

# Integrating Pavement Preservation into Pavement Management Systems

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# Pavement Management is a Decision Making Process

- Find cost-effective treatments
- At designated times
- Give a desired level of service

# Pavement Preservation Goals

- Preserve investment in pavements
- Enhance pavement performance
- Extend pavement life
- Meet customer needs



# Pavement Preservation Concepts

- Apply:
  - the right treatment
  - to the right pavement
  - at the right time
- Dedicate funds to preventive maintenance
- Gain long-term benefits
- Specific approach to pavement management

# Preventive Maintenance

- Treatment applied
  - To preserve the existing structure
  - To retard deterioration
- Primarily prevents environmental caused deterioration
- PM Treatments
  - Applied before major structural damage
  - Relatively inexpensive
  - Results long term

# Network-Level PMS Elements

- Inventory
- Assess Condition
- Determine Needed Work & Funds
- Prioritize Candidate Projects
- Show Impacts of Alternatives
- Feedback

## To Incorporate PPP Into PMS

- Each of the first five elements must be designed to address PPP



# Needs Analysis

- Identify Sections Needing Work
  - Treatment Selection
  - Condition Prediction
- Estimate Funds Needed
  - Cost Estimates

# Incorporating PPP in Needs Analysis

- Ability to select treatments
  - Most systems adequate for rehab
  - Need to identify appropriate sections for PM
  - Need to assign “best” or “right” treatments
- Many current condition assessment methods are not adequate to identify segments needing preventive maintenance



# Condition To Identify Need for PM

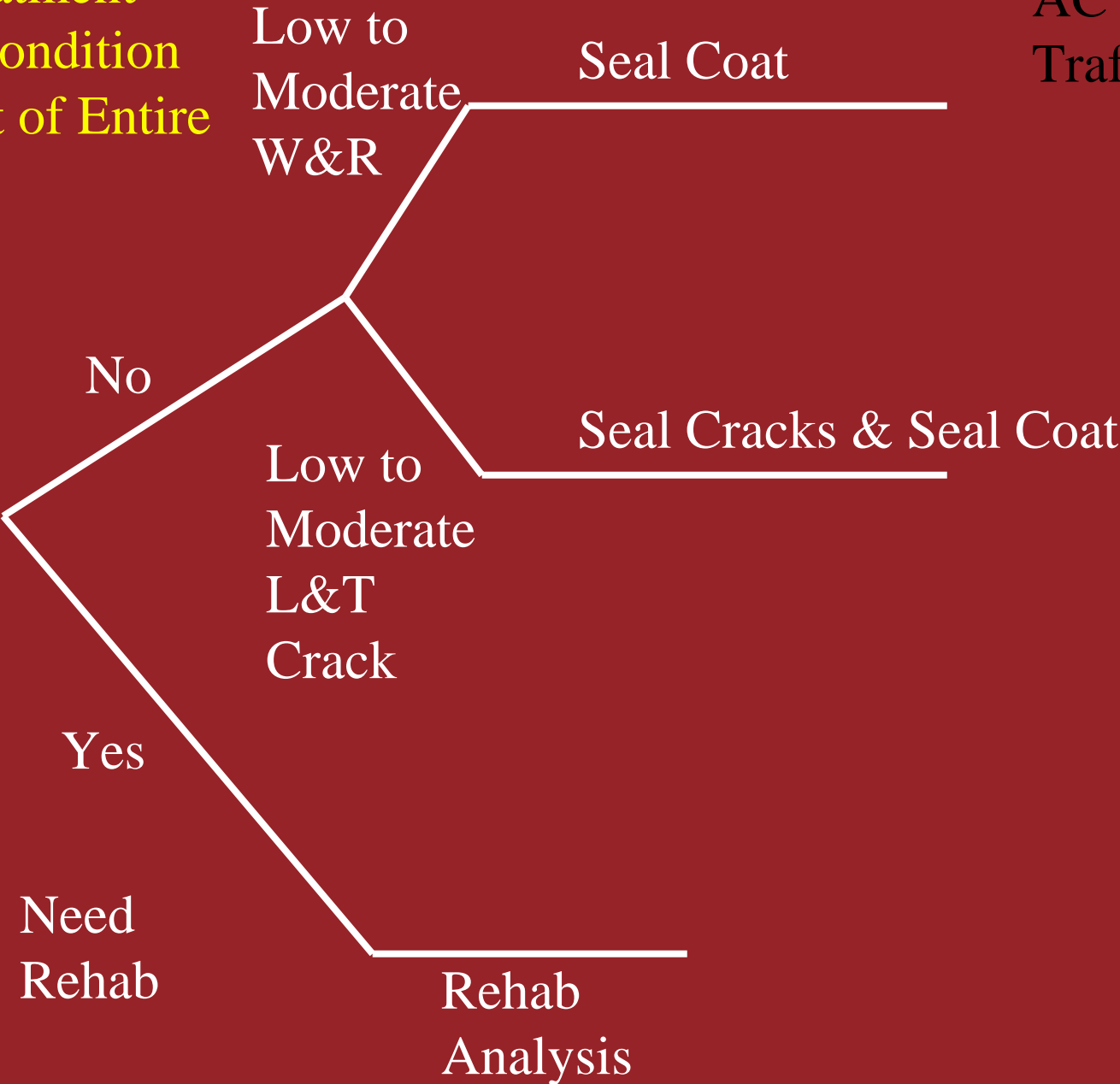
- Generally need distress information
- Distress surveys **MUST** include
  - Type - What Is Wrong
  - Severity - How Bad
  - Density - How Much
- Windshield & driving surveys **DO NOT** identify the low severity distresses that indicate need for PM

# Options

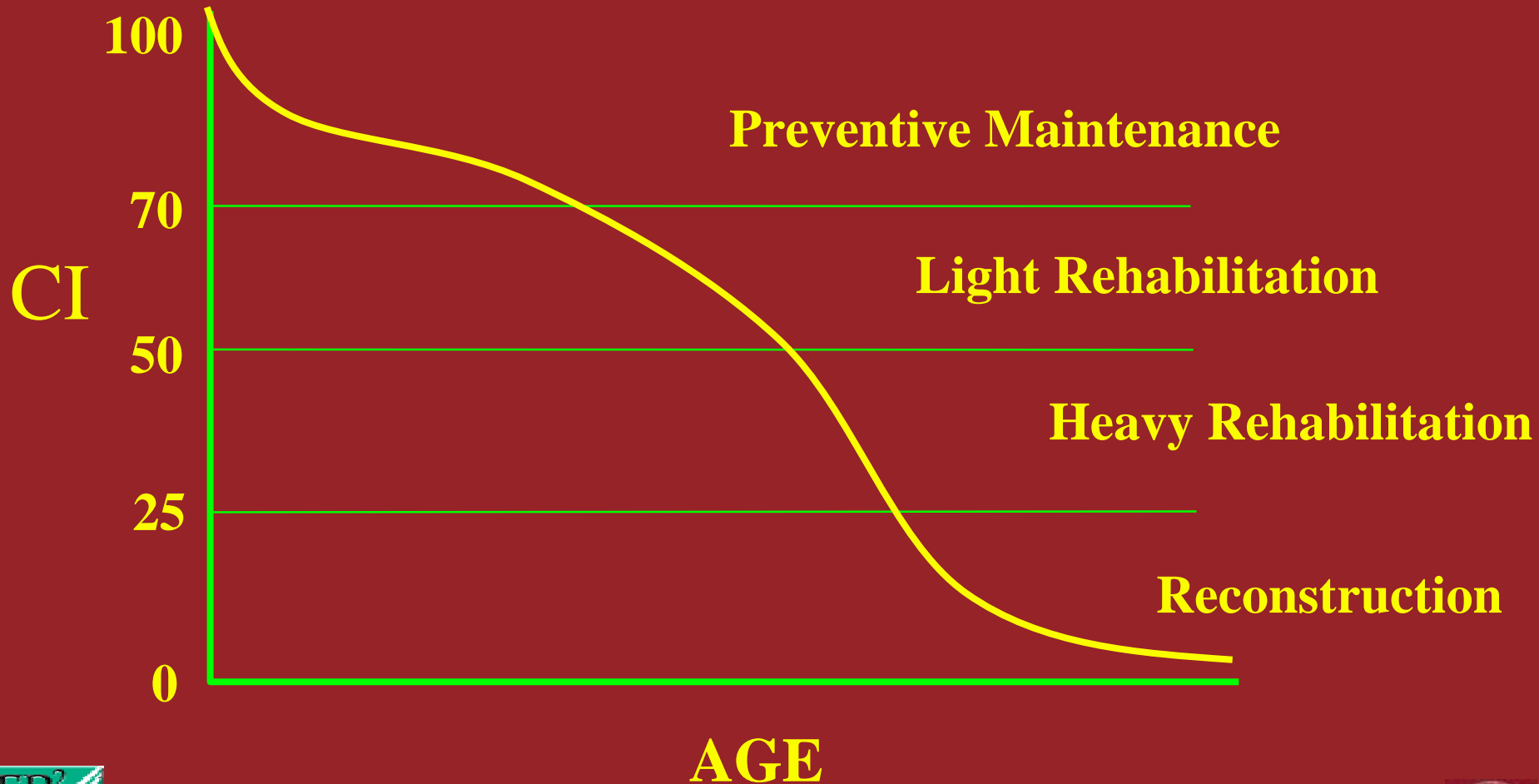
- Conduct distress survey on entire system that will identify segments that need PM
- Conduct distress survey on entire system that will identify segments for which PM is not appropriate – those that need rehab
  - Those not needing rehab are PM candidates
  - Complete more detailed analysis of PM candidates

Assign Treatment  
Based on Condition  
Assessment of Entire  
Network

AC Moderate  
Traffic



# Identify PM Candidates



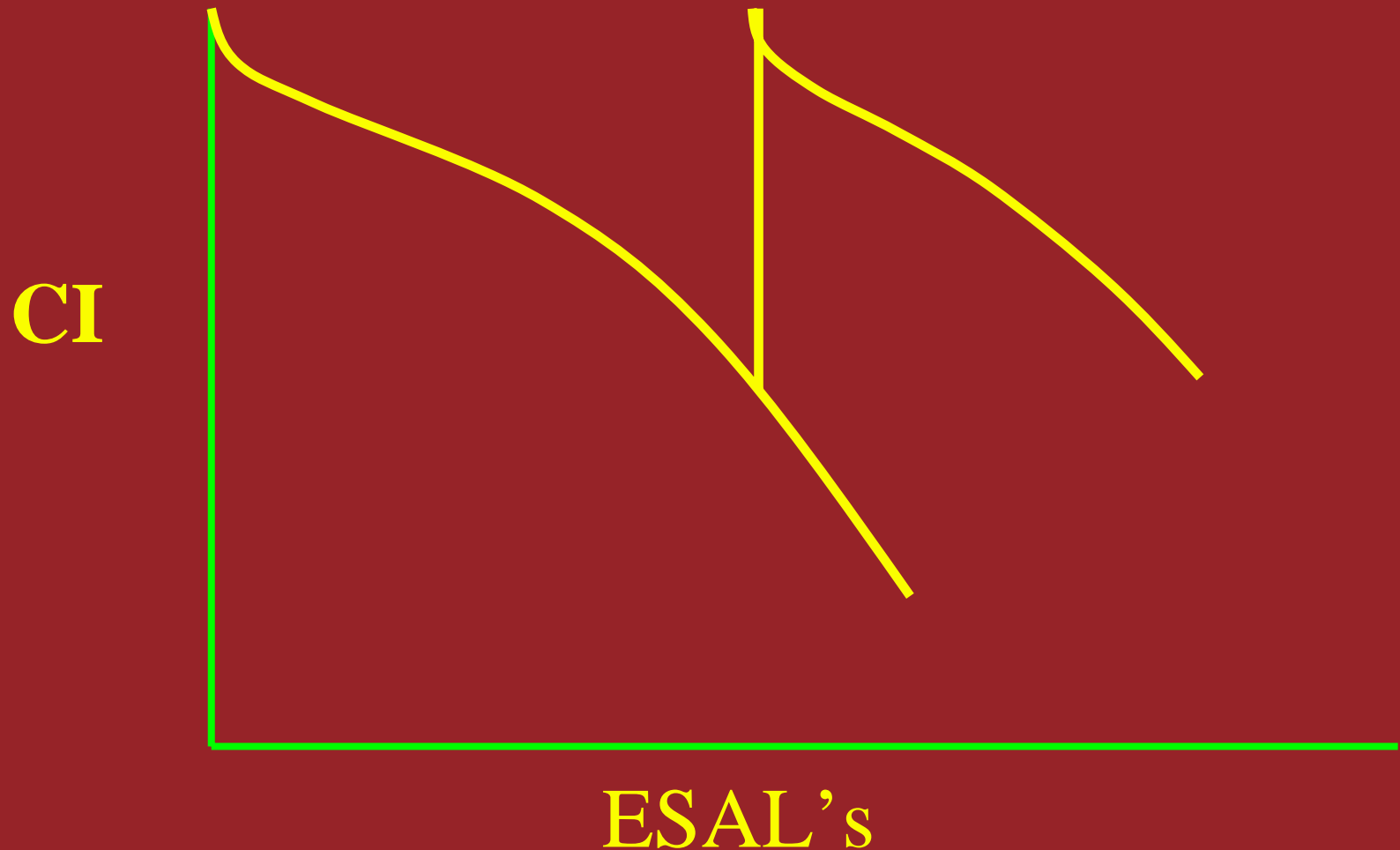
# Office Checks

- Check PM candidates sections for
  - Time since last treatment
  - Traffic levels
  - Other items considered important
- Final list of PM candidates

# Future Needs

- Predict future work needed
- Need prediction models for
  - Rrehabilitation
    - » and
  - PM

# Projected Condition for Rehabilitation Treatments

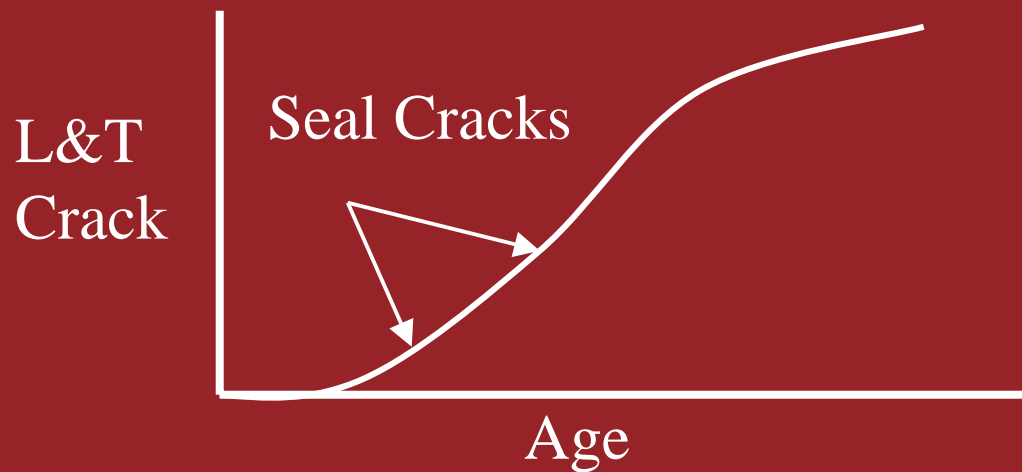
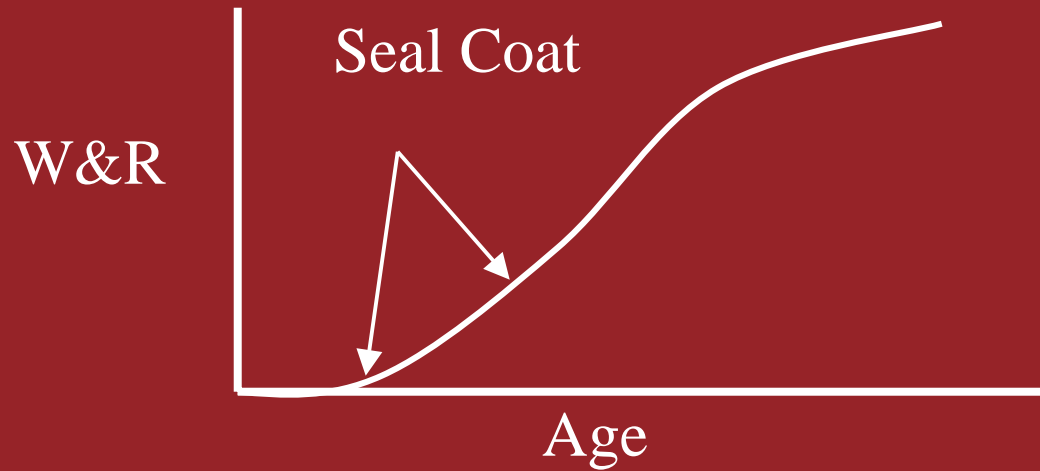


# Condition Prediction

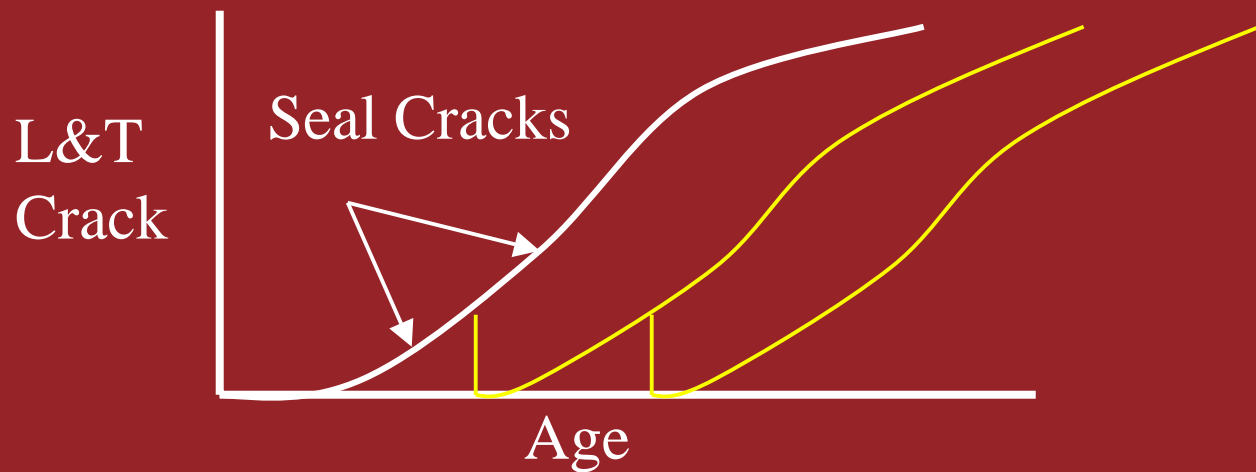
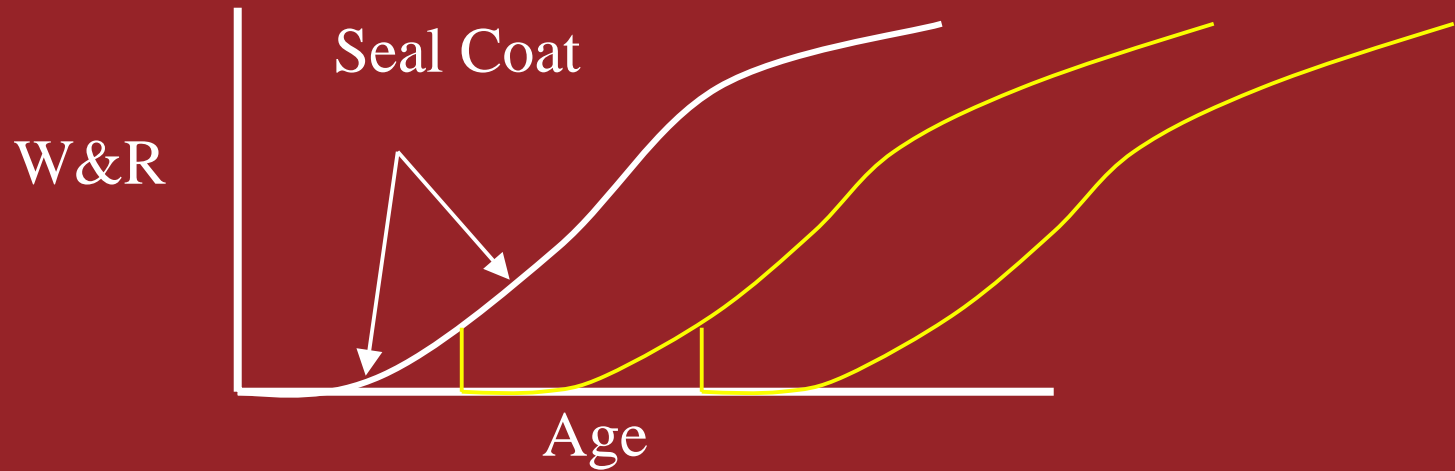
- Many of the PM treatments not included in structural analysis & design
- They preserve the existing pavement – they do not add structural capacity
- Generally must use age instead of ESAL's/ traffic loadings
  - Loadings affect rate of deterioration



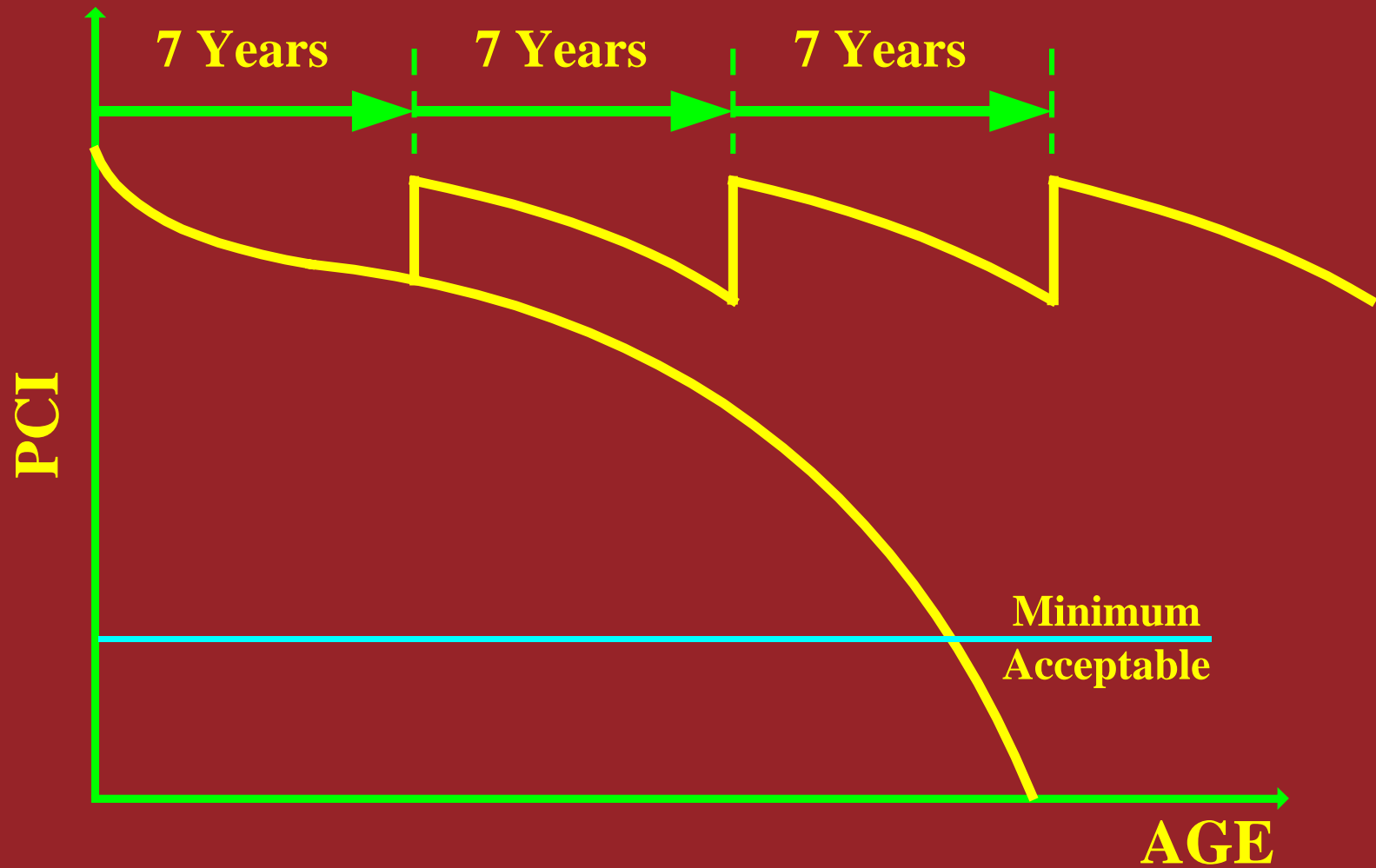
# Ability to Predict Damage Appropriate for PM



# Predict Repeated PM – With & Without Treatment



# Predict PM Treatments for Candidates



# Network-Level Inventory (Data)

- Critical data for PM to support PPP
  - Date of construction
  - Layer information
  - Date & type of subsequent treatments - especially PM treatments

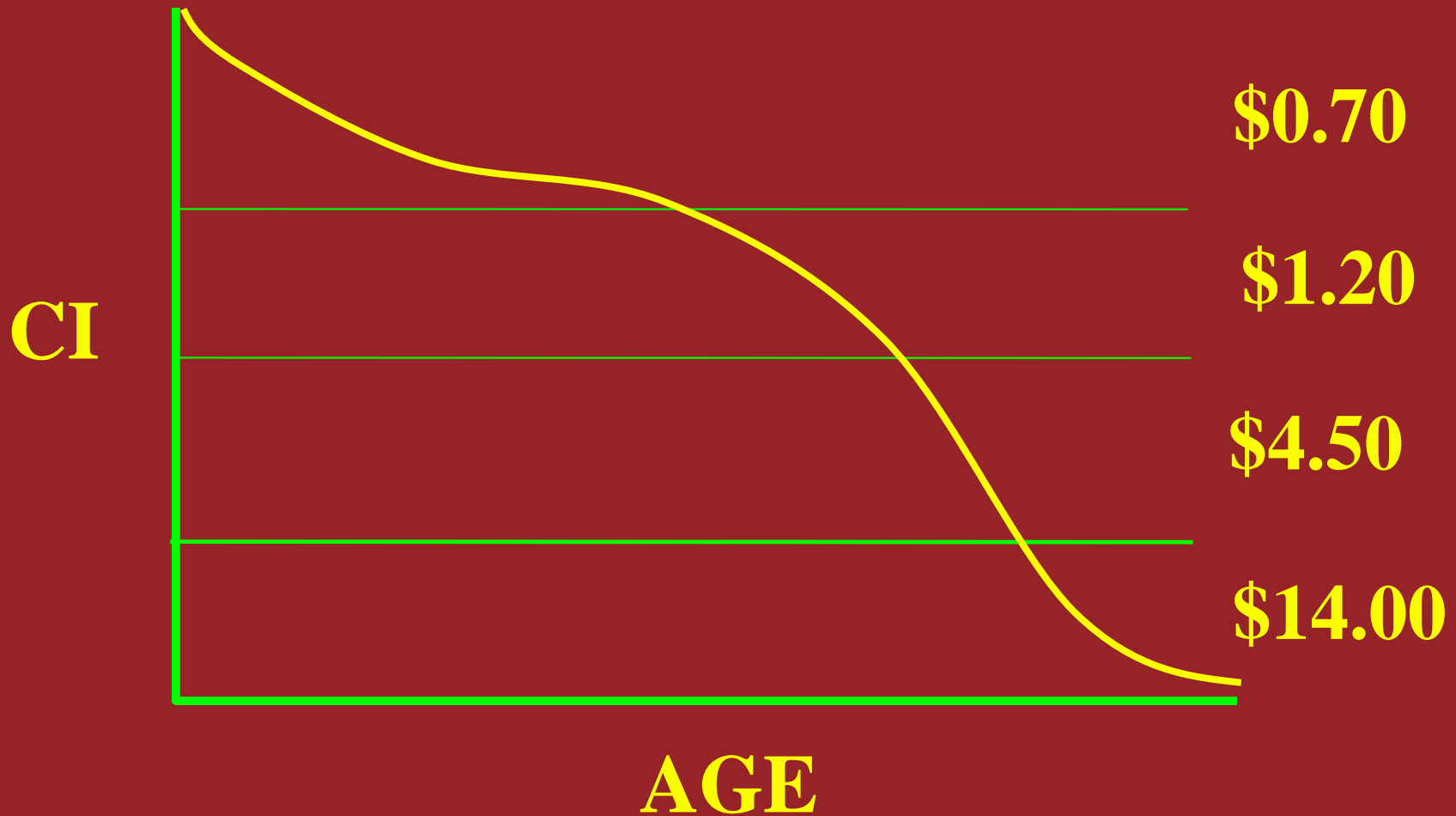
# Prioritize Projects Needing Work

- Produce prioritized list of sections agency should consider funding
- Consider effect of available funds
- Goal - best pavement network over analysis period for available funds

# Incorporating PP in Prioritization

- MUST look long-term
  - 20 years or more (30+ for PCC)
- Models must include impacts of PM
  - Generally time based
- Worst-First will not work
  - Adjusting for usage will not help
- Provide an approach where PM funding can be controlled

# Must Know Costs and Some Estimate of Return on \$'s Spent

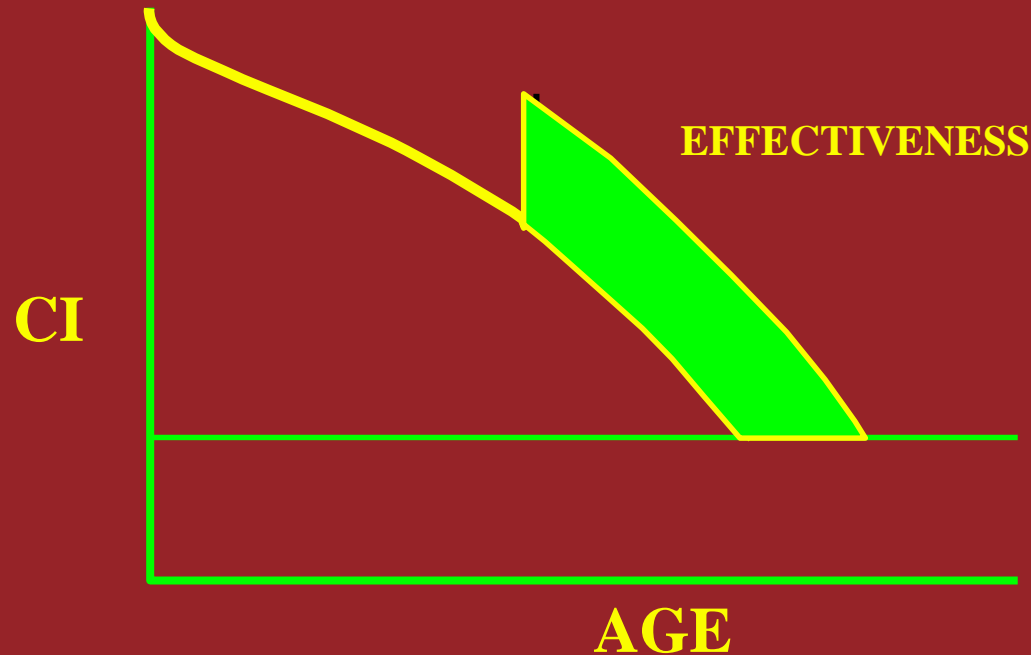


# Economic Approaches

- Present value of treatment strategies
- Present value of total costs
  - Including vehicle operating and other user costs

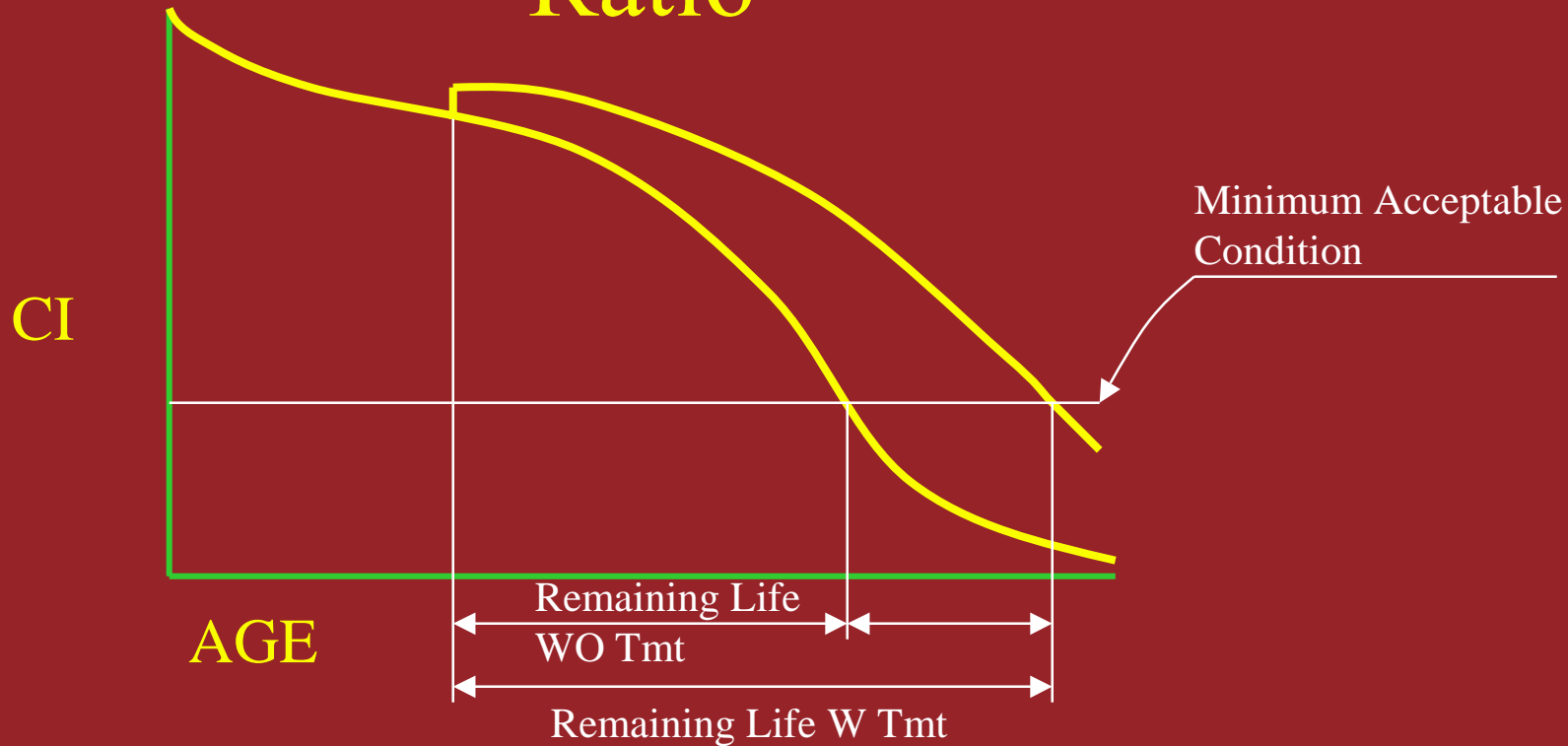


# Weighted Cost-Effectiveness Ratio



$$\text{Weighted Cost-Effectiveness Ratio} = \frac{\text{AREA} / \text{YR}}{\text{EUAC} / \text{SY}} \times \text{WF}$$

# Weighted Cost- Remaining Life Ratio

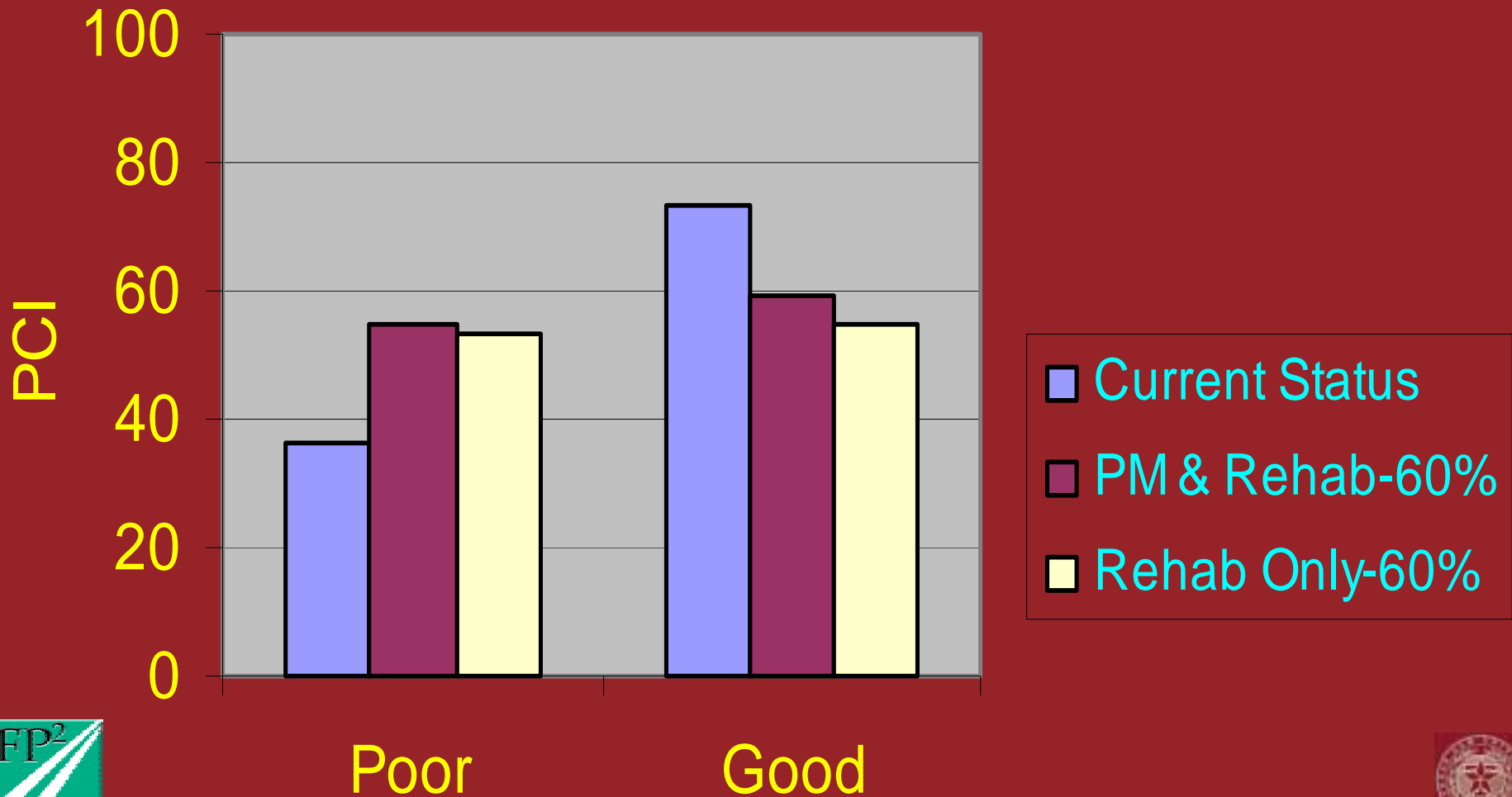


$$\text{Weighted Cost- Life Ratio} = \frac{\text{LIFE}}{\text{EUAC} / \text{SY}} \times \text{WF}$$

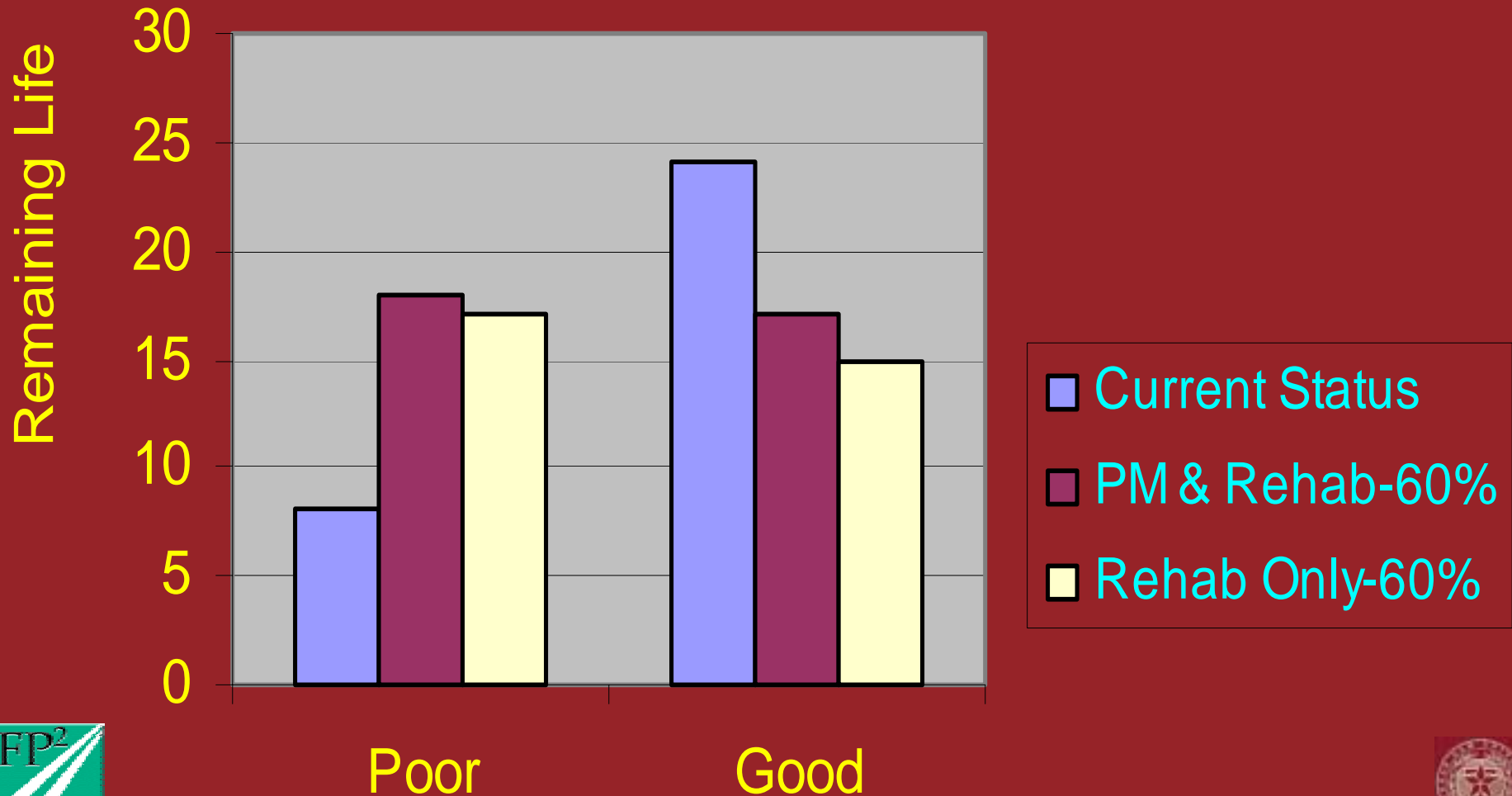
# Impact Analysis

- Show impacts of alternatives
  - Different funding levels
  - Different allocation of funds
    - » all rehab vs
    - » rehab and PM
- Use several impacts
  - Condition alone generally not adequate

# Compare Results - Future PCI



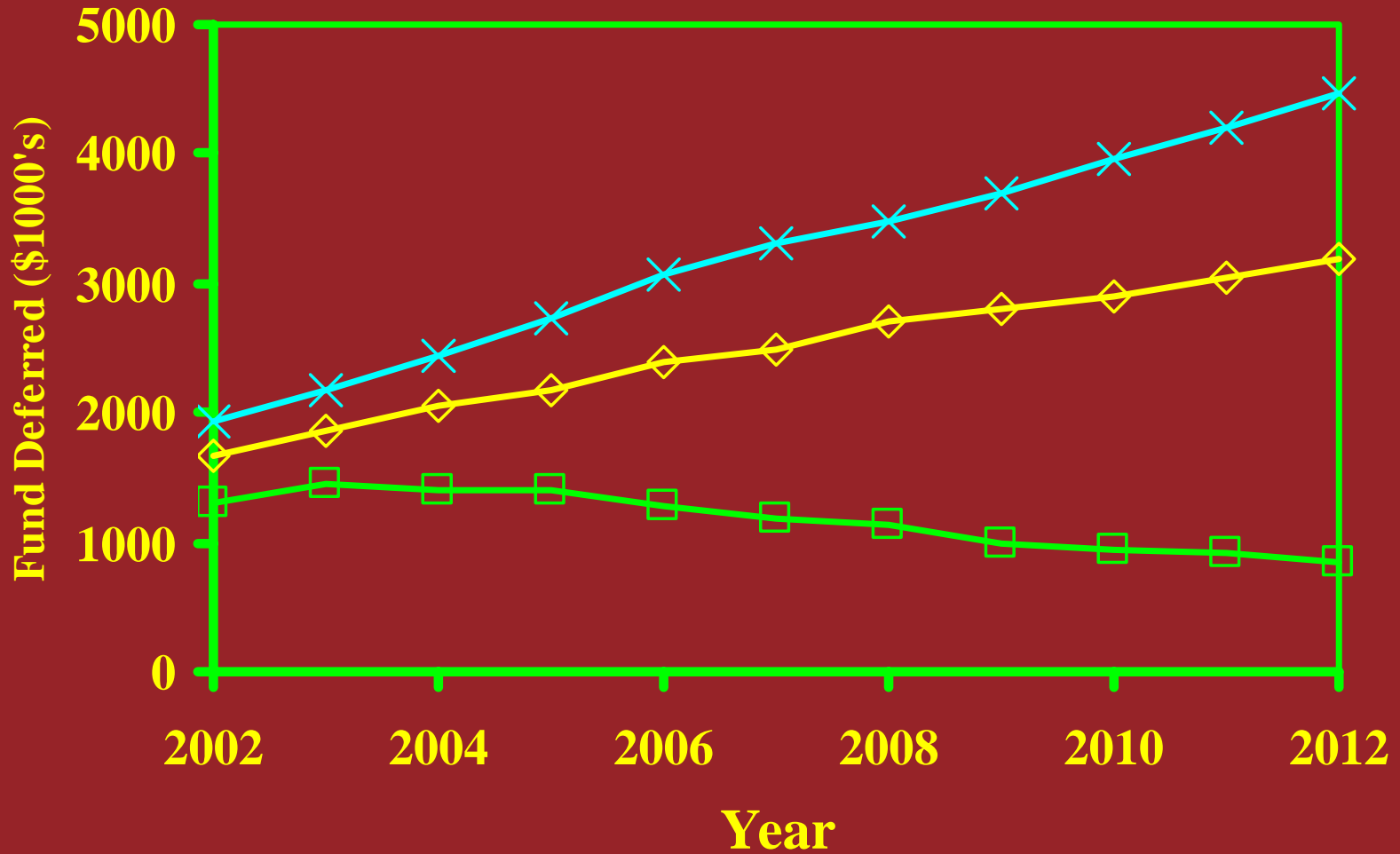
# Compare Projected Remaining Life



# Deferred or Back-Logged

- Deferred Fund Needs
  - Needs Minus Spend
  
- Back-logged
  - Sections That Needed Work That Was Not Recommended

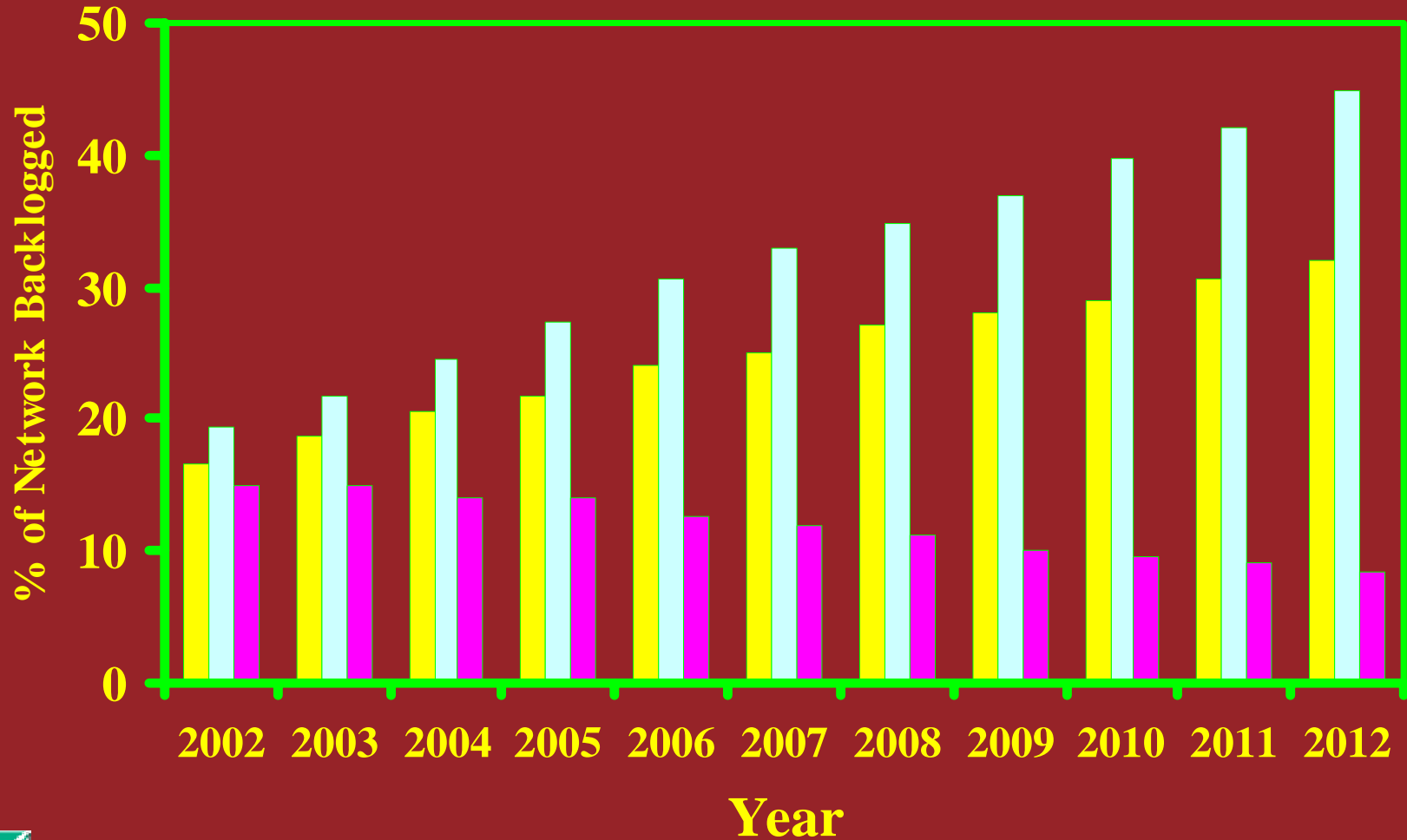
# Deferred Funding



◆ Current Fund    × Reduced Fund    □ Increased Fund



# Backlogged Work Needs



■ Current Fund ■ Reduced Fund ■ Increased Fund





# Pavement Management Is a Decision Making Process

- Find Cost-effective Treatments
- At Designated Times
- Give a Desired Level of Service



# Pavement Preservation Principles

- It Costs the Maintaining Agencies Less to Have Good Roads Than Bad Roads
- Providing:
  - Reasonable Level of Service Provided
  - Pavements Will Respond to Preventive Maintenance
    - » Structurally Adequate

# Need Balance

- Keep Better Pavements in Good Condition
  - Preventive Maintenance
- Repair Those That Are Deficient
  - Rehabilitation or Reconstruction

# Summary

- PP can/should be included in PMS philosophy
- PM can/should be in network-level PMS
- Must have the following:
  - Appropriate inventory data - dates & treatments
  - Appropriate distress types & severity levels
  - Method to identify PM candidates & tmt needs
  - Prioritization approach that considers PM treatments
  - Impact analysis that shows impact of PM over time