Global Resilience Institute
at Northeastern University

CUAHSI
allied for water science

CIROH

Accessing Hydrological Data to Support Flood Forecasting & Mitigation Project Prioritization

Location: Two Rivers-Ottauquechee Community, VT

2025

Community Narratives

Narrative Summary

With limited stream gauges and data gaps across small, flood-prone streams, the Two Rivers-Ottauquechee region is not able to accurately forecast flood events and identify where to focus mitigation efforts. FloodSavvy helps address this by providing easy access to modeled streamflow forecasts and inundation maps, helping anticipate risks, improve response efforts, and target projects more effectively.

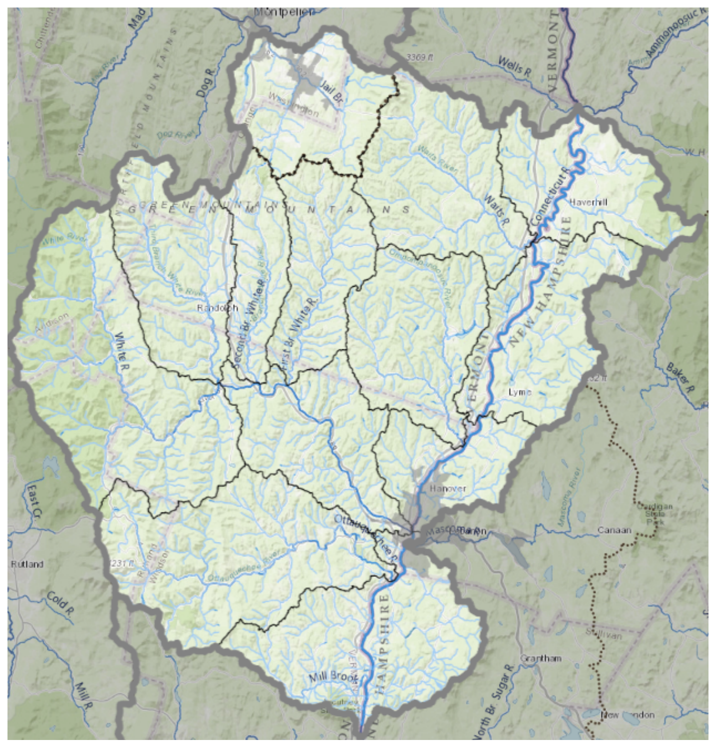
Contributing Authors

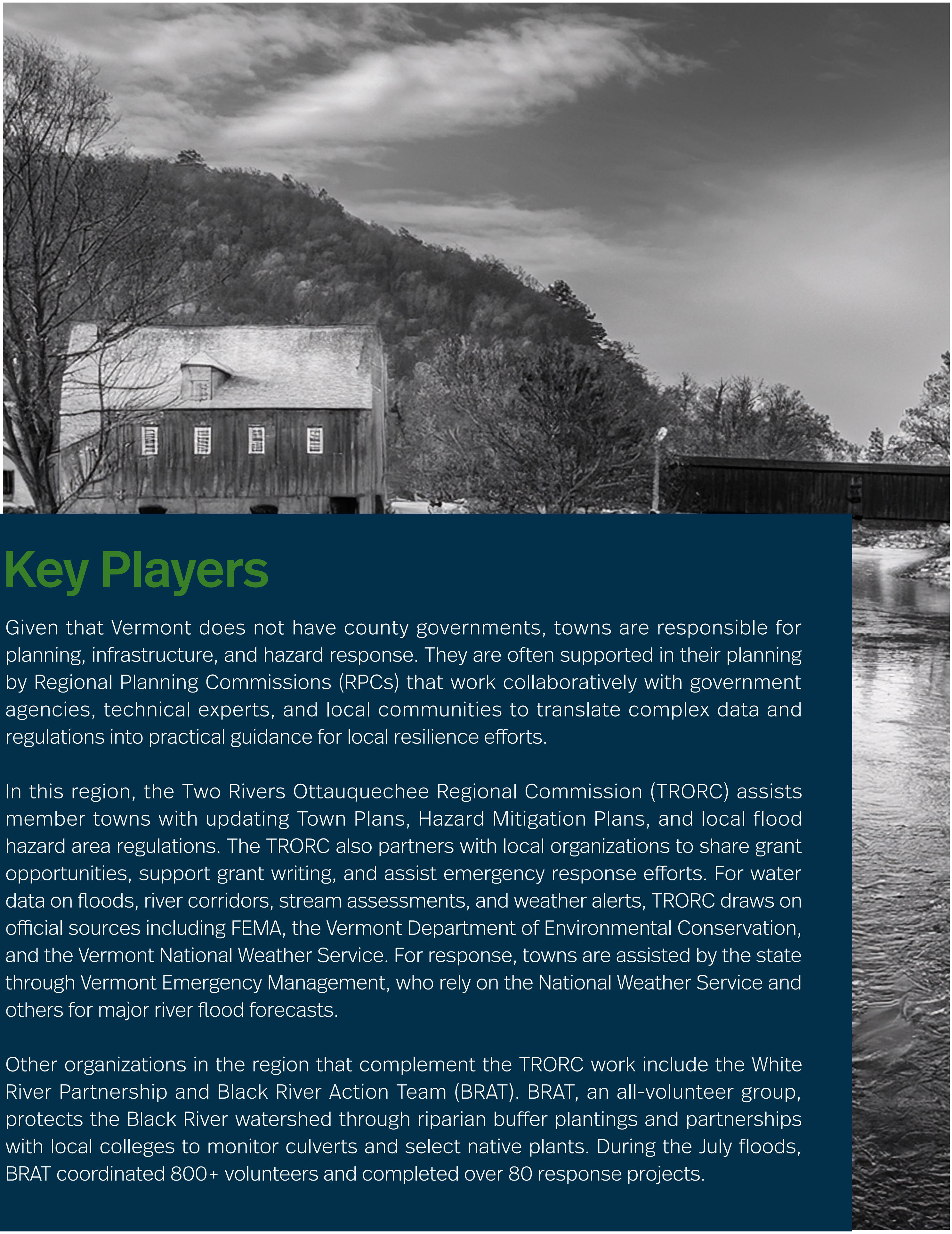
Daniela Rincon-Reyes
Emma Hibbert
Kristin Raub
Robin White
Allison Deese
Shivangi Basu
Members of the Two Rivers-Ottauquechee region

Community Context

The Two Rivers-Ottauquechee region is located in east-central Vermont, covering 30 member towns across the Windsor and Orange counties, plus two towns in Addison and one in Rutland counties. These towns range from tiny hamlets to Hartford, the region's largest settlement, with a population of 10,686 (2020 Census). The region is bordered by the Green Mountains to the west, where both the Ottauquechee and White Rivers flow from, as well as the Connecticut River valley to the east.

The mountainous topography and proximity to major water bodies increase the Two Rivers region's susceptibility to flash flooding and fluvial erosion. Existing development within the floodplain, including homes, municipal buildings, and roads that serve as evacuation routes, has been damaged or inundated in past events. The most recent destructive floods occurred during Hurricane Irene in 2011 and the last two summers (July 2024 and 2023), highlighting the communities' continued vulnerability over the last decade. Irene dumped up to 11 inches of rain over eastern Vermont, sending the Ottauquechee River well above its banks, washing out bridges, and inundating homes. Simultaneously, the White River overflowed across its floodplain, causing widespread road closures and property damage throughout its watershed. Heavy summer storms in July 2023 also triggered flash floods along both rivers, which prompted swift-water rescues in Woodstock and Bridgewater, where local businesses and roadways were submerged.





Key Players

Given that Vermont does not have county governments, towns are responsible for planning, infrastructure, and hazard response. They are often supported in their planning by Regional Planning Commissions (RPCs) that work collaboratively with government agencies, technical experts, and local communities to translate complex data and regulations into practical guidance for local resilience efforts.

In this region, the Two Rivers Ottauquechee Regional Commission (TRORC) assists member towns with updating Town Plans, Hazard Mitigation Plans, and local flood hazard area regulations. The TRORC also partners with local organizations to share grant opportunities, support grant writing, and assist emergency response efforts. For water data on floods, river corridors, stream assessments, and weather alerts, TRORC draws on official sources including FEMA, the Vermont Department of Environmental Conservation, and the Vermont National Weather Service. For response, towns are assisted by the state through Vermont Emergency Management, who rely on the National Weather Service and others for major river flood forecasts.

Other organizations in the region that complement the TRORC work include the White River Partnership and Black River Action Team (BRAT). BRAT, an all-volunteer group, protects the Black River watershed through riparian buffer plantings and partnerships with local colleges to monitor culverts and select native plants. During the July floods, BRAT coordinated 800+ volunteers and completed over 80 response projects.

Challenges and Information Gaps

Interviews with regional planning staff and local decision-makers highlighted that keeping up with the demands of changing water-related threats is challenging, given the limited staff capacity of small towns. Efforts are at times stifled by the high turnover of voluntary town officials, such as emergency managers. Additionally, communicating flood risk both for planning and immediate warning to existing residents, especially in the context of changing river dynamics, is a challenge.

Additionally, within the Two Rivers Ottauquechee region, there are only four gauges serving 30 towns. While a major long-term goal, according to a local planner, would be to avoid building in floodplains, the lack of high-resolution flood models and precipitation data has led to inadequate zoning requirements. Given the insufficient stream gauge data and without a comprehensive knowledge of where water has been and will be, town planners are unable to adequately mitigate flood risks, and Emergency Management Directors have reduced lead times during flood events, essentially relying on personal experience in the last flood. This also means that mitigation projects, like culvert upgrades, can't be prioritized in the most vulnerable areas. This lack of recorded real-time and localized data has also created a perceived lack of trust in flood models and maps. Some local decision-makers noted that existing maps do not accurately map the flood extents observed and experienced by them or capture new risks to properties as rivers change course. There are also areas in the Region where rivers have migrated outside of the mapped FEMA floodplain.

> *Some residents feel that the rivers should be put back to where they used to be, rather than look at the reasons why the river moved and accommodate where it needs to be.*
>
> *- BRAT Volunteer*

FloodSavvy: A National Water Model-derived Tool for Accessible Flood Risk Information and Water Decision-Making

NOAA's National Water Model (NWM) simulates streamflow at 18-hour, 10-day, and 30-day intervals, while also storing 40 years of retrospective data for both gauged and ungauged rivers across the U.S. While stakeholders in Two Rivers-Ottauquechee recognized the value of NWM data, they also noted that its technical complexity creates accessibility barriers for first-time users or users without hydrological expertise.

To address this, our team worked with Two Rivers-Ottauquechee to develop FloodSavvy, a web interface that translates complex NWM outputs into clear, actionable flood risk insights for this community. We also created a beginner-friendly NWM Tutorial: A 101 Guide to Understanding and Using the NWM, available in both PDF and video format, to help new users navigate the model. Both resources were shaped with input from Two Rivers-Ottauquechee stakeholders to ensure they serve as practical, intuitive entry points for applying NWM data to local decision-making. See our project website for more details on FloodSavvy and the co-development process.

After piloting these tools with Two Rivers Ottauquechee stakeholders, they identified several ways they could integrate FloodSavvy and the NWM Tutorial to address the lack of easily accessible, localized water data. They found the tools especially useful for understanding where the water has been and will be for strengthening local flood resilience.

Integrating FloodSavvy's streamflow forecasts and inundation maps for emergency preparedness and project prioritization

FloodSavvy allows users to select their local region and stream reaches of interest. Once a stream or river is selected, users can visualize streamflow forecasts up to eight days in advance, even on ungauged streams prone to flash flooding. It allows users to access forecast data seamlessly, while accessing comparable data on the NWM would require more time and an understanding of the different forecasting datasets. TRORC planners are interested in using this tool on ungauged stream reaches to improve their prediction accuracy and forecast fidelity on small streams. They mentioned this supports emergency planning by helping anticipate the timing and extent of potential flooding and comparing it against other sources, such as the National Weather Service and USGS.

Beyond forecasting, users are interested in applying *FloodSavvy's* pre-computed inundation maps derived from NWM-historical data to prioritize projects, locate critical infrastructure, and strengthen grant applications. FloodSavvy allows users to visualize flood extents at different streamflow levels, which they mentioned could help them identify where upstream interventions could reduce downstream flooding, supporting efforts such as culvert replacements and watershed restoration. TRORC planners see the flood scenarios as a valuable tool to anticipate the scale of events and contextualize past events, such as the 2023 July Floods, against present-day streamflow and flooding. One BRAT volunteer echoed this sentiment by mentioning that they could use these flood maps to assess where they can do the most impactful work.

> I'll use it when thinking about flood warnings... it gives me a direction and I can take that and go, this is an indication that this is worse than that.
>
> \- Regional Planner

> What I would see myself using this for the most is trying to put together a grant application or a proposal....
>
> \- Regional Planner

What Can You Do If Your Area Is Not Covered by FloodSavvy?

The Two Rivers users' experience with *FloodSavvy* demonstrates how NOAA's National Water Model (NWM) can be made more accessible and useful for different types of end-users. In Two Rivers-Ottauquechee, for example, *FloodSavvy* used NWM data to provide expanded access to improved flood forecasting and flood maps for prioritizing mitigation actions. If your community is outside the six currently served by *FloodSavvy*, you can still leverage the NWM in your work. The NWM Tutorial is publicly available and designed for first-time users.

01 Access our NWM Tutorial here.

02 For users interested in the Two Rivers experience, Sections 1–3 walk through how to access streamflow forecasts for both gauged and ungauged rivers via the National Water Prediction Service website. Then Section 5 details how to access Flood Inundation Mapping for covered areas experiencing active or forecasted flooding.

03 Other useful resources include:

- National Weather Service Latest Alerts: Active flood warnings across the U.S.
- U.S. Geological Survey's Water Data: Comprehensive hydrological data at gauged sites.
- U. S. Geological Survey's Flood Inundation Mapper: Interactive flood maps for select gauged sites.

Funding Acknowledgement: *This research was supported by the Cooperative Institute for Research to Operations in Hydrology (CIROH) with funding under award NA22NWS4320003 from the NOAA Cooperative Institute Program. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the opinions of NOAA.*