

# Pavement Management Systems

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Ames, Iowa



providing engineering solutions to improve pavement performance

# Why Pavement Management???

- Pavements are expensive
- Budget constraints
- Accountable for infrastructure assets
- Move from reactive to proactive management of pavement repairs



# Some Challenges of Starting a PM System

- A different way of doing business
- Staffing issues
- Start up costs
- Tried it before...never worked out



# Different Way of Doing Business



Pavement Management supports this new way of doing business

# Different Way of Doing Business



- Document needs
- Improve accountability in decisions
- Assess and manage risk
- Make better use of technology

Change The  
Way Assets Are  
Managed

- Increase service life
- Improve performance
- Preserve asset value
- Reduce annualized costs

Tell The Story  
More  
Effectively

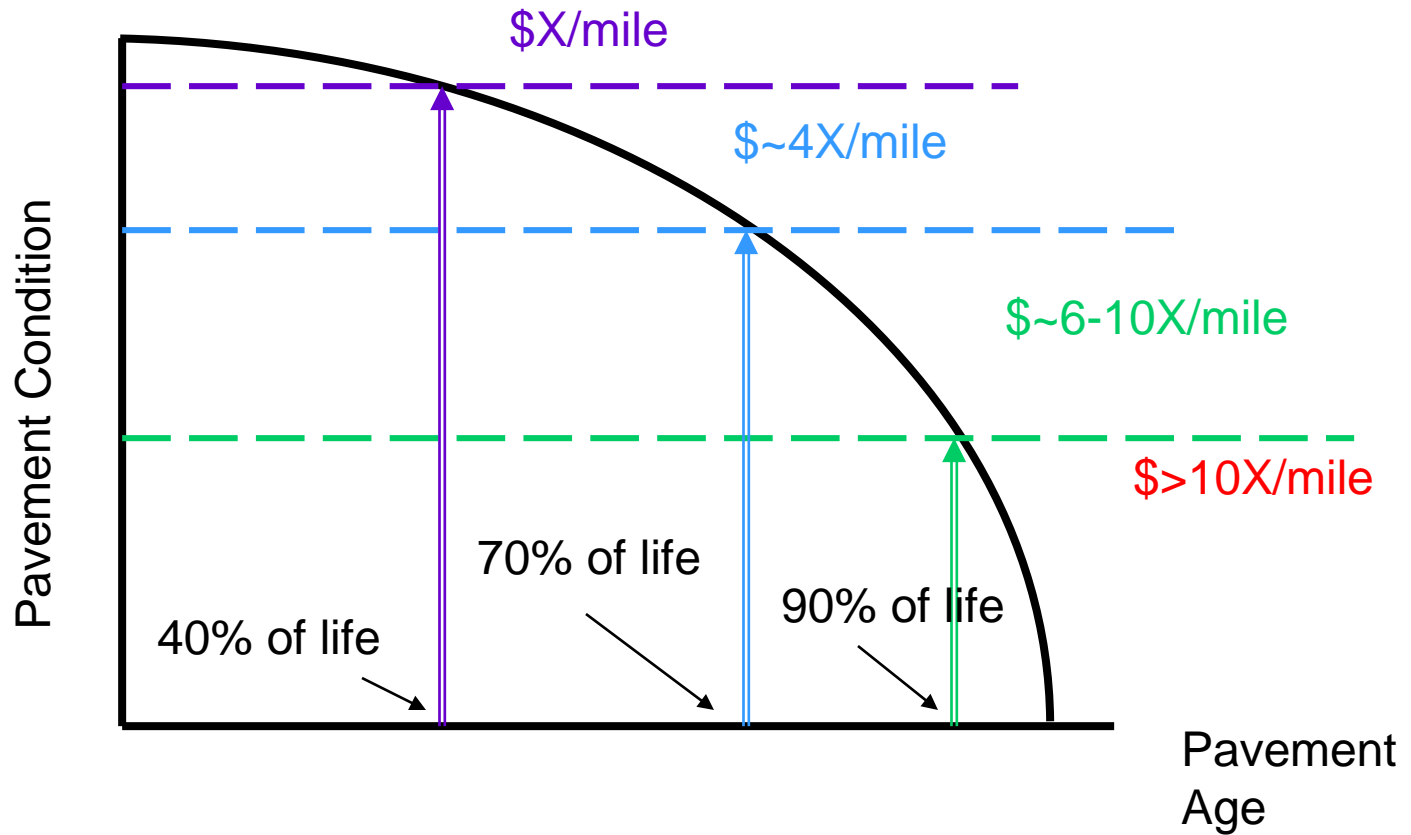
# What Is Pavement Management?



- ...a **management approach** used by personnel to **make cost-effective decisions** about a road network.  
*AASHTO Pavement Management Guide (2001)*
- A pavement management system is a **set of tools or methods** that **assist decision-makers** in **finding optimum strategies** for providing, evaluating, and maintaining pavements in a serviceable condition over a period of time.  
*AASHTO Guide for Design of Pavement Structures (1993)*



# Pavement Management Concept



# Three Levels of Pavement Management



- Network Level
  - Collect condition information on the network
  - Analyze condition information
  - Provide information to upper management to assist in making strategic decisions
  - Provide information to other users to support project selection, design, and other types of analyses





# Three Levels of Pavement Management



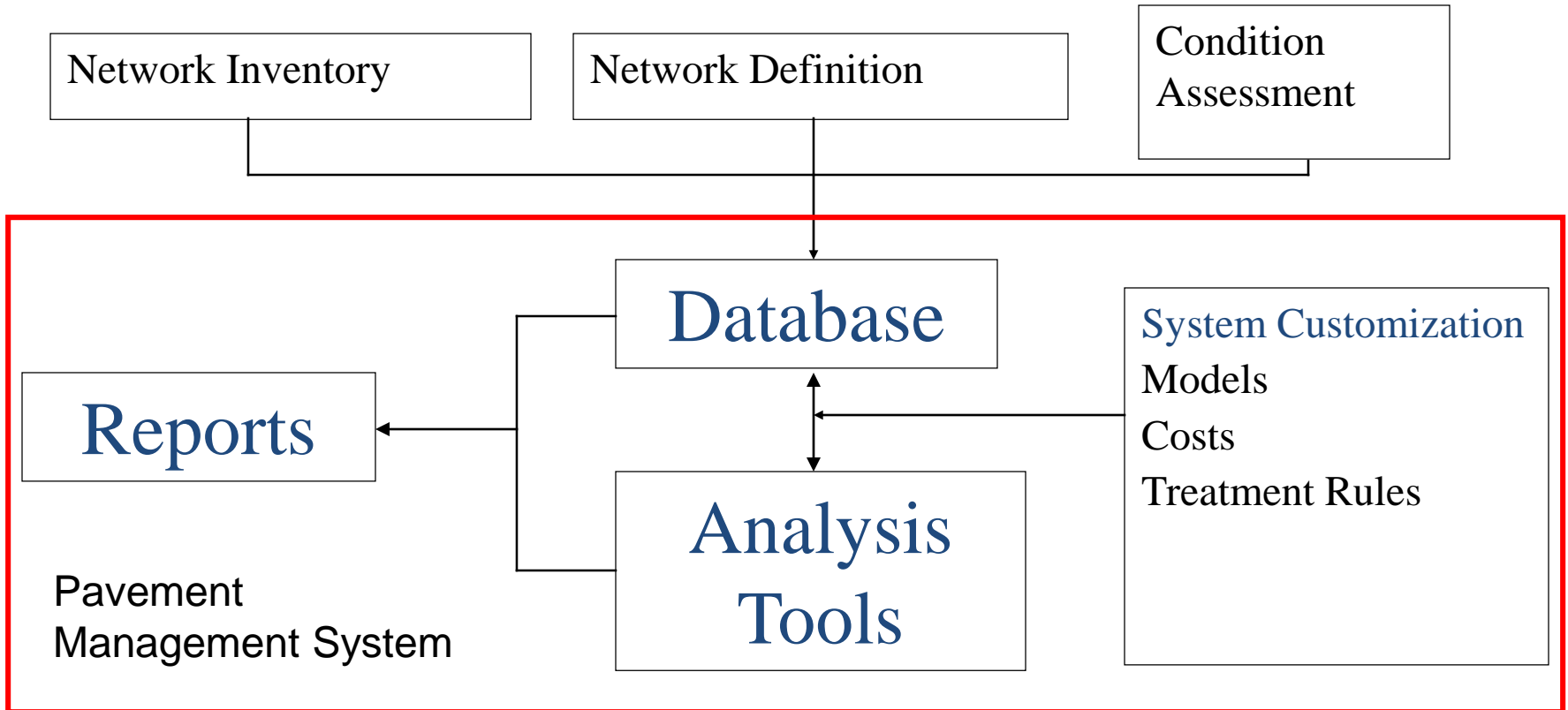
- Strategic (Policy) Level
  - Make policy decisions
  - Set funding allocations
  - Establish preservation strategies
  - Identify corridor projects
- Project Level
  - Determine final project recommendations
  - Design rehabilitation strategies
  - Conduct special studies



# Benefits of Pavement Management

- More efficient use of available resources
- Ability to justify funding needs
- More accurate and accessible information on the pavement network
- Ability to track pavement performance
- Present consequences of different treatments and timing
- Improved communication

# Pavement Management Components



# Network Inventory

- Type of Data to be Collected
  - Physical characteristics
  - Construction and maintenance history
  - Traffic levels and/or street classification
  - Soils information
- Minimal Amount of Information Required
  - Surface type
  - Physical dimensions (length, width, area), From/To
  - Last construction date (or best guess)

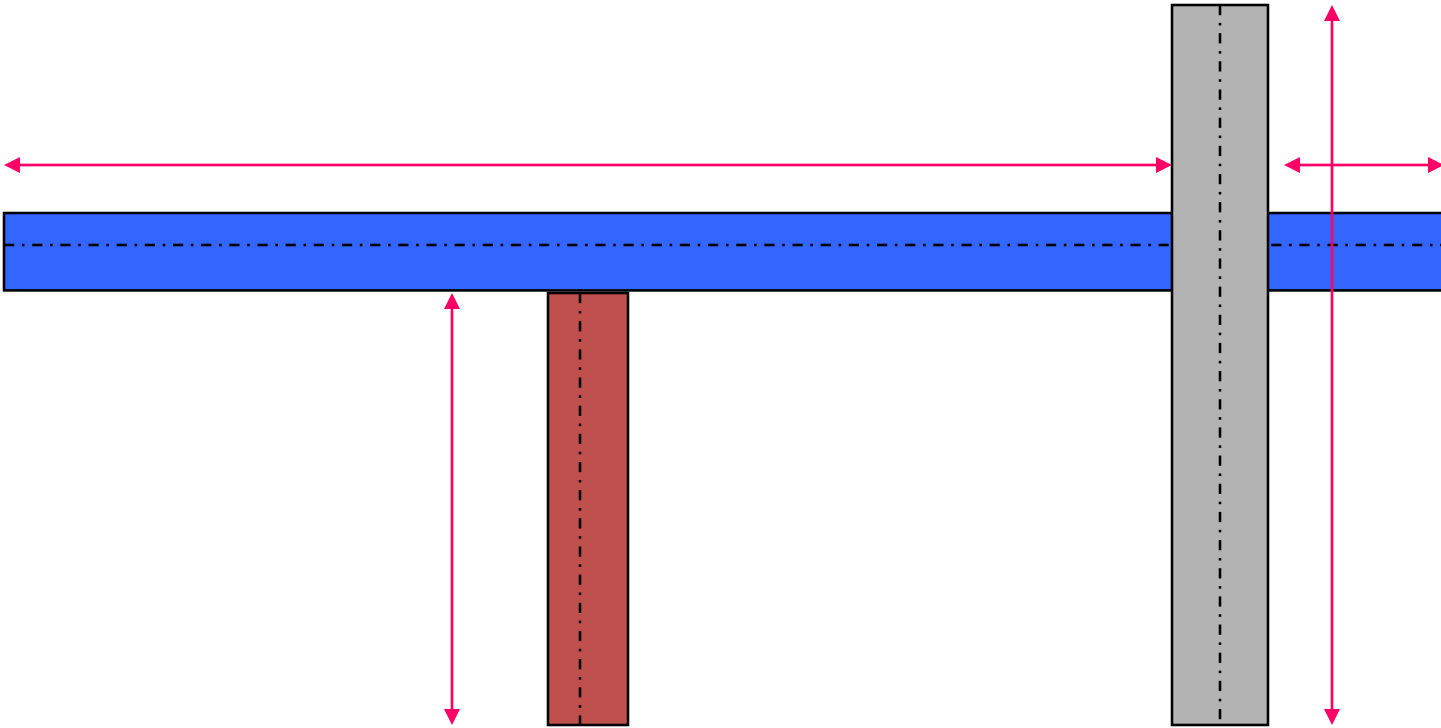


# Street Segmentation

- The general rules for segmentation are
  - Same surface type
  - Similar construction age, condition range
  - Contiguous
  - Similar maintenance and traffic characteristics
  - Think of them as management units
    - Those that are managed together get segmented together



# Network Definition – Local Agencies



# Condition Assessment

All pavement management recommendations are based on the most recent condition assessment.

Therefore, the assessment of current condition **MUST** be objective, repeatable, and reflect current conditions.



# Types of Pavement Condition Data Collected



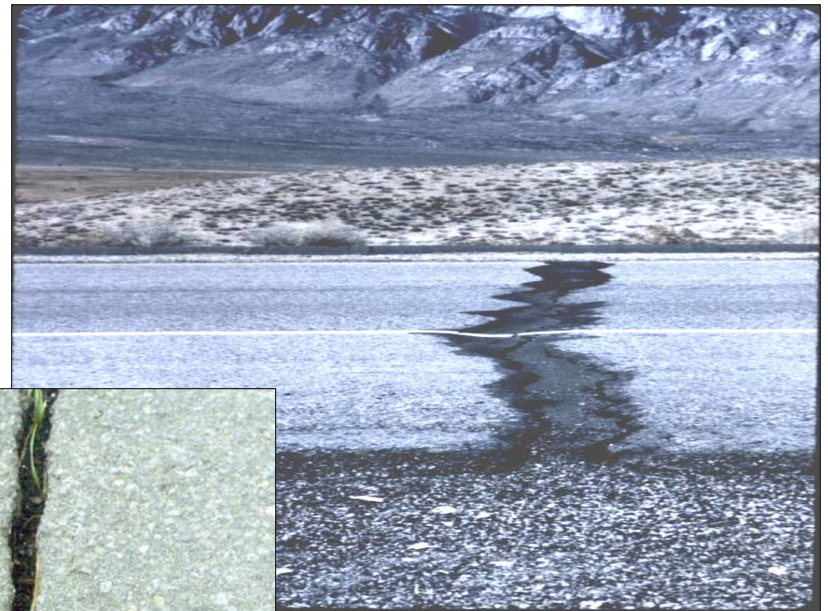
- Surface distress (ex. cracking, surface deformation)
- Roughness (ride quality)
- Faulting
- Rutting
- Structure (pavement strength and deflection)





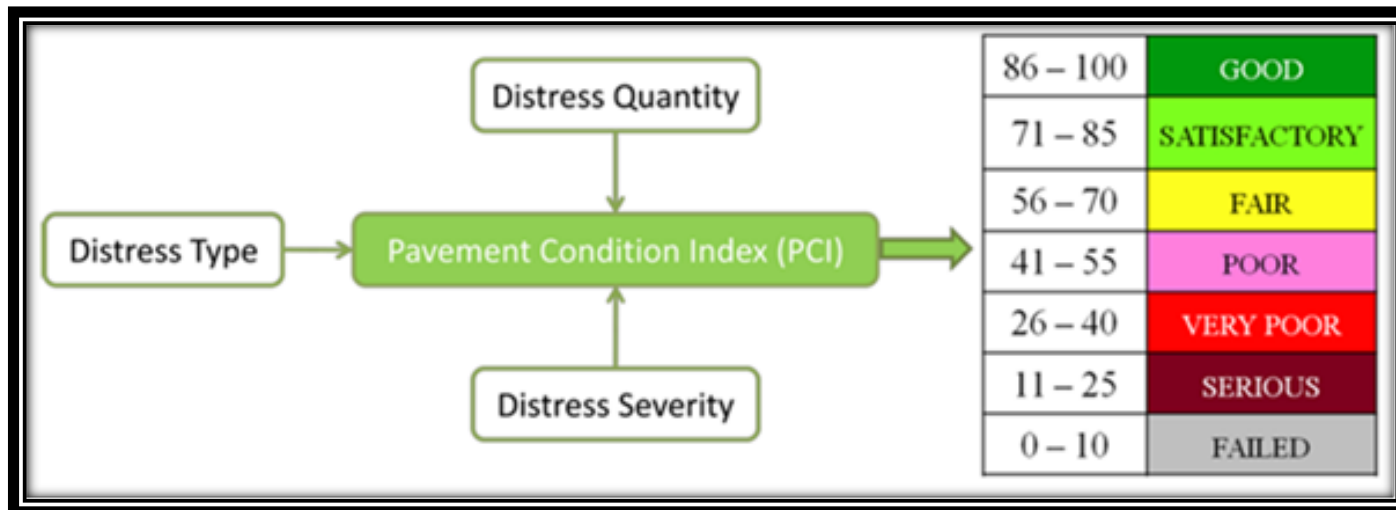
# Pavement Distress

- Type – what kind?
- Severity – how bad?
- Quantity – how much?



# Methods for Quantifying Pavement Condition

- Pavement Condition Index (PCI)
  - ASTM D6433
- Modified PCI
- Windshields

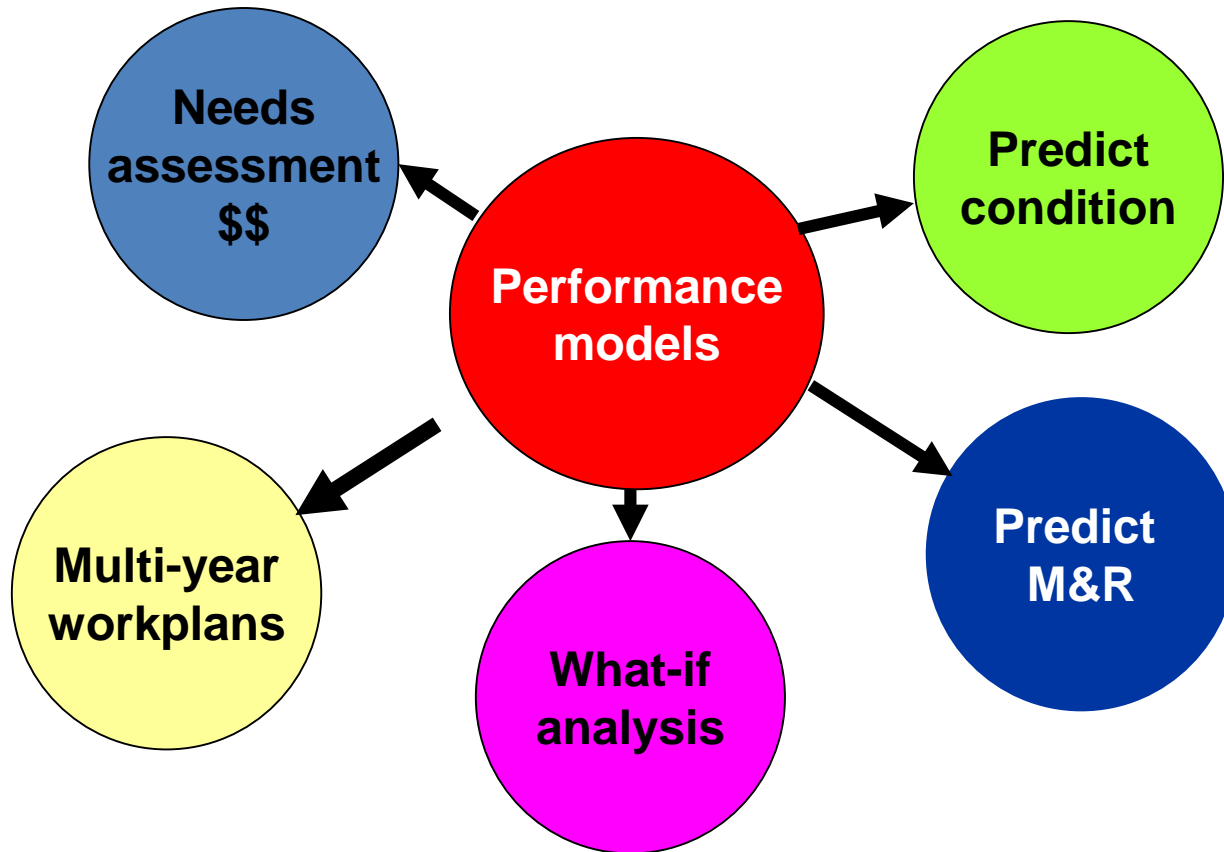


# Customization Activities

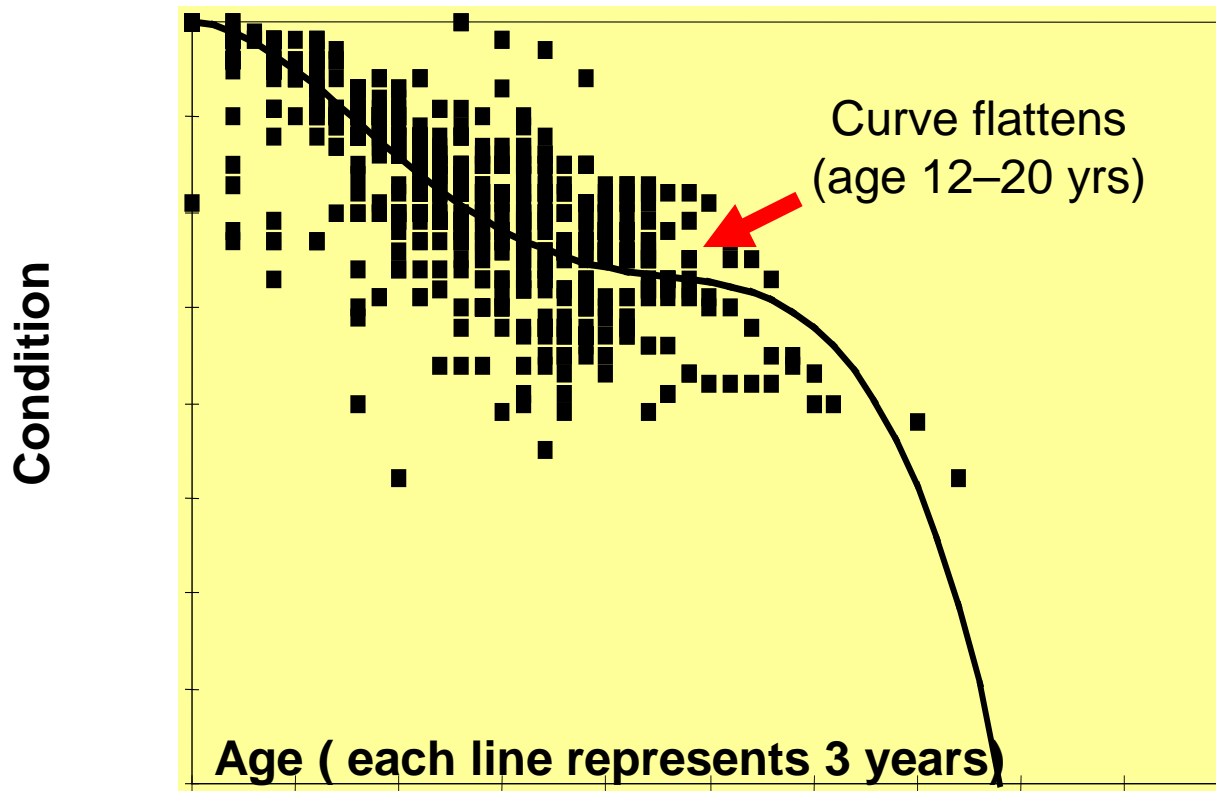
- Performance models
- Priority ranking
- Viable treatment options (& conditions to apply)
  - Maintenance (ex. crack sealing, patching, etc.)
  - Major repair (overlay, slab replacements, reconstruction, etc.)
- Costs
  - Unit costs, annual budgets



# Why Use Performance Models?



# Example Performance Model



# Family Modeling Approach



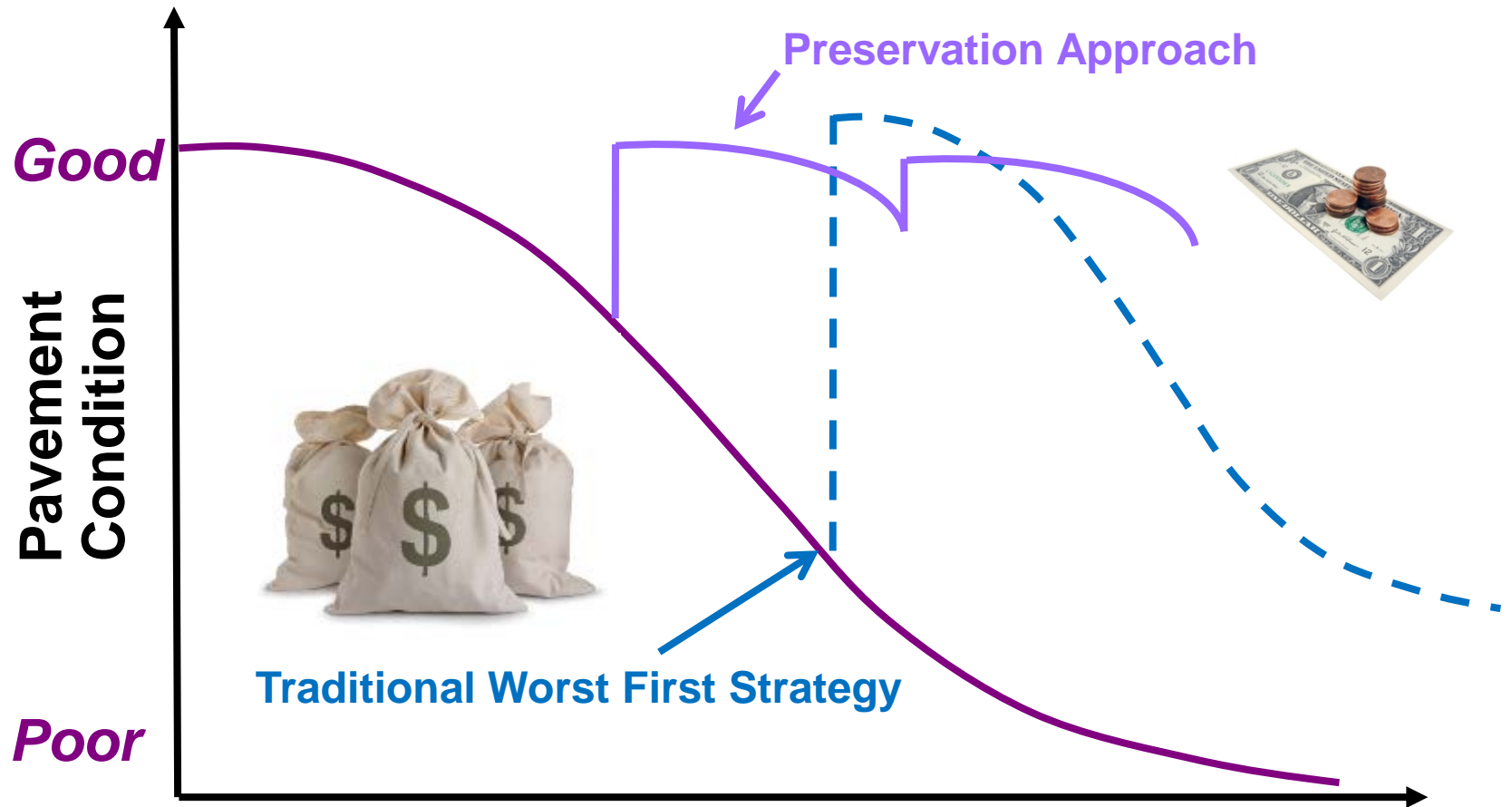
- Group pavement sections by characteristics
- Reduces number of variables and models
- Assume similar deterioration
- Reflects average deterioration for family
- Allows ranges of values to be used for developing families

# Other Customization Activities

- Treatment Costs
  - Based on recent bid documents
  - May vary based on certain factors (location, street network, and so on)
- Budgets
  - Funds available for each analysis year
  - Some agencies have separate budgets for maintenance and rehabilitation activities

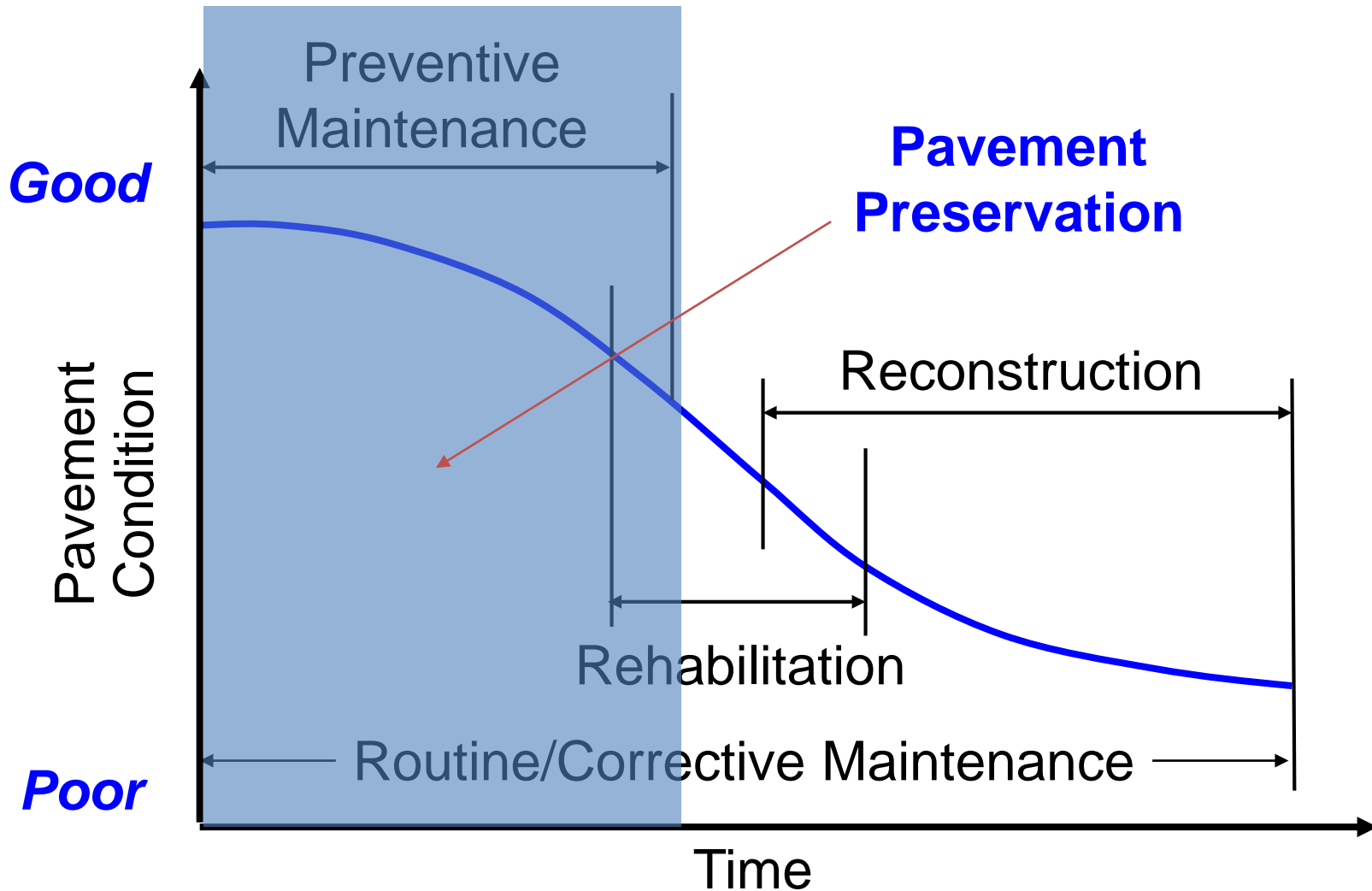


# Methods of Managing Assets





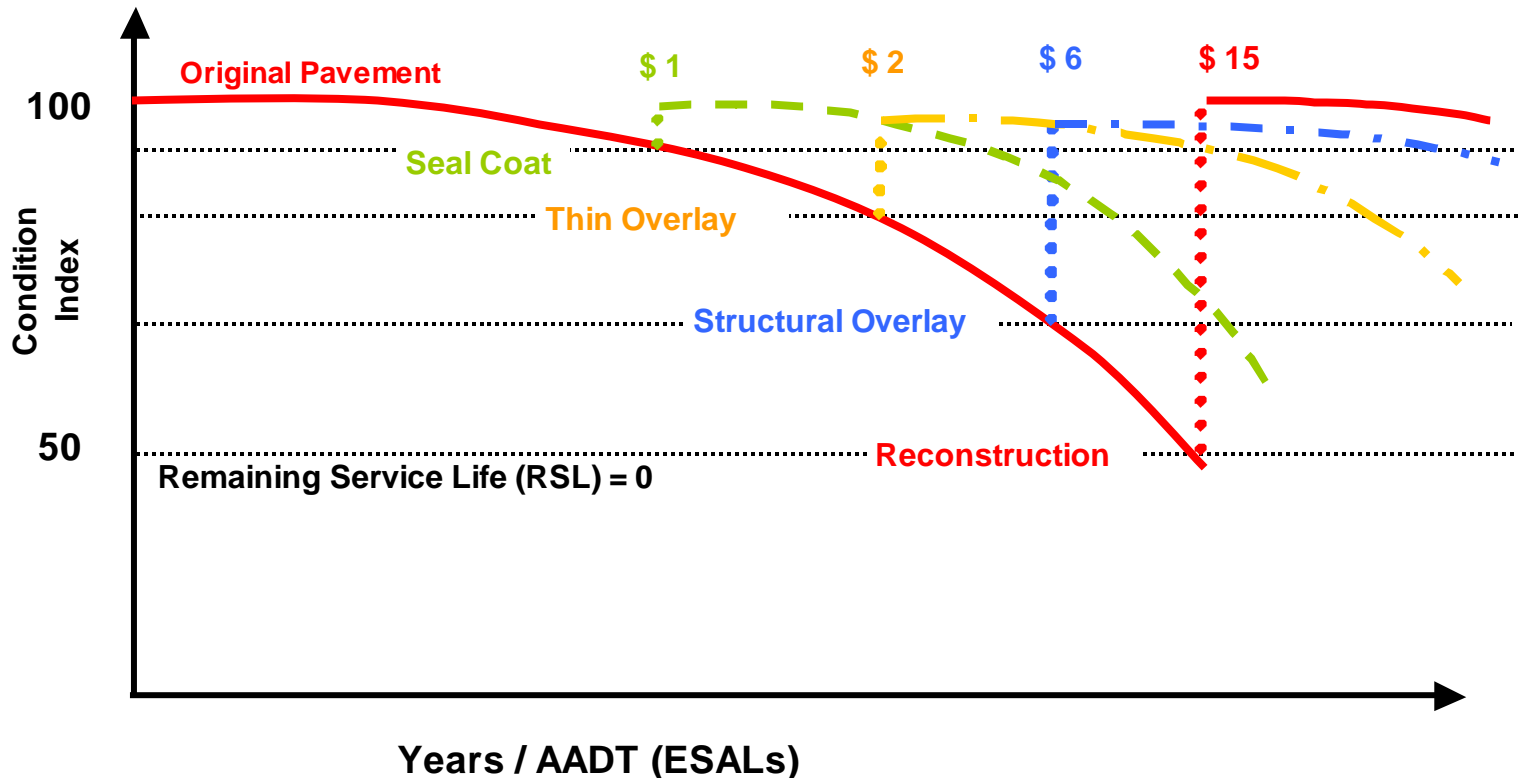
# What Is Pavement Preservation?



# Getting the Most Bang for Your Buck



## Condition Deterioration & Treatment Triggers / Resets

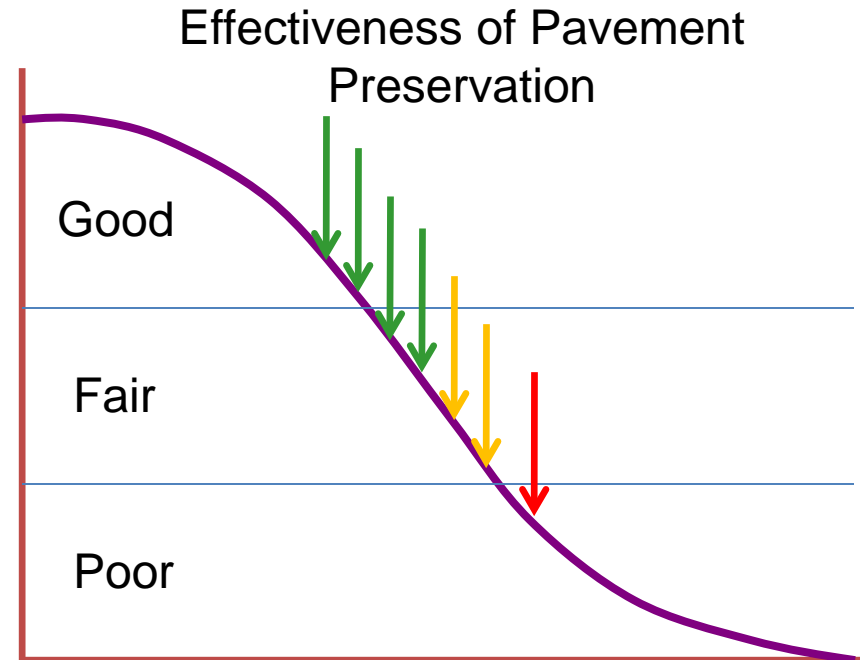


From Utah DOT



# Keys to Success

- Be **proactive**
- Keep roads from dropping into poor condition
- Incorporate a **mix of fixes** into your program



*A pavement management system helps identify **what** treatments are needed and **when** they are cost-effective*



# Resource Allocation and Utilization

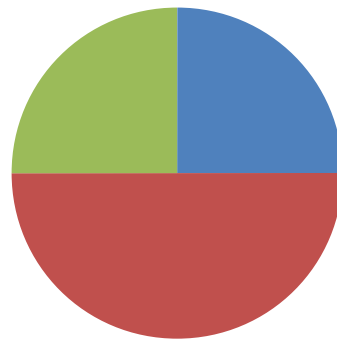


- Sample network distribution
  - Initial distribution: 25 mi in *good*, 50 mi in *fair*, and 25 mi in *poor*
- 20 year repair cycle = 5%/year = 5 mi/year
- 10% deterioration from good & fair each year
- \$500 available (\$100/mi to fix poor & \$25/mi to fix fair)
- Scenario 1: Fix roads in poor condition  
Scenario 2: Fix some roads in poor & some in fair

# Sample Outputs After 3 Years

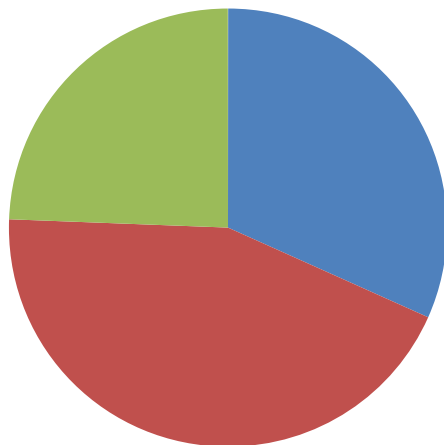


**Now**

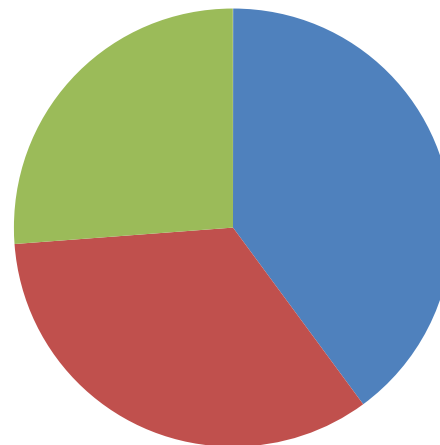


- Good
- Fair
- Poor

**Scenario 1**



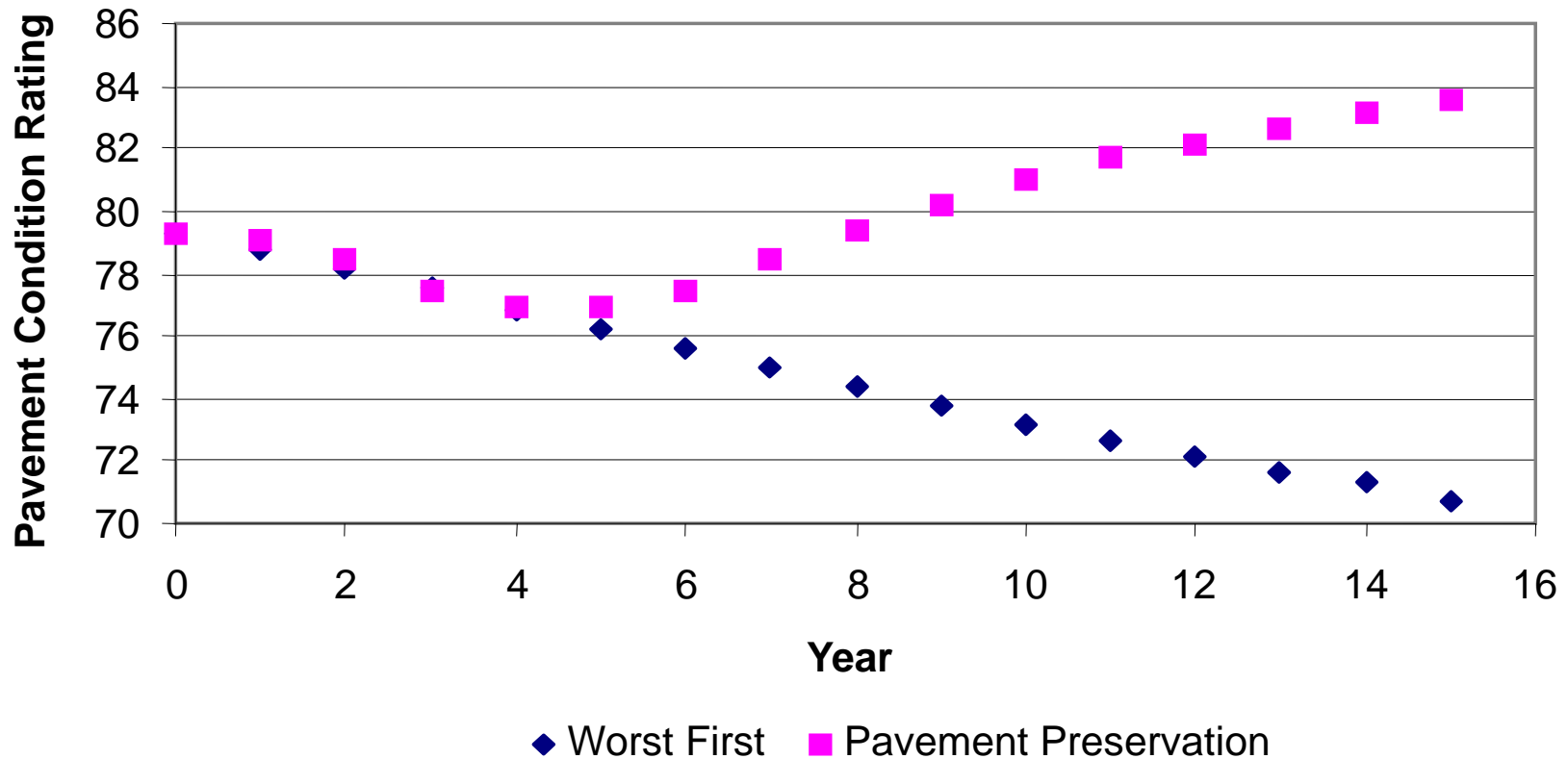
**Scenario 2**



# Demonstrating Pavement Preservation Benefits




## Average Pavement Condition over Time





# Using Pavement Management To Tell Your Story

# 5 Core Questions



1. What is the current state of our pavements?

- What do we own?
- Where is it?
- What condition is it in?
- What is the remaining service life and economic value?



# 5 Core Questions



2. What is the required level of service?

- What do stakeholders expect?
- How different is this from actual conditions?


# 5 Core Questions



3. What level of deterioration is acceptable?

- How do these assets deteriorate?
- What are the likelihood and consequences of deterioration?


# 5 Core Questions



4. What are the feasible strategies to consider?

- What repair options are most feasible for our agency?
- How do these strategies impact system performance?

# 5 Core Questions



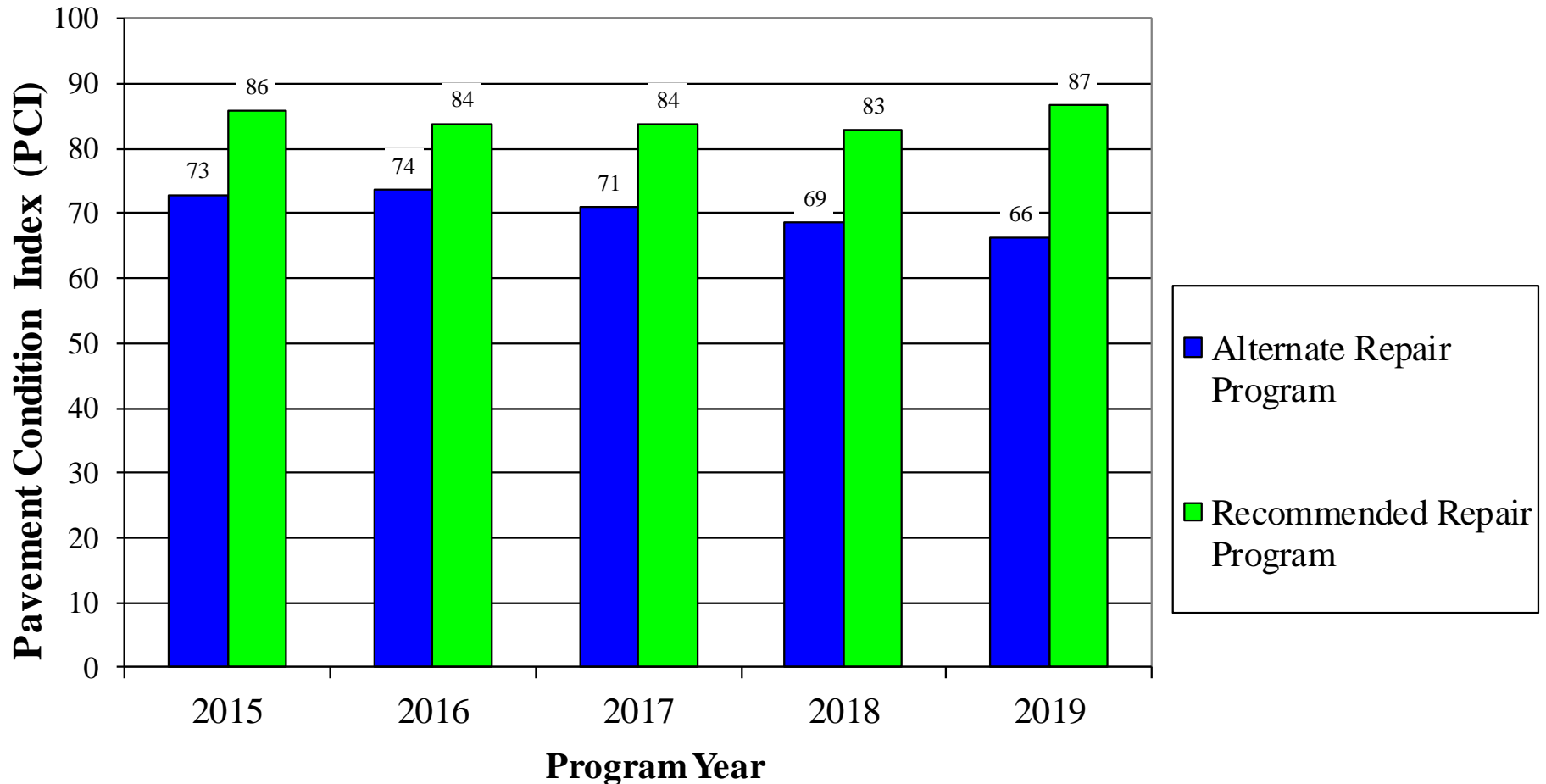
5. Which long-term funding strategy should be selected?

- Does the selected strategy align with policy goals?

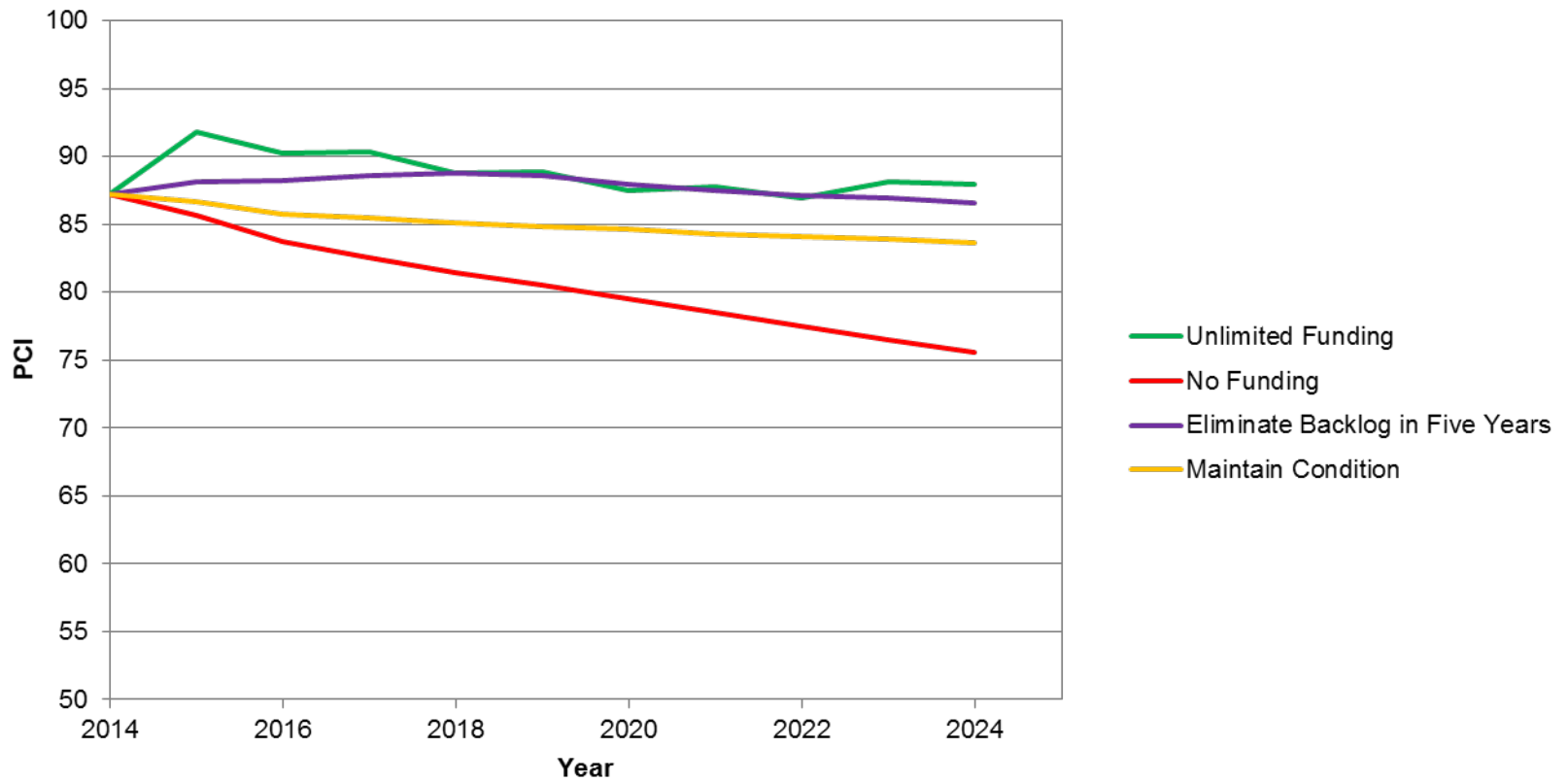
# Reporting Network Conditions



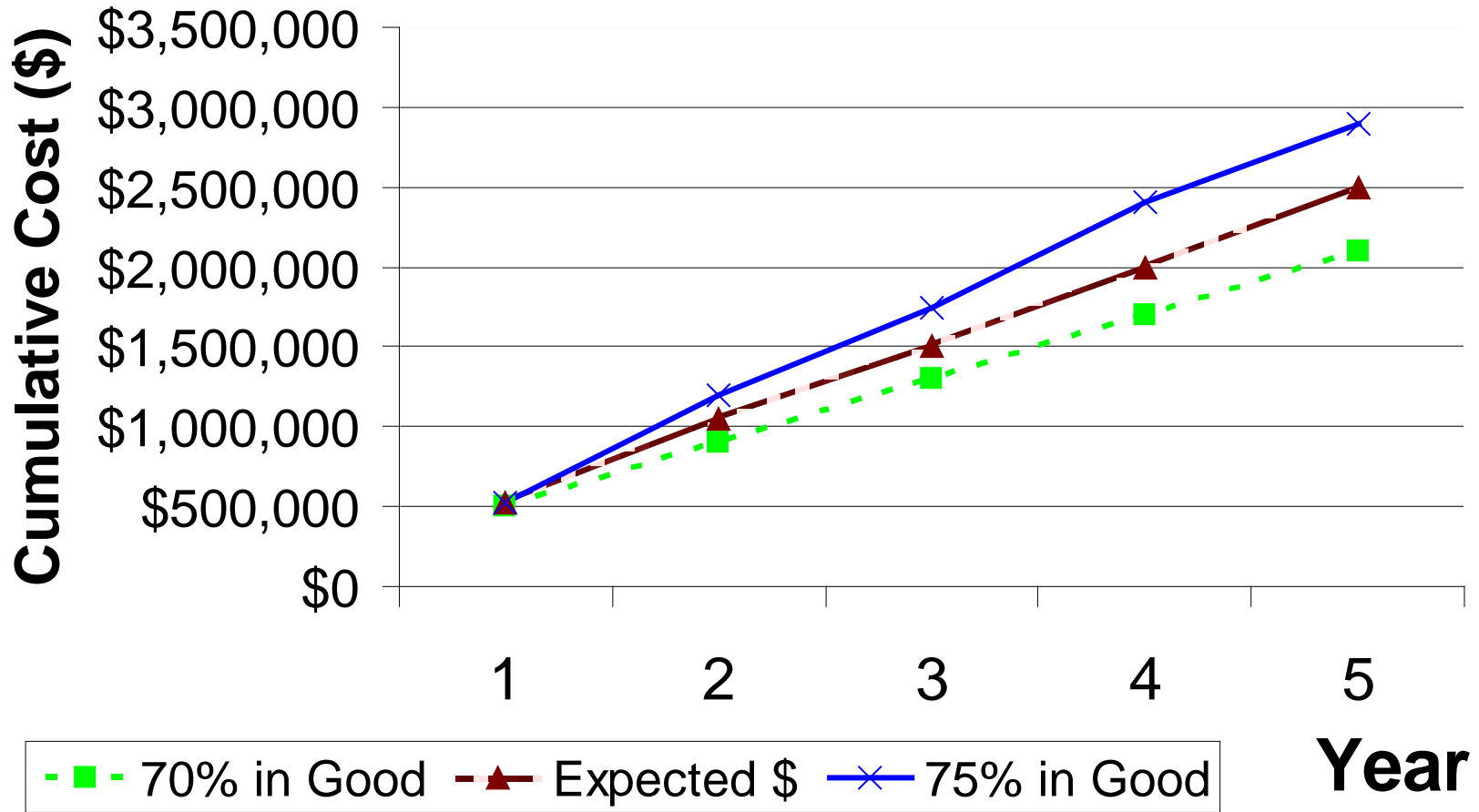
# Determining Impacts of Program Choices



# Compare Various Budget Scenarios



# Setting Agency Goals





# Presenting Results to Stakeholders



- ***Network Level***
  - City Counsel/County Board
  - Senior agency management
  - Public
- ***Project Level***
  - Design engineers
  - Mid-level management



# Don't Take My Word For It...

- “Due to the state of the economy, the pavement management system has become more important” – *City of Naperville, IL*
- “We are now able to reduce political pressure” – *Champaign County, IL*
- “Complete the right work at the right time for the right reasons” – *Edgar County, IL*
- “We wanted to have more *engineering* behind decisions.” – *Stark County, IL*



# Take Away Points

- Start with the basics, then grow it
- Identify your agency's PM champion
- Don't rely on a worst first strategy
  - Use a **mix of fixes** that includes preventive maintenance treatments on roads in good or fair condition
- Consider the use of pavement management tools to:
  - Help you make the best use of your road \$
  - Help you tell your story





Questions?

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