2.4 COMPARABLES

Photo Credit: Peter Dooling

"A first-rate trails system can only be created by people."

– President's Commission on American Outdoors, 1987

Introduction

The first three sections of the Research and Analysis chapter focused on the context, existing conditions, and review of studies, reports, and regulatory documents for the ROGG Study Area. This section provides analysis of comparable projects that have successfully addressed similar issues or situations as those identified for ROGG. To that end, the purpose of this section was to review best practices used in the design and implementation of comparable greenway projects and assess lessons learned that can be applied to ROGG.

Three elements comprise this section: 1) Comparable Descriptions, 2) Best Practices, and 3) Lessons Learned. The Comparable Descriptions element describes successful projects from around the world within seven categories of trails or trail elements similar to conditions found within the Study Area. The Best Practices element identifies principles and criteria for planning, constructing, and operating trail systems as well as best practices for design, construction, and maintenance identified in the project examples. The Lessons Learned element summarizes findings concerning trail planning and development relative to the Comparable Descriptions and Best Practices for consideration of the ROGG.

2.4.1 Comparable Descriptions

The ROGG Study Area is an ecologically and culturally unique area of the world. While there is no single greenway project that replicates the exact conditions and constraints of the ROGG Study Area, there are a variety of projects around the world that offer successful solutions to issues relevant to the feasibility study and master plan for the ROGG. Comparable greenway projects within the following categories were reviewed as part of the feasibility study and master plan process because of similarities to conditions observed in the ROGG Study Area. The seven categories referenced below include comparables from projects that represent iconic or inspirational trails to projects that are exemplary of relatively localized issues such as low impact trails. The following are the seven categories researched:

1. Inspirational/ iconic trails;
2. Trails of significant scale;
3. Trails within two-lane highway right-of-way;
4. Trails located on retrofitted highway bridges (culverts and large length bridges);
5. Trails associated with levee rights-of way, water control structures, and canals;
6. Trails in environmentally sensitive landscapes, including wetlands;
7. Heritage trails.

For each category, a brief description is provided followed by one to three specific project example summaries. Following the project summaries, descriptions of the anticipated ROGG user groups are provided.

Inspirational / Iconic Trails

While there are many inspirational destinations throughout the world, there are few that are connected or traversed by functioning long distance trails that cater specifically to the unique travel needs and desires of bicyclists and pedestrians. Some of those locations and countries that have taken advantage of this emerging form of eco-tourism have developed networks of trails that link users to stunning natural landscapes and significant cultural sites, thereby incorporating the journey into the experience of the sites. Three inspirational and iconic greenways located in the Czech Republic, Canada, and along the Danube River in Central Europe are profiled.

Prague to Vienna Greenway

Within the Czech Republic, a long distance greenway trail known as the Prague to Vienna Greenway links together two of Europe's most celebrated and historic cities: Prague in the Czech Republic and Vienna in Austria. The greenway consists of a 250-mile long network of hiking and biking trails through the Moravian and Bohemian regions of the republic. Travelers can walk or bike between historic towns and villages, visit castles, medieval churches and monasteries, discover old Jewish settlements, and soak in some of the most picturesque countrysides in all of Europe. The greenway stretches along the Vltava River Valley in Southern Bohemia and the Dyje River Valley in Southern Moravia.

Greenways are valued portions of the civil and social infrastructure within the Czech Republic. They are thought of as routes, trails or natural corridors used in harmony with their ecological function. Moreover, they foster the preservation of natural and cultural heritage, provide options for safe transportation, recreation and tourism, and encourage a healthier lifestyle.

The Prague to Vienna Greenway is a project of the Greenways-Zelene Stezky organization, which is a member of the Environmental Partnership for Sustainable Development (Nadace Partnerstvi) in Brno, Czech Republic. The objective of the organization is to restore and preserve the natural and cultural heritage of the region and develop sustainable tourism. In 2001, local civic groups, cultural associations, small business owners, and town and village governments joined together to form the Prague-Vienna Greenways Association. More than 30 members now cooperate on local projects,

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Prague to Vienna Greenway, Europe

Prague to Vienna Greenway, Europe natural trail surface

Trans Canada Trail

organization of events, and sustainable tourism. Local businesses seek and are conferred "certified" status so that as a visitor travels along the greenway, they encounter certified hotels, pubs, restaurants, bike shops and other businesses that cater to greenway tourists.

The Prague to Vienna Greenway enables visitors to journey along centuries-old salt, silver and amber trade routes to discover interesting off-the-beaten path places, many of which had been closed for 40 years behind the Iron Curtain of the Cold War. Visitors have the capacity to access historic castles and villages and are afforded opportunities to view architectural monuments, some of which have been declared World Heritage Sites by UNESCO. The Greenway provides access to locales where trail users can taste Moravian wines and Czech beer and attend concerts and festivals.

Relevance to ROGG: The opportunity to observe and experience natural beauty, connect to social and tourist opportunities, and experience the unique setting along long distance travel are similar attributes of the Prague to Vienna Greenway and the ROGG. In addition, the Prague to Vienna Greenway provides a unique example of a greenway system that provides infrastructure used more than just for recreation uses.

Trans Canada Trail

The Trans Canada Trail is the world's longest network of recreational trails that, when fully connected, will stretch 14,000 miles from the Atlantic to the Pacific to the Arctic oceans. More than 10,400 miles of trail were usable in 2012, making it approximately 73% complete. Two hundred forty gaps totaling 3,900 miles remain to be connected to achieve a fully integrated and connected trail. The Trans Canada Trail planning team hopes to close these gaps before the trail's 25th anniversary and Canada's 150th anniversary in 2017 to reach this objective.

The concept of the Trans Canada Trail was created during the nation's 125th anniversary celebration in 1992. The network of trails comprised of more than 400 community trails varies significantly, ranging from wilderness routes to urban greenways that extend through the heart of Canada's largest cities. The Trail makes use of footpaths and hiking trails, abandoned rail corridors, levees, utility corridors, and urban pathways. The Trail supports a wide variety of users, including hikers, bicyclists, equestrians, cross country skiers, and other sanctioned users.

Map of Trans Canada Trail (red and blue line indicate route)

Cyclists on the Trans Canada Trail

The Trans Canada Trail is being developed through the support of two oversight organizations: A Charitable Organization and a Foundation. The Charitable Organization is responsible for overseeing the development and construction of the Trans Canada Trail by working in partnership with territorial and provincial trail organizations and more than 400 local trail groups, municipalities, and conservation authorities that manage and maintain local trails. The Charitable Organization also grants funds to partner organizations, making it possible for them to develop trails that showcase distinct features. The Charitable Organization promotes and markets the Trail and communicates progress in construction of the system. The Foundation, which was incorporated as a non-profit corporation in October 2010, is responsible for raising funds to support the advancement of the Trans Canada Trail. The Foundation has launched a national campaign to raise the $150 million needed to complete the Trail by 2017.

Relevance to ROGG: Even short tourist opportunities along segments of the national greenway offer significant access to a wide variety of natural features and cultural landscapes, similar to opportunities present in the ROGG Study Area. The coordination for the Trans Canada Trail between multiple jurisdictions and interest groups provides an example for ROGG of cooperative efforts to complete a unique and inspirational trail system.

Danube River Trail, Europe

What is possibly the most spectacular of all long distance greenways in the world, the Danube River Trail extends through Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Romania, Bulgaria and the Ukraine. Also referred to as the Danube Cycle Path, this trail encompasses a total distance of approximately 1,790 miles, ranging from the Black Forest community of Donaueschingen, Germany to the Black Sea. The cycle path is part of the EuroVelo Route EV6 and winds its way through a diverse landscape, including mountainous terrain, famous towns and cities, nature reserves, monasteries, and unique geologic features. The trail links some of Europe's finest and historic cities, including Budapest, Bratislava and Vienna.

Much of the route for the cycle track follows a system of levees that extend parallel to the river and offer flood protection and water management. There is no formal organization that manages and maintains the cycle path. Each of the nine countries that the trail touches maintains the pathway to a different standard. A non-profit group, Danube-Cycle-Path, provides information about the most developed and accessible stretches of the pathway in Germany, Austria, Slovakia and Hungary. Services offered to tourists include bicycle rentals, lodging and restaurants that cater to cycle tourists.

Relevance to ROGG: Components of the Danube River Trail that are particularly comparable to ROGG include long-distance trail connections, travel through picturesque and/or unique settings, use of levee systems for trail networks, and connections to services for tourism.

Trails of Significant Scale

Trail systems of similar lengths to the ROGG occur in various locations in the world, both as part of larger trail networks and as individual trails connecting specific locations. These trail systems provide opportunities for an array of cyclists and hikers as well as point-to-point connections between towns and villages. These systems can occur adjacent to roadways or on separate facilities on levees or abandoned rail corridors. Two greenways with lengths similar to ROGG located in the Netherlands and Idaho are profiled.

LF5 Trail – Netherlands

Cycling in the Netherlands is a popular method of transportation with over 38% of all trips in Amsterdam made by bicycles, compared to about 1% in the United States. With over 30 years of bicycle-friendly policies implemented across the country, trail development has grown beyond a daily benefit of residents' lives into a major tourism draw for the country. In order to facilitate a trail network capable of drawing foreign tourists, unique experiences and a seamless integration of cycling into infrastructure is needed.

Trail Loops within the Netherlands

Map of long-distance trails throughout the Netherlands (http://holland.cyclingaroundtheworld.nl/Wheretogo/WhereToGo-LongDistance.html)

With over 300 posted routes by the Dutch Automobile Association, the Netherlands offers a vast array of user experiences for cyclists and hikers. Most routes connect to form loops, with the upper range of distance between 125 and 250 miles. The LF5 Trail is a segment of the overall trail network that travels 50 miles along the lowlands of the Netherlands, connecting visitors to each town and village's visitor center. The trail travels on dikes and along roadways throughout the lowlands.

Relevance to ROGG: Components of the LF5 Trail relevant to ROGG include successful implementation of trails on levees and dikes and connections to other regional trail systems for increased user experiences and trail loops. These trail loops provide users unique natural experiences, while also creating a system of tourism and recreation focused opportunities. This approach for recreational tourism based on trails is similar to the efforts of the FDEP Office of Greenways and Trails.

Trail of the Coeur d'Alenes, Idaho

Located in the scenic Silver Valley areas of Idaho, the Trail of the Coeur d'Alenes stretches over 71 miles in length. The Trail of the Coeur d'Alenes is a rail-to-trail project which offers three distinct user experiences; prairie to lake setting (downhill); river to lake setting (flat) and Silver Valley (uphill). These unique experiences divide the trail into manageable sections.

Rich in history of exploration and Native American culture, the Trail of the Coeur d'Alenes builds on what use to be a fur trading route and later a railroad which connected gold and silver boom towns. Overdevelopment of mining facilities eventually led to environmental deterioration of the Coeur d'Alene Lake and drainage area by 1990s. A successful lawsuit by the Coeur d'Alene Tribal Council led to the formation of a 21 square mile Superfund site, the nation's second largest, and included a $30 million clean-up fund for the rail corridor. In 2000, rail ties and up to eight feet of contaminated rail-bed was removed from the corridor, with development of the trail to cap the remaining pollutants completed in 2003. Similar to the much of the ROGG corridor, the Trail of the Coeur d'Alenes was born out of one of the largest restoration efforts in the country, and provides a solution for the continued exploration of a scenic landscape.

Managed by the Idaho Department of Parks and Recreation, the Trail of the Coeur d'Alenes requires daily management activities by several jurisdictions with law enforcement provided by both municipal and County jurisdictions. A 14.5-mile segment is managed by the Coeur d'Alene Indians who also represent three of the six seats on the Trail Commission.

Relevance to ROGG: Components of the Trail relevant to ROGG include successful implementation of a trail within a large scale environmental restoration effort, coordination of development, implementation and management of the trail with a Native American group, coordination across multiple jurisdictions, and unique experiences in different sections of the trail.

Trails within Two-Lane Highway Rights of Way

Along the 75-mile length of the ROGG Study Area, it will be necessary for trail route and alignment to extend parallel to sections of the U.S. 41 corridor. Multiple options for traversing the U.S. 41 corridor are available, ranging from bike lanes to separate facilities within the non-maintained portions of the road ROW. Trails separated from traffic flow by structural buffers or physical separation can improve safe use of the trail and enhance user experience by removing traffic concerns. For portions of the corridor, trail route and alignments may require using existing bridges to support trail structures. One of the most prominent trails with a number of segments similar to these conditions is the East Coast Greenway.

East Coast Greenway, United States

Though approximately 29% of the East Coast Greenway (ECG) is now off-road and automobile traffic-free, the majority of this landmark greenway relies upon on-road routes and linkages. Stretching from the U.S. and Canadian border in Calais, ME to Key West, FL, and made up of over 100 independent trails, the East Coast Greenway was launched in 1991 by a group of ten bicycling advocates. The initial route was entirely on-road facilities until 1996 when the first 56 miles of off-road trail opened in multiple areas in the Northeast and Mid-Atlantic areas. A number of the areas with off-road facilities are located within existing highway rights-of-way, as shown with the image of a segment of the ECG in Rhode Island.

The ECG has developed route selection guidelines and interim on-road route guidelines and procedures. Though neither set of guidelines established a distance requirement for facility separation or a minimal standards for on-road bike lanes, the guidelines do establish the need for directness of the route, safety and comfort of

Walkers on the Danube River Trail, Europe

Cyclists travling on the Danube River Trail, Europe

A cyclist on the LF5 Trail located on a dike, Netherlands - Photo Credit : Jane Hudall

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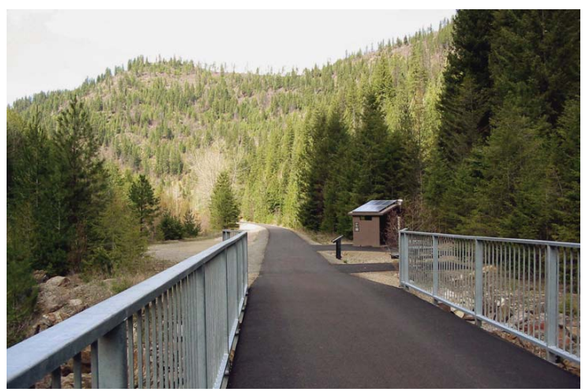
Trail of the Coeur d'Alene, ID



Amenities along the Trail of the Coeur d'Alene, ID

East Coast Greenway in Rhode Island with spatial separation from nearby roadway (Photo courtsey of the East Coast Greenway)

users. The Route Selection Guidelines establish criteria for permanent routes and interim on-road routes to maintain continous route connections. These criteria include recommendations for surfacing, width, and location. Application of these criteria is intended to facilitate the placement of the trail that is physically or spatially separated from nearby roadways or highways, but still within publicly accessible lands or easements, where possible.

Relevance to ROGG: Elements of the ECG that pertain to the planning and design of ROGG include the establishment of criteria for on-road and off-road trail facilities with the goal to separate the trail facilities from roadways, emphasis on a continuous route, and criteria for directness of route, safety and comfort of users.

Seminole Trail, Florida

The Seminole Tribe of Florida in Hendry County received a $3.7 million Transportation Investment Generating Economic Recovery (TIGER) grant in 2011 to fund a 2.25 mile roadway improvement project on the tribe's Big Cypress Reservation in Hendry County, FL. The existing roadway was a narrow 20 foot route with worn, unpaved shoulders. The project was designed to enhance safety and accessibility for tribe members, improving a designated hurricane evacuation route and enhancing access to commercial and tourist destinations on the reservation.

Relevance to ROGG: The Seminole Trail is intended to increase mobility for pedestrians and bicyclists to the commercial and tourist destinations within the reservation, similar to conditions found along the ROGG Study Area. The project also identifies trail widths and surfacing for a south Florida trail project adjacent to an existing roadway, which provides input on trail widths that could be used for ROGG.

Trails Located on Retrofitted Highway Bridges

The restoration of the Everglades includes the construction of multiple new bridges ranging in length from 0.38 mile to 2.6 miles to replace the existing U.S. 41 roadway, thereby allowing water to flow more freely under the road. The first bridge constructed as part of this program was 1.0 mile in length and did not include a separate trail facility. Bridges in other parts of the country have been retrofitted to accommodate a trail facility parallel to the roadway through various means. These have included: the reconfiguration of the width of the roadway on the bridge, the construction of a separate

Case Study: St. Georges Bridge, St. Georges, DE

The St. Georges Bridge carries the South Dupont Highway/ U.S. 13 across the Chesapeake and Delaware Canal (C & D), which connects the Chesapeake Bay with the Delaware River. From 1942 until 2008, the bridge was dedicated to four lanes of automobile traffic, which provided two lanes in each direction.

In 2005, the Delaware Department of Transportation and the USACE, commissioned a study to evaluate the feasibility and cost of a number of options for installing a bicycle and pedestrian path that would be cantilevered on the outside of the then-existing four lane road bed. The recommended option would have placed a bidirectional bicycle and pedestrian path on the western side of the bridge, preserving the four lanes of traffic that existed at the time. The plan was not implemented. However, the goal of accommodating cyclists on the St. Georges Bridge was not abandoned.

When the USACE decided the bridge would be repaired, instead of permanently closed, they worked with local bicycle advocacy organizations and the Delaware Department of Transportation to create bike lanes on the bridge. When the bridge reopened, there was one bike lane in each direction, replacing one vehicle travel lane on each side of the bridge. No additional width was added to the bridge, and there is no physical barrier between the bike lanes and the motor vehicle lanes, though there is a wide buffer. The bridge is extremely popular with recreational cyclists, despite its high elevation (133 feet over the C & D at its highest point) and length of 2.5 miles.

Future Canal Trail Connection

The St. Georges Bridge will provide an important link across the canal for the future Michael Castle Trail, a 16-mile trail along the C & D Canal's north bank. The multi-purpose trail will feature facilities for cyclists, pedestrians, and equestrians. Planned amenities include trail markers, restrooms, parking, information kiosks, picnic areas, and repaired piers for fishing. The design also incorporates solar-powered restroom facilities with composting toilets, pervious asphalt, and trail furniture built of recycled materials. After eight years of planning and development, the nine-mile first Phase is currently under construction.

Design

The road bed is paved and striped to create one 8.5-foot bike lane in each direction. The bike lanes are separated from traffic by a four-foot buffer and contained on the outer edge of the bridge by a 54-inch railing on the approach and a taller protective fence on the bridge itself. Bike lane buffers contain orange tubular markers that break away when struck by a vehicle. Since the project was part of a larger resurfacing project, the cost to re-stripe was minimal.

Connections

The St. Georges Bridge is the only bridge across the canal with dedicated bicycle lanes. The Reedy Point Bridge to the east has wide shoulders, but no designated lanes. These two bridges create an ideal recreational loop for cyclists. The bridge also connects to bicycle routes east to Fort Dupont State Park, Augustine Wildlife Area, and the Silver Run Wildlife Area to the southeast. To the west, the bridge provides a link to Lums Pond State Park, the largest freshwater lake in the state. The bridge provides a critical north-south connection for recreational riders traveling south from the cities of Newark and New Castle

St. Georges Bridge with space and physical separator

and adjacent bridge structure for the trail, and the addition of a cantilevered trail structure on the margin of the bridge. Trail alignment options for ROGG considered the use of the new bridges as part of the ROGG system. Two profiles are provided: one of a successful bridge retro-fit trail project and one set of trail design standards. A case study of a retrofitted bridge in Delaware is also highlighted.

Missouri River Bridge Attachment, Jefferson City, Missouri

The Missouri River Pedestrian/Bike Bridge is a new structure attached to the northbound side of the Highway 54 Missouri River Bridge that is dedicated exclusively for bicycle and pedestrian access. With the attachment, pedestrians and bicyclists are now able to easily and safely cross the Missouri River Bridge.

The new bridge attachment is eight feet wide, fully ADA accessible, and includes two lookout points with a spectacular views of the Missouri State Capitol and the Jefferson City riverfront. The undercarriage of the bridge illustrates its construction methods, using steel ribs to support a steel superstructure. The total cost of the Missouri River Pedestrian Bridge was $6.7 million, $5.6 million of which came from the federal Bicycle/ Pedestrian Enhancements program. The remaining $1.1 million was funded jointly by the Missouri Department of Natural Resources, Jefferson City, and the Missouri State Parks Foundation. A partnership between these entities and the Missouri Department of Transportation allowed this project to become a reality.

Relevance to ROGG: Components of the Missouri River Pedestrian Bridge relevant to ROGG include successful implementation of adding a trail structure to an existing bridge and partnerships for funding the improvement.

Minnesota Department of Transportation – Bikeway Facility Design Manual

The Minnesota Department of Transportation included a chapter about bridges and grade separations in its Bikeway Facility Design Manual. Though many bike facilities are being built in the Twin Cities, the guide is meant for cycling facilities across the state, in urban and rural settings.

The manual discusses three main methods for accommodating bicycles on a bridge:

- A separate, shared-use path on one side of the bridge is best if the bridge path will connect with a shared-use path at both ends, there is sufficient width on the bridge on the side of the path, and the path can be physically separated from motor vehicle traffic
- Paved shoulders or bicycle lanes on the bridge are best when a shared-use path has transitioned into bicycle lanes at one or both ends of the bridge, restriping can create sufficient width, and there is a separate sidewalk to accommodate pedestrians
- An existing sidewalk can be used if it is wide enough for both cyclists and pedestrians (at least eight feet), but it is not usually recommended, especially when the sidewalk is raised and no railing exists

The manual offers a number of best practices, including the following:

- Expansion joints can be made “bicycle-safe” by installing them as close to a 90 degree angle as possible to the direction of movement on the trail
- When assessing bridge conditions for bicycle compatibility, the facility should be considered under wet conditions since many metals used in bridges become dangerously slick when wet
- A minimum cross slope of 1% is necessary for drainage, but no more than 2% is recommended to accommodate path users with mobility impairments
- A separate, off-road facility is best when motorized vehicular traffic on the bridge is high-speed and high-volume
- The width of the bicycle facility on the bridge should be the same width as the on-road facility on the approach, with an additional two feet added to accommodate the shy distance from the bridge’s railing or barrier
- Three types of railings are allowed for use on bicycle facilities: the first is designed for motor vehicles, the second for bicycles and pedestrians, and the third for both. If traffic exceeds 45 mph, a railing designed for motor vehicles is required between the bicycle lane and motor vehicle lane. If less than 40 mph, the railing can be of the type designed for both motor vehicles and bicycles. This railing must be a minimum of 4.5 feet high.

Relevance to ROGG: Components of the Minnesota Bikeway Facility Design Manual relevant to ROGG include application of the three main methods for accommodating bicycles on bridges in addition to the identification of criteria that could be used for establishing railing, slope, width and materials for ROGG.

Trails Associated with Levee Rights-of-Ways, Water Control Structures, and Canals

There are miles of existing earthen levee systems located within the ROGG Study Area that were built many years ago as part of regional drainage and water control

Case Study: New Orleans Levee-Top Trail

The New Orleans Levee-Top Trail is a shared-use path extending for 25 miles west from Audubon Park in New Orleans to Destrehan Plantation in St. Charles Parish. The trail is constructed along the levee of the east bank of the Mississippi River and is part of the larger 3,000 mile Mississippi River Trail. Locally, the Levee-Top Trail is known as the Mississippi Levee Trail. The trail is heavily used by a wide range of cyclists, including commuters and college students, as well as both recreational riders and long-distance cyclists out for training rides. Pedestrians, dog walkers, and roller-bladers also use the path.

I The goal for many regional planners and advocates is to pave the levee trail for the entirety of the distance between Baton Rouge and New Orleans. Through the design of the trail, the USACE worked very closely with the Louisiana Department of Transportation and parishes and municipalities that had studied or constructed paved paths on top of the levee. n the early 1990s, the local parishes worked with the USACE to design and construct the trail, converting the existing clam shell and crushed limestone paths on top of the levees into a paved bikeway. Many stakeholders anticipated economic benefits from tourism that would result from having a separated bike trail over 100 miles long in the region. The USACE continues to work with private companies and landowners along the levee to ensure access.

Design

The levee trail is paved with asphalt and is ten feet wide. Design and construction was conducted in conjunction with the levee districts and the USACE to ensure safety, compliance with levee design standards, and coordination with ongoing levee maintenance as a result of Hurricane Katrina (for new sections of the trail).

The levee path is generally on the top of the levee. One exception is on the New Orleans portion of the trail where limitations on access to the levee occurs because the trail traverses the USACE headquarters. In this area, the trail is bordered by a fence on both sides and runs along the toe of the levee between the levee and the railroad tracks.

Amenities

The trail has sign posts and trash receptacles every few miles, but no major amenities outside of the parks that it intersect. A few benches are available along the trail, but the trail does not have lighting.

Connections

The trail begins in Audubon Park, which houses the New Orleans Zoo and borders both Tulane University and Loyola University and then travels through residential neighborhoods in East Carrollton and through the western suburb of Metairie. The trail passes through numerous parks and open spaces, including Jefferson Park, Colonial Golf Course, and Morgan Playground, before extending past the Louis Armstrong Airport. St. Charles Cemetery and Jefferson Memorial Gardens are two additional open spaces along the trail. The Oschner Hospital is located adjacent to the trail, and employees often utilize the trail for recreation. The trail ends at Dehestran Plantation, a 224 year old plantation that is the oldest documented in the lower Mississippi. Along the way, the trail passes numerous commercial establishments and small businesses in Orleans Parish as well as in Jefferson and St. Charles parishes.

Crossings

There are approximately 30 maintenance road crossings along the levee trail between Audubon Park and Destrehan Plantation. The at-grade crossings are typically unpaved with minimal traffic since the crossings only lead to single industrial businesses on the river or maintenance facilities.

Cyclists on the New Orleans Levee-Top Trail

Missouri River Bridge, Jefferson City, MO, under construction

Lake Okeechobee Scenic Trail, Trail user and USACE maintenance vehicle

Lake Okeechobee Scenic Trail, FL (on top of USACE-managed levee system)

alterations and continue to be operated by the SFWMD. Although regional restoration plans for the Everglades have targeted portions or all of these levees for removal, the ones that remain as part of the seepage control, flood control, or other water management activities may provide platforms for trail connections separate from the U.S. 41 roadway. One option for ROGG is to use portions of the existing system of levees to support trail development. Throughout the country, there are many examples of trails that are constructed on top of levee systems.

The ROGG Study Area includes several water control structures in the ROGG East segment that are used to manage water levels in canals and the WCAs, several of which provide public access to the associated levees from U.S. 41. The main purpose for these structures is water management, which requires access by managing agencies to maintain and operate the structure. However, public access is also allowed over several of these structures in the ROGG Study Area, including access from U.S. 41 over the S-333 and S-334 structures in the L-29 Canal. This public access occurs via the existing 12-foot wide maintenance access road. This access can include both pass-through public use to access the adjacent levees and/or site-based access for fishing at or near the structure. Pass-through use includes vehicles, bikers and hikers that currently cross these structures to gain access to existing boat ramps or passive use along levees.

Site-based access by fisherman often occurs at the structures as the flows passing through the structures provide high quality locations for fishing. These flows can be turbulent and dangerous upstream from the structures during most conditions, while downstream flows can also be significant during high water conditions. Providing public access over water control structures increases the potential vandalism, which can have significant ramifications if equipment is damaged before or during high water conditions. Safety features such as fencing or physical barriers provide some protection against vandalism, but may limit fishing access. For ROGG, crossing water control structures and/or canals is needed to establish a fully connected trail or greenway system. Brief profiles of two trails located on levee systems with passage over or around water control structures located in the Florida and Kentucky are provided as well as a detailed case study of a levee trail in Louisiana.

Lake Okeechobee Scenic Trail, Florida

One does not have to travel very far from the ROGG Study Area in south Florida to find one of the nation's most successful trail projects built on a USACE-managed levee system. The Lake Okeechobee Scenic Trail (LOST) is a 110-mile multi-use trail system that was built on top of levees and across USACE-managed water control structures. Originally developed by the U.S. Department of Agricultural and U.S. Forest Service as a segment of the Florida National Scenic Trail (FNST), the trail was a natural surface hiking route atop the 35-foot high Herbert Hoover Dike surrounding Lake Okeechobee. In the mid-1990s, FDOT and representatives of USACE, FDEP and SFWMD, hosted a series of public meetings to discuss improving the trail surface to make it suitable for multiple types of recreation uses and outlined each agencies role in implementation. SFWMD coordinated with FDOT to assure safe circumnavigation of several water control structures and continued access to the dike.

The final trail configuration consisted of a 10 to 12-foot wide, paved and partially gravel levee system trail for walking, hiking, biking, skating and horseback riding adjacent to the paved trail surface. The trail is also used by USACE for maintenance and monitoring of water control structures and the dike. Multiple, simultaneous use of levee trails can be compatible with coordination between agency and user groups.

Relevance to ROGG: Components of the LOST relevant to ROGG includes the successful implementation of a levee trail in Florida with many of the same managing entities involved in the trail development as would be needed for ROGG. In addition, it represents an example of the use of paved trail surfaces for a levee trail and operations and maintenance that are compatible with a paved trail surface on a levee.

LOST provides examples of ways in which trail access across water control structures can be accommodated. Including both on structure and off-structure crossings, the LOST demonstrates that structure crossings can be completed for structures managed by the USACE that are critical to a regional scale water management projects. This includes trail crossings that accommodate operation and maintenance protocol and safety measures for the structures and waterbodies. The LOST provides an example of safety features such as fencing and physical barriers, to separate pedestrian routes from structures.

Ohio River Levee Trail, Kentucky

In the late 1990s the USACE began a multi-year effort to redevelop the levee system that protects the city of Louisville and surrounding communities from seasonal

Ohio River Levee Trail, Louisville, KY, located on top of a USACE levee

Steel bridge crossing of the New River Canal along the Lake Okeechobee Scenic Trail, Fl

Water Control Structure S-333 along the L-29 Canal with existing vehicle and pedistrian access, Miami-Dade County

flooding from the Ohio River. About a year later, the City launched an initiative to build a 100-mile greenway around the city. These two projects came together as a successful implementation project for both as part of a 12.9-mile greenway, linking the city's Riverwalk to the Ohio Greenway.

The levee greenway was developed as a 10 to 12-foot wide asphalt trail located on top of the redeveloped and strengthened levee. What makes this trail unique is the placement of the supporting trail amenities, such as seating and lighting along the route at the top of the levee, however, similar to the Lake Okeechobee Scenic Trail, no canopy trees were located on or in the levee right-of-way due to potential damage from roots to the levee itself. The trail's asphalt surface has served as an access route for USACE monitoring and maintenance access to the levee.

Relevance to ROGG: Components of the Ohio River Levee Trail relevant to ROGG include successful implementation of a levee trail with paved trail surfaces with minimum user amenities and operations and maintenance compatible with a paved trail surface on a levee.

A number of water control structures occur in the eastern portion of the ROGG Study Area that are used to manage water levels in canals and the WCAs. Access to operational elements of the structures is critical as part of water management operations. Water conditions upstream of the structures can be turbulent and dangerous, although downstream flows can also be significant during high water conditions. These same flows can provide high quality fish habitat, and attract fisherman at or near the structure. Water control structures can also be susceptible to vandalism, which has significant ramifications if equipment is damaged before or during high water conditions. For ROGG, crossing water control structures and/or canals is needed to establish a fully connected trail or greenway system. Connections across control structures operated and managed by the USACE have been allowed in numerous places - a brief profile of two comparable examples follow:

Trails in Environmentally Sensitive Landscapes, Including Wetlands

Trails are frequently located in areas which provide public access to scenic landscapes and/or areas which have constrained access by other modes of transportation, such as National Parks, wetlands and stream corridors.

Sections of the Bear Creek Trail, CO being installed on-site

Located in an environmentally sensitive area, Bear Creek Trail, CO uses innovative construction techniques

Though there are thousands of miles of trails that have been constructed in environmentally-constrained landscapes throughout the US, none employ all the techniques that the ROGG would need as one single comparable. Profiles for five trails that occur within environmentally sensitive landscapes are provided, including trails in Colorado, the Grand Canyon, a NWR in Washington, a floodplain trail in Texas, and a National Seashore trail in Massachusetts.

Bear Creek Trail, Morrison, Colorado

In the town of Morrison, Colorado, innovative design and engineering methods were used to build a 10-foot paved trail in an environmentally sensitive landscape that is characterized by steep slopes, river crossings and narrow route opportunities. There was not enough land between existing roadways and Bear Creek to support full development of a 10 - 12 foot wide trail without significant impacts to wetlands. So the design team built cantilevered trail segments and portions of the trail on concrete piles that enable the creek to flow unimpeded and with minimum impact to the surrounding wetlands. Sections of the trail were manufactured off-site and lifted into place as prefabricated twin-tee concrete spans. These spans were later fitted with a surface and railing was added to facilitate safe travel and use.

Relevance to ROGG: Components of the Bear Creek Trail relevant to ROGG include successful implementation of a cantilevered trail to an existing bridge to maintain water flow and construction methods that limited wetland impacts.

Grand Canyon Greenway, Arizona

One of the concerns about trail development in the ROGG Study Area is its potential impact on sensitive landscapes comprised of wetlands and other natural resources. There are examples of trails being developed within sensitive landscapes to reduce expected human impacts on natural resources and serve as a catalyst for environmental restoration, such as the Grand Canyon Greenway in Arizona.

The 72-mile Grand Canyon Greenway system was planned, designed and constructed to reduce human impact on the high desert landscape of the Canyon South Rim. Annual visitation to the South Rim tops four million and impact to the natural resources was evident. The Greenway provided a paved, 8 to 10-foot wide multi-use trail, extending for more than 10 miles along the South Rim. The Greenway also spurred environmental restoration of disturbed landscapes, serving to eradicate social trails. The Greenway was part of a multi-modal transportation system that transports millions of visitors throughout the Park.

Relevance to ROGG: The relevance to ROGG includes the extensive use of a trail system in a National Park, and the ability to direct visitors to a specific, managed corridor. This trail system also connects with a multi-modal transit system that uses mass transit to transport trail users to and from specified destinations.

Grand Canyon Greenway, AZ

Environmental restoration along the Grand Canyon Greenway, AZ

Multi-modal transportation connectivity along the Grand Canyon Greenway, AZ

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Cyclist on the Nisqually Estuary Boardwalk Trail, WA

Nisqually Estuary Boardwalk Trail crossing the Nisqually National Wildlife Refuge, WA

Buffalo Bayou Trail near Addicks Dam for Baker Reservoir, TX (image courtesy of Robert Boyd)

Nisqually Estuary Boardwalk Trail, Washington

The Nisqually NWR in Washington provides an example of an effective boardwalk trail across a long distance of water and wetlands. The ten-foot wide Estuary Boardwalk Trail features an observation tower and overlooks specifically designed for wildlife viewing. This has made the Trail very popular with tourists anxious to gain access to the unique waters and wetlands of the Refuge.

Relevance to ROGG: The manner in which this trail was designed and constructed offers an excellent model for the ROGG. The hallmark of this boardwalk trail is the way in which it spans the tidal estuary, providing access while at the same time protecting the environment that visitors want to experience first-hand. Portions of the four mile long boardwalk trail also support a variety of uses, including bicycle travel.

Buffalo Bayou Trail, Texas

Buffalo Bayou is a 53-mile long waterway through Houston, Texas that flows east towards the Houston Ship Channel and into Galveston Bay. In 1986, an appointed task force published the Buffalo Bayou Master Plan, redefining a once open-air sewer into a vibrant and valuable park space with opportunities for canoeing, hiking, biking and events. Since the development of the Master Plan, a non-profit partnership named Buffalo Bayou Partnership was formed to champion the vision. The Partnership raised over $45 million from private donors to implement projects such as the $15 million Buffalo Bayou Promenade.

Crossing an area of the bayou that includes a tangled web of freeways and street bridges, the promenade has become a popular attraction and has changed the way citizens see their waterways. Furthermore, the vision includes expanding this promenade and connecting it to a future link of the Buffalo Bayou Greenway stretching over 20 miles.

A significant challenge for the planning and design of the Buffalo Bayou Promenade was the imminent threat from flash flooding, which can cause the Bayou to rise from sea level to over 35 feet in depth in a matter of hours. To counter this threat, the Promenade was designed using amenities and features that can withstand periodic submersion by muddy flood water and impacts from floating debris. Hydrants are located along the Promenade to allow maintenance crews to wash off deposited silt from the hard surfaces and other trail amenities before the debris dries. These or other similar innovative design techniques provide examples of ways to address concerns of periodic flooding within the ROGG.

Relevance to ROGG: Components of the Buffalo Bayou trail relevant to ROGG include successful implementation of methods to address changing water conditions, maintenance of impacts after flooding events, and resilient design for hurricanes in and near wetland and flowing water systems.

Cape Cod National Seashore Trail System, Massachusettes

The Cape Cod National Seashore contains a network of trails across a variety of environmentally constrained landscapes. There are rail-trails, canal trails, trails through marshland, and trails through sand dunes. A goal for the ROGG to construct hard surface multi-use trails was successfully accomplished at Cape Cod National Seashore.

Relevance to ROGG: The Cape Cod trail system is relevant to ROGG because it makes use of various boardwalks to span wetlands and marshlands. The trail system also links tourists to visitor centers and other historic landscapes of the seashore.

Heritage Trails

Multi-use trails offer the opportunity for interpretation of natural and cultural heritage. Heritage trails normally include interpretive signage and programs that are used to celebrate the unique history of a landscape or region.

Delaware and Raritan Canal Greenway, New Jersey

The 77-mile Delaware and Raritan Canal State Park supports a wide variety of recreational corridors for hiking and bicycling as well as canoeing, fishing and wildlife observation. The linear park supports heritage tourism through extensive educational signage and wayfinding systems. The canal trail is a 10 – 12 foot wide unpaved trail that extends for from Trenton to New Frenchtown, New Jersey, a distance of more than 77-miles. The gravel trail surface is reminiscent of historic canal towpaths in the region and supports a variety of trail users, including cyclists, hikers and equestrians. One of the greatest highlights of this trail is a number of interpretive information kiosks and signs that educate trail users of the route's historical past and connect users to nearby historic destinations. Several of the interpretative kiosks educate visitors on the functions of the adjacent canals and spillways that acted as an interconnected flood prevention system.

Relevance to ROGG: Elements that are relevant to the ROGG include the incorporation of educational signage about the function of the canal, spillways and towpath. This could be applied to educational opportunities of the CERP and other restoration efforts of the Everglades.

Interpretive kiosk along the Delaware and Raritan Canal Greenway, NJ

Unpaved Delware and Raritan Canal Greenway, NJ

Cape Cod National Seashore Trail through marshlands, MA

Example of a levee trail in Marion County, FL

2.4.2 Best Practices

Overview

One of the objectives of the Comparables section was to identify best practices from selected projects for consideration by the design team and stakeholders involved in the feasibility study and master plan. Best practices were identified for project goals and feasibility criteria; the design, construction and maintenance of several trail types with potential for use on ROGG; trail amenities and materials; and criteria for construction phasing.

Best Practices

Inspirational / Iconic Trails

World-class trails not only serve the needs of the surrounding community, but also act as tourism destinations for entire regions. Combined with the natural scenic landscape and climate of south Florida, the Everglades area currently draws millions of tourists annually. Ultimate success requires looking beyond the ROGG Study Area to ensure that the ROGG is an important piece of an interconnected trail system that connects these natural resource oriented destinations.

Trails of Significant Scale

Planning for a 75+ mile greenway requires a broad understanding of regional ecological and transportation systems as well as implementation strategies that take advantage of landscape-scale amenities and recognizes the magnitude of complexities associated with security, operations and maintenance. This requires cooperation among multiple jurisdictions and shared responsibilities to control costs over the long-term.

Trails Within Two-Lane Highway Right-of-Ways

The ideal greenway provides a high level of safety and a strong sense of comfort. In most cases this is difficult to achieve when planning for a trail adjacent to a highway. Physical or spatial separation typically can accomplish a higher level of comfort for trail users. Planning a greenway of significant length requires a hierarchical approach that includes numerous on-road scenarios, options adjacent to roadways, and trail easements on private lands.

Trails on Retrofitted Highway Bridges

Bridges often prove to be the most complicated to design and expensive to construct portions of shared-use trails. The potential to construct or reconstruct bridges is typically limited since they only undergo renovations every few decades. Some cities have been successful in prioritizing bicycle and pedestrian access during routine maintenance schedules of the bridges or redesigning the existing roadbed of a bridge to incorporate bicycle and pedestrian facilities.

Beyond their often-constrained widths, some bridge features make it difficult to accommodate bikeways. These include bridge widths that are narrower than the approach roadway (especially when combined with steep grades), open grated metal decks, low railings or parapets, and finger-type expansion joints or other joints that cause steering difficulties for cyclists. Width can often be added during reconstruction by filling open grating with lightweight concrete, modifying railings, and installation of steel plates or elastomer filler to solve expansion joint issues.

For federally-funded projects, planners and bicycle advocates can refer to Federal legislation that mandates the inclusion of bicycle and pedestrian facilities on bridges where the on-road facilities already exist. Section 23 USC 237(e) states:

> *"In any case where a highway bridge deck being replaced or rehabilitated with Federal financial participation is located on a highway on which bicycles are permitted to operate at each end of such bridge, and the Secretary determines that the safe accommodation of bicycles can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations."*

Going further than these stated requirements, a USDOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations released in 2010 encouraged Departments of Transportations to design and build beyond the minimum standards for bicycle and pedestrian structures. The Policy Statement indicated that when constructing or reconstructing bridges, it is more effective to build beyond the existing demand by anticipating an increase in demand, than to retrofit an old facility to accommodate demand.

Trails Associated with Levee Rights-of-way, Water Control Structures and Canals

Trails on levees and water control structures have a number of constraints, especially relating to placement of amenities and parking. However, they can also be quick to construct and often become popular community resources. For levee-top trail construction, the levee may need to be widened to accommodate the higher runoff from a paved surface. Typically, paved levee trails are made by excavating the existing gravel trail and dirt to a depth of 10 to12-inches. Six inches of stone is then added and five inches of asphalt are placed at the surface to provide a smooth substrate. Construction of a trail on a levee typically requires crossings over canals and/or water control structures that require a thoughtful accommodation of all potential users' needs. Of particular concern when designing levee and water control structure/canal crossing trails are the following:

- Maintaining structural integrity of the levee is of primary importance to USACE and SFWMD;
- Placement of bridges over water control structures or canals cannot impede water flow or operations of the structure;
- Minimizing construction impacts on existing levees is essential, requiring the use of lighter and smaller machinery;
- Stormwater runoff from paved surfaces needs to be addressed to minimize erosion of levees;
- Ramps and/or stairs up to the levee trail and the trail grade need to meet compliance with ADA standards,
- Width of the trail may be highly constrained at the top of the levee, but may not be as constrained on benches at the base of the levee slope;
- Implementation of lighting and other amenities may be constrained;
- Parking on/near levee can be limited;
- Proposed culverts must allow for clearance for cyclists, pedestrians and maintenance vehicles;
- Tree placement on the landside near the toe of the levee may not be feasible due to bank maintenance needs,
- Fencing must allow for mowing and easy access for maintenance crews;
- Access by managing agencies to control structures and other sensitive equipment is essential for safe operation;
- Control structure crossings should be placed downstream of the control structure to minimize dangerous water conditions if someone were to fall in at the crossing; and
- Maintenance access is a critical consideration and may require specialized equipment for paved trails different than that required for non-paved trails on levees.

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Trails in Environmentally Sensitive Landscapes, Including Wetlands

Development of trails and greenways in environmentally sensitive landscapes require careful planning of routes in addition to thoughtful design solutions and context sensitive construction methods. Materials should be comprised of materials that do not affect long-term health of the adjacent resources and preferably assembled off-site prior to being placed into final position. Planning and design should include careful consideration of impacts to the contextual surroundings, and consider sustainable practices or materials, such as the reuse of asphalt or sub-base materials, high performance materials that will last in the harsh climate of south Florida, and the labor, distance and impact that construction activities will have on the surroundings.

Bicycle and pedestrian trails typically have smaller impacts on wetlands than roadways due to their narrower widths. In addition, there can be benefits to allowing the more personal experience of these users in sensitive natural areas. Appropriate access to these sensitive areas can promote stewardship and foster appreciation for their values. Comparable trails investigated for this study provided several guiding principles for evaluating the feasibility of trails in wetlands, including the following elements:

Wetland Trails Planning and Design Best Practices

- Avoid building in wetlands, or use existing structures or pathways where possible.
- Where impacts are required, focus impacts on disturbed wetland systems.
- Seek to provide views from the edges or plan for overlooks for visual access without physical impacts.
- Provide design solutions that protects natural flow of water.

Wetland Trails Construction Best Practices

- Use equipment with smallest footprint possible.
- Build in sections while working from above (if decking/creating boardwalk) or from the boardwalk.
- Limit construction to periods when the least impact is more likely - within the driest portions of the year (October through April), and outside breeding season and migratory season of sensitive wildlife.
- Use pre-cast or prefabricated materials that allow for installation with minimal contact with the wetland.

Heritage/ Tourism Trails

Trails which strive to meet heritage standards or serve as tourist draws for regions typically include a high level of design, though not necessarily a high level of construction costs. Heritage trails can help regions share in the stories and history that make an area unique. In order to achieve this, a comprehensive package of signs and wayfinding, complete with interpretative kiosks, along with connectivity to destinations is important.

Trail Features and Amenities

Successful trails and greenways have amenities and context-sensitive features. Without such amenities as parking, access to water, or air for tires, projected use of a trail may never be achieved. When planning a trail the scale of ROGG, identifying the amenities and trail features that a wide array of potential users may need is vital. Following are best practices for trail features and amenities.

Trailheads

A series of full service trailheads would be needed along the ROGG. For a trail corridor 75-miles long, a minimum of five full service trailheads would be needed to be placed on a spacing approximately 10 to 12-miles apart. Existing facilities, such as identified destinations along the corridor, could meet many of the services and amenities needed for a trailhead. A full service trailhead should provide the following services:

- Parking for between 10-20+ automobiles,
- Drinking fountains (potable water),
- Trash receptacles (recycling if possible),
- Picnic shelters,
- Group and individual seating areas,
- Air station,
- Cellular or wireline emergency call boxes,
- Wayfinding signage system,
- Vending machines (optional),
- Toilets (optional),
- Showers (optional),
- Bike Racks (minimum 3),
- Picnic Tables (minimum 3).

Rest Areas

In addition to trailheads, rest areas should also be developed throughout the ROGG Study Area. Rest areas would not need to provide automobile parking, but could include storm shelters or picnic shelters, bench seating, trash receptacles and, potentially, emergency call boxes. At least one rest area should be located between trailheads.

Shelters

The construction of sturdy storm shelters is an important feature for the ROGG, due to the realities of long distance travel in an isolated and exposed corridor. Shelters should be constructed to blend with the native environment, through indigenous architecture and use of local materials, and include adequate lighting for evening use. Shelters should shield users from the intense Florida sunshine, be capable of withstanding hurricane force winds, and include a lightning protection system and picnic tables.

Observation Platforms

The landscape along the length of the ROGG Study Area is very flat, which could make traversing long stretches relatively monotonous. Observation platforms and viewing areas, elevated above the surrounding landscape would provide opportunities to better appreciate the landscape context and view wildlife or scenery.

Signage and Wayfinding

Trail signage is an important element of future ROGG development. There are four sign types that have been considered: regulatory (to meet federal standards), identity (signifying that you are on the ROGG), wayfinding (letting you know where you are and where you want to go) and interpretive (enabling a user to understand something unique about the landscape or attraction).

Low Impact Trail Materials

For the ROGG Study Area, concern over the impact of trails on the environment requires an assessment of the potential for constructing a system that is multi-use, accessible, and capable of supporting transportation travel. Future trail development must adhere to AASHTO standards, which defines a minimum width, hard-surfaced trail tread of 10 feet, with a preferred width of 12 feet. In order to lessen the impact associated with the federally-prescribed trail tread standards, construction of the ROGG must include the use of construction materials that have the least impacts on the environment.

Given the fact that much of the future ROGG system would be constructed within publicly-owned lands

Example of a full service trailhead with amenities

Information kiosk example

Image of a typical rest area (Miami-Dade County Trail Design Guidelines and Standards: Ludlam Trail Case Study)

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dedicated to conservation, pervious surface design would be expected to be evaluated as the standard for all construction. This construction technique could be applied to the construction of levee trails and roadside trails in particular. Elevated trail treads will be necessary at various locations where deep marsh, wetland sloughs, canals and rivers must be traversed. Where trails are not constructed adjacent to the road or on top of existing levees, they could be constructed as boardwalks or bridges across open water or wetlands. Elevated trails would need railings for trail user safety. The minimum height of the top rail for bicycle travel is 42-inches from the travel surface. Floating trail treads are a third option for consideration and could be a series of trail treads constructed on pontoons or some other system that floats on water. As with boardwalks and bridges, safety railings would be needed for these trail types.

Future Trail Development

Greenways of similar scale rarely are constructed as a single project. Typically, a phased approach is developed that may take years or even decades to complete after routing alternatives and funding are defined. Similarly, ROGG would likely not be developed as one continuous project along its entire length. Trail development for ROGG would likely be constructed in phases, requiring planners, designers and sponsors to plan for trail development as a series of segmented projects that may not be initially connected or linked end-to-end. The following criteria have been developed to guide the establishment of a phased approach for future facility development.

Potential Criteria for Defining Trail Segments/ Phases for Construction

1. Strong end-to-end origin/destination
2. Length of travel meets a specific user's needs and expectations
3. Connects to local, regional, statewide or national trails
4. Connects to local attractions such as parks, employment or tourist destination
5. Meets federal, state and local design criteria for trail development
6. Available ROW for trail development
7. Ability to secure permits for trail development
8. Cost of trail construction

Using this criteria, segments of the future ROGG trail development can be categorized in one of three classifications:

a) Ready for immediate development,
b) Capable of near term development,
c) Challenging for future trail development.

As a multi-jurisdictional Study Area, extending across multiple federal, state and local jurisdictions, discussions on operations and management were initiated as part of the feasibility study and master plan process.

Issues for operations and management addressed in Chapter 4 of the feasibility study and master plan include:

- Roles and responsibilities of jurisdictional partners,
- Guiding principles governing operation and management of the trail,
- Operation and management functions,
- Description of facilities to be managed and maintained,
- Access and use policies,
- Trail facility management policies,
- Land management policies,
- Water management policies,
- Safety and security of trail users,
- Risk management and liability,
- Administrative costs for operations and management,
- Labor and equipment needs for operations and management,
- Anticipated costs and funding for operations and management.

The ROGG User

Users of long distance trails similar to the ROGG are a unique blend of cyclists and pedestrians. Long distance trails that are primarily linear in nature with strong end points promote a type of use that is different from local and regional trails. Below is a list of trail user types most likely to use ROGG based on research of comparable long distance trails.

Out and Back or Half Back:
Halfbackers are trail users that ride linear greenways roughly half the total distance and then retrace their route to their point of origin. For the ROGG, this may be the most popular user of the corridor due to its end points in Miami and Naples. Halfbackers are typically cyclists who are looking for a health and wellness opportunity. For these users, the intent is a vigorous ride as part of a normal fitness routine.

Explorer:
Greenway users that arrive by car and stop at trailheads or other current destinations, such as visitor centers, along the route are classified as "explorers." This user has typically not made use of a greenway as a primary focus of their travel within the corridor, but will use short segments of the trail system during their brief stay.

Tourist:
It is anticipated that the ROGG would grow in popularity and would attract tour groups to south Florida. A variety of different rides and walks could be established to accommodate these tourists. As one example, a three-day tour could consist of 20 to 30 miles of cycling combined with interpretive stops and lunch breaks. Themed tours could be developed to attract a variety of interested users, from lovers of nature to cycle enthusiasts looking for the next great adventure ride.

Looper:
Loopers are trail users that typically reside at the trail end points or at population centers along long distance greenways. Loopers are cyclists and pedestrians that make use of portions of a long distance trail corridor as part of a circuit ride or walk. This means that the greenway is connected to a network of local or regional trails and that the use of the greenway is part of daily or weekly loop rides and walks.

Through User:
Trail users that travel from end-to-end on a long distance greenway are called "through users." This user would be expected to be the minority trail user for the ROGG. Nevertheless, the number of these users could be fairly high because a) the project corridor is flat and accessible, b) the south Florida landscape and climate could support 75-80 mile rides and c) the population centers in Miami and Naples could support through users. Relatively fit through users could ride the entire end-to-end route in five to seven hours. Tour hikers could accomplish the walk across the corridor in three to five days.

Internal Users:
The ROGG already has a population of users working and living within the corridor that would make use of the greenway on a daily basis, though this would likely be limited since population centers are located at the terminus of the corridor. The range of use would be strongly associated with existing population centers, popular destinations and employment centers. Internal users could also come from the service and utility sectors, such as employees of the SFWMD, NPS, or USACE whose jobs take them into the corridor.

Cyclist on Tram Trail at Shark Valley Visitor Use Area - Photo by Ginny Nadolny

2.4.3 Lessons Learned

From the comparable projects and summary of best practices that are relevant to long distance trails, the following "lessons learned" were identified as relevant to conditions similar to those found within the ROGG Study Area. As lessons learned, these summaries form recommendations that are to be considered in the planning and design of the ROGG. These lessons learned do not necessarily constitute a criteria for feasibility.

Location of Trail Facilities

Greenway trail facilities are best located separated from the street or off-road on existing infrastructure where available, such as levee tops, shared-use or multi-use trails and maintenance roadways, and roadside trails adjacent to U.S. 41. Shared-use or mulit-use trails need to preserve natural waterflow. In limited circumstances where other locations are not available, bicycle lanes or other on-road faclities that are not greenway oriented within the existing roadway corridor can be planned in order to ensure full route connections as a substitute for a shared-use or multi-use trail.

Trail Corridor Width

The minimum width for the ROGG is determined by the operation and management requirements of the particular trail tread as well as the environmental and cultural constraints present. For ROGG a corridor that is at least 30 feet wide would provide for a 10 to 12-foot wide trail tread with six to 10 feet on either side for furnishings, operations and management.

Separation of Trail and Roadway

Trails separated from roadways typically provide an improved user experience. Options to separate ROGG from U.S. 41 should be pursued throughout the corridor. The minimum width between the edge of road shoulder and the edge of trail should be five feet consistent with FDOT standards.

Build Loop Trails

To the extent practical, the ROGG system should connect to a series of loop trails built across the corridor. Loop trails are typically of varying length and type, although trail crossings over U.S. 41 will need to be considered for safety concerns.

Water Trails

Defined as a hard-surface multi-use trail supporting transportation and recreation, the ROGG should also connect to water-based access opportunities in the surface waters of the Everglades, Big Cypress, Fakahatchee and myriad waterways that are found throughout the corridor. Connections to a system of canoe and kayak trails is recommended to enhance the project. Opportunities to provide connectivity to existing and proposed water trails should be utilized.

Modifications to Existing Roadway Bridges

Modifying the superstructure of existing roadway bridges to facilitate trail development can be difficult to accomplish where the structure of the bridge is not designed to accommodate expansion. Where bridges cannot be expanded, restriping or other alterations within the existing structure may accommodate a trail connection, but not maintain the desired separation between vehicles and trail users. Though this technique has been utilized throughout the country, consideration for use for the ROGG should be only as an alternative option.

Connectivity to Destinations

Connectivity to destinations is important to consider along the entire route of ROGG. This includes destinations offering experiences with cultural and environmental resources and educations as well as trail user amenities such as food, water, transit and lodging. Connectivity is best when it is consistently utilized across multiple jurisdictions, such as various public lands, counties and tribal areas.

Trail Tread Width

Trail tread width should be no less than 10 feet, in accordance with AASHTO and FDOT standards. As a multi-use trail, ROGG is recommended to have a tread width of at least 12-feet. However, a 14-foot trail tread would provide an improved user experience. Trail tread width must be balanced with environmental impact. Given that the trail tread would be a hard surface, a wider trail would create greater natural resource impacts.

Design guidance for the width of a multi-use or shared-use path based on successful comparables that it should range from 10 to 15-feet in width depending on factors such as volume of users and mix of expected use. FHWA and Florida Greenbook standards call for 15-foot wide bike/pedestrian trails or a 10-foot wide bike trail if the facility is adjacent to a separate pedestrian facility. Where the trail crosses wetland systems, the trail tread should be the minimum width. A clear zone on either side of the trail must be maintained in accordance with AASHTO and must be at least two-feet from the edge of the trail. A minimum operations and management zone is recommended to extend at least five-feet from the edge of trail.

Trail Surface Materials

Similar projects across the nation and around the world have employed porous pavement, wood boardwalks, plastic lumber made from recycled waste, geogrid membranes or pre-cast concrete segments stretched across wetlands. The controlling factor is AASHTO standards and the preference for paved or hardened trail surfaces.

Trail Furnishings

Trail furnishings and amenities should be designed and constructed to reflect the south Florida and Everglades landscape context. Hardwoods can be the dominant feature of furnishings and furniture as this material is readily available and typically has a life-span of 10 to 20 years. For materials that are planned to withstand fire hazards, concrete products should be considered. Materials selected would need to withstand the hydrological and wind-load forces of south Florida.

Signage and Wayfinding

A comprehensive system of signage and wayfinding is best throughout the corridor. A full complement of signs includes regulatory, directional, interpretive and identity signs, which should all follow the latest update to the Miami-Dade County 2009 Sign Implementation Manual for wayfinding signs, as well as the latest edition of Manual for Unified Traffic Control Devices (MUTCD) standards.

Goals for ROGG Planning and Design

There are four primary goals that should be considered in the future development of the ROGG: safety, connectivity, diversity of experience, and efficiency of travel.

Safety of Users

Safety of trail users is paramount to a successful project. To promote and ensure the safety of future trail users, the ROGG should strive to separate trail users from motor vehicle travel whenever and wherever possible.

Connectivity

The hallmark of the ROGG is its ability to connect users to the unique landscapes and attractions of the corridor. Supporting end-to-end travel along the entire 75 to 80-mile corridor is certainly a goal, but it is also equally important to provide quality connections to popular destinations throughout the corridor. Additionally, the ROGG should link users to other local, regional, statewide and national trails to promote a choice in travel and experience.

Diversity of Experience

The ROGG would offer users a wealth of travel and visitor experiences. The project should take full advantage of the Everglades landscape and the south Florida climate to allow users a diverse range of experiences including educational experiences of CERP activities. These opportunities should be made available for users who vary in their capabilities and intensity and for the array of landscapes, cultural attractions and duration of visits.

Efficiency of Travel

To the greatest extent practical, the ROGG should follow the U.S. 41 corridor. This serves to promote efficient travel through the corridor and allows trail users to experience the diversity of landscapes and cultural attractions that exist in the corridor. The speed of travel through the corridor may vary for different user groups.