# Challenges and Opportunities in Bridging Hydrology Research and Practice: Co-Developing FloodSavvy Through Interdisciplinary Collaboration and Community Engagement

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*CIROH DevCon 2026*

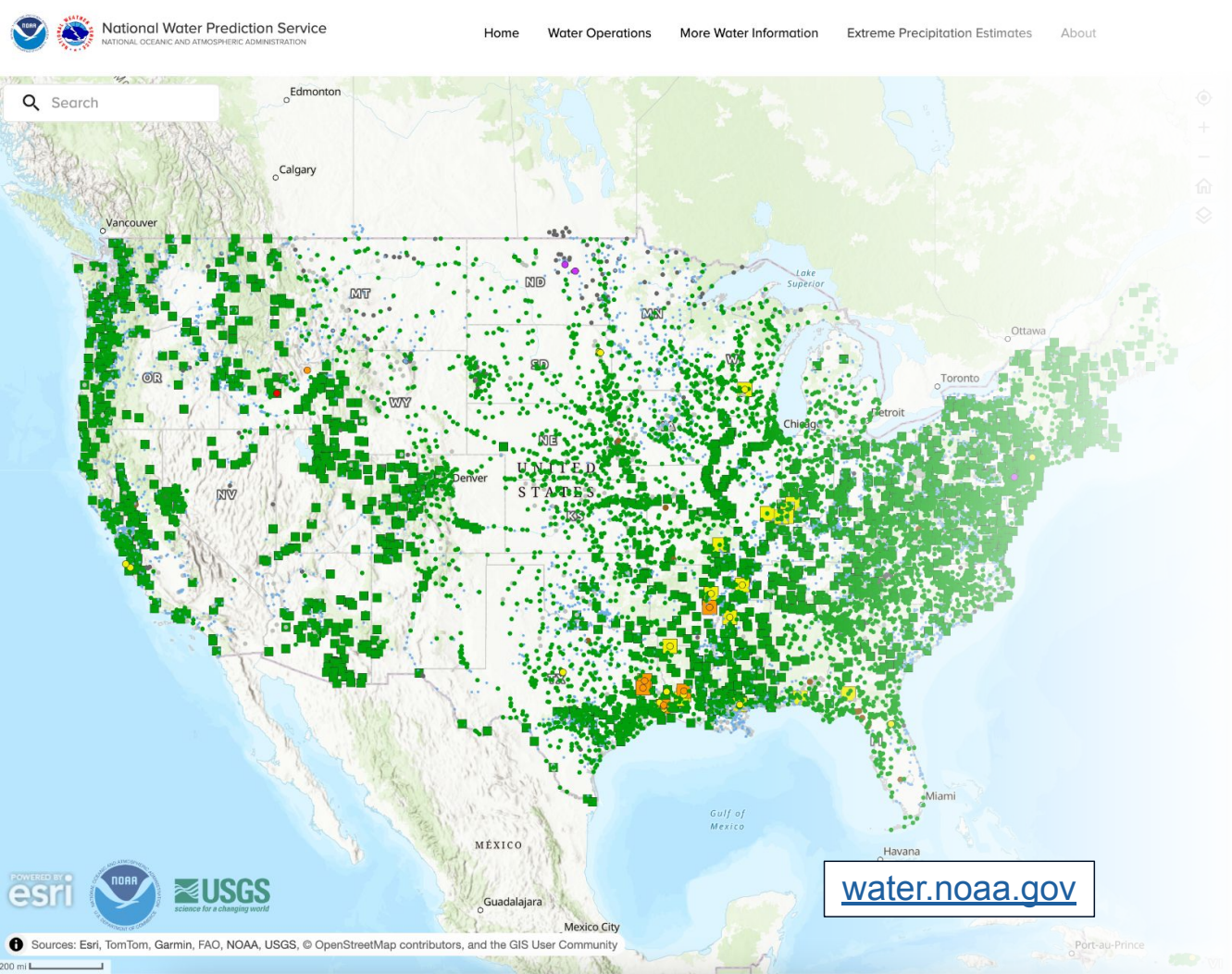
Global Resilience Institute at Northeastern University

CUAHSI allied for water science

# Workshop Overview

1. **Who needs streamflow data** - and why it’s hard to access
2. **Activity** - NWM vs FloodSavvy
3. **Co-developing FloodSavvy** - process and team
4. **Brainwriting & Discussion** - your work, barriers, needs


Project Background




## *Research Question:*

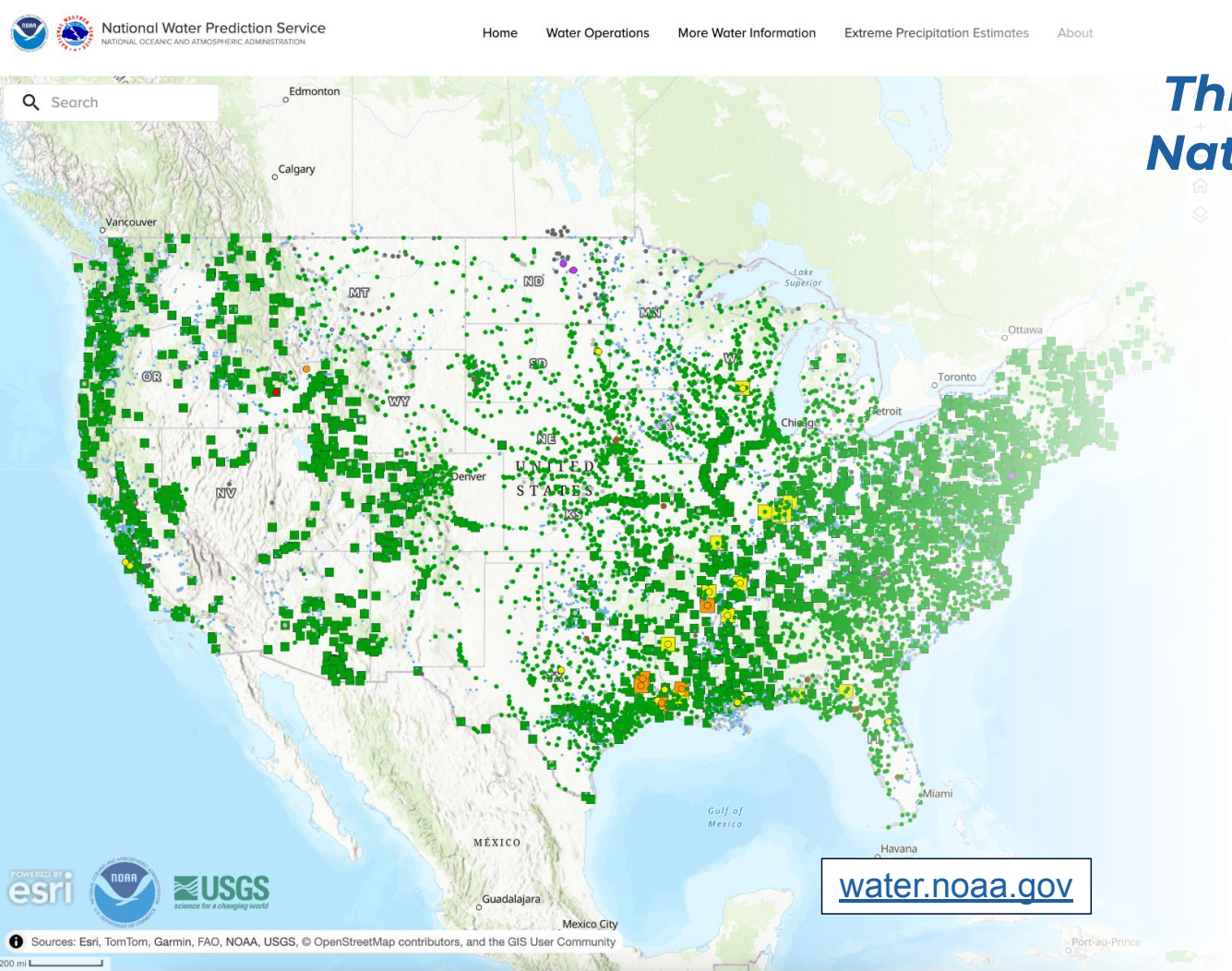
How can NOAA's National Water Model (NWM) be used to aid community resilience planning and water decision-making?

# Who actually needs flood data - and can’t get it

**Three real decision makers:**

1. **The Regional Planner, Vermont** — Works with small towns to update Hazard Mitigation Plans and apply for FEMA grants. Relies on a single stream gauge for an entire watershed. When the gauge was removed, the region lost its only window into what the river was doing. Not a hydrologist.
    a. Needs to know: where is flood risk highest, and how do I justify a mitigation project?
2. **The Park Superintendent, Missouri** — Manages 4,294 acres and over 1 million visitors a year at Roaring River State Park. Flash floods can reach campgrounds in minutes. He described himself as "the guy who has to get up in the middle of the night and get people out." Not a hydrologist.
    a. Needs to know: is a flood coming, and do I evacuate now?
3. **The Floodplain Administrator, DeSoto MO** — Manages buyout programs and emergency notification for a small city on Joachim Creek. Flooding occurs outside mapped floodplains. Relies on a single USGS gauge and local knowledge. Not a hydrologist.
    a. Needs to know: which areas are most at risk, and how does this event compare to past floods?

*All of them want NWM data.*




# *This data exists - the National Water Model*

- 40 years of retrospective streamflow data
- Forecasts up to 30 days
- Coverage of gauged and ungauged rivers nationwide
- New FIM services

# **Activity 1**: NWM vs FloodSavvy

# Scenario Exercise: Part 1 - NWM

**Background:** Imagine you're an emergency manager who lives near the Black River, which flows through the town of Ludlow in southern Vermont (Mount Ascutney Region). Your region has very few stream gauges, so you can't rely on gauge data to know whether the river is at risk of flooding. You want to know what the river is likely to do over the next 8–10 days and whether you should prepare for a response.


**The Task:**

1. Go to water.noaa.gov
2. Locate a 8-10 day ensemble streamflow forecast for the Black River
3. Assess whether you think a flood response is warranted

**Background:** You are a regional planner with the Windham Regional Commission in southeastern Vermont, helping member towns update their Hazard Mitigation Plans. You want to understand the historical streamflow record for the Saxtons River, a stream with very limited gauge coverage, to identify past flood trends and inform which areas should be prioritized for mitigation investments.

**The Task:**

1. Go to water.noaa.gov
2. Locate historical streamflow data for the Saxtons River
3. Has the Saxton River had any flood events in the past 10 years may be notable for a HMP?


# DISCUSSION

1. What was your experience finding and using the information from the NWM and NWPS?
2. Were you able to find the information you sought for both scenarios?
3. What steps did you take to reach the information?

# Scenario Exercise: Part 2 - FloodSavvy

**Background:** Imagine you're an emergency manager who lives near the Black River, which flows through the town of Ludlow in southern Vermont (Mount Ascutney Region). Your region has very few stream gauges, so you can't rely on gauge data to know whether the river is at risk of flooding. It's July 1st 2025, and you want to know what the river is likely to do over the next 8–10 days and whether you should prepare for a response.


**The Task:**

1. Go to FloodSavvy: https://floodsavvy.cuahsi.io/#/
2. Locate a 8-10 day streamflow forecast for the Black River in July 2025
3. Assess whether you think a flood response is warranted

**Background:** You are a regional planner with the Windham Regional Commission in southeastern Vermont, helping member towns update their Hazard Mitigation Plans. You want to understand the historical streamflow record for the Saxtons River from Jan 1, 2021 - Dec 31, 2025, a stream with very limited gauge coverage, to identify past flood trends and inform which areas should be prioritized for mitigation investments.


**The Task:**

1. Go to FloodSavvy: https://floodsavvy.cuahsi.io/#/
2. Locate historical streamflow data for the Saxtons River
3. Has the Saxton River had any flood events between 2021-2025 that may be notable for a HMP?

# Scenario Exercise: Part 2 - FloodSavvy

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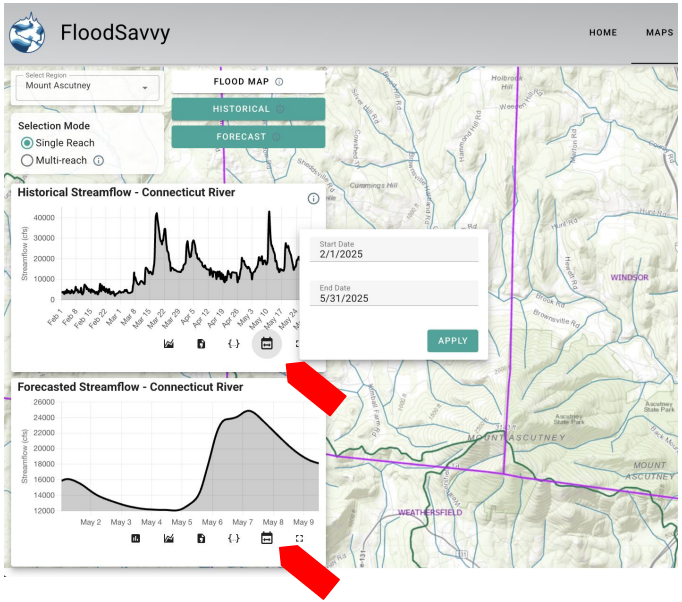
**NOTE:** Adjust date range icon looks like this





# DISCUSSION

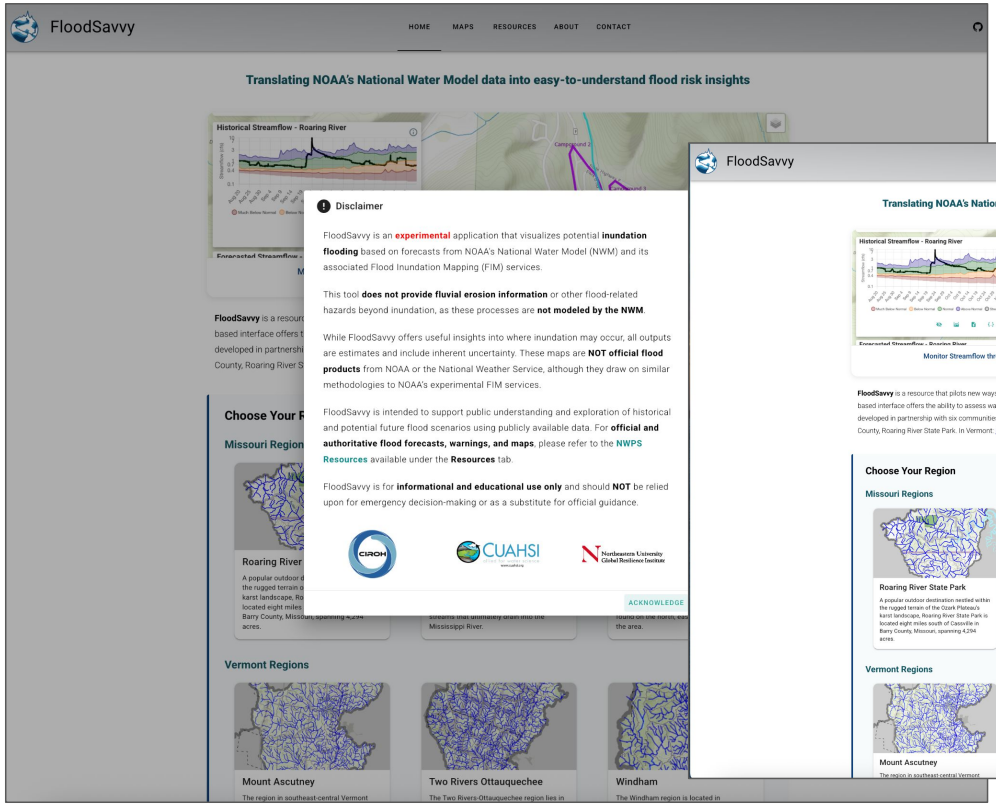
1. What was your experience finding and using the information on FloodSavvy?
2. What was different between using the NWM and using FloodSavvy when locating the information?
3. In your opinion, what decisions would the NWM better support and what decisions would the FloodSavvy better support?

# FloodSavvy Overview

# FloodSavvy Overview: Landing Page

Disclaimer language - experimental product

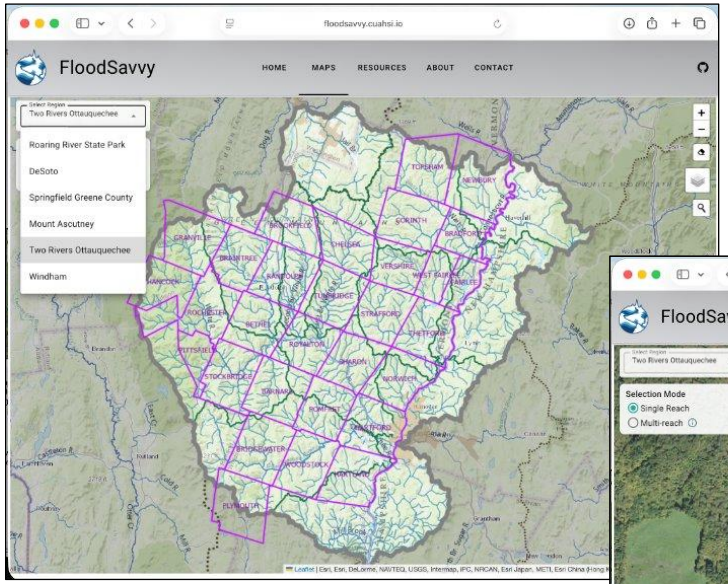
Home page offers easy site selection



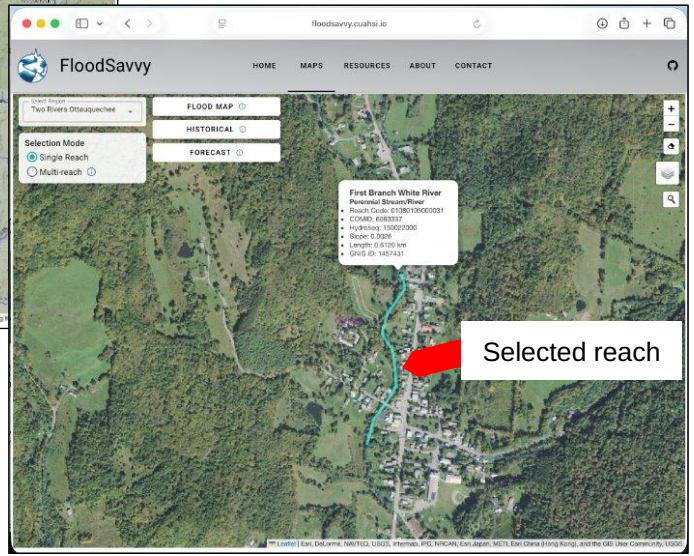
# FloodSavvy Overview: Localized Data

Site-specific map interface provides focused, relevant, and actionable information.

River metadata is made available through web services.



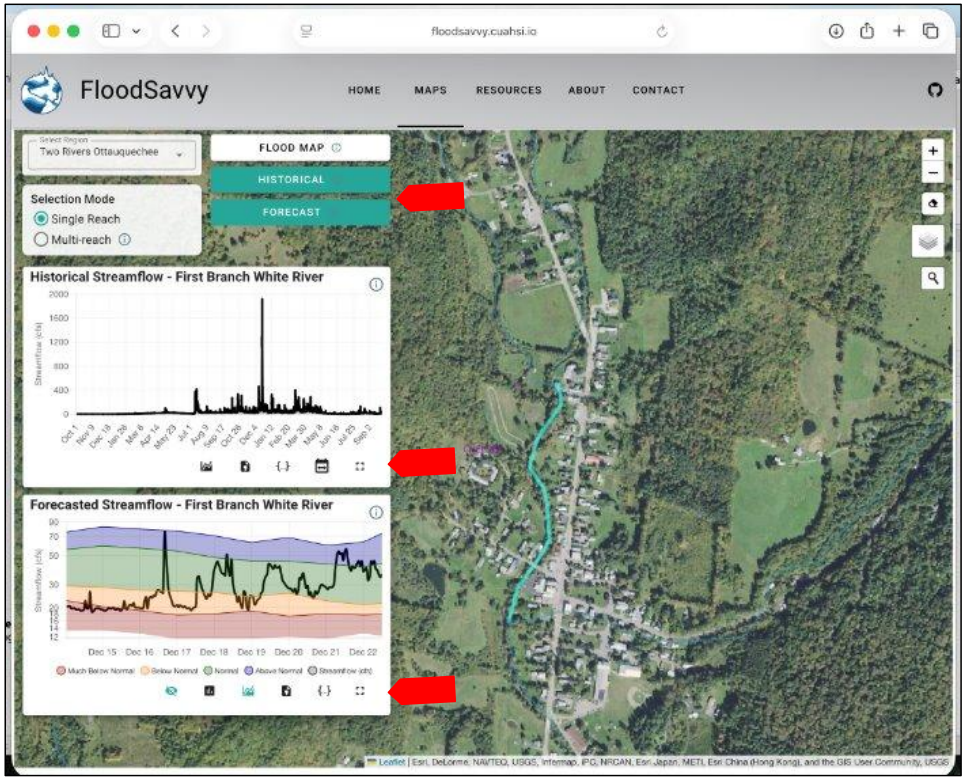

First Branch White River
Length: 0.6km



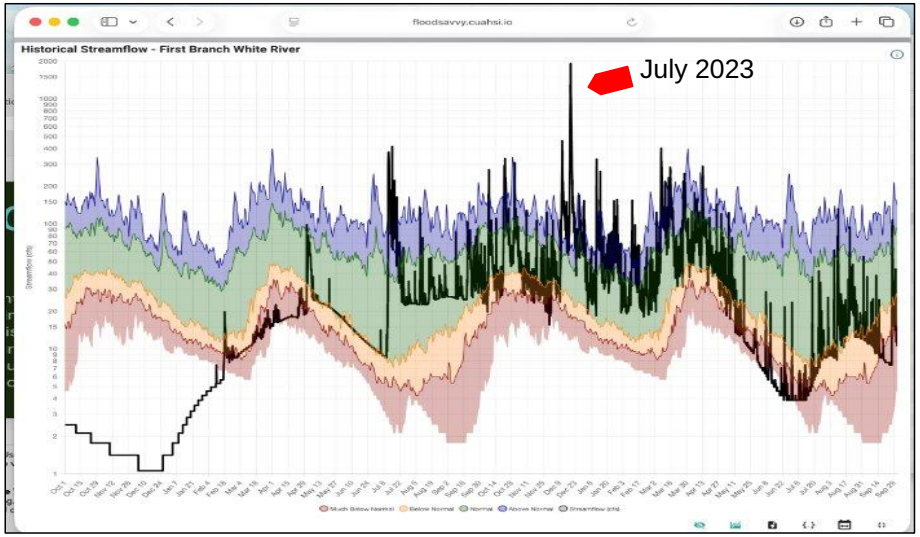
# FloodSavvy Overview: Time-Series Data

Interactive time series visualizations helps understand past, current, and future conditions.

Historical streamflows are available from 2018 - 2025.

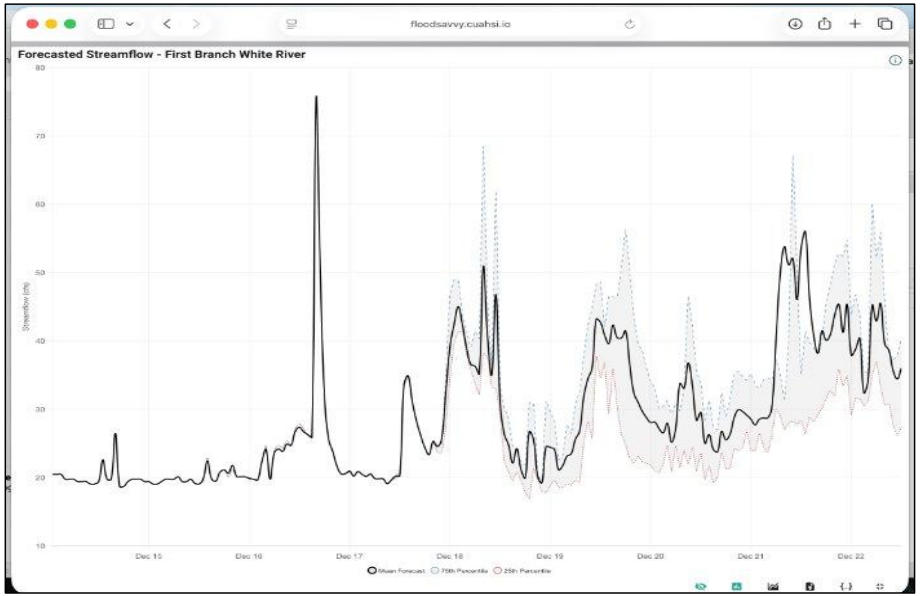


# FloodSavvy Overview: Time-Series Data



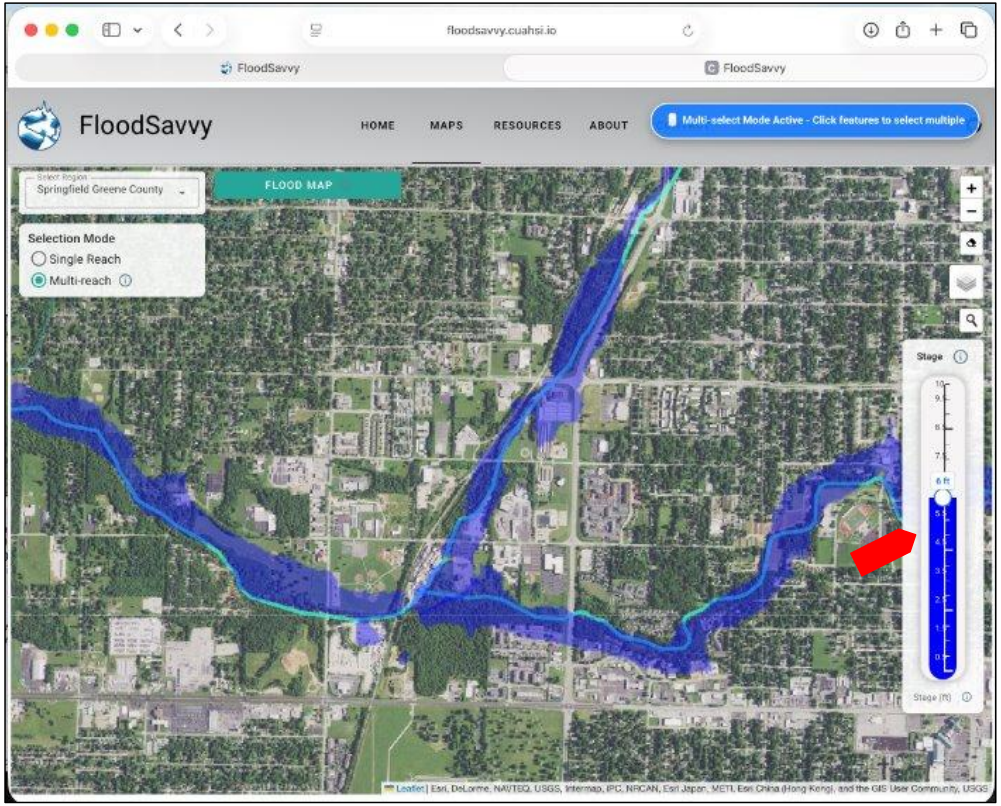

Users can view how modeled streamflow compares to past, modeled, streamflow trends.

A measure of statistical dispersion, representing the range which middle 50% of the ensemble data lie.

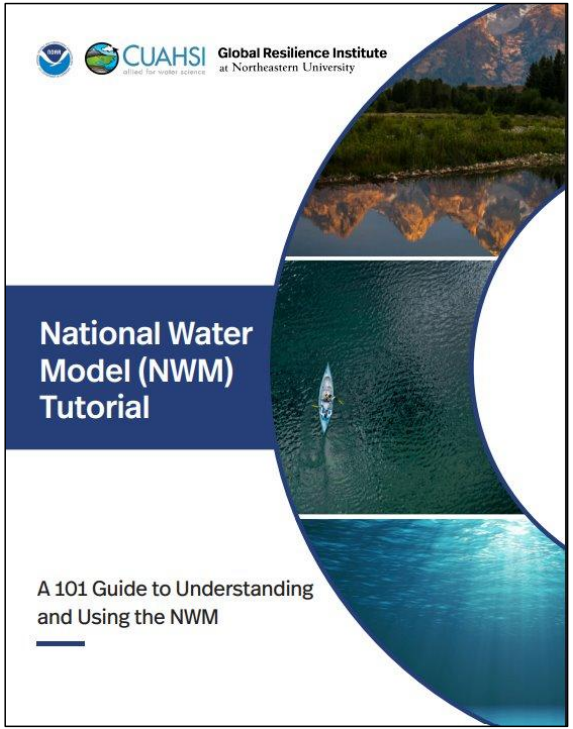


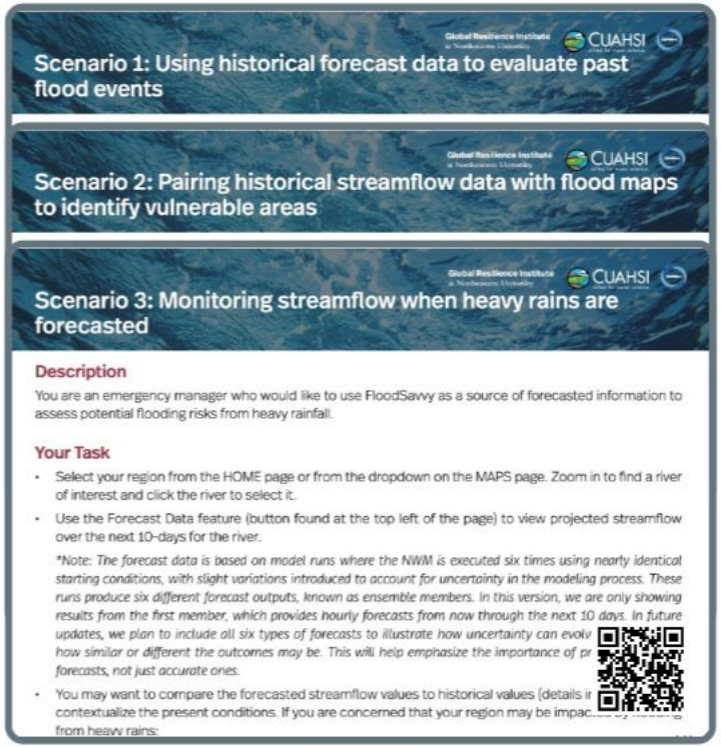
# FloodSavvy Overview: Flood Maps

Interactive, on-demand visualization of pre-generated flood extents for scenario analysis and identification of vulnerable areas.



# FloodSavvy Overview: Tutorials & Resources

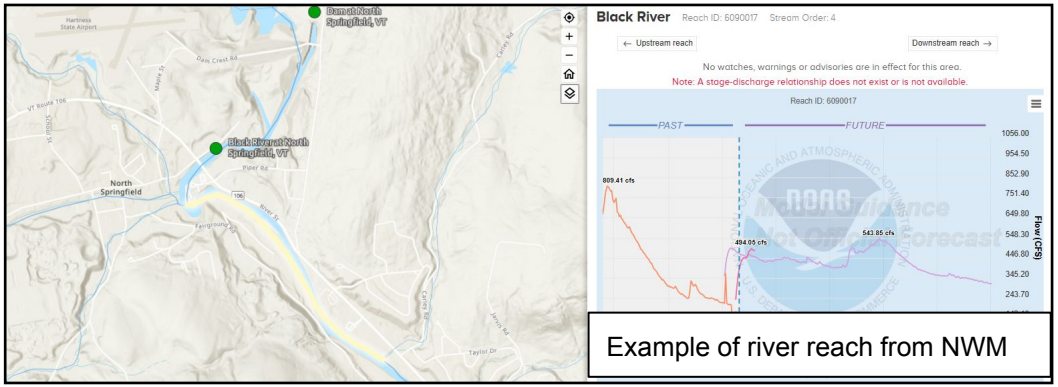


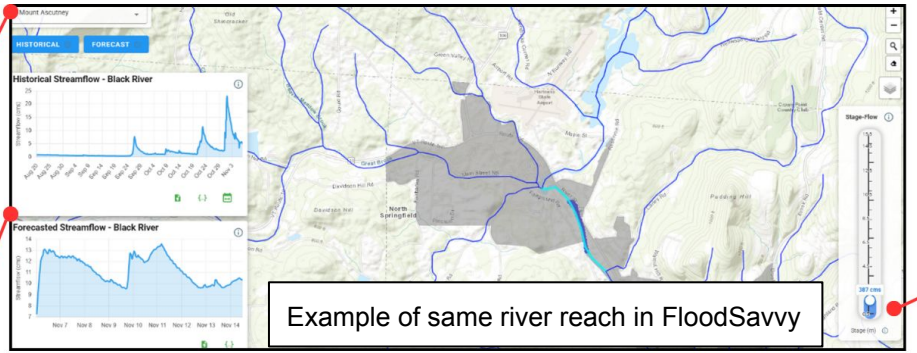
# We did not simplify the NWM, we translated it.

The same rigorous data. A different format designed for how local decision-makers actually make decisions.

How did we do this and how might you be able to do something similar in your work?




Example of river reach from NWM




Example of same river reach in FloodSavvy

Dropdown Menu to Select Region

Simple hydrographs of historical and forecasted streamflow

Adjustable streamflow scenarios to visualize flood inundation scenarios

# Project Background

## PHASE 1

How does resilience planning operate in practice?

How can the NWM support this work?

**Main finding:** 65% of stakeholders had never heard of the NWM, but after they had, many had ideas for how they could use it.

## PHASE 2

How could outputs from the NWM be utilized by six stakeholder groups in their resilience planning work?

**Main finding:** There was a range of uses and users. Accessibility challenges arose when users desired technical applications of NWM data but did not have the expertise.

## PHASE 3

How can accessibility challenges to using NWM data in community resilience planning be overcome?

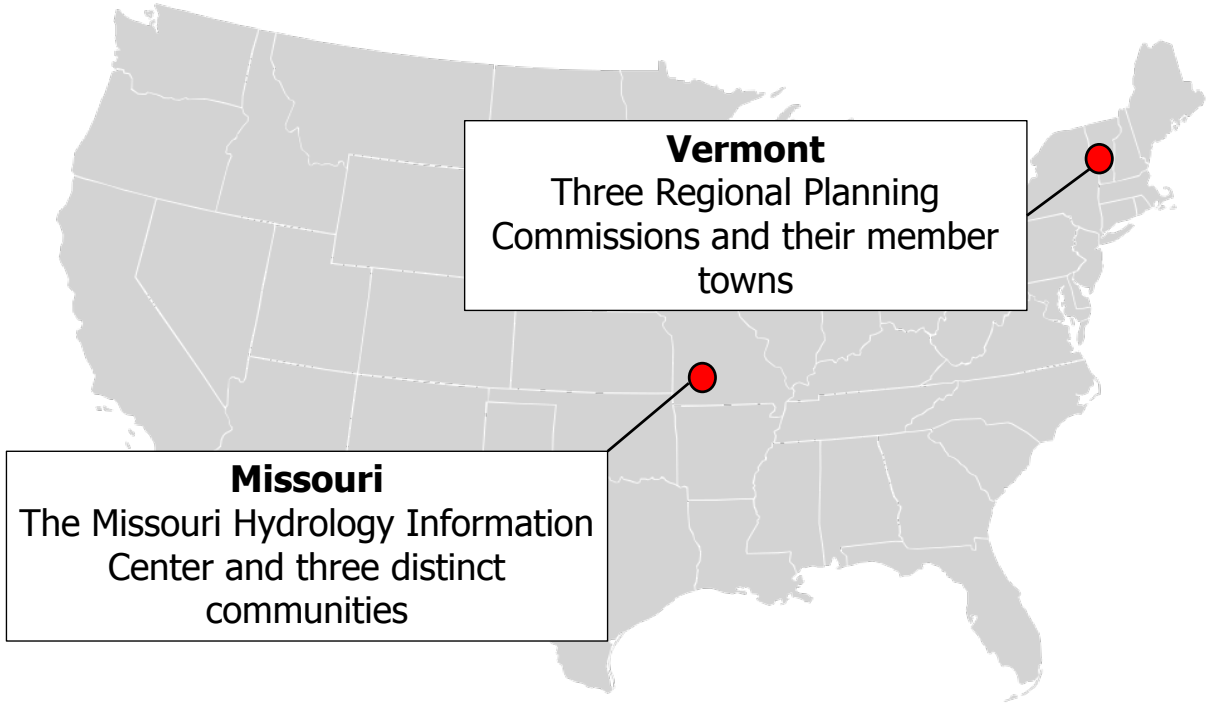
Investigate, co-develop, and pilot solutions

**Main finding:** Two co-developed supplementary resources were needed for diverse users to access NWM data: *FloodSavvy* & a NWM Tutorial.

# Co-Developing FloodSavvy

# Who did we work with?

## Community Partners



**Vermont**
Three Regional Planning Commissions and their member towns

**Missouri**
The Missouri Hydrology Information Center and three distinct communities

## Research Partners

Northeastern University
Global Resilience Institute

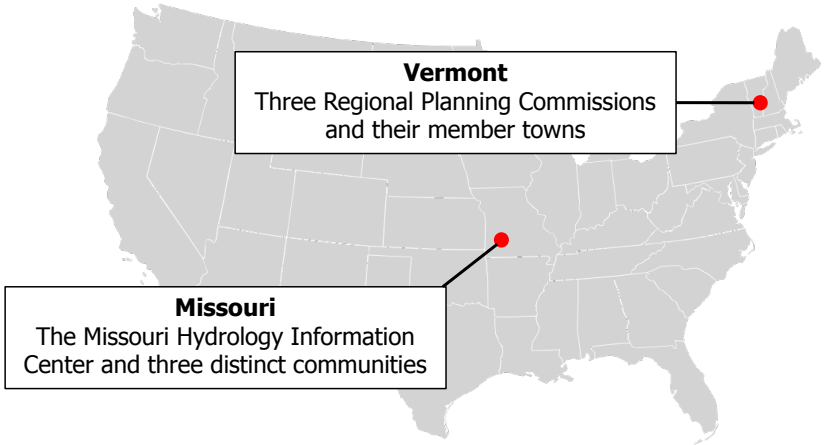
CUAHSI
allied for water science
www.cuahsi.org

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

# Co-Development Process

**1.) Interviews**
Conducted interviews to understand local water hazards, decision-making contexts, information gaps, as well as opportunities to use the NWM.

**2.) NWM Deep Dive**
Organised a virtual training session to establish a baseline understanding of the NWM and its potential applications.




**3.) Collaborative Sessions**
Facilitated community discussions to refine ideas for how the NWM could be used and what supplementary resources could enable this use.

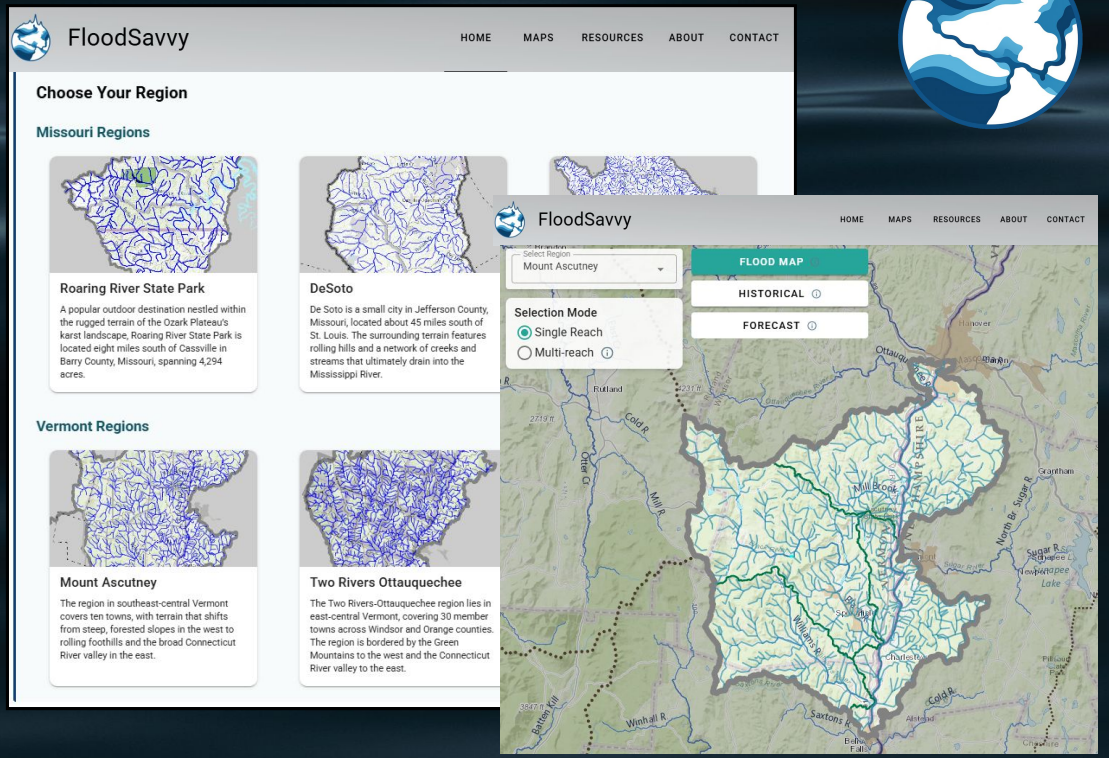
# Matching Community Needs with Key Capabilities

| | Capability | Tailored Map Interface | Flow Time Series | Flood Extents | Other Hydro - Information | Download Results | Vulnerable Areas | Tutorials | Compare Other Sources |
|---|---|---|---|---|---|---|---|---|---|
| Missouri | DeSoto | ■ | ■ | ■ | | ■ | ■ | | ■ |
| | Roaring River | ■ | ■ | ■ | | ■ | ■ | ■ | ■ |
| | Springfield | ■ | ■ | ■ | ■ | ■ | ■ | | ■ |
| Vermont | Mt Ascutney | ■ | ■ | ■ | ■ | | | ■ | |
| | Two Rivers | ■ | ■ | ■ | ■ | | ■ | ■ | |
| | Windham | ■ | ■ | ■ | ■ | | ■ | ■ | |

■ Requested Capability

# Introducing FloodSavvy

A web interface that translates NOAA's National Water Model data into easy-to-understand flood risk insights.



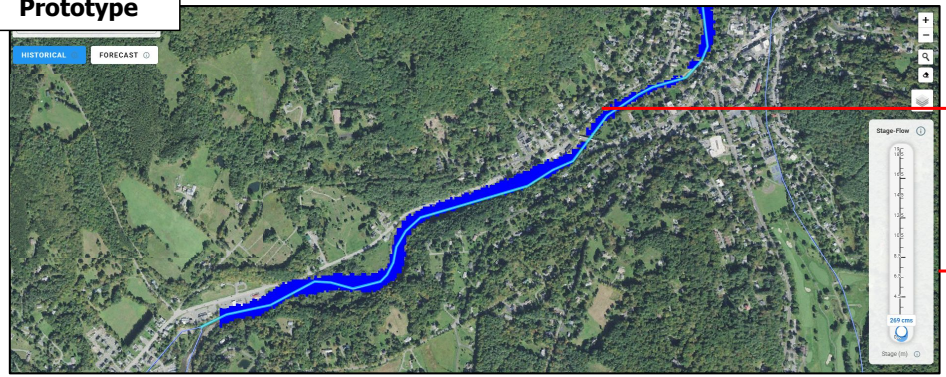
# Co-Development Process

**4.) Co-Development ~ Initial Prototype**

After proposing the idea of *FloodSavvy*, the web interface was developed with frequent stakeholder input through:

- virtual meetings,
- biweekly update emails,
- a soft launch where access to the tool was shared.

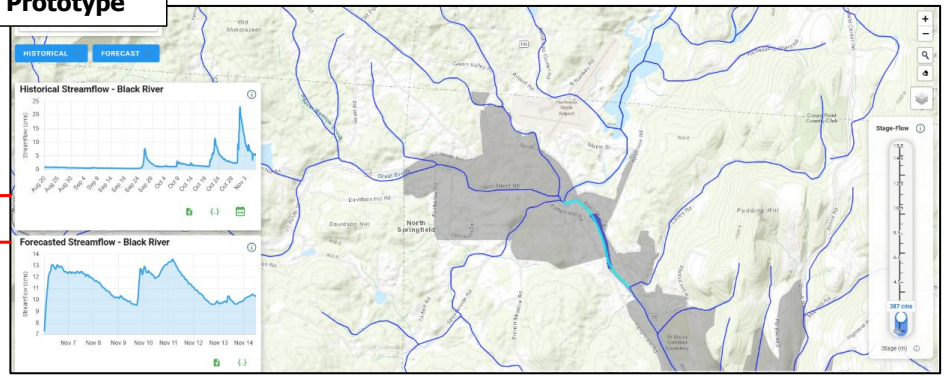
**Prototype**




Flood Extent Visualizer

Interactive Slider

**Prototype**

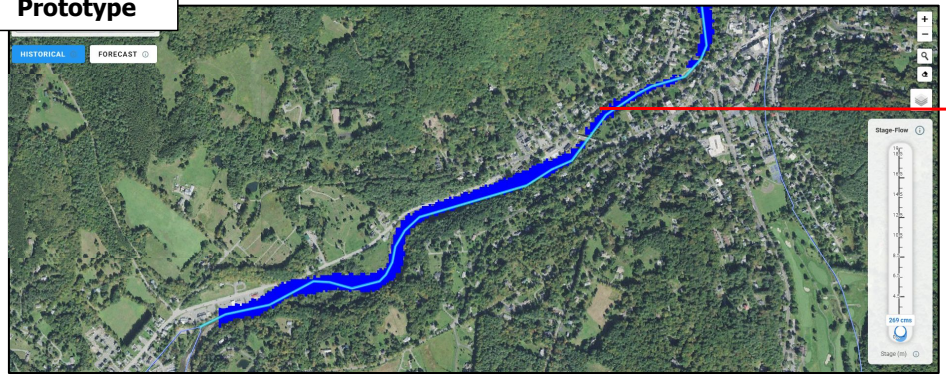



Historical & Forecasted Streamflow

# Co-Development Process

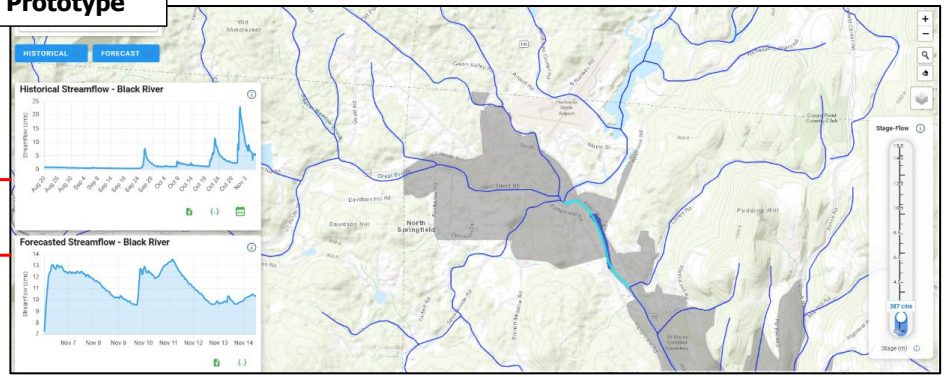
**5.) Co-Development ~ User Testing**
We conducted semi-structured user testing to refine *FloodSavvy's* capabilities and improve the website's usability. After incorporating this feedback, *FloodSavvy* was formally launched at an online event.

**Prototype**




Non-transparent flood extent + can only select one segment.

**Prototype**




Lack of context on what these streamflow values mean

# Co-Development Process

**5.) Co-Development ~ User Testing**
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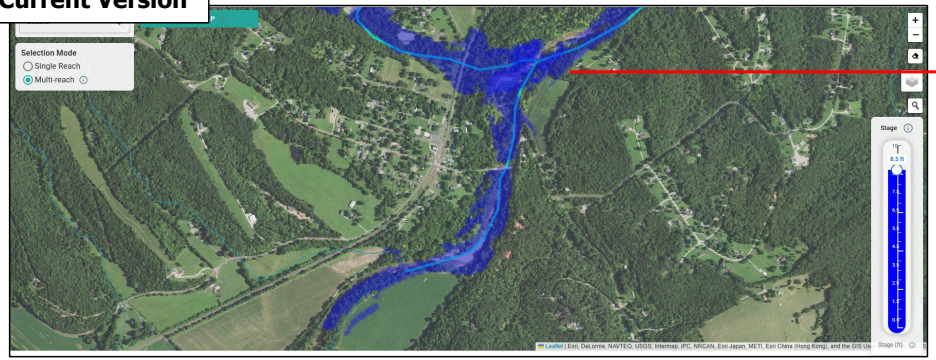
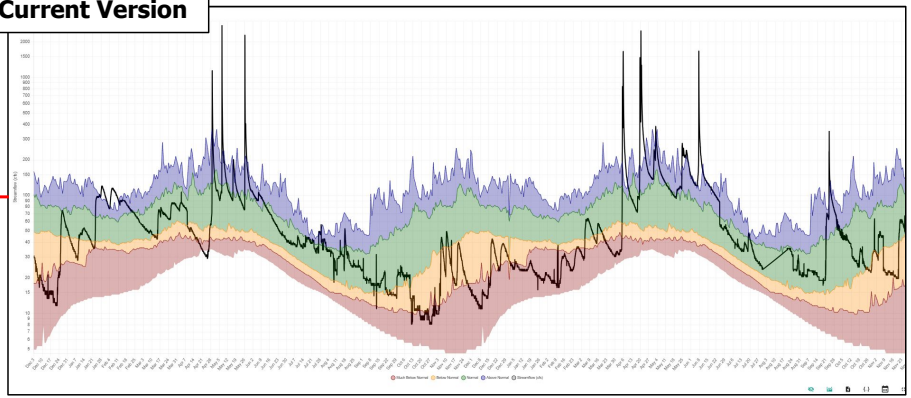
**Current Version**




Transparent flood extent + option to select multiple segments.

**Current Version**

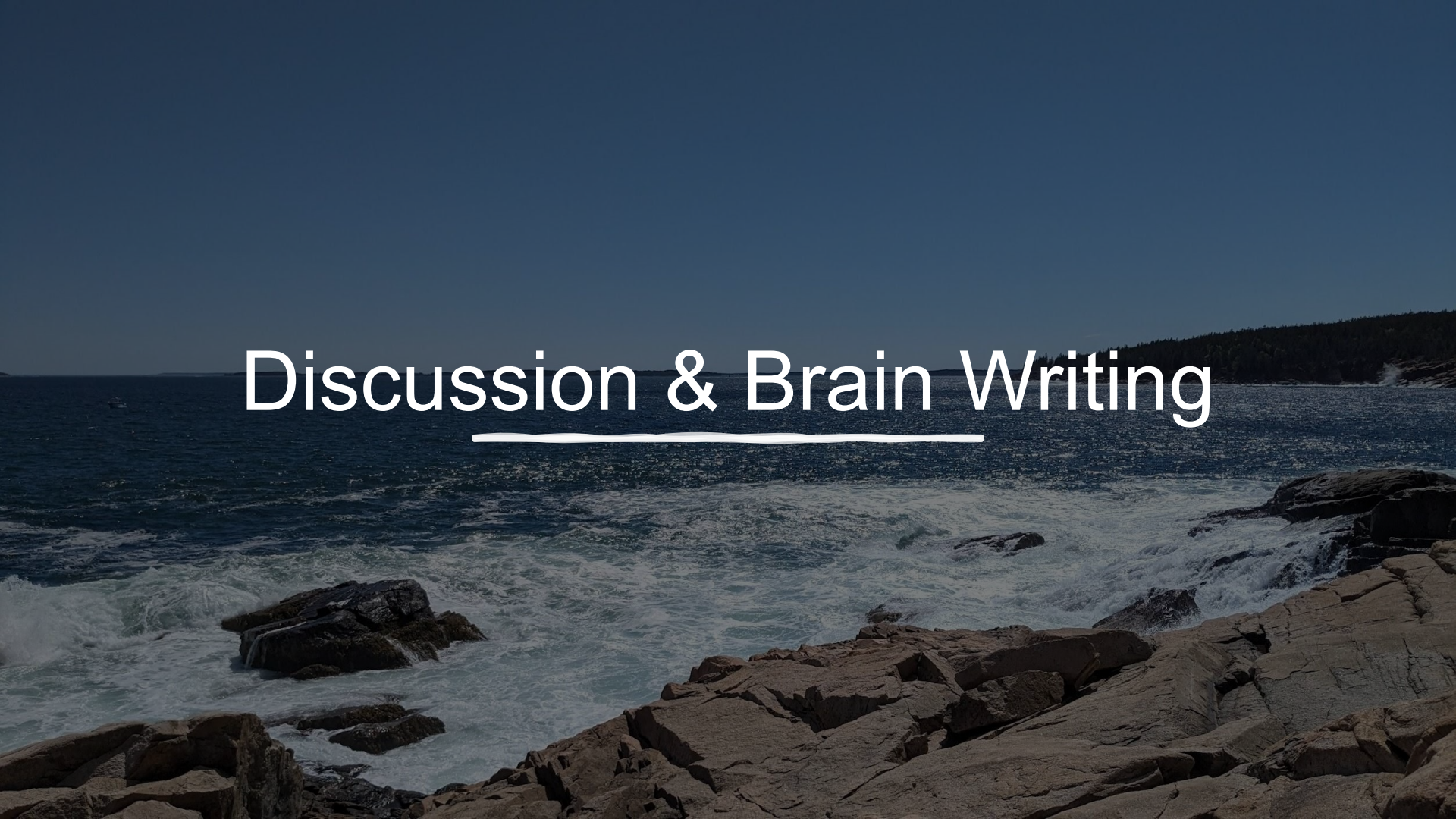


Option to view historical quantiles to provide context

# Why this project required two (really 4) kinds of expertise?

| Social Science (GRI) | Hydrology (CUAHSI) |
|---|---|
| Led stakeholder engagement | Built the technical platform |
| Conducted interviews and collaborative sessions | Ensured hydrologic science rigor and data integrity |
| Shaped narrative content and user guidance | Translated NWM outputs into accessible formats |
| Understood how decisions are actually made | Understood what the data could and couldn't do |

***Neither alone would have been sufficient. Neither would have known what to build without the community partners. And none of it would have been possible without NOAA.***


Discussion & Brain Writing

# Brain Writing Session

Type answers to the following questions in the following document. The Google Doc has a separate tab for each question.

**Link: https://tinyurl.com/bwtciroh**

# Discussion Questions

1. What is your experience with community or end-user engagement? Who were those groups, what level of engagement did you employ? What went well or not so well?
2. What has been your experience with interdisciplinary collaboration, especially across the social and hydrologic sciences? What went well or not so well?
3. What are the biggest challenges, barriers, or questions you have — or have seen others have — about engaging communities and end-users or collaborating across disciplines?
4. Given those challenges — what could CIROH do to better support you in doing this kind of work?

**Link: https://tinyurl.com/bwtciroh**

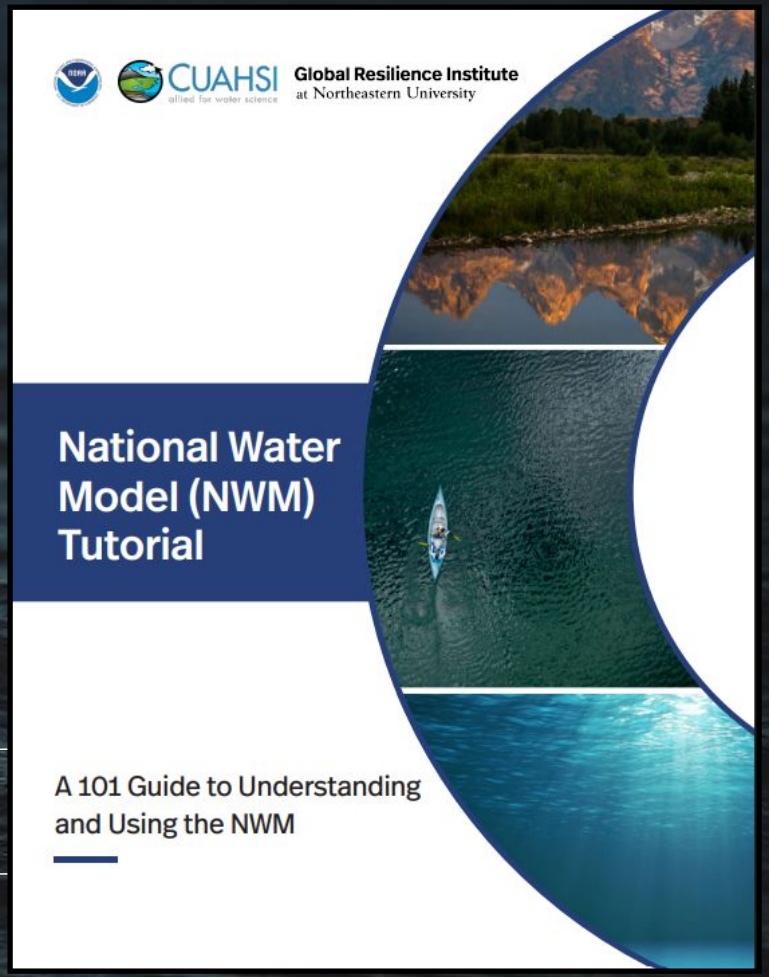

Want to learn more?

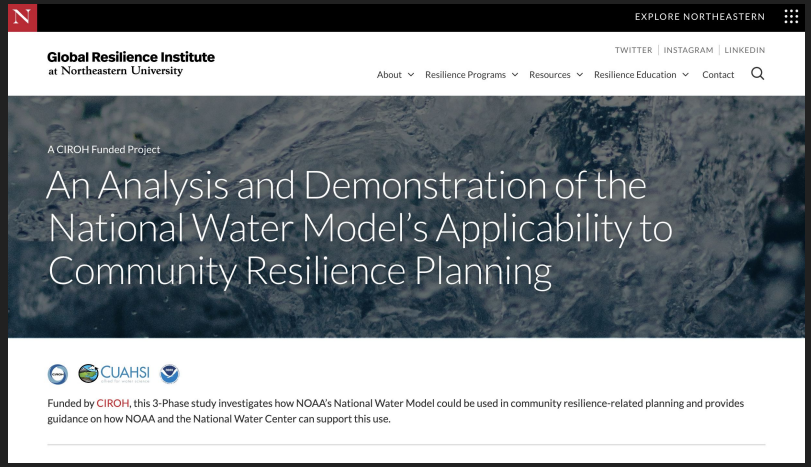
# FloodSavvy

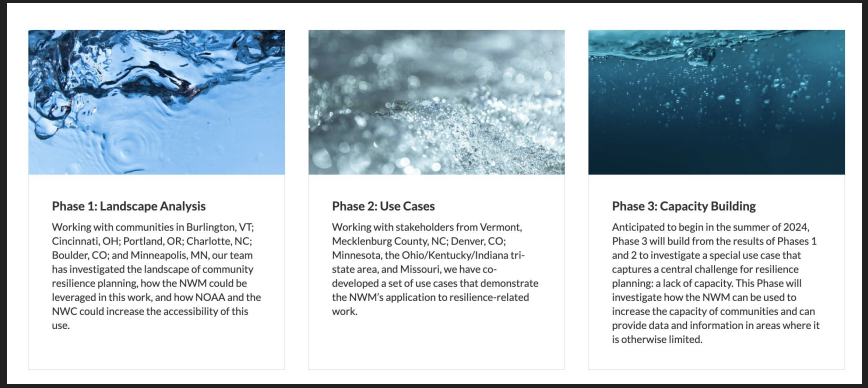
https://floodsavvy.cuahsi.io/#/

# NWM Tutorial

Link to the tutorial






# Study Website

https://tinyurl.com/NWM-ResilienceStudy

# Thanks to our team!

PI (GRI): Dr. Kristin Raub
Co-PI (CUAHSI): Dr. Anthony Castronova
Co-PI (GRI): Dr. Stephen Flynn

CUAHSI Collaborators: Dr. Irene Garousi-Nejad
Devin Cowan

GRI Collaborators: Dr. Robin White
Daniela Rincon-Reyes
Emma Hibbert
Shivangi Basu
Nalini Gunawardena

*A special thank you to our community collaborators in Vermont and Missouri - this project would not have been possible without you!*

Thank you to our collaborators from NOAA for contributing their time and expertise!

NOAA Collaborators: David Vallee
Brian Cosgrove
Juzer Dhondia
Cecelia Batterbee
Emily Crisci
& many more!

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CUAHSI allied for water science
CIROH
NOAA

# Thank you!


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