

MnROAD/NCAT Partnership

Pavement Preservation Research Study



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MnDOT State Aid for Local Transportation

October 25, 2018



Outline

- **MnROAD**
- **NCAT**
- **Partnership**
- **Pavement Preservation Study**

MnROAD History

- **MnROAD Owned and Operated by Minnesota DOT**
- **Built in 1994**
- **Test Track Pavements**
 - High-volume: I-94 3.5 miles
 - Low-volume: Closed loop 2.5 miles
- **24-Years of Long Term Customer Service (since 1994)**
 - Minnesota Department of Transportation
 - Minnesota Local Road Research Board
 - SHRP II / NCHRP / FHWA
 - Pooled Funds Efforts (States)/Industry
- **HMA and PCC Pavements**



MnROAD Future

- **MnROAD – NCAT Partnership**
- **NRRA – National Road Research Alliance**
 - New (2016) pooled fund project.
- **Expansion from two to three lanes?**



MnROAD Layout



MnROAD Mainline – 3.5 Miles



MnROAD

East Transition I-94



West Transition I-94



MnROAD Low Volume Road – 2.5 Miles



MnROAD and Minnesota Test Sections

MnROAD Overall Studies

- 35 unique ongoing studies
- 141 unique test sections

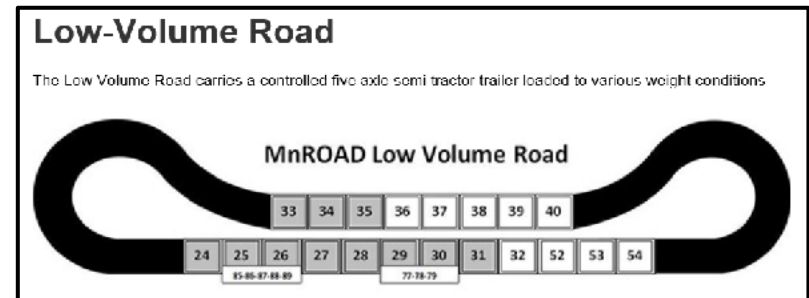


Interstate 94 Westbound

- **Mainline (3.5 miles)**
 - 12 ongoing studies/44 test sections
- **Old Westbound (3.5 miles)**
 - 4 ongoing studies/48 test sections

Low Volume Road (2.5 mi.)

- Local Road Research Board
- (MN - City and Counties)
- 19 Studies / 49 test sections



Additional Offsite Test Sections

- Partnership - National Center Asphalt Technology (NCAT)
- 50 Test Sections south of Milaca – US-169 and Mille Lacs Co. CSAH-8

MnROAD Traffic Loading



Interstate Mainline

I-94 WB Public Traffic
29,700 AADT -- 13% HCAADT
(2013)

Rigid ~ 1.2 Million ESALs/yr
Flexible ~ 0.8 Million ESALs/yr

Low Volume Road

5-axle Tractor-Trailer Truck
Inside Lane – 80K (5 days/week)
Outside Lane - Environmental

Rigid ~ 25,500 ESALs/yr
Flexible ~ 16,000 ESALs/yr



National Road Research Alliance

Phase III at MnROAD is
Pooled Fund Project

- Phase-I (2016-2019)
- 6 States
- ~50 Associates



National Road Research Alliance



Funded So Far:

- 8 Long Term Research Projects
- 8 Short Term State of Practice
- Implementation
- Technology Transfer
- 6-8 more projects in 2019

NCAT Test Track

- Established in 1986.
- 1.7 mile oval test track.
- Is a partnership between Auburn University and the National Asphalt Pavement Association (NAPA) Research and Education Foundation.
- Provide practical research and development.
- Ensure industry's ability to provide pavements that are durable, sustainable, quiet, safe and economical.

NCAT Test Track

- Full scale, off-line, high speed accelerated pavement testing track.
- There are 46 - 200 foot long test cells sponsored by highway agencies and transportation industry.
- 10 million ESAL's applied in two years.
- Three year testing cycles.



MnROAD

Safer, Smarter, Sustainable Pavements Through Innovative Research



at AUBURN UNIVERSITY

Partnership (2015)



MnROAD

Safer, Smarter, Sustainable Pavements Through Innovative Research

National Center for
Asphalt Technology
NCAT

at AUBURN UNIVERSITY

These are the nation's two largest full-scale pavement testing facilities.

Live traffic is used under actual climatic conditions to provide authentic environmental research of pavement materials.



Why Partner?

- Share resources and expertise.
- Improve coordination of experiments.
- Expand evaluation of pavement performance in both northern and southern climates.
- Provide cost-effective solutions for nationwide implementation.



Lets talk Climate!

Minnesota

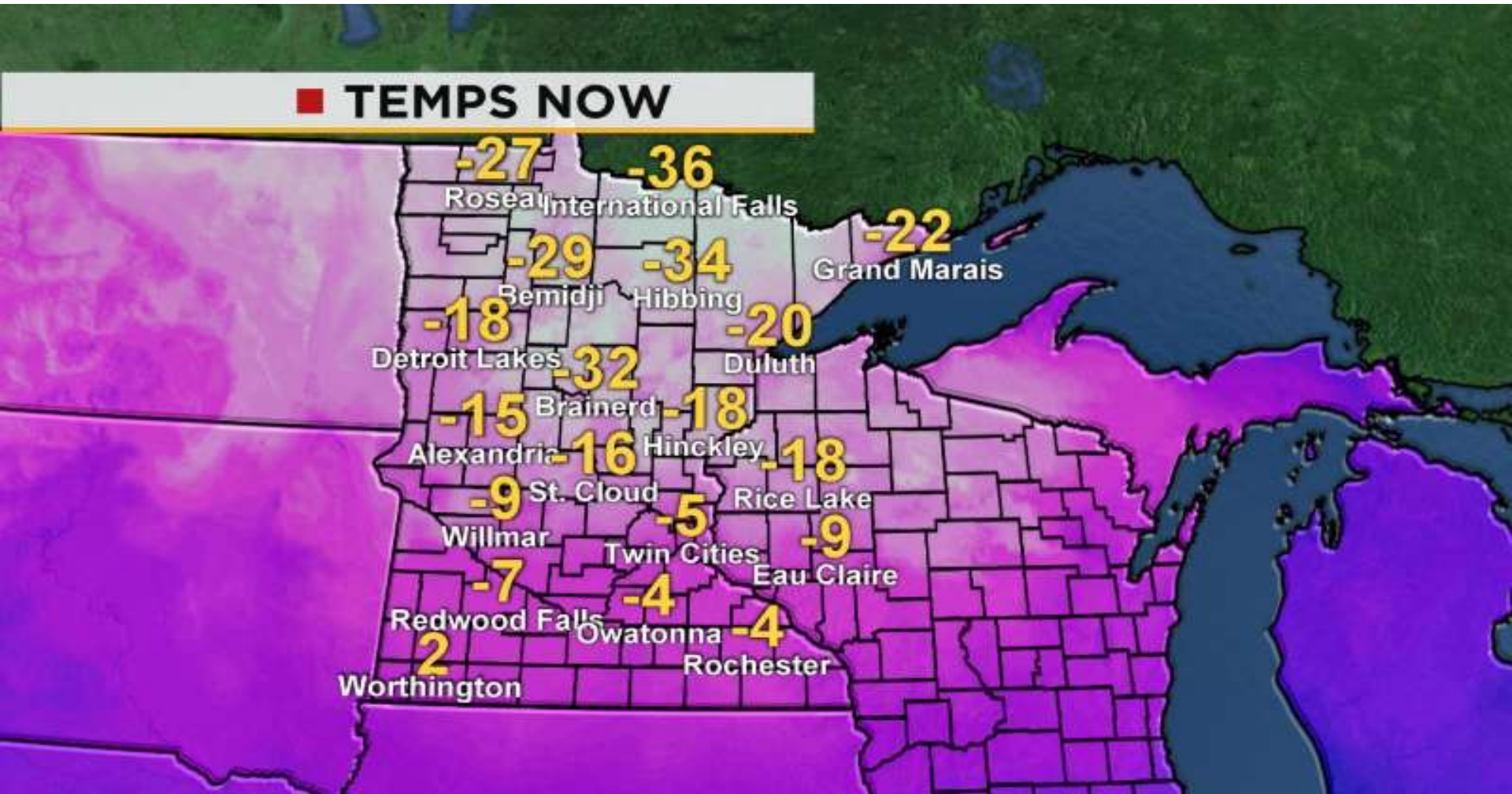
vs

Alabama



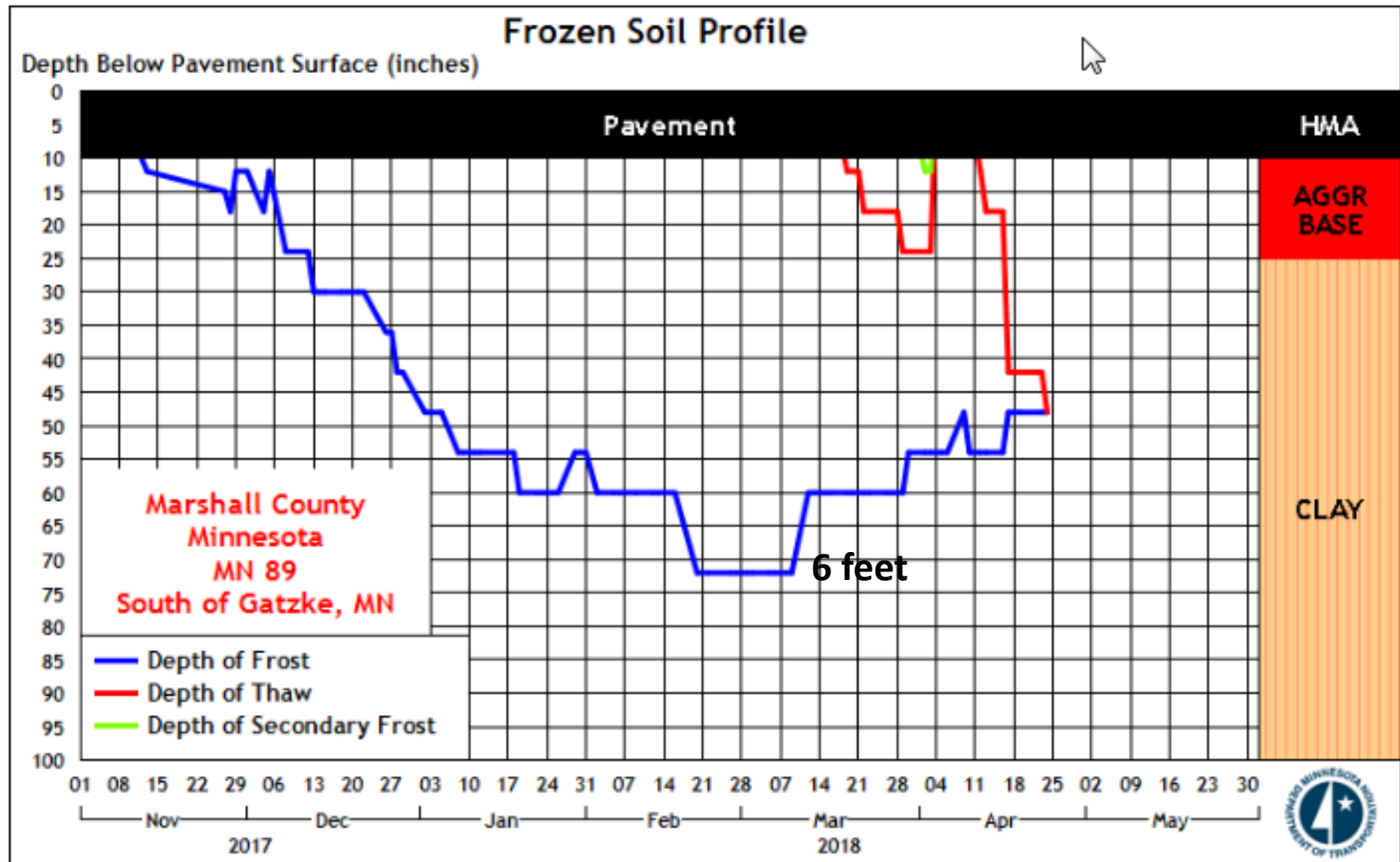
Minnesota gets cold!

Jan. 4, 2018 -44F in Embarrass, MN

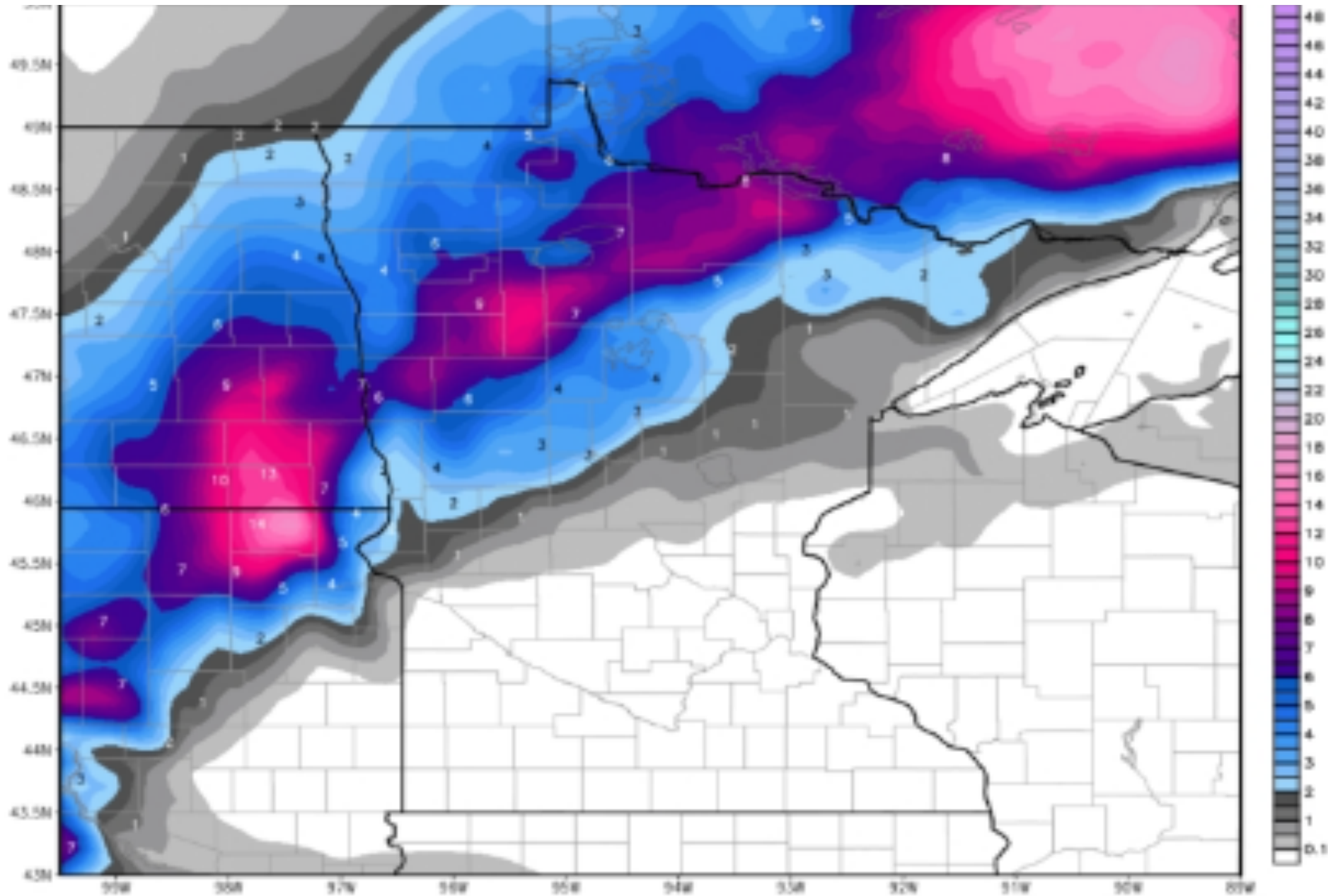


Marshall County Frozen Soil Profile

(operating sensors to a maximum depth of 96 inches)



Snowfall - October 11, 2018



Early Winter Fog Machine



Alabama gets hot!

Heat Advisory

Through 9 PM

Weather Forecast Office
Birmingham, AL
Issued Jul 22, 2017 3:44 AM CDT



Hazards

Heat
Advisory

Maximum heat indices
in the 103-106°F range
in the advised area.

Safety Tips:

- Drink plenty of water
- Wear loose-fitting clothing
- Take frequent breaks in the shade
- Limit time outdoors



Dew Points

- 70-74F Very Humid, quite uncomfortable
- 75-80F Extremely uncomfortable, fairly oppressive
- Over 80F Severely high, deadly for asthma

Summer 2015

- Alabama from June 15 – Sept 11 ~ 70+ dew points.
- Minnesota 12 days total over 70+ dew points
 - Jan 2015 9 days below 0, Feb 12 days below 0

MnROAD

Safer, Smarter, Sustainable Pavements Through Innovative Research



at AUBURN UNIVERSITY

Partnership Focus



Safer, Smarter, Sustainable Pavements Through Innovative Research



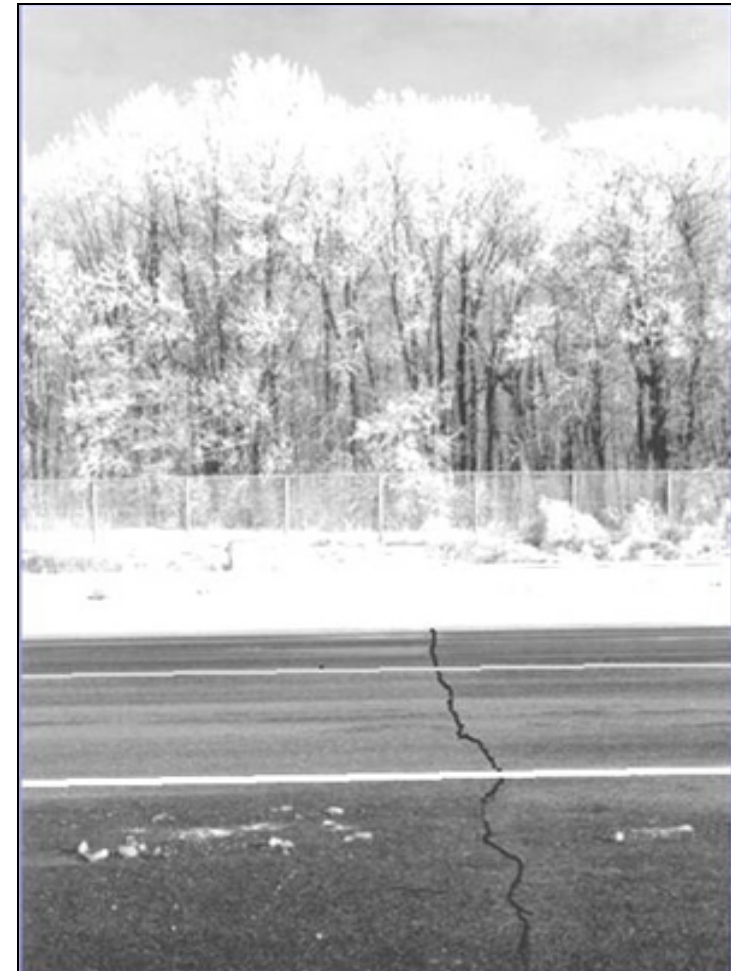
at AUBURN UNIVERSITY

Partnership was created to advance national pavement engineering on two national issues that impact every agency:

- **Asphalt pavement preservation.**
- **Asphalt pavement cracking.**

Pavement Cracking

Development and implementation of performance tests to predict cracking for common asphalt pavement distress.

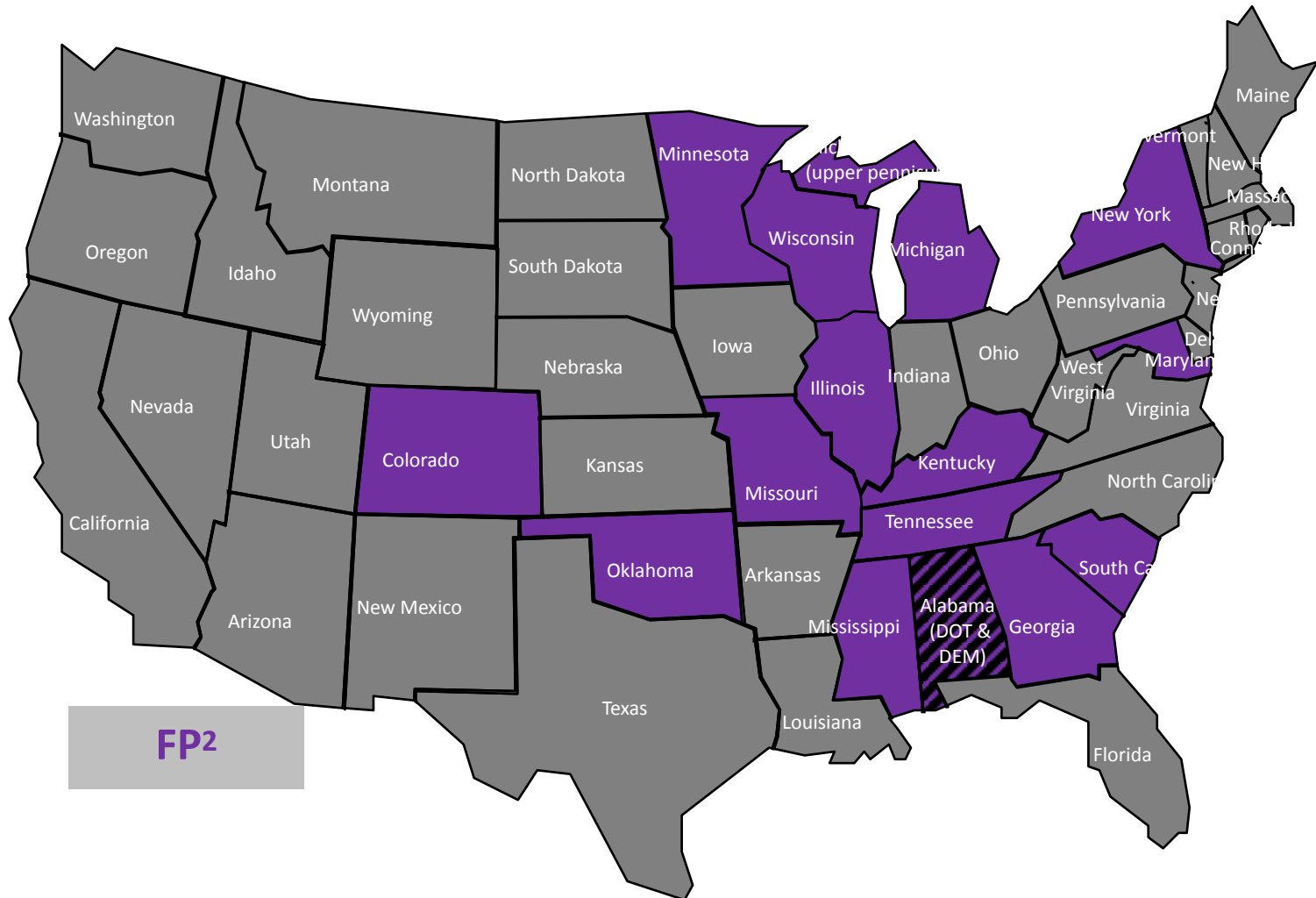


Pavement Preservation

Determine life extending benefit curves of a number of different asphalt pavement preservation techniques.

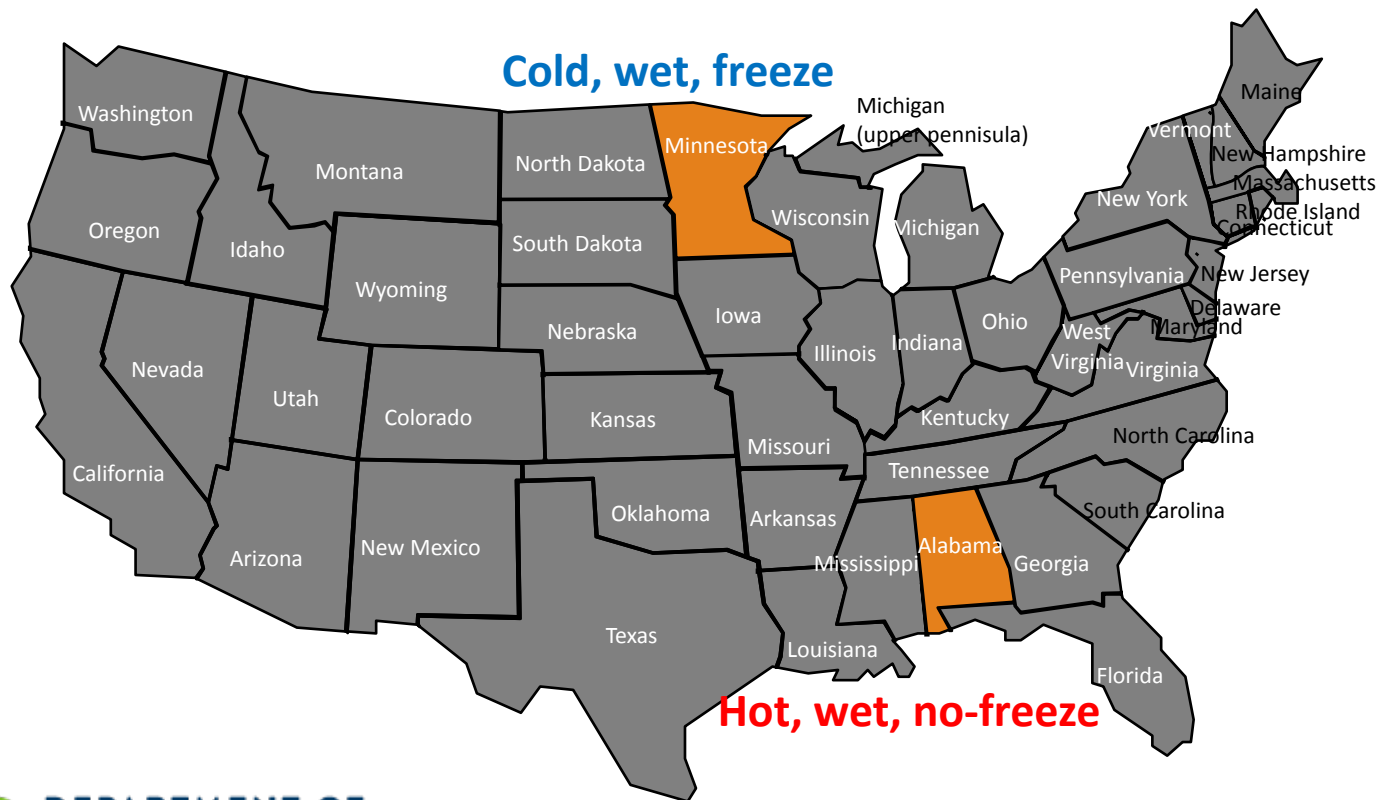


2015-2018 Pavement Preservation Research Sponsors



Preservation Group Study Goals

Develop independent life-extending benefit curves for a range of pavement preservation treatments under varying traffic levels and climates





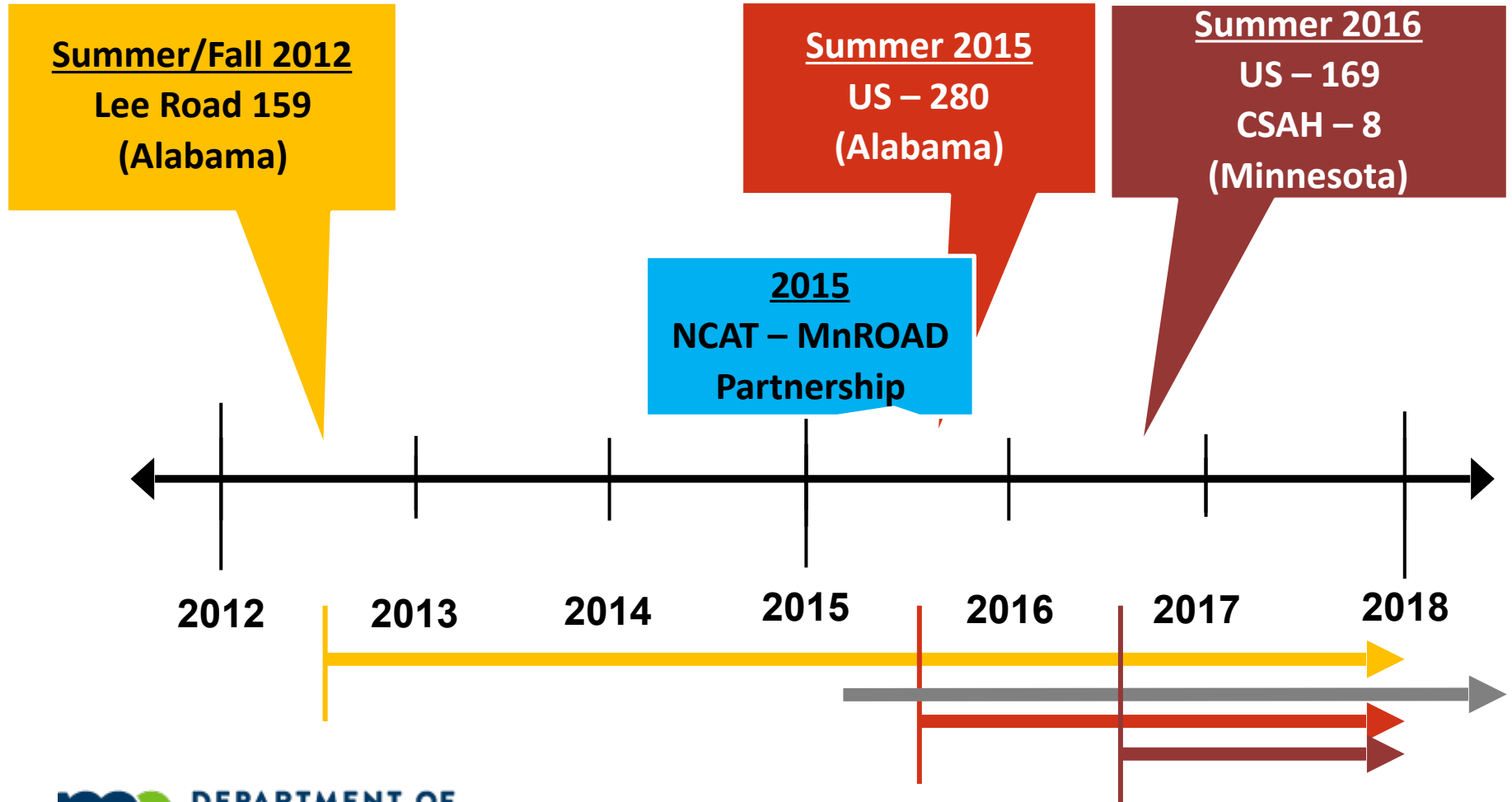
Partnership

- Build Off of Lee Road 159 Experience
- MnROAD (North) / NCAT (South)
 - **Offsite** Low and High Volume Road Installations
- FP² / National Center for Pavement Preservation
- Government / Academia / Industry involvement

Goals

- National Study (Climatic zones)
- Construction Consistency
- Provide consistently collected data / analysis
- Quantify the life extending benefits

MnROAD / NCAT Partnership History



Test Sections all Roadways

- **Control Sections**
- **Surface Treatments**
 - Crack Sealing
 - Fog Seal
 - Chip Seals
 - Scrub Seals
 - Micro surfacing
 - Treatment Combinations
- **Thin Overlays (3/4")**
 - Dense Graded (4.75 mm)
 - OGFC (Alabama and MnROAD)
 - UTBWC
 - Treatment Combinations

Built on US-280

Cold Recycling + Thin Overlay

Cold-In-Place (CIR)

Cold Central Plant Recycle (CCPR)

Roadway Details

Roadway	LR-159	US-280	CSAH-8	US-169
Traffic volume	Low	High	Low	High
Thickness (inch)	5.5	9.9	7.0	6.5
Section length (feet)	100	528	528	528
# Test Sections	23	34	22	21
Age (Years) @placement	14	9	11	6



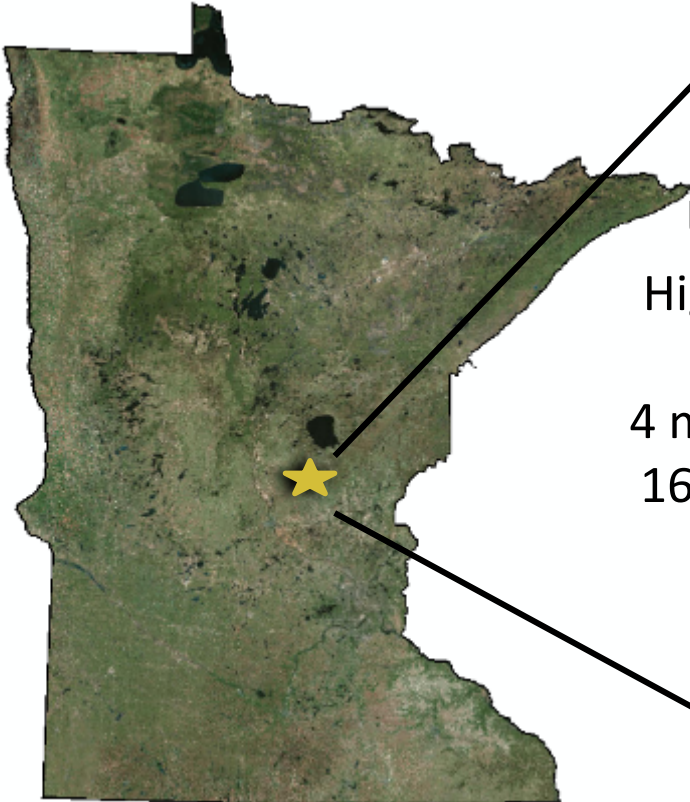
Northern Pavement Preservation

Minnesota US Hwy 169

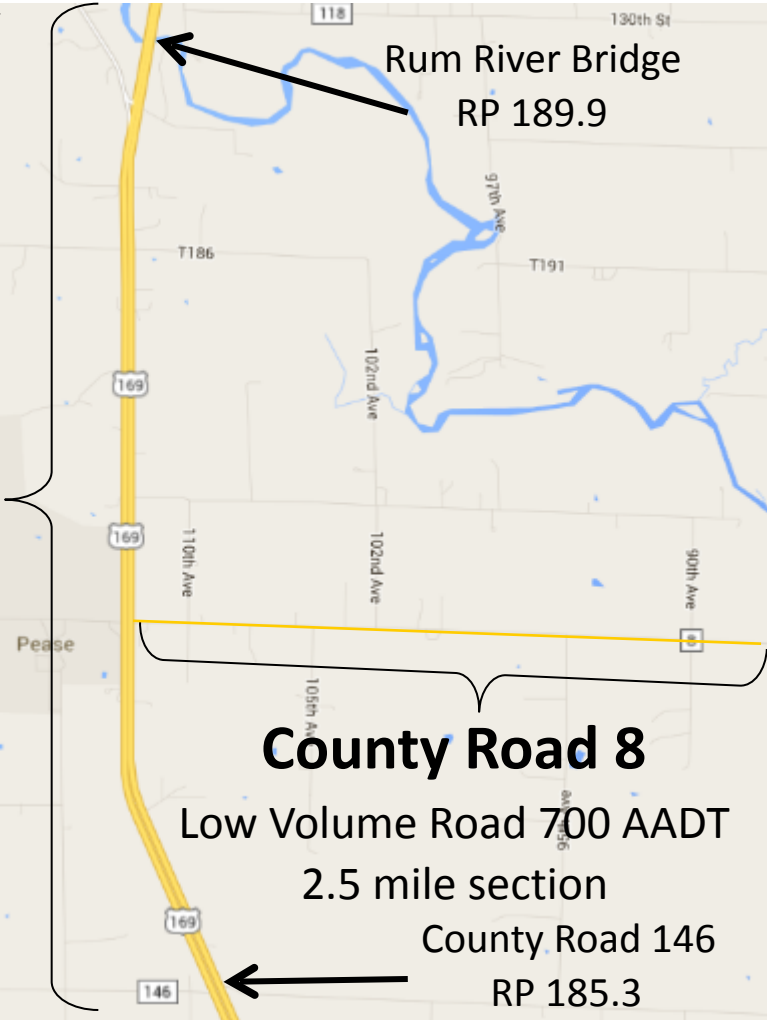
Mille Lacs County CSAH 8

Northern Pavement Preservation

Mille Lac County



US-169
High Volume
Road
4 mile section
16,000 AADT



County Road 8
Low Volume Road 700 AADT
2.5 mile section
County Road 146
RP 185.3

National Pavement Preservation Study (Northern Test Sections)

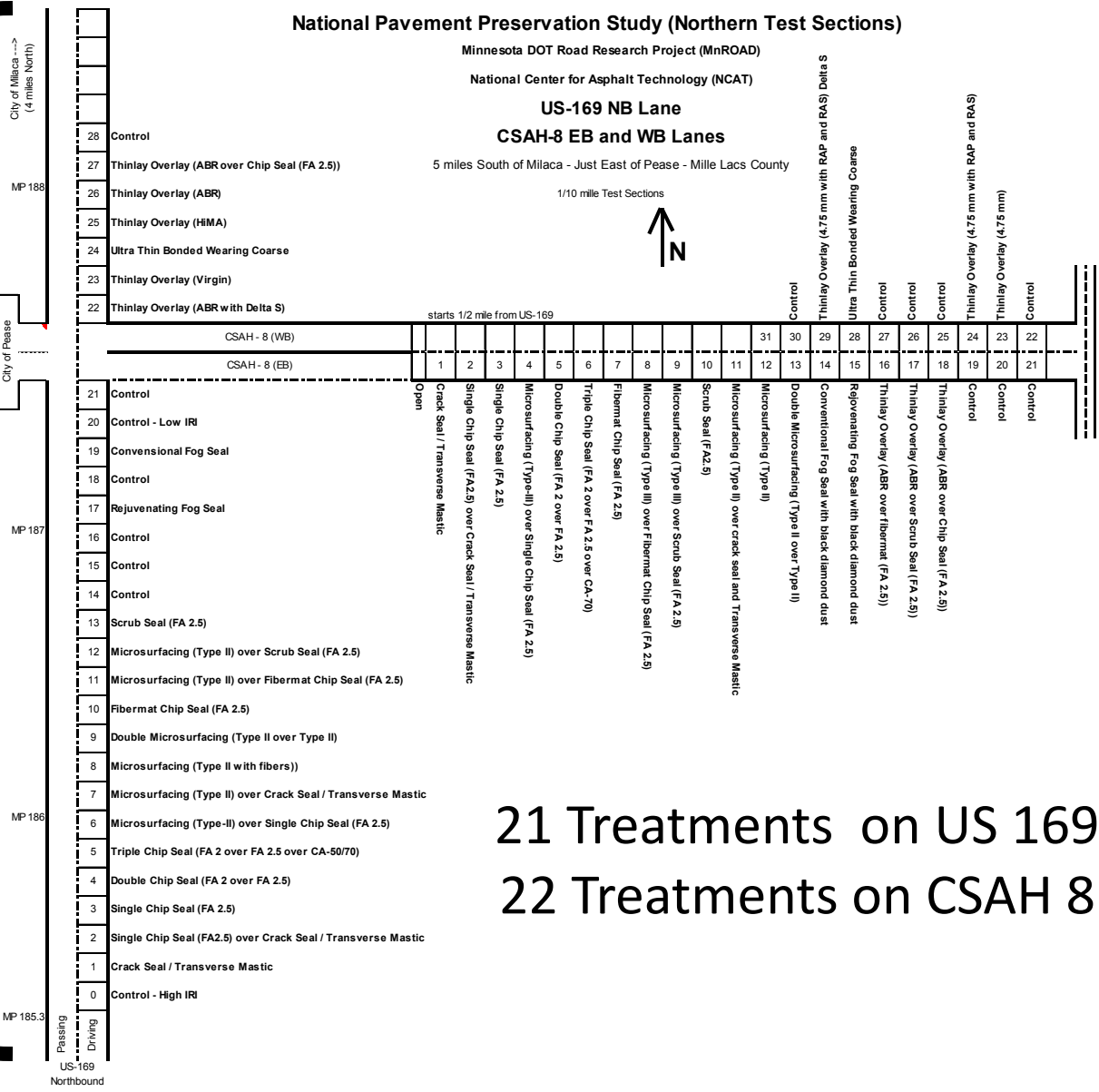
Minnesota DOT Road Research Project (MnROAD)

National Center for Asphalt Technology (NCAT)

US-169 NB Lane CSAH-8 EB and WB Lanes

5 miles South of Milaca - Just East of Pease - Mille Lacs County

1/10 mile Test Sections



**Northern
High Traffic
Preservation
on US-169
16,000 AADT**

**Northern
Low Traffic
Preservation
CSAH-8
700 AADT**

**21 Treatments on US 169
22 Treatments on CSAH 8**

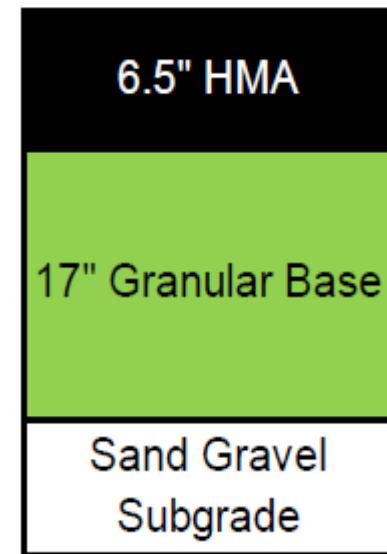
Pretreatment Condition

US-169

Northbound Lane



Layers



2009 – 2" mill & 4" overlay

US-169 High Traffic Preservation



Pretreatment Condition

CSAH-8

East and Westbound Lanes

Constructed 2005



Layers

7" HMA

6" Granular
Base

Sand and
Gravel
Subgrade

CSAH 8 Low Traffic Preservation



Minnesota Treatments

Treatment Category	Treatment / Treatment Combination(s)
Single Treatments	Fog Seal
	Rejuvenating Fog Seal
	Crack Sealing
	Chip Seal
	Scrub Seal
	Fibermat Chip Seal
	Micro Surface
	Micro with Fibers III
	HiMA Micro Surface III

Minnesota Treatments

Treatment Category	Treatment / Treatment Combination(s)
Combination of Surface Treatments	Chip Seal with Crack Sealing
	Micro Surface with Crack Sealing
	Cape Seal (Micro Surface on chip seal)
	Scrub Cape Seal (Micro Surface on Scrub Seal) III
	FiberMat Cape Seal (Micro Surface III on Fibermat Chip Seal)
	Double Micro Surface
	Double Chip Seal
	Triple Chip Seal

Minnesota Treatments

Treatment Category	Treatment / Treatment Combination(s)
HMA Thin Overlays	Virgin Thinlay
	ABR Thinlay
	OGFC
	Ultra Thin Bonded Surface
	HiMA Thinlay

Minnesota Treatments

Treatment Category	Treatment / Treatment Combination(s)
Combination with HMA Thin Overlays	Micro Surface on Thinlay
	Thinlay Scrub Cape (HMA on Scrub Seal)
	Thinlay FiberMat Cape (HMA on FiberMat Chip Seal)
	Thinlay Cape (HMA on Chip Seal)

Northern Pavement Preservation

- Emulsion treatments placed week of 8/1
- Vance Brothers (Alabama) contractor
- Quality of treatments was very good
- Focus on QC/QA testing for micro surface
- Thinlay treatments placed week of 8/15
- EAP contractor used for asphalt placement



Safer, Smarter, Sustainable Pavements Through Innovative Research



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Southern Pavement Preservation

Alabama US Hwy 280

Lee County Road 59

US-280 High Traffic Preservation



Southern Pavement Preservation

Alabama US Hwy 280

In 2015

34 – 500' Test Sections Placed

on a 10" HMA Pavement

Constructed in 2006

Lee Road 159 Low Traffic Preservation



556,437 ESALs, 198 ESALs

Southern Pavement Preservation

Lee County Road 159

In 2012

23 – 100' Test Sections Placed
on a 5½" HMA Pavement

Lee Road 159

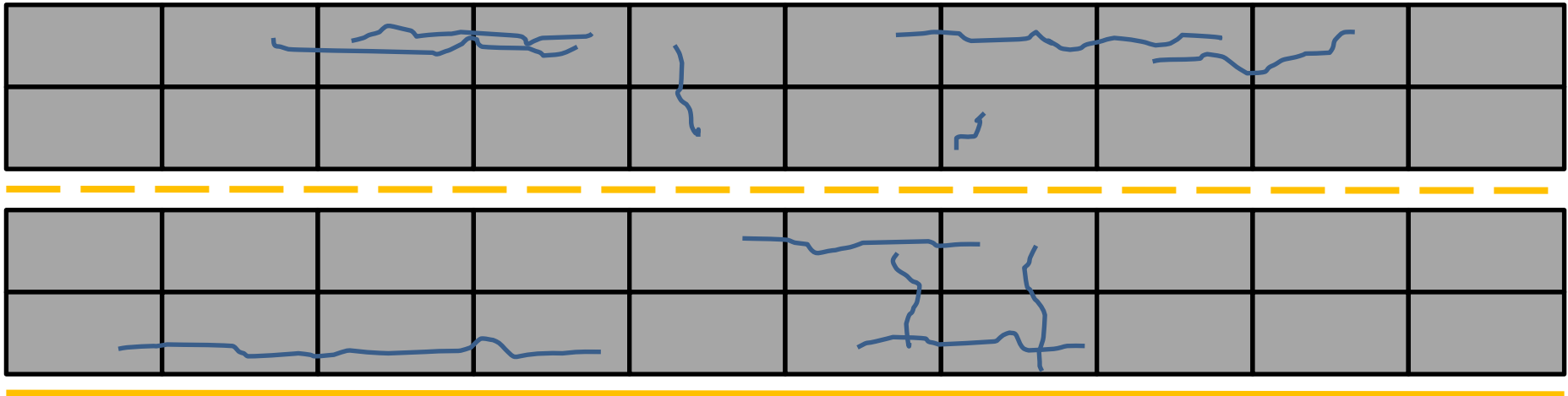
Pavement Preservation Sections

1. Rejuvenating Fog Seal
2. Fibermat Chip Seal
3. Control
4. Control
5. Crack Seal (CS)
6. Single Layer Chip Seal
7. CS + Single Layer Chip Seal
8. Triple Layer Chip Seal
9. Double Layer Chip Seal
10. Single Chip + Microsurfacing (Cape)
11. Microsurfacing
12. CS + Microsurfacing
13. Double Layer Microsurfacing
14. Fibermat Chip + Microsurfacing (Cape)
15. Scrub Seal + Microsurfacing (Cape)
16. Scrub Seal
17. Distress Demo Section
18. Fibermat Chip + HMA thinlay (HMA Cape)
19. HMA Thinlay (PG 67-22)
20. HMA + 100% Foamed Recycle Inlay
21. HMA Thinlay (PG 76-22)
22. Ultra Thin Bonded Wearing Course
23. HMA Thinlay (50% RAP)
24. HMA Thinlay (5% PCRAS)
25. HMA Thinlay (High Polymer)

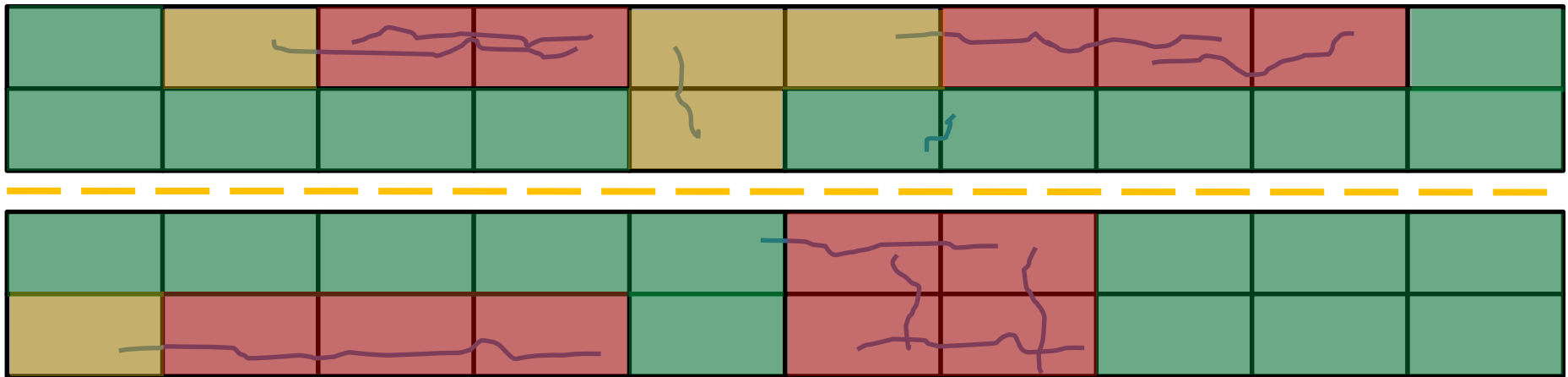
Test Section Layout - Assessment



Test Sub-Section Analysis



Test Sub-Section Analysis



Good: < 5%

Fair: 5 - 20%

Poor: > 20%

Utilizing FHWA Performance Measures

Pavement Preservation Study

Minnesota

- Just two years into pavement preservation study.

Alabama

- Just three years since construction of treatments on US 280.
- Six years of data on Lee Road 159 and starting to develop deterioration curves.

For More Information:

MnROAD

www.dot.state.mn.us/mnroad/ncatpartnership/pavementpreservation

NCAT

<http://eng.auburn.edu/research/centers/ncat/testtrack/preservation>

THANK YOU!

