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# VT AOT Resilience Planning, Standards, and Research

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# VTrans RESILIENCE

*“The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions” (FHWA Order 5520)*



## Emergency Response and Recovery

COOP  
Preparedness  
Rapid Response



## Planning and Programming

Rivers and Roads Training  
Tool Development  
Resilience Improvement



## Design and Engineering

Design Standards Update  
Hydraulics Manual Update  
TH Road and Bridge Standards



## Infrastructure Investments

Rail and Road Structures  
Slope Stability  
Nature Based Designs

# Discussion

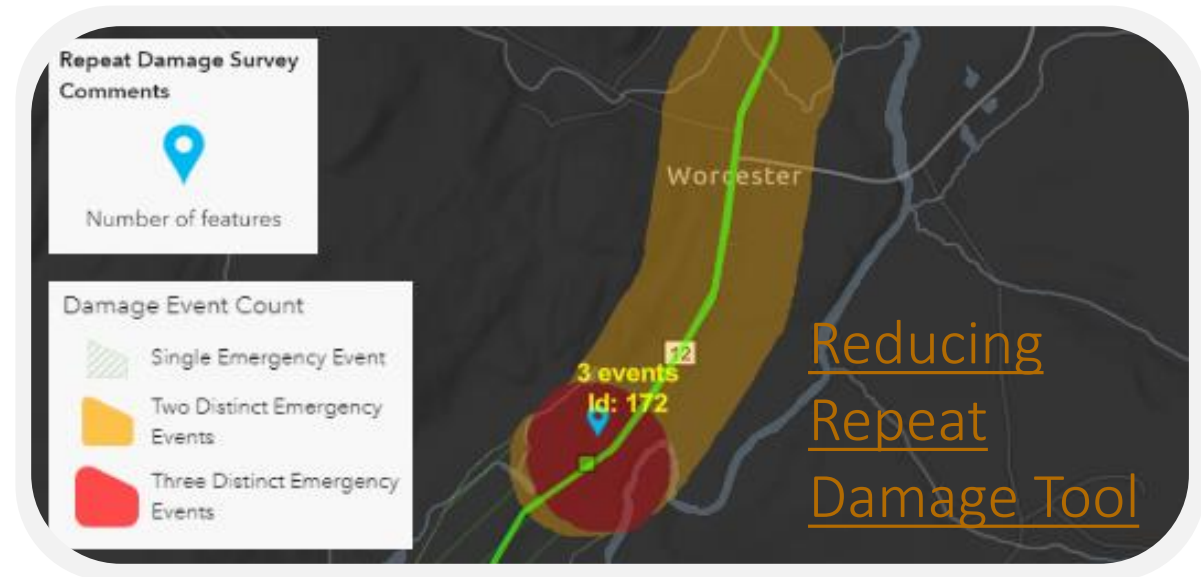
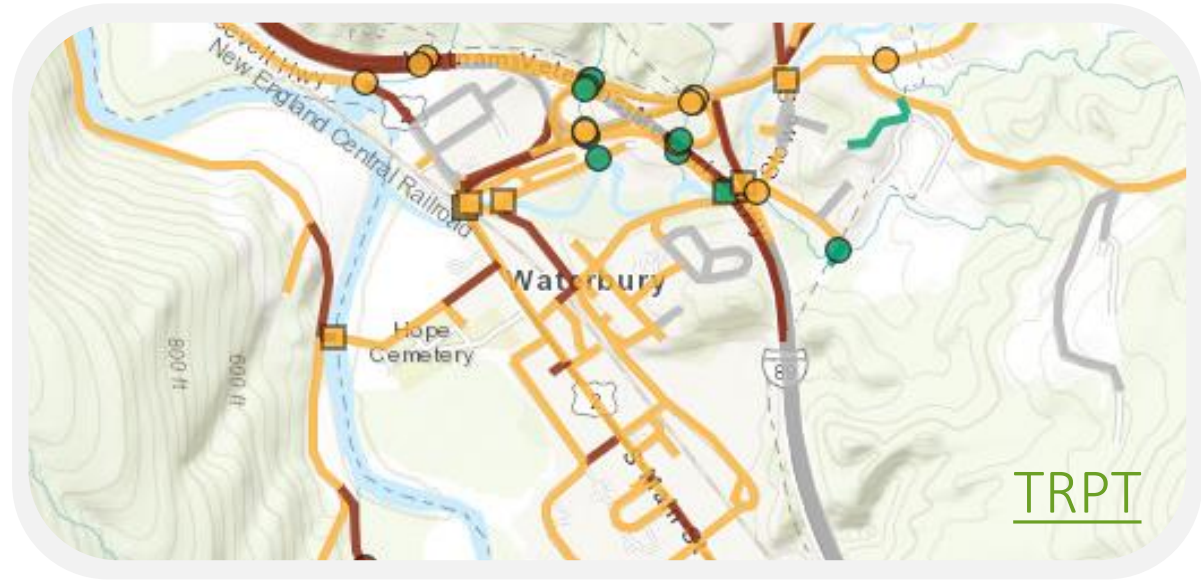
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- Transportation Resilience Planning Tools
- Resilience Improvement Plan
- Design Standards
- Resilience Research

# Resilience Planning



## Tools



## Vulnerability:

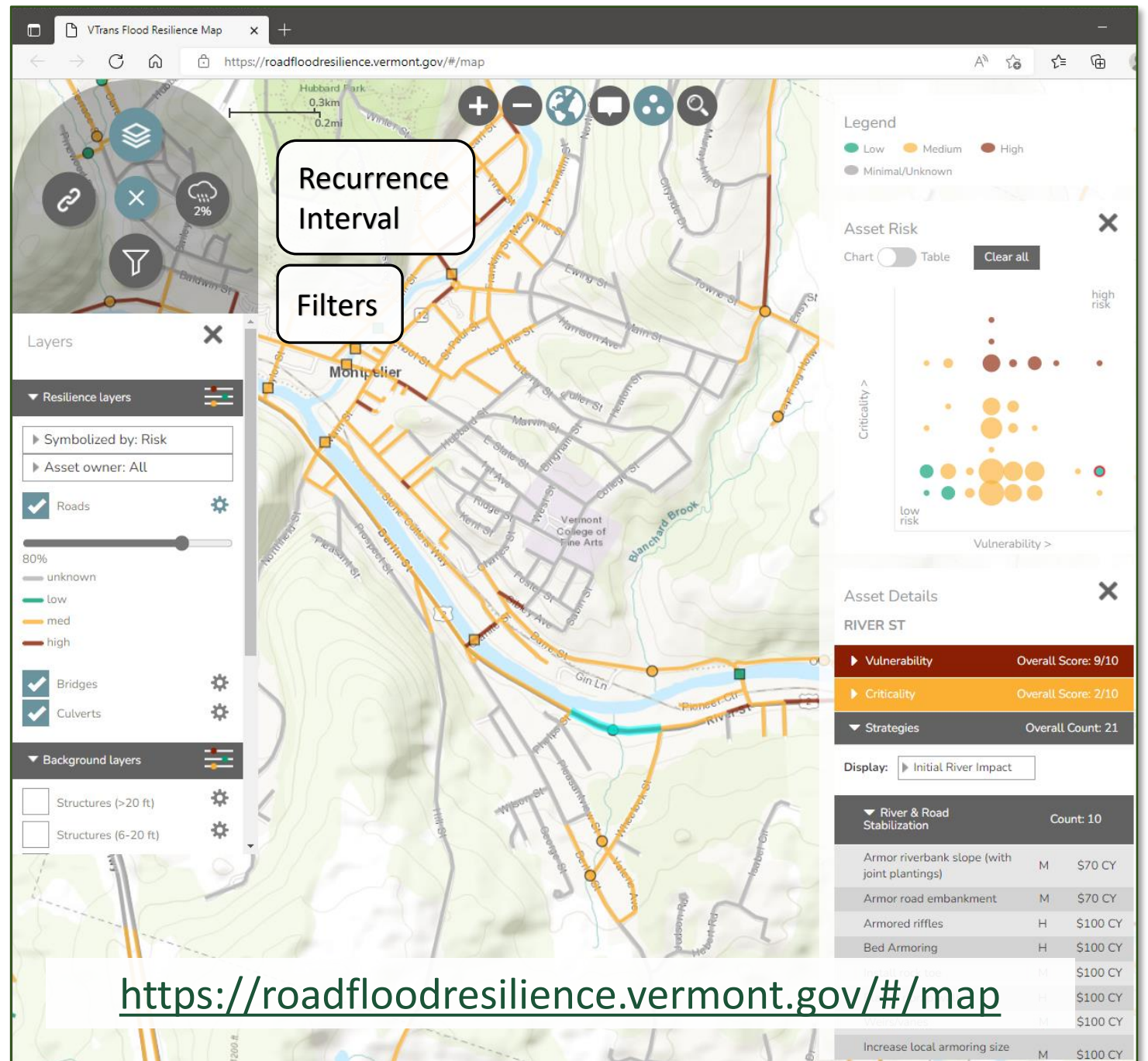
The extent that a transportation asset is exposed to a threat from inundation, erosion, or deposition from river processes.

## Criticality:

How important is the transportation asset that dictates the consequence of the disruption to mobility due to damage.

## Risk:

The combination of the probability of vulnerability and criticality.



# TRPT as a Resource



Resilience Improvement Plan (RIP)



State and local hazard mitigation planning



Project identification and prioritization



Funding proposals

## Website:

[Transportation Resilience Planning Tool](#)

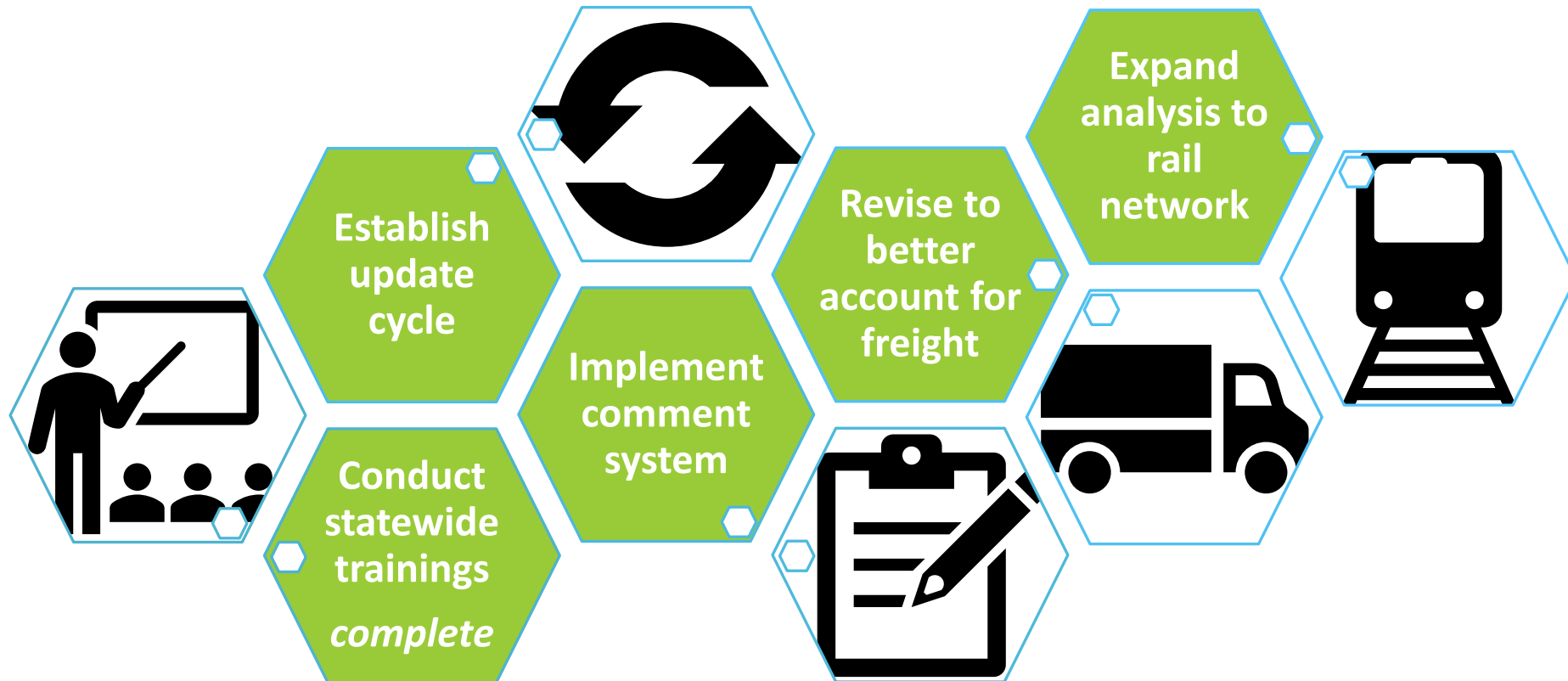
[- TRPT Web Application](#)

[- TRPT User Guide](#)

[- Training Videos and Slides](#)

# TRPT Next Steps

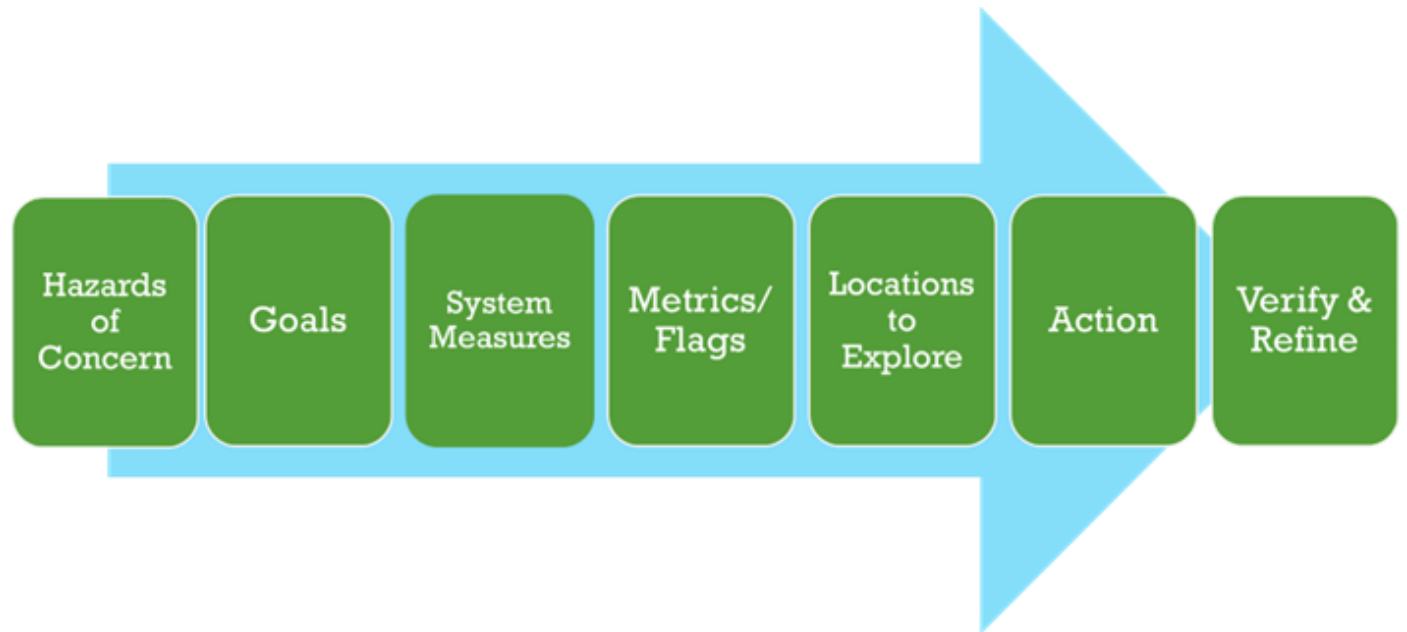
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# Resilience Planning

**VT PROTECT**  
Formula - \$37 million  
Discretionary Grants

# Resilience Improvement Plan





# Resilience Improvement Plan (RIP)

## GOALS

1. Less damage in the future.
2. Systems return to normal quickly.
3. Vermont is Resilient for all people.
4. Essential Freight moves.
5. Resilience efforts are coordinated.

Explore the [VTrans RIP!](#)

## MEASURES



High TRPT Risk & Repeat Damage



Transit Resilience & TRPT



Social Vulnerability Index (SVI) & TRPT



Resilience for Commodities Distribution



Coordination with Other Plans

## METRICS



Each measure has a metric—a definition of what counts as “high”



Locations where the measure is high get a point (or "flag")



Flags can then be viewed or summarized by road segment or structure

# High Hazard Rock Slopes

Assessed and prioritized based on likelihood of occurrence and potential impact.

Factors considered include:

- Geometry of slope
- Ditch and roadway characteristics
- Moisture
- Geology
- Event history
- Roadway level of service
- Average vehicle risk
  - Combination of AADT, slope length & speed limit



# RIP Priority Locations

**Structure Flag**

- ★ 4
- ★ 3
- ✱ 2

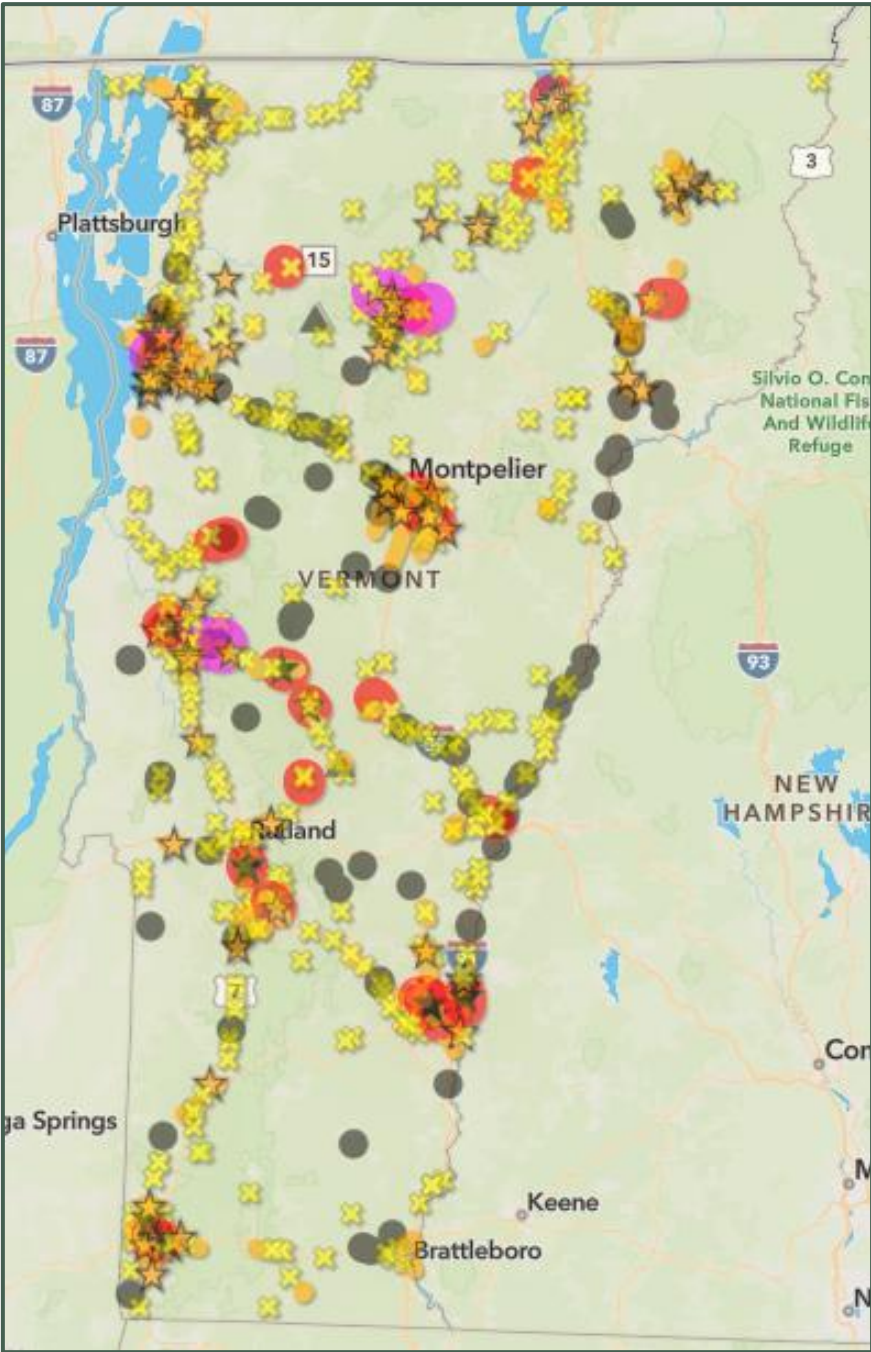
**Road Flag**

- 6
- 5
- 4
- 3

**RIP Analysis - High Hazard Rock Slopes**

Grades

- Rock: A
- ▲ Hybrid: A



Explore the [web map](#)

# RIP Implementation and Next Steps

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Guide investment of IJA PROTECT funds



Inform project selection and prioritization



Inform project design



Refine RIP scoring



Identify and track resilience metrics

# Design Standards for Resilience

Design structures to satisfy the hydraulic performance criteria required for the roadway classification.

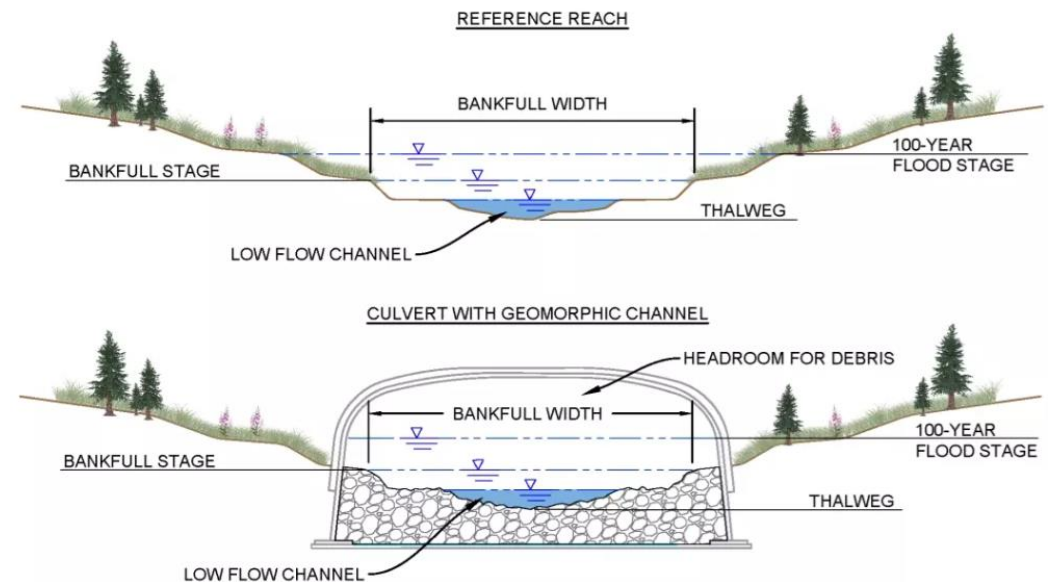
- **Interstate** = 100-yr flood event/200-yr flood check
- **State Highway** = 50-yr flood event/200-yr flood check
- **Local Road** = 25-yr flood event/100-yr flood check

## Resources

[VTrans Hydraulics Manual](#)

[Rivers and Roads Field Manual](#)

[VTrans Orange Book – Municipal Standards \(optional\)](#)



*Bankfull width structure sizing*

# Research Projects

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## Nature-Based Solutions (NBS)

- Compile catalog of NBS suitable to Vermont
- Map potential NBS project sites
- Incorporate NBS in VTrans project development

## Landslide Hazard Identification and Monitoring

- Map areas near VTrans infrastructure with high landslide risk

## MRGP Resilience Cost/Benefit

- Quantify resilience benefits of MRGP BMPs based on 2023 and 2024 storm damages



*Restoration Project - West Branch White River*

# Questions

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