Thin Asphalt Concrete Overlays

Southeastern Pavement Preservation Partnership

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National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

Outline

- NCHRP Synthesis Topic 44-07
- Purpose/Scope
- Use
- Design and Construction
- Performance, Maintenance, Rehab
- Case Studies
- Conclusions

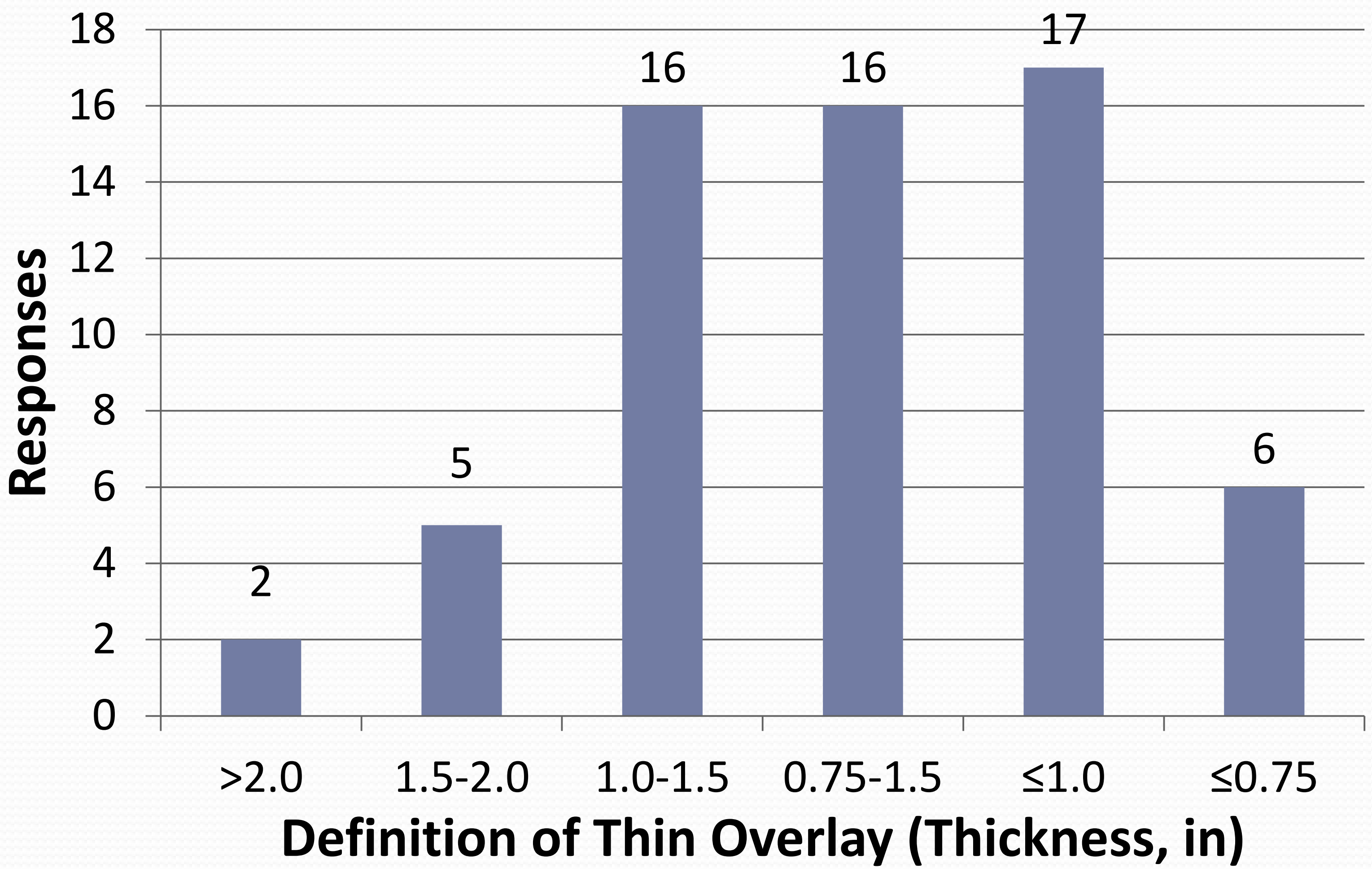
Purpose/Scope

- Document current experience/research
- Agency/industry survey
  - 43 States
  - 8 Private Industry companies

Advantages of Thin Overlays

- Provides long service life (when placed over structurally sound pavements)
- Provides good riding surface
- Reduces noise (fine-graded mixes)
- Maintains grade and slope geometry
- Is easily maintained
- Is recyclable

Thin Overlay Definition



Previous Research

- NAPA – (Newcomb, 2009) IS 135
- Zubek – Cold Regions, 2012
- Montana – (Cuelho, 2006)
- NCHRP Synthesis 222 – (Zimmerman, 1995) Project/Treatment selection

Montana Survey

Preventive Maintenance Treatment	Average Service Life (Years)	Cost per Lane Mile (12 feet wide)
Thin Overlay	8.4	$14,600
Double Chip Seal	7.3	$12,600
Microsurfacing	7.4	$12,600
Slurry Seal	4.8	$6,600

Project/Treatment Selection Strategies (NCHRP Synthesis 222)

- Current condition rating
- Prediction models ("What if" scenario)
- Network Optimization models
- Find treatment that addresses deficiencies (may be affected by local policies/mandates)

Types of Thin Overlays

- 9.5 and 12.5mm Superpave
- 9.5 and 12.5mm SMA
- UTBWC
  - Arkansas
  - Illinois, Kansas, Louisiana, Minnesota, Vermont
- 4.75mm Superpave and SMA
- OGFC/PFC

UTBWC

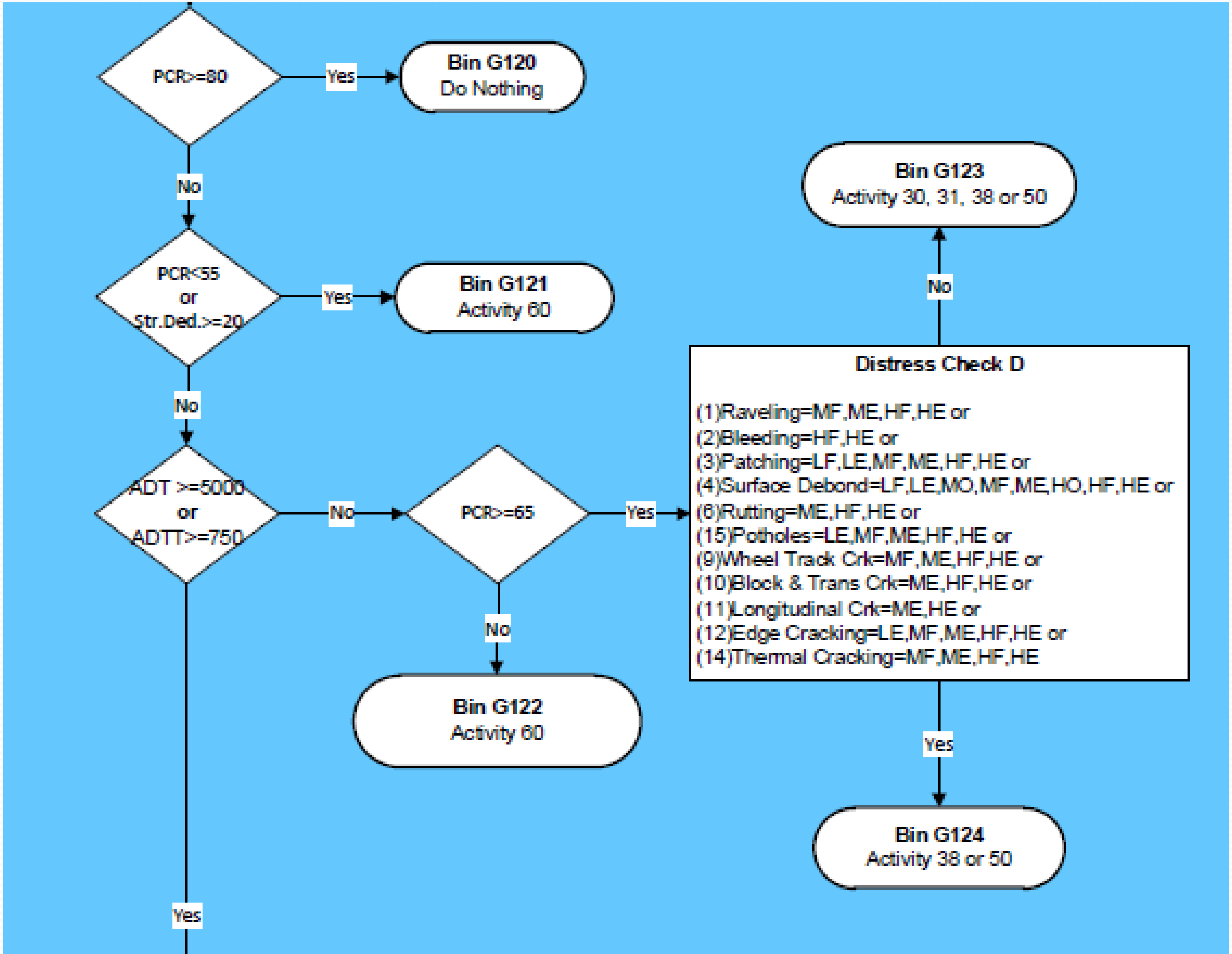
Use of Thin Overlays

Pavements that are failing, or have already failed, cannot be successfully treated with a thin overlay alone.

PennDOT Use of Thin Overlays

Where Not To Use Thin Overlays

Ohio Decision Tree



NCAT Pavement Preservation Study

Section	18	19	20	21	22	23	24	25
Surface	4.75/PG 67-22	4.75/PG 67-22	4.75/PG 76-22	4.75/PG 76-22	UTBWC	4.75 50% RAP	4.75 5% Shingles	4.75 PG 88-22
Subsurface	Fibermat	Existing	Full-Depth Reclamation	Existing	Existing	Existing	Existing	Existing

Design and Construction

- Aggregate – Superpave quality standards
- Binder – Often modified
- Compaction level – 50 gyrations, locking point, other
- Testing constraints (due to thin layer)

RAP May Need to be Crushed/Fractionated

Design and Construction

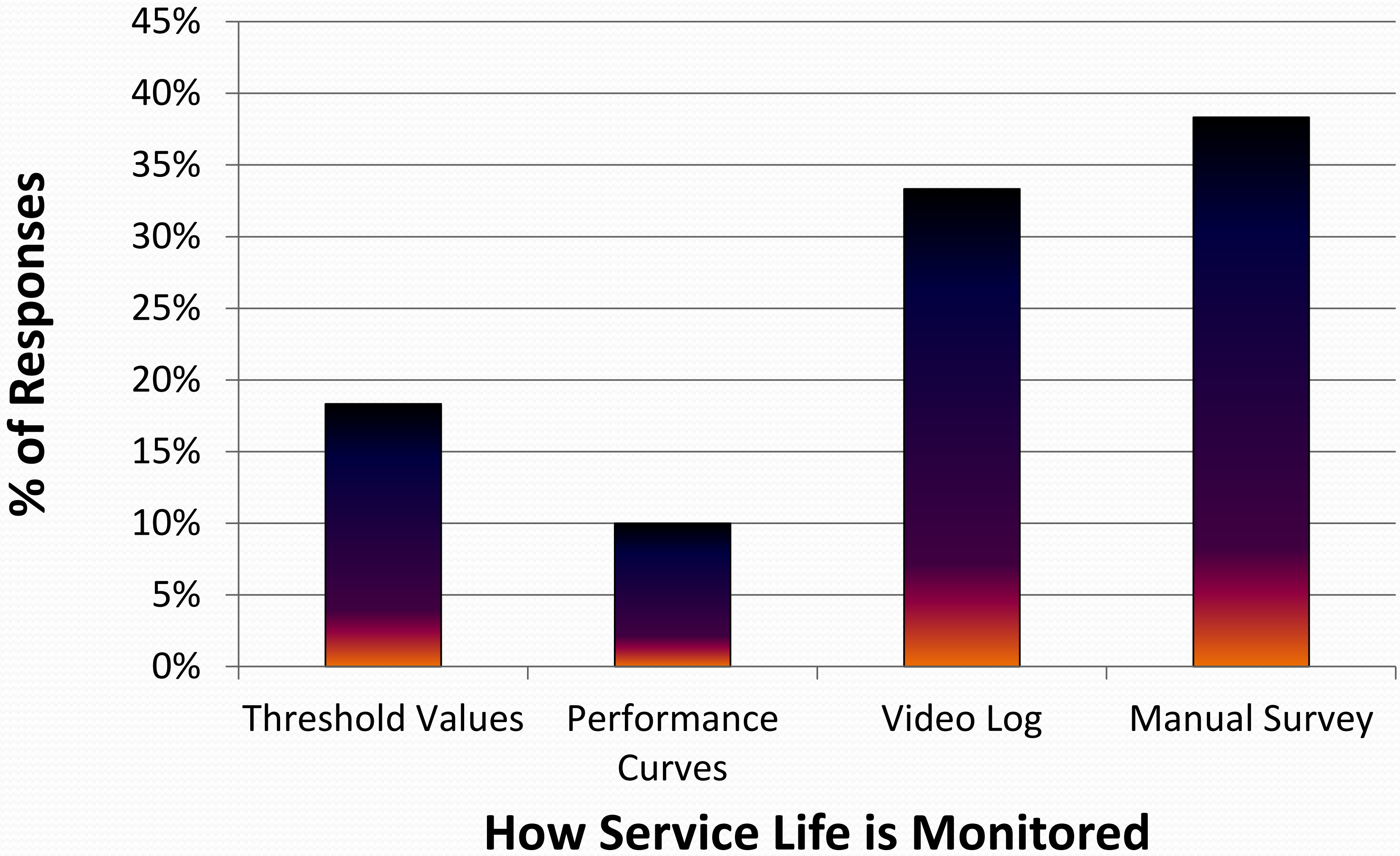
1% increase in moisture = 10-12% increase in drying cost while reducing production about 11%.

Design and Construction

Design and Construction

As a general rule, only 40-60% improvement in ride quality can be expected with a single layer of asphalt mix.

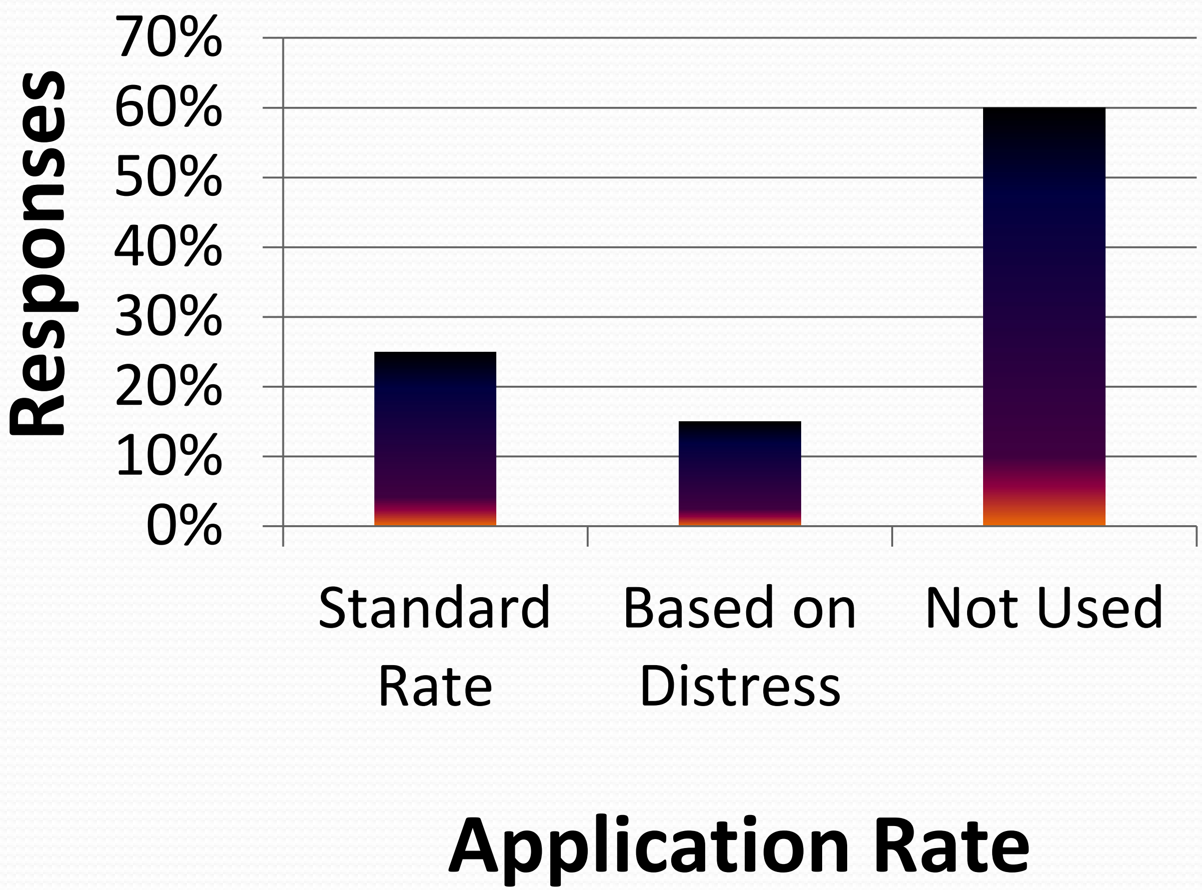
Performance, Maintenance, Rehab



Performance Measures (Purdue Study)

Performance Indicator	Roughness (IRI)	Condition (PCR)	Rut Depth
Threshold Used	110 in/mi (1.74 m/km)	85	0.25 in (6 mm)
Expected Life (Yrs.)	7 - 10	7 - 11	8 - 11

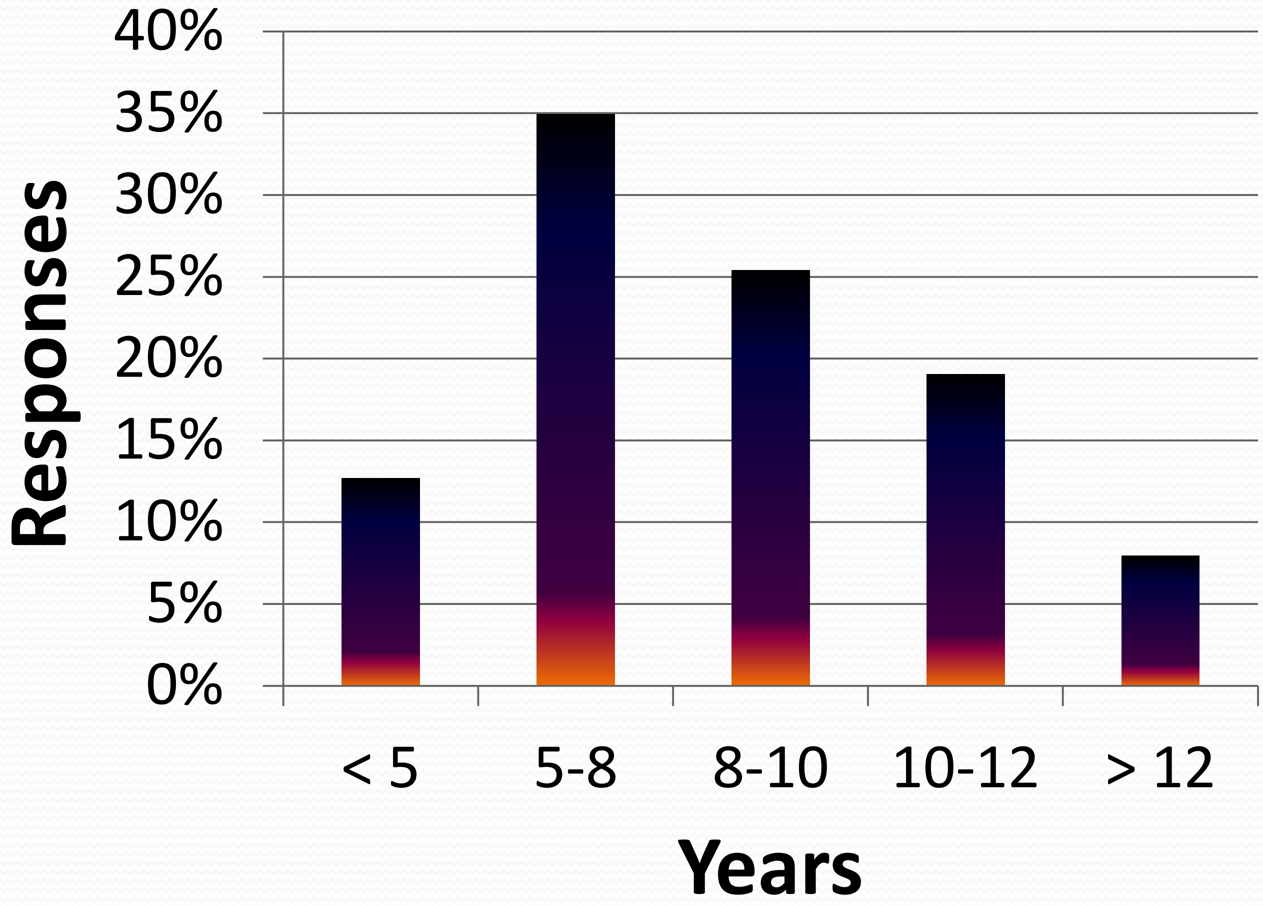
Maintenance
(Fog Seal/Rejuvenator Application)



Service Life

- LTPP Data (Liu, 2013)
  - 341 Thin Overlay Sections
  - 40 States, 8 Canadian Provinces
- Typical life expectancy – 7 to 9.5 years

Service Life



Explanations for Range in Service Life

Environmental Differences

Explanations for Range in Service Life

Construction Quality Standards - Interstate versus Secondary

Explanations for Range in Service Life

Variation in material quality

Explanations for Range in Service Life

Temporary Fix (They knew it wouldn't last under project conditions, but needed something to just get by temporarily)

Cost/Benefit of Preservation Treatments

- Wang, 2012 – 29 state agencies
  - Thin Overlays cost more initially
  - Extended pavement life the longest
- Oregon (Parker, 1993) – 87 sites within state
  - Thin overlays most cost-effective
  - Particularly more effective for heavy traffic

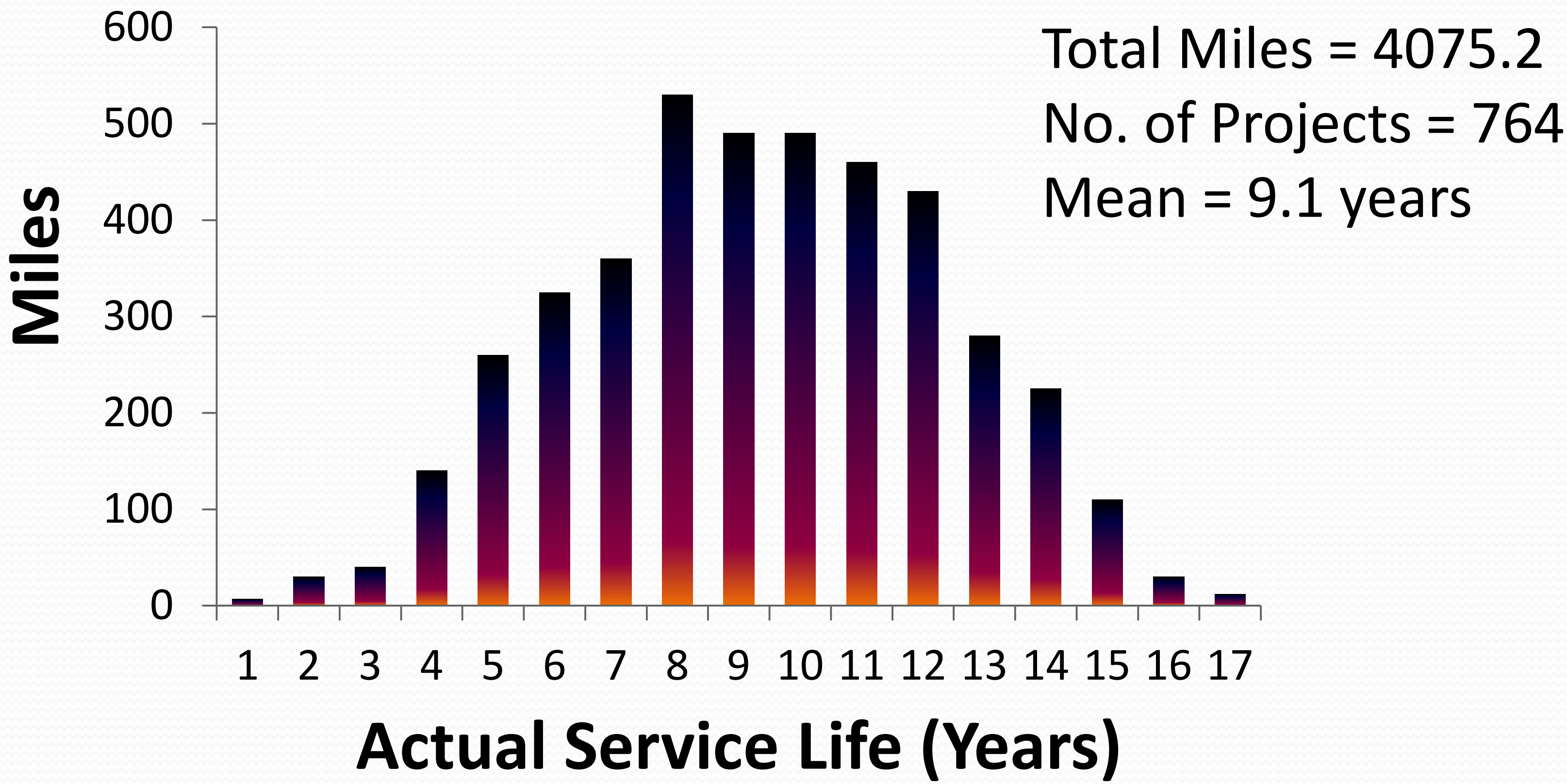
Case Studies - Tennessee

Bid Prices for Preservation Treatments

Year	Microsurfacing ($/sy)	4.75 mm NMAS ($/sy)
2013	2.02	2.24
2011	2.41	1.88
2009	2.15	2.09

Case Studies - Ohio

Mileage vs Service Life of Thin Overlays



Conclusions

- Thin overlays routinely used as maintenance/preservation tool
- Thin overlays are economical
- Thin overlays extend life of concrete pavements
  - Act as insulation to reduce curling of slabs
  - Provides smoother surface
- Success depends on existing distresses
- Service life generally in 7 – 11 year range
- Some test procedures not reliable for thin layers