

# Section 7.0

## Maintenance

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A well designed, constructed, and maintained trail system provides the foundation for many enjoyable years of community activities including walking, hiking, in-line skating, and bicycling, as well as an appreciation of the natural and cultural heritage.

Since trail construction represents a considerable capital investment by all partners, it is prudent to consider the associated roles, responsibilities, and tasks to properly maintain both the individual facilities and the overall network. To keep the trails safe, functional, and attractive, it is advisable for trail managers to establish an operations team, a maintenance program, and a maintenance budget.

The following guidelines will identify the basic tasks and issues associated with maintaining a shared-use trail facility. As each trail section is unique in its context, the level of associated maintenance and tasks will also vary. On-road sections of trails, trails through natural areas, and pedestrian-only trails, for example, will experience varying levels of maintenance depending on the construction materials, surrounding environment, and use.

### 7.1 Management System

A trail management system is the fundamental building block for the necessary planning, costing, scheduling, implementing, and evaluating of maintenance activities. A systematic approach to maintenance will also assist in reducing exposure to liability claims purporting that trail facilities have not been maintained to acceptable levels of safety. It is, therefore, important that a planned inspection routine be developed and then followed. Activities should be systematically recorded in a maintenance log book.

The management system for trail maintenance involves keeping a variety of records, such as trail inventories, trail condition surveys and analysis, inspection checklists, cost estimates for maintenance tasks, implementation schedules, volunteer programs, maintenance contracts, and public comment and suggestion surveys.

The objectives, guidelines, and level of inspection and maintenance will vary with each trail and trail segment depending upon the type of trail, trail usage, and the natural and community setting.

Cooperation and coordination among departments, agencies, and municipalities is necessary to ensure that the trail meets maintenance objectives. This is especially important to transition areas (e.g., when traveling between on-road to off-road sections and between municipalities) which may be maintained by different departments. Development of maintenance agreements should begin during the study phase of a trail with formal approval by all agencies involved prior to the design phase of the trail. The Mount Dora Trails Network will be funded through a wide range of strategic partnerships. Each trail will likely be funded differently. In some situations private developers will fund the entire trail. In some other situations, the trail will be funded by one state agency on an easement provided by another state agency and maintenance will be required by Mount Dora. Because each trail is unique, the maintenance agreements will require individually crafted arrangements based on a wide range of issues, such as who owns the right-of-way, financial contributions by each of the stakeholders, and whether the trail is within an incorporated or unincorporated area.

#### Action

- Identify what agencies share in the maintenance of the trail and their potential roles and responsibilities and enter into a maintenance agreement on existing trails.
- Obtain maintenance agreements from the responsible jurisdiction(s) prior to construction of a trail. A sample maintenance agreement may be found in Appendix G.

### 7.2 Maintenance Plan

An effective management system will record maintenance tasks, locations, and necessary

## Section 7.0 – Maintenance

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adjustments that are required to meet the trail's maintenance objectives. This record includes an inventory and assessment of trail surfaces, signing, parking, amenities, drainage, rest areas, restrooms, and trailheads.

It is the responsibility of the trail manager to monitor physical changes in conditions on trail segments and provide a maintenance budget that reflects the expected level of degradation based on the trail type.

The maintenance plan should be developed for each trail prior to completion of construction. There are three main areas that should be considered for developing the maintenance plan: analysis, approach, and implementation.

### 7.2.1 Analysis

It is vital to have a regular system for reporting on the trail's condition and its use. In this regard, trails must receive a thorough inspection/maintenance at least twice a year. In Florida, it is recommended these bi-annual inspections occur in the early spring and early fall prior to the peak seasons for trail use. Less detailed inspections are also recommended with each mowing cycle in the summer and every other month in the winter to assess overall trail surface conditions.

Trail inspections provide information on existing conditions, including all deficiencies regarding the trail surface, signage, amenities, and landscaping. The inspector should record the exact location of any work required. Trail managers can also schedule the work tasks and later assess the accuracy of their work estimates and contracts by comparing original checklists with the work that was actually performed.

User input and surveys are also valuable in predicting user demands, establishing priorities for trail implementation and amenities budgets, and for suggesting actions for preventative maintenance.

#### Action

- Establish a regular monitoring system to carry out a systematic inspection and assessment of the trail's condition and signage.
- Record all monitoring activities and results in

a maintenance log book that lists trail issues and concerns to be reported on.

- Provide opportunity for trail users to share input regarding trail conditions, issues, and concerns through surveys and the City's web site.

### 7.2.2 Approach

#### Levels of Maintenance

- **Level 1:** Maintenance which is aimed primarily at protecting the trail from serious deterioration and providing for user safety (e.g., sweeping; removing debris; repairing wash-outs; maintaining bridges and signs; trash receptacles; invasive vegetation control; and tree, shrub and grass care).
- **Level 2:** Maintenance aimed primarily at preserving the trail investment and environmental quality (e.g., patching asphalt, repairing directional signage, traffic barriers, guardrail, gates, fencing, utilities, lighting, and pavement markings).
- **Level 3:** Maintenance aimed at user comfort. Involves Levels 1 and 2 as well as additional tasks (e.g., repairing vandalized furniture and interpretive signs, landscape maintenance, rest area amenities, restrooms, trailheads, vistas, overlooks, and special corridor views).

### 7.2.3 Implementation

Trail systems and their amenities should be inspected on a monthly basis as well as after each significant storm event to ensure the trails are adequately maintained. Two in-depth inspections per year should occur in early spring and late summer prior to the anticipated peak season.

#### Routine Maintenance

Routine scheduled maintenance throughout the year not only ensures trail safety, but can increase a trail's longevity.

- **Erosion, Slopes and Drainage** - Regular inspection to ensure proper drainage on the trail can minimize the need for reconstruction. Improper drainage from trail surfaces, a lack of defined swales and

## Section 7.0 – Maintenance

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ditches in the immediate area, and clogged drainage inlets can increase the deterioration of the trail surface and alignments. If needed, redesign and improvement of badly damaged trails can reduce ongoing future maintenance costs. Trails should be inspected for erosion, slopes, and drainage at a minimum of once per year. The routine monthly inspections should note any substantial issues and major issues which create safety concerns should be corrected immediately.

- **Pavement** - Trail resurfacing and rehabilitation needs will vary and are based on a segment's initial construction quality and the surrounding environmental conditions it is exposed to. Pavement should be inspected and maintained to ensure safety for trail users. Holes should be patched, cracks filled, and markings repainted as needed. Routine monthly inspections should note any substantial issues and major issues which create safety concerns should be corrected immediately.
- **Dead Trees** - Trails should be regularly inspected for dead or dying trees which may pose a hazard to trail users. Tree trunks and branches may be scattered or pushed back in throughout wooded or naturalized areas as these materials are often home to wildlife. It can be ecologically advantageous not to remove it totally and can provide moderate cost savings. Inspection for potentially hazardous trees should be conducted at least twice a year. Marking trees that have been previously inspected will save time and cost. Routine monthly inspections should note any substantial issues and major issues which create safety concerns should be corrected immediately.
- **Vegetation** - Ideally, vegetation should be routinely cut back immediate to the trail since overgrown shrubs and low-hanging branches can obscure signs and pose a hazard to trail users. Adequate clearance and sight distance should be maintained at driveways and intersections. It is recommended that maintenance of vegetation originating on private property be required through other local municipal bylaws. Routine monthly inspections should note any substantial issues and major issues which create safety concerns should be corrected immediately.

- **Mowing and Naturalization** - Cutting should occur at least six times a year unless otherwise mandated by the City's regulations or bylaws for the control of noxious weeds.

A mown edge is typically maintained on both sides of the trail except through forested areas. The edge is cut more frequently to prevent the encroachment of plant material onto the trail surface or road shoulder, to retain sight distances, and to provide an operating safety margin. The mown edge is typically a minimum of two-feet-wide but can extend further if warranted.

In recent years, it has become common practice to maintain open spaces in a natural state. It is encouraged to naturalize the trail corridor to assist in regeneration of the greenway and promote species diversity.

- **Trash Cans and Litter Removal** - Trash cans should be emptied on a weekly basis. While the task of collecting litter is usually a municipality responsibility, it has become common practice to encourage citizen groups to assist in litter control. One possibility is to implement an Adopt-A-Trail program.
- **Debris Removal** - Accumulated debris poses the most common hazard to trail users. This debris consists of leaves, trash, and dirt deposited on the trail due to rain events and wind. Additionally, those individuals requiring mobility aides may have a difficult time maneuvering around piles of slippery leaves. It is recommended that excessive fallen leaves be removed from the traveled portion of the trail as soon as possible. Routine monthly inspections should note any substantial issues and major issues which create safety concerns should be corrected immediately.
- **Wildlife** - Maintaining a healthy co-existence between wildlife and the trail involves management of natural habitats and regulation of human activities. It is a popular activity for people to feed wildlife that they encounter in urban open space situations. Wildlife viewing stations should be investigated in appropriate areas, if this need exists, in order to fulfill the need for close contact with wildlife.

## Section 7.0 – Maintenance

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- **Vandalism** - When vandalism occurs, it should be promptly repaired to send the message that vandalism will not be accepted, discouraging further damage. The repair or restoration of the trail or trail appurtenances is a key principle in CPTED discussed in Section 4.0 of this report.
- **Signage** - Regulatory and directional signs should be inspected at a minimum of once per year by the municipality or proponent that installed the signs. This task should be monitored with the assistance of a signage schedule and maintenance record. Missing or damaged signs should be promptly replaced to maintain continuity of the signage system. Routine monthly inspections should note any major issues. Any safety concerns should be corrected immediately.
- **Relevant Regulations** - Any maintenance plan must conform to local municipal policies, bylaws, and statutes. Examples of this may relate to weed control and pesticide use, naturalization goals, etc.

### 7.3 Trail Bridges and Underpass Structures

#### *General*

Maintenance of the trail bridges is a critical component of the overall trail management and maintenance program and is crucial to maintaining the integrity and aesthetic quality of the trail system. User safety is the primary objective of the trail maintenance operations. Scheduled, periodic inspections of the trail bridges by licensed and qualified professionals are necessary to identify and correct any deficiencies that may exist. Before a trail opens, policies and procedures for inspecting and maintaining the trail bridges should be established and implemented as part of an effective framework for trail management. Maintenance costs will vary depending on the type, size, and location of the structures. Structures crossing major highways, such as State and County roads, will typically be incorporated into the State's inspection database and be scheduled for inspection every two years. Trail operations personnel may perform routine, minor maintenance procedures; however, major operations, such as structural repair and repainting, will generally require hiring a

specialty contractor. The maintenance program for the bridges will also include the approach ramps, walls, and stairways.

Bridges and underpasses ranging in length from 100 feet to 180 feet will be required to accommodate the grade separated crossings within the Mount Dora Trails Network. Three primary superstructure types are under consideration. Prefabricated steel trusses and steel box girders will be used for longer spans and in areas where superior aesthetics is a high priority. These are the most maintenance intensive. Concrete AASHTO girder bridges will be used for shorter spans. The concrete bridges generally require less maintenance. Concrete substructures will be utilized for all three types of superstructures.

#### *Inspections*

Two types of inspections should be routinely scheduled for the trail bridges.

- **Safety inspections**, performed by trail operations personnel, should be done at least bi-monthly. These inspections should include items that ensure user safety such as handrails, fencing, and deck surfaces. Special attention should be paid to loose or damaged railings and posts and irregularities in the deck surfaces, such as loose or warped timbers and open joints, that can promote tripping or hazards for bicycles and inline skates. Also of special concern are algae or mold growths that can cause the deck to become slippery.
- **Comprehensive inspections**, performed by licensed and qualified professionals, should be done every two years in accordance with the State's bridge inventory system. These inspections include not only safety items as discussed above, but also the structural components that ensure the long-term integrity of the bridge.

#### *Maintenance*

Table 7-1 is a general guideline for various maintenance activities, including the frequency that these activities should be performed, for the types of structures previously discussed. When these activities should actually be performed will be at the discretion of the trail operator. It is important to remember, much like any type of structure, as the bridges age, maintenance will be required more frequently.

## Section 7.0 – Maintenance

**Table 7-1  
Recommended Structures Maintenance**

TASK	FREQUENCY		
	STEEL TRUSS	STEEL BOX	AASHTO GIRDER
Repair loose or damaged safety components	As Required	As Required	As Required
Remove debris and vegetation	As Required	As Required	As Required
Remove mold/algae from deck surface	As Required	As Required	As Required
Replace loose deck timbers	As Required	As Required	As Required
Repair minor cracks and spalls in concrete deck	Semi-annually	Semi-annually	Semi-annually
Clean/remove graffiti	Semi-annually	Semi-annually	Semi-annually
Remove/destroy vegetation in retaining wall panel joints	Semi-annually	Semi-annually	Semi-annually
Repair/replace expansion joint material	*Bi-annually	*Bi-annually	*Bi-annually
Repair/replace loose or missing hardware	*Bi-annually	*Bi-annually	*Bi-annually
Repair/replace slope protection	*Bi-annually	*Bi-annually	*Bi-annually
Paint touch-up	*Bi-annually	*Bi-annually	N/A
Class 5 coating	N/A	N/A	*10-20 years
Repaint structure	*10-20 years	*10-20 years	N/A
Bearing replacement	**As Required	**As Required	**As Required

\*These are estimated intervals. Frequency may be shorter or longer determined by inspection recommendations.

\*\*Typically, if bearings are designed and installed properly, they will last the life of the structure.

### 7.4 Maintenance Costs

#### 7.4.1 Structures Maintenance Costs

The cost to maintain the structure should be considered during the trail planning process. Future maintenance expenditures can be greatly reduced by selecting materials during construction that have a reputation for durability and longevity. Paint systems, for example, utilizing ultra-violet protective coatings have proven to greatly reduce the frequency of repainting structural steel.

Major maintenance operations performed by specialty contractors will typically be the most significant expenditure. Painting for a typical single steel box girder trail bridge can be estimated to cost between \$75 and \$100 per linear foot. Steel truss bridges will have similar costs.

Routine minor maintenance performed by trail operations personnel on an as-needed basis can range widely in costs depending on usage and weather conditions. This should be part of the

trail's daily operating budget similar to general items such as mowing or trash removal.

Bi-annual inspections performed by licensed professionals should also be included in maintenance costs. The inspection and documentation will typically range from approximately \$2,000 to \$3,500, depending on structure type.

#### 7.4.2 Shared-Use Trail Maintenance Costs

Maintenance costs will vary greatly depending on the type of trail, amount of volunteer labor, available amenities, and location of the trail. Several studies have been completed to research the cost to maintain trails in Florida. The cost to maintain a shared-use trail has been documented between \$1,000 and \$10,000 per linear mile. Based on recommendations from the Rails-to-Trails Conservancy and utilizing 2005 maintenance contracts utilized by Lake County to maintain the South Lake Trail, the estimated maintenance cost is estimated at \$6,500 per linear mile.

# Section 7.0 – Maintenance

## Trail Condition Report

**NOTE:** The Mount Dora Trails Master Plan requires that this report be filled out in early spring (February) and early fall (September) of each year.

Trail Inspected:		
Inspection Date:		
Spring:	Fall:	Year:
<b>CHECK (✓) ITEMS IF IN SATISFACTORY CONDITION, IF NOT, PUT AN X AND COMMENT INCLUDING ACTION TAKEN OR TO BE TAKEN. REPORT MAJOR PROBLEMS IMMEDIATELY TO RESPONSIBLE PARTY.</b>		
<input type="checkbox"/> Trail Surface:		
<input type="checkbox"/> Rights-of-Way:		
<input type="checkbox"/> Bridges (to include hand rails and approaches):		
<input type="checkbox"/> Boardwalks (to include hand rails and approaches):		
<input type="checkbox"/> Fences:		
<input type="checkbox"/> Visual buffering:		
<input type="checkbox"/> Proper signing on trail:		
<input type="checkbox"/> Parking area:		
<input type="checkbox"/> Lighting:		
<input type="checkbox"/> Drainage:		
<input type="checkbox"/> Neighboring land use and access points:		
<input type="checkbox"/> Rest areas:		
<input type="checkbox"/> Restrooms:		
<input type="checkbox"/> Trailheads:		
<input type="checkbox"/> Grass and shrubbery trimmed:		
<input type="checkbox"/> Safety hazards removed (dead limbs, leaning trees, loose rock, etc.):		
<input type="checkbox"/> Litter pick up and disposal (including parking area):		
<input type="checkbox"/> Vandalism/graffiti:		
Trail Inspected by:		
Name:	Tel:	Signature:

# Section 7.0 – Maintenance

## Trail Vegetation

	Required Elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Maintenance Activities
A.	Tree care		√											<b>Level 1</b> <ul style="list-style-type: none"> <li>• Maintain trees within 10 feet of trail, curb or edge of pavement.</li> <li>• Trees should be inspected after each large storm for damage.</li> <li>• Prune dead branches and trees overhanging trail and roadways as a regularly scheduled maintenance task.</li> </ul>
B.	Shrub care			√						√				<b>Level 1</b> <ul style="list-style-type: none"> <li>• Check for damage and make list for pruning and replacements.</li> <li>• Clean trash out of shrubs on a weekly basis.</li> </ul>
C.	Grass care			√			√			√				<b>Level 1</b> <ul style="list-style-type: none"> <li>• Apply the required fertilizers and weed controls as per Mount Dora requirements.</li> <li>• Mowing should occur on an as-needed basis.</li> </ul>
E.	Trailheads and trail crossings			√						√				<b>Level 1</b> <ul style="list-style-type: none"> <li>• Remove hazardous trees and limbs.</li> <li>• Prune and thin trees and underbrush for access and safety.</li> </ul>
F.	Invasive vegetation control			√						√				<b>Level 1</b> <ul style="list-style-type: none"> <li>• Develop a 10-year plan for replacing large trees on the invasive plant list with native trees. Do the same with shrubs, perennials, vines and grasses.</li> </ul>
G.	Leaf Raking			√						√				<b>Level 1</b> <ul style="list-style-type: none"> <li>• Remove piles of leaves, blow dry leaves, and sweep wet leaves.</li> </ul>

## Section 7.0 – Maintenance

### Trail Pavement

	Required Elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Maintenance Activities
A.	Pavement surface						√							<b>Level 2</b> <ul style="list-style-type: none"> <li>• Replace in kind, restore crown and cross slope as necessary. Fill and seal cracks.</li> <li>• Fill and repair potholes.</li> <li>• Power sweep the roadway surface according to the volume of usage of trail.</li> </ul>
B.	Shoulders and parking areas						√							<b>Level 2</b> <ul style="list-style-type: none"> <li>• After heavy rains and inclement weather, inspect and repair shoulder grade to predetermined slopes, replace materials lost to wash-outs, and remove debris.</li> <li>• Sweep and monitor parking areas.</li> </ul>
C.	Pavement markings						√							<b>Level 2</b> <ul style="list-style-type: none"> <li>• Repaint all pavement striping every spring. Check in the fall for fading and repaint as necessary.</li> </ul>
D.	Trails and pathways			√						√				<b>Level 1</b> <ul style="list-style-type: none"> <li>• Trim back or remove overhanging branches.</li> <li>• Sweep debris.</li> <li>• In summer, remove weeds from pavement cracks.</li> <li>• In fall, remove leaves weekly or as needed.</li> </ul>
E.	Retaining walls						√							<b>Level 2</b> <ul style="list-style-type: none"> <li>• In spring, check for damage.</li> <li>• In summer, remove weeds and plant growth from cracks in masonry and repair.</li> <li>• Remove leaves from weepholes.</li> </ul>
F.	Curbs						√							<b>Level 2</b> <ul style="list-style-type: none"> <li>• In spring, check for damage.</li> <li>• Remove weeds and plant growth from cracks and repair.</li> </ul>

### Trail Drainage

	Required Elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Maintenance Activities
A.	Erosion, Slopes and Drainage			√						√				<b>Level 2</b> <ul style="list-style-type: none"> <li>• Clean drainage systems and structures. Clean out ditches, culverts, etc.</li> <li>• If needed, modify to eliminate ponding.</li> </ul>

## Section 7.0 – Maintenance

### Trail Amenities

	Required Elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Maintenance Activities
A.	Trash cans and litter removal	√	√	√	√	√	√	√	√	√	√	√	√	<b>Level 3</b> • Pick up trash, and empty trash receptacles.
B.	Rest areas and benches			√						√				<b>Level 3</b> • Maintain, repair, and paint as needed.
C.	Restrooms and drinking fountains	√	√	√	√	√	√	√	√	√	√	√	√	<b>Level 2</b> • Repaint all pavement striping every spring. Check in the fall for fading and repaint as necessary.
D.	Trailheads	√	√	√	√	√	√	√	√	√	√	√	√	<b>Level 3</b> • Inspect and clean as needed. • Update and replace literature as needed.
E.	Lighting		√		√		√		√		√		√	<b>Level 2</b> • Clean and replace bulbs and fixtures as necessary.
F.	Vandalism	√	√	√	√	√	√	√	√	√	√	√	√	<b>Level 2</b> • In spring, check for damage. • Remove weeds and plant growth from cracks and repair.

### Trail Signing

	Required Elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Maintenance Activities
A.	Signing						√							<b>Level 1</b> • Replace missing or damaged signs. • Inspect signs for continuity.

The resulting plan should be used to determine financial and staffing requirements needed to complete the tasks. This data can also be used to identify equipment, tool, and vehicular requirements, as well as the potential for volunteer and service club participation.