Using Pavement Management To Support a Pavement Preservation Program

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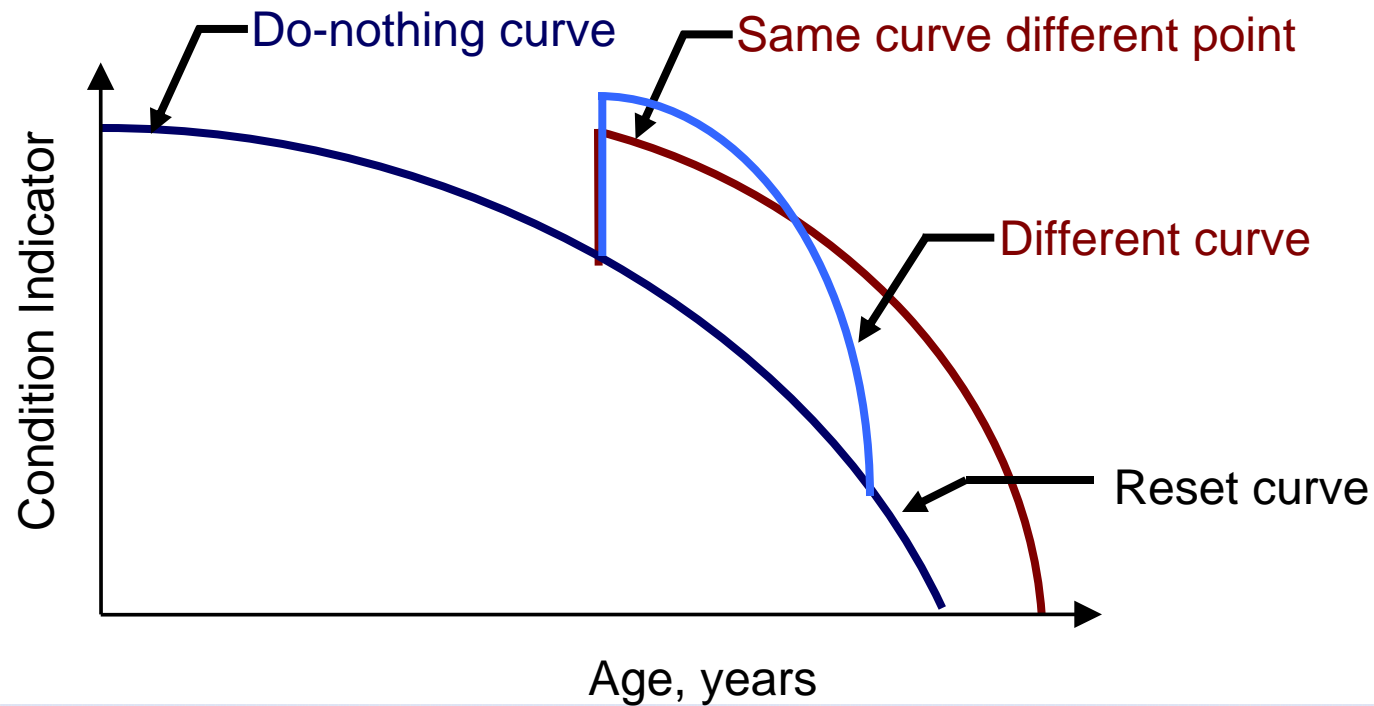
Applied Pavement Technology, Inc. (APTech)

Why is Integration Important?

- To identify good candidates for preventive maintenance

- To allocate funding cost-effectively

- To demonstrate the benefits of a pavement preservation program

- To determine the funding needed to achieve condition targets

Integration Requirements

- Method of identifying preventive maintenance needs

- Models that predict future pavement performance with and without preventive maintenance treatments

- Prioritization process that considers preventive maintenance

- Analysis period long enough to display the impact of preventive maintenance

Why Is It Such a Challenge?

Do-nothing curve

Same curve different point

Different curve

Reset curve

Condition Indicator

Age, years

- Difficulty in modeling

Why Is It Such a Challenge?

- **Pavement management and maintenance aren't integrated**
  - Don't know where maintenance has been applied
  - Maintenance may record information in a way that's not compatible
  - Maintenance typically selects their own projects
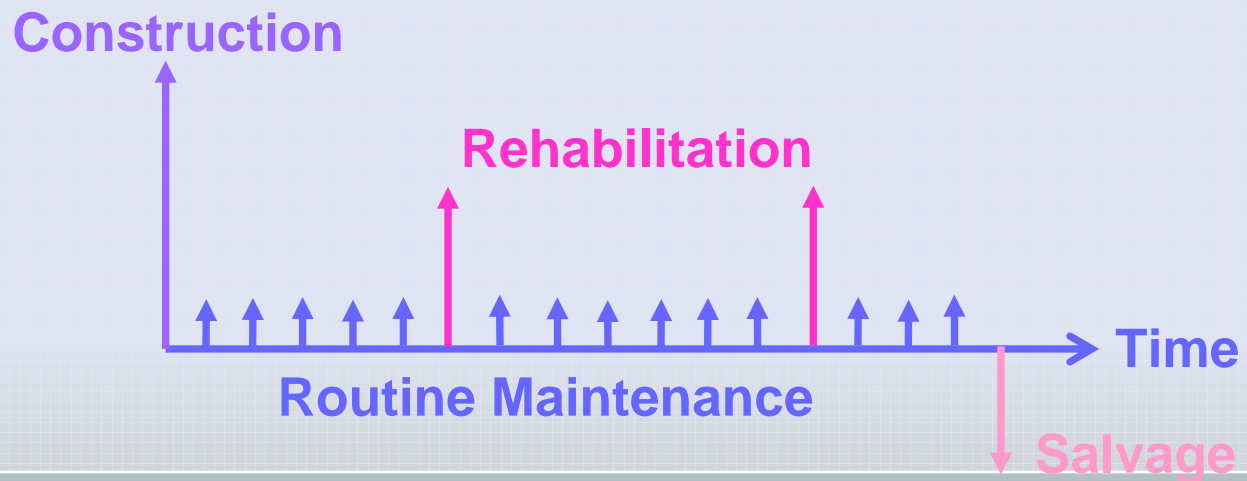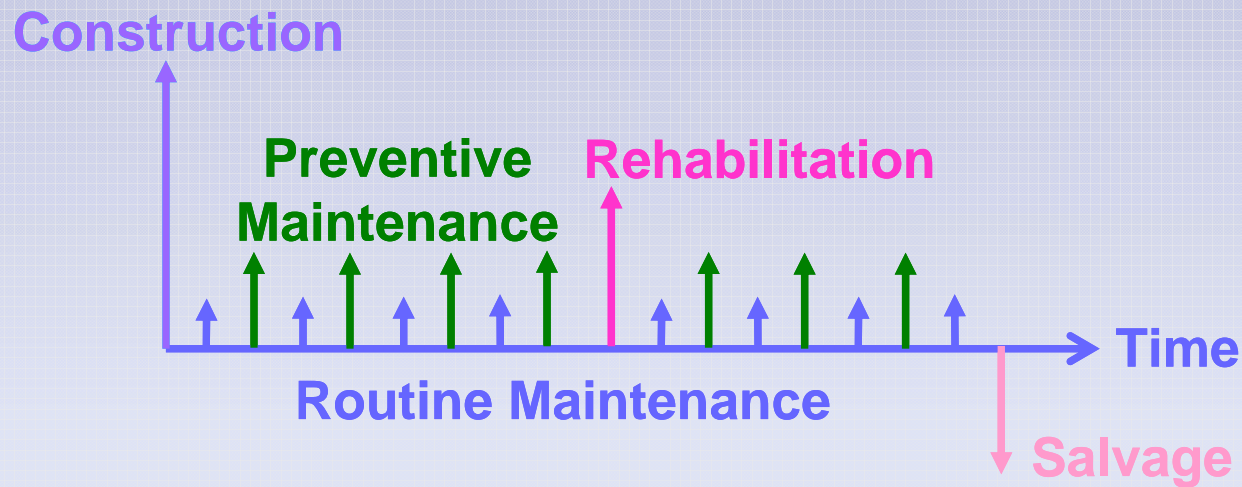
Why Is It Such a Challenge?

- Funding needs exceed funding levels provided

- Public perceptions don't support pavement preservation
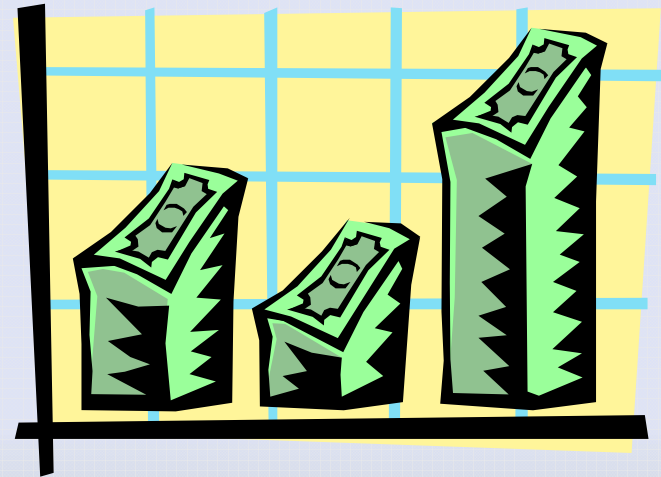
Overcoming Challenges

- Education and Communication
  - On-going effort
  - Provide information in meaningful ways
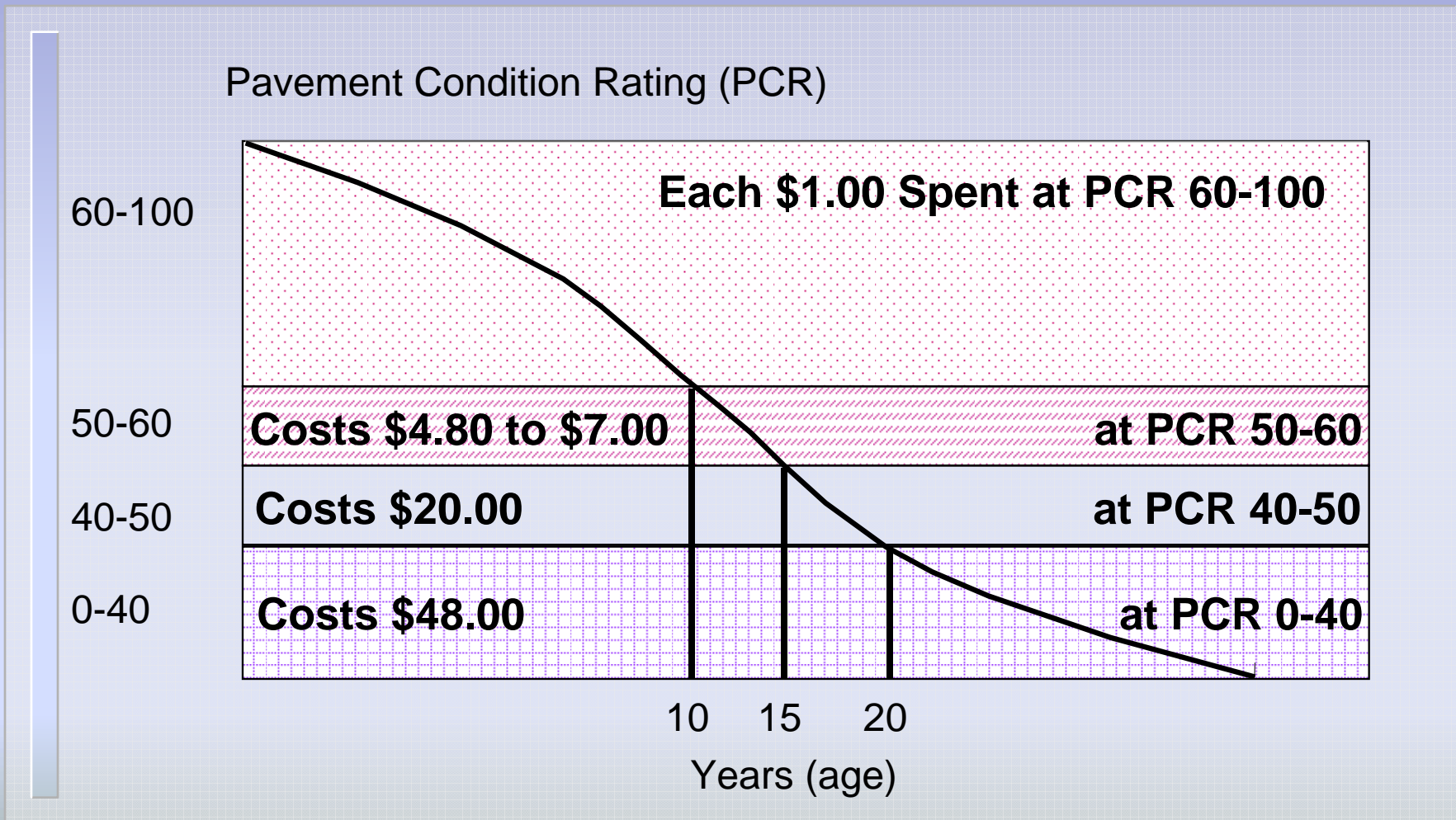
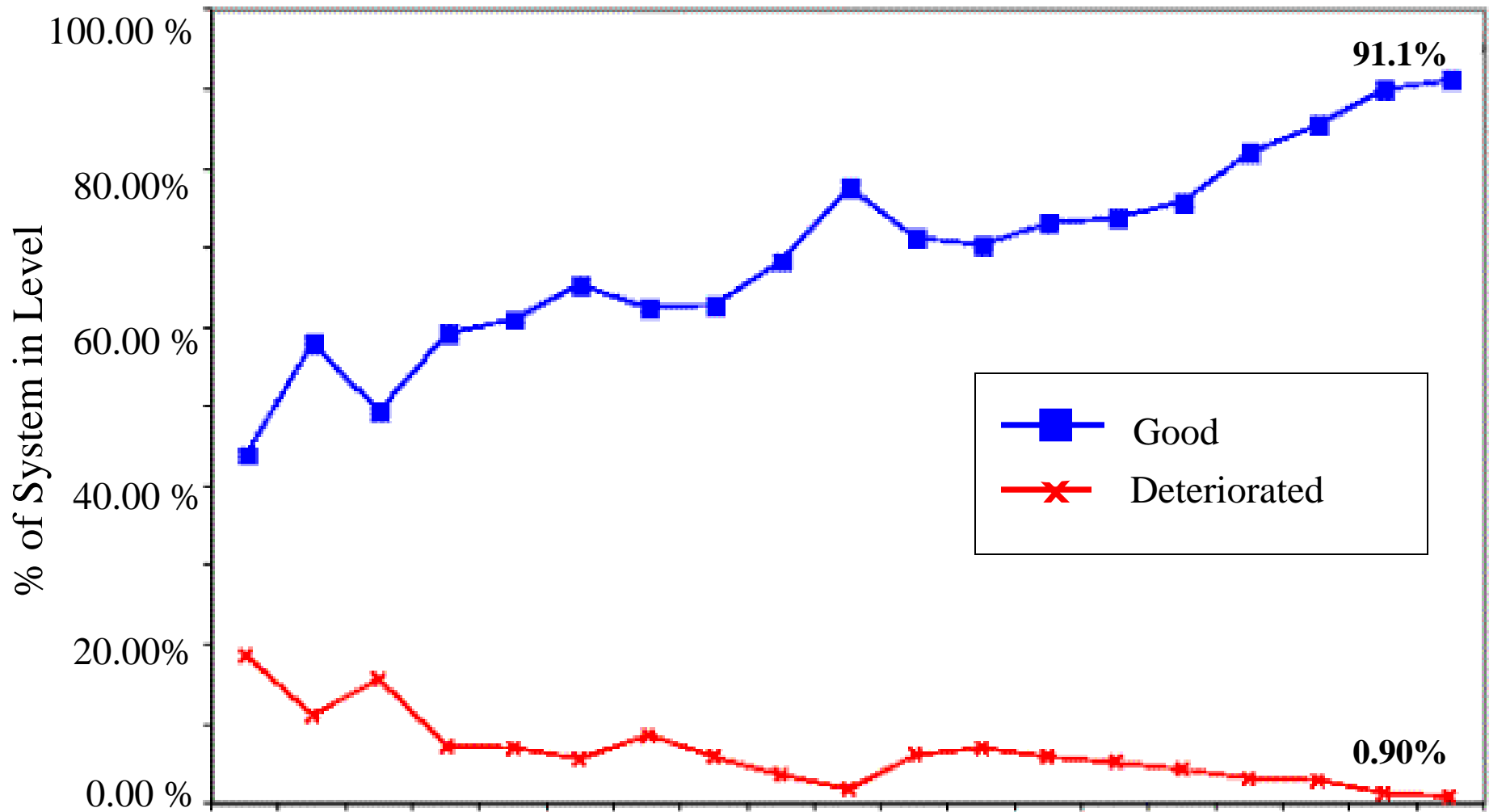# Demonstrate Cost-Effectiveness

Demonstrate Cost-Effectiveness

$315 million
Rehabilitation and Reconstruction

=

$190 million
Rehabilitation and Reconstruction

+

$10 million
Preventive Maintenance

Achieved same results for $115 million less

Demonstrate Cost-Effectiveness

Pavement Condition Rating (PCR)

Each $1.00 Spent at PCR 60-100

60-100

50-60 **Costs $4.80 to $7.00**   **at PCR 50-60**

40-50 **Costs $20.00**   **at PCR 40-50**

0-40 **Costs $48.00**   **at PCR 0-40**

10   15   20

Years (age)

Demonstrate Cost-Effectiveness

# Communicate the Concept

Organizational Changes

- Pavement Preservation Engineer or Pavement Management Engineers in Regions/Districts

- Address contracting issues
  - Reduce contracting period
  - Use warranties
  - Use construction dollars for first treatment

Technical Issues

- Pavement Management Integration (PMI) Levels
  - Level 1: Full Integration
  - Level 2: Partial Integration
  - Level 3: No Integration

○ PMI Level 3

- Use Pavement Management System for rehabilitation and reconstruction

- Any sections not recommended for rehabilitation or reconstruction should be evaluated as preventive maintenance candidates

Advantages/Disadvantages
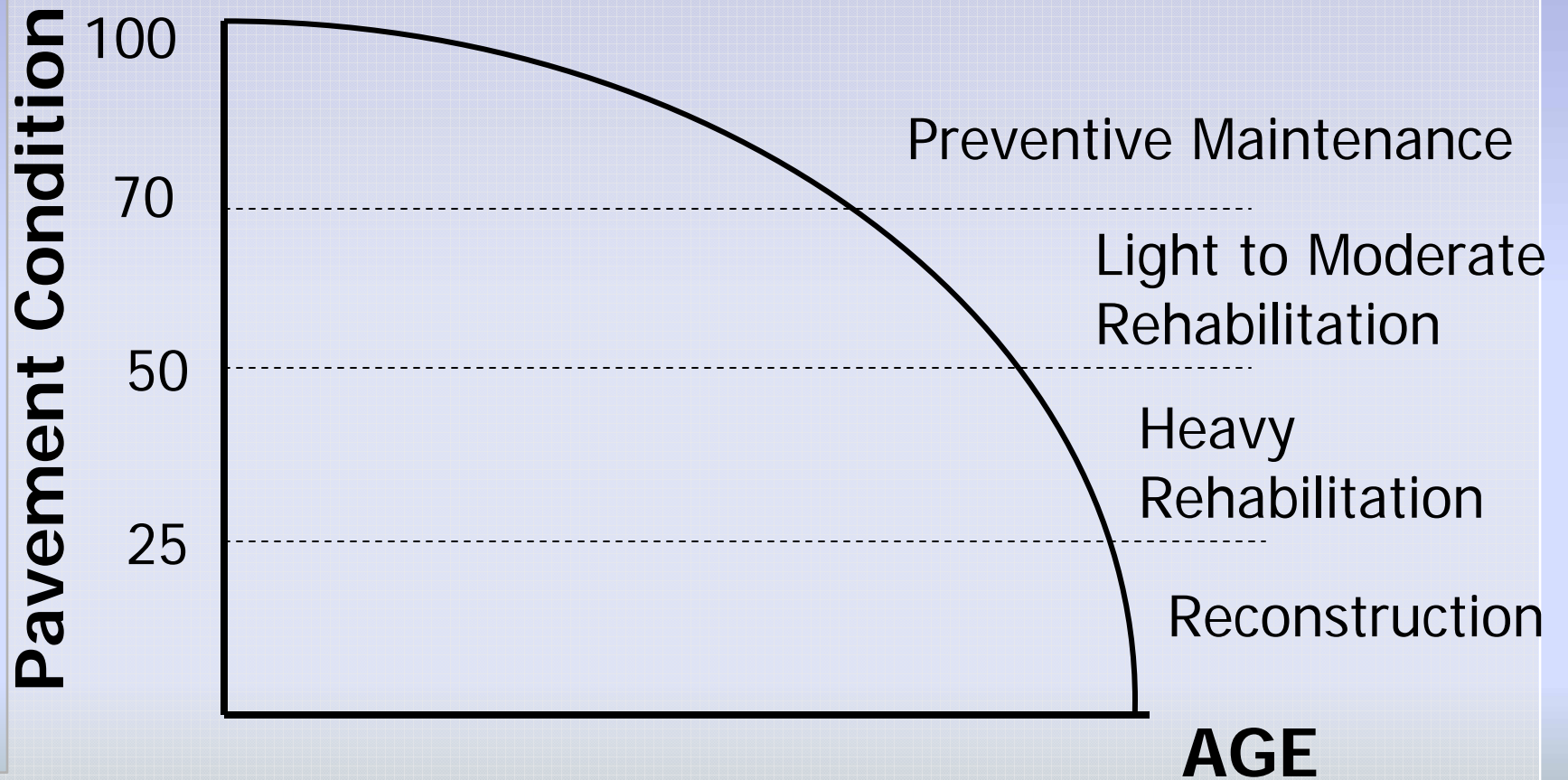
- **Advantages**
  - Easy

- **Disadvantages**
  - Can't demonstrate preventive maintenance benefits
  - Requires strong coordination with maintenance

PMI Level 2

- Use a single preventive maintenance treatment
- Use average costs and performance characteristics
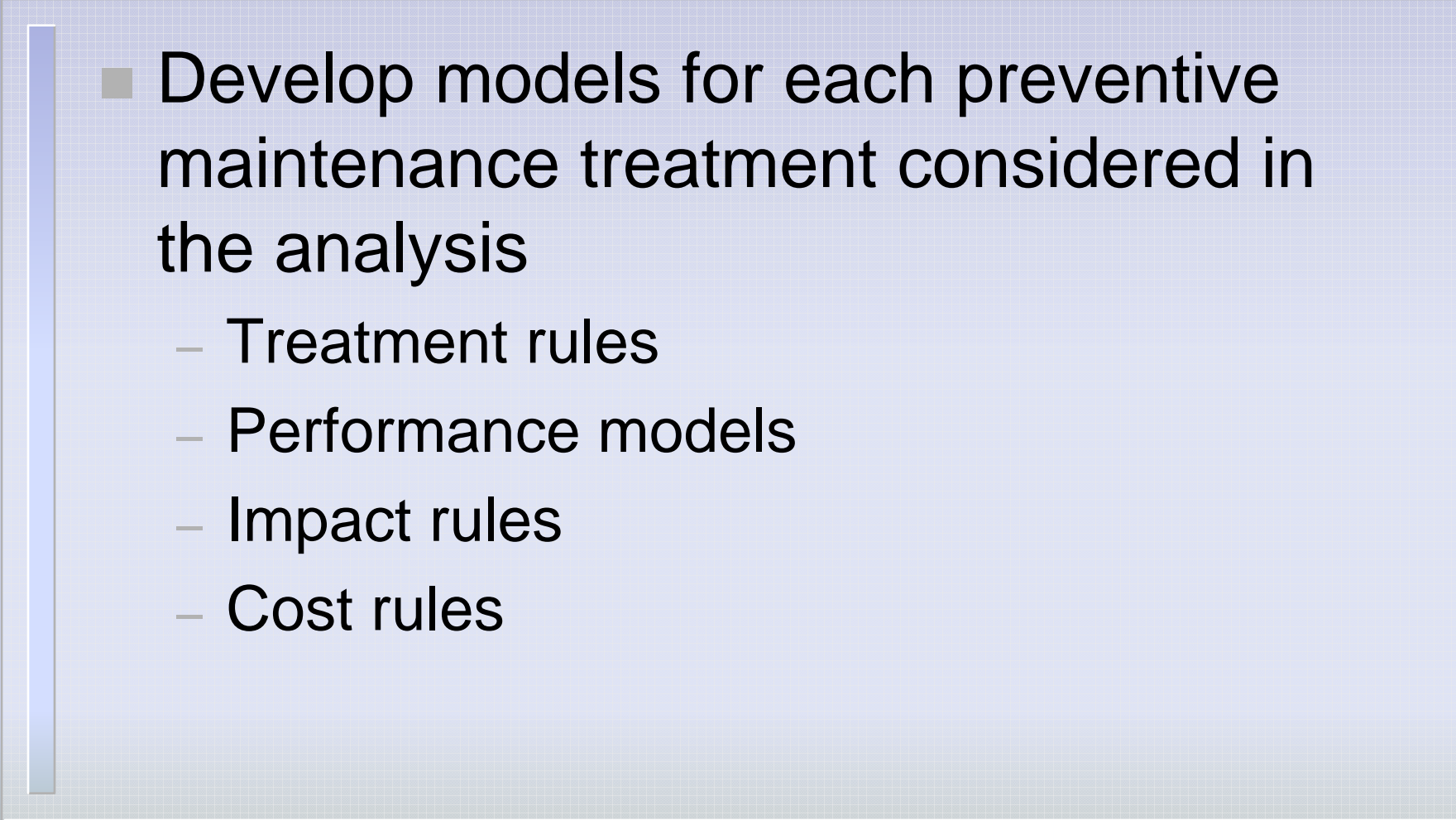
Example

Advantages/Disadvantages

- Advantages
  - Relatively easy
  - Allows benefits to be demonstrated
  - Treatment selection at maintenance level
- Disadvantages
  - Differences in treatments aren't considered

PMI Level 1

- Develop models for each preventive maintenance treatment considered in the analysis
  - Treatment rules
  - Performance models
  - Impact rules
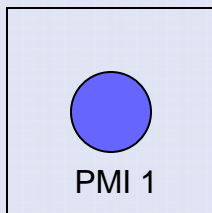 - Cost rules
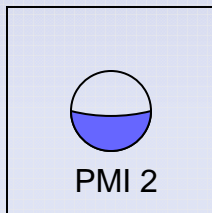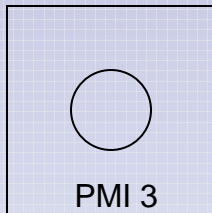
Advantages/Disadvantages

- **Advantages**
  - Recommendations better match needs
 - Estimates of cost and performance reflect more realistic information
- **Disadvantages**
  - Requires more data
  - Increases the complexity of the system

Condition Information

PMI 3

PMI 2

PMI 1

- Composite index sufficient

- Composite index supplemented with structural information OR individual indexes

- Need both functional and structural indicators (such as bleeding, friction, unfilled cracks)

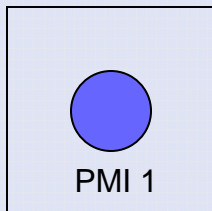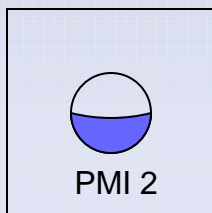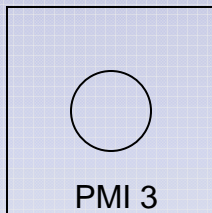# Is The Right Information Collected?
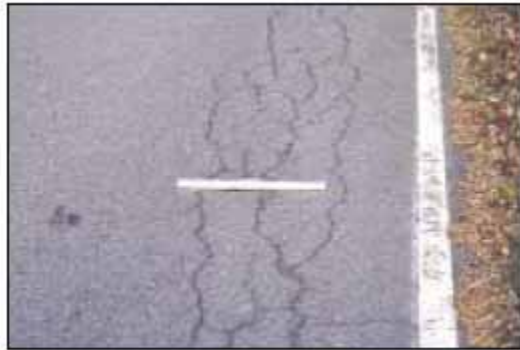
Can you differentiate between structural and functional deterioration?

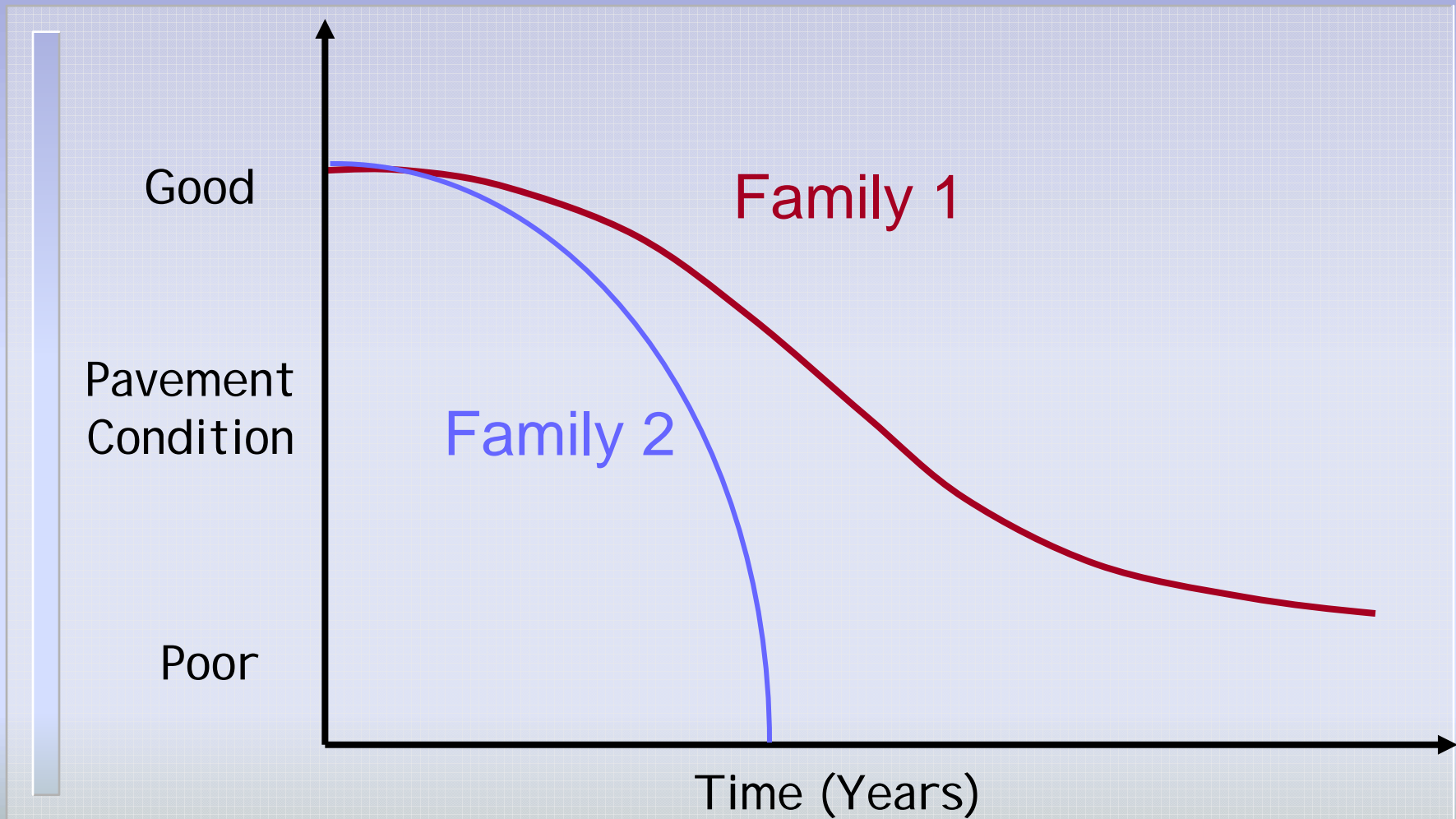Are triggers for preventive maintenance treatments available?

Performance Models
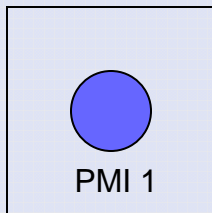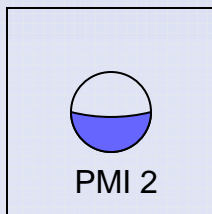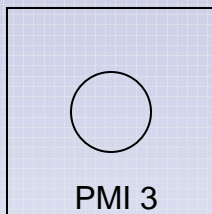
PMI 3

PMI 2

PMI 1

- No models for preventive maintenance required

- Need at least one preventive maintenance model

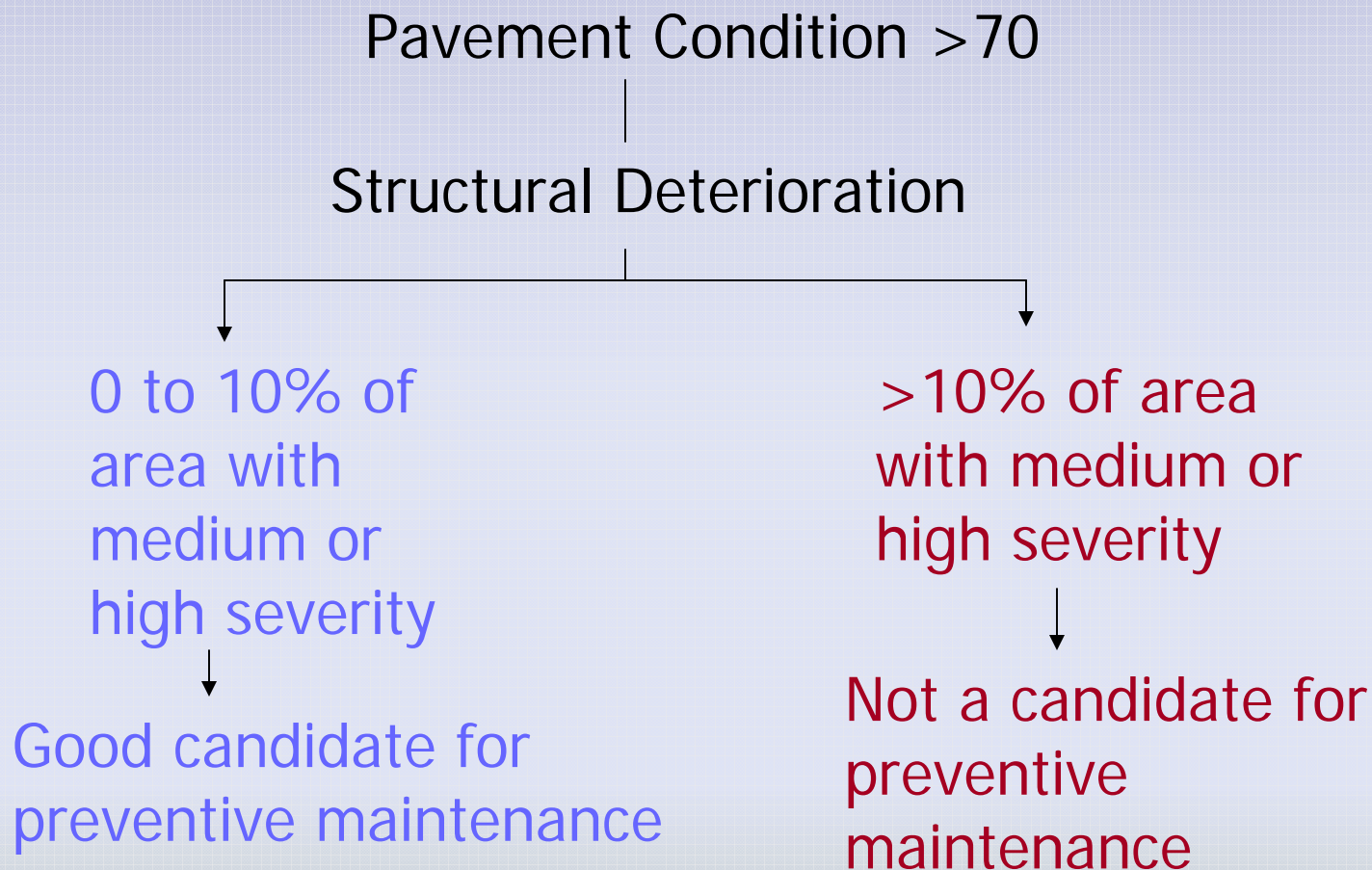- Models required for each treatment

Is The Change in Model Known?

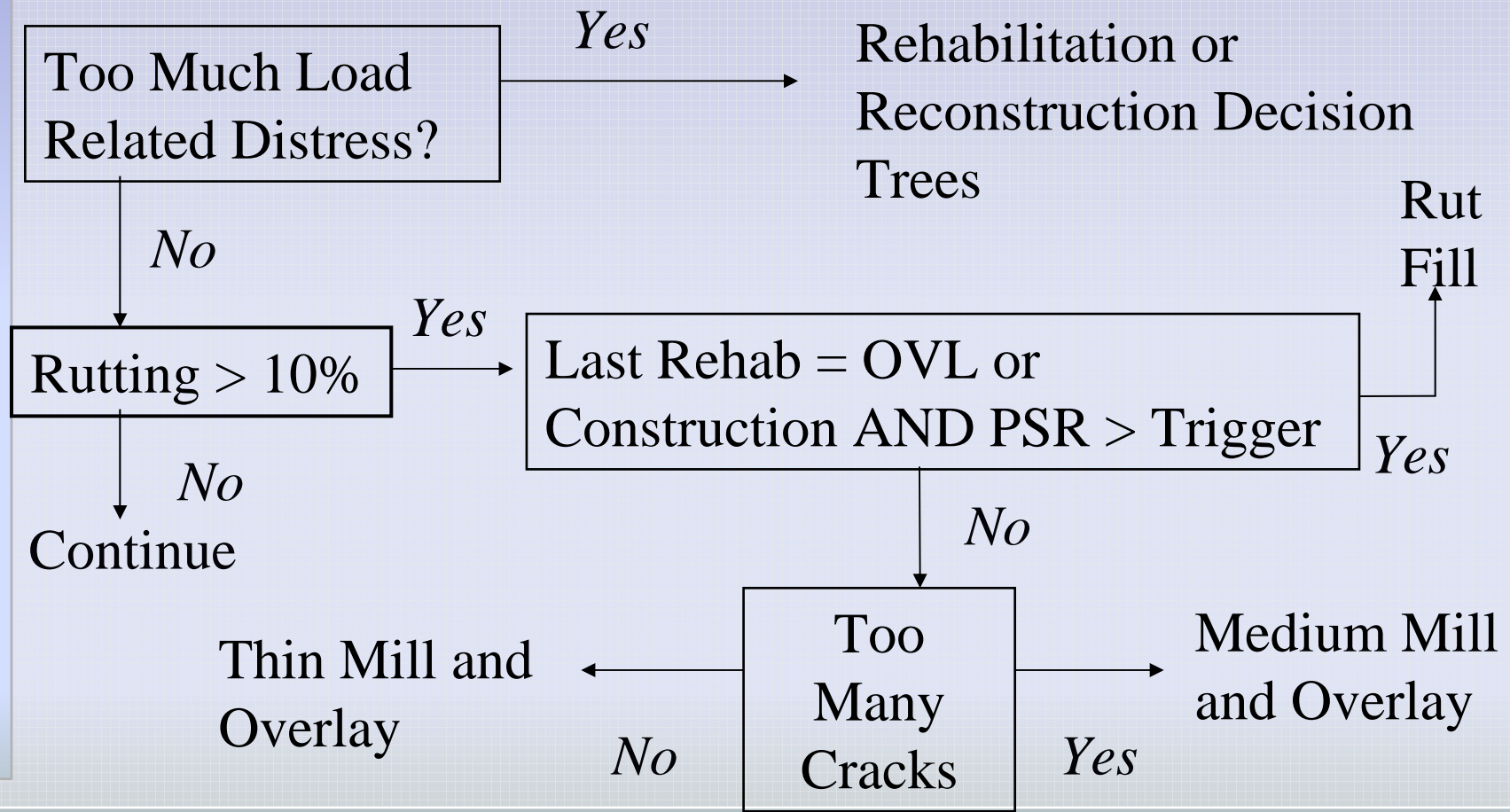# Treatment Rules

PMI 3

PMI 2

PMI 1

- No rules for preventive maintenance treatments required

- Only one treatment rule required

- Treatment rules required for each treatment considered

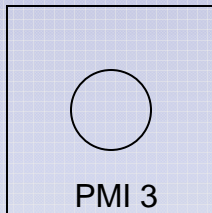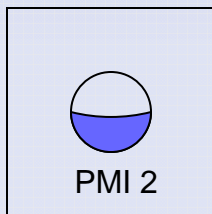# Simple Decision Tree For Level 2

Pavement Condition >70

Structural Deterioration

0 to 10% of area with medium or high severity

Good candidate for preventive maintenance

>10% of area with medium or high severity

Not a candidate for preventive maintenance

A Portion of a Minnesota Decision Tree – Level 1

Too Much Load Related Distress? → *Yes* → Rehabilitation or Reconstruction Decision Trees

No ↓

Rutting > 10% → *Yes* → Last Rehab = OVL or Construction AND PSR > Trigger → *Yes* → Rut Fill

No ↓

Continue

No ↓

Too Many Cracks

Thin Mill and Overlay ← *No* — Too Many Cracks — *Yes* → Medium Mill and Overlay

Impact Rules

PMI 3

PMI 2

PMI 1
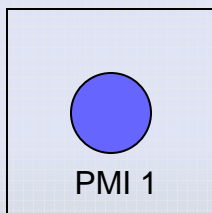
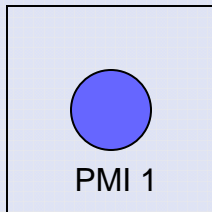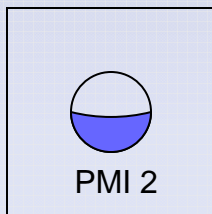- No impact rules required for preventive maintenance treatments
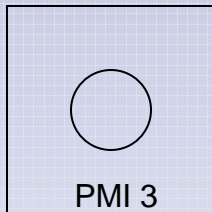
- Define one set of rules for condition changes and predicted performance

- Define changes in condition, surface type, and performance for each treatment

Analysis Periods

PMI 3

PMI 2

PMI 1

- Commonly uses a single year analysis

- Multi-year analysis performed, often for 5-year period

- Multi-year analysis performed for more than a 5-year period

Final Comments

- Preventive maintenance treatments must be integrated into pavement management to:
  - Demonstrate benefits
  - Establish goals
  - Identify cost-effective strategies
- Target your integration efforts to achieve PMI Level 2 or Level 1