The Vermont Transportation Resilience Planning Tool (TRPT): A Web Tool for Assessing Infrastructure Risk

STONE
ENVIRONMENTAL

Awards & Recognition

2018 Grand Award, American Council of Engineering Companies of Vermont (ACEC/VT)

2018 GIS & Data Science Project of the Year, Vermont Center for Geographic Information

Services / Expertise

Geospatial & Data Solutions
Web Application Development
Spatial Analysis
Database Design
User Experience
JavaScript API
ArcGIS Server
MS SQL Server
Google Charts
AngularJS

Markets

State Government
Regional Planners
Risk Assessment
Climate Resilience
Infrastructure Planning

Project Location

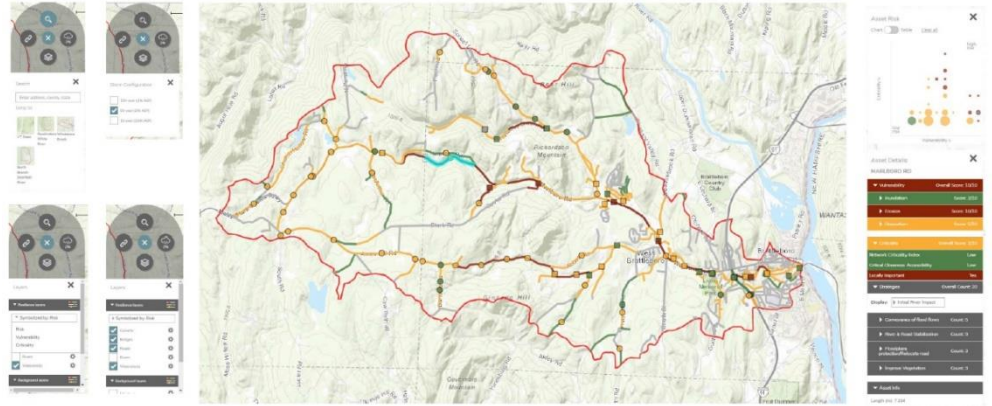Montpelier, Vermont

Date Completed

2015-present

Project Owner

Vermont Agency of Transportation, Operations Division

Project Manager

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Link to Application

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

esri Partner Network
Silver

The Vermont Transportation Flood Resilience Planning Tool includes intuitive symbolization and infographics to display rich data of transportation infrastructure risk and criticality in extreme weather events.

STONE worked with the Vermont Agency of Transportation (VTrans), a multi-disciplinary team of consultants, and a variety of local, regional, and state agency partners to develop the Vermont Transportation Resilience Planning Tool (TRPT), a web-based application designed to help integrate climate risk and transportation resiliency into VTrans' planning process and ultimately create a more resilient transportation network in Vermont. The TRPT, advanced through the *Methods and Tools for Transportation Resilience Planning Project*, combines river science, hydraulics and transportation planning methods to help VTrans and project partners understand the vulnerability of their transportation systems to the impacts of climate change and extreme weather and identify and prioritize mitigation strategies to avoid or minimize the impacts of future damages in the most critical, highest risk locations.

We used the agile or iterative method for developing this web application to ensure that the product meets the expectations of the stakeholders and users. The application identifies bridges, culverts and road embankments within a watershed that are vulnerable to damage from floods; estimates risk based on the vulnerability and criticality of roadway segments; and identifies potential mitigation measures based on the factors driving the vulnerability and criticality.

The TPRT uses Esri's ArcEnterprise to publish spatial datasets from the indexed database and Google charts to display the results of vulnerability, criticality/transportation modeling, risk, and mitigation strategies assessments in these watersheds, and allows users to review these data for three flood sizes (10-year, 50-year, and 100-year; or 10%, 2%, and 1% chance annual recurrence interval) and three processes (inundation, erosion, and deposition). Key features include a map service for viewing spatial datasets, graphical data for summary analyses, and tabular display of mitigation alternatives for at-risk transportation assets. The app is available for use by anyone connected to the internet and is compatible with multiple internet browsers and devices. It provides a centralized repository and display for all users without requiring any specialized desktop software or

internet browser plug-ins. This tool is for planning purposes only and findings must be confirmed I the field prior to seeking funding and initiating design.

The TRPT, which is applied at the watershed level, was developed and tested in three pilot watersheds. As an extension of the project, our team is currently building data processing automation tools to allow VTrans and other partners to update data within the app for the existing watersheds and new watersheds that will be added to the app in the future.

In 2018, the project and app received the Grant Award from the American Council of Engineering Companies of Vermont (ACEC/VT) and the GIS & Data Science Project of the Year from the Vermont Center for Geographic Information (VCGI).

As a separate task for this project, Stone worked with VTrans, Chittenden County Regional Planning Commission, and Central Vermont Regional Planning Commission to develop a statewide analysis of bankfull width for Vermont infrastructure. The analysis was also converted to a reusable tool that is executed within the state's VTCulverts website when a bridge or culvert is added or edited by users.