

3.6 Pavement

Pavement inspection and maintenance are the most important activities for ensuring trail safety and longevity. Many resources for evaluation of trail surface conditions, ranging from simple ratings systems to complicated integrated planning tools, are available for no cost online. Decisions about preventive maintenance and major reconstruction depend on a host of factors, including available funding and the age of the trail.

Purpose: The benefits of pavement preservation include extended pavement life and reduced long-term expenses through preventative maintenance. FP2 reports that every \$1 spent on pavement preservation yields a savings on future rehabilitation or reconstruction of \$6 to \$10.ⁱ Additionally, [Table 7](#) of Section 2.4 of this documents provides the estimated lifecycle extensions for asphalt pavements that can be gained through recommended preventative maintenance applications.

An Indiana LTAP presentation on PASER - Pavement Management offers the following cost-benefit information (per mile of roadway):

Figure 3: Cost Effectiveness of Treatments

Fix Type	Cost \$ Per Mile	Added Life ESL	Cost per Year of Added Life
Crack Seal	\$4,000	1 yr.	\$4,000
Seal Coat & CS	\$20,000	4-9 yr.	\$5,000
Overlay	\$100,000	8-12 yr.	\$12,500
Crush & Shape	\$150,000	14 yr.	\$10,700
Reconstruction	\$300,000	15 yr.	\$20,000

Source: Domonkos, Richard. (09/2014). PASER – Pavement Management. Indiana Local Technical Assistance Program. Prepared for 2014 AIC Annual Conference

Best Practices: A comprehensive pavement management system should evaluate four trail characteristics: roughness (ride), surface distress (condition), surface skid characteristics, and structure (pavement strength and deflection). Surface condition can be simply evaluated with the rating system outlined in the Asphalt PASER Manual.ⁱⁱ

An Indiana LTAP presentation on PASER – Pavement Management shows the correlation of PASER rating and typical treatments:

Figure 4. Typical Treatments Tied to PASER Ratings

Rating 9 & 10	No Maintenance Required
Rating 8	Little or No Maintenance
Rating 7	Routine Maintenance – Crack Seal, Patching
Rating 5 & 6	Preservative Treatments – Sealcoat

Rating 3 & 4	Structural Improvement = Overlay / Recycle
Rating 1 & 2	Reconstruction

Source: Domonkos, Richard. (09/2014). *PASER – Pavement Management*. Indiana Local Technical Assistance Program. Prepared for 2014 AIC Annual Conference.

For planning purposes, a custom inventory which combines PASER ratings with other data (pavement type, width, length, etc.) can be created by using the [Wisconsin Information System for Local Roads \(WISLR\)](#) as a template.

Table 8. Sources of “Check Lists” for Asphalt Pavement Maintenance and Preservation Construction

Title	Website
Crack Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl01.cfm
Chip Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl02.cfm
Fog Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl04.pdf
Thin Hot Mix Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl03.pdf
Slurry Seal Application	http://www.fhwa.dot.gov/pavement/preservation/ppcl13.cfm

Source: FHWA

Example of Slippage Cracking



The Pavement Preservation Checklist Series is available as a mobile app through the Google Play store or the iTunes App store. Additionally, FP2 maintains a helpful “Preservation Toolbox” link on their website homepage that is organized by topic. ⁱⁱⁱ

Pavement preservation methods [can be categorized](#) as nonstructural preventive maintenance (including surface treatments like slurry surfacing, crack sealing, chip sealing, micro surfacing, rejuvenation, hot and cold in-place recycling and thin-lift hot-mix asphalt paving) or structural preservation.

The following is a maintenance check schedule from [Best Practices for Bicycle Trail Pavement Construction and Maintenance in Illinois \(p.34\)](#):

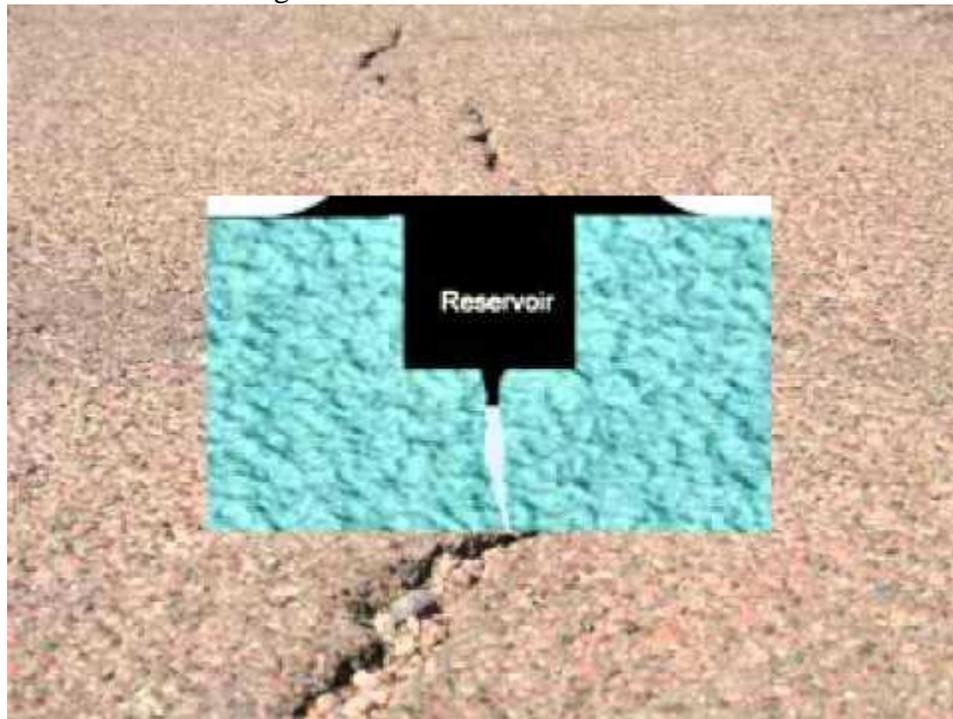
Table 9. PCC-Surfaced Trail Maintenance Recommendations

Maintenance Task	Maintenance Interval (years)
Check drainage components for proper function, no pooling water	1
Identify and complete joint crack sealing	6

Source: Best Practices for Bicycle Trail Pavement Construction and Maintenance in Illinois (p.34)

Solutions: Surface deterioration can be corrected with fog seal, seal coat, slurry seal, or micro surfacing. Engelmann notes that “each of these treatments is successively more costly but also lasts longer. Fog sealing is least expensive, yields a smooth surface, and lasts four to six years. Seal coating costs more than fog sealing but lasts 6 to 10 years. Slurry sealing is a bit more costly than seal coating and lasts a little longer. Micro surfacing is most expensive and has an 8 to 10 year lifespan.”¹⁴

Craftco Crack Sealing Instruction Manual:



Crack Sealing Asphalt Pavement Video (part 1):



Crack Sealing Asphalt Pavement Video (part 2):



Micro Surfacing Project using Western Emulsions:



Chip Seal Application (LTAP):



Slurry Seal Kuihelani Hwy, Maui HI:



Table 10. INDOT Standard Materials for Seal Applications

INDOT Standard Specification's Section	Application	Asphalt Emulsion or Paving Grades
404	Seal Coat	RS-2, AE-90, AE-90S, or HFRS-2
408	Sealing Cracks	AE-90, AE-90S, AE-150, or PG64-22
412	Fog Seal	AE-F

Source: [Lee, Jusang and Todd Shields, Treatment Guidelines for Pavement Preservation](#)

Complete replacement can mean installing a new crushed limestone surface, completely overlaying a crushed limestone or asphalt trail with a new asphalt surface, or replacing of an asphalt trail with a concrete trail. Costs should be on par with the original construction costs, though crew mobilization might be an added complication.^v

Providers in Indiana can be found by searching the IRMCA (Indiana Ready Mix Concrete Association) directory. This directory is [available in printable format](#), and a companion application, [IRMCA Directory App](#), is available for Android and iOS platforms.

Notes: Several agencies and industry groups, including the U.S. Green Building Council and the National Ready Mix Concrete Association (NRMCA), are promoting the

use of pervious concrete pavement for trails and paths to mitigate issues of pollutant run off and tree root heaving. NRMCA, has developed design, construction, and maintenance procedures as well as certification training programs for producers and contractors.

Several studies report that maintenance costs are lower for porous pavements than for standard asphalt trails. An accounting of costs from a Wisconsin trailway concludes that, “By reducing the need for winter plowing, labor, and equipment, Middleton’s cost savings amount to \$3,500 per year compared to regular asphalt trails. Maintenance costs for the crushed rock trail are about \$5,000 per year compared to only \$300 per year for the porous pavement. The trail is cleaned a couple of times a year with sweepers or blowers to remove accumulations of leaves or dirt.”^{vi}

Additionally, there is support for using “porous asphalt as an overlay for existing asphalt trails that have begun to deteriorate. While the old impermeable layer will not let much moisture through, the real benefit is the flexibility of the porous overlay. Even where unstable soils keep shifting the trail base, cracks do not seem to show through the top layer of porous asphalt.”^{vii}

The Director of the Luray-Hawksbill Greenway in Virginia notes that routine maintenance for porous pavements includes bi-annual vacuuming to remove accumulations of dirt and debris, annual vacuuming and fine gravel replacement, and weekly to monthly sweeping or blowing.^{viii}

See [Appendix B](#) for additional information on porous pavements.

ⁱ [FP2, Why Pavement Preservation](#)

ⁱⁱ [Walker, Pavement Surface and Evaluation](#)

ⁱⁱⁱ [FP2, Home](#)

^{iv} [Engelmann, Preventive Maintenance for Recreational Trails](#)

^v [St. John’s County, Greenway, Blueway, and Trails Master Plan](#)

^{vi} [Macdonald, Porous Asphalt Shows Advantages](#)

^{vii} [Macdonald, Porous Asphalt Shows Advantages](#)

^{viii} [Beard, Porous Pavement Benefits](#)