



Coordinating Minnesota's Transportation Assets and Climate Change and Extreme Weather Vulnerability

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Your Destination...Our Priority





What is a Transportation Asset Management Plan?

The TAMP serves as a way to formalize and document the following types of key information into a single document:

- A summary listing of the transportation assets in the State, including a description of the condition of those assets.
- Initial requirements include pavements and bridges on the NHS system.
- Asset management objectives and measures.
- A summary of the gap between targeted and actual performance.
- Strategies for cost-effectively managing the assets, including lifecycle cost and risk management analysis.
- A financial plan for addressing the performance gap.
- Investment strategies that describe planned improvements and planned performance resulting from the implementation.



Performance-based Planning and Programming

Policy Plan

Investment Plans

Performance Monitoring

Policy 1: Traveler Safety
Reduce the number of fatalities and serious injuries for all travel modes

1.1 Fatalities on All Roads
Measure: Annual vehicle-related fatalities on all state and local roads.
Target: Reduce fatalities to fewer than 500 in 2008 and fewer than 400 by 2010.

Relevance/Purpose: In 2001, MnDOT partnered with local road authorities, law enforcement, community leaders, and public health professionals in a shared initiative known as Toward Zero Deaths (TZD). Based on this initiative, MnDOT established the number of traffic-related fatalities as the key statewide safety performance measure. The mission of TZD is "To move Minnesota toward zero deaths on our roads, using Education, Enforcement, Engineering, and Emergency Services."

Source: Minnesota Department of Public Safety (DPS)

Reporting Office: MnDOT Office of Traffic Safety and Technology

Methodology: Accident reports are required for all crashes that occur or originate on a public traffic way and that involve injury or total property damage of greater than \$1,000. State and local law enforcement professionals file reports with the Department of Public Safety Office of Drive and Vehicle Services. The Minnesota Department of Public Safety, Office of Traffic Safety, compiles this data and publishes the annual summary report Minnesota Motor Vehicle Crash Facts.

Trends through 2008: The annual number of fatalities on Minnesota roadways trended upward between 1995 and 2003. However, since 2003 significant progress has been made in reducing total fatalities from a high of 657, down to 455 in 2008. The following figure shows the fatality trend and target for all state and local roadways in Minnesota.

STRATEGIC INVESTMENT PRIORITY	PLANNING PERIOD				2009 to 2028	
	2009 to 2018	2019 to 2028	2009 to 2028	Need (\$)	% of Total	
Traveler Safety	1,780	1,360	3,140	6%	5%	
Roadway Enhancements	790	800	1,590			
Capacity Improvements	990	560	1,550			
Infrastructure Preservation	7,080	9,240	16,320	23%	26%	
Chapter 152 Bridge Program	2,420	100	2,520			
Other Bridge	720	2,000	2,720			
Pavement	3,600	6,480	10,080			
Other Infrastructure	340	660	1,000			
Mobility	21,760	20,840	42,600	71%	69%	
Interregional Corridors	1,740	1,840	3,580			
Greater MN Trade Centers	130	120	250			
Twin Cities Metro Area	19,890	18,880	38,770			
Total Investment	\$30,620 M	\$31,440 M	\$62,060 M			

Annual Minnesota Transportation Performance Report 2009

Minnesota 2009 Transportation Results Scorecard

Legend: Green = On or above target, Yellow = Performance below target, Red = Seriously below target, Blue = Priority, Red = Results Trend

Measure	Score	Result	Target	Trend	Analysis
Traveler Safety	421	420	420	Stable	Minnesota Traffic Fatalities—All state and local roads
Infrastructure Preservation	37.4%	34%	34%	Down	Bridge Condition—One principal arterial, % Good and Satisfactory
Maintenance	68.3%	70%	70%	Down	Score and Use—Frequency of Adhering Best Lane Width

Overarching goals, policies, and performance measures that guide investment



Detailed analysis of investments, including expected performance impacts, legislative guidance, and stakeholder input



Regular review of performance in each policy area

MAP-21

Systems

Highway

- NHS
- Other

Transit

- Highway
- Rail

Airports

Ports/Waterways

Assets

- **Pavement**
- **Bridge**
- Drainage Structures
- Guardrails
- Traffic Signals
- Signs
- Pavement Markings
- ITS
- Overhead Signs
- Pedestrian Ramps
- Lighting
- Land
- Rest Areas
- Sidewalks
- Retaining Walls
- Tunnels
- Noise Barrier
- Fencing
- Weigh Stations
- ADA Infrastructure
- Modal Infrastructure
- Transit Vehicles

Plan Elements

Capital (Financial) Planning

Maintenance Planning

Risk Assessment

Life Cycle Cost Analysis





Minnesota's Transportation Asset Management Plan

- All State Highways
- Pavements
- Bridges
- Drainage
- Tower Lighting
- Overhead Sign Structures





TAMP Objectives

- 1. Inventory and conditions
- 2. Objectives and measures
- 3. Performance gap ID
- 4. Lifecycle cost considerations
- 5. Risk management analysis
- 6. Financial plan
- 7. Investment strategies
- 8. Asset management process enhancements





Desired Outcome

- “Planning for operations” -bridge the divide between capital investment decisions and operation and maintenance budgeting.
- Document established asset management practices in pavement and bridge
- Expand asset management principals and practices to other asset types.
- Make investment decisions more transparent





Climate Change and Extreme Weather Vulnerability Assessments

- **FHWA Pilot Project Criteria**
 - Exposure to Climate Effects
 - Sensitivity to Climate Effects
 - Adaptive Capacity





Recent Minnesota Extreme Weather Events

- Flooding
- Forest Fires
- Extended Winter Season

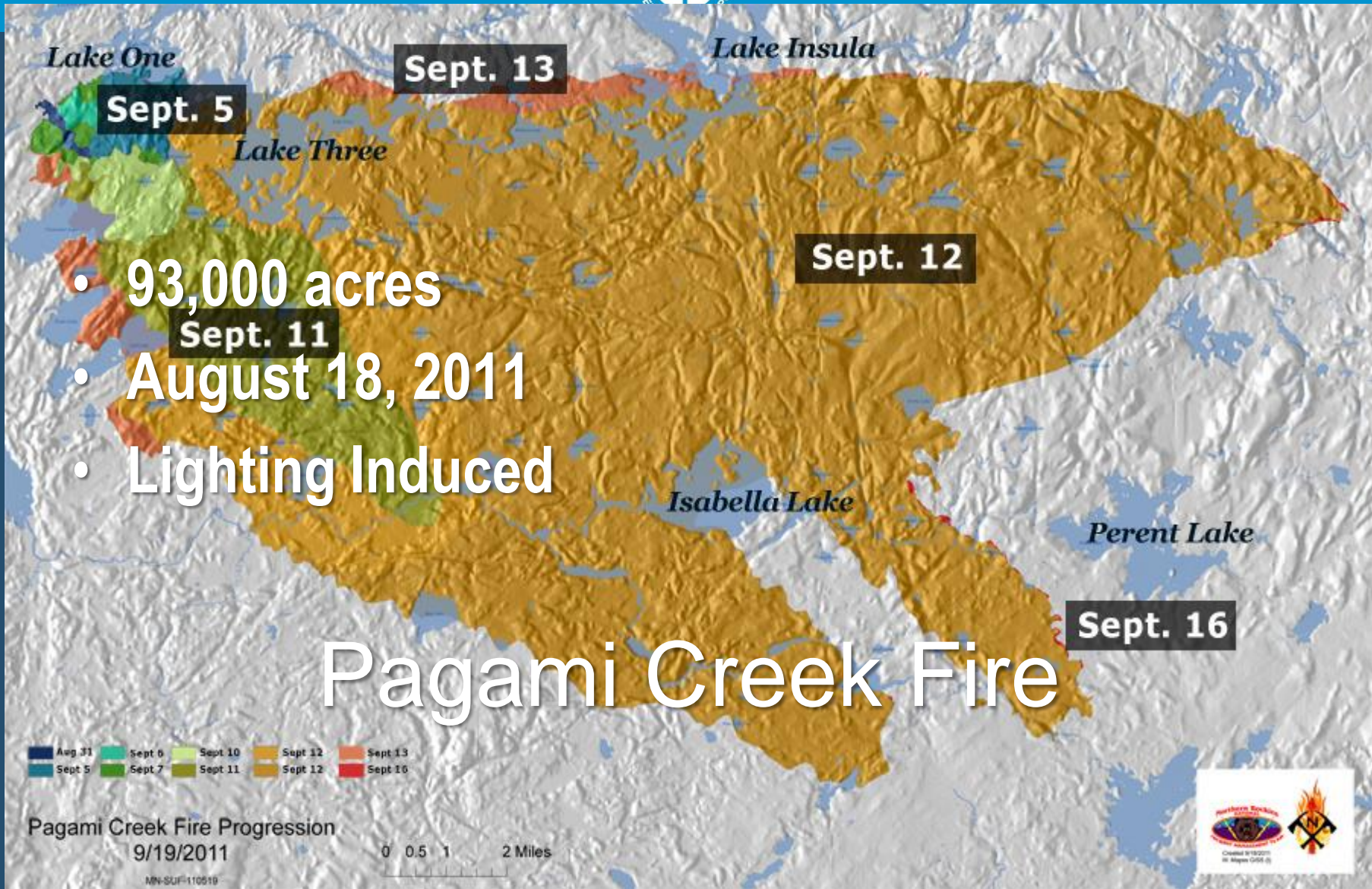




Trunk Highway 210 – Thomson

Duluth Flooding June 19, 2013





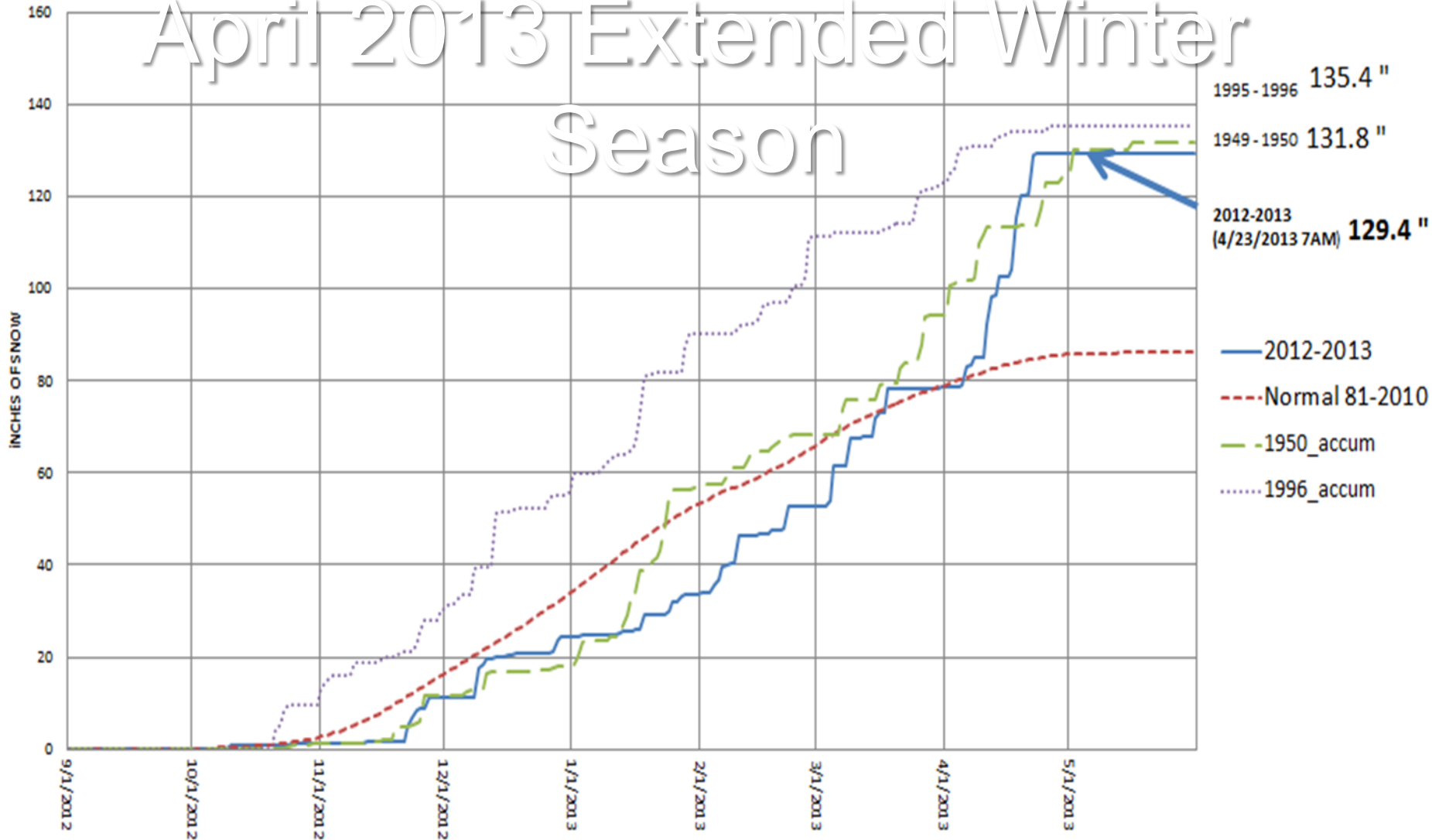
- 93,000 acres
- August 18, 2011
- Lightning Induced





DULUTH SNOW ACCUMULATION 2012-2013

April 2013 Extended Winter Season





Desired Outcomes

- Risk Assessment methodology that can be applied to future projects to assess vulnerability to extreme weather events.
- GIS-based maps that display vulnerable locations and system threats
- A benefit/cost analysis of adaptive and mitigation methods
- Analytical toolkit to supplement the TAMP





Risk Assessment Methodology

- **Determine vulnerability of infrastructure**
- **Measure degree of exposure, sensitivity, adaptive capacity and consequences of impacts**
- **Conduct in-depth analysis of mitigation strategies**
- **Use risk reduction analysis to maximize benefit of strategy implementation**





Methodology

- **Project Management team approach utilizing advisory group and consultants for support.**
- **Selection and Characterization of relevant assets**
- **Selection of key climate exposure variables**
- **Vulnerability and risk assessment**
- **Identify, analyze and prioritize adaption options.**
- **Integrate benefit/cost**





Potential Risk Reduction Strategy Example

- 2012 Flooding Near Duluth, Minnesota – 500 year event.
- Damage concentrated in areas with steep terrain, unstable soils, culverts that became blocked with debris.
- Examine Undermined Pavement



TH 2 and I-35 Proctor/Duluth





Identify Risk Event

- **Pavement undermining due to steep grades in combination with parallel flow in ditches and watercourses.**





Identify Probability of Event and Impact on MnDOT Vision

- Probability may be very low for 100 to 500 year event $< 5\%$.
- Impact would be great in that this type of event would result in a road closure that could last more than a week to several months and depend on the number of users and length of detour.





Identify risk response strategies and costs

- One strategy for this risk may be to partially pave the in-slope in areas where this flow may be concentrated near the pavement.
- Cost could be a pure calculation based on the GIS analysis of the system, length of roadway where the risk is present and unit cost of the repair.





Identify the effectiveness of the strategy

- Identify the residual risk
- Identify the return on risk
- Determine the cost/benefit





Outcome:

- Methodology of determine which risk mitigation and adaptation strategies are most cost effective.





Conclusions

- **Public Agencies should address the potential impacts of extreme weather events.**
- **In transportation, these events can interrupt service and have significant recovery costs.**
- **The extreme weather vulnerability assessments will help MnDOT identify the most beneficial mitigation strategies to pursue in addressing these events.**

