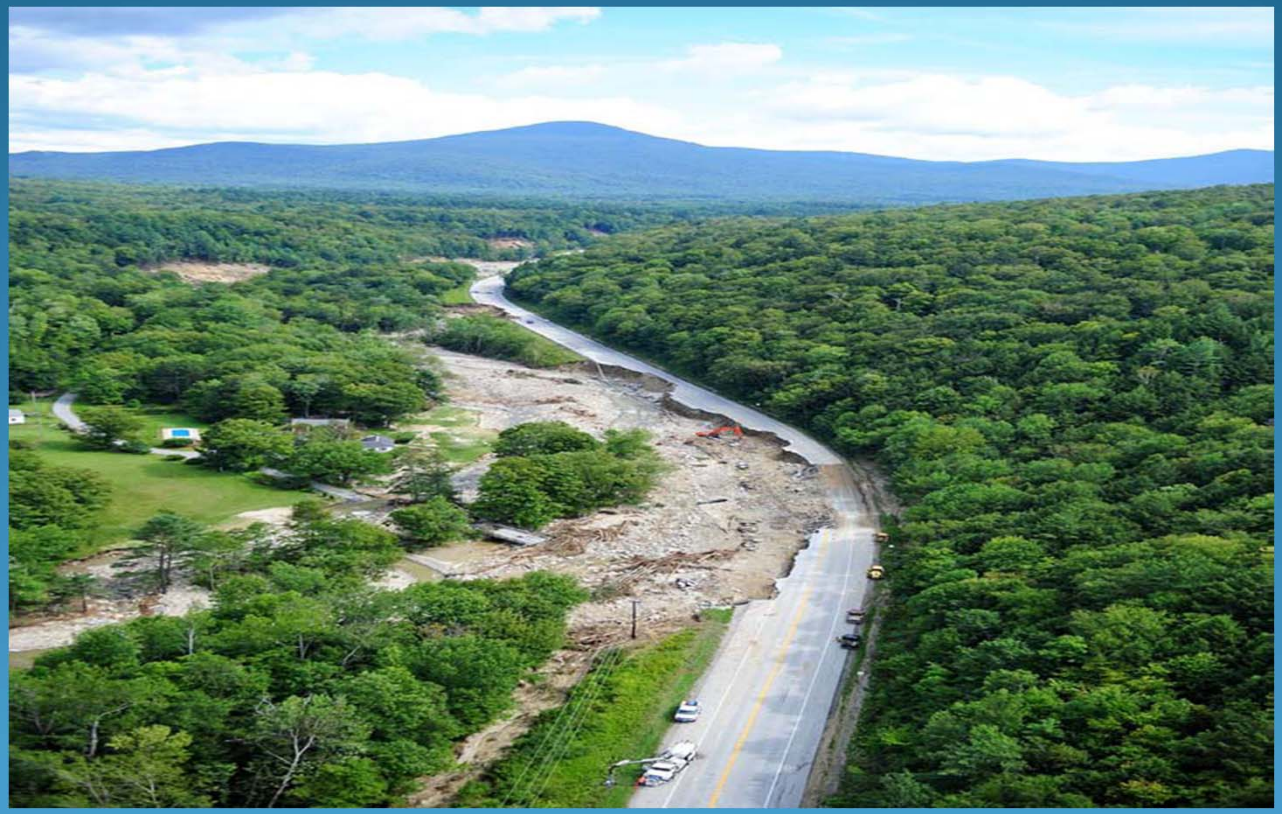
Climate Change Scenario Workshop



Gina Campoli
Vermont Agency of Transportation
November 13, 2012

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U.S. Department of Transportation
Federal Highway Administration

Office of Planning, Environment, & Realty (HEP)

http://www.fhwa.dot.gov/environment/climate_change/

Ongoing and Current Research

- **Vulnerability Assessment Pilots** - This project funded pilots for DOTs and MPOs to implement a framework to use in conducting vulnerability and risk assessments of infrastructure to the projected impacts of global climate change (GCC). FHWA is currently updating the vulnerability assessment framework based on the pilot results and other studies.
- **Gulf Coast Study** - This research comprises a comprehensive, multi-phase study of climate change impacts in the Central Gulf Coast region. Phase 1 (completed in 2008) examined the impacts of climate change on transportation infrastructure at a regional scale, while Phase 2 (ongoing, with expected completion in 2013) is focusing on a smaller region, enhancing regional decision makers ability to understand potential impacts on specific critical components of infrastructure and to evaluate adaptation options.

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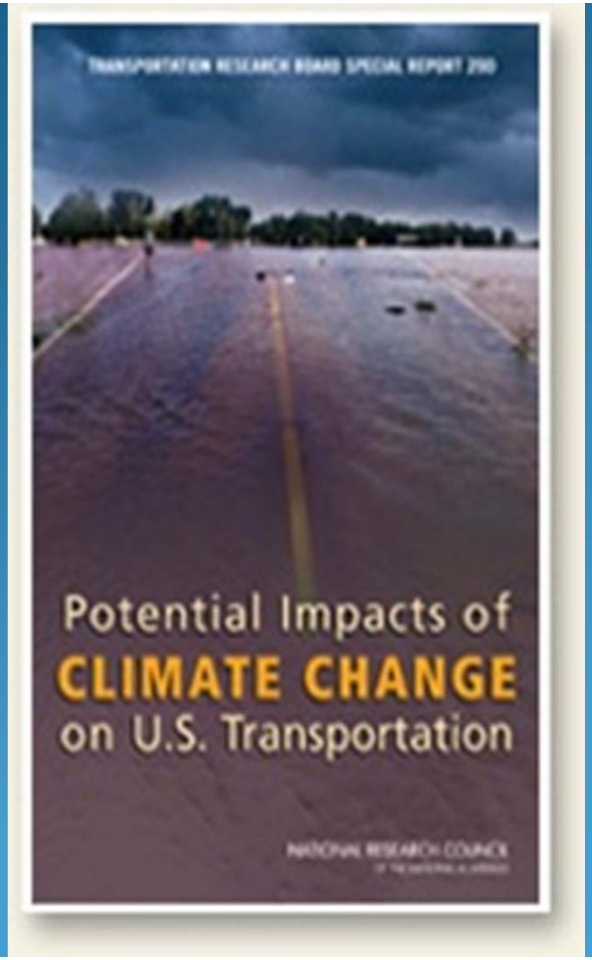

Potential Impact of Climate Change on U.S. Transportation
(TRB Special Report 290)

Transportation Research Board
Division on Earth & Life Studies
National Research Council

http://onlinepubs.trb.org/onlinepubs/sr/sr290.pdf

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Adapting Infrastructure to Extreme Weather Events: Best Practices and Key Challenges Background Paper(AASHTO).

Climate/Weather Change		Impact to Infrastructure	Impact to Operations & Maintenance
Temperature	Increased extreme maximum temperature	- Premature deterioration of infrastructure; - Damage to paved roads from rutting, buckling, and raveling; - Bridges stressed by thermal expansion and movement;	- Safety concerns for highway workers limiting activities and work time; - Increased costs of bridge inspection and repair; - Need for more stringent weight restrictions;
	Greater variability and range of maximum and minimum temperatures,	- Increased frequency of freeze-thaw events leading to potholes and heaves; - The increase in freeze thaw cycles will damage bridge expansion joints.	- Longer road-construction season; - Increased load restrictions due to an increase in the duration of the thaw aka 'mud-season' - Increased use of roadsalt due to water freezing on the road.

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Climate/Weather Change		Impact to Infrastructure	Impact to Operations & Maintenance
Precipitation	Increased intense precipitation and storm events	- Greatly increased risk of fluvial erosion embankment deterioration; - Increased rate of bridge scour or aggregation; - Greater likelihood of exceeding culvert capacity; - Signs and bridges stressed by increased wind;	- Greater road closures due to washout and flooding; - Construction sites may face severe erosion prompting delays; - Increased weather related accidents; - Increased lane obstructions due to drifting of snow, flood, or tree/cable downfall; - Electrical disturbances could lead to loss of signaling, delay maintenance activity, and pose risk to personnel - Increased need for debris removal from bridge openings.

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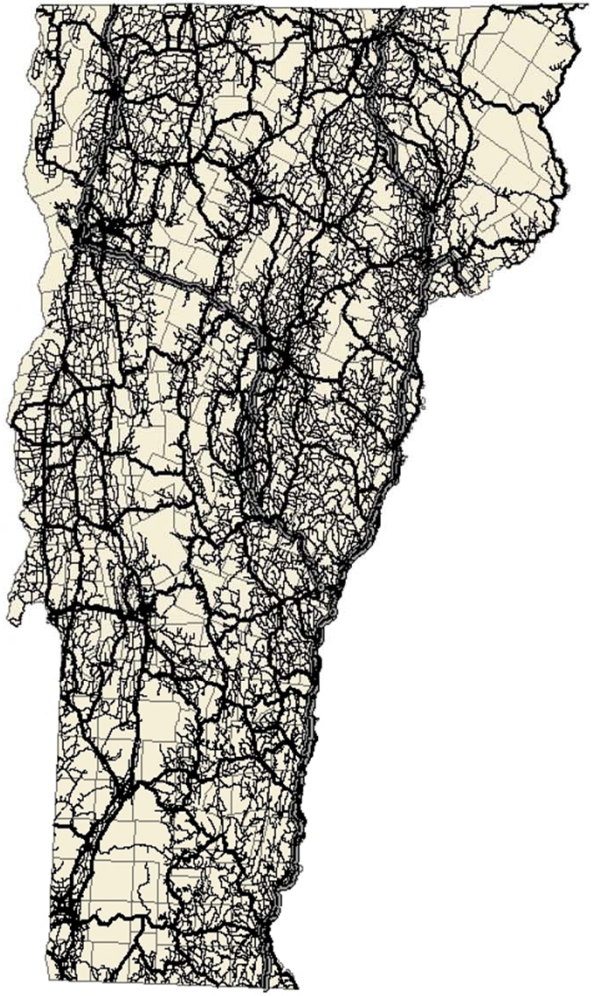

The Vermont roadway system includes 2,702 miles of state roads and 13,102 miles of town roads - in total the distance equal to going 5 times across the US.

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- Approx. 85,000 bridges and culverts are on the state system with 90% of the culverts less than 6 ft.

- Best guess assuming the same number of structures per mile as state system – 400,000 on the municipal system

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305.5 miles of State-owned and
295.32 miles of privately-owned
railroad lines

Over 60 miles of state and
municipal bike paths

Growing transit service through
out the state

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1. Response –emergency preparedness
2. Recovery – put back in order after the event
3. Resilience – build and act in such a way as to mitigate the problem in the future - No disruptions to transportation needs .

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Transportation Flood Resilience Focus Areas:

- Bridge and culvert sizing – statewide standards
- Aquatic organism passage and wildlife movement
- Work in rivers – when and how, emergency and non-emergency
- Improvements and repairs to existing infrastructure in flood plains
- Stormwater practices - operational BMPs, LID, improving dirt road maintenance
- Future growth and planning

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Mechanisms for change within VTrans to address flood resilience:

- Improve practices, procedures, manuals, and funding priorities to reflect new priorities
- Train staff and managers at all levels how to do their jobs differently
- Share new knowledge and priorities with partners – RPCs , municipalities and the public
- Constant coordination and integration with sister agencies
- Ongoing data collection and research to inform change

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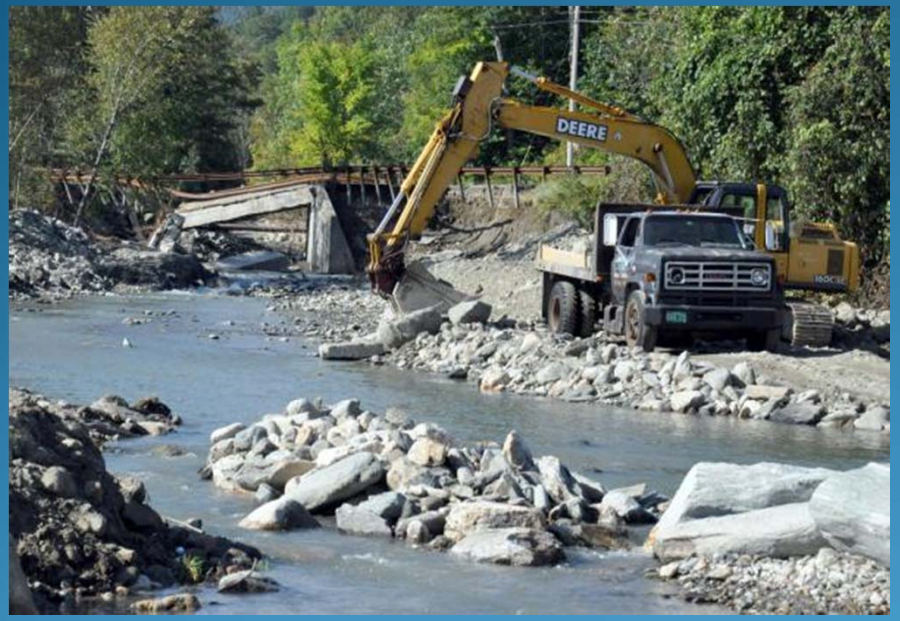
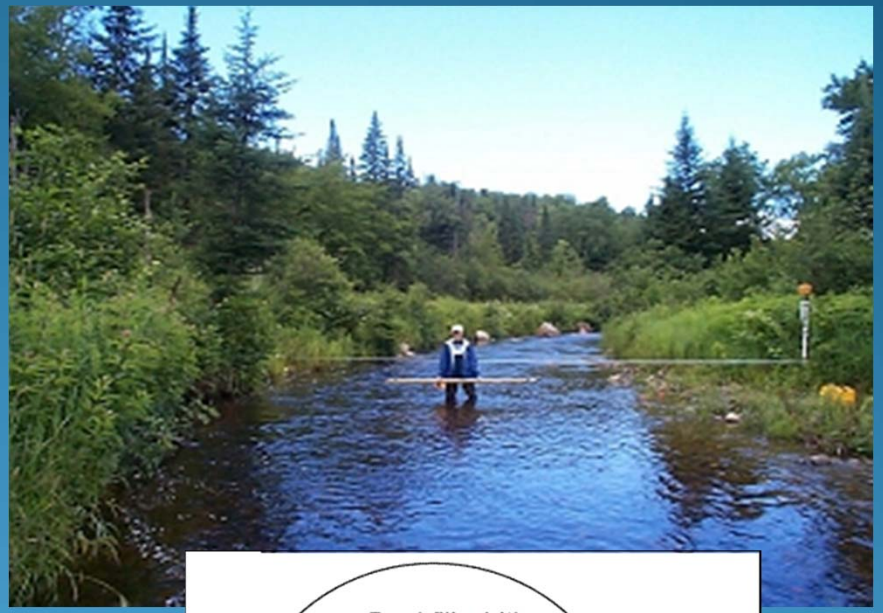
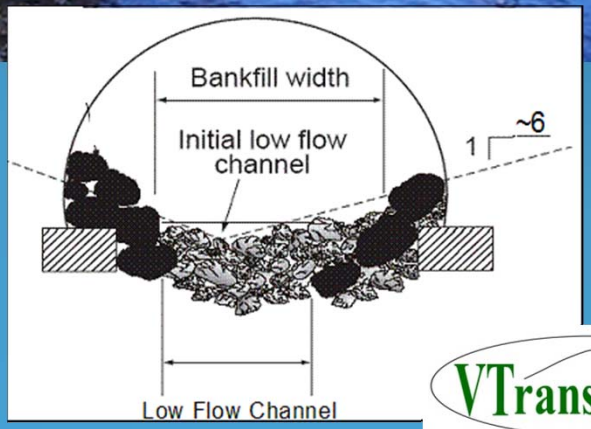




Implementation Action:

Revised VTrans Hydraulics Manual



Washington DOT

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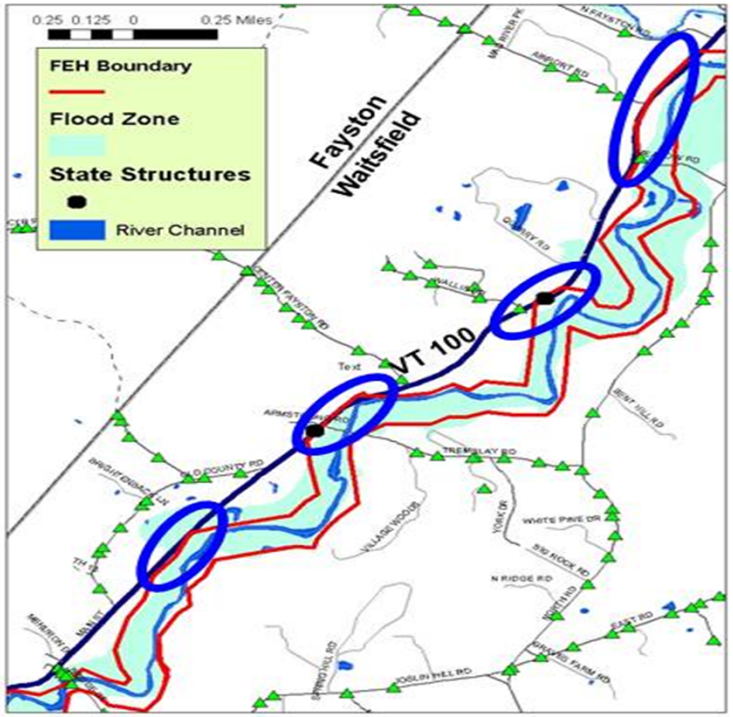
VTrans Transportation Resilience Plan

- Vulnerability Assessment
- Risk Assessment
- Adaptation Strategies
- Implementation Actions



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