Forgotten Too Long - Preventative Maintenance Strategies for Trails

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Why is Trail Management Important?

- Trail user safety
- Trail preservation
- Maintenance is cost-effective in the long run
- Community expectation - comparable level of service to other public amenities
- Requirement of all federally funded trails
Example of a Cross-Section for a “Designed” Trail

- **Vertical Clearance**: 10’-0”
- **Clear Zone**: 2’-3’
- **Base Material**: Extends 1’-2’ beyond pavement
- **Shoulder**: 2’-0”
- **Sub Grade**: 2’-3’
- **Boulevard Width**: Varies, 2’-0” Min.
- **Clearance to Signs**: 3’-0”
Section Overview

• Build it Right the First Time
• Pavement Life Cycle
• Causes of pavement failure
• Typical trail pavement failure types & treatments
Trail Pavement Management

“Build it Right the First Time”

- Proper initial construction saves money over the life of a trail
- Review plans for trail construction by developers or other agencies to confirm the proper specifications are being followed
- Inspect trail construction
## Trail Pavement Management

### Pay Now or Pay More Later

<table>
<thead>
<tr>
<th>Condition</th>
<th>Preventive Maintenance $1.50/sy</th>
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</thead>
<tbody>
<tr>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>Minor Rehabilitation $19/sy</td>
</tr>
<tr>
<td>Poor</td>
<td>Major Rehabilitation $32/sy</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Reconstruction $95/sy</td>
</tr>
</tbody>
</table>

Source: LRRB
Trail Pavement Management

Causes of Trail Pavement Failure

• **Environmental**
  - Damage caused by sunlight, oxidation, water and/or thermal cycling, age of trail, vegetation

• **Traffic (Type & Frequency)**
  - Maintenance equipment, emergency vehicles, utility vehicles, wear, seasonal weaknesses

• **Improper Trail Construction**
  - Designed trail vs. built-up trail
  - Quality of materials and/or construction
Trail Pavement Management

Issue #1: Cracking

Problems

• Longitudinal cracks
  o Cracks parallel to the direction of traffic typically caused by heavy loading or by lateral movement of the sub-grade.

• Transverse cracks
  o Cracks perpendicular to the direction of traffic often caused by thermal cycling.

• Edge cracks
  o Cracks parallel to the outer trail edge or scalloped which are typically caused by loading or insufficient width of sub-grade support under trail edge

• Cracks from vegetation
  o Cracks caused by root growth or sprouting seeds.
Trail Pavement Management
Issue #1: Cracking

Treatments

• Crack filling/sealing

A maintenance procedure that involves placing an elastic material (for sealing) and a rigid material (for filling) into cracks to prevent infiltration of water and other substances into the pavement structure. Overbanding should be less than 1” wide, less than 1/16” thick and routing, if done, should be less than ½” wide.

  o Lifespan: 3-5 years
  o Cautions: Application dependent, soft in hot weather
  o Benefits: Reduce pavement deterioration, extend pavement life
  o Cost: $$$$
Trail Pavement Management

Issue #1: Cracking (Caused by Vegetation)

Treatments

• Root barriers
  Placing a physical barrier in the ground to block roots from getting under the trail pavement

• Full-depth patching
  A pavement repair treatment that involves saw cutting and removing damaged asphalt and filling with a hot-mix bituminous mixture
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Issue #2: Surface Deterioration

Problems

• Aging surface
  o The asphalt surface is several years old and the process of oxidation has started.

• Raveling
  o Progressive disintegration of the surface downward caused by the loss of binder and dislodged aggregate.
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Issue #2: Surface Deterioration

Treatments

• Fog seal

Diluted asphalt emulsion without a cover aggregate which is used to seal and protect the asphalt pavement surface.

- Lifespan: 4-6 years
- Texture: Smooth
- Benefits: Seals asphalt from oxidation and wear, improved aesthetics
- Open for users: One day after application
- Cost: $$$$  
- For product information, see LRRB Report 2009-25 (http://www.lrrb.org/pdf/200925.pdf)
Trail Pavement Management

Issue #2: Surface Deterioration

Treatments

• Sealcoat (chip seal)
  An application of asphalt emulsion followed immediately with an aggregate cover which seals the asphalt pavement, provides additional protection from wearing and increases the frictional characteristics of the surface.
  o Lifespan: 6-10 years
  o Texture: Dependent on aggregate size (a small aggregate size is more suitable for multi-use trails)
  o Benefits: Seals asphalt, improved aesthetics
  o Open for use: After sweeping (24-48 hours after application)
  o Cost: $$
  o For product information, see LRRB Report 2009-25 (http://www.lrrb.org/pdf/200925.pdf)
Trail Pavement Management

Issue #2: Surface Deterioration

Treatments

• Slurry seal

A mixture of liquid asphalt emulsion, aggregate and additives applied in a liquid form to provide a new pavement surface.

- Lifespan: 8-10 years
- Texture: Typically smoother than chip seal but it is dependent on aggregate size
- Benefits: Provides new surface, fills small cracks and depressions, improved aesthetics
- Open for use: 24 hours after application
- Cost: $$$
- For product information, see LRRB Report 2009-25 (http://www.lrrb.org/pdf/200925.pdf)
Trail Pavement Management
Issue #2: Surface Deterioration

Treatments

• Micro surfacing
  A mixture of asphalt emulsion, aggregate and chemical additives applied in a liquid form to provide a new pavement surface. Faster cure time than slurry seal.
  - Lifespan: 8-10 years
  - Texture: Similar surface to a slurry seal
  - Benefits: Provides new surface, fills small cracks and depressions, improved aesthetics
  - Open for use: 1 hour after application
  - Cost: $$$
  - For product information, see LRRB Report 2009-25 (http://www.lrrb.org/pdf/200925.pdf)
Trail Pavement Management

Issue #2: Surface Deterioration

Treatments

• Overlay

  A layer of hot-mix asphalt typically two inches or greater placed over the existing pavement surface to improve the non-structural condition of the pavement.

  o Lifespan: 15 years
  o Texture: Smooth
  o Benefits: Fills small depressions and cracks, new trail surface
  o Open for use: Typically 24 hours after application
  o Cost: $$$$
Trail Pavement Management

Issue #3: Potholes & Depressions

Problems

• Potholes
  o Deformation in the pavement usually caused by moisture intrusion or heavy loads

• Depressions
  o Low points or settling in the pavement which may be caused by water infiltration, a failed patch, an improperly compacted base or settlement

Courtesy of Three Rivers Park District
Trail Pavement Management

Issue #3: Potholes & Depressions

Treatments

Two bituminous patch types, 1 of 2:

• Temporary
  A cold mix repair that will eventually crumble or pull out and may not be flush with the trail.
  o Lifespan: Less than one-year
  o Texture: May be uneven
  o Benefits: Temporary patch option when something needs to be done for a short-term fix.

Courtesy of Three Rivers Park District
Two bituminous patch types 2 of 2:

- **Permanent**
  A pavement repair treatment that involves saw cutting and removing damaged asphalt and replacing with a high quality bituminous mixture.
  - Lifespan: 15 years with proper preparation and installation
  - Texture: Smooth
  - Benefits: Replaces problem areas with surface that should last as long as original asphalt
How to Build a Trail Maintenance Schedule

• Examples of:
  • Slurry seal schedule
  • Fog seal schedule
  • Crack seal, overlay and reconstruct schedule

• Schedules based on:
  • General industry estimates for life spans
  • Trail specific environment, usage and desired level of service
  • Requires on-going monitoring and adjustments
How to Build a Trail Maintenance Schedule

Primary Asphalt Treatment Example: Slurry Seal
How to Build a Trail Maintenance Schedule

Primary Asphalt Treatment Example:
Fog Seal and Sealcoat (chip seal)
Primary Asphalt Treatment Example: Crack Seal