Motor Vehicles for All Activities

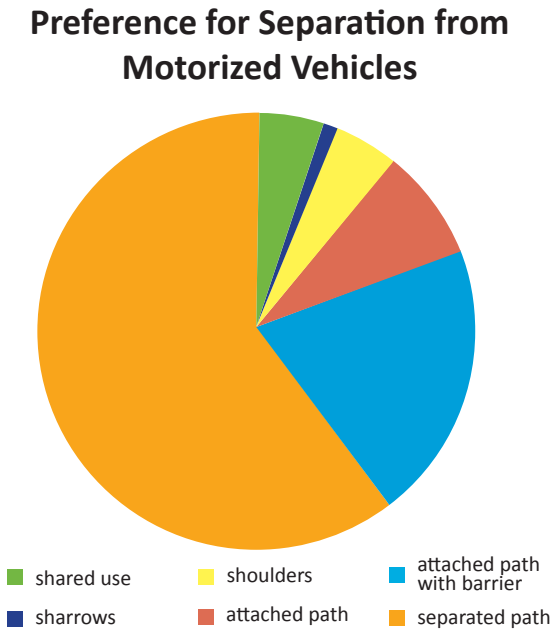


Figure 3: Trail Width Preferences

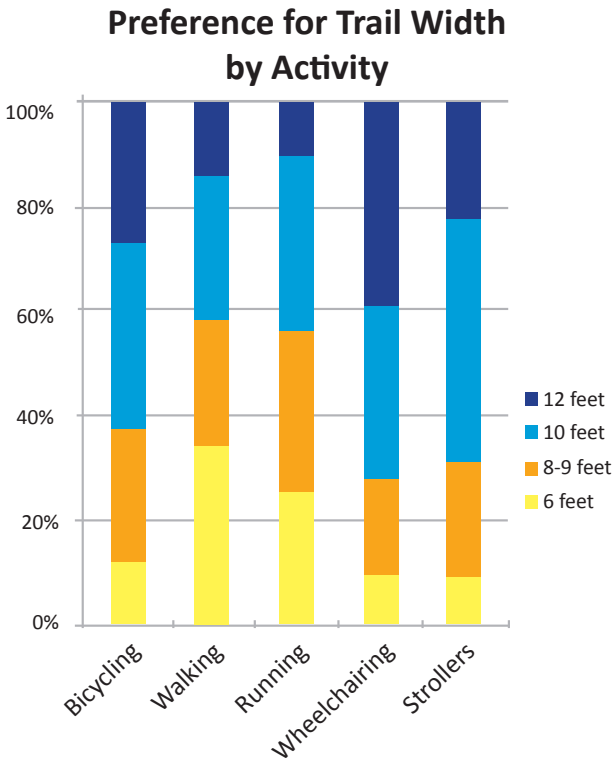


Table 2 summarizes all preferences for trail design elements. Total respondent numbers vary among activity. Not all respondents indicated a preference for every activity, and the 64 youth respondents were not asked to indicate a preference for pushing strollers. The following values indicate total respondents for: bicycling=215; walking=223; running=211; wheelchairs=178; strollers=126.

Table 2: Comprehensive Outreach Preference Summary

	trail design options **surfacing**	natural surface	asphalt	concrete	**trail widths**	6 feet	8-9 feet	10 feet	12 feet	**shared use & separation**	shared use	sharrows	shoulders	attached path	attached path with barrier	separated path
Bicycling																
TOTAL		86	95.5	38		26	55	77	58		13	5	21	29	53.5	110
		40%	44%	18%		12%	25%	36%	27%		6%	2%	10%	13%	25%	51%
Walking																
TOTAL		141	49.5	39		77	55	62	31		14	0	14	23	43.5	135
		63%	22%	17%		34%	25%	28%	14%		6%	0%	6%	10%	19%	60%
Running																
TOTAL		103	84	31		53	64	69	21		13	4	11	21.5	41.5	124
		49%	40%	15%		25%	30%	33%	10%		6%	2%	5%	10%	20%	59%
Using Wheelchairs/Mobility Aids																
TOTAL		20	80	79		17	32	58	68		8	2	4	9	41	116
		11%	45%	44%		10%	18%	33%	38%		4%	1%	2%	5%	23%	65%
Pushing Strollers																
TOTAL		14	66	49		11	27	56	27		4	0	1	5	23	92
		11%	52%	39%		9%	21%	44%	21%		3%	0%	1%	4%	18%	73%

Tables 3 and 4 collect results from youth and from people who use wheelchairs. In Table 3, 64 youth responded to the input sheet. In Table 4, five adults responded to the input sheet.

Table 3: Youth Preferences

trail design options	surfacing: natural surface	asphalt	concrete	trail widths: 6 feet	8-9 feet	10 feet	12 feet	shared use & separation: shared use	sharrows	shoulders	attached path	attached path with barrier	separated path
Bicycling													
TOTAL	34	6	22	5	11	17	29	5	2	6	2	16	32
	55%	10%	35%	8%	18%	27%	47%	8%	3%	10%	3%	26%	52%
Walking													
TOTAL	31	6	27	17	15	13	19	8	0	7	10	14	25
	48%	9%	42%	27%	23%	20%	30%	13%	0%	11%	16%	22%	39%
Running													
TOTAL	32	16	13	12	15	24	10	7	4	5	7	14	26
	52%	26%	21%	19%	24%	39%	16%	11%	6%	8%	11%	23%	42%
Using Wheelchairs/Mobility Aids													
TOTAL	11	23	25.5	3	6	15	35	5	1	3	3	18	29
	19%	39%	43%	5%	10%	25%	59%	8%	2%	5%	5%	31%	49%

Table 4: Preferences from People Who Use Wheelchairs

trail design options	surfacing: natural surface	asphalt	concrete	trail widths: 6 feet	8-9 feet	10 feet	12 feet	shared use & separation: shared use	sharrows	shoulders	attached path	attached path with barrier	separated path
Using Wheelchairs/Mobility Aids													
TOTAL	3	3	1	4	1	1	2	0	0	0	2	5	4
	60%	60%	20%	80%	20%	20%	40%	0%	0%	0%	40%	100%	80%

Analysis

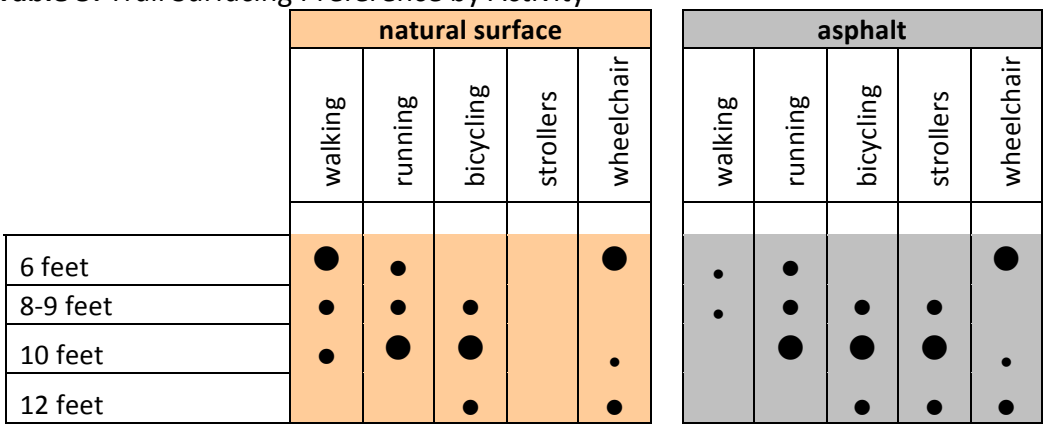
Responses indicate some variation for surfacing type and trail width among different activities, whereas the general pattern for shared use or separation from motor vehicle traffic remains fairly consistent across all activities. Generally, public input reflects preference for social and intimate trail experiences separated from motor vehicle traffic.

Surfacing

A majority of respondents prefer a natural surface trail for walking (63%) and running (49%). The target audiences present a clear interest in mountain biking opportunities with 40% of respondents preferring to bike on a natural surface trail. Asphalt proves a preferable surfacing material for respondents, and 40% or more respondents prefer this surfacing type for all activities except walking. Concrete rates highest for wheelchairing and pushing strollers (44% and 39% respectively) although in no case does concrete gain preference over asphalt or natural surface.

In Table 5, below, large dots indicate outreach participants' strongest preference for surfacing type by activity. The dots get smaller as preference strength diminishes.

Table 5: Trail Surfacing Preference by Activity



Note: Wheelchair preference is based on input from people who use wheelchairs.

These preferences indicate some overlap in surfacing type by activity. Of note is the strong preference for narrow, natural surface walking trails and wide asphalt trails for pushing strollers. Shared preference among running, bicycling, and wheelchair use suggests that visitors would be happy using either or both surfacing types and that most consideration for surfacing should be given to areas where the Refuge would like to attract walkers and people pushing strollers.

Trail Width

A majority of respondents prefer a narrower trail for walking with 34% preferring a 6-foot wide trail. While respondents did not rate running as highly as walking for 6-foot width, the activity still captured primary preference from a quarter of respondents. Respondents were not asked to rank trail widths narrower than 6 feet because 6 feet is the minimum width for maintenance vehicles to access the trail. However, it might be worth considering that any respondent who indicated a 6-foot wide trail might potentially be interested in a trail narrower than 6 feet.

Standard shared use paths accommodate a mix of bicycle and pedestrian traffic within a 10-foot wide trail. Respondents ranked 10-foot wide trails as one of four width options. For biking (36%), wheelchairing (33%), and pushing strollers (44%), this standard 10-foot wide shared use trail satisfies respondents' preference for trail width.

Respondents had an opportunity to rate a trail width wider than the 10-foot standard. Wheelchairing (38%) received the highest preference for a 12-foot wide option although the absence of actual wheelchair users in the sample could suggest that preference for a wide trail might be perceived rather than actual.

Respondents also had two options to rate trail widths narrower than the 10-foot standard – one at 6 feet and the other at 8 or 9 feet. One respondent did note preference for a 1-foot wide trail for biking, walking, and running. Regardless of the actual foot-distance of the trail, responses for a 6-foot wide trail suggest desire for an intimate experience with the surrounding environment. Walking and running both garnered a majority of responses for trails narrower than 10 feet – 59% and 55% respectively. At 37%, bicycling came in fairly positive for support of narrower trails, again indicating a preference for mountain biking options.

In all, more preference for trails narrower than the 10-foot standard exists, and respondents demonstrate less preference for trails wider than the 10-foot standard. This preference pattern can be seen in Table 6 with strongest preference for 10-foot wide trails.

Table 6: Trail Width Preference by Activity

	walking	running	bicycling	strollers	wheelchair
6' natural	●	●			●
6' asphalt	•	●			●
8-9' natural	●	●			
8-9' asphalt	•	●	●	●	
10' natural	●	●	●		•
10' asphalt		●	●	●	•
12' natural			●		●
12' asphalt			●	●	●

Note: Wheelchair preference is based on input from people who use wheelchairs.

Shared Use and Separation

A definite majority of respondents prefer trail facilities separated from motor-vehicle traffic for all activities. Out of six options for degree of separation from motor vehicles, pushing strollers (73%) rated highest and bicycling (51%) rated lowest. By including the option for attached path with barrier, three quarters of all respondents prefer this level of separation from motor vehicle traffic.

While bicycling rated lowest for "separated path," bicycling on this type of facility still received over half the total responses. For the target audiences, bicycling on a path separated from motor vehicle traffic is clearly the facility of choice. For all other categories of shared use and separation, bicycling received the most responses over any other activity (except for "shared use" where it shares preference with walking and running). The higher rating for bicycling across facilities suggests that people may be more inclined to perceive bicycling as a form of transportation – something that has a place on the road – or that they may perceive some conflicts mixing bicycling with other activities.

Two respondents (and perhaps some that indicated "shared use" as their preference) expressed feeling more safe on a separated path but conflicted in that preference when weighing the effects of a separate path to wildlife and habitat. One respondent at the open house addressed an interest in preserving the land for wildlife and felt strongly that no facilities for people should be added to the Refuge. His original inclination was toward a separated path for all activities. Another open house respondent stressed that a separated path would be "ideal," but he expressed concern that a separated path would adversely affect habitat for wildlife.

"Sharrows" elicited a low response rate. One like-storm comment indicated that people are unfamiliar with sharrows as a traffic control device. Respondents' unfamiliarity with this design option may have contributed to the low response rate it received. Sharrows may have ranked more highly among specialized recreationalists, such as road cyclists, who are more likely to have encountered or noticed sharrows than the casual recreationalists who were asked about their preference for trails.

Youth

Park Lane Elementary 4th and 5th grade students indicated their preferences for trail design options after a brief presentation in a structured classroom environment. Students independently filled out the input sheet. Responses were checked for task comprehension, and while some students demonstrate confusion in their responses, the full collection indicates that they understood the exercise.

Youth indicate a split preference for natural surface (slightly more preferred) and concrete, generally prefer wider trails, and definitely prefer paths separated from motor vehicle traffic by distance or barrier.

The students appear to draw on their personal experiences in responding to the input sheet where 'natural surface' means 'dirt road' or 'hiking trail,' 'asphalt' means 'road,' and 'concrete' means 'sidewalk.' The Park Lane Elementary neighborhood abuts the Lawton city boundary and exhibits suburban residential development patterns – few interconnected streets and few access points to the major roads. Neighborhood streets allow on-street parking and have no sidewalks.

Surfacing

Natural surfacing emerged as a clear preference for youth in all activities except wheelchair use (at 19%, students rated natural surface for wheelchairs substantially higher than other able-bodied input groups). Students also rated concrete highly, but not as high as natural surface. One student commented that concrete can break and have uneven areas, leading to tripping and tumbles.

Trail Width

Mathematical concepts were used to explain differences in trail width with one person needing 3' of trail width. 'Wiggle room' explained why there is an extra foot of trail width in the 10' standard that accommodates one person traveling in each direction and room to pass for a third. While students appeared to have some challenges providing input on trail width, their overall responses do demonstrate a pattern for more space rather than less on the trails.

Youth appear to consider trails social environments, places where they play and appreciate wildlife with other kids or family members. They prefer wider trails to accommodate the group nature of trail activities.

Bicycling (47%) and wheelchairing (59%) rated highest for 12'-wide trails. Youth may consider that people using wheelchairs need extra space on the trail for safety. Preference for a wider trail for bicycling could indicate more perceived need for wiggle room, especially if the students envisioned many kids riding bikes on a trail at the same time.

Walking received fairly even response distribution among all trail widths. Lack of a clear preference for walking trail width suggests that trail experiences that provide width varieties would likely be most engaging to young audiences. For example, a narrow, intimate trail coursing through trees or an edge environment that widened into a nature play area at an edge or open area would satisfy youth needs for movement, activity, diverse experiences, and discovery.

Running presents as a hybrid of student responses for bicycling and walking. Students may equate running speeds with a greater need for safety provided by a wider trail (39%

for 10’ and 16% for 12’). Yet, on feet rather than wheels, youth may feel closer to the natural environment. A narrower trail could provide opportunities to see lizards, butterflies, snakes, spiders, birds or other small wildlife (24% for 8-9’ and 19% for 6’).

Shared Use and Separation

Students rated paths separated by distance or a barrier as their preference for all activities. Bicycling received the highest rating for a separated path (52%) further supporting a wiggle room safety buffer. These same respondents might also be interested in mountain biking (55% prefer bicycling on a natural surface). Wheelchairing rated second highest for a path separated from motorized traffic (49%), reinforcing the concern for safety students appear to express by preferring wide trails for wheelchairs.

Some students indicated a preference for facilities on the road, and this interest can be interpreted in several ways. First, a preference for road facilities could indicate misunderstanding on the students’ part about what these shared facilities are. Second, students could be drawing upon their experiences to formulate a preference. Facilities around the school and in most of the Lawton area have no designated space for bicycling and walking, making the street a probable place where youth might walk, run, or ride a bike. In relatively quiet suburban or rural neighborhoods, the street (or dirt road) could be a likely activity space. Third, students might not hold the same safety concerns as their parents or guardians. For these students, the street could be an interesting, action-filled space where they want to be.

People Using Wheelchairs

Ratings for trail design elements significantly differ between actual wheelchair users and able-bodied respondents’ perceptions of what wheelchair users prefer. While the sample size for actual wheelchair users is much smaller than the sample size for non-wheelchair users, the focus of this analysis will only cover responses from actual wheelchair users. Wheelchair users in Portland, Oregon, were asked their preferences for trail design and recreational opportunities in a place like the Refuge.

Respondents prefer narrow, natural surface trails separated from motor vehicle traffic by, at minimum, a barrier or distance as appropriate.

Respondents reiterated that people who use wheelchairs want the same kinds of experiences as everyone else. Different types of facilities should not be planned for wheelchairs, but facilities that are already being planned should include accommodation for people with physical disabilities. Like the overall preference for walking facilities, people who use wheelchairs entirely support natural surfacing and a 6’ wide trail. One respondent indicated that a 5’ wide trail would be sufficient for wheelchair use. Natural surface trails can be more difficult for people who use manual wheelchairs than motorized wheelchairs. A harder surface, such as asphalt, can make the trail easier to

use, and resting areas, regardless of trail surfacing, can also provide needed relief for people who have to work harder to use a trail. Providing clear descriptions of trail facilities and difficulty at trailheads enhances accessibility far more than design elements alone.

Wheelchair users also prefer paths separated from motor vehicle traffic by a barrier or distance. For safety reasons, mixing wheelchairs with motor vehicle traffic should not be considered. Only when motor vehicle traffic travels a maximum of 10 m.p.h. may mixing the two modes be considered.

Findings

Trails developed on the Refuge for families with children, youth, casual recreationalists, people who use wheelchairs, and active seniors/retirees should meet these audiences' safety needs while providing diverse natural and social spaces for them to engage Refuge resources.

Trails on the Refuge that meet the target audiences' needs should be separated from motor vehicle traffic. In locations where the Refuge cannot create a separate trail, providing a designated space for non-motorized transportation on the side of the road with a separating barrier would be most suitable. Where occasional motorized traffic may mix with non-motorized use, motor vehicle design speed should be 10 m.p.h. or less.

As much as is feasible, trails should include natural surfacing. In some areas, trail surfacing could include a mix of surfacing options, such as a 5'-wide asphalt surface with a 2'-wide natural surface area adjacent. Surfacing materials should be either natural soils (potentially with soil stabilizer), compacted gravel/crushed rock, or asphalt. Surfacing color should blend into the surrounding environment regardless of surface type.

Trail widths will vary depending on location, visitation, and function. Trails likely to experience higher visitation, especially by children or slow-moving adults, should have a wider footprint to allow people to walk abreast, to accommodate mobility aids, and to provide visitors with passing room around one another. A 6'-wide trail may sufficiently accommodate this high visitation scenario; however, if bicycles mix with this slow pedestrian traffic, a wider trail would be needed.

Trail design speed should be low for the target audiences but give consideration to overall trail functionality. For example, spur trails, areas with interpretive and/or nature play elements, or areas that experience high visitation from youth or people with disabilities require slower design speeds (no faster than 13-14 m.p.h.) than trail segments that simply connect people from one destination to another (18 m.p.h.).

Varied trail experiences should be included to maintain interest, draw visitors along the trail, encourage observation, and provide an array of animal, plant, and cultural interpretation and education opportunities. These varied trail experiences could include variable trail widths, particularly in places with nature play areas, and trail siting that follows habitat edges and that makes use of natural gateways.

Outreach participants identified several elements that would enhance visits to a place like the Refuge: restrooms, safety, parking, information, signage, water, shade, and nature/wildlife viewing opportunities.

- Target trail audiences identified restrooms as the most important amenity when planning a visit. Attractive trailheads should include accessible restrooms, particularly for locations with high use from children or seniors.
- Several participants identified safety as a highly important consideration. Safety includes places to use non-motorized modes without motor vehicle traffic/conflict, emergency contact services (infrastructure or responders), and some kind of protection from animals.
- Many participants expressed interest in signage and information that helped them find trailheads, trails, and destinations and that indicate trail difficulty and points of interest, interpretive information (plants, animals, history, and structures), distance to services, and safety information – such as what to do when you encounter a bison on the trail or where to contact someone in case of an emergency.
- Important to note, target audiences expressed interest in diverse nature and wildlife viewing opportunities. These opportunities include small vertebrates and invertebrates, plants and wildflowers, and geology in addition to large mammals. Children, in particular, enjoy plants, butterflies, snakes, lizards, fish, tarantulas, skipping rocks, and climbing trees.

Bicycling

Facilities on the Refuge should include options for the target audiences to ride bicycles on paved paths and natural surface trails. The target audiences seek a trail environment that provides enough room to socialize (ride abreast), appreciate the natural environment, and accommodate a need for wiggle room. These audiences do not seek single-track mountain bike facilities nor road shoulders; however, they do seek interesting and engaging trails that lead to destinations and wildlife viewing opportunities. Providing bicycle parking at destination areas or nature play sites encourages visitors to engage Refuge resources and organizes the trail space to enhance safety.

Walking

Target trail audiences seek walking environments similar to the hiking trails they might find on the Refuge's west side. They prefer natural surface trails 6-feet wide or narrower situated away from roads. Like the bicycle riders, walkers appreciate trails that provide enough room to socialize and that allow them to engage the natural environment. They seek interesting and engaging trails with interpretation that lead to destinations, discovery, and wildlife viewing opportunities.

Running

Facilities for running, like bicycling, should include natural surface and paved options. Target audiences expressed interest in narrow, natural surface trails suitable for trail running. These trails, like the walking trails, could be 6-feet wide or narrower and might include singletrack trails or narrow, natural surface running trails adjacent to paved paths. Target audiences who enjoy running would equally use paved paths and would like trails wide enough to run abreast or in social groups (not wider than 10 feet). Unlike slower walking and interpretive trails, running provides visitors with a kinesthetic appreciation of the environment and opportunities to observe wildlife. Trails that traverse interesting edges and that include terrain variation enhance the in-motion experience of Refuge resources. Running facilities should link to other trails and provide a variety of distance opportunities. Runners are less likely to seek destinations, nature play, or out-and-back trails but are more likely to use loop or interconnected trails.

Using Wheelchairs or Mobility Aids

People who use wheelchairs or mobility aids emphasize that trail facilities should be designed for the planned experience – such as walking and nature play – and adapted for wheelchairs and other types of mobility aids. Natural surface or asphalt trails would be suitable trail surfaces although both need to be maintained to provide quality accessible experiences and access. Variable width trails from 5' wide to 12' wide would provide a full range of trail experience types. A 5'-wide natural surface trail would provide the adaptive equivalent of a narrow hiking trail, like those found on the Refuge's west side. A 12'-wide trail would allow people using wheelchairs or scooters to stroll abreast and enjoy the natural environment in a social context. Pullout areas along the trail provide opportunities for people with physical disabilities to rest, and benches should be provided in these places. In areas with significant drop offs or ditches next to the trail, raised edges or railings will provide additional safety.

In all cases, providing descriptive signage at trailheads and access points will allow people with special mobility needs to make informed decisions about their ability to use the trail. This information element, more so than any design element, will make trails most accessible to people with physical disabilities.

Pushing Strollers

Target audiences in this category have high concern for safety and decided interest in smooth surfacing. Trails of asphalt or concrete that provide space for trail users to walk or run abreast provide the best options for this audience. Ten-foot wide trails would be most satisfactory for people pushing strollers; however, some variation in trail width between 8 and 12 feet could allow for a more interesting, engaging, and varied experience while providing some flexibility to site a wider trail on the landscape. Particularly if strollers would be mixed with people riding bicycles, a wider trail provides flexibility for bicyclists and runners to pass safely. Nature play areas would be desired spaces on stroller trails, providing physical activity and discovery opportunities for children in the strollers. Trails that include interpretation and that lead to destinations would provide observation and education opportunities.

Conclusion

With the extensive public outreach conducted for trails planning on the Refuge, a solid understanding exists of target audience trail preferences for surfacing, width, and separation from motor vehicles. In addition to these basic design elements, target audiences expressed interest in trails with slow design speeds, opportunities to engage Refuge resources, space on trails for social experiences, and attention to the Refuge's uniqueness and ecological setting.

Outreach participants represent an array of perspectives from Lawton and communities surrounding the Refuge. Input on accessible facilities comes from mobility advocates located in Portland, Oregon. Findings, consequently, can be applied as guidance for trails that develop in the region for the target audiences. Application of these findings may not apply optimally to urban trails because participants, who represent non-specialized recreationalists, were asked to identify their preferences for trails in a place like the Refuge. Specialized recreationalists, also, may present different needs for trail design.

Appendix A: Like-storm input sheet

The attached input sheet was modified slightly for different audiences, but remained essentially the same in its structure and instructions for all audiences.

Like-storming, design options for Refuge east side trails

Lawton Area Girl Scouts Leaders

November 6, 2012

We're interested in where your likes (👍) are. Put a LARGE DOT in the 👍 column for the surfacing, width, and separation you would most like to see for each activity (listed across the top -- biking, walking, running, wheel chairing, and pushing strollers). If the activity does not apply to you, leave that column blank. Please write any comments about the trails or the design options on this sheet.

ACTIVITIES	BIKING	WALKING	RUNNING	WHEEL CHAIRING MOBILITY AIDS	PUSHING STROLLERS
👍					
DESIGN OPTIONS					
Trail Surfacing					
Natural Surface					
Asphalt					
Concrete					
Trail Widths					
6 feet					
8 feet					
10 feet					
12 feet					
Shared Road Use & Separation					
Shared Use					
Sharrows					
Shoulders					
Attached Path					
Attached Path with Barrier					
Separated Path					

Appendix C: Stacked Loop Trail System

A stacked loop trail system acknowledges that trail systems attract recreationalists interested in different types of activities and who present a range of skill levels. No single trail design can accommodate this range of activities or skills. Instead, well-designed trails that serve an array of trail user skills and needs assemble a variety of trail experiences in an area, creating an interconnected system.

Figure 1: Stacked Loop Trail System Concept Diagram

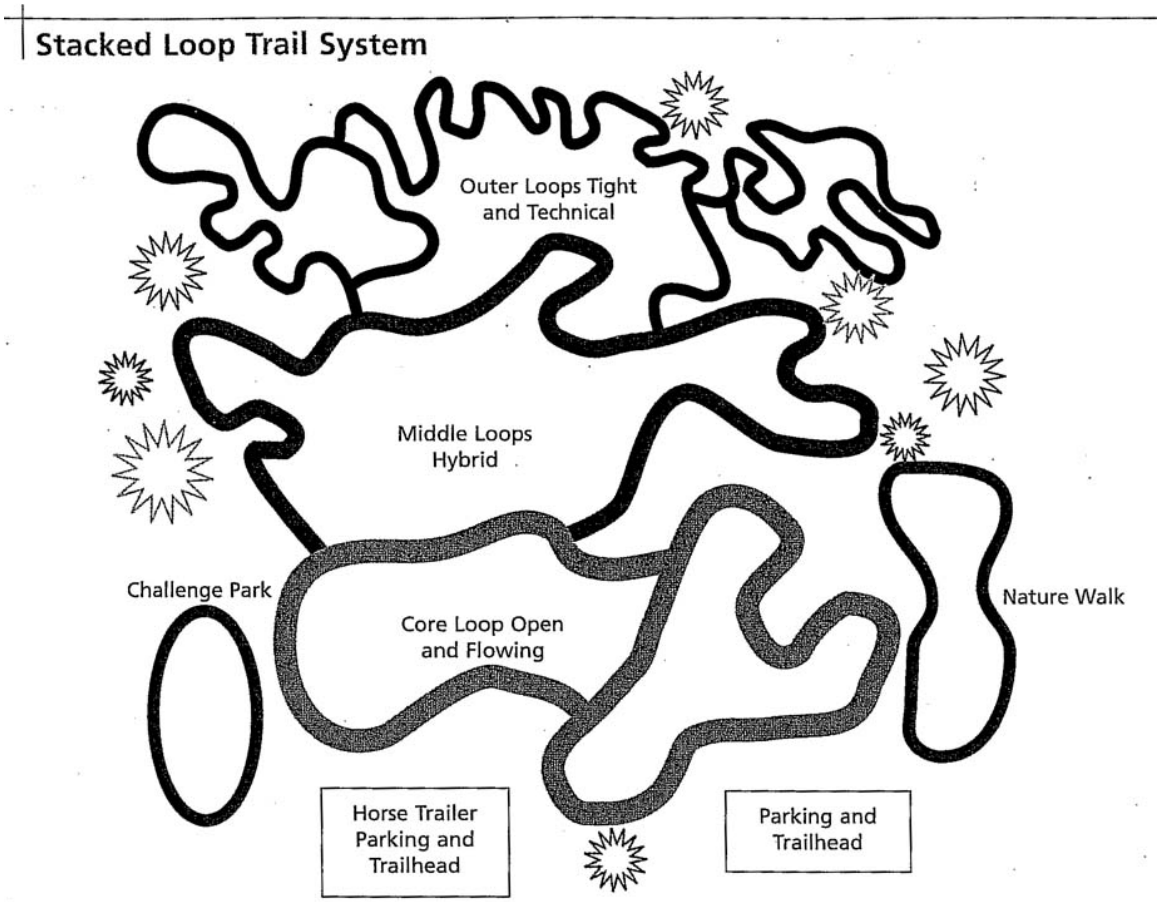


Figure 1 from the International Mountain Bicycling Association's resource guide for trail development, *Trail Solutions*, highlights some essential characteristics of a stacked loop trail system. The system organizes trail users based on abilities. The easiest and busiest trails are close to parking and trailhead facilities. The further away from parking, the more difficult and technical the trails become. Another feature of this system is in the interconnectivity of the different loops which allows trail users to vary their routes and enables them to create long or short distance trail experiences within a relatively contained area.

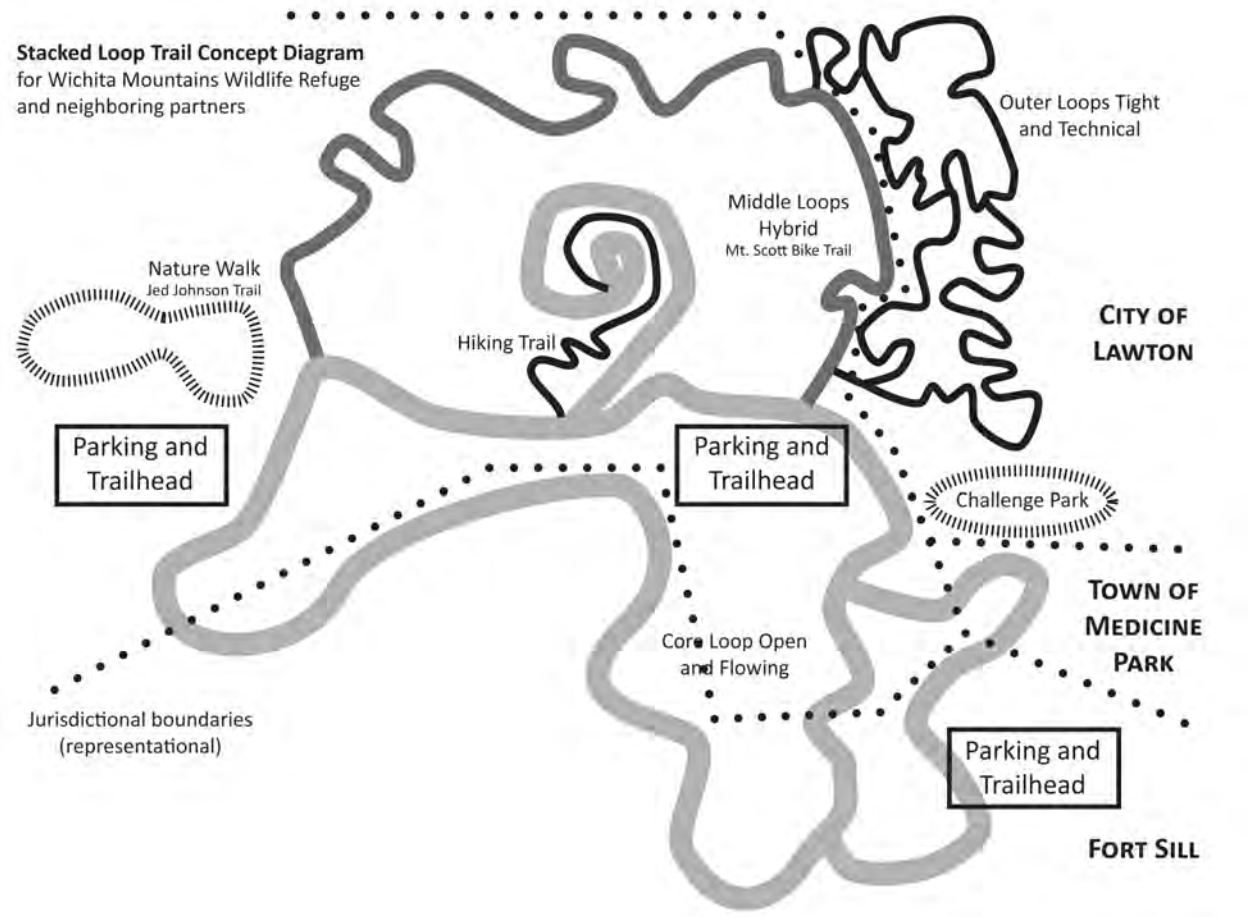
Near to parking and near the trail system but not necessarily connected to it are two destination areas that attract different types of trail users – a challenge park and a nature walk. Both of these spaces are all-ages all-abilities areas, one for bicycles and skill development and the other for walking and interpretation. Both of these areas might be single destinations for trail visitors,

but they could also serve as areas that enhance self-guided visitor experiences within the interconnected trail system.

The Refuge's east side, when viewed beyond its boundaries to include the jurisdictions of City of Lawton, Town of Medicine Park and Fort Sill, offers a nascent structure for a stacked loop trail system. Within Refuge boundaries, the parking and trailheads exist along with potential core loops, an existing middle/hybrid loop, and nature walks.

Figure 2 illustrates a concept for a stacked loop trail system situated on the Refuge's east side. The dotted lines indicate jurisdictional boundaries to illustrate that the trails on the Refuge link to other non-motorized trails outside the Refuge. The diagram suggests elements of this east side stacked loop trail concept that do not currently exist, such as the challenge park and hiking trail. The challenge park would be situated on City of Lawton property, adjacent to the Town of Medicine Park, and accessed from the Refuge at the Lake Lawtonka trailhead. The hiking trail would approximately follow the road up Mt. Scott but would be entirely separate from it, offering hikers and trail runners a challenging, rugged, and lengthy journey to the peak and its rewarding vistas.

Figure 2: Stacked Loop Trail Concept Diagram for Wichita Mountains Wildlife Refuge



The core loops that connect to parking and the trailhead should be wide and smooth to appeal to a variety of trail users and to allow visitors to travel side by side and socialize at the start. Visitors access the rest of the system from the core loops. Consequently, this type of trail in the system receives the most use. This type of trail also provides direct routes for destination-oriented trail users and accommodates a variety of trail user speeds.

The LETRA connection trail has the potential to provide this kind of core loop experience. Main parking areas on the Refuge (Lake Elmer Thomas fishing pier) and at neighboring properties (LETRA and the Medicine Park Museum) connect to this trail. From the Lake Elmer Thomas fishing pier parking lot, visitors can access the Refuge's middle/hybrid loop – the Mt. Scott Bike Trail – or access the City of Medicine Park Lake Lawtonka technical trails (and proposed challenge park) at the on-Refuge trailhead. Other technical trails on Fort Sill can be accessed from LETRA.

The Jed Johnson Tower trail provides an ideal nature walk as part of this stacked loop system. Future trail planning or enhancements could also include the Mt. Scott Picnic Area trail as a second nature walk (identified in the CCP for this purpose) that complements the stacked loop trail system.

Reference

Trail Solutions: IMBA's Guide to Building Sweet Single Track. 2004. International Mountain Bicycling Association. IMBA, Boulder, CO.

Appendix D: Trail Design Details

Separation from or Shared Use with Motor-Vehicle Traffic

During the outreach process conducted between July 2012 and January 2013, diverse audiences were asked to consider their preferences for mixing with motor-vehicle traffic or being separated from it. Respondents included youth, parents, casual recreationalists, people who use mobility aids, runners, and some avid road cyclists and mountain bikers.

Sharrows

These large arrows painted on the road surface indicate that motorists share the road with cyclists. In a rural setting, such as the Refuge, sharrows provide space for bicyclists on the roadway without requiring road widening to add bicycle lanes. Sharrows may also be more visible to motorists than signage.

Sharrows did not receive much response during public outreach, likely because the public was unfamiliar with this type of pavement marking.

Meers Road would likely benefit from the addition of sharrows. The symbols may function as traffic calming devices and help slow motor-vehicle traffic on the road. They are also one way to add green infrastructure to the Refuge without substantial cost, effectively designating 1.87 miles of Refuge roads as a bicycle route. Additionally, Meers Road has no extra width to accommodate bicycle lanes, and this is one treatment that would work without adding to the existing road footprint.

Shoulders

The Refuge added shoulders to Highway 49 from the Cache gate to the Medicine Park gate. Shoulders provide space for motorists to exit the travel lanes, either for breakdowns or wildlife viewing opportunities. Bicyclists and pedestrians are allowed to use the shoulders for travel purposes, and they do. Far more bicyclists and pedestrians use the shoulders on Highway 49 than other roads on the Refuge without shoulders.

The shoulders, however, are not designated bicycle lanes. Lacking designation, they are not part of the Refuge's green infrastructure. Vehicles using the shoulders block bicyclists and pedestrians, requiring these road users to travel in the active motor-vehicle lanes to get around vehicles.

Shoulder construction was a possible solution proposed in the 2010 Alternative Transportation Study to provide bicycle and pedestrian access on Meers Road. Shoulder construction is a costly proposition considering that the existing road does not offer any additional width to simply expand the road. The terrain of the Meers Road would

probably require blasting or major earth moving, bridge construction or modification, and new drainage structures.

Shoulders are not recommended improvements to Meers Road because they would add to motor-vehicle infrastructure without offering dedicated protections to non-motorized travelers. Additionally, more wildlife are killed on the areas of Highway 49 with shoulders because people tend to drive faster on the wider road. Shoulder construction on Meers Road could be expected to increase wildlife kills in this area.

Attached path with barrier

One option for providing safer space than sharrows on Meers Road for bicyclists and pedestrians would be to create a protected two-way non-motorized path on one side of the road. Protection for non-motorized travelers from motor-vehicle traffic could include something like lines of boulders. Concrete barriers could also work but would interfere with the scenic character of the road and potentially limit wildlife crossing.

Visitors might use this path configuration to travel between destinations if it were the only option, but proximity to motor-vehicle traffic would limit its attractiveness as a Refuge experience.

Separated path

A path separated from motor-vehicle traffic by at least 10 feet is the most preferred option for Refuge visitors using non-motorized modes.

Compared to shoulder construction, a separated path would be considerably less expensive to construct, would add the Refuge's green infrastructure, and would be considerably safer for visitors using non-motorized modes.

Trail Surfacing

Four surfacing types could be considered for a non-motorized trail along the Meers Road corridor: concrete, asphalt, crushed gravel, and natural surface. Much of the decision regarding surface type will relate to identification of the target trail user(s).

Concrete

Expensive but highly durable, concrete might be an option for select sections of path. Colored concrete could help the facility blend into the surrounding environment and provides an extremely smooth surface.

Asphalt

Less expensive than concrete but requiring more long-term maintenance, asphalt

provides a smooth, stable surface attractive to all potential trail users. Local colored rock could be used in asphalt to help the facility blend into the surrounding environment.

Crushed gravel

Less expensive than asphalt but requiring more near- and long-term maintenance, crushed gravel offers a relatively natural trail experience. It provides a firm and stable surface suitable for wheelchair use and useable for all potential trail users although people on road bikes might avoid trails surfaced this way. Local colored rock could be used as the gravel to help the facility blend into the surrounding environment. Natural soil stabilizers such as Road Oyl or EMC^2 could be used with this surfacing type.

Natural surface

The least expensive surfacing type, natural surface trails require the most near- and long-term maintenance. They also provide the most natural experience of the Refuge for non-motorized travelers. Natural surface trails are not suitable for wheelchairs, other mobility aids, or road cycling, but they are most preferred for running, walking, and mountain biking. Like crushed gravel surfacing, natural soil stabilizers could be used to help maintain the trail tread but are not a replacement for regular trail maintenance.

Trail Width

Decisions regarding trail width will relate to identification of who will use the trail and how many of these trail users are anticipated.

Mountain bikers, runners, and walkers have expressed interest in narrow, natural surface trails – or single track. Trails to accommodate wheelchairs require a 5-foot trail width minimum. Trails that mix bicyclists and pedestrians in one-way travel require a 5-foot trail width minimum, and trails that mix them in two-way travel require a 10-foot trail width minimum. Busy trails and social trails that mix many different trail user speeds should consider 12-foot trail width minimums.

Wichita Mountains Wildlife Refuge

Trail Design Options Assessment

February 28, 2013

Prepared for:

U.S. Fish and Wildlife Service
Wichita Mountains Wildlife Refuge

Paul S. Sarbanes Transit in the Parks
Technical Assistance Center

Prepared by:

Heidi Beierle
Public Lands Transportation Scholar
Wichita Mountains Wildlife Refuge

Table of Contents

The 2012 Wichita Mountains Wildlife Refuge (WMWR) Transportation Scholar collected information that influences trail design. Some of the information guides selection of possible design options, whereas other information pertains to Refuge decision-making regarding those potential designs.

In mid-February 2013, the Transportation Scholar facilitated discussion with the Refuge regarding trail design options. This facilitated discussion was the culmination of other aspects of the trail design scoping process. In October 2012, Refuge staff and community stakeholders participated in review of possible criteria with which to assess potential trail designs. Development of the final assessment tool includes input gathered from individual conversations with Refuge staff (beginning June 2012) and feedback received through the community outreach process (from July 2012 through mid-January 2013, 329 community participants contributed their perspective on Refuge trail design).

The following list includes people who helped review possible assessment criteria and develop trail design options in October 2012:

- Tony Booth, WMWR Refuge Manager.
- Ralph Bryant, WMWR, Deputy Refuge Manager.
- Susan Howell, WMWR Visitor Services Manager.
- Kelly Moran, WMWR Senior Park Ranger.
- Joe D'Arrigo, WMWR Maintenance Supervisor.
- Walter Munsterman, WMWR Supervisory Wildlife Biologist.
- Richard Baker, WMWR Fire Management Officer.
- Ben Cooper, Fit Kids of Southwest Oklahoma.
- Kyle Rogers, Fit Kids of Southwest Oklahoma.
- Chris Hise, The Nature Conservancy.

In February, focus of the design options assessment rested with Refuge staff and included:

- Tony Booth, WMWR Refuge Manager.
- Ralph Bryant, WMWR, Deputy Refuge Manager.
- Susan Howell, WMWR Visitor Services Manager.
- Walter Munsterman, WMWR Supervisory Wildlife Biologist.
- Kelly Moran, WMWR Senior Park Ranger.
- Joe D'Arrigo, WMWR Maintenance Supervisor.
- Richard Baker, WMWR Fire Management Officer.

Patricia Land, Program Assistant, and Jason Riggins, Fire Management Officer, also participated in the design options review discussion.

The design options assessment exercise asked Refuge managers to consider six design elements: public motor vehicle access, trail surfacing, trail or road width, alignment options, separation of motorized and non-motorized trail or road users, and amenities. The February 12, 2013, discussion centered on the Lake Elmer Thomas Recreation Area (LETRA) connection trail and the Jed Johnson Tower trail. The discussion also informs potential design options for the Meers Road trail.

The questions asked of potential trail design elements comprise four categories:

- **Environmentally Sensitive Design.**
  Prevent resource loss and maintain or improve conditions of resources

- **Wildlife Observation Experience.**
  Encourage wildlife and resources discovery through facility design

- **Safety.**
  Protect public safety, health, and welfare

- **Provide Cost-Effective, Environmentally Responsible, and Otherwise Beneficial Development for U.S. Fish and Wildlife Service.**
  Other advantages, such as low long-term facility maintenance needs and costs

Refuge managers were each given a packet of material that provides a summary of the community outreach for the trail projects and that describes existing conditions, planned use, and design options. The packets also contain spreadsheets that compare differences among design options and that rate how each option meets the advantages listed in each category. The rating numbers in the spreadsheets derive from public and Refuge input received from July 2012 through January 2013. The contents of the packets were described with an associated presentation. Refuge managers participated in discussion of:

- Primary trail target audience,
- Accessibility,
- Anticipated visitation on the trails, and
- A key design option, maintaining or closing public motor vehicle access on one segment of the planned LETRA connection trail.

At conclusion of the meeting, Refuge managers planned to conduct a field visit to assess alignment options for the Jed Johnson Tower trail. The field visit occurred on February 15, 2013 with Tony Booth, Refuge Manager, Ralph Bryant, Deputy Refuge Manager, Walter Munsterman, Supervisory Wildlife Biologist, and Heidi Beierle, Transportation Scholar.

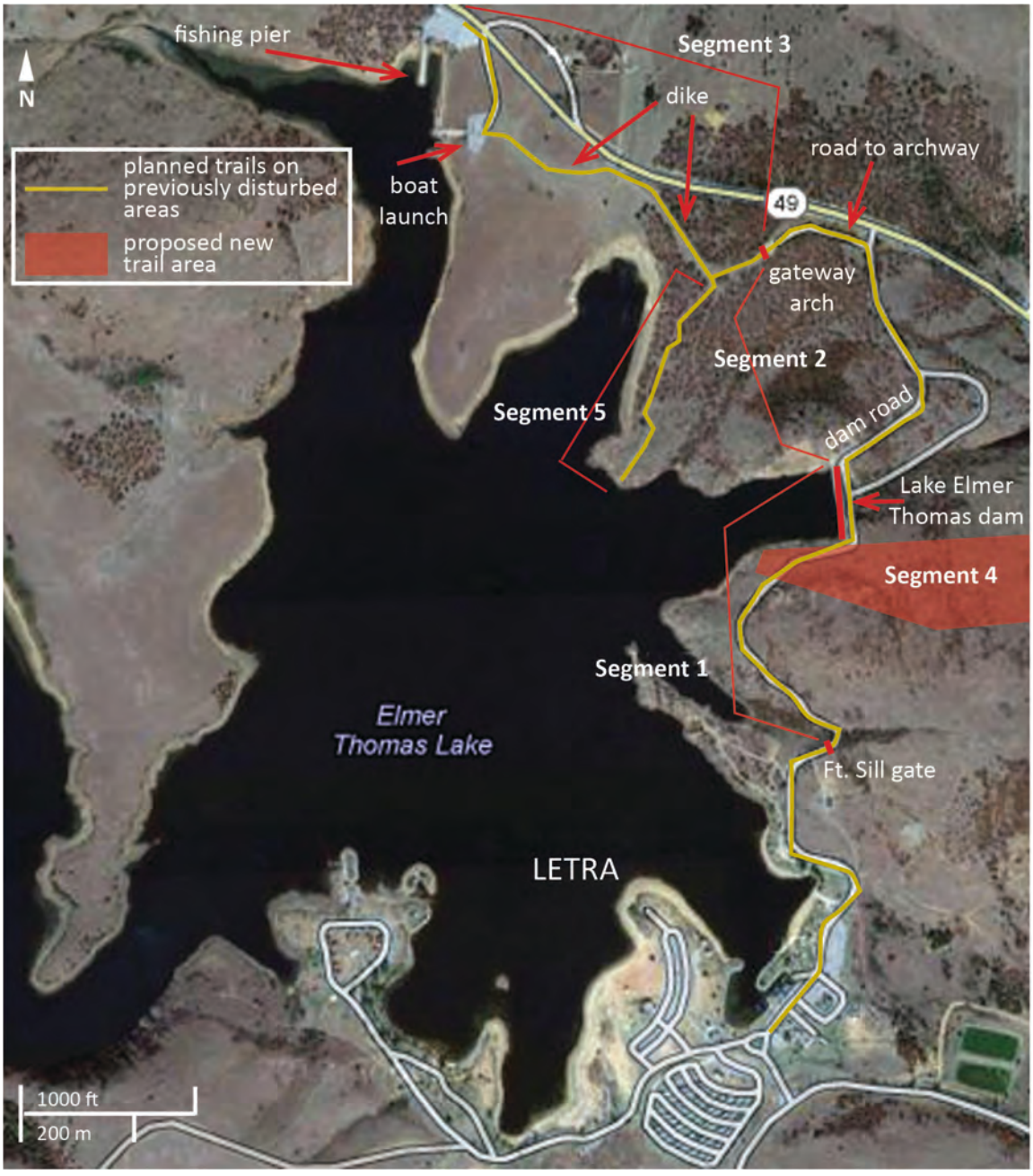
A second meeting occurred on February 19, 2013. This discussion revisited considerations for accessibility, delved into different management approaches for the Jed Johnson Tower trail, addressed current management positions regarding public motor-vehicle access on the Lake Elmer Thomas dam road, and systematically approached trail/road width, separation between motorized and non-motorized trail users, and trail surfacing on the LETRA connection trail. Additionally, management provided direction on an alignment option for the LETRA connection trail.

Details from the trail design options assessment will appear in the final, NEPA-ready project proposals and will be reflected in the different alternatives. While the managers did not reach consensus on a preferred alternative, they did agree to move the project forward to NEPA assessment.

The following materials include the February 12, 2013, trail design options assessment packet in its entirety along with the presentation that accompanied distribution of the packets to Refuge managers.

PROJECT PACKET

LETRA Connection Trail



LETRA Connection trail: Design Options Summary

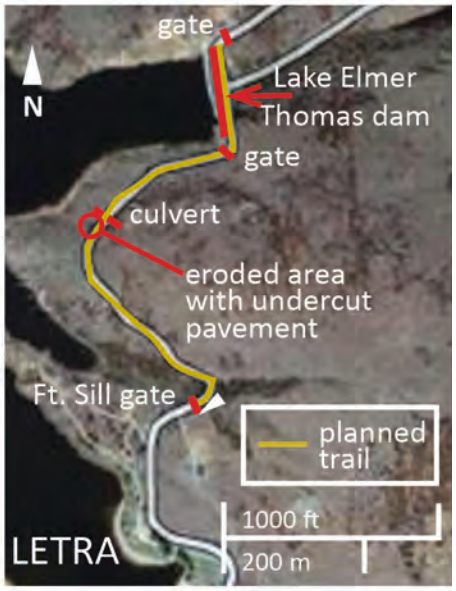
	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
Public Motor Vehicle Access					
		Close the road to public motor-vehicle travel			
		Close the road to the archway to public motor-vehicle travel			
		Maintain public motor-vehicle access to the entire segment			
Surfacing					
	Asphalt	Asphalt	Crushed gravel	Crushed gravel	Crushed gravel
			Asphalt	Asphalt	Asphalt
Road/Trail Width					
	10'	10'	8'	8'	6'
	12'	12'	10'	10'	8'
	14'	14'	12'		10'
	20'	20'			
		24'-27'			
Alignment Options					
			Option A		
			Option B		
Shared Use/Separation					
		Shared use road	If Option A is selected.		
		Sharrows			
		Attached path			
		Attached path with barrier			
Amenities					
	Add resting areas with benches	Add motor-vehicle pullouts	Add resting areas with benches	Add resting areas with benches	Add resting areas with benches
		Add resting areas with benches	Add nature play area(s)	Add nature play area(s)	Add nature play area(s)
					Add bicycle parking

SEGMENT 1

Lake Elmer Thomas dam south to Fort Sill Gate

EXISTING CONDITIONS

The segment would connect the Refuge to Fort Sill and provide access to the planned spur trail that would connect to the Medicine Park Museum of Natural Science.



The road on this segment receives infrequent motor-vehicle use for official purposes only. The road also experiences infrequent use by people bicycling, walking, and running.

This trail segment has existing asphalt in poor repair and a roadbed measuring 20'. Lake Elmer Thomas dam, constructed of concrete, is in good repair and has an 18' wide travel area.

PLANNED USE

Once the Refuge markets use of this public facility, visitation will increase. Opening of the Medicine Park Museum of Natural Science and establishing access into Fort Sill/LETRA will also increase visitation on the facility.

Segment 1 is primarily intended to serve youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists. In addition to this primary market, this trail segment will likely be used by road cyclists and mountain bikers to access riding areas within and outside the Refuge boundaries (Hwy 49, Mt. Scott bike trail, Lake Lawtonka mountain bike trails). Consequently, planning for Segment 1 and Segment 2 should consider the presence of these bicyclists and reflect design that provides for safe shared use among all non-motorized trail users.

DESIGN OPTIONS

All design options for Segment 1 include these attributes:

- Provide visitors with wildlife viewing and natural resources engagement opportunities.
- Cater to target audiences: youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists.
- Improve opportunities for non-motorized connections between LETRA and the Medicine Park Museum of Natural Science, providing an increase in the Refuge's green infrastructure.
- Provide attractive trail conditions by being sited away from main motor-vehicle routes and experiencing minimal auto use.

A thorough review of Refuge management goals, existing conditions, adjacent infrastructure, planned use, and public opinion eliminated many potential design options. For Segment 1, Surfacing and Amenities have only one design option and are not compared with other options. Their attributes and advantages are listed below.

For Segment 1, decision focus rests on how wide the preferred alternative will be. For the Trail Width category, the different design options all possess a number of similar attributes, and those similarities

are listed below. The attached matrix compares the different width advantages beyond what is listed below.

Surfacing

- Asphalt
  Using a local rock source for this surfacing type can improve its aesthetic integration into the landscape, and using highly reflective materials can also lessen heat absorption. Maintain every 3-5 years.

  ADVANTAGES
  - Smooth, low-friction surfacing type for trail users – easiest to use.
  - Firm and stable surface reinforces accessibility.
  - Minimizes trail tread obstructions.
  - Encourages bicycling by families with children.
  - Produces less road/trail noise than other surfacing types.
  - Low/no dust when used by motor vehicles.

Trail Width

The following advantages apply to all the below-listed trail widths. The attached matrix compares advantages that differ among the following trail widths.

- 10' wide.
- 12' wide.
- 14' wide.
- 20' wide.

ADVANTAGES
- Maintains facility in existing right-of-way.
- Allows for a mix of target audience bicyclists and pedestrians on the trail when no motor vehicles are present.
- Eliminates conflicts among target audience trail users when no motor vehicles are present.
- Allows for Refuge, maintenance, and emergency vehicle access.
- Maintains motor-vehicle speeds below 20 m.p.h., affording safe shared use among motorized and non-motorized trail users.

Amenities

- Add resting areas with benches.
  Furniture and design for these amenities could blend into the surrounding environment.

  ADVANTAGES
  - Offers resting opportunities for people with mobility challenges.
  - Provides space for trail users to exit the trail to facilitate: passing by faster non-motorized trail users and motor vehicles, quality observation experiences, and social encounters.
  - Modest implementation cost.
  - Minimal long-term maintenance cost.
  - Contributes to WMWR's accessible facility offerings.

Segment 1: Lake Elmer Thomas dam south to Fort Sill gate : TRAIL WIDTH SCENARIOS

Comparing different trail widths, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN					
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	10' wide	12' wide	14' wide	20' wide	Notes
Advantages					
Reduces existing hard surfacing footprint	5	4	3	1	
Increases opportunity for stormwater infiltration	5	4	3	1	
Allows revegetation	5	4	3	1	
Smallest facility footprint	5	4	3	1	
Subtotal	*20*	*16*	*12*	*4*	
WILDLIFE OBSERVATION EXPERIENCE					
FACTOR 2 – Encourage wildlife and resource discovery through facility design	10' wide	12' wide	14' wide	20' wide	
Advantages					
Provides sufficent space to have a quality observation experience given the potential presence of fast bicyclists and motor vehicles.	1	2	3	4	
Provides adequate trail space to combine all the different trail uses and anticipated visitation.	0	1	3	5	
Subtotal	*1*	*3*	*6*	*9*	
SAFETY					
FACTOR 3 – Protect public safety, health, and welfare	10' wide	12' wide	14' wide	20' wide	
Advantages					
Provides sufficient space for mixing all non-motorized trail users (including faster bicyclists) when motor vehicles are not present.	1	3	4	5	
Provides sufficient space for all non-motorized trail users (including faster bicyclists) to avoid conflicts when motor vehicles are present.	1	2	3	4	
Subtotal	*2*	*5*	*7*	*9*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS					
FACTOR 4 – Other advantages, such as facility maintenance	10' wide	12' wide	14' wide	20' wide	
Advantages					
Least cost materials implementation.	5	4	3	2	
Least cost long-term maintenance.	4	4	4	2	
Subtotal	*9*	*8*	*7*	*4*	

GRAND TOTAL	***32***	***32***	***32***	***26***	

SEGMENT 2

Lake Elmer Thomas dam north to the gateway arch

EXISTING CONDITIONS

This segment's planned design would collect non-motorized trail users and deliver them to other trail segments (Segments 1 or 3), Highway 49, and the gateway arch.

This segment experiences low-volume public motor-vehicle traffic, primarily for visitors to access fishing and SCUBA opportunities. The road also sees occasional use from pedestrians and bicycle riders.

East of the access gate on the north side of Lake Elmer Thomas dam, a parking lot (5871 ft^2) surfaced with crushed gravel provides visitor parking. The road that provides access to the parking lot is surfaced with large crushed gravel. Gravel gives way to a combination of crusher fines and large gravel, and the road measures between 24' and 27' wide, hard packed and washboarded on the steeper section. Near the Highway 49 entrance, large gravel is replaced by crushed asphalt. The road appears to drain well. A box culvert allows water to cross under the road and continue downhill.

The road to the archway is a combination of old, intact asphalt and crushed asphalt and measures 17' wide. The old Refuge boundary fence extends on either side of the gateway arch, and a cattle guard extends the full span underneath the arch. Large boulders on the west side of the arch block motor-vehicle passage.

PLANNED USE

Once the Refuge markets use of this public facility for biking, walking, and running, visitation will increase. Opening of the Medicine Park Museum of Natural Science and establishing access into Fort Sill/LETRA will also increase visitation on the facility.

Segment 2 is primarily intended to serve youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists. In addition to this primary market, a portion of or all of this trail segment will likely be used by road cyclists and mountain bikers to access riding areas within and outside the Refuge boundaries (Hwy 49, Mt. Scott bike trail, Lake Lawtonka mountain bike trails). Consequently, planning for Segment 1 and Segment 2 should consider the presence of these bicyclists and reflect design that provides for safe shared use among all non-motorized trail users.

It is anticipated that faster bicyclists would exit or enter Segment 2 to or from Highway 49 rather than following the trail to the gateway arch. Different design strategies, such as adding some curves to the trail at the intersection of the archway road, creating a different pavement pattern, and/or slightly narrowing the trail width, would encourage faster cyclists to ride a direct route rather than turning up the archway trail.

DESIGN OPTIONS

All design options for Segment 2 include these attributes:

- Improved opportunities for non-motorized connections, providing an increase in the Refuge's green infrastructure.
- Sited away from main motor-vehicle routes.

A thorough review of Refuge management goals, existing conditions, adjacent infrastructure, planned use, and public opinion eliminated several potential surfacing design options and some potential trail widths. It is anticipated that the trail will have an asphalt surface, and proposed amenities include pullouts and benches.

For Segment 2, decision focus is multifaceted and includes addressing Public Motor Vehicle Access, Shared Use/Separation between motorists and non-motorized users, and Road/Trail Width. Only Road/Trail Width has design option attributes similar to all options, and those similarities are listed below. The attached matrices compare the different advantages for Public Motor Vehicle Access, Shared Use/Separation, and Road/Trail Width beyond what is listed below.

Public Motor Vehicle Access

- Close the entire road to public motor-vehicle travel.
- Close the road to the archway to public motor-vehicle travel.
- Maintain public motor-vehicle access to the entire Segment.

Surfacing

- Asphalt

  Using a local rock source for this surfacing type can improve its aesthetic integration into the landscape, and using highly reflective materials can also lessen heat absorption. Maintain every 3-5 years.

  ADVANTAGES
  - Smooth, low-friction surfacing type for trail users – easiest to use.
  - Firm and stable surface reinforces accessibility.
  - Minimizes trail tread obstructions.
  - Encourages bicycling by families with children.
  - Produces less road/trail noise than other surfacing types.
  - Low/no dust when used by motor vehicles.

Road/Trail Width

The following attributes apply to all the below-listed trail widths. The attached matrix compares advantages that differ among the following trail widths.

- 10' wide.
- 12' wide.
- 14' wide.
- 20' wide.
- 24'-27' wide (full width of existing road).

  ADVANTAGES
  - Maintains facility in existing right-of-way.
  - Allows for a mix of target audience bicyclists and pedestrians on the trail when motor vehicles are not present.

- Eliminates conflicts among target audience trail users when motor vehicles are not present.
- Allows for Refuge, maintenance, and emergency vehicle access.

Shared Use/Separation

- Shared use road

Shared use road

Any road width could be a shared use road. Road design emphasizes motor vehicle use, and all other uses share the road with motor vehicles.

- Sharrows

Sharrows

Any road width could use sharrows although they are typically used when the road is not wide enough to accommodate bicycle lanes or when other road uses interfere with safe cycling in a bicycle lane (such as can occur with on-street parking). Road design emphasizes motor vehicle use, like the shared use road above, and includes pavement markings (sharrows) to indicate that bicyclists share the road with motor vehicles. The sharrows also suggest placement of bicyclists in the lane where they are most visible.

- Attached path

Attached path*

To accommodate two-way bicycle and pedestrian traffic in a rural environment, a path width of 10' provides the accepted standard for mixing bicycles and pedestrians. This designated non-motorized space is separated from motor-vehicle traffic by pavement markings (usually a single or double continuous white line, like for a road shoulder).

*Note: The image here shows a designated two-way bicycle facility with separated pedestrian walkway in an urban environment. The image is included here to illustrate two-way non-motorized travel adjacent to motorized vehicle travel lanes that uses only pavement markings to create separation.

- Attached path with barrier

Attached path with barrier

The same conditions that apply to an attached path also apply to an attached path with barrier. To create greater safety between motor vehicles and non-motorized modes, a barrier, such as a line of boulders or a guardrail, reinforces the separation between motorized and non-motorized travel spaces.

Amenities

- Add motor-vehicle pullouts.
  In addition to providing for motor-vehicle safety on this road segment, the pullouts could be used for non-motorized trail users as pullouts, rest areas, or potentially wildlife observation areas. The pullouts could remain permeable; however, the pullouts would require different design and surfacing if the Refuge plans for them to be used by motorists and non-motorized trail users.

  ADVANTAGES
  - Remains within existing right-of-way.
  - Limits the amount of new hard surface area.
  - Helps maintain motor-vehicle speeds below 20 m.p.h.
  - Supports smaller motor-vehicle road footprint and slower motor-vehicle speeds.
  - Increases road/trail safety for motorized and non-motorized trail users.
  - Implementation and maintenance cost included in total facility costs.

- Add resting areas with benches.
  Furniture and design for these amenities could blend into the surrounding environment.

  ADVANTAGES
  - Offers resting opportunities for people with mobility challenges.
  - Provides space for trail users to exit the trail to facilitate: passing by faster non-motorized trail users and motor vehicles, quality observation experiences, and social encounters.
  - Modest implementation cost.
  - Minimal long-term maintenance cost.
  - Contributes to WMWR's accessible facility offerings.

Segment 2: Lake Elmer Thomas dam north to archway: ROAD CLOSURE SCENARIOS

Comparing different road closure scenarios, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN				
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	Close road to public MV use	Close only road to arch to public MV use	Maintain existing public MV use	
Advantages				
Lessens ecological/environmental effects from automobiles	5	3	1	
Allows revegetation of automobile facility	5	3	1	Depends on trail design/width
Improves access to natural, historic, and cultural resources for visitors using non-motorized modes	5	3	1	Depends on trail design, motor-vehicle volumes and speeds
Subtotal	*15*	*9*	*3*	
WILDLIFE OBSERVATION EXPERIENCE				
FACTOR 2 – Encourage wildlife and resource discovery through facility design	Close road to public MV use	Close only road to arch to public MV use	Maintain existing public MV use	
Advantages				
Improves observation experiences for children.	5	3	1	Depends on trail width, motor-vehicle volumes and speeds
Improves observation experiences for people who use mobility aids.	5	3	1	Depends on trail width, motor-vehicle volumes and speeds
Provides enjoyable observation experiences for all target audiences.	5	3	1	Depends on trail width, motor-vehicle volumes and speeds
Subtotal	*15*	*9*	*3*	
SAFETY				
FACTOR 3 – Protect public safety, health, and welfare	Close road to public MV use	Close only road to arch to public MV use	Maintain existing public MV use	
Advantages				
Encourages non-motorized trail use by families with children.	5	3	1	
Profides safe, enjoyable, and comfortable use of the facility for all users.	5	3	1	
Encourages motor-vehicle speeds of 20 m.p.h. or slower.	5	3	1	Depends on visitor use, road/trail design and width.
Subtotal	*15*	*9*	*3*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS				
FACTOR 4 – Other advantages, such as facility maintenance	Close road to public MV use	Close only road to arch to public MV use	Maintain existing public MV use	
Advantages				
Maintains motor-vehicle access for SCUBA diving	1	5	5	
Receives positive perception of access from SCUBA divers, fishers, and visitors using non-motorized modes	1	5	5	Depends on administrative or facilities approach for closed road option
Subtotal	*2*	*10*	*10*	

GRAND TOTAL	47	37	19	

Segment 2: Lake Elmer Thomas dam north to archway: ROAD WIDTH SCENARIOS

Comparing different trail widths, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN						
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	10' wide	12' wide	14' wide	20' wide	24'-27' wide	Notes
Advantages						
Smallest facility footprint.	5	4	3	2	1	
Provides for stormwater infiltration.	5	4	3	2	1	
Allows revegetation.	5	4	3	2	1	
Subtotal	*15*	*12*	*9*	*6*	*3*	
WILDLIFE OBSERVATION EXPERIENCE						
FACTOR 2 – Encourage wildlife and resource discovery through facility design	10' wide	12' wide	14' wide	20' wide	24'-27' wide	
Advantages						
Encourages wildlife and natural resource discovery when motor vehicles are present.	0	1	3	3	3	Depends on motor-vehicle volumes, speeds, and separation
Provides sufficent space for all road/trail users to have a quality observation experience given the potential presence of fast bicyclists and motor vehicles.	0	0	1	4	5	Depends on motor-vehicle volumes, speeds, and separation
Subtotal	*0*	*1*	*4*	*7*	*8*	
SAFETY						
FACTOR 3 – Protect public safety, health, and welfare	10' wide	12' wide	14' wide	20' wide	24'-27' wide	
Advantages						
Provides sufficient space for all non-motorized trail users (including faster bicyclists) to avoid conflicts when motor vehicles are present.	0	0	1	4	5	
Provides facilities children will want to use when motor vehicles are present.	0	1	3	5	5	Depends on motor-vehicle volumes, speeds, and separation
Provides facilities people using mobility aids will be able to use when motor vehicles are present.	0	0	1	4	4	Depends on motor-vehicle volumes, speeds, and separation
Provides sufficient space for mixing all non-motorized trail users (including faster bicyclists) when motor vehicles are not present.	1	3	5	5	5	
Provides adequate road/trail space to combine all the different trail uses and anticipated visitation.	0	0	1	5	5	Depends on motor-vehicle volumes, speeds, and separation
Encourages motor-vehicle speeds of 20 m.p.h. or slower	5	4	3	2	1	
Profides safe, enjoyable, and comfortable use of the facility for all users.	0	1	2	5	5	Depends on facility design and separation of uses.
Subtotal	*6*	*9*	*16*	*30*	*30*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS						
FACTOR 4 – Other advantages, such as facility maintenance	10' wide	12' wide	14' wide	20' wide	24'-27' wide	
Advantages						
Least cost materials implementation.	5	4	3	2	1	
Least cost long-term maintenance.	5	5	5	3	1	
Subtotal	*10*	*9*	*8*	*5*	*2*	

GRAND TOTAL	***31***	***31***	***37***	***48***	***43***	

Segment 2: Lake Elmer Thomas dam north to archway: ROAD CONFIGURATIONS

Comparing different road configurations, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN					
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	Shared Use	Sharrows	Attached Path	Attached Path with Barrier	Notes
Advantages					
Smallest facility footprint.	4	4	2	1	Depends on facility width.
Provides for stormwater infiltration.	4	4	2	1	Depends on facility width.
Allows revegetation.	4	4	2	1	Depends on facility width.
Subtotal	*12*	*12*	*6*	*3*	
WILDLIFE OBSERVATION EXPERIENCE					
FACTOR 2 – Encourage wildlife and resource discovery through facility design	Shared Use	Sharrows	Attached Path	Attached Path with Barrier	
Advantages					
Encourages wildlife and natural resource discovery when motor vehicles are present.	0	0	1	5	Depends on motor-vehicle volumes, speeds, and trail width.
Provides sufficent space for all road/trail users to have a quality observation experience given the potential presence of fast bicyclists and motor vehicles.	1	2	4	5	Depends on facility width, motor-vehicle volumes and speeds, and all bicyclists' speeds.
Subtotal	*1*	*2*	*5*	*10*	
SAFETY					
FACTOR 3 – Protect public safety, health, and welfare	Shared Use	Sharrows	Attached Path	Attached Path with Barrier	
Advantages					
Provides sufficient space for all non-motorized trail users (including faster bicyclists) to avoid conflicts when motor vehicles are present.	2	3	4	4	Depends on facility width and motor-vehicle speeds.
Provides facilities children will want to use when motor vehicles are present.	0	0	1	5	Depends on motor-vehicle volumes and speeds.
Provides facilities people using mobility aids will be able to use when motor vehicles are present.	1	1	5	5	Depends on facility width and motor-vehicle speeds.
Provides sufficient space for mixing all non-motorized trail users (including faster bicyclists) when motor vehicles are not present.	1	2	5	5	
Provides adequate road/trail space to combine all the different trail uses and anticipated visitation.	1	2	4	5	Depends on facility width, motor-vehicle speeds, and all bicyclists' speeds.
Encourages motor-vehicle speeds of 20 m.p.h. or slower	3	5	1	4	Depends on total facility width and/or motor-vehicle travel lane width.
Profides safe, enjoyable, and comfortable use of the facility for all users.	1	3	5	4	
Subtotal	*9*	*16*	*25*	*32*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS					
FACTOR 4 – Other advantages, such as facility maintenance	Shared Use	Sharrows	Attached Path	Attached Path with Barrier	
Advantages					
Least cost materials implementation.	5	4	3	1	
Least cost long-term maintenance.	5	3	4	1	
Subtotal	*10*	*7*	*7*	*2*	

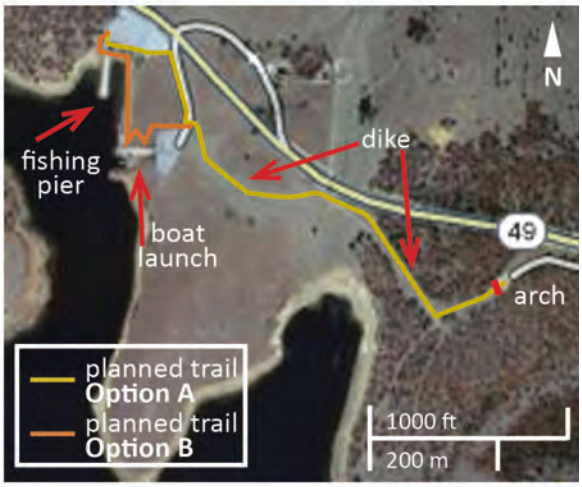
GRAND TOTAL	***32***	***37***	***43***	***47***	

SEGMENT 3

Gateway Arch to Lake Elmer Thomas Fishing Pier

EXISTING CONDITIONS

This segment follows old road right-of-way that has been naturalized with native plants. The segment begins at the historic gateway arch, meets the Lake Elmer Thomas dike, and follows the dike to the Lake Elmer Thomas boat launch. At the boat launch, Option A parallels the boat launch access road along disturbed borrow pit, and meets the Lake Elmer Thomas fishing pier at Highway 49. Option B crosses the boat launch access road at the parking lot entry, parallels the parking lot along disturbed area, and continues west to the lakeside trail that connects the boat launch to the fishing pier. The entire segment currently receives occasional foot traffic.



Both Options of the proposed trail would deliver target trail users to destinations, such as the Lake Elmer Thomas fishing pier, viewpoints along Segment 4, the gateway arch, and wildlife-dependent recreation activities accessed by Segment 2 and/or Segment 1.

West of the gateway arch, the terrain is relatively flat. The average segment slope measures 1.3% and the span between trees where a trail may be located measures 35'. The dike emerges abruptly from this flat area, the principal elevational feature of this segment. The same plants that grow on the old roadbed grow on the sides and top of the dike. The top of the dike is also relatively flat and approximately 14' wide (edge to edge) its entire length. As the dike curves into an open meadow, it loses definition and merges into the natural land contours. The dike ends at the eastern edge of the Lake Elmer Thomas boat launch parking lot.

The boat launch access road measures 21' wide. The drainage ditch on the east side of the access road to the line of boulders measures 18' wide. The drainage ditch on the west side of the access road to the line of boulders measures 18' wide. The disturbed area north of the boat launch parking area measures 4' wide at the narrowest point to the boulders, and the existing lakeside trail measures 10' wide (and 6' to 8' wide on the north end). The dike sheds water into the surrounding landscape and shows little to no evidence of erosion. At the boat launch, drainage is managed with borrow pit ditches adjacent to the paved areas.

PLANNED USE

Once the Refuge markets use of this public facility, visitation will increase. Opening the Medicine Park Museum of Natural Science and establishing access into Fort Sill/LETRA will also increase visitation on the facility.

Segment 3 is primarily intended to serve youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists. Given the design strategies and planned use for Segment 2 that would encourage faster bicyclists to use other facilities, planned use for Segment 3 includes only the target audiences who may be exploring Refuge resources on foot, by bicycle, or by

wheelchair.

DESIGN OPTIONS

All design options for Segment 3 include these attributes:

- Provide visitors with wildlife viewing and natural, historic, and cultural resources engagement opportunities.
- Cater to target audiences: youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists.
- Improve opportunities for non-motorized access, providing an increase in the Refuge's green infrastructure.
- Provide attractive trail conditions by being sited away from main motor-vehicle routes.

A thorough review of Refuge management goals, existing conditions, adjacent infrastructure, planned use, and public opinion narrowed potential design options into two categories – Surfacing and Trail Width. The two alignment options are also compared. Proposed amenities include resting areas with benches and nature play area(s).

Surfacing

The two surfacing types being considered for Segment 3 are crushed gravel and asphalt. Each surfacing type has unique maintenance needs, described below.

- Crushed gravel
  Maintain twice annually (twice per year, trail-edge mowing; once per year, surface replenishment; once per year, apply herbicide). Every two years add gravel and compact trail.

- Asphalt
  Using a local rock source for this surfacing type can improve its aesthetic integration into the landscape, and using highly reflective materials can also lessen heat absorption. Maintain every 3-5 years.

The following advantages apply to both crushed gravel and asphalt trail surfacing. The attached matrix compares advantages that differ among these trail surfacing types.

ADVANTAGES

- Firm and stable surface reinforces accessibility.
- Minimizes trail tread obstructions.

Width

The following advantages apply to all trail widths. The attached matrix compares advantages that differ among widths.

- 8' wide.
- 10' wide.
- 12' wide.

ADVANTAGES

- Maintains facility in existing right-of-way.
- Allows for a mix of target audience bicyclists and pedestrians on the trail.

Alignment

The following advantages apply to both alignment options. The attached matrix compares advantages that differ between the alignments.

- Option A
  This option would route non-motorized trail users along the Lake Elmer Thomas boat launch parking lot access road, triggering a need to consider Separation and Shared Use between motorists and non-motorized trail users as described in Segment 2.

- Option B
  This option would route users along established non-motorized trail areas. Some habitat would be disturbed to achieve accessible trail grades between the top and bottom of the boat launch ramp.

  ADVANTAGES
  - Allows for stormwater management and/or infiltration, depending on surface type.
  - Maintains viewsheds and access.
  - Provides safe shared use among non-motorized trail users.
  - Encourages motor-vehicle speeds of 20 m.p.h. or slower in the area where the planned trail intersects with the Lake Elmer Thomas boat launch and fishing pier.

Amenities

The following advantages apply to both alignment options. The attached matrix compares advantages that differ between the alignments.

- Add resting areas with benches.
  Furniture and design for these amenities could blend into the surrounding environment.

  ADVANTAGES
  - Modest implementation cost.
  - Minimal long-term maintenance cost.
  - Enhances facility accessibility.
  - Provides space for trail users to exit the trail to facilitate: passing by faster non-motorized trail users and motor vehicles, quality observation experiences, and social encounters.
  - Contributes to WMWR's accessible facility offerings.

- Add nature play areas.
  The purpose of nature play areas is to provide children and youth with unstructured, nature-based play and that effectively bonds them to the natural world. These experiences have a powerful influence on the development of life-long conservation values.

Nature play areas require little to no improvement of the natural environment. Properly siting these areas leads to their success more than what materials might be available. However, a nature play area could be designed to include some rocks or large boulders, logs, or by trimming trees that may already be on the ground. Nature play areas could have some infrastructure and might include areas delineated by rocks or sitting areas where parents can watch their children play.

Some examples of nature play include: catching a grasshopper, following ant trails, gazing at the clouds, balancing on a log, finding a feather, taking a picture of a deer, and jumping from rock to rock, to name only a few.

Nature play areas could be used in conjunction with resting areas with benches. Not every resting area that would improve trail accessibility would necessarily be a good nature play area, but some consideration should be given to siting resting areas in places that lend themselves to nature play.

ADVANTAGES

- Allows stormwater infiltration.
- Maintains viewsheds and access.
- Minimal to no facility footprint.
- Potentially sited within existing roadbed.
- Provides dedicated places that encourage children and youth to engage natural resources.
- Improves space for all trail users to exit the trail to facilitate: passing by faster non-motorized trail users, quality observation experiences, and social encounters.
- Provides dedicated facilities for children and youth.
- Provides a facility that is safe and enjoyable to use for non-motorized trail users.
- Modest implementation cost, depends on if or what kinds of materials may be brought in.
- Minimal long-term maintenance cost.

Segment 3: Gateway arch to Lake Elmer Thomas fishing pier: SURFACING OPTIONS

Comparing different trail surfacing options, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN			
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	Crushed Gravel	Asphalt	Notes
Advantages			
Lessens heat absorption through reflective surfacing.	5	1	
Provides for stormwater infiltration.	5	1	
Integrates aesthetically into the surrounding environment.	5	1	
Lessens noise from trail use.	1	5	
Lessens dust from trail use.	1	5	
Subtotal	*17*	*13*	
WILDLIFE OBSERVATION EXPERIENCE			
FACTOR 2 – Encourage wildlife and resource discovery through facility design	Crushed Gravel	Asphalt	
Advantages			
Encourages families with children to observe wildlife while using bicycles.	1	5	
Allows people using wheelchairs, canes, or other mobility aids to use the facility easily.	1	5	
Subtotal	*2*	*10*	
SAFETY			
FACTOR 3 – Protect public safety, health, and welfare	Crushed Gravel	Asphalt	
Advantages			
Provides for safe shared use among all non-motorized trail users.	1	5	
Profides safe, enjoyable, and comfortable use of the facility for all trail users.	1	5	
Subtotal	*2*	*10*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS			
FACTOR 4 – Other advantages, such as facility maintenance	Crushed Gravel	Asphalt	
Advantages			
Least cost materials implementation.	5	1	
Least cost long-term maintenance.	1	5	
Subtotal	*6*	*6*	

GRAND TOTAL	***27***	***39***	

Segment 3: Gateway arch to Lake Elmer Thomas fishing pier: TRAIL WIDTH

Comparing different trail widths, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN				
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	8' wide	10' wide	12' wide	Notes
Advantages				
Smallest facility footprint.	5	3	1	
Provides for stormwater infiltration.	5	3	1	Depends on surfacing type.
Subtotal	*10*	*6*	*2*	
WILDLIFE OBSERVATION EXPERIENCE				
FACTOR 2 – Encourage wildlife and resource discovery through facility design	8' wide	10' wide	12' wide	
Advantages				
Provides sufficent space for all trail users to have a quality observation experience.	1	5	5	
Subtotal	*1*	*5*	*5*	
SAFETY				
FACTOR 3 – Protect public safety, health, and welfare	8' wide	10' wide	12' wide	
Advantages				
Eliminates conflicts among target audience trail users.	0	5	5	
Provides for anticipated non-motorized visitation.	1	5	5	
Eliminates conflicts between non-motorized trail users and motor vehicles in the areas where the planned trail intersects with the Lake Elmer Thomas boat launch, access road, and fishing pier.	1	5	5	Depends on motor-vehicle volumes and separation option for non-motorized trail users.
Profides safe, enjoyable, and comfortable use of the facility for all trail users.				
Subtotal	*2*	*15*	*15*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS				
FACTOR 4 – Other advantages, such as facility maintenance	8' wide	10' wide	12' wide	
Advantages				
Least cost materials implementation.	5	3	1	
Allows for Refuge, maintenance, and emergency vehicle access.	0	5	5	
Subtotal	*5*	*8*	*6*	

GRAND TOTAL	***18***	***34***	***28***	

Segment 3: Gateway arch to Lake Elmer Thomas fishing pier: ALIGNMENT OPTIONS

Comparing different trail alignment options, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

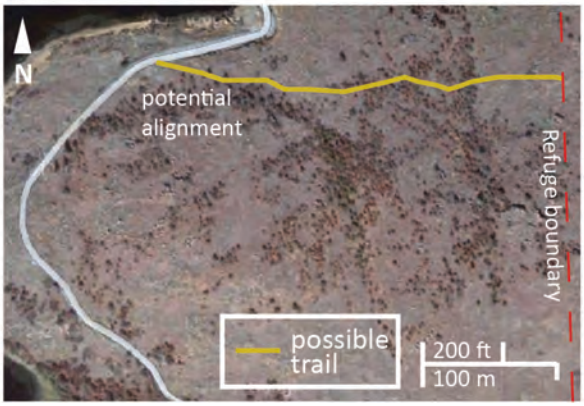
ENVIRONMENTALLY SENSITIVE DESIGN			
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	Option A	Option B	Notes
Advantages			
Remains within existing facility footprint or existing disturbed area.	5	1	
Subtotal	*5*	*1*	
WILDLIFE OBSERVATION EXPERIENCE			
FACTOR 2 – Encourage wildlife and resource discovery through facility design	Option A	Option B	
Advantages			
Follows routes where people want to go.	1	5	
Meets children's and other target audiences needs for safe and enjoyable use of the facility.	1	5	Depends on trail width, motor-vehicle volumes and separation.
Provides facilities accessible to people who use mobility aids.	3	3	Depends on trail width, motor-vehicle volumes and separation.
Subtotal	*5*	*13*	
SAFETY			
FACTOR 3 – Protect public safety, health, and welfare	Option A	Option B	
Advantages			
Provides safe shared use between motor vehicles and non-motorized trail users.	1	5	Depends on motor-vehicle volumes, speeds, and separation.
Profides safe, enjoyable, and comfortable use of the facility for all users.	1	5	Depends on facility design and separation of uses.
Subtotal	*2*	*10*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS			
FACTOR 4 – Other advantages, such as facility maintenance	Option A	Option B	
Advantages			
Least cost materials implementation.	5	1	Option B may require more materials.
Subtotal	*5*	*1*	

GRAND TOTAL	***17***	***25***	

SEGMENT 4
Medicine Park Museum Spur

EXISTING CONDITIONS

This proposed trail segment will be approximately .25-mile long and cross undisturbed habitat, which includes the edges of black-capped vireo nesting habitat, the Refuge's endangered bird species. The proposed spur trail will meet a planned trail from the Medicine Park Museum of Natural Science at the Refuge boundary fence and traverse the rocky hillside to a point where it will meet Segment 1 south of Lake Elmer Thomas dam.



This proposed spur trail will cross rocky terrain with outcroppings and shallow soil. The general area of the trail will traverse the hillside, allowing for natural water drainage. Trail alignment will follow areas with least disturbance to black-capped vireo habitat and will meet accessible trail design guidelines.

PLANNED USE

As the link between the Museum and the Refuge's connecting trail from LETRA, this proposed spur will provide opportunities for visitors to access, appreciate, and engage natural resources. The proposed spur trail will provide access to these natural resource education opportunities for people who use mobility aids and for all other target audiences (youth, families with children, active seniors/retirees, and casual recreationalists).

Once the Medicine Park Museum opens, the Refuge could likely experience increased interest in non-motorized activities. Marketing a connecting trail between the Refuge and Museum will also increase visitation on the facility. Any non-motorized trail use between the Refuge and LETRA could also increase visitation to this spur trail, particularly if both LETRA and the Museum include some form of bike sharing system.

Anticipated use includes walkers, runners, and casual bicycle riders (families with children on bicycles) with more emphasis on pedestrian modes. A trail that accommodates bicycle riders in addition to people using mobility aids, walkers, and runners requires more width than a pedestrian-only trail, and this trail segment should be designed to provide for the safety of all trail users.

DESIGN OPTIONS

All design options for Segment 4 include these advantages:

- Provide visitors with wildlife viewing and natural resources engagement opportunities.
- Cater to target audiences: youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists.
- Improve opportunities for non-motorized connections between the Refuge and the Medicine Park Museum of Natural Science, providing an increase in the Refuge's green infrastructure.
- Provide attractive trail conditions by being sited away from main motor-vehicle routes.

A thorough review of Refuge management goals, existing conditions, adjacent infrastructure, planned use, and public opinion narrowed potential design options into two categories – Surfacing and Trail Width. Proposed amenities include resting areas with benches and nature play area(s).

Surfacing

The two surfacing types being considered for Segment 4 are crushed gravel and asphalt. Each surfacing type has unique maintenance needs, described below.

- Crushed gravel
  Maintain twice annually (twice per year, trail-edge mowing; once per year, surface replenishment; once per year, apply herbicide). Every two years add gravel and compact trail.

- Asphalt
  Using a local rock source for this surfacing type can improve its aesthetic integration into the landscape, and using highly reflective materials can also lessen heat absorption. Maintain every 3-5 years.

The following advantages apply to both crushed gravel and asphalt trail surfacing. The attached matrix compares advantages that differ among these trail surfacing types.

ADVANTAGES
- Firm and stable surface reinforces accessibility.
- Minimizes trail tread obstructions.

Width

The following advantages apply to both trail widths. The attached matrix compares advantages that differ among widths.

- 8’ wide.
- 10’ wide.

ADVANTAGES
- Maintains facility in existing right-of-way.
- Allows for a mix of target audience bicyclists and pedestrians on the trail.

Amenities

The following advantages apply to both alignment options. The attached matrix compares advantages that differ between the alignments.

- Add resting areas with benches.
  Furniture and design for these amenities could blend into the surrounding environment.

ADVANTAGES
- Modest implementation cost.
- Minimal long-term maintenance cost.
- Enhances facility accessibility.
- Provides space for trail users to exit the trail to facilitate: passing by faster non-motorized trail users and motor vehicles, quality observation experiences, and social encounters.
- Contributes to WMWR’s accessible facility offerings.

- Add nature play areas.
  See Segment 3 for a description of nature play areas.

  ADVANTAGES
  - Allows stormwater infiltration.
  - Maintains viewsheds and access.
  - Minimal to no facility footprint.
  - Potentially sited within existing roadbed.
  - Provides dedicated places that encourage children and youth to engage natural resources.
  - Improves space for all trail users to exit the trail to facilitate: passing by faster non-motorized trail users, quality observation experiences, and social encounters.
  - Provides dedicated facilities for children and youth.
  - Provides a facility that is safe and enjoyable to use for non-motorized trail users.
  - Modest implementation cost, depends on if or what kinds of materials may be brought in.
  - Minimal long-term maintenance cost.

Segment 4: Proposed spur trail Medicine Park Museum

SURFACING OPTIONS

Comparing different trail surfacing options, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN			
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	Crushed Gravel	Asphalt	Notes
Advantages			
Minimizes heat absorption through reflective surfacing.	5	1	
Provides for stormwater infiltration.	5	1	
Integrates aesthetically into the surrounding environment.	5	1	
Lessens noise from trail use.	1	5	
Lessens dust from trail use.	1	5	
Subtotal	*17*	*13*	
WILDLIFE OBSERVATION EXPERIENCE			
FACTOR 2 – Encourage wildlife and resource discovery through facility design	Crushed Gravel	Asphalt	
Advantages			
Encourages families with children to observe wildlife while using bicycles.	1	5	
Encourages families using strollers to observe wildlife.	1	5	
Allows people using wheelchairs, canes, or other mobility aids to use the facility easily.	1	5	
Subtotal	*3*	*15*	
SAFETY			
FACTOR 3 – Protect public safety, health, and welfare	Crushed Gravel	Asphalt	
Advantages			
Provides for safe shared use among all non-motorized trail users.	1	5	
Provides for accessible use with firm and stable surface.	1	5	
Minimizes trail tread obstructions.	1	5	
Profides safe, enjoyable, and comfortable use of the facility for all trail users.	1	5	
Subtotal	*4*	*20*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS			
FACTOR 4 – Other advantages, such as facility maintenance	Crushed Gravel	Asphalt	
Advantages			
Least cost materials implementation.	5	1	
Least cost long-term maintenance.	1	5	
Subtotal	*6*	*6*	

GRAND TOTAL	***30***	***54***	

Segment 4: Proposed spur trail Medicine Park Museum

TRAIL WIDTH OPTIONS

Comparing different trail widths, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

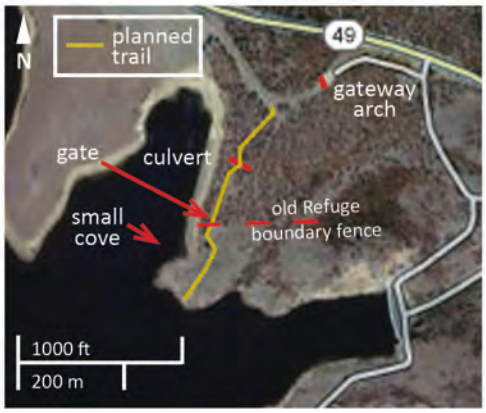
ENVIRONMENTALLY SENSITIVE DESIGN			
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	8' wide	10' wide	Notes
Advantages			
Smallest facility footprint.	5	1	
Provides for stormwater infiltration.	5	1	Depends on surfacing type.
Subtotal	*10*	*2*	
WILDLIFE OBSERVATION EXPERIENCE			
FACTOR 2 – Encourage wildlife and resource discovery through facility design	8' wide	10' wide	
Advantages			
Provides sufficent space for all trail users to have a quality observation experience.	1	5	
Subtotal	*1*	*5*	
SAFETY			
FACTOR 3 – Protect public safety, health, and welfare	8' wide	10' wide	
Advantages			
Allows for a mix of target audience bicyclists and pedestrians on the trail.	1	5	
Provides for anticipated non-motorized visitation.	1	5	
Profides safe, enjoyable, and comfortable use of the facility for all trail users.	1	5	
Subtotal	*3*	*15*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS			
FACTOR 4 – Other advantages, such as facility maintenance	8' wide	10' wide	
Advantages			
Allows for Refuge, maintenance, and emergency vehicle access.	1	5	
Subtotal	*1*	*5*	

GRAND TOTAL	***15***	***27***	

SEGMENT 5
Spur Trail Segment to Accessible Viewpoints

EXISTING CONDITIONS

This segment follows old roadbed that has a 20'-wide crushed gravel surface and that has been revegetated. The surface appears to drain well, and an existing culvert drains water across the roadbed. The planned spur begins where the old roadbed on Segment 3 intersects the Lake Elmer Thomas dike. From this intersection, the spur trail heads south along the western side of the point. The trail approaches a small cove with panoramic views of Mt. Scott. From the cove, the trail crosses through a gate at the old Refuge boundary fence and continues across an open area to the end of the point. The trail receives occasional foot traffic.



This site was originally developed as a Forest Service camping and picnicking area, and while the facilities have been removed, widened areas along the trail with rock walls and water drainage structures still exist. Along with the remnant Forest Service facilities, this area of Lake Elmer Thomas possesses archaeological resources, including American Indian campsites and Civilian Conservation Corps campsites.

In addition to the cultural and historic resources in the area, this out-and-back spur trail meets a need for an accessible destination where visitors may fish, observe wildlife, take photographs, and appreciate the Refuge's natural resources. The small cove offers waterfowl observation opportunities, and large mammals, reptiles, insects, songbirds, and blooming plants populate the area.

PLANNED USE

Once the Refuge markets use of this public facility, visitation will increase. Opening the Medicine Park Museum of Natural Science and establishing access into Fort Sill/LETRA will also increase visitation on the facility.

Segment 5 is primarily intended to serve youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists. Anticipated use includes walkers, runners, and casual bicycle riders (families with children on bicycles). A trail that accommodates bicycle riders in addition to people using mobility aids, walkers, and runners requires more width than a pedestrian-only trail, and this trail segment should be designed to provide for the safety of all trail users.

This trail segment offers considerably more opportunity for visitors to spend some time in the area. As an out-and-back destination, the trail could meet the needs of children and youth for nature play experiences while providing areas for parents, people with mobility challenges, and active seniors or retirees to enjoy the scenery, fish, watch birds, take pictures, and supervise young explorers.

To encourage leisure time along this trail, infrastructure that supports this pace should be considered, including benches and/or picnic tables, interpretive panels, shade structures, and bicycle parking. Infrastructure may already exist in the natural environment, such as trees that provide shady areas and

rocks that could be used to lean bicycles against for parking. In the absence of such natural features, organizing the space with designated areas (i.e., bicycle parking and sitting) to encourage responsible visitor use will help maintain environmental quality.

DESIGN OPTIONS

All design options for Segment 5 include these attributes:

- Provide visitors with wildlife viewing and natural resources engagement opportunities.
- Cater to target audiences: youth, families with children, people who use mobility aids, active seniors/retirees, and casual recreationalists.
- Improve opportunities for non-motorized wildlife-dependent recreational experiences, providing an increase in the Refuge's green infrastructure.
- Provide attractive trail conditions by being sited away from main motor-vehicle routes.

A thorough review of Refuge management goals, existing conditions, adjacent infrastructure, planned use, and public opinion narrowed potential design options into two categories – Surfacing and Trail Width. Proposed amenities include resting areas with benches, nature play areas, and bicycle parking.

Surfacing

The two surfacing types being considered for Segment 5 are crushed gravel and asphalt. Each surfacing type has unique maintenance needs, described below.

- Crushed gravel
  Maintain twice annually (twice per year, trail-edge mowing; once per year, surface replenishment; once per year, apply herbicide). Every two years add gravel and compact trail.

- Asphalt
  Using a local rock source for this surfacing type can improve its aesthetic integration into the landscape, and using highly reflective materials can also lessen heat absorption. Maintain every 3-5 years.

The following advantages apply to both crushed gravel and asphalt trail surfacing. The attached matrix compares advantages that differ among these trail surfacing types.

ADVANTAGES

- Firm and stable surface reinforces accessibility.
- Minimizes trail tread obstructions.

Width

The following advantages apply to the three trail widths. The attached matrix compares advantages that differ among widths.

- 6' wide.
- 8' wide.
- 10' wide.

ADVANTAGES

- Maintains facility in existing right-of-way.
- Allows for a mix of target audience bicyclists and pedestrians on the trail.

Amenities

- Add resting areas with benches.
  Furniture and design for these amenities could blend into the surrounding environment.

  ADVANTAGES
  - Modest implementation cost.
  - Minimal long-term maintenance cost.
  - Enhances facility accessibility.
  - Provides space for trail users to exit the trail to facilitate: passing by faster non-motorized trail users and motor vehicles, quality observation experiences, and social encounters.
  - Contributes to WMWR's accessible facility offerings.

- Add nature play areas.
  See Segment 3 for a description of nature play areas.

  ADVANTAGES
  - Allows stormwater infiltration.
  - Maintains viewsheds and access.
  - Minimal to no facility footprint.
  - Potentially sited within existing roadbed.
  - Provides dedicated places that encourage children and youth to engage natural resources.
  - Improves space for all trail users to exit the trail to facilitate: passing by faster non-motorized trail users, quality observation experiences, and social encounters.
  - Provides dedicated facilities for children and youth.
  - Provides a facility that is safe and enjoyable to use for non-motorized trail users.
  - Modest implementation cost, depends on if or what kinds of materials may be brought in.
  - Minimal long-term maintenance cost.

- Add bicycle parking.
  As described in Design Options above, visitors who choose to linger in this area will need somewhere to park bicycles, if they arrive on bike. A short destination from the Lake Elmer Thomas fishing pier parking lot, this spur trail could attract families with children, many of whom may enjoy bicycling from the parking lot to the point.

  Without designated parking, people may leave bicycles wherever they can find room. Unmanaged bicycle parking could adversely affect habitat, pose safety hazards to other trail users, and congest otherwise usable visitor spaces.

  Well-designed bicycle parking could blend in with the surrounding natural environment and be multi-purpose. For example, bicycle parking in shady areas will ensure that bicycles do not become too hot to ride while visitors enjoy the destination opportunities along this spur trail. Designated parking areas will also prevent people from parking bicycles where they interfere with accessibility needs; however, bench design might include bicycle parking behind the benches.

  ADVANTAGES
  - Allows stormwater infiltration, depending on design and installation.
  - Minimal facility footprint.
  - Potentially sited within existing roadbed.

- Manages and organizes bicycle use and short-term storage.
- Improves trail space and safety for all users.
- Modest implementation cost, depends on design and materials.
- Minimal long-term maintenance cost.

Segment 5: Proposed spur trail to accessible viewpoints

SURFACING OPTIONS

Comparing different trail surfacing options, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN			
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	Crushed Gravel	Asphalt	Notes
Advantages			
Minimizes heat absorption through reflective surfacing.	5	1	
Provides for stormwater infiltration.	5	1	
Integrates aesthetically into the surrounding environment.	5	1	
Lessens noise from trail use.	1	5	
Lessens dust from trail use.	1	5	
Subtotal	*17*	*13*	
WILDLIFE OBSERVATION EXPERIENCE			
FACTOR 2 – Encourage wildlife and resource discovery through facility design	Crushed Gravel	Asphalt	
Advantages			
Encourages families with children to observe wildlife while using bicycles.	1	5	
Encourages families using strollers to observe wildlife.	1	5	
Allows people using wheelchairs, canes, or other mobility aids to use the facility easily.	1	5	
Subtotal	*3*	*15*	
SAFETY			
FACTOR 3 – Protect public safety, health, and welfare	Crushed Gravel	Asphalt	
Advantages			
Provides for safe shared use among all non-motorized trail users.	1	5	
Provides for accessible use with firm and stable surface.	1	5	
Minimizes trail tread obstructions.	1	5	
Profides safe, enjoyable, and comfortable use of the facility for all trail users.	1	5	
Subtotal	*4*	*20*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS			
FACTOR 4 – Other advantages, such as facility maintenance	Crushed Gravel	Asphalt	
Advantages			
Least cost materials implementation.	5	1	
Least cost long-term maintenance.	1	5	
Subtotal	*6*	*6*	

GRAND TOTAL	***30***	***54***	

Segment 5: Proposed spur trail to accessible viewpoints
TRAIL WIDTH OPTIONS

Comparing different trail widths, rate how each option meets the advantages from a scale of 1 (least) to 5 (most), and 0 (not applicable).

ENVIRONMENTALLY SENSITIVE DESIGN				
FACTOR 1 – Prevent resource loss and maintain or improve conditions of resources	6' wide	8' wide	10' wide	Notes
Advantages				
Smallest facility footprint.	5	3	1	
Provides for stormwater infiltration.	5	3	1	Depends on surfacing type.
Subtotal	*10*	*6*	*2*	
WILDLIFE OBSERVATION EXPERIENCE				
FACTOR 2 – Encourage wildlife and resource discovery through facility design	6' wide	8' wide	10' wide	
Advantages				
Provides sufficent space for all trail users to have a quality observation experience.	1	3	5	
Subtotal	*1*	*3*	*5*	
SAFETY				
FACTOR 3 – Protect public safety, health, and welfare	6' wide	8' wide	10' wide	
Advantages				
Allows for a mix of target audience bicyclists and pedestrians on the trail.	0	1	5	
Provides for anticipated non-motorized visitation.	0	1	5	
Profides safe, enjoyable, and comfortable use of the facility for all trail users.	1	3	5	
Subtotal	*1*	*5*	*15*	
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR FWS				
FACTOR 4 – Other advantages, such as facility maintenance	6' wide	8' wide	10' wide	
Advantages				
Allows for Refuge, maintenance, and emergency vehicle access.	0	1	5	
Subtotal	*0*	*1*	*5*	

GRAND TOTAL	***12***	***15***	***27***	

Jed Johnson Tower Trail with proposed alignment

green line = proposed alignment
yellowish line = existing alignment
North is to the top of the page

APPENDIX A: Outreach Results

Executive Summary

Public outreach to develop bicycling, walking, and accessible trails at Wichita Mountains Wildlife Refuge occurred principally during late October through mid-November 2012. Outreach activities introduced target trail audiences to planned trails and collected input on trail design preferences. Target trail audiences include families with children, youth, people with physical disabilities, active seniors/retirees, and casual recreationalists.

Findings from the outreach process indicate that target trail users prefer paths separated from motor vehicle traffic by a barrier or by a distance from the road 10 feet or greater. Outreach participants most prefer natural or asphalt surfacing, and their preferred trail widths vary depending on activity. Overall, natural surface walking trails 6-feet wide or narrower and shared use asphalt trails approximately 10-feet wide would meet most target audiences' needs for non-motorized transportation options on the Refuge.

In addition to the trails themselves, target audiences seek a variety of support facilities or services to enhance their experiences on the Refuge. Safety is a key factor in target audiences' interest in using trails. Visitors want to be safe from motor vehicles and large mammals. They also need to know how or where to recruit help for emergencies. Trailhead facilities and services such as restrooms, information, shade, and water all enhance the experience. Presence of these facilities could make the difference for visitors choosing to stop at one location over another without them. Target visitors would like their wildlife-dependent recreational activities to have a social dimension, and trails should have enough room for visitors to recreate side by side. Variety makes for a dynamic, engaging environment rich with opportunity to explore and discover. Trail experiences that change and include different habitat types encourage visitors to rediscover a trail during every visit. Nature play areas located along trails enhance trail safety and provide places for children and youth to discover the Refuge's treasures.

While youth and people who use wheelchairs prefer somewhat different facilities or services than all outreach participants, these other interests are reflected in the overall summary findings. In short, facilities that provide varied experiences and that are designed with youth and people who use wheelchairs in mind will meet the public's expectation of safe and enjoyable trail experiences that provide opportunities to engage in wildlife-dependent recreation.

Figure 1 reflects an aggregated total preference for shared use or separation from motor vehicle traffic without distinguishing among different activities. All activities rated similarly in the proportion of preference they received across activities. Table 2 shows the differences among activities in this category, and discussion of these results occurs in the "Analysis" section under "Shared Use and Separation."

Figure 2 and 3 reflect data aggregated for all activities for surfacing type and trail width. In these figures, preferences for wheelchair use reflect all responses for wheelchair use as represented in Table 2.

Figure 2: Trail Surfacing Preferences

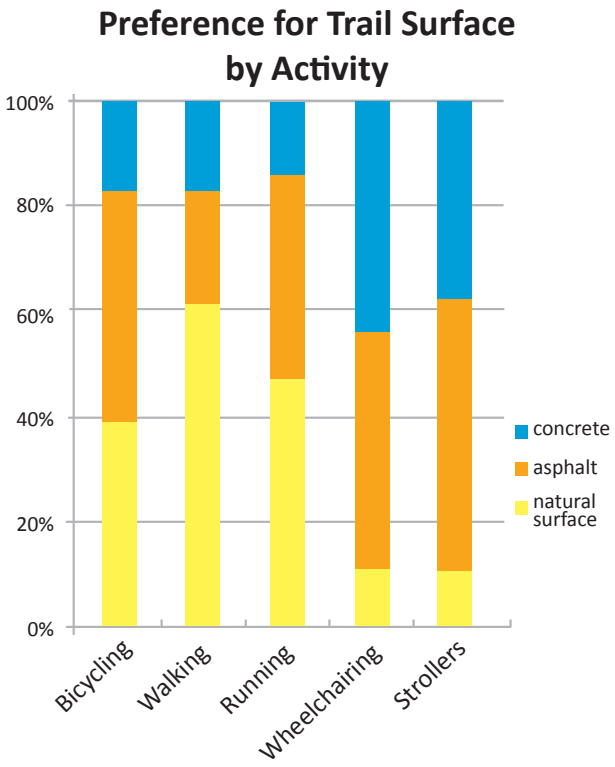


Figure 1: Averaged Preference for Shared Use or Separation from Motor Vehicles for All Activities

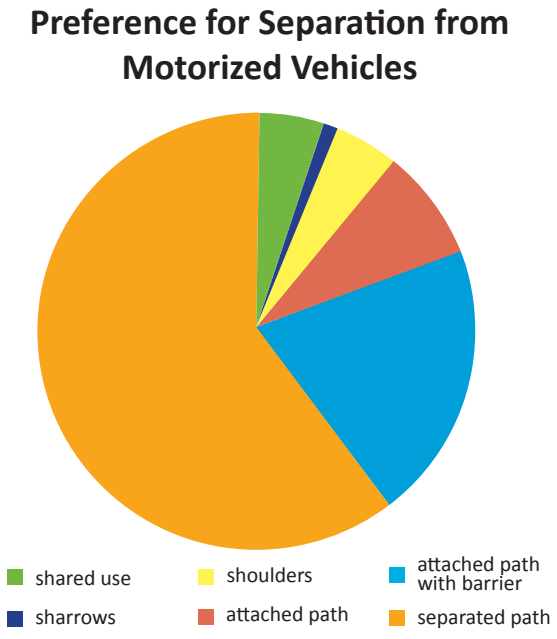
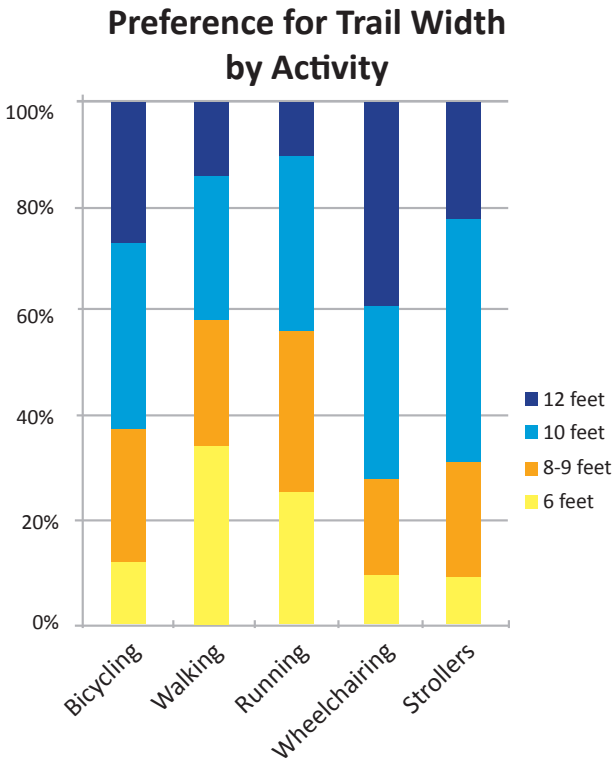


Figure 3: Trail Width Preferences



Appendix E: Issues and Possible Solutions Data

Problem	Possible Solutions	How Addressed
Motor-vehicle speeding	• Design and/or maintain roads for slower speeds (narrow total road width, narrow travel lanes, curves, short sight distance, mixed modes, parked vehicles, no roadside "clear zone", add roadside obstacles). • Increase ticketing and/or fines for speeding.	• Trail design – in places where motorized and non-motorized trail users mix – maintaining narrow motor-vehicle travel lanes.
Wildlife collisions and fatalities	• Design and/or maintain roads for slower speeds (narrow total road width, narrow travel lanes, curves, short sight distance, mixed modes, parked vehicles, no roadside "clear zone", add roadside obstacles). • Increase ticketing and/or fines for animal-vehicle collisions. • Install sign that totals wildlife kills and injuries to raise road user awareness. • Track number and location of wildlife collisions and injuries to identify hot spots and potential areas to consider wildlife crossings and/or road redesign. • Reduce posted speed limit. • Educate Refuge staff on wildlife safe road design and principles.	Not an issue for LETRA connection and Jed Johnson Tower trails. • For Meers Road trail, consider maintaining narrow, windy road character with no roadside "clear zone". • For Meers Road trail, consider adding sharrows to the road to increase awareness of shared use and to increase non-motorized users safety/comfort on the road. • Encouraged Refuge law enforcement wildlife collision and fatality data collection to include hit locations (along with type of animal, severity of collision, date, and time of collision).
Parking congestion	• Redistribute parking to less heavily used areas. • Close parking areas when they become full. • Encourage people to visit (areas that can get congested) on less busy days or at less busy times of day. • Encourage visitors to travel to areas with congested parking using other travel modes (bicycling, walking, car pooling, or transit). • Increase ticketing and/or fines for parking infractions. • Post information regarding potential ticketing for parking off road or in non-designated areas. (Ticketing information should be posted at visitor points of origin – online, at lodging establishments, visitor center, etc.)	Not particularly an issue for the east side trail projects. • A large, under-used parking lot at the Lake Elmer Thomas fishing pier was identified as the primary trailhead for visitors wishing to access the new trails from within the Refuge.
Habitat degradation	• Educate visitors about roadside and trailside habitat degradation and invasive vegetation. • Ticket vehicles parked on habitat, provide information on habitat degradation and invasive vegetation with ticketing. • Use volunteers to help monitor and re-direct parking during busy times.	• Designing and aligning trails along previously disturbed areas. • Routing trails to places people want to go (limit trail braiding and desire lines). • Recommending complementary programmatic

Problem	Possible Solutions	How Addressed
	• Conduct volunteer invasive vegetation removal projects along roadsides and trailsides. • Design and/or maintain roads and trails to cause least habitat disturbance possible and to encourage road and trail users to stay on/within designated visitor facilities.	activities, such as information and education, provided and delivered to visitors.
Pollution	• Reduce pollution from motorized vehicles: reduce length of time people drive on the Refuge; reduce length of time motor vehicles idle on the Refuge. • Increase non-motorized travel options for visitors and Refuge staff onto and within the Refuge. • Consider stormwater management strategies that retain and filter road, parking lot, and trail runoff. • Use natural or locally sourced materials in facility construction.	• Increasing and promoting options for visitors to explore the Refuge using non-motorized modes. • Recommending stormwater management strategies in facility designs. • Recommending natural and locally sourced materials in facility construction.
Limited pullouts for wildlife viewing	• Encourage visitors to park at trailheads and view wildlife from trails. • Provide attractive and compelling facilities for out-of-automobile wildlife viewing that visitors feel safe and comfortable using. • Complement trail viewing with a Trail Ambassador program to enhance visitor safety and comfort. • Development of wildlife viewing guides for "East side trails for walking or bicycling" that focus on birds, reptiles, invertebrates, flowers, plants, tracks, scat, "nests" (places where these animals live), and fish (could also include rocks and clouds to round out the ecological picture).	• Increasing and promoting options for visitors to explore the Refuge using non-motorized modes. • Recommending complementary programmatic activities, such as information, interpretation, and education, provided and delivered to visitors. • Reinforcing the wide variety of wildlife on the Refuge, most of which are best seen on foot, by bike, or otherwise outside of an automobile.
Blind curves	*The problems with blind curves are related to other problems: motor-vehicle speeding, wildlife collisions and fatalities, and limited pullouts for wildlife viewing. In many respects, blind curves are possible design solutions for the above-stated problems. Blind curves are a problem when the goal is to move motor vehicles quickly and directly (without regard to scenic qualities of the landscape or terrain features). It might be worth considering if there are abrupt transitions before blind curves, which could create crash hot spots, or if there is a particular wildlife crossing that occurs at a blind curve or immediately before or after the curve. These studies are beyond the scope of the current project.*	*Blind curves are not addressed as a problem as part of the trail projects but could be addressed through the Road Safety Audit.*
High road maintenance	• Maintain existing facilities to reduce compounding road maintenance costs (drainage infrastructure, surface condition, crack sealing, etc.).	• Encouraging visitors to park once on the Refuge and explore the resources using bicycles, or pedestrian

Problem	Possible Solutions	How Addressed
costs	• Maintain exclusion of semi-truck traffic on Refuge roads. • Reduce the number, weight, and frequency of vehicles traveling Refuge roads. • Concentrate motor-vehicle use in the Refuge's high-density public use zones. • Encourage visitors to explore Refuge resources using bus/transit rather than driving.	means. • Providing attractive facilities for non-motorized travel that encourage visitors to explore the Refuge using non-motorized modes. • Encouraging visitors to park at sites off the Refuge and use non-motorized modes to explore Refuge resources. • Providing signage and marketing that informs visitors about these parking areas and non-motorized facilities and that highlight the opportunities to enjoy the Refuge in this way. • Maintaining planned trails – once built – to prolong their useful life and to minimize long-term maintenance costs.
Large carbon footprint	• Reduce carbon emissions from motorized vehicles: reduce length of time people drive on the Refuge; reduce length of time motor vehicles idle on the Refuge. • Implement a "No Idle" policy on the Refuge (for staff and visitors). • Provide attractive and compelling facilities for out-of-automobile wildlife viewing that visitors feel safe and comfortable using. • Increase transit, carpooling, and non-motorized travel options for visitors and Refuge staff onto and within the Refuge. • Provide designated non-motorized travel areas, such as bike lanes. • Use local materials for construction. • Use and plan for small transportation facility footprints. • Use fuel-efficient motor vehicles and travel strategies for Refuge business needs. • Locate visitor areas in proximity to one another.	• Increasing and promoting options for visitors to explore the Refuge using non-motorized modes. • Increasing non-motorized travel connectivity options on the east side. • Providing needed and conveniently spaced services, such as restrooms and water, on the east side along non-motorized travel routes. • Using local rock for construction.
No regional transportation coordination	• Work with National Scenic Byway Committee to consider improvements or enhancements in a broad/regional context. • Work with project partners, especially Fit Kids, to develop a coordinated regional trail system.	• Considering east side Refuge trail development as pilot projects for national scenic byway design strategies. • Discussing strategies to develop the National Scenic

Problem	Possible Solutions	How Addressed
	• Coordinate with MPO and Oklahoma Department of Transportation Commissioner about strategies to expand MPO boundary (or something similar). • Involve the tribes in regional transportation projects. • Coordinate with county government to initiate regional transportation planning.	Byway Committee and its capacity to support and enhance the Byway. • Coordinating with Fit Kids on different aspects of non-motorized travel options and trail development. • Maintaining project partnerships.
Auto-dependent development patterns	• Create opportunities for residents and visitors to access and explore the Refuge through non-motorized modes. • Improve interconnectivity of trails and facilities within the region. • Coordinate trail planning with other partners planning and building trails. • Close roads at certain times to motor vehicles but keep them open and accessible to people using non-motorized modes (such as the Mt. Scott road).	• Coordinating with Fit Kids, Fort Sill, Medicine Park Museum, Medicine Park, and City of Lawton Parks and Recreation on different aspects of non-motorized travel options and trail development. • Encouraging development of bicycling infrastructure and bicycle friendly practices within the region. • Recommending closure of the Lake Elmer Thomas dam road to public motor-vehicle access and creating a facility that prioritizes non-motorized modes for enjoying Refuge resources. • Establishing and maintaining partnerships.
Poor statewide health (sedentary lifestyles, obesity)	• Promote opportunities for people to be active outdoors. • Provide attractive and convenient facilities that people will use to be active outdoors. • Prescribe outdoor activity for wellness. • Establish, promote, and support groups of people who will engage in outdoor activities together. • Support outdoor activity events. • Develop institutional cultures at the Refuge and within the region that model healthy, active lifestyles.	• Promoting development of wildlife bicycle tours. • Developing trails for non-motorized use on the Refuge. • Connecting the Refuge's non-motorized trails to other non-motorized facilities outside the Refuge. • Modeling active lifestyle and supporting others' efforts to make active lifestyle changes. • Maintaining partnerships.
Disconnected public, especially youth	• Provide trail facilities that parents are comfortable using with their children or letting their children use alone. • Provide other visitor services and/or facilities that enhance visitor comfort and safety (such as toilets, water, shade, and emergency response).	• Partnering with Lawton Public Schools to gather input from students (elementary school through high school) on trail facilities and design. • Gathering input from parents and casual recreationalists on trail facilities and design.

Problem	Possible Solutions	How Addressed
	• Provide opportunities for all visitors to get out of motor vehicles and explore the Refuge through multiple senses and "feet on the ground". • Provide accessible, inclusive facilities. • Provide facilities and Refuge discovery opportunities that engage and are relevant to visitors of all ages. • Develop education programs and/or partnerships that empower youth to explain and share Refuge relevance with peers and broader audiences. • Develop partnerships with local schools and/or community youth organizations. • Market Refuge facilities and resources, underscoring relevance to the target audiences.	• Promoting trail design that offers an active, natural experience separated from motor-vehicle traffic. • Providing unstructured spaces (nature play) for youth to experience nature and the outdoors. • Promoting diverse wildlife experiences on the Refuge (birds, reptiles, plants, etc. and not just large mammals, which can be rather big, scary and make people feel "unsafe"). • Designing trails that people of all abilities can access.
Few accessible facilities	• Develop LETRA connection trail and Jed Johnson Tower trail as accessible trails (using ABA guidelines). • Improve accessibility of existing trails by providing information and signage at the trailheads. • Improve overall accessibility on the Refuge by providing information on the website about accessible facilities. • Follow AccessRecreation.org guidelines for providing trail information to people with disabilities. • Engage people with disabilities in Refuge projects and/or activities. • Market accessible facilities through partners, outreach, online, at conferences, and within the agency.	• Conducting outreach to people who use mobility aids. • Designing options for the Jed Johnson Tower trail to meet slope guidelines in the ABA. • Adding information to the LETRA connection and Jed Johnson Tower trails as specified in the Access Recreation guidelines. • Attending conferences and public events and sharing information about accessible trail design on the Refuge.
Overuse of the Wilderness Area	• Close attractive visitor service facilities at Wilderness Area trailhead and open similar facilities on the east side (i.e., picnicking areas, and toilets). • Close entry to Wilderness Area parking facilities after a set time in the morning (10 a.m. perhaps?). • Provide physically challenging hiking opportunities with vista rewards on the east side (Mt. Scott hiking trail). • Provide a variety of recreational experiences and challenges on the east side. • Provide all ages and all abilities facilities on the east side. • Encourage visitors to explore the east side (rather than directing them to the Wilderness Area).	• Including the Mt. Scott hiking trail in the new CCP. • Exploring parking strategies at the Wilderness Area with the ITS demonstration project and the Volpe project. • Supporting development of a mountain bike challenge park on City of Lawton property on the south side of Lake Lawtonka. • Developing a stacked loop trail system on the east side with adjacent partners that includes walking/hiking, wheelchairing, pushing strollers, running, and bicycling opportunities.

Problem	Possible Solutions	How Addressed
	• Provide access to recreational destinations (i.e., mountain bike challenge park, Medicine Park Museum, LETRA, Medicine Park businesses – lodging and eateries). • Develop a hiking trail up Mt. Scott. • Develop a mountain bike challenge park on City of Lawton Property accessed by the Lawtonka trails trailhead on the Refuge. • Direct visitors to parking and walking and bicycling opportunities accessed at the Lake Elmer Thomas fishing pier parking lot. • Conduct interpretive walks and bike rides (particularly for school programs) on the east side. • Develop self-guided discovery resources for the east side, including a birding guide, small wildlife guide, plants guide, and ecology guide. • Include nature play in east side trail design. • Develop a stacked loop trail system for the east side.	• Enhancing the Lake Elmer Thomas fishing pier trailhead. • Enhancing the Lake Lawtonka trails access and trailhead. • Recommending marketing strategies to alert visitors to the facilities and recreational opportunities on the east side. • Supporting Park Lane Elementary School bicycle safety and mountain biking skills classes on the Mt. Scott bike trail. • Developing an east side birding guide. • Designing trail facilities to include nature play.
Littering	• Add trash and recycling receptacles at trailheads. • Replace difficult to open and unattractive dumpsters with human-scale receptacles. • Provide information at trailheads that indicates where receptacles are and that underscores the importance of not littering. • Add cigarette butt cans (or “Feed the Cigarette Butt Monster” collectors) at trash areas with accompanying signage that “Butts are trash too.” • Organize youth stewardship programs in collaboration with area schools to teach the importance and relevance of conservation and wise resource use to youth. • Increase monitoring and ticketing for littering, including for cigarette butts. • Create reward program within Visitor Services or the Friends for youth visitors who collect trash from the Refuge. • Enlist supporting partners (such as mountain bikers, cyclists, groups, etc.) in Refuge stewardship litter collection and log volunteer hours and waste collected (weight, number, type).	• Enhancing east side trails to include wildlife-resistant, easy-to-open trash and recycling receptacles. • Adding information about littering and receptacle location to trailhead kiosks. • Conducting outreach with trail interest groups regarding littering.

Trails, bike paths seen as solution to challenges at refuge

By Mitch Meador
Staff writer
mmeador@lawton-constitution.com

Michael D. Pope/Staff

Heidi Beierle, a transportation scholar who has been working at the Wichita Mountains Wildlife Refuge for the past year, discusses three trail proposals for the east side of the refuge during a town hall here Thursday.

Transportation proposals and issues that have been in the planning stages for months were unveiled at a town hall Thursday on the proposed Comprehensive Alternative Transportation Plan for the Wichita Mountains Wildlife Refuge.

"The main thing is we want to make the refuge better. We want to make it to be a fun place for people to come and enjoy," Deputy Refuge Manager Ralph Bryant said.

One of 560 refuges in the National Wildlife Refuge System, its main mission is to preserve habitat for wildlife, he noted. The refuge draws 1.5 million visitors a year and sometimes close to 1.8 million, Bryant said. Visitors from 106 countries have come to see its splendors.

In trying to manage the visitation, U.S. Fish & Wildlife Service personnel have seen times where the refuge is almost overcrowded in some areas, Bryant said.

"We've been doing a lot of planning over the past five years, maybe six," he said, taking stock of the various stakeholders in the audience who have contributed their expertise and recommendations.

Heidi Beierle is a transportation scholar who has been working at the refuge for the past year. She said she is working on a three-pronged project, and approval of a $444,000 2012 Transit in the Parks grant from the Federal Transit Administration increases the odds that something will happen.

She covered several issues the transportation plan will attempt to address. These include speeding; a certain amount of parking congestion, particularly at Sunset Picnic Area, which can result in habitat degradation; littering; collisions with wildlife and wildlife fatalities; the fact Oklahoma ranks low in terms of its overall health, and youth who are disengaged from the natural world and their part in it.

Beierle showed a diagram of a stacked loop trail system. Under this concept, easy trails would be close to parking areas so that they would be more accessible to people with limited mobility. Trails would become progressively more difficult the farther you get from parking so that the most difficult, challenging trails would be the farthest away of all. The refuge already does something like this, but with a few missing pieces, she said.

Beierle is working on three trail proposals on the east side of the refuge that she said would be "open and flowing."

By that she means they would be for families with children, people using wheelchairs, active recreationists, active seniors and retirees, and people who have mobility challenges of one sort or another.

One would be the Lake Elmer Thomas Recreation Area (LETRA) Connection Trail that includes the historic gateway arch and lots of opportunities to view wildlife.

Another is the existing Jed Johnson Tower Trail, which would be improved to eliminate steep inclines so that it is wheelchair-accessible all the way to the tower.

The third is the proposed Meers Road Trail that would accommodate bicyclists and pedestrians as part of a tie-in to the work the Fit Kids Coalition is doing. At a previous town hall, Beierle asked how bicyclists and pedestrians feel about motorized vehicles in their vicinity, and they expressed a preference for having some type of barrier between them and traffic.

Beierle said she is now involved in a decision-making process with the refuge to narrow down design options before she goes on to the actual design phase.

In addition to what she's doing, the U.S. Department of Transportation Volpe Center has been working on a separate, four-lobe project that, like hers, came out of refuge management plans. Luis Mejias, a community planner with the Volpe Center, gave a recap of what he and Ben Rasmussen did in their 2010 transportation study on the Wichita Mountains Wildlife Refuge.

Mejias presented a PowerPoint slide with nine recommendations that came out of the study. Many were underlined to show that they are currently under way, while four others were highlighted to show they will be the focus of a new study to encourage alternative forms of transportation to and on the refuge. These were a traffic analysis study, wayfinding and signage, a pilot program to loan out bicycles and a transit shuttle study.

Mejias went over four project components that the Volpe Center is working on. One was a traffic study on roadway and parking data, plus an analysis of how visitors circulated about various sites while on the refuge, so as to establish a baseline for future studies.

The second was a multimodal alternatives analysis that examined transit, biking and hiking, and their possible effects on parking at the refuge.

The third was to produce a resource guide as a document the refuge could use to manage bicycling and walking between different sites on the refuge. It attempted to address safety for all visitors, planning for increases in bicycling and walking, wayfinding and marketing, cost and sources of funding.

The fourth was a transit study. It covered an analysis of transit routes, suitability of transit stops, how transit could be tied to other forms of transportation, financial considerations and opportunities.

City of Lawton Community Services Director Richard Rogalski, Dr. Ben Cooper of the Fit Kids Coalition, Park Lane Elementary School physical education teacher Ken Gray, Doug Kemper of the Medicine Park Aquarium and Natural Sciences Center, Chad Everett and City of Lawton Parks and Recreation Director Kim Shahan all offered their unique perspectives on what the refuge has to offer in terms of luring people to community, promoting mental and physical well-being and educating the next generation on the importance of good stewardship and conservation.

Town hall set on refuge transportation plan

Wichita Mountains Wildlife Refuge has embarked upon a new project — developing a comprehensive alternative transportation plan for the refuge.

The project kicks off Thursday from 5-6:30 p.m. at the Lawton City Hall auditorium lobby and builds upon:

- Recommendations from the 2010 alternative transportation study
- Completion of the refuge's comprehensive conservation plan process' and
- Trail plans developed by a 2012 public lands transportation scholar.

The project kickoff will inform participants about recent transportation-related activities on the refuge and will continue the momentum of recent transportation planning efforts. Results of the refuge's October and November 2012 outreach on trail design will be presented. The outreach results focus on bicycling and walking trail design for eastside refuge trails.

Input sought from participants extends the prior conversation about trails to transit and potential options for mixing bicyclists, pedestrians, buses and automobiles on refuge roads; bicycle sharing; and using parking or carpooling strategies.

Call Heidi Beierle, Wichita Mountains Wildlife Refuge transportation scholar, (580) 429-2118; or Luis Mejias, Volpe, transportation center community planner, (617) 494-2041.

THE LAWTON CONSTITUTION

THURSDAY, NOVEMBER 15, 2012 THE SOURCE FOR INFORMATION IN SOUTHWEST OKLAHOMA · www.swoknews.com 75 CENTS

Refuge seeks public input on expanded trail designs

BY MITCH MEADOR
STAFF WRITER
MMEADOR@LAWTON-CONSTITUTION.COM

More than 100 people attended a town hall here Wednesday to provide public input on three proposed trail designs for the eastern side of the Wichita Mountains Wildlife Refuge.

Giving an overview on the proposals was Heidi Beierle, a transportation scholar who will be on the refuge through the end of March under a Sarbanes grant. Her mission has been to study alternative forms of transportation on the east side of the refuge.

Attendees were asked to rate trail design options and turn them in. One of the reasons U.S. Fish & Wildlife Service is considering the new trails is that Oklahoma ranks 48 out of the 50 states for overall health, and this is part of a community partnership to provide healthier options while teaching people to care about special places like the refuge, Beierle said.

The designs also take into consideration families with young children

SEE REFUGE, 2A

KALI ROBINSON/STAFF

Parklane Elementary School had its own delegation at Wednesday's town hall on three proposed trail designs for the Wichita Mountains Wildlife Refuge. From left are Makeveion Hill, physical education instructor Ken Gray, Kylie Mosier, Gunner Smith, Amy Gilpen, Colby Gilpen and Heidi Beierle, a transportation scholar currently at the refuge on a Sarbanes grant.

REFUGE: Could connect to LETRA

CONTINUED FROM 1A

and people who require wheelchairs or other mobility aids, she noted.

The Lake Elmer Thomas Recreation Area (LETRA) connective trail would use the original gateway arch to the refuge as its trailhead, thus restoring it to its original purpose. The trail would utilize the existing dam access road to go over the Lake Elmer Thomas dam and all the way to LETRA, which is on Fort Sill. The trail would also provide a connection to the boat launch, the fishing pier and the future Medicine Park Museum of Natural Science. It would be approximately two miles long.

The Jed Johnson Tower Trail would follow the present trail almost exactly, except at one point where it is too steep. There it would be re-routed to create a more accessible gradient. The trail is approximately ½-mile long.

The proposed Meers Road Trail is not a trail at this point, Beierle said.

"We're looking at more comfortable facilities for biking and walking," she said.

The trail could potentially incorporate a 1923 roadway section from the Parallel Forest that is close to the road but not actually on it. Or it could incorporate a 1935 roadbed, if, in fact, it exists. The complete trail would be roughly two miles long, or 1.7 miles if the Parallel Forest road is used.

Features audience members said they would like to see in a trail include safety; parking; restrooms; water access; a way to get back; interesting things to see, such as fall foliage; information about scenery, animals and history; shade; hammocking, and yoga. One person suggested a 35-mile single-file mountain bike trail for an all-day event.

Beierle also went over three categories of design alternatives: surfacing, trail widths and shared use vs. separation of bikers and walkers from motorists.

Ken Gray, physical education teacher for Parklane Elementary School, was present with three of his fifth graders, Kylie Mosier, Makeveion Hill, and Gunner Smith. They set up a station displaying some of the five new mountain bikes, helmets, jerseys and other gear the school received from the California-based organization Trips for Kids. Gray said Terry's Bicycles assembled the bikes at no charge, and he has been working with Dan Kite, owner of Krooked Krank Bicycle Repair, for the past year to get 12 more. Gray hopes to have 24 mountain bikes by next spring.

Gray said he will be teaching students how to ride a bicycle if they don't already know. He'll be having Lawton police talk to his fourth- and fifth-grade physical education classes about bike safety. They'll start by riding Henderson Park behind the school, and they'll venture out from there, taking trips to the Wichita Mountains Wildlife Refuge and other destinations for the students to ride. The grant from Trips for Kids stipulates that the recipient will teach bike safety and take the students on at least five trips per year.

Doug Kemper brought a scale-model replica of what the Medicine Park Museum of Natural History will look like. He noted that LETRA is less than a mile from where the museum will be, and the dam is only a couple of hundred yards away. The LETRA connective trail could make use of the existing dam access road to connect LETRA with the Lake Elmer Thomas dam, the Oklahoma Scenic Byway and the new museum. It could also connect with other trails around Lake Lawtonka and Medicine Park.

"It's a pretty ambitious program," he said.

Jim Stone, president of the Friends of the Wichitas, said Beierle has been working on the trail system for some time now "and we want to be a part because we want to help do whatever we can to help maintain and protect the refuge. One of the concerns the staff has is the high impact use in the Charons Gardens Wilderness Area. They're wanting to move some of that traffic to the eastern side of the refuge, and they've asked us to contribute our thoughts about what we think would work and what wouldn't work, as far as getting access not only for hikers and bikers but for people who are challenged, so they have someplace they can go — either interpretive trails for people in wheelchairs, or older or younger visitors to the refuge. We want to help the staff any way we can to maintain and protect that beautiful Wichita Mountains Wildlife Refuge."

KALI ROBINSON/STAFF

Doug Kemper, project director for the proposed Medicine Park Museum of Natural Science, talks about where the project will stand in relation to the Lake Elmer Thomas Recreation Area (LETRA) connective trail and other trails in Medicine Park and around Lake Lawtonka.

Beierle said the input she gets from the town hall will go into a final report at the conclusion of her assignment here. The input will also support the refuge decision-making process about the trail design options. The Region 2 office of U.S. Fish & Wildlife Service will support the design process.

As for whether the trails will be built by volunteers, staff or contractors, "we have not gotten that far yet. Right now we don't know if we are even going to build a trail, so it's hard to know who's going to construct it," Beierle said.

While the agency isn't sure it's going to build the trails, it is looking for money to do them, she said near the end of the town hall.

Appendix G

Wichita Mountains Wildlife Refuge East Side Non-Motorized Route Interconnectivity

Wichita Mountains Wildlife Refuge was established "for the protection of game animals and birds and shall be recognized as a breeding place thereof." Preservation of Wilderness is also a purpose for those portions of the Refuge designated as Wilderness. This document focuses on non-motorized routes in the Refuge both as a means to assist in the preservation and protection of designated Wilderness and as one dimension of managing Refuge visitation and its impacts to the regional ecosystem. It is understood that Refuge visitation and Refuge visitor experiences are wildlife-dependent recreation. What wildlife-dependent recreation that occurs from motor vehicles also occurs using non-motorized modes of travel. In fact, the outdoor exposure and slower speeds of bicycling, walking, and running provide more and better opportunities for visitors to engage in wildlife-dependent recreation than they can otherwise do from a motor vehicle and with far less negative impact to wildlife and habitat. With this in mind, the following information describes a strategy for redirecting visitation from the ecologically sensitive west side Wilderness Area to the less ecologically sensitive east side area and details particular trail planning considerations for these modes.

Developing non-motorized trails on the Refuge's east side has the potential to attract visitors. East side trail development, in part, addresses a need to lessen visitation impacts in the sensitive Wilderness Area by redirecting visitors to this less ecologically sensitive area. Non-motorized trails on the east side address more issues than only overuse of the west side Wilderness Area; however, the degree to which the east side trails could successfully lessen visitor impacts in the Wilderness Area is the subject of much discussion and worth considering at greater length as a potential strategy.

Questions about whether the east side trails might succeed in lessening visitor impacts on the west side first need to consider why people choose the west side as their destination.

- To see wildlife
- To hike
- To find views and vistas
- To take photographs
- To get away from the city
- To backpack
- To have physically challenging experiences
- To enjoy a nice setting away from the road where the kids and whole family can play for the day (includes access to parking, restrooms, and picnic areas, shade in the summertime)
- To enjoy nature
- To experience solitude
- To rock climb and/or boulder hop
- To trail run
- To follow recommendations of others (made by the Visitor Center, lodging establishments, word of mouth, Facebook, websites, etc.)

While the east side provides most of the same kinds of experiences as the Wilderness Area, it cannot currently provide them all, namely backpacking and challenging trail hiking and running. However, the east side offers other kinds of experiences that cannot be had on the west side, particularly a variety of bicycling opportunities. The east side also offers an optimal location on the Refuge for visitors who have more interest in or higher tolerance for social experiences in the outdoors than people seeking solitude in the Wilderness Area.

With current management practices, visitors have little reason to recreate on the east side rather than the west side, except to go bicycling or drive to the top of Mt. Scott. Consequently, enhancements to the east side bicycling infrastructure can improve the destination appeal of the east side for visitors interested in bicycling. Improvement in bicycling infrastructure would likely increase the numbers of people bicycling and could lead to a reduction in driving trips (drivers may avoid areas with high numbers of bicyclists on the road and/or areas with slow-moving traffic). The existing appeal of bicycling on the east side is an asset for the Refuge independent of west side activity. Yet, if Refuge management is interested in concentrating visitation on the east side, enhancing bicycling opportunities is one strong way to establish visitation appeal in this area.

Redirecting visitors from the west side to the east side involves considerably more than simply improving bicycling infrastructure on the east side. The same principles of the stacked loop trail system apply to east side/west side discussions. People interested in more technical, rugged experiences are willing to travel further or endure conditions with fewer amenities than people seeking convenient, easy, accessible, or amenity-rich experiences. Consequently, a strategy that improves visitor infrastructure and amenities on the east side and that later removes amenities and services on the west side may actually result in high visitation directed at the east side and low visitation occurring in the Wilderness Area.

Important infrastructure and amenities to add to the east side and adjacent areas outside the Refuge include (see attached map for locations):

- LETRA connection trail
- Accessible Jed Johnson Tower trail and parking lot improvements
- Mt. Scott hiking trail (extremely important)
- Links and/or barrier crossings that interconnect the loops of the stacked loop system:
    - LETRA gate
    - Fence at Ferguson House (connecting Deer Creek Canyon Rd to the Refuge)
    - Fence just off the Mt. Scott Bike Trail (northeast side of the loop)
- Highway 49 trail (a shared use path with a barrier or separated from the road on the south side of Hwy 49 from the Lake Elmer Thomas Fishing Pier trailhead west through the Mt. Scott Picnic Area and that continues to the Jed Johnson Tower trailhead just past the Meers T)
- Meers Road trail
- Mt. Scott Picnic Area trail and nature walk
- Water source at Lake Elmer Thomas Fishing Pier
- Toilet facilities or improved toilet facilities at Refuge trailheads
- Improved signage and wayfinding to parking areas, trailheads, and within the trail system
- Lawtonka mountain bike trails to northeast Mt. Scott Bike Trail fence crossing
- Mountain bike challenge park

Additionally, shifting marketing focus to the attractive and unique east side destinations will support visitation redirection.

Facilities the Refuge might consider closing on the west side after destination appeal is established on the east side include:

- Most toilet facilities
- Picnicking facilities
- Some parking

The Refuge may want to consider other strategies to reduce visitation in the Wilderness Area:

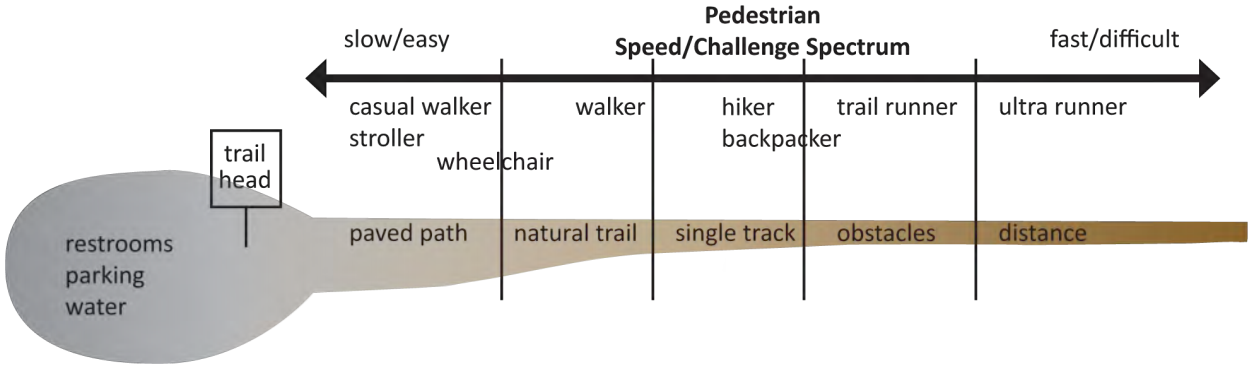
- Enforcement and ticketing of parking violations and littering violations (trash, recycling, and human waste) at Wilderness Area trailheads
- Visitation caps in the Wilderness Area

Attractive east side destinations have something to offer a full spectrum of visitors. With a focus on non-motorized modes, there are important considerations when planning for pedestrian modes, bicycling modes, and both pedestrian and bicycling modes together. Both pedestrian and bicycling modes vary in their facility and amenity needs based on speed/challenge and activity type. Pedestrian modes include walkers, wheelchair users, people with strollers, hikers, and trail runners. Bicycling modes most relevant to the area include road riding, mountain biking, and hybrid bicycling (commuting, fitness, all purpose bicycling).

Not all pedestrians or all people on bicycles have the same needs. Even among the same mode choice, people will differ based on speed and the level of challenge they seek.

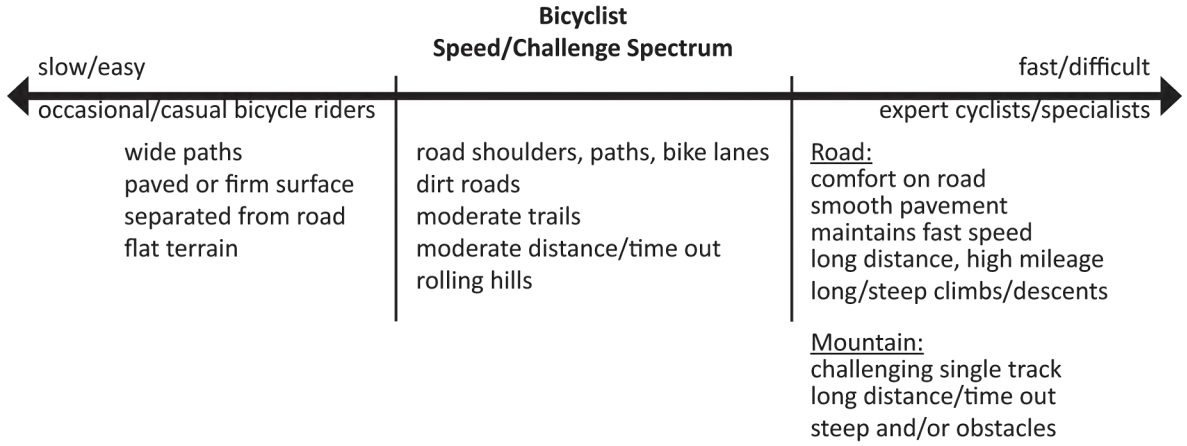
For pedestrians, Figure 1 illustrates how facilities change based on pedestrian mode and speed/challenge. Wider, firmer paths meet the needs of pedestrians on the slow or easy end of the spectrum and are typically closest to trailheads with restrooms, parking, and water. Conversely, narrow, natural surface technical trails far from parking meet the needs of pedestrians seeking challenging and rugged trail experiences, conditions one would expect to find in a wilderness setting.

Figure 1: Pedestrian Speed/Challenge Spectrum



For people riding bicycles, Figure 2 illustrates the variety of different needs that arise when considering the three principal bicycling modes found on the Refuge: road cycling, mountain biking, and hybrid bicycling.

Figure 2: Bicyclist Speed/Challenge Spectrum



When mixing pedestrians and bicyclists together in the same space, relative speed becomes an important factor in overall trail design. Very few travel spaces are designed exclusively for bicycling (and those that are occur mainly in urban environments or are specialized mountain biking trails). Consequently, bicyclists must share facilities in most places with either pedestrians or motorists. Bicyclists can generally easily maneuver around faster pedestrians (runners) traveling solo or in small groups – as might be found on the Refuge's road shoulders. However, trails with numbers of slower pedestrians (children, teens, people using mobility aids, and social groups) require slower bicycling travel speeds and more maneuvering room (wider trails). These slower trails or 'core loops' on the Refuge include the LETRA connection trail and a possible trail along Highway 49 (See map). Bicyclists who want to move at a faster pace than the core loop trails offer will generally choose to share road space with motor vehicles. Given different bicycle riders' comfort on paths and/or roads, it will be important to plan for bicycle use in both places.

A good trail system will also allow for skill building and graduated challenge. While not suggested for Refuge property, development of a mountain bike challenge park adjacent to the Refuge will provide an area for all ages and skill levels to practice and develop mountain biking skills. Providing a specific location for this activity becomes its own destination, limits unwanted off-trail activity, provides a safe and controlled environment for visitors to develop skills, and builds community and future stewards. With the challenge park located with easy access to the mountain biking trail system, visitors can grow into the trail system. Providing links between the different trail system 'loops' enables bicyclists and pedestrians to add mileage and variety to their experiences by allowing multiple loop combinations, keeping the experiences fresh, interesting, and scalable to their abilities or desired level of challenge.

The east side area currently provides a good mix of bicycling opportunities for mountain bikers, road cyclists, and hybrid bicyclists. With improvements described above – some of which are currently planned – the east side will also provide attractive and accessible trails for pedestrians and occasional or casual bicyclists. A hiking trail up Mt. Scott would complete a full range of pedestrian needs that currently is being met by allowing visitors to walk on the Mt. Scott road (but that falls short of a rugged trail away from motor vehicles that most hikers seek). By offering a full spectrum of pedestrian and bicycling activities on the Refuge's east side, it will be possible to redirect visitation from the west side Wilderness Area to these east side destinations.

Base of Mt. Scott to Parallel Forest = 3.6 miles
Jed Johnson parking area to Parallel Forest = 2.1 miles
Lake Elmer Thomas fishing pier to Mt. Scott base = 1.3 miles
LETRA to fishing pier = 1.5 miles