Integration of Pavement Management and Preservation

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So Far This Week….

What's Coming…

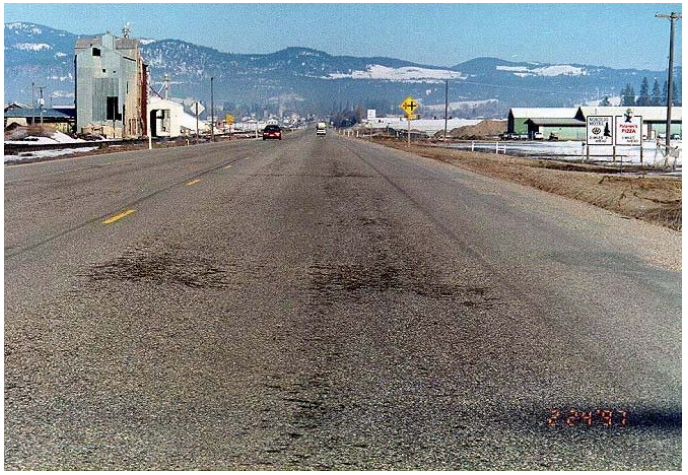
Role of Pavement Management in a Preservation Program

- Assist with project and treatment selection
- Determine best project timing
- Establish program funding needs
- Build program support
- Provide accountability

Project and Treatment Selection

- Analyze pavement performance
  - Assess type of deterioration present
  - Assess extent of deterioration present
- Identify factors that lead to the selection of preventive maintenance treatments
  - Assess what can be differentiated within the pavement management system

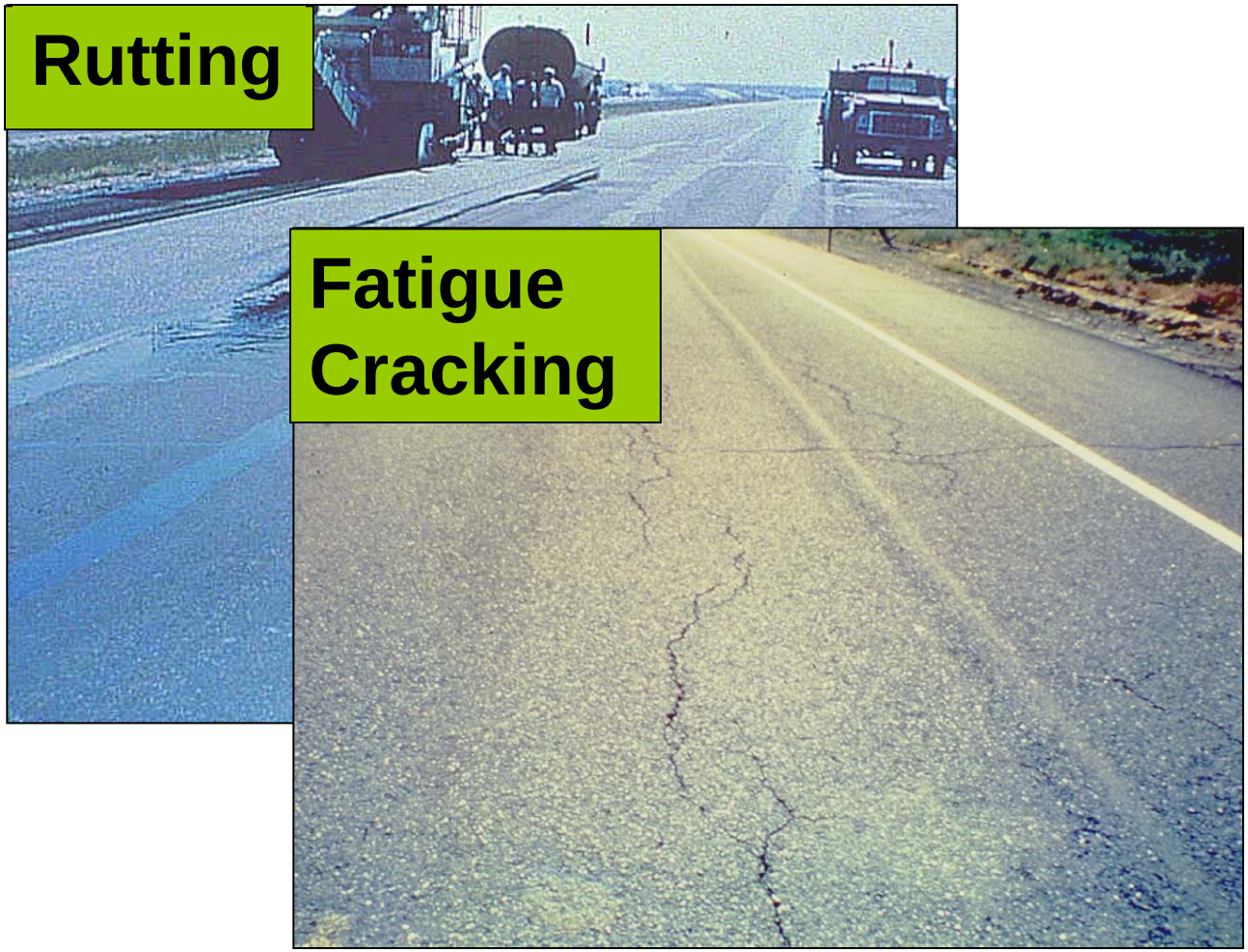
Analyzing Pavement Performance



Structural HMA Distress

- Load

Plastic Deformation

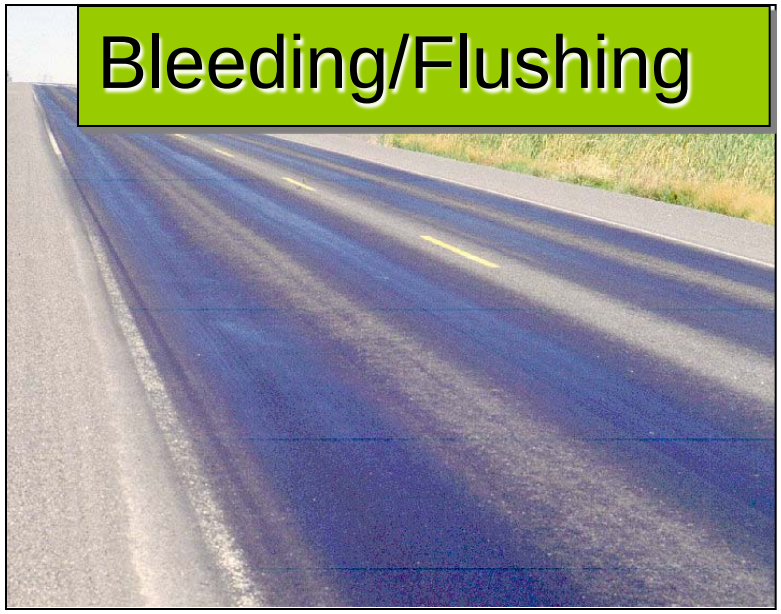


Functional Deterioration

- Most pavement surface distress somehow affects a pavement's function by increasing roughness or reducing friction

Polishing

Bleeding/Flushing



Safety Enhancements

- Restored Friction Characteristics

Identifying Candidates

What information is needed to identify candidates for PM?

1. _____
2. _____
3. _____

Treatment Selection Approaches

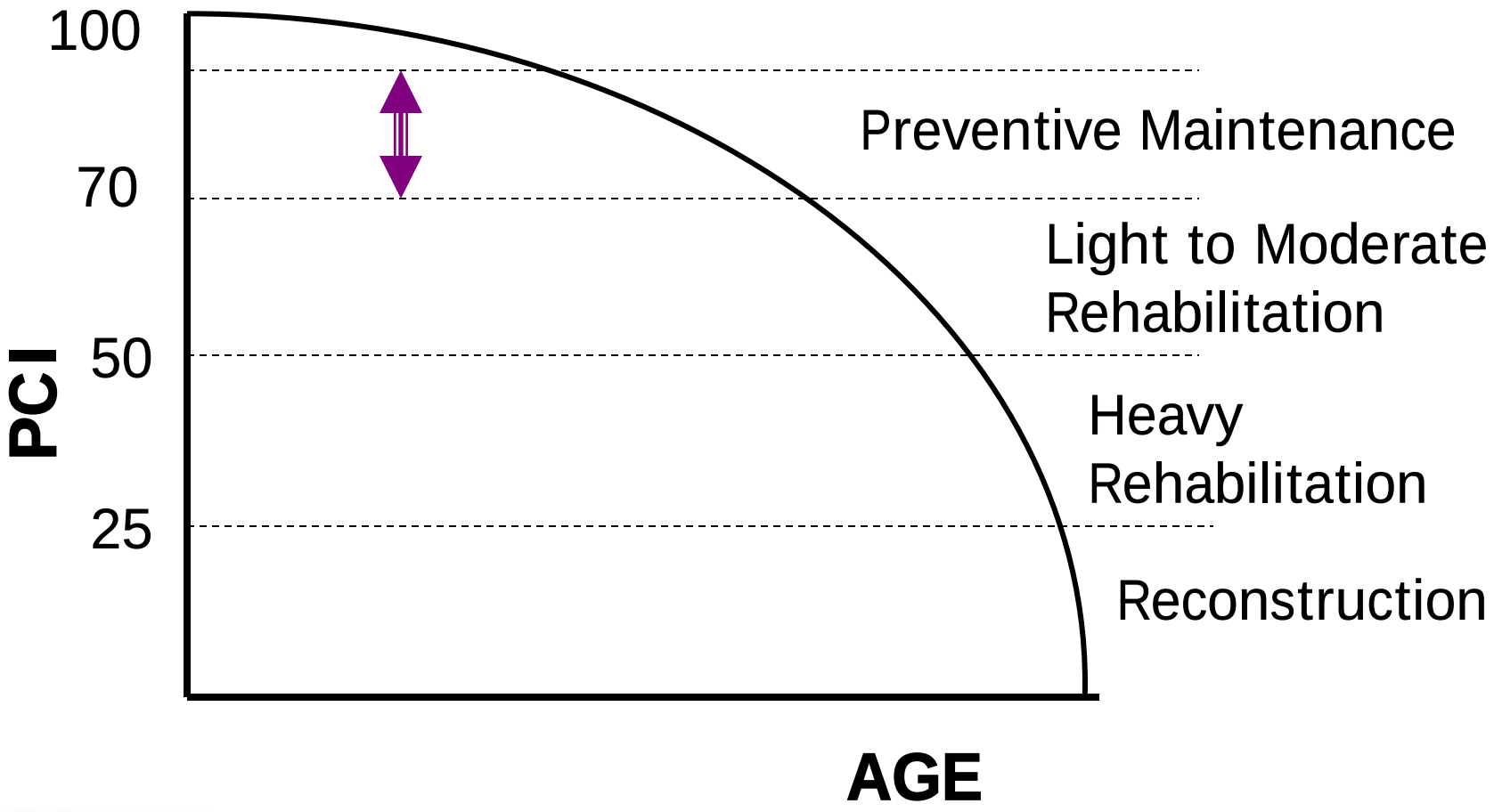
Easiest Approach

1. Group all preventive maintenance treatments into one or two treatments

2. Develop treatment rules, impact models, and costs for the general treatments

3. Have the districts/regions select the final treatment based on actual conditions

Sample Simple Decision Tree



Treatment Selection Approaches

More Sophisticated Approach

1. Develop decision trees for each preventive maintenance treatment

2. Develop performance models, impact rules, and costs for each treatment in the decision tree

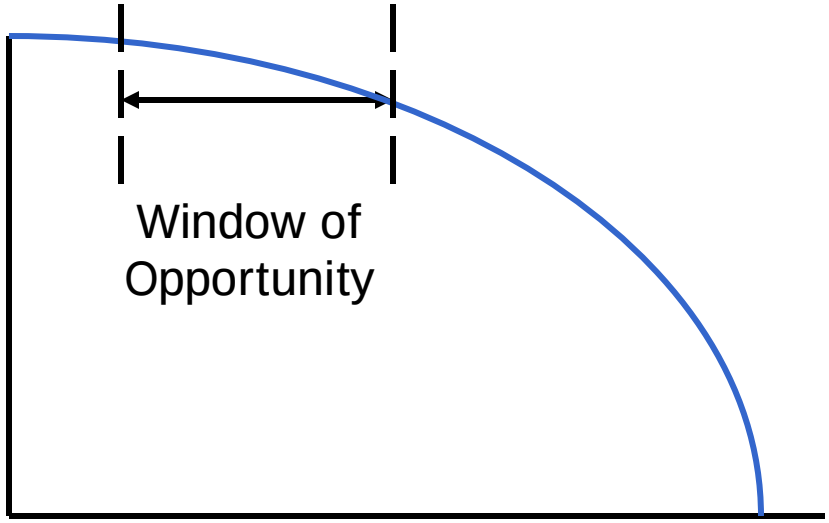
3. Provide treatment recommendations to the District/Regions to confirm

Recommendations

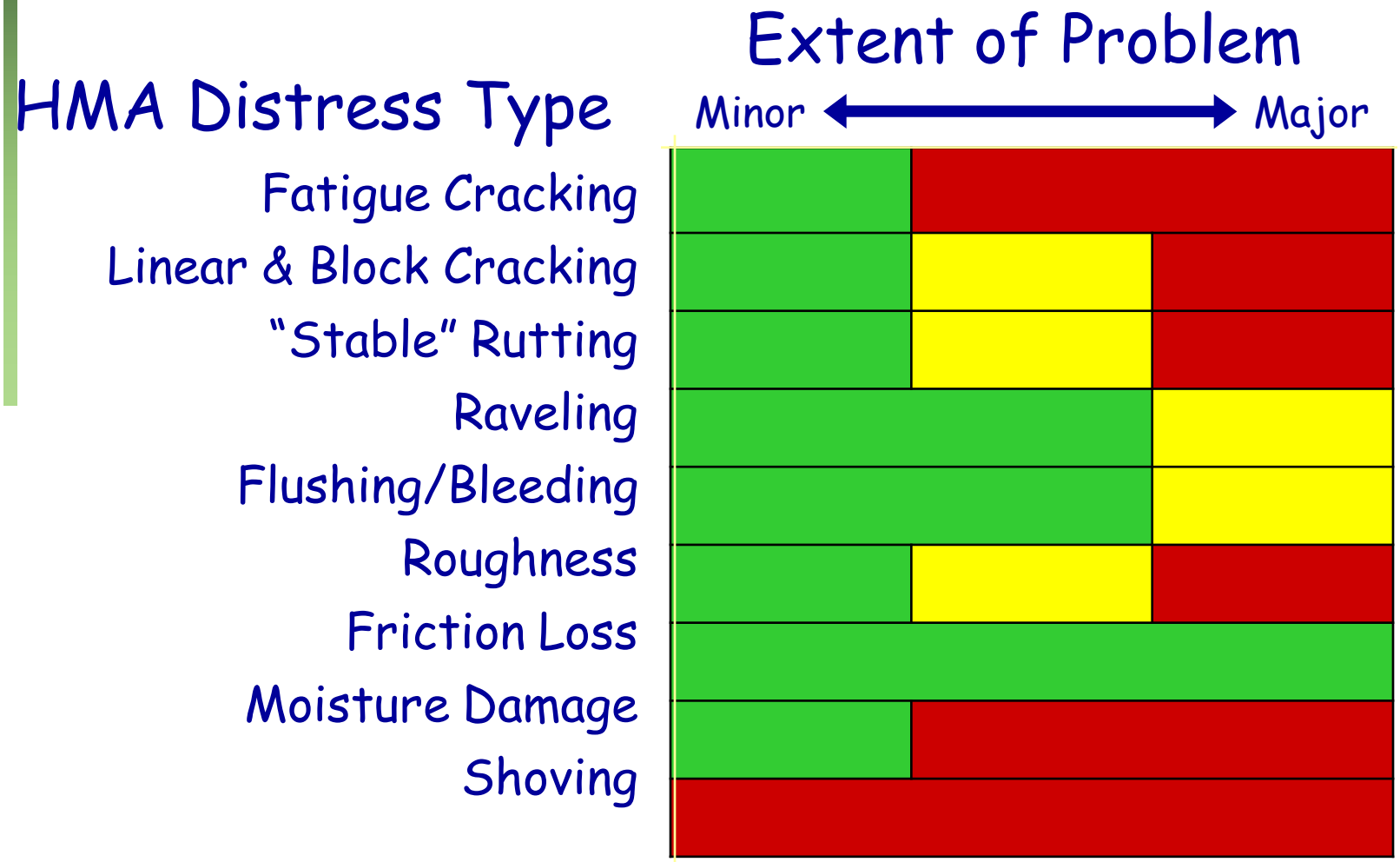
- Use existing condition information to identify candidates for preventive maintenance
- Identify the additional factors that trigger preventive maintenance treatments
- Incorporate the additional factors into your pavement management models
- Establish processes for tracking treatments

Project Timing

- Predict pavement deterioration
- Estimate when a more substantial treatment will be needed



Maximum Allowable Distress



Sample Treatment Guidelines

HMA Distresses	Low		Moderate		High	
	Occasional	Frequent	Occasional	Frequent	Occasional	Frequent
Fatigue Cracking	Fog Seal, Do Nothing	Fog Seal, Chip Seal	Chip Seal, Fog Seal, Thin HMA Overlay	Chip Seal, Slurry Seal	Patching, Chip Seal, Thin HMA Overlay	Recon, Patching
Edge Cracking	Do Nothing, Crack Seal or Fill	Crack Seal or Fill, Do Nothing	Crack Seal, Patching	Crack Seal, Patching	Patching	Patching
Longitudinal Cracking	Crack Seal, Do Nothing	Crack Seal, Chip Seal, Do Nothing	Crack Seal, Chip Seal	Crack Seal, Chip Seal	Patching, Crack Seal, Chip Seal	Chip Seal, Crack Seal, Patching
Bleeding	Do Nothing	Do Nothing, Chip Seal	Chip Seal, Do Nothing, Mill	Chip Seal, Mill	Mill + Chip Seal	Mill + Chip Seal, Thin HMA Overlay

Treatment Guidance - IDOT

Pavement Conditions	Severity Levels	Crack Filling	Crack Sealing	Fog Seal	Sand Seal	Scrub Seal	Rejuvntr	Slurry Seal	Micro-surfacing	Chip Seal	Cape Seal	CIR	HIR	Thin HMA Overlay	Ultra- Thin Bonded Wearing Course	UTW	Cold Mill	Drainage Presrvtn
Alligator/ Fatigue Cracking [1]	L1	F	F	NR	NR	NR	NR	F	F	F	F	F	F	F	F	F	NR	R
	L2, L3, L4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	F
Block Cracking	M1	R	R	F	R	R	F	R	R	R	R	R	R	F	F	R	F	NR
	M2	R	R	NR	NR	F	NR	F	NR	F	F	F	F	NR	NR	NR	NR	NR
	M3, M4	F	F	NR	NR	NR	NR	NR	NR	NR	NR	F	F	NR	NR	NR	NR	NR
"Stable" Rutting [2]	N1, N2	NR	NR	NR	NR	NR	NR	F	R	F	F	R	R	R*	F	R*	F	R
	N3	NR	NR	NR	NR	NR	NR	NR	F	NR	NR	R	R	R*	NR	R*	F	F
Joint Reflection and Transverse Cracking [3]	O1	NR	NR	F	R	R	NR	F	R	R	R	F	F	R**	F	NR	F	NR
	O2, O3	R	R	NR	NR	NR	NR	NR	F	F	F	F	F	F	NR	NR	NR	NR
	O4, O5	F	F	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Overlayed Patch Reflective Cracking	P1, P2, P3, P4, P5	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*
Longitudinal / Center of Lane Cracking	Q1	R	R	F	F	F	NR	F	F	F	F	F	F	F	F	F	F	NR
	Q2, Q3	R	F	NR	NR	NR	NR	NR	NR	F	F	F	F	F	F	F	F	NR
	Q4, Q5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Reflective Widening Crack	R1	R	R	F	F	F	NR	F	F	F	F	F	F	F	F	F	F	NR
	R2, R3	F	F	NR	NR	NR	NR	F	F	F	F	F	F	F	F	F	F	NR
	R4, R5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Centerline Deterioration	S1, S2, S3, S4	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*
Edge Cracking	T1	F	F	F	R	R	NR	F	F	F	F	F	F	F	F	F	F	NR
	T2	F	F	NR	NR	NR	NR	F	F	F	F	F	F	F	F	F	F	NR
	T3, T4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Permanent Patch Deterioration	U1, U2, U3, U4	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*
Shoving, Bumps, Sags, and Corrugation	V1	NR	NR	NR	NR	NR	NR	NR	F	NR	NR	NR	NR	NR	F	NR	NR	NR
	V2, V3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Weathering/ Raveling	W1, W2	NR	NR	F	F	F	F	R	R	R	R	R	R	R	F	R	F	R
	W3, W4	NR	NR	NR	NR	NR	NR	NR	F	F	F	F	F	F	F	F	F	F
Reflective D-Cracking	X1, X2, X3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	F	F	NR	F	NR	F	NR
Friction	Poor	NR	NR	NR	R	R	NR	R	R	R	R	F	F	R	R	F	F	NR
ADT	< 5,000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	5,000 – 10,000	R	R	F	F	F	R	F	R	R	R	F	R	R	R	R	R	R
	> 10,000	R	R	NR	NR	NR	NR	NR	F	F	F	NR	R	R	R	R	R	R
Relative Cost	($ to $$$$)	$	$	$	$$	$$	$$	$$	$$	$$	$$	$$$	$$$	$$$	$$$	$$$$	$	Varies

R - Recommended treatment for the specified pavement condition. Care must be examined in making sure that all critical distress types are addressed by the selected treatment.

R* - Recommended treatment when used with milling prior to treatment.

R** - Used in combination with crack sealing.

F - Feasible treatment but depends upon other project constraints including other existing distresses.

F* - This is a localized distress and should be treated locally while other distress types present should dictate choice of global treatment.

NR - Treatment is not recommended to correct the specified pavement condition.

1- Preservation treatments do not correct alligator cracking. Of the treatments, chip seals are most appropriate at addressing the alligator cracking.

2 - If stable rutting is present without other distresses, microsurfacing or mill and overlay are the recommended treatments.

3 - If cracking is joint reflection related, the preservation treatments will not correct the distress.

Time-Based Schedule Example

New York State Initial Guidelines for Treatment Application Cycles

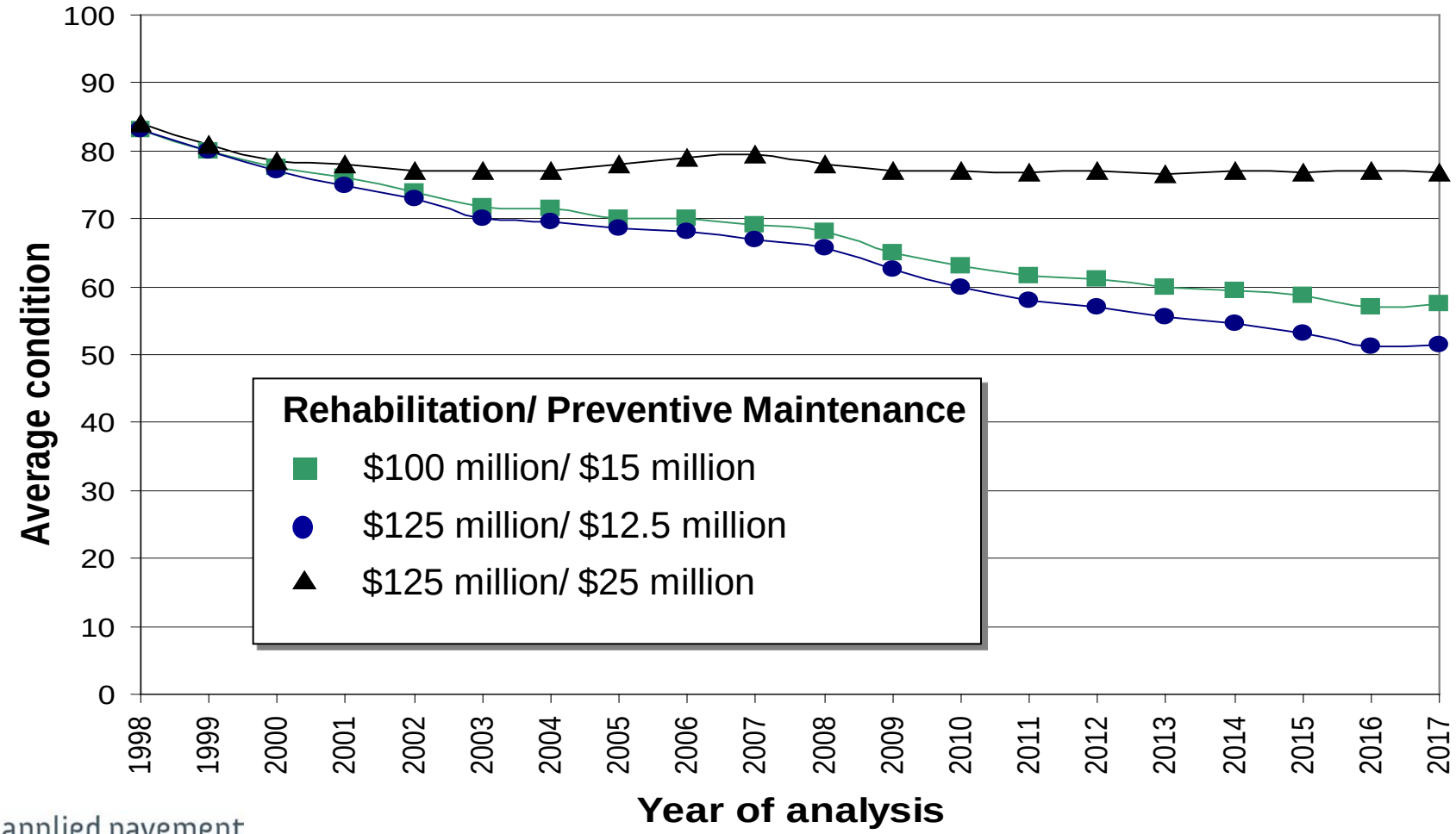
Treatment Type	Appl. Cycle, yrs
• PCC pavement joint and crack sealing	8
• HMA pavement crack sealing	4
• Thin HMA overlays (38 mm [1.5 in])	12
• Surface treatments of HMA pavements	4
• Surface treatments of shoulders	4
• Clean drainage	10

Recommendations

- Use performance models to determine the “window of opportunity”
- Establish internal guidelines on the amount of deterioration that can be addressed with preventive maintenance treatments
- Establish dedicated funding so scheduled treatments are applied on time

Program Funding

From Indiana DOT for its Interstates



Recommendations

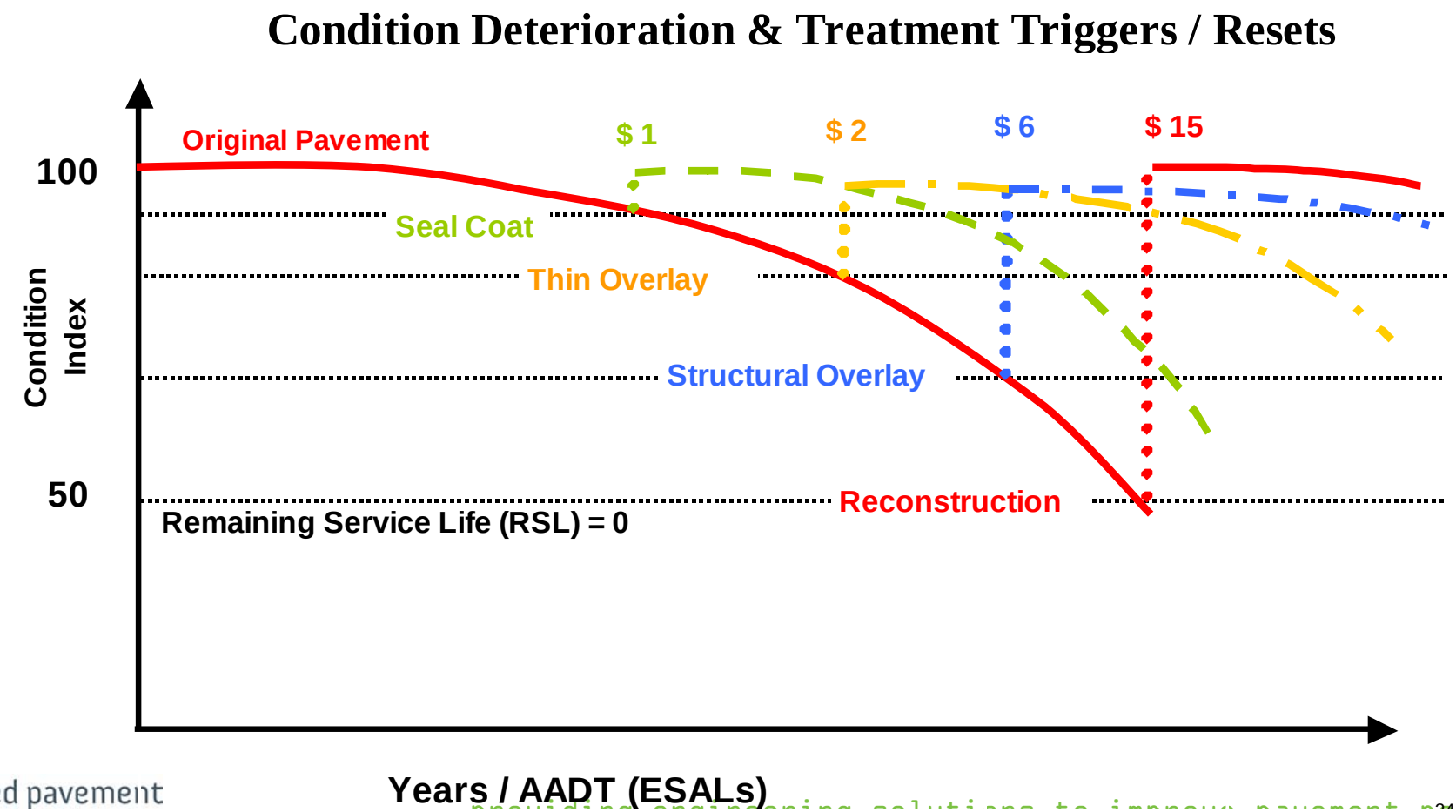
- Use your pavement management analysis to determine the appropriate funding level for your pavement preservation program
- Link funding levels to performance targets

Program Support

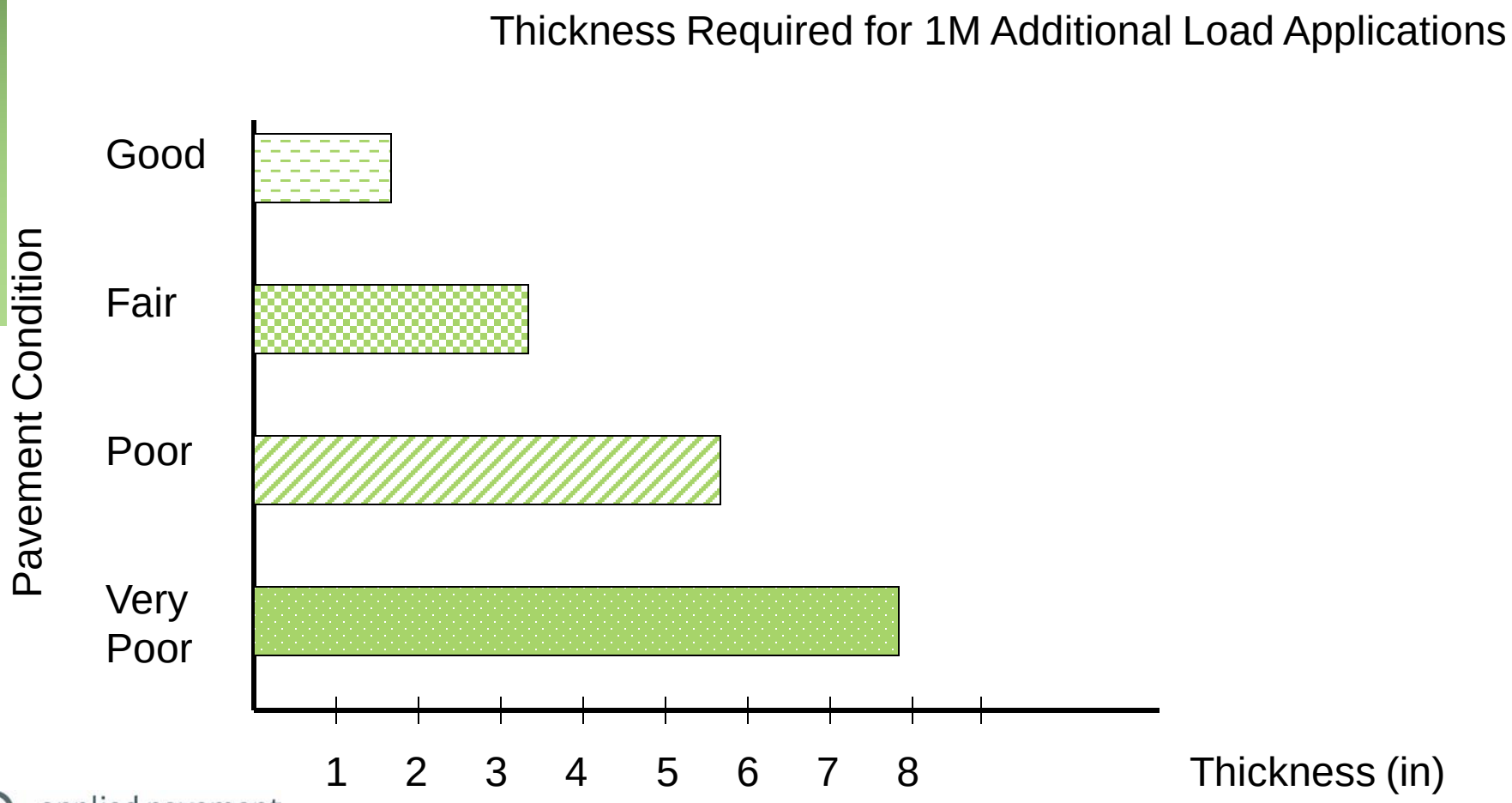
- Promote concepts
- Demonstrate cost effectiveness
- Illustrate impacts with and without preventive maintenance
- Justify expenditures

Promoting Concepts

- Educating decision makers



Good Roads Cost Less (1977)



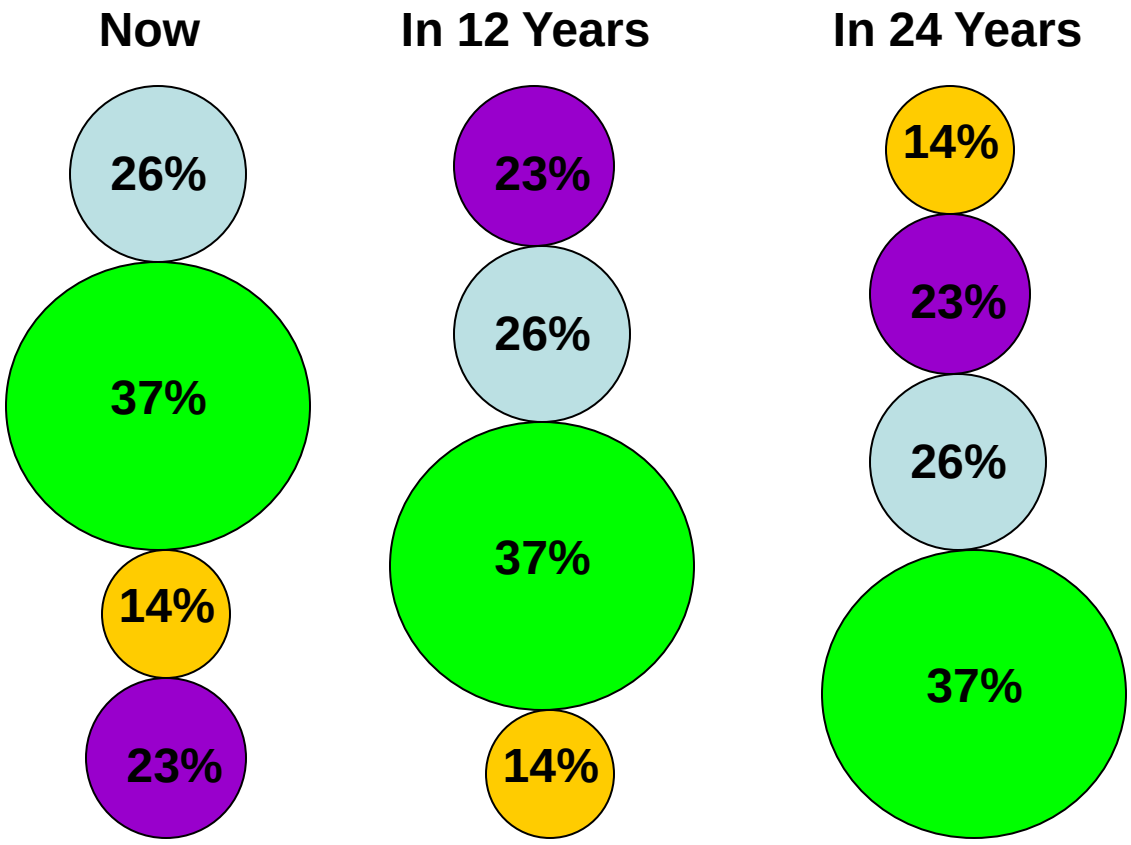
Program Support

0 to 25% of asset life
Minor Maintenance

25 to 50% of asset life
Preventive Maintenance

50 to 75% of asset life
Rehabilitation

75 to 100% of life
Replacement



The dynamic life cycle requirements of an aging infrastructure…Hamilton, Canada

Challenge

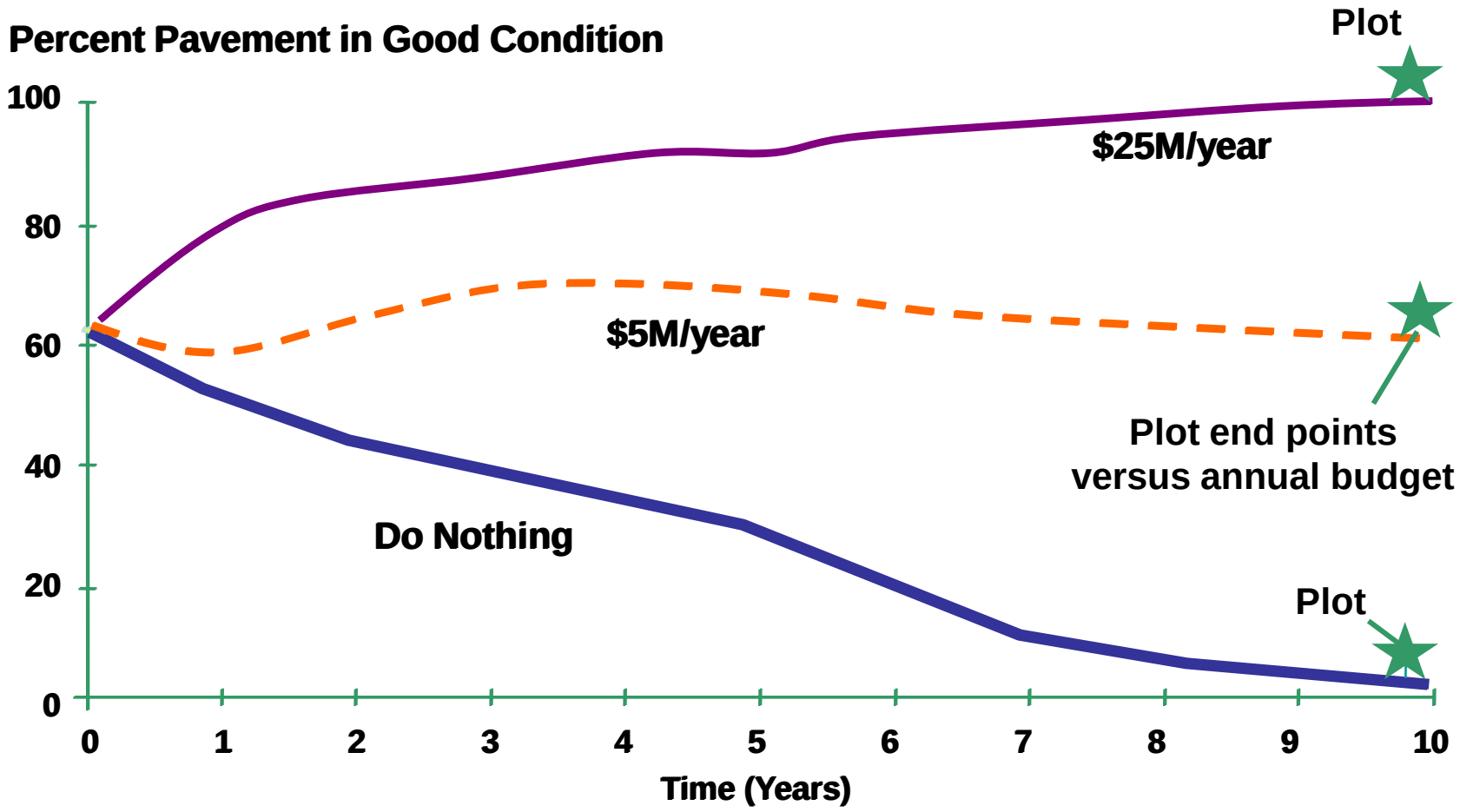
- Does distress data allow you to measure the effectiveness of a preventive maintenance treatment?
  - Example: crack sealing

Recommendations

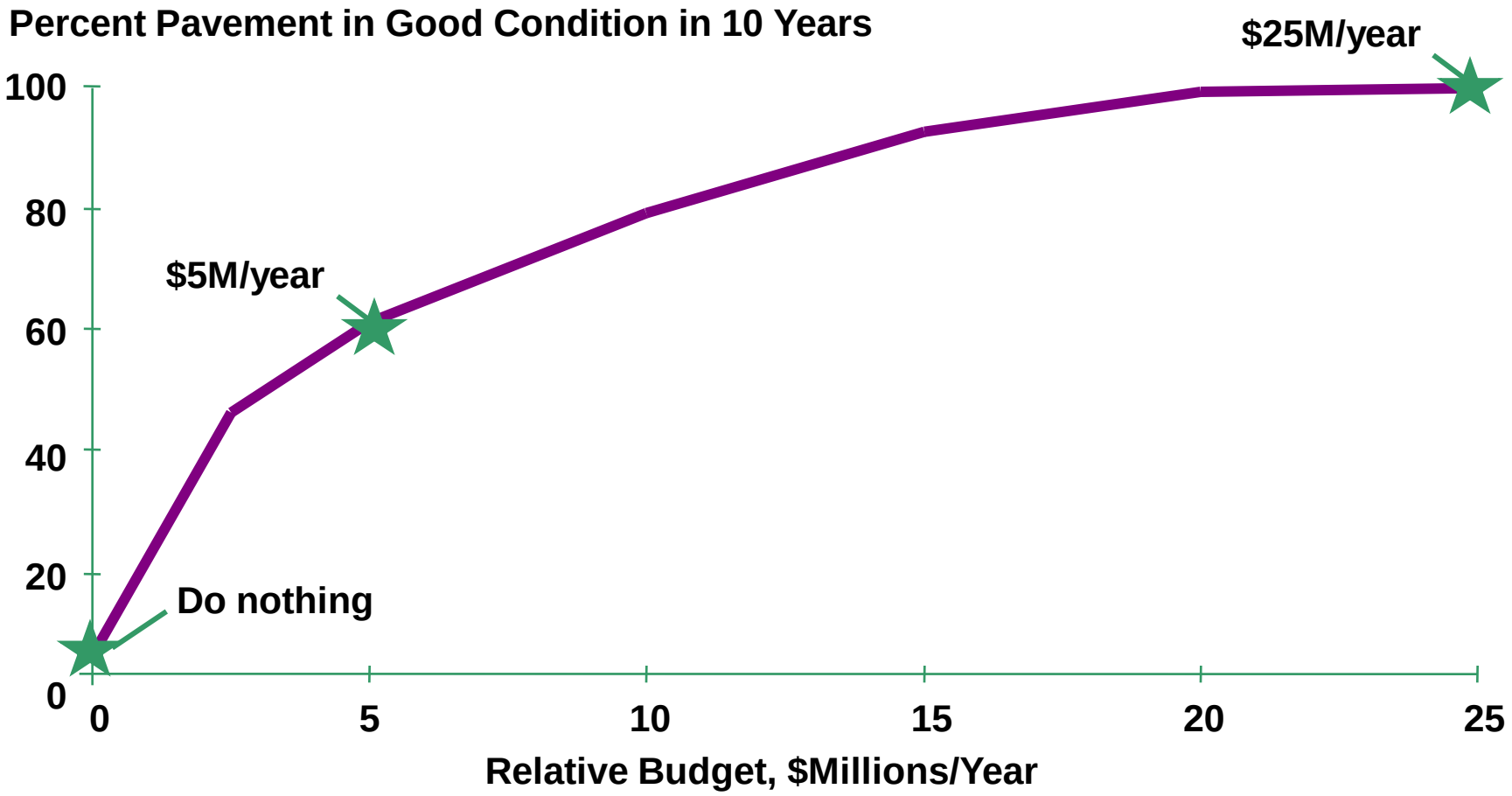
- Incorporate preventive maintenance treatments into the analysis
- Demonstrate benefits using strategies that resonate with decision makers
- Improve your measures of effectiveness as data become available

Accountability

Setting Performance Targets



Setting Performance Targets

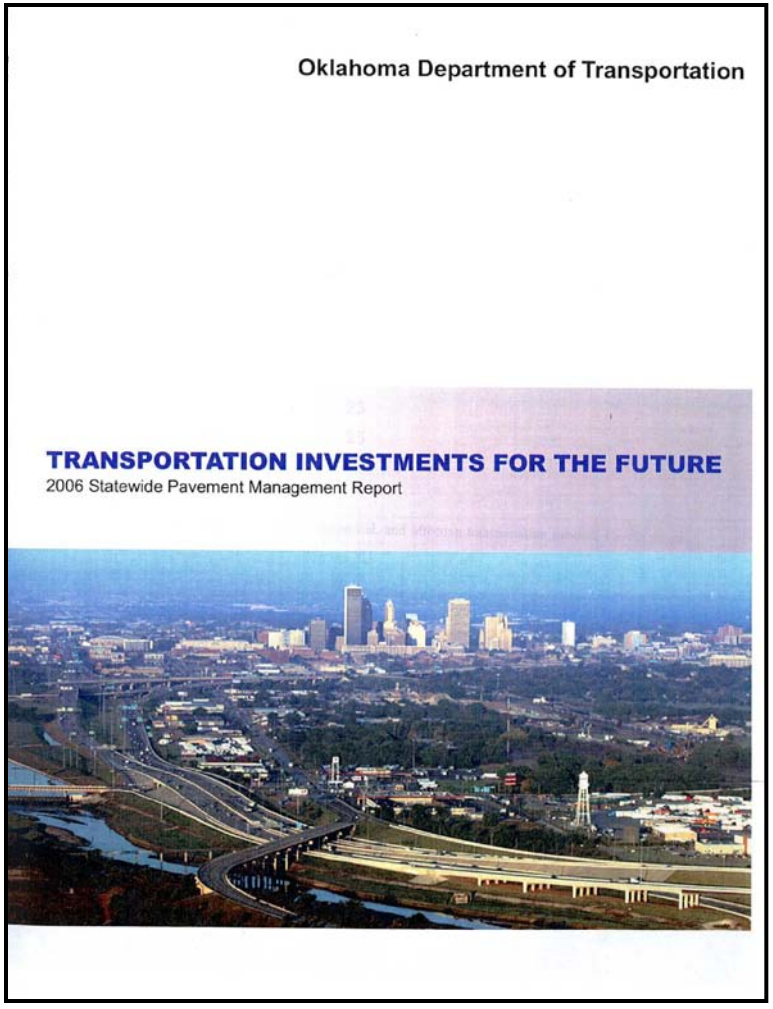


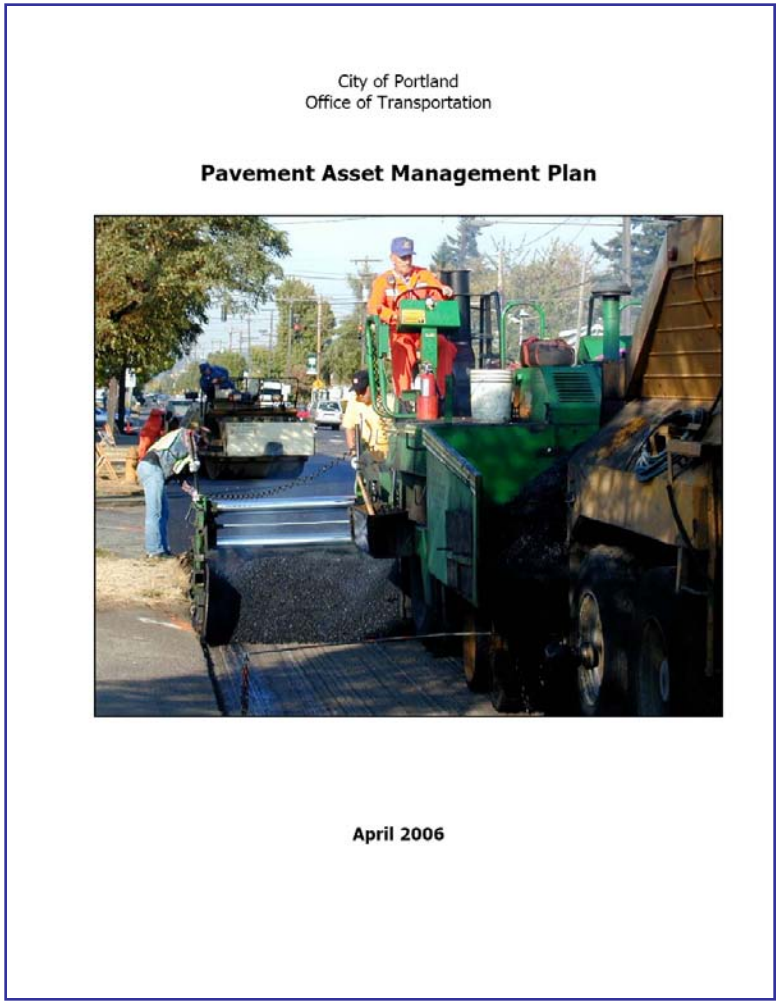
Enhance Accountability

- Pavement Management Plans

Background → Description of Services Provided → Description of Pavement Conditions → Description of Targeted Service Level → Program Descriptions → Financial Requirements and Funding Strategies → Performance Metrics → Commitment to the Users

Asset Plans


Oklahoma Department of Transportation
TRANSPORTATION INVESTMENTS FOR THE FUTURE
2006 Statewide Pavement Management Report


City of Portland
Office of Transportation
Pavement Asset Management Plan
April 2006

Recommendations

- Establish the processes necessary to track preventive maintenance applications
- Prepare Pavement Asset Plans showing what funding is needed and how it will be used.

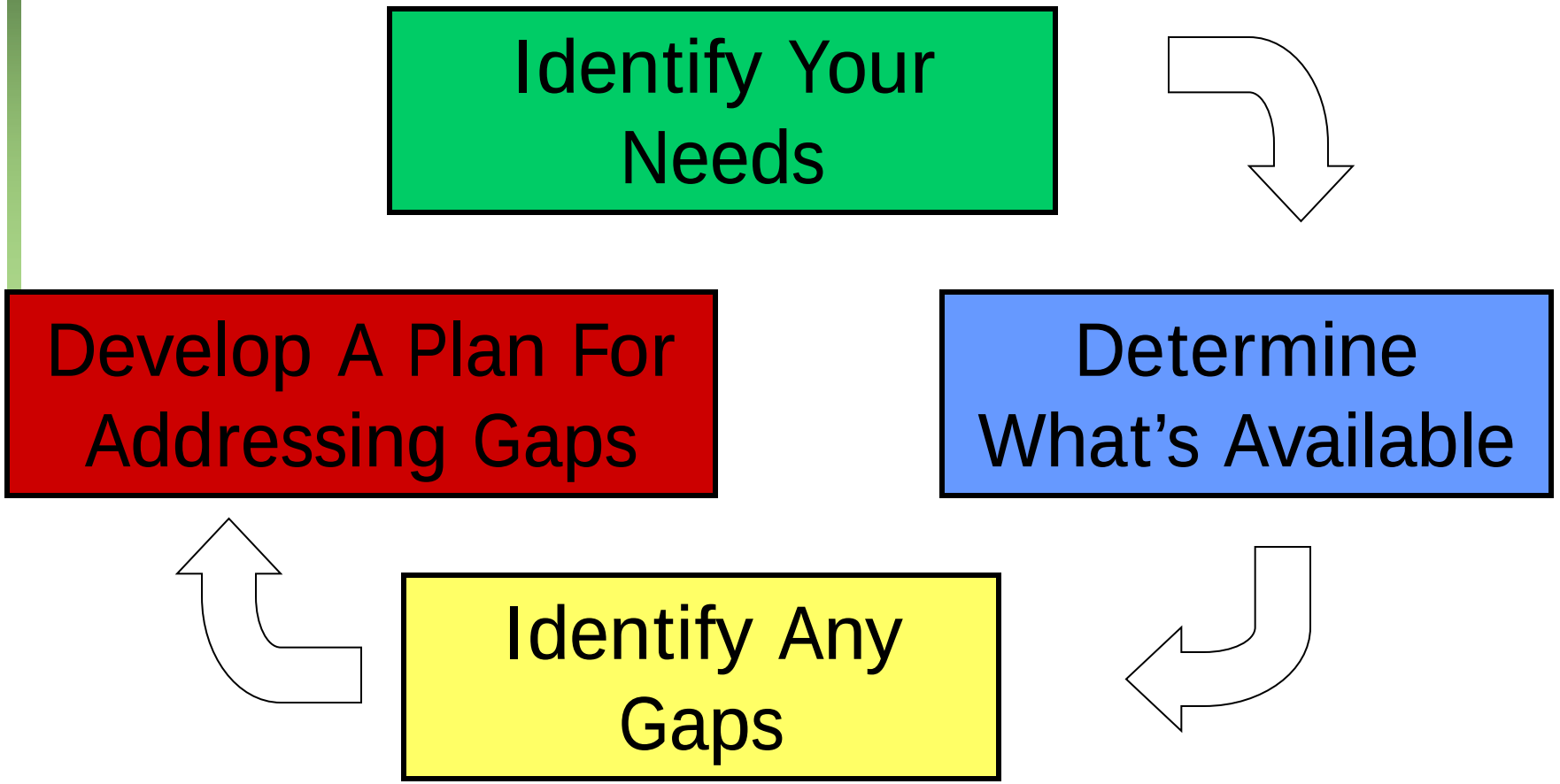
Making Improvements

- Address the core questions
- Identify factors impacting the degree to which pavement preservation is integrated in your pavement management system
- Consider creating a Pavement Preservation Engineer position
- Keep moving forward!

5 Core Questions

- What is the current state of my pavements?
- What is the required level of service?
- Which pavements are most critical to achieving our performance objectives?
- What are the best strategies for Maintenance & Operations and Capital Improvement investments?
- What is the best long-term funding strategy?

Moving Forward



Addressing Data Issues

- Accessibility
- Integration

Addressing Institutional Issues

- Resistance to change
- Disconnected decisions

Resources Available

- NHI 131116: Pavement Management: Characteristics of an Effective Program
  - Free to state highway agencies
  - 1 day
  - Conducted by FHWA
  - www.nhi.fhwa.dot.gov (In the training catalog)
- Final Report from the First Pavement Management Peer Exchange
- http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=600

Useful Resources - Websites

- FHWA Pavement Preservation website:
  www.fhwa.dot.gov/preservation

- FHWA Office of Asset Management:
  www.fhwa.dot.gov/infrastructure/asstmgmt

It's Time

- Pavement management should be designed to support an agency's decision processes
- Today, that means more than ever before with the increased demands associated with:
  - Pavement preservation
  - MEPDG calibration
  - HPMS changes
  - Accountability requirements

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