# Using The Transportation Resiliency Planning Tool (TRPT) To Strengthen Hazard Mitigation Planning

ACRPC| 01/19/2021

# Definitions

Vulnerability: The extent that a transportation asset is exposed to a threat from inundation, erosion, or deposition.

Probability: The likelihood that a threat will damage a transportation asset, as linked to storms of different sizes.

Criticality: How important is the transportation asset that dictates the consequence of the disruption to mobility due to damage? How close is it to essential facilities?

Risk: The combination of the probability of vulnerability and criticality.

# PROJECT

## VULNERABILITY

- Watershed and River Corridor Analysis
- 10-year, 50-year, and 100-year floods
- Road, Bridges, and Culverts
- Failure Mode

## CRITICALITY

- State and Local Roads
- Novel Consideration of Vulnerability
- 1,000 Simulations of Network Disruption
- Failures and Delays

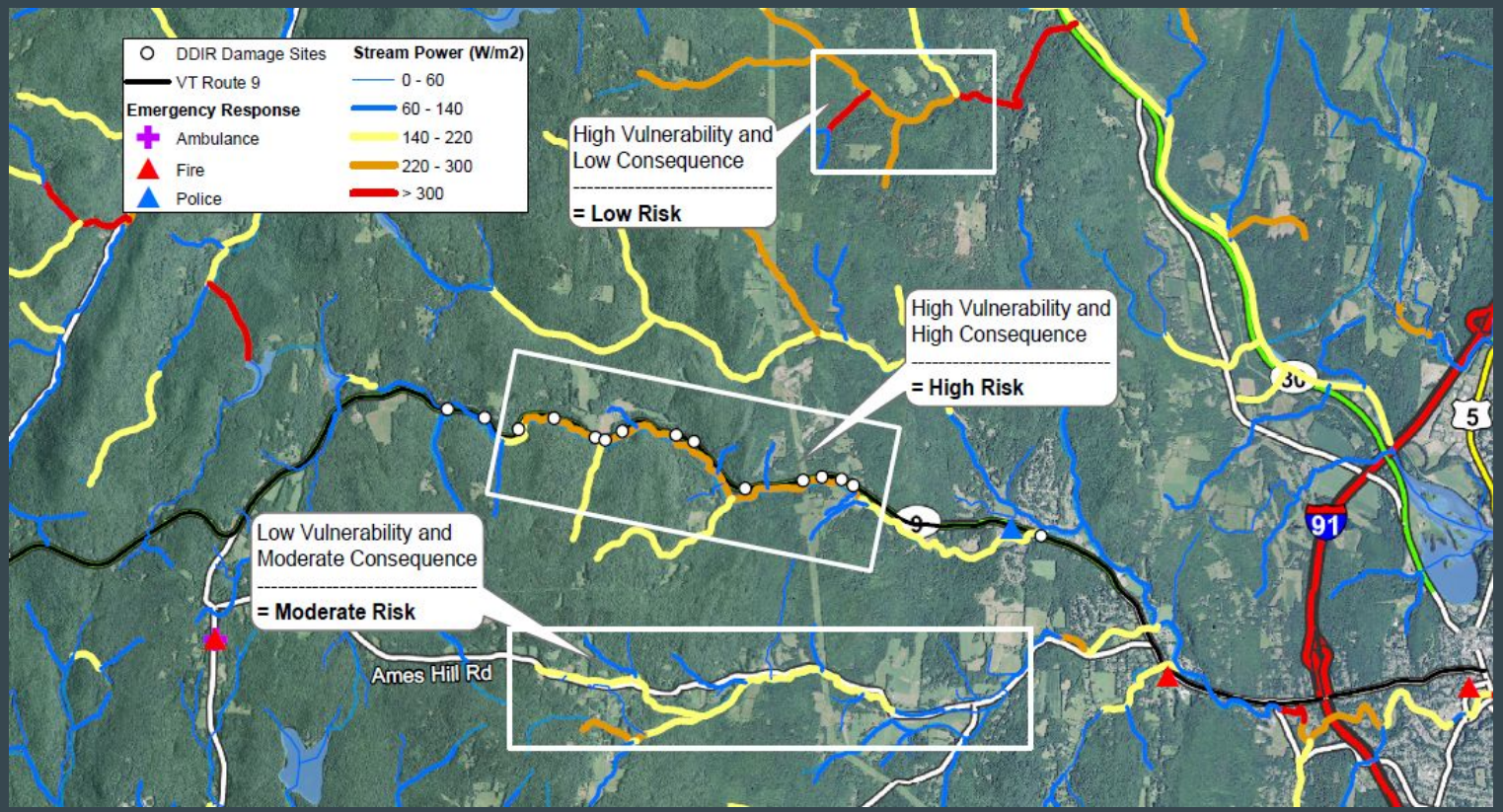
## RISK

## Mitigation

- Resiliency App
- VTrans Prioritization Updates
- Watershed Resiliency Plans
- Project Guide Book

# GOALS

1. Develop flood risk identification methods and tools.
2. Systematically identify high risk road segments and crossing structures.
3. Incorporate vulnerability and risk into planning process.



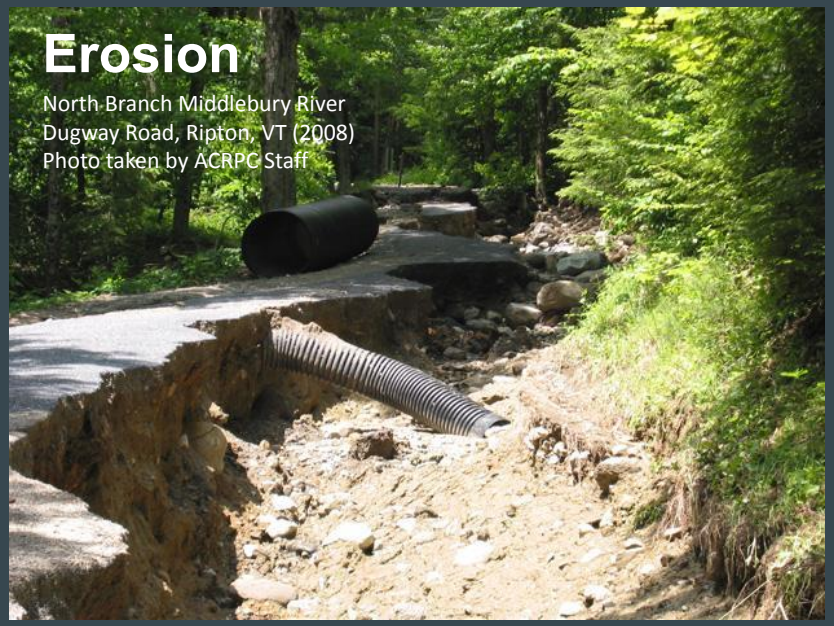
# VULNERABILITY PROCESSES

**Deposition**

Little Otter Creek
North Street, New Haven, VT (2004)
Photo taken by ACRPC Staff

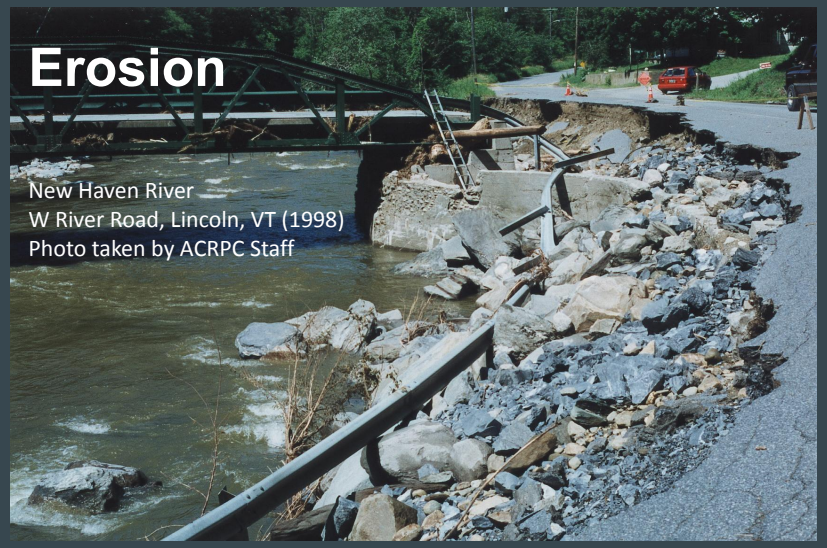
**Inundation**

Otter Creek Flooding
Swamp Road, Cornwall VT (2007)
Photo taken by ACRPC Staff



**Erosion**

North Branch Middlebury River
Dugway Road, Ripton, VT (2008)
Photo taken by ACRPC Staff

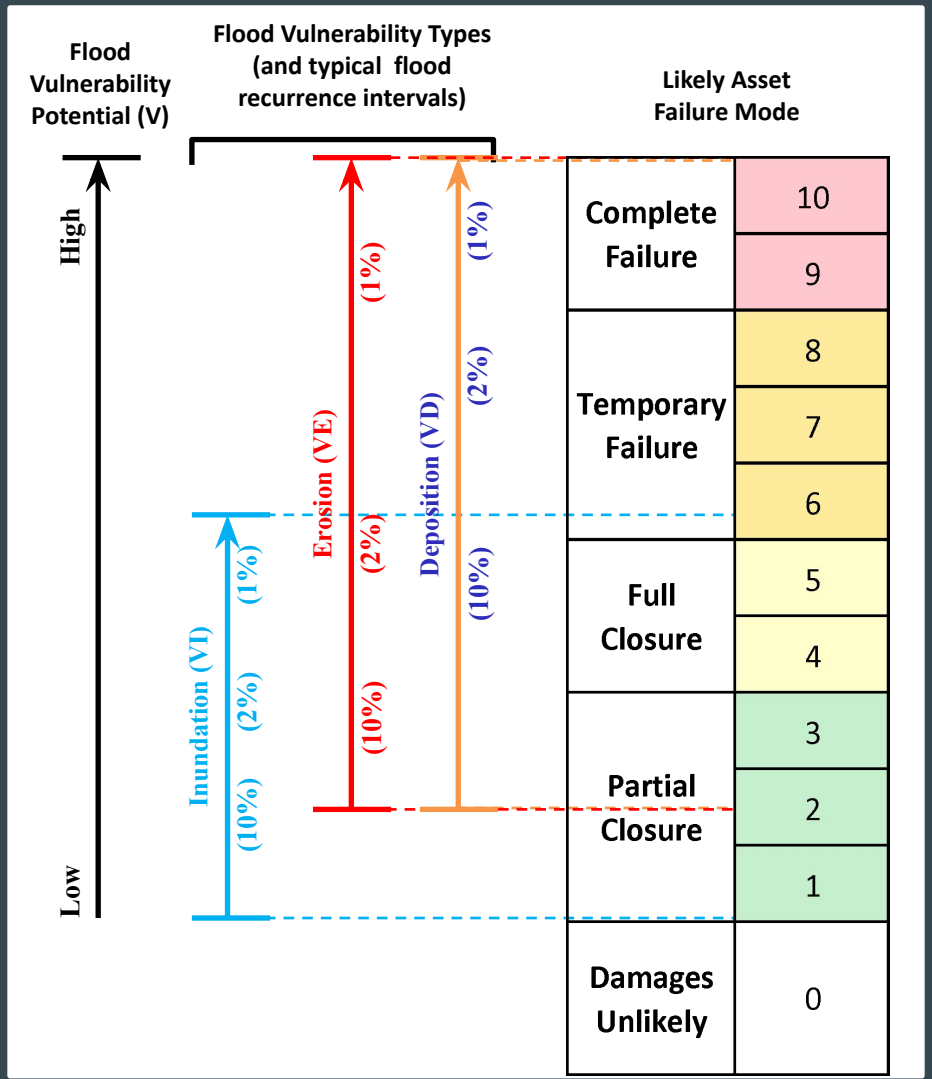


**Erosion**

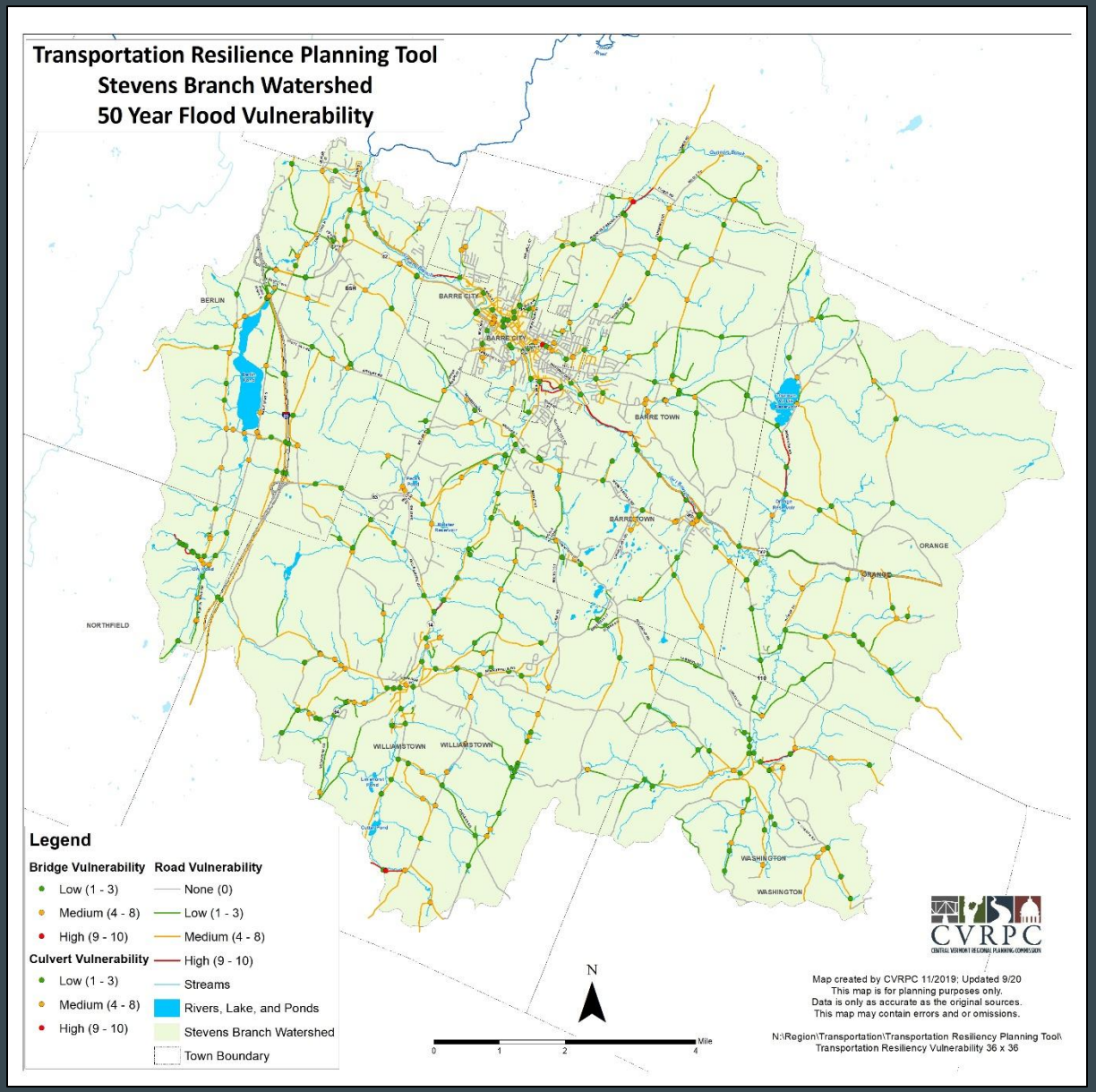
New Haven River
W River Road, Lincoln, VT (1998)
Photo taken by ACRPC Staff

# Vulnerability

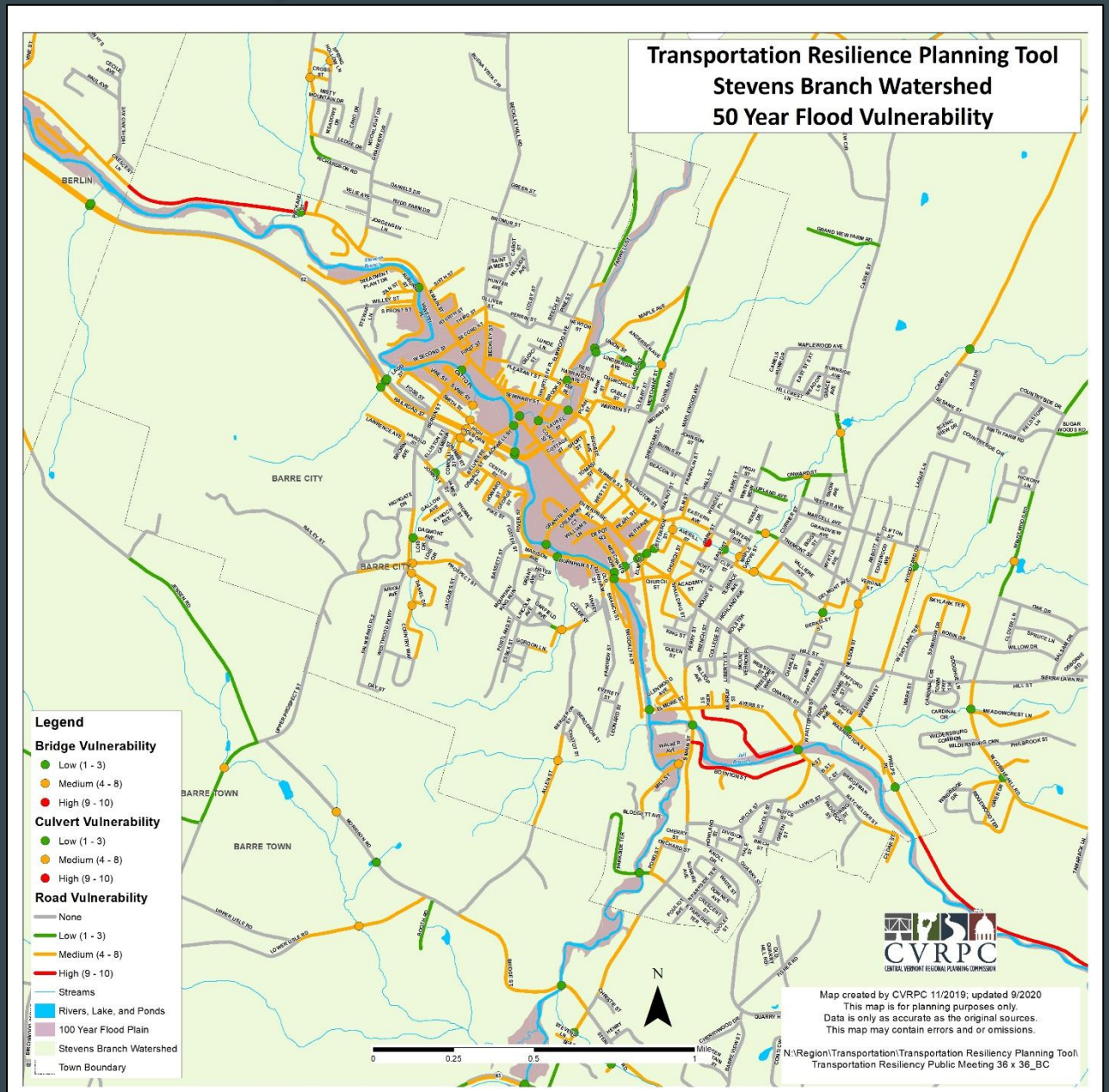
- Vulnerability estimated at road embankments, bridges, and culverts.
- Assigned maximum from inundation, erosion, and deposition.



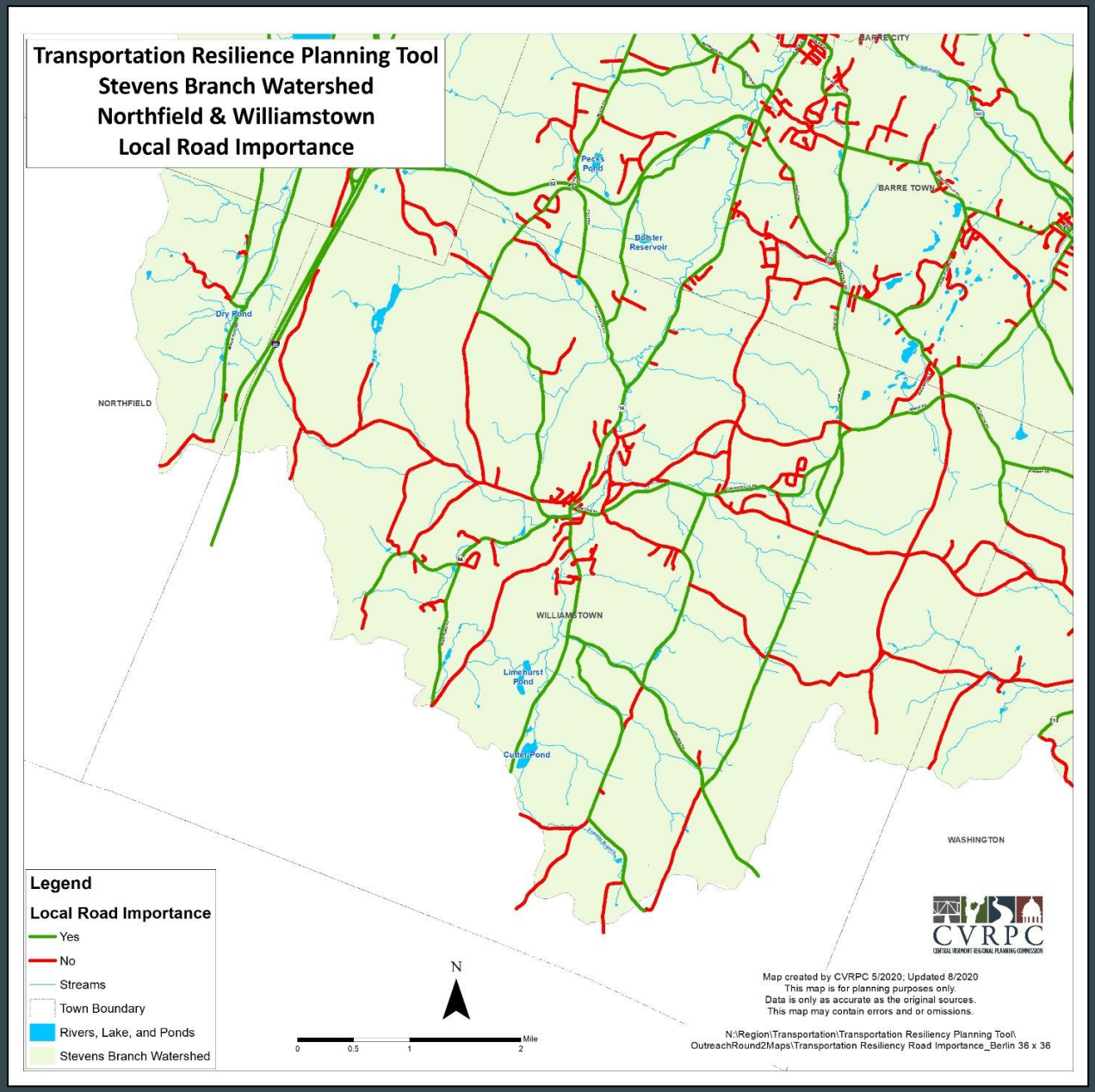
# Vulnerability - Combined 50 Year Flood



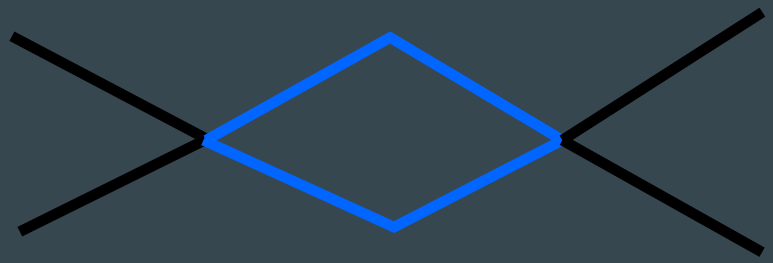
# Vulnerability - Barre City Combined 50 Year Flood



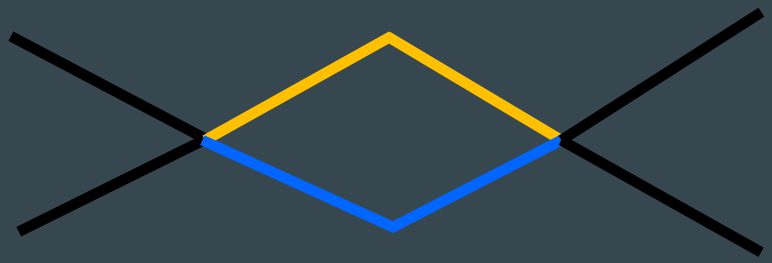
# Local Road Importance – Northfield & Williamstown

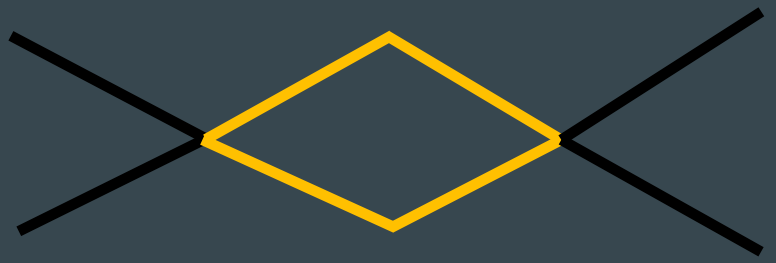


# Network Criticality

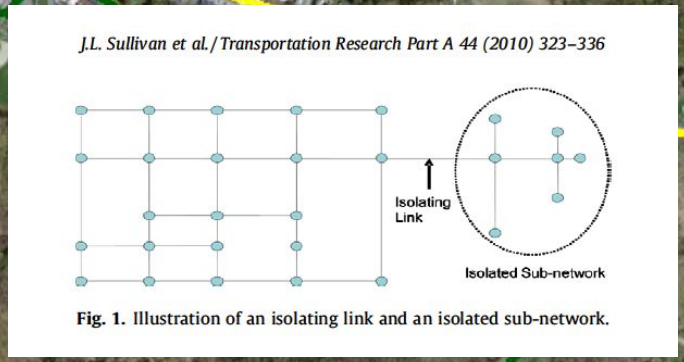


High criticality – Both routes vulnerable





# Criticality – Critical Closeness Accessibility



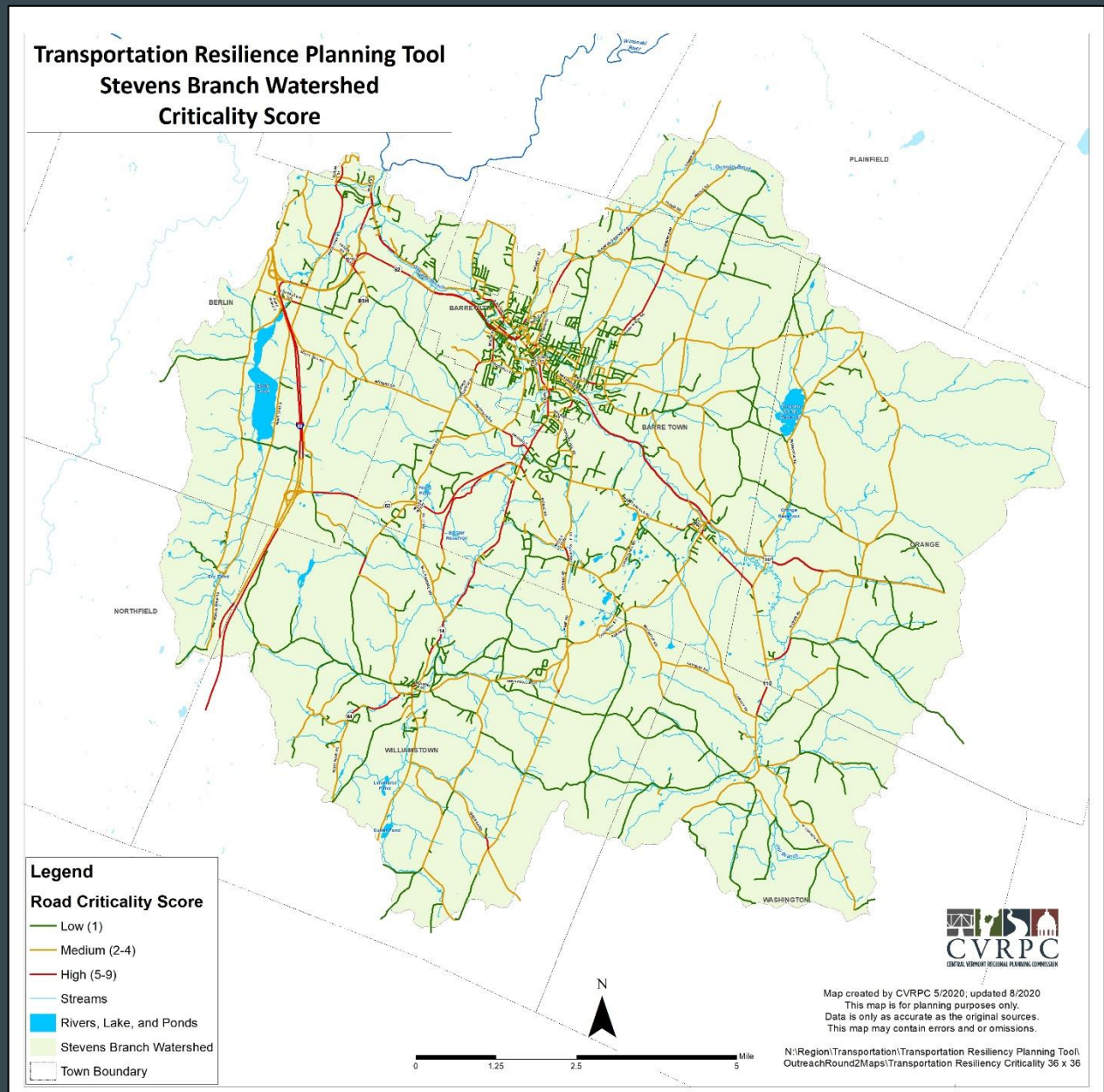

(Novak and Sullivan, 2014)

# Criticality Matrix

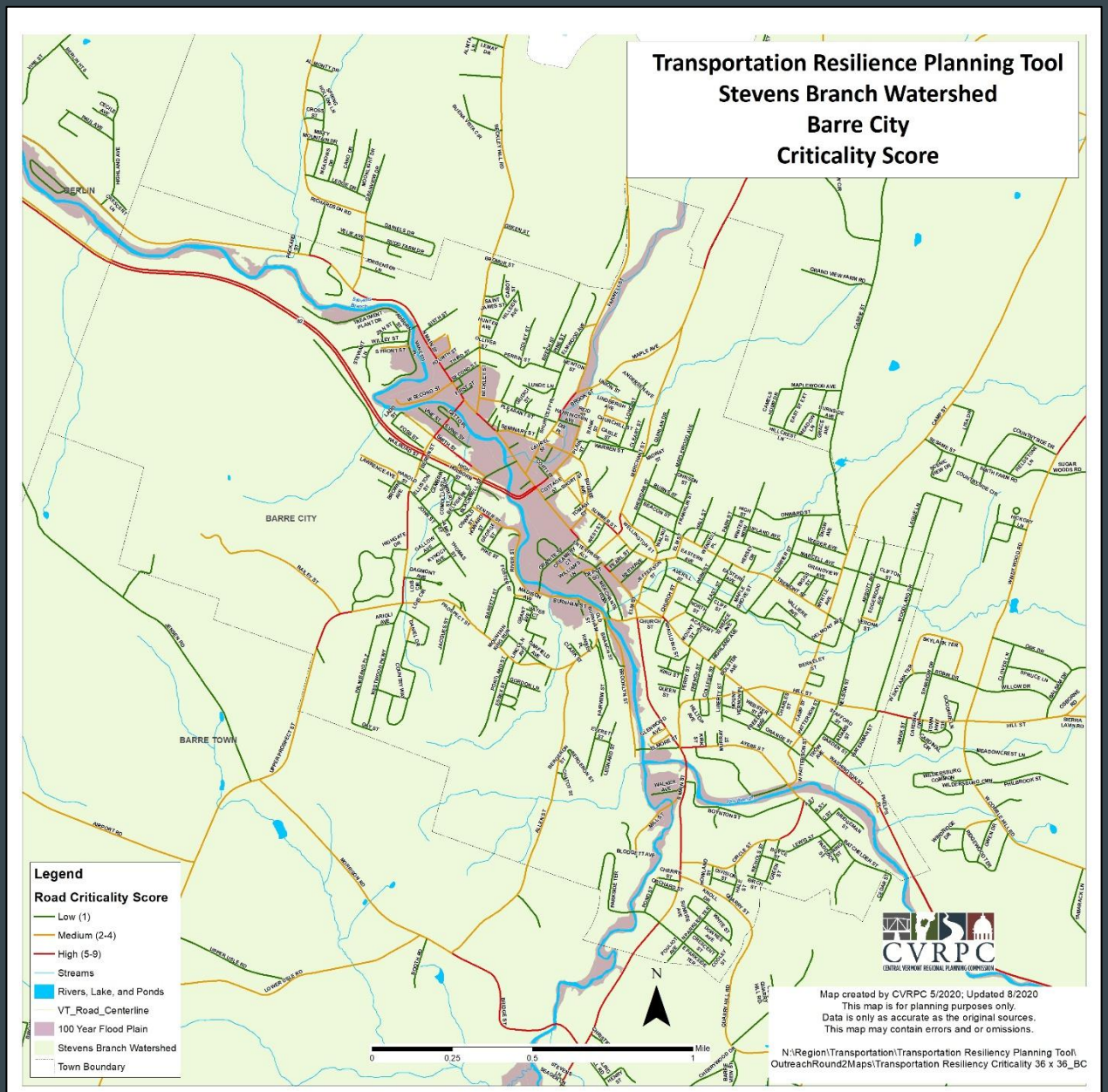
| SCORE | Key Link in Network Criticality Index (High or Medium) | | Critical Closeness Accessibility (UVM) | | Locally Important for daily regular function or for detour* | Combined Score for Map Display |
|---|---|---|---|---|---|---|
| 10= | High or Medium | AND | High | AND | y | HIGH (RED) |
| 9= | High or Medium | AND | Medium | AND | y | |
| 8= | High or Medium | AND | High or Medium | AND | n | |
| 7= | High or Medium | AND | Low | AND | y | |
| 6= | Low | AND | High | AND | y | |
| 5= | Low | AND | Medium | AND | y | |
| 4= | High or Medium | AND | Low | AND | n | MEDIUM (YELLOW) |
| 3= | Low | AND | High or Medium | AND | n | |
| 2= | Low | AND | Low | AND | y | |
| 1= | Low | AND | Low | AND | n | LOW (GREEN) |

# Criticality – Watershed Wide

- **Network criticality index** - based on simulations of failure – if there are secondary routes and no vulnerability = low, if no secondary and vulnerable or both routes vulnerable = high.
- **Criticality closeness accessibility index** = indicates closeness to critical facilities such as hospitals, police departments, ambulance dispatch, fire stations.
- Then a tool is run to factor these things in with the local road importance to come up with a criticality score.



# Criticality Scores – Barre City



# Next Steps

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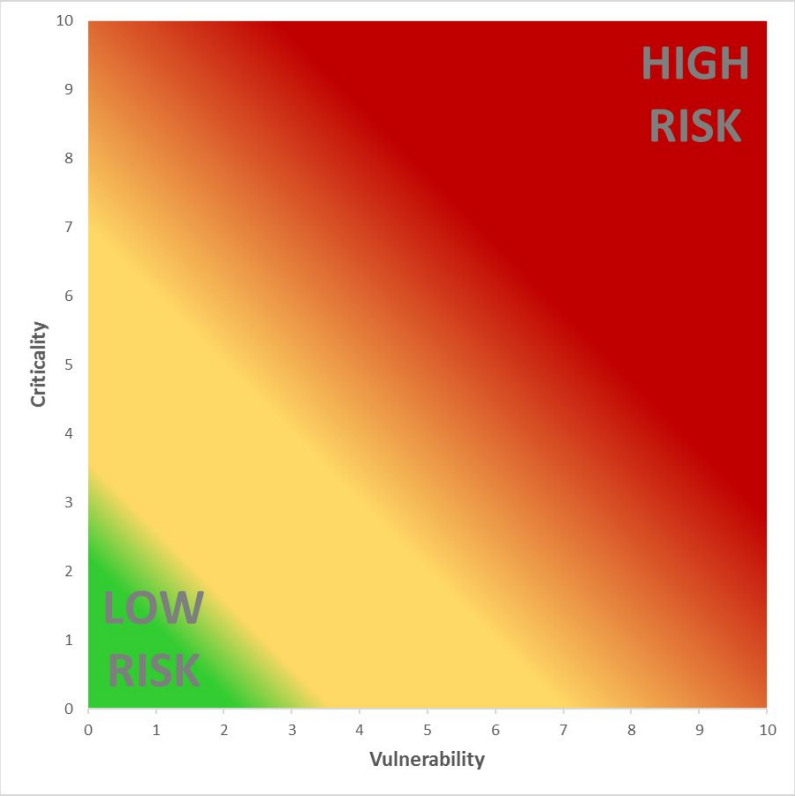
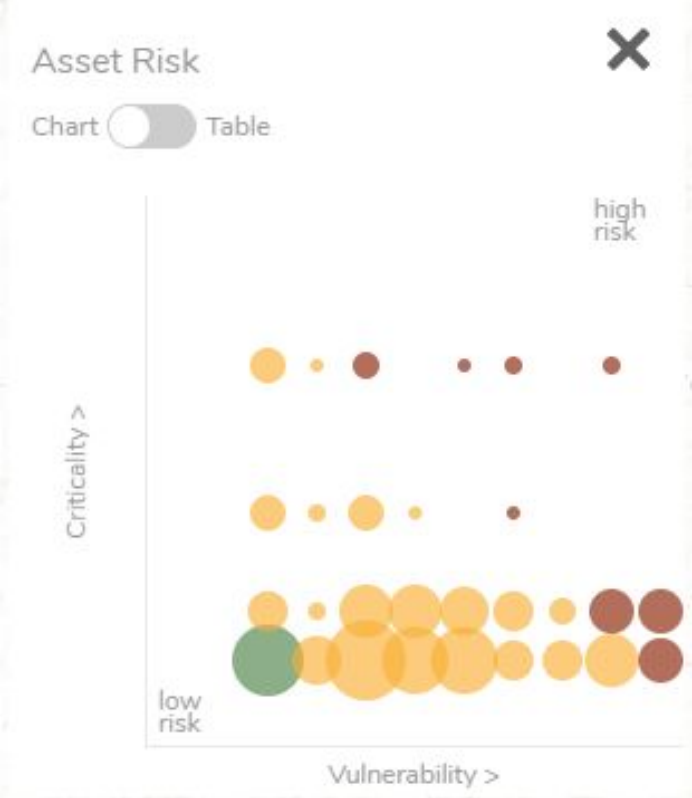
# Risk

Risk is equal to the average of Vulnerability and Criticality.



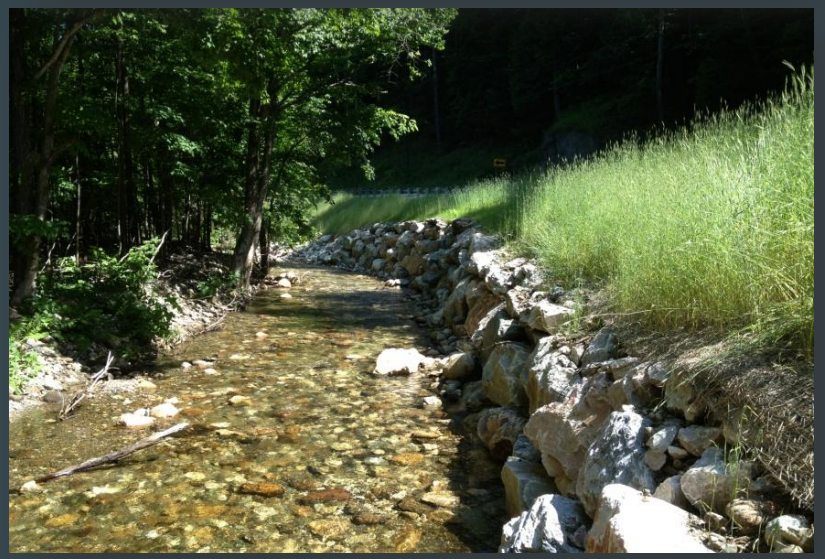




| | V | C | R |
|---|---|---|---|
| **High** | 9, 10 | 5, 6, 7, 8, 9, 10 | 6, 7, 8, 9, 10 |
| **Medium** | 5, 6, 7, 8 | 2, 3, 4 | 2, 3, 4, 5 |
| **Low** | 0, 1, 2, 3, 4 | 0, 1 | 0, 1 |

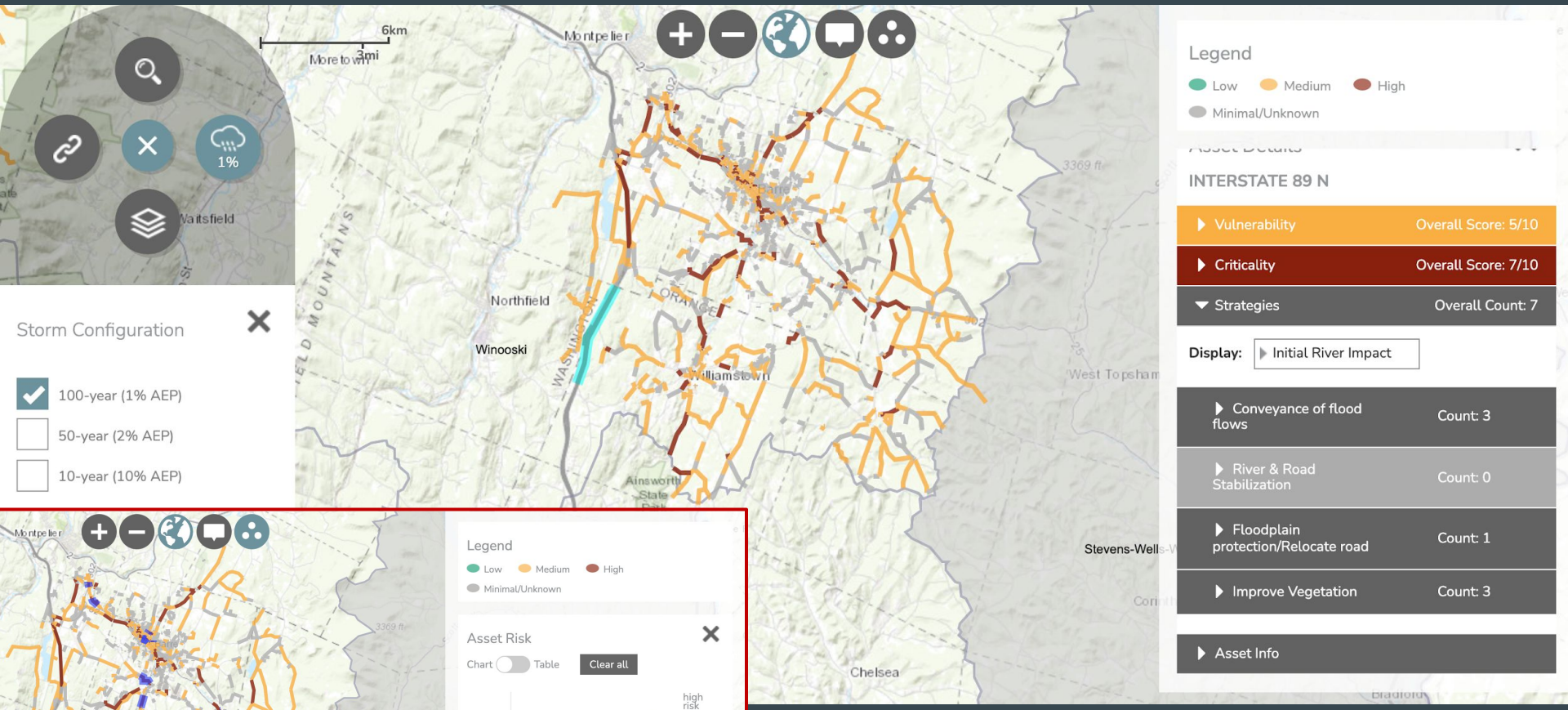
# Mitigation Planning

## Mitigation Options

- Infrastructure Improvements (Revised alternatives analysis and design standards)
- River Management
- Alternative Routes
- Roadway Relocation
- Conservation
- Land Use Regulation

# Mitigation Planning



# Explore TRPT Websites

Direct link to TRPT

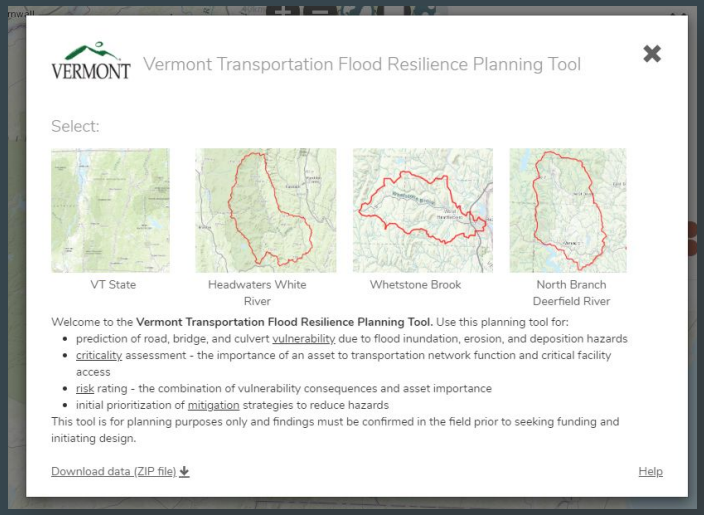
https://roadfloodresilience.vermont.gov/#/map

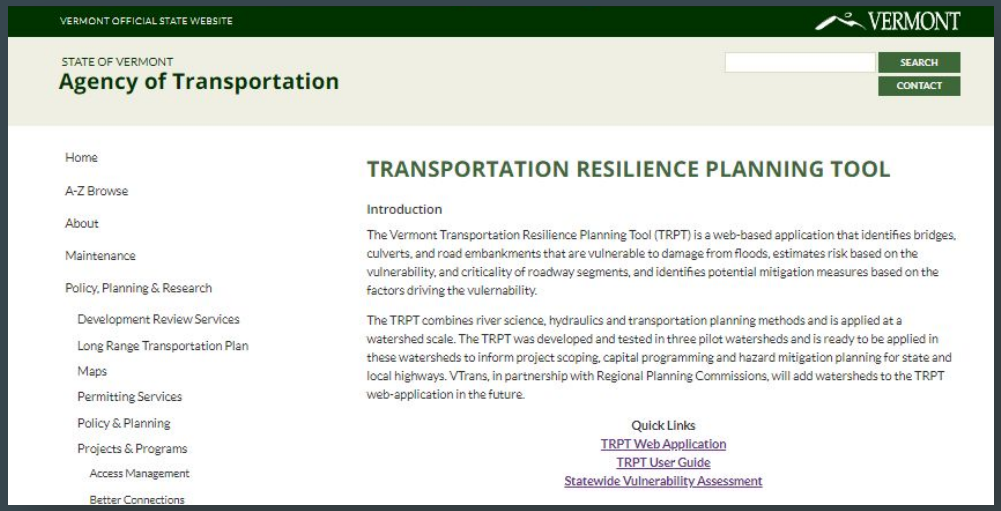
Link to VTrans TRPT Website

https://vtrans.vermont.gov/planning/transportation-resilience

Link to statewide Vulnerability, Criticality & Risk Assessment

https://vtrans.vermont.gov/planning/transportation-resilience/statewide



# Questions?

Source: VT Historical Society