

# Risk-Based Approach to Improving Transportation System Resilience

Methods & Tools for Transportation Resilience

2016 NASTO Conference  
June 7, 2016

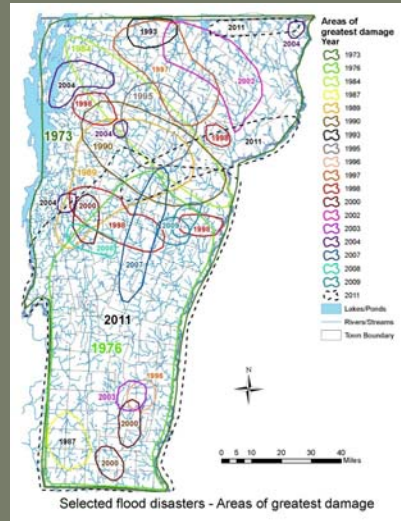
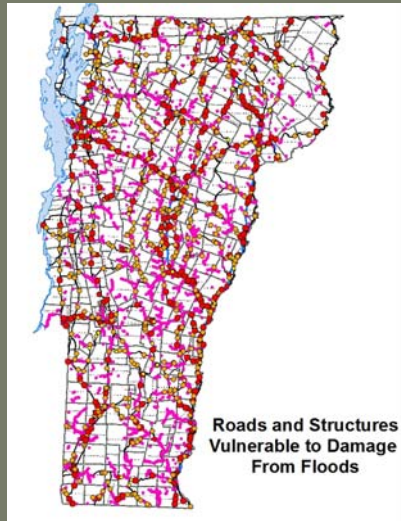
Joe Segale, P.E./PTP  
VT Agency of Transportation  
Policy, Planning and Research Bureau Director



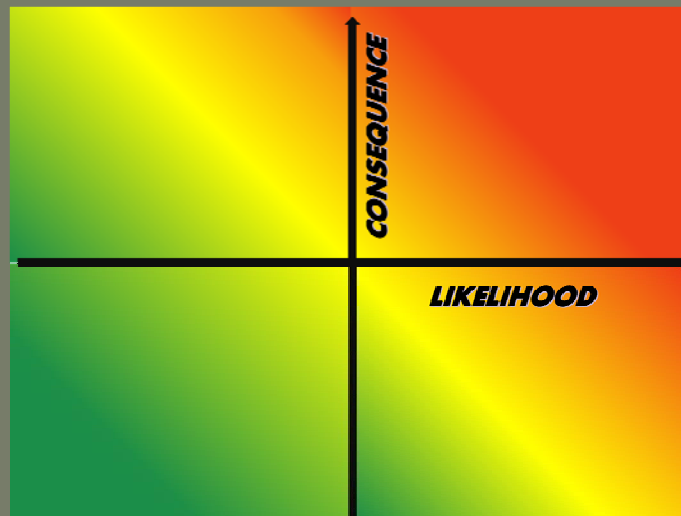
## VT 107 – The Last Mile



# VT Road Network Preliminary Vulnerability Assessment

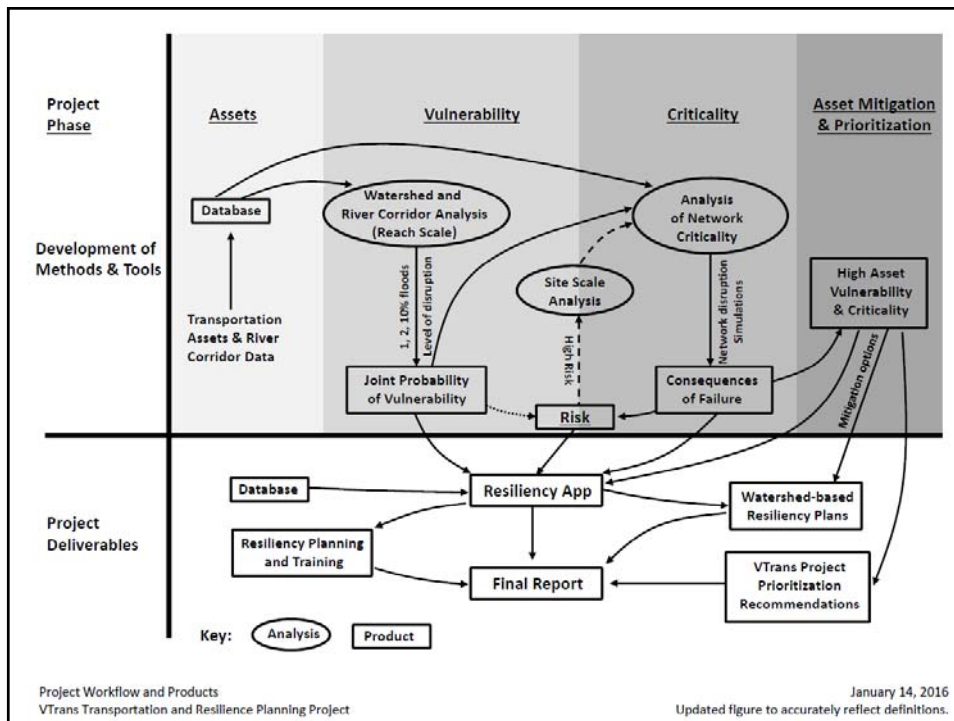
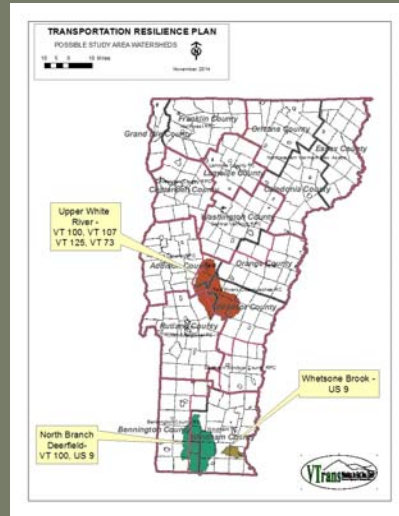


# RISK



# Methods & Tools for Transportation Resilience Planning

- Software tools to assess vulnerability, probability, consequence, and risk
- Technical documentation and training materials
- Training workshops
- Transportation System Resilience Plans for three study watersheds
- A recommended update to the *VTrans Project Prioritization Process*



## Vulnerability Potential

| Impact                       | Vulnerability Potential |
|------------------------------|-------------------------|
| Long Term Structural Failure | 10                      |
| Temporary Structural Failure | 7                       |
| Full Operational Closure     | 4                       |
| Partial Operational Closure  | 1                       |

INUNDATION

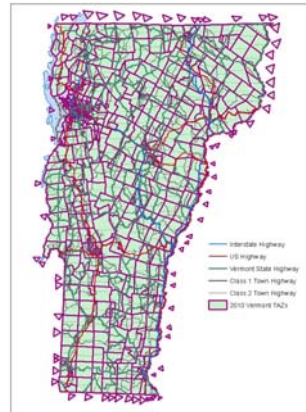
EROSION & DEPOSITION

## Specific Erosion Criteria

- Past Damage
- Stream Power
- Stream Substrate Size
- Entrenchment & Incision Ratio
- Length of Road in River Corridor
- Valley Confinement
- Structure Geomorphic Compatibility
- Structure Hydraulic Capacity

# Criticality Methodology

- Network Robustness Index
- Critical Closeness Accessibility

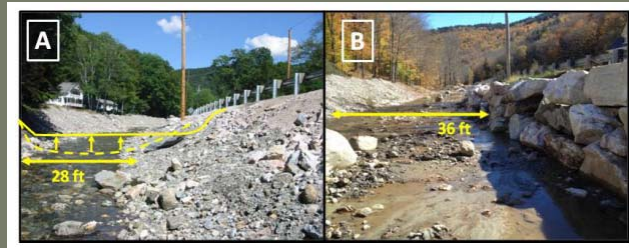


Statewide Travel Demand Model

# Mitigation Options: Infrastructure

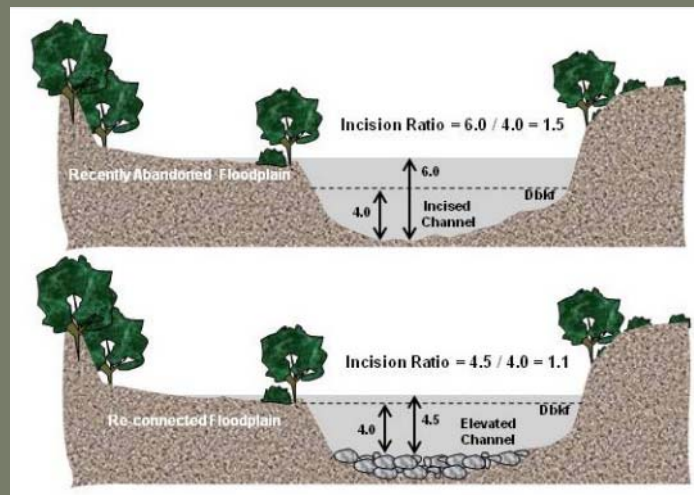


## Mitigation Options: River Management



Source: VT Standard River Management Principles & Practices (July 2015)

## Mitigation Options: Land Use



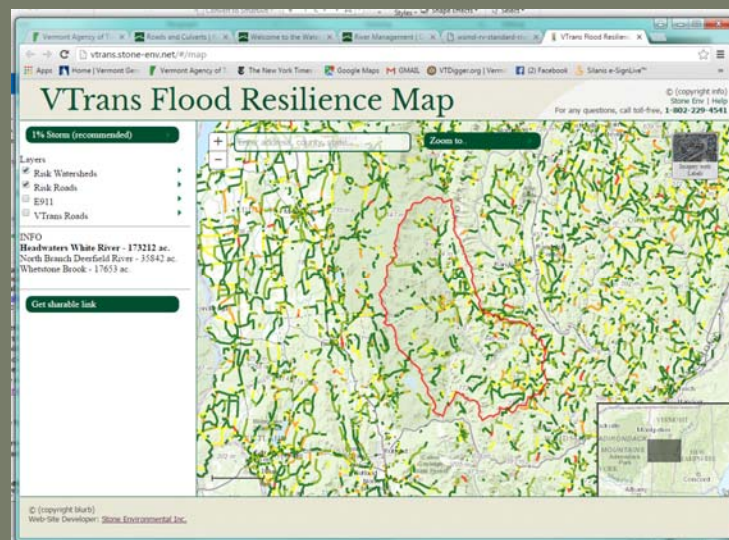
Source: VT Standard River Management Principles & Practices (July 2015)

# Flood Resilience Risk Management Strategies

|          |          |
|----------|----------|
| Mitigate | Transfer |
| Accept   | Avoid    |

| Risk Level | Service Life   |   |  |
|------------|--|---|--|
|            | <i>Beginning</i>   | <i>Middle</i>   | <i>End</i>   |
| High       | <ul style="list-style-type: none"> <li>• Play Book</li> <li>• River Mng</li> <li>• Land Use</li> </ul> | <ul style="list-style-type: none"> <li>• Play book</li> <li>• Rehab/Replace</li> <li>• River Mng</li> <li>• Land Use</li> </ul> | <ul style="list-style-type: none"> <li>• Replace</li> <li>• Response play book</li> <li>• River Mng</li> </ul> |
| Medium     | <ul style="list-style-type: none"> <li>• Accept</li> <li>• Land Use</li> </ul>                         | <ul style="list-style-type: none"> <li>• Rehab</li> <li>• River Mng</li> <li>• Land Use</li> </ul>                              | <ul style="list-style-type: none"> <li>• Replace</li> <li>• River Mng</li> </ul>                               |
| Low        | <ul style="list-style-type: none"> <li>• Accept</li> </ul>   | <ul style="list-style-type: none"> <li>• Accept</li> <li>• Land Use</li> </ul>  | <ul style="list-style-type: none"> <li>• Replace</li> <li>• River Mng</li> </ul>                               |

# On-Line Resilience App



# Project Team

## STAKEHOLDERS

VTrans  
VT Agency of Natural Resources  
VT Department of Homeland Security & Emergency Management  
VT Agency of Commerce and Community Development  
UVM Transportation Research Center  
Regional Planning Commissions

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