

61st Annual New Jersey Asphalt Paving Conference

Pavement Preservation

What to do and When to do it



U.S. Department of Transportation
Federal Highway Administration



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Pavement Preservation

What to do and When to do it

Moderator: James J. Purcell, PE – New Jersey Asphalt Pavement Association

Panelists: Susan Gresavage – NJDOT

Brett Williams – National Asphalt Pavement Association

Helene Roberts – Federal Highway Administration

Paul Pogorzelski, PE, CME – Municipal Engineer

Transportation Performance Management

- ▶ Managing pavements (and bridges) on the National Highway System
- ▶ Performance measures and targets for pavements
- ▶ Targets to be set this May; set by NJDOT
- ▶ Each State DOT reports targets; public-facing website
- ▶ Ensures preventive maintenance and other activities are planned and programmed
- ▶ Life-cycle Approach



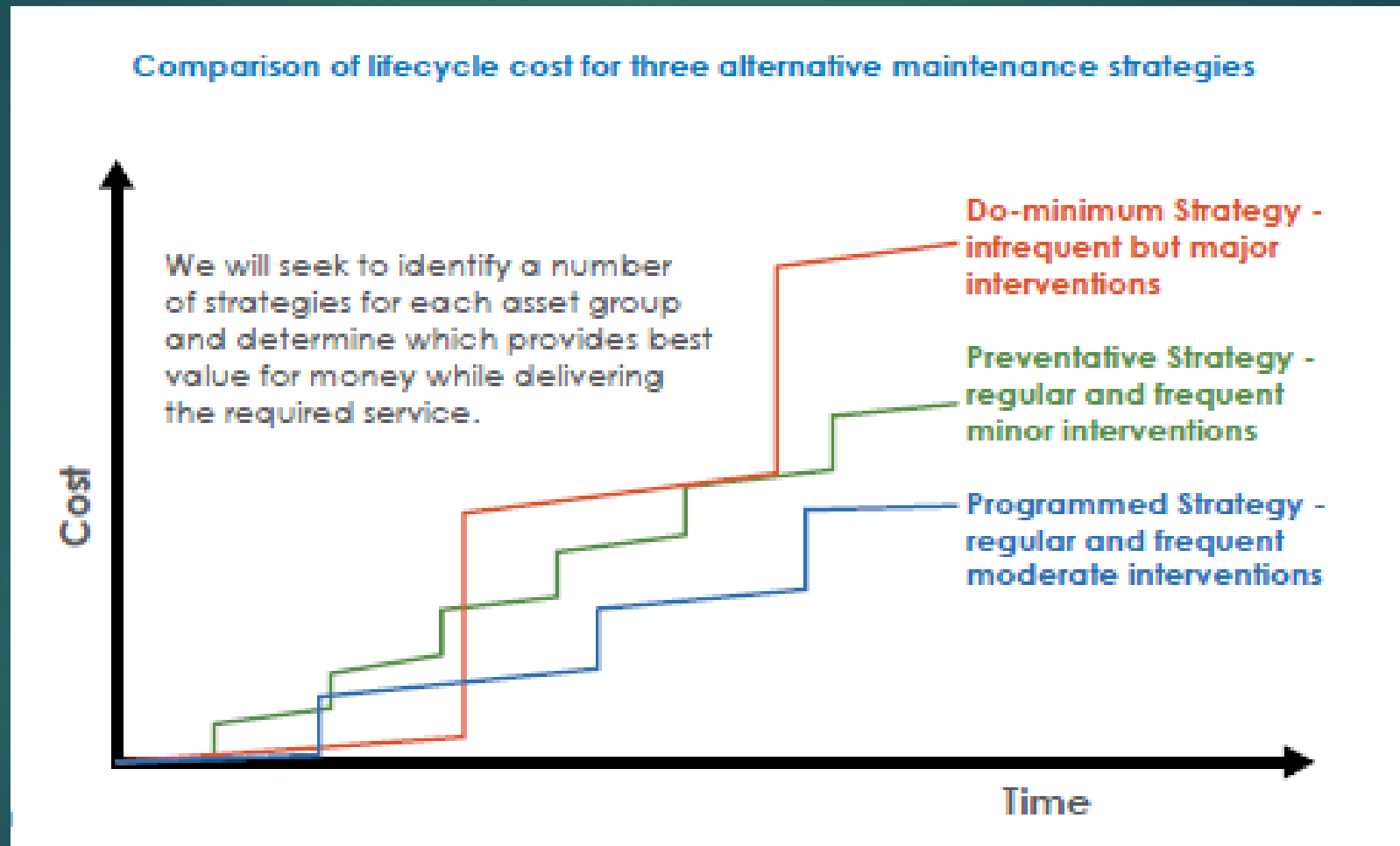


Asset Management

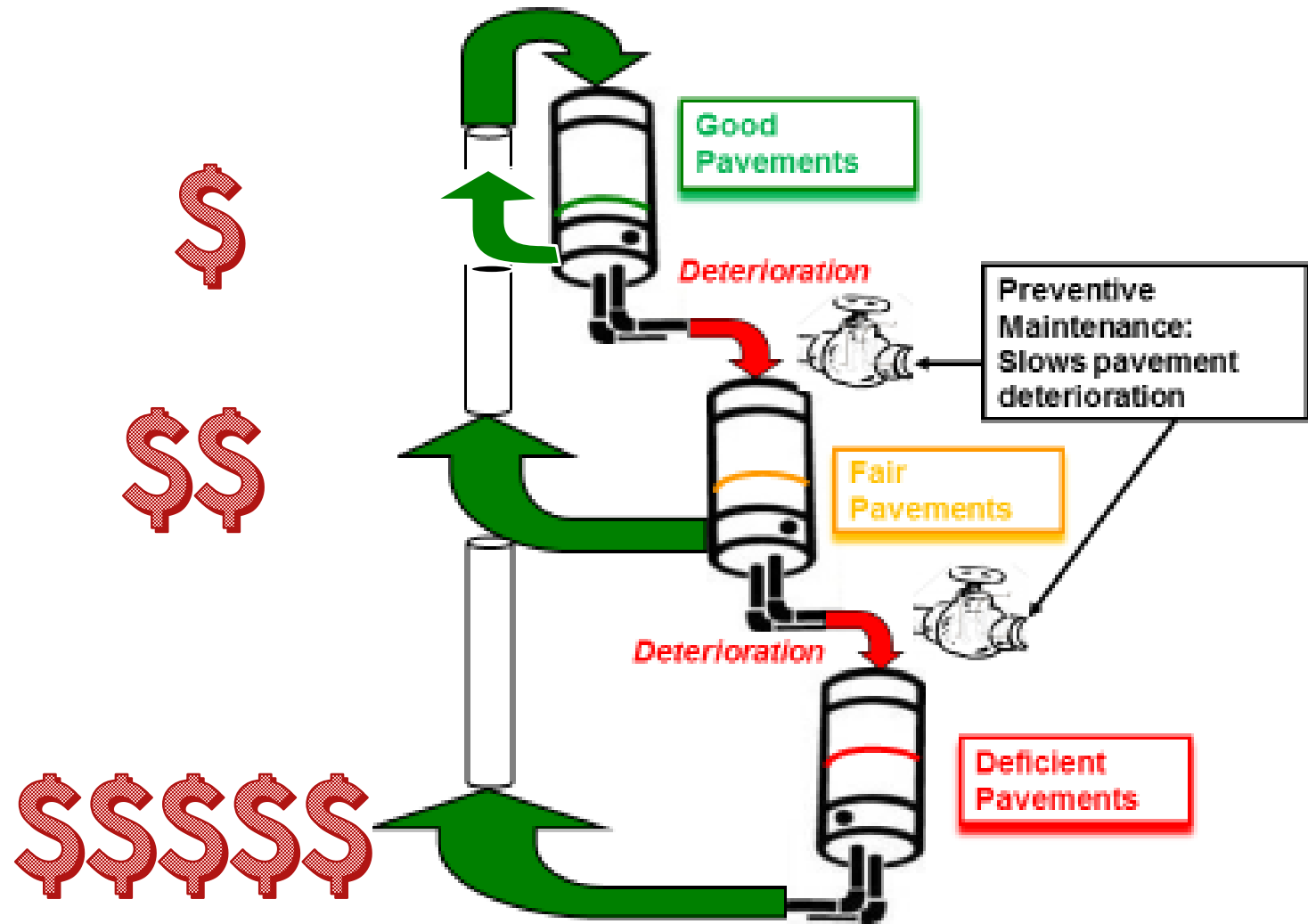


- ▶ Transportation Asset Management Plan (TAMP) – April 30
- ▶ Pavements and Bridges on National Highway System (regardless of owner)
- ▶ Life-Cycle Planning
- ▶ Financial Planning
- ▶ Risk Component

Benefits of Programmed Approach



Pavement Preservation Methodology



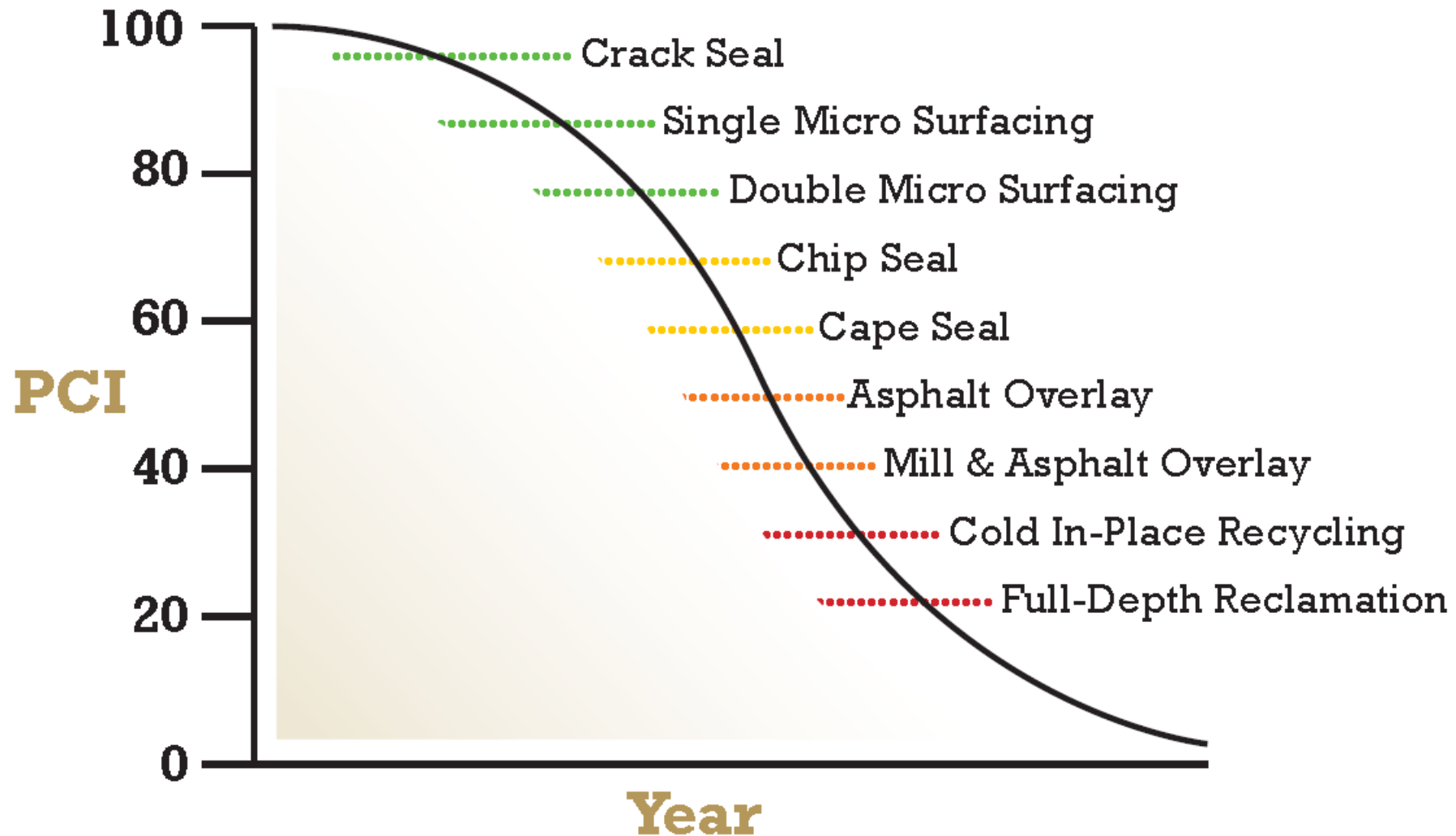
Every Day Counts: Pavement Preservation (When and Where)


- ▶ Fits with TPM and TAMP
- ▶ Moving preservation significantly forward
- ▶ Managing pavements through their whole life
- ▶ Comprehensive strategy using pavement management system



<http://www.maserconsulting.com/extending-roadway-lifespans-with-micro-surfacing>

Effective Pavement Management: "Right Road, Right Treatment, Right Time"





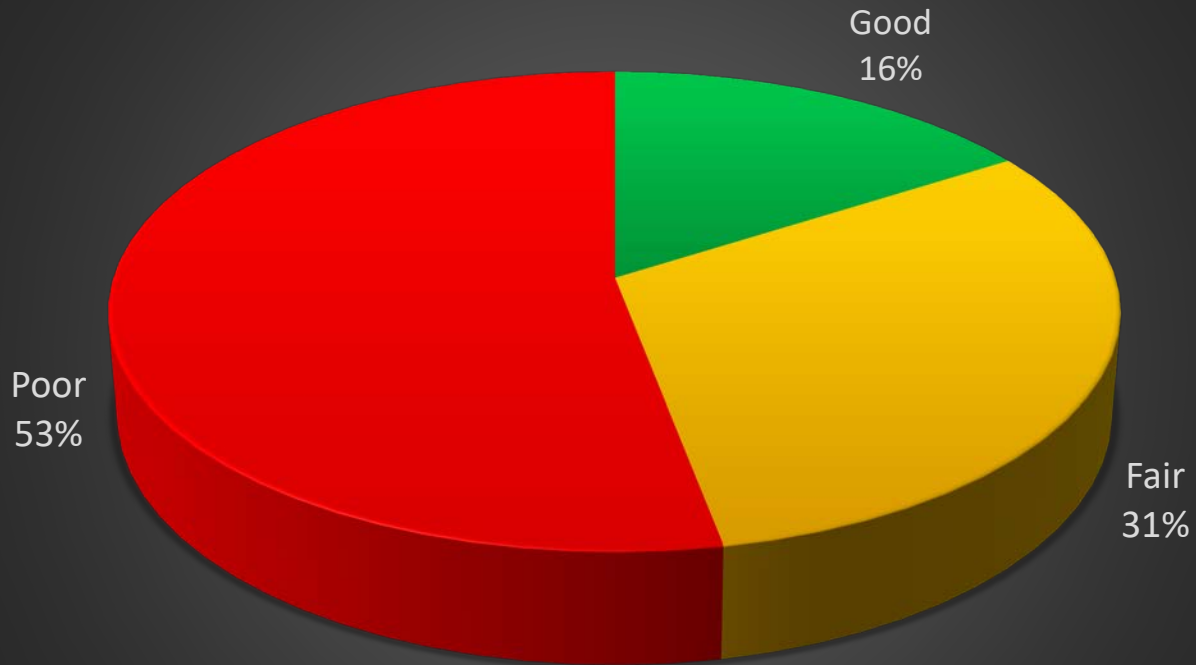
Every Day Counts: Pavement Preservation (How)



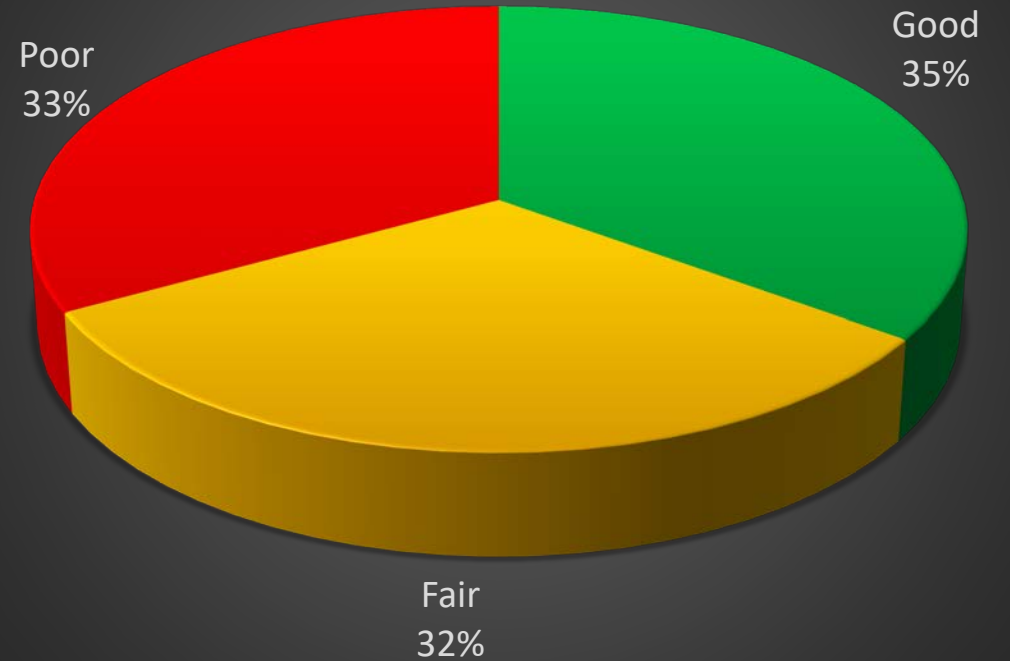
Improving Construction by:

- Material innovations
- Better construction practices
- Improved specifications
- Better equipment
- More emphasis on construction quality

NJDOT Pavement Condition 2008



NJDOT Pavement Condition 2016

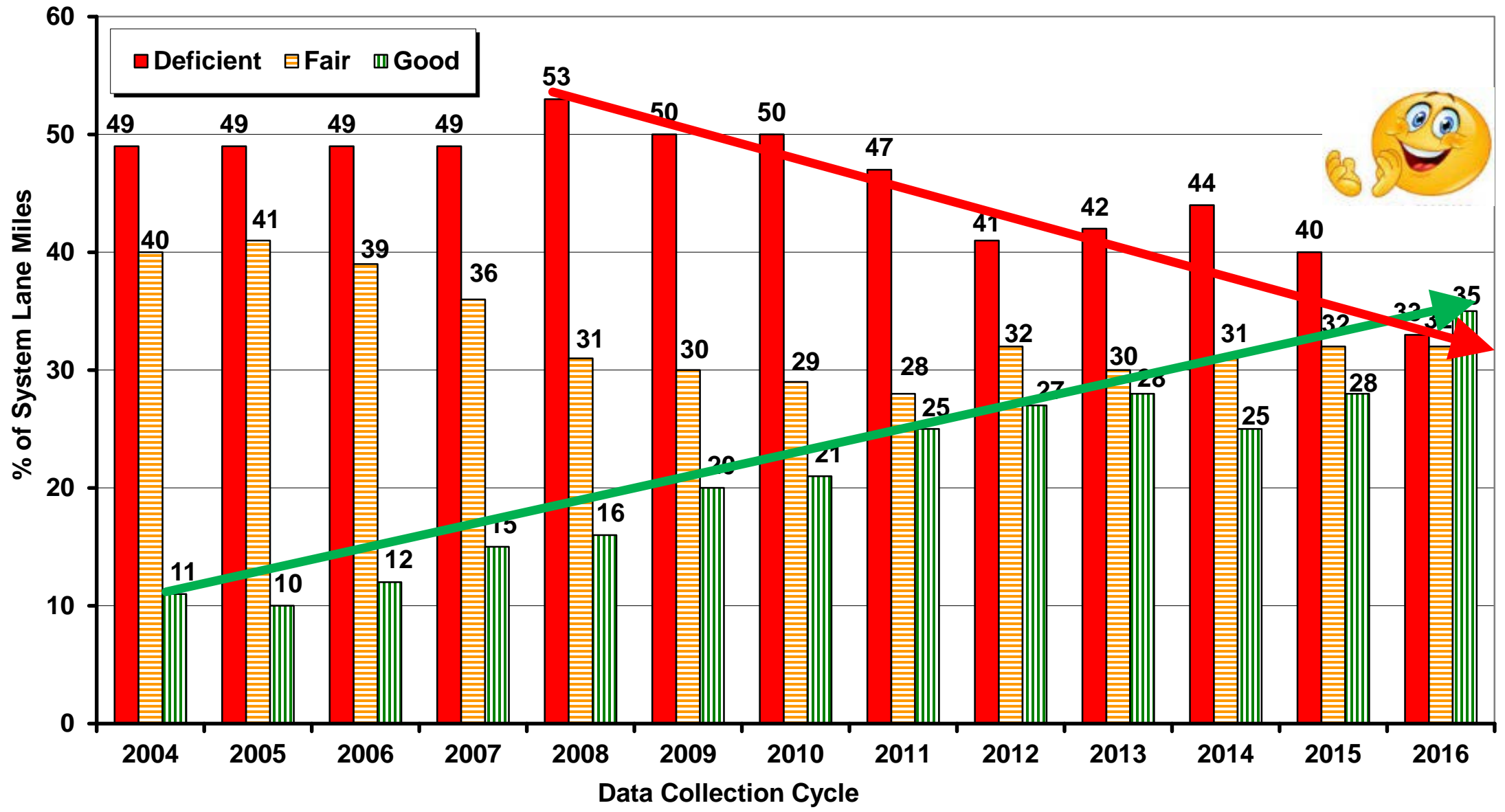


Good = IRI < 95 and SDI \geq 3.5

Poor = IRI > 170 or SDI \leq 2.4

Fair = Everything in between

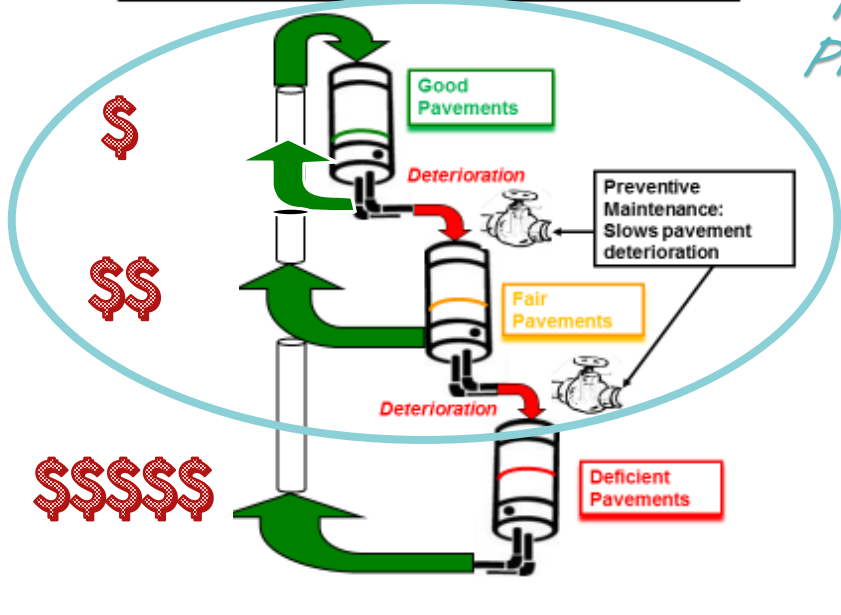
Multi-Year Status of State Highway System



Source: NJDOT Pavement Management System

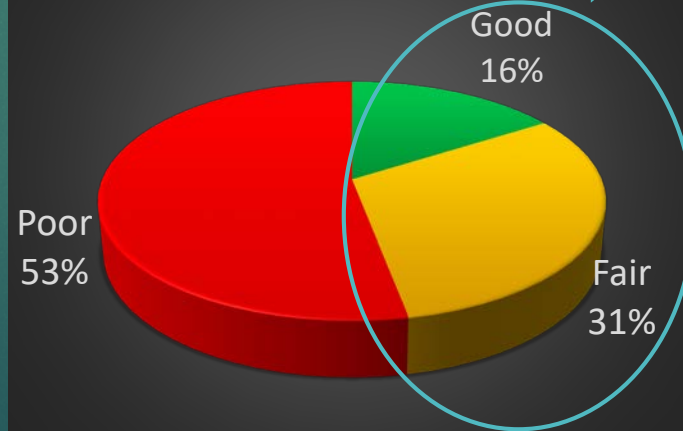
Pavement Preservation Methodology

Pavement Preservation

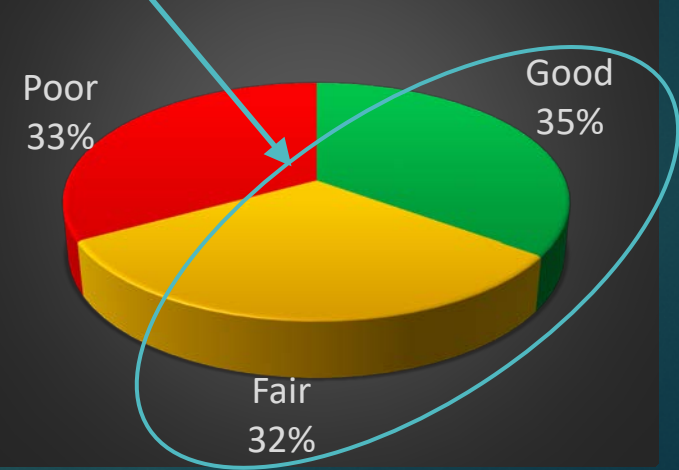


Candidate Pool

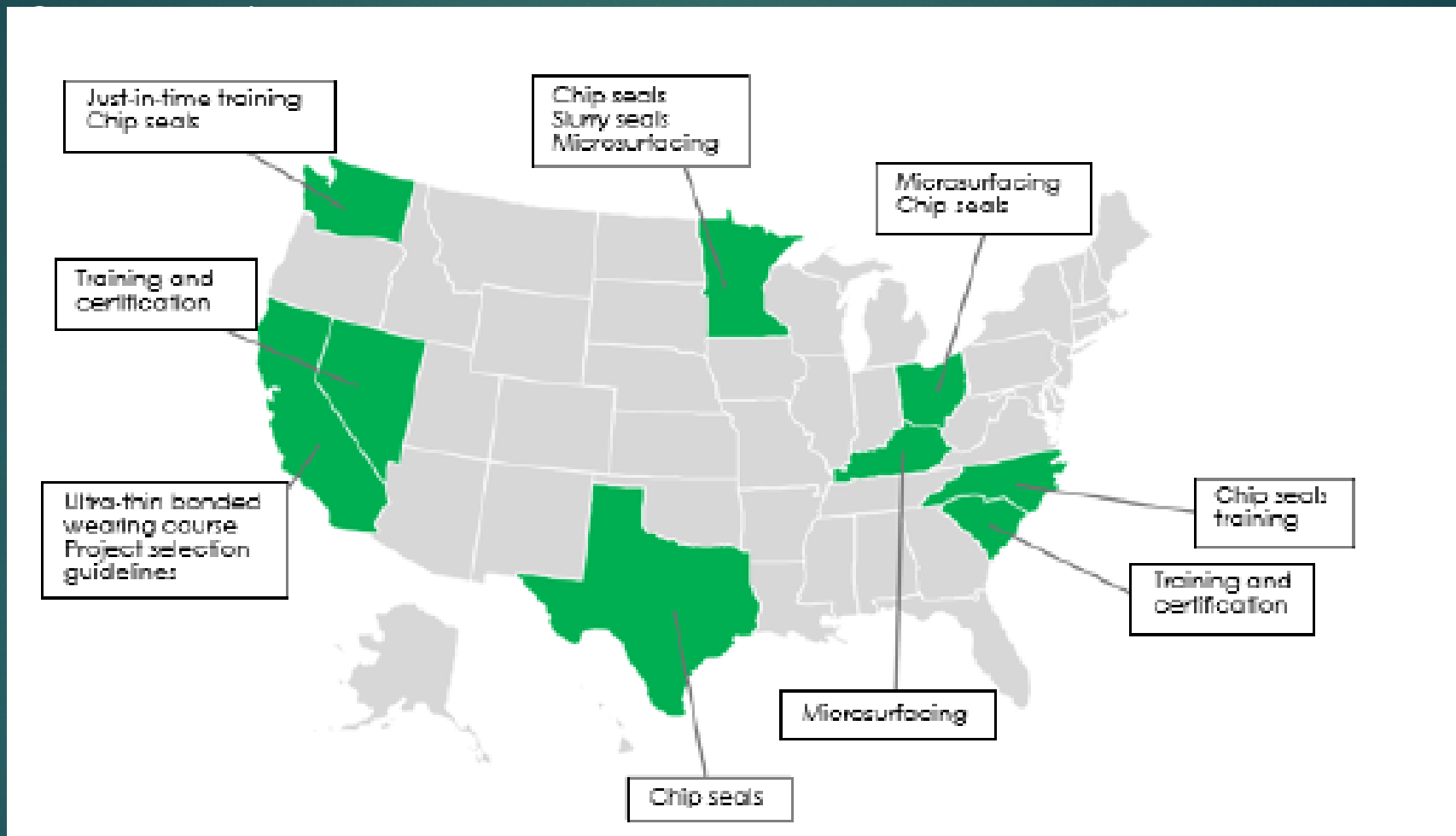
NJDOT Pavement Condition 2008



NJDOT Pavement Condition 2016



States with Noteworthy Preservation



Source: <https://www.fhwa.dot.gov/pavement/preservation/pubs/how.pdf>

Project Selection

- ▶ Time based (4-8 year window)
- ▶ Assess condition and performance
- ▶ Select specific preservation treatment based on
 - ▶ Road type
 - ▶ Condition
 - ▶ Traffic volumes
 - ▶ Other unique project characteristics



Visual Survey

- Part of a good Pavement Management System.
- Get current project-specific data
- Need to know:
 - Type of distress
 - Extent
 - Severity
- Visit the site and validate data.





Types of Distress



- Raveling
- Longitudinal Cracking (not in wheelpath)
- Longitudinal Cracking (in wheelpath)
- Transverse Cracking
- Alligator Cracking
- Rutting

Raveling



Longitudinal Cracking (not in wheelpath)



Longitudinal Cracking (wheelpath)



Temporary Fix for Minor Distress

Transverse Cracking



Alligator (Fatigue) Cracking



Temporary Fix for Minor Distress

Rutting or Shoving



Severe Structural Failure



Surface Failure –
Milling Required

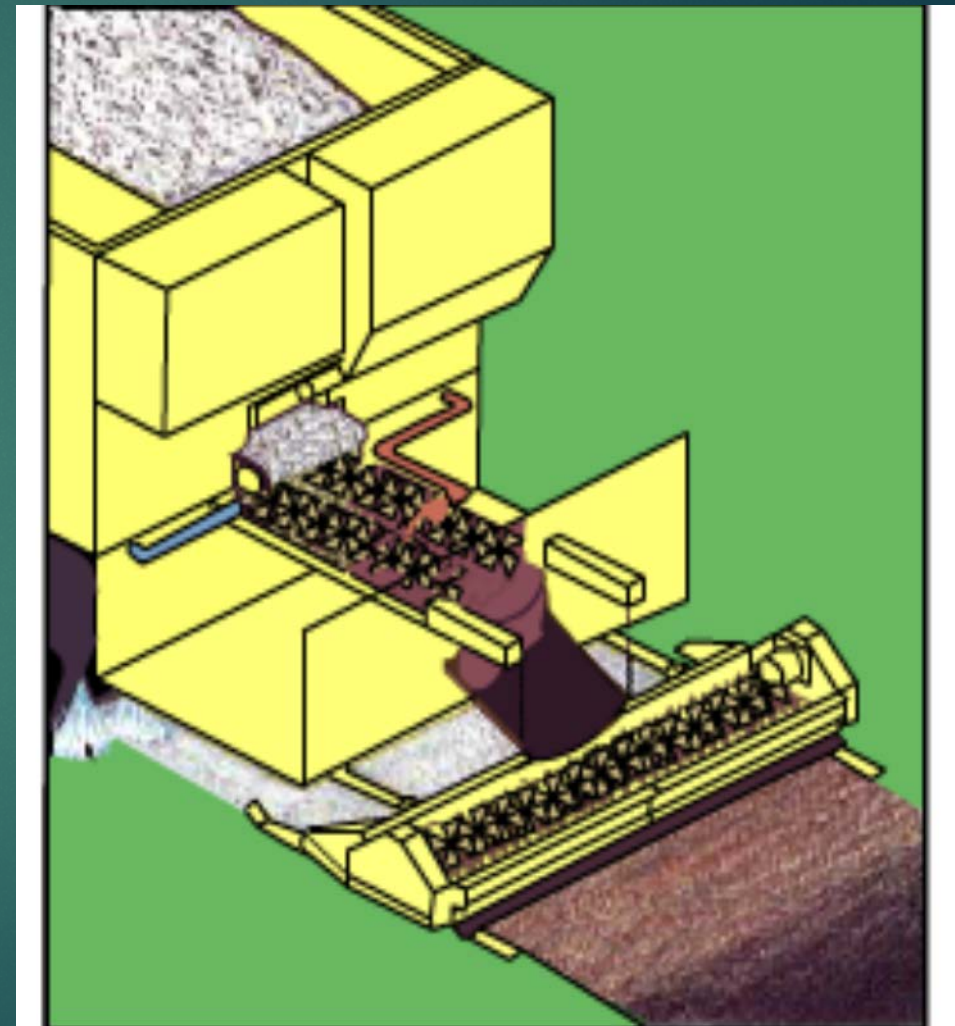
Preventive Maintenance: Microsurfacing



Preventive Maintenance: Microsurfacing

Process

- Mineral Filler (Cement and/or Lime) Aggregate and cement drop into pug mill
- Water and field control additive is mixed
- Emulsified asphalt is added
- Materials are mixed and deposited into a spreader box and distributed on road surface with primary and secondary strike-offs
- *ALL MATERIALS ADDED AT METERED RATES DETERMINED THROUGH MACHINE CALIBRATION & ACCORDING TO MIX DESIGN*



Preventive Maintenance: Chip Seal

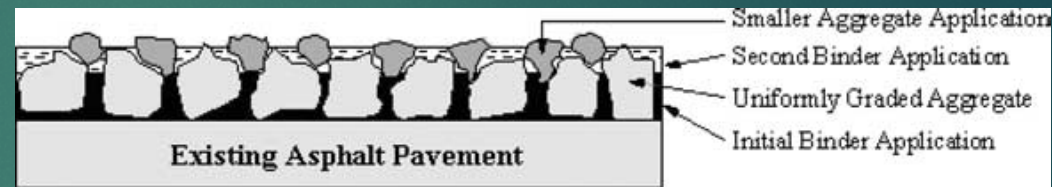


Preventive Maintenance: Chip Seal

➤ Single Chip Seal



➤ Double Chip Seal



➤ Cape Seal



➤ The Cape Seal process is when a Micro-surfacing or Slurry seal application is placed over the Chip Seal.

Preventive Maintenance – Thin Asphalt Overlays

- Milling is recommended to:
 - Remove defects
 - Roughen surface
 - Improve smoothness
- Tack
- Pave
 - Cooling can be an issue - warm mix will help
- Compact
 - Static Rollers



Cold In-Place Recycling

1. Inject asphalt emulsion stabilizing agent while milling the existing asphalt.
2. Conveyor recycled material into a modified asphalt paver.
3. Pave the recycled material to the appropriate cross-slope and elevation.
4. Pave over the recycled base course with conventional asphalt (after 7 days).



Service Life Extension based on preservation techniques

Treatment	Service Life Extension
<u>Routine</u>	
Crack Sealing	1 – 3 years
Micropave Joints	5 – 8 years
<u>Preventive</u>	
Slurry Seal	3 - 5 years
Chip Seal	3 – 6 years
Micro Surfacing – Single Application	5 – 8 years
Double Application	6 - 10 years
Cape Seal	6 – 10 years
Thin Overlays	8 – 10 years
<u>Major Rehabilitation</u>	
Cold In-Place Recycling	10 – 15 years
Full Depth Reclamation	10 – 15 years

Service Life Extension – Thin Asphalt Overlays

Location	Traffic	Underlying Pavement	Performance, yrs.
Ohio	High/Low	Asphalt	16
	Low	Composite	11
	High	Composite	7
North Carolina	----	Concrete	6 – 10
Ontario	High	Asphalt	8
Illinois	Low	Asphalt	7 – 10
New York	----	Asphalt	5 – 8
Indiana	Low	Asphalt	9 – 11
Austria	High/Low	Asphalt	≥ 10
	High	Concrete	≥ 8
Georgia	Low	Asphalt	10

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Economics

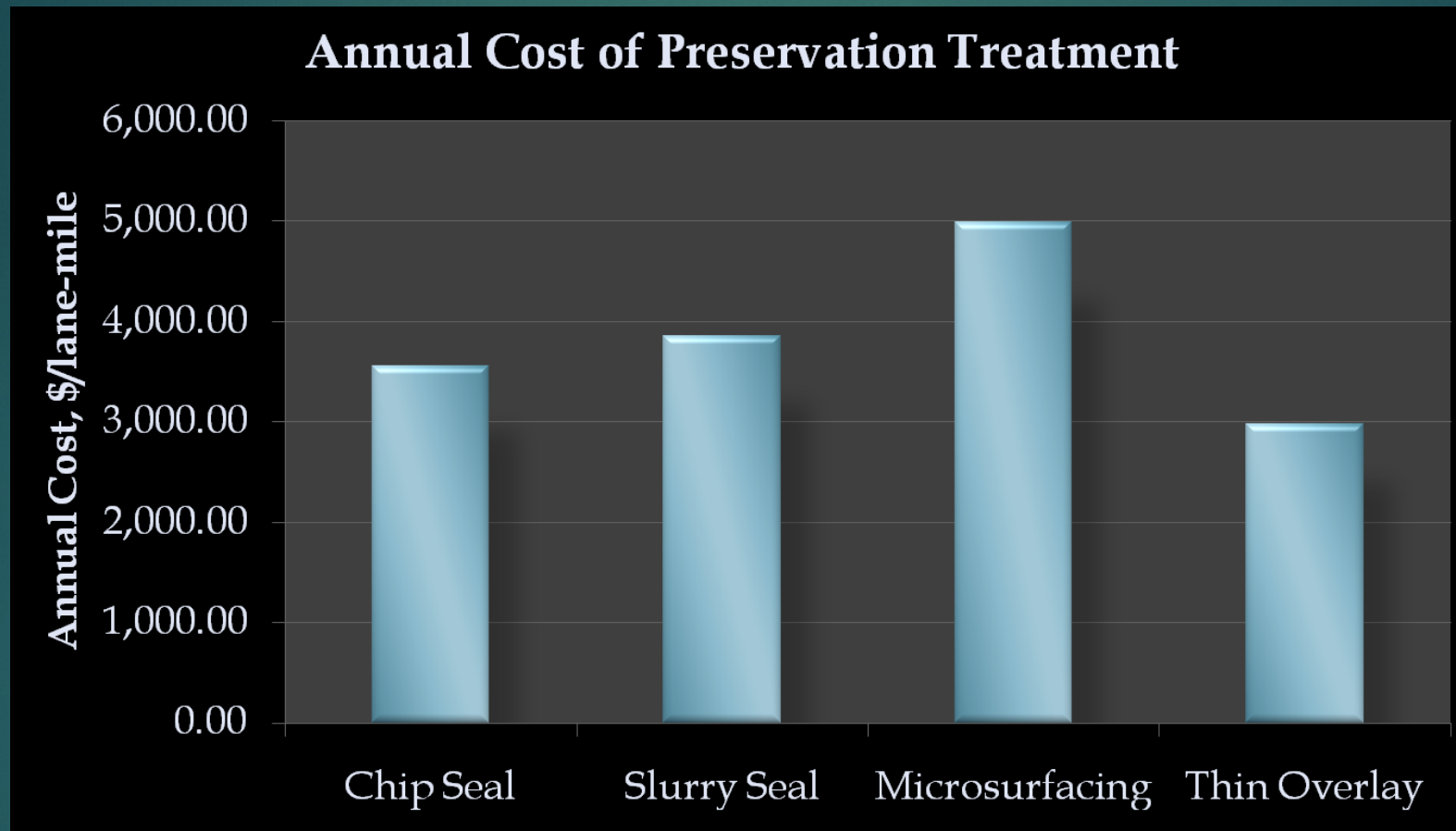
➤ Chou et al. (2008):

- Thin overlays on asphalt – almost always most cost effective
- Thin overlays on PCC – not as cost effective, but greater deterioration prior to overlay

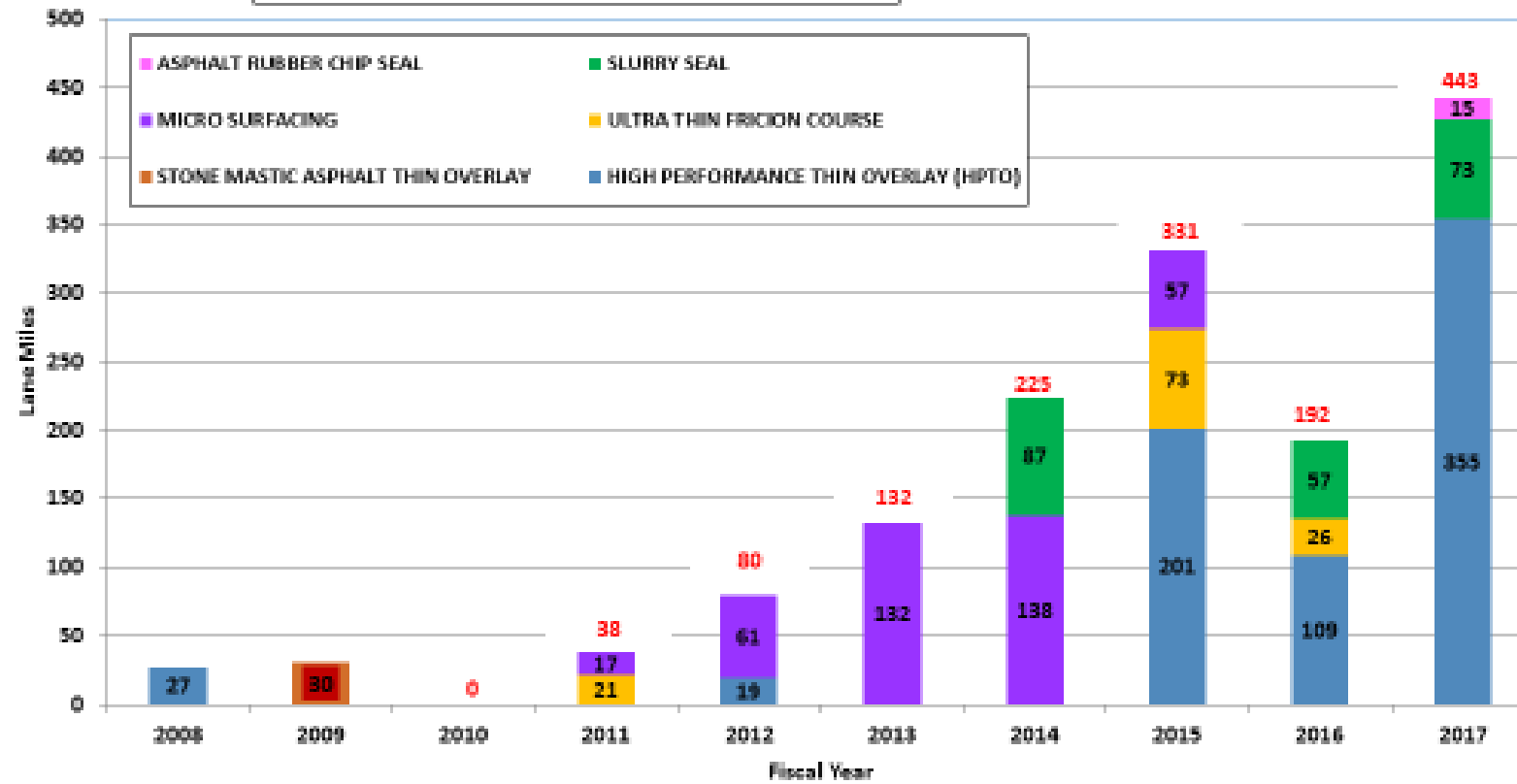
➤ 2008 NAPA Survey of State Asphalt Associations

Treatment	Expected Life, yrs	Range	Cost, \$/SY	Range	Annual Cost, \$/lane-mile
Chip Seal	4.08	2.5 - 5	2.06	0.50 – 4.25	3,554.51
Slurry Seal	3.25	2 - 4	1.78	1.00 – 2.20	3,855.75
Micro-surfacing	4.67	4 - 6	3.31	2.30 – 6.75	4,989.81
Thin Surfacing	10.69	7 - 14	4.52	2.40 – 6.75	2,976.69

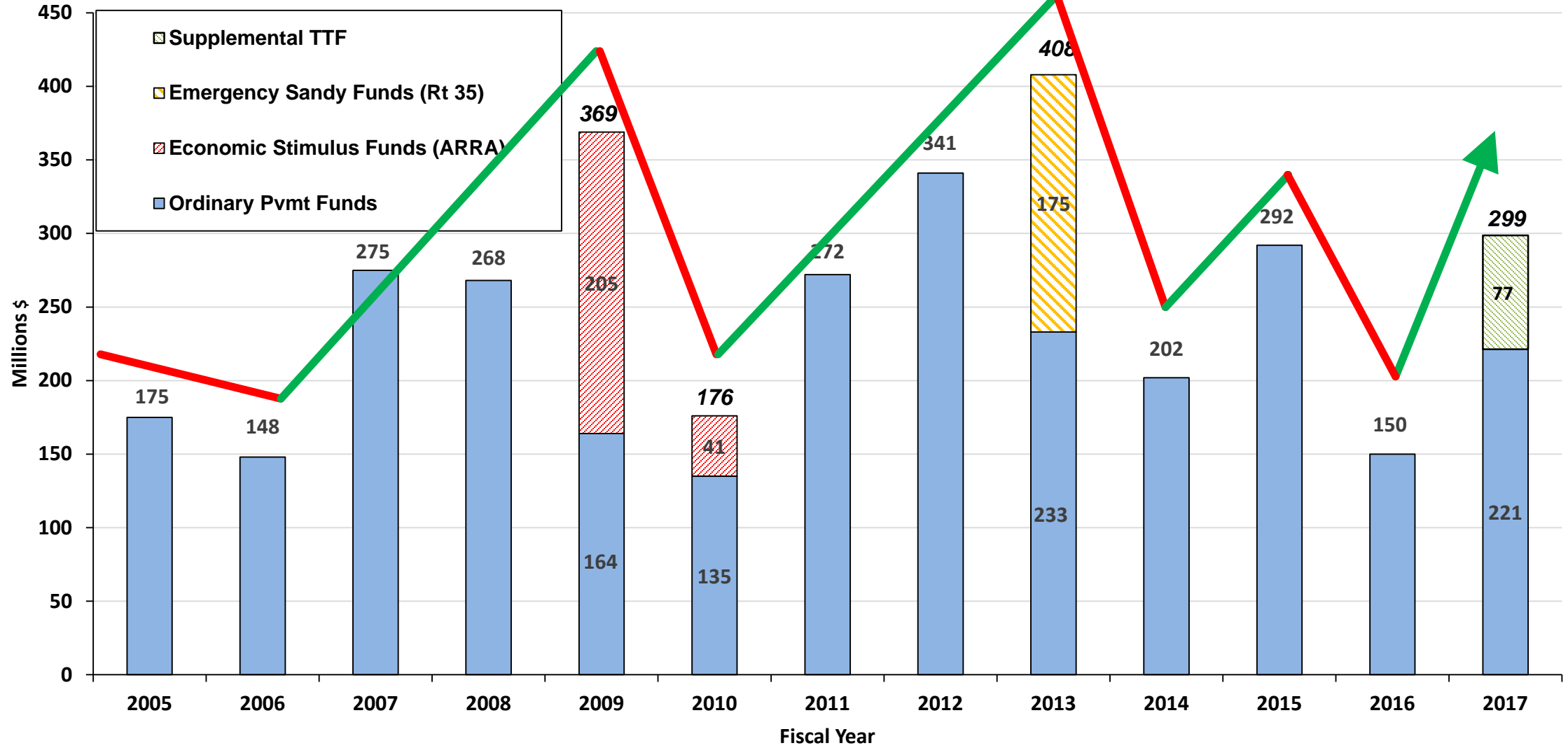
Economics



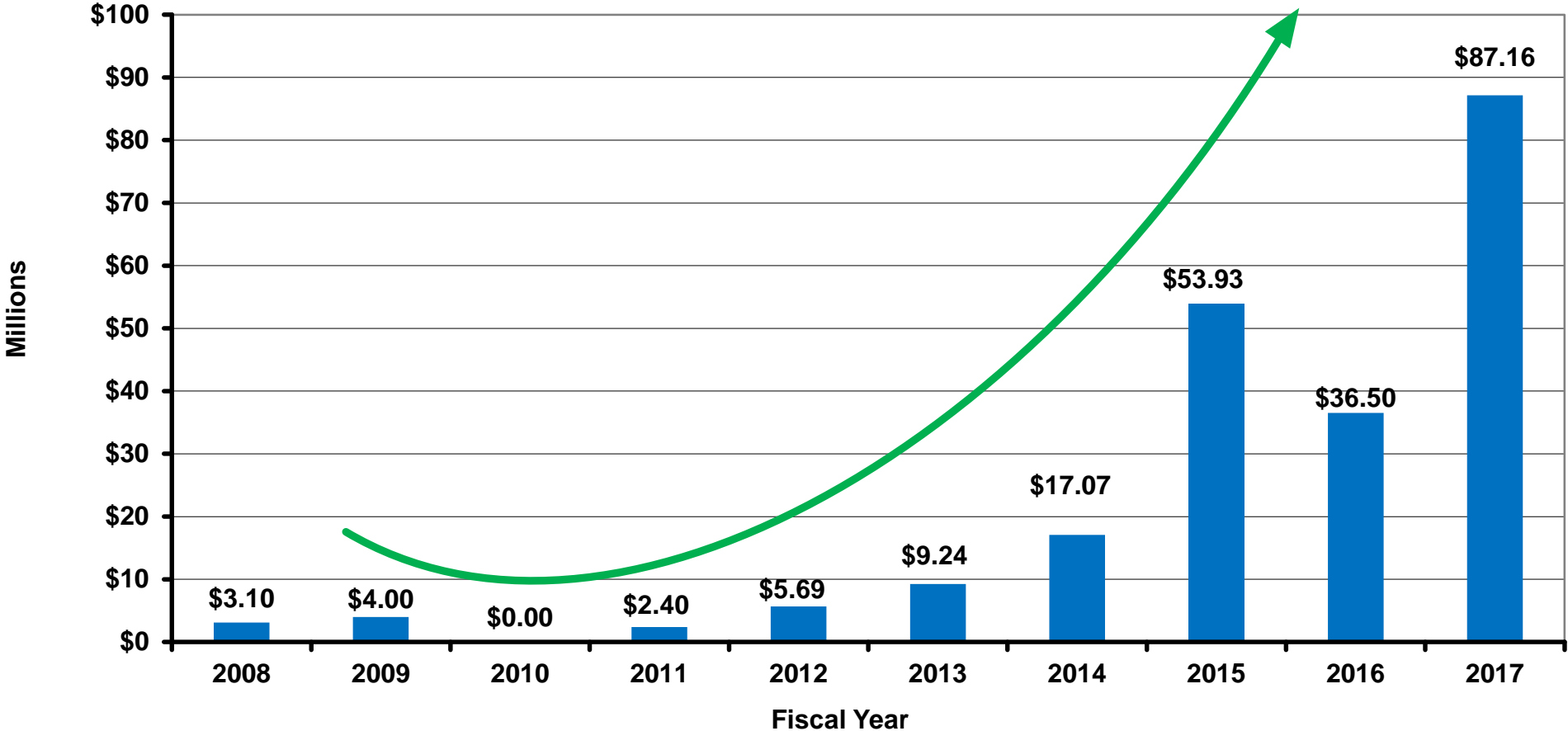
**NJ State Highway System
Lane Miles of Preventive Maintenance Pavement Work
(Total System Mainline Lane Miles = 8542)**



PAVEMENT CONSTRUCTION SPENDING HISTORY



NJ State Highway System Annual Preventive Maintenance Pavement Investment



Performance of Thin Asphalt Overlays

- Pavement Condition (Labi et al. (2005))
 - reduced roughness
 - decreased rut depth
 - improved condition rating
- Noise
 - Between 5 and 6.7 dB reduction on overlaid PCC
 - 3 dB reduction = $\frac{1}{2}$ traffic volume



Lessons Learned - HPTO

- ▶ Most frequently used preservation treatment.
- ▶ Performance – Rutgers preliminary performance study shows that treatment timing is critical
 - ▶ $SDI < 2.4 = 5$ years service life
 - ▶ $SDI > 2.4 = 13$ years service life



Lessons Learned - UTFC

- ▶ Aggregate shape and gradation is critical to success
- ▶ Aggregate crushing operation is critical
- ▶ Refined specification to better control gradation



Lessons Learned – Micro/Slurry

- ▶ Minimal ride quality improvement
- ▶ Most temperature sensitive
- ▶ Customer expectations



Resources

- ▶ New Jersey Asphalt Pavement Association – <http://www.njapa.com>
- ▶ National Asphalt Pavement Association – <http://www.asphaltpavement.org>
- ▶ Foundation for Pavement Preservation – <http://www.fp2.org/>
- ▶ National Center for Pavement Preservation – <https://www.pavementpreservation.org/>
- ▶ National Center for Asphalt Technology – <http://eng.auburn.edu/research/centers/ncat/>



Acknowledgements

- ▶ Robert Blight – NJDOT Pavement Design
- ▶ Philip Bertucci, P.E. – NJDOT Pavement Management
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- ▶ Dr. Nick Vitillo – Rutgers University
- ▶ The staff of Asphalt Paving Systems
- ▶ The engineering staff at NAPA
- ▶ AND
 - ▶ Your panelists
 - ▶ Helene Roberts
 - ▶ Paul Pogorzelski
 - ▶ Sue Gresavage
 - ▶ Brett Williams

