

# Science to Advance Freshwater Ecosystem and Community Resilience in the Appalachians (SAFER Apps):

*A National Science Foundation Planning Grant*



**Flooding is rapidly becoming one of the most widely experienced, deadliest, and costly natural disasters threatening our economy, well-being and security.** In this project, we seek to bring more attention to forecasting floods and their impacts in steep, mountainous terrain and the opportunities that nature-based solutions (NBS) afford for improving flood resiliency.

## THE CHALLENGE

- Mountains play a disproportionately large role in providing freshwater ecosystem services compared to lower lying regions, as Earth's so-called "water towers" and the headwaters of river systems.
- Mountains are key biodiversity hotspots, under severe threat by climate change.
- Flooding in mountainous terrain can be especially destructive, as it initiates dynamics that generate impacts to downstream communities, biodiversity, and other ecosystem services.
- Managing flood risks in mountain environments is challenged by uncertainty in how disturbances interact with climate change, which in itself is driven by the lack of basic data and robust forecasting models in headwater systems.

## OUR GOAL

Develop capacity for the integration of flood risk prediction science and NBS deployment that is responsive to community needs and builds resilience for highly vulnerable, rural communities of mountain regions, using the Appalachians as a model mountain system.

## WHY THE APPALACHIANS?

The Appalachian Mountains **provide water to tens of millions of people** in the eastern and mid-western US, including the Boston, New York, Washington DC, Pittsburgh, Louisville, and Atlanta metro areas.

Small towns, gateway cities, and rural communities throughout the Appalachians have endured **extreme climate-related disruption**. Many Appalachian communities struggle to prepare for future climate risks.

We aim to use the Appalachian mountain chain as a model system to understand the risks experienced by freshwater ecosystems and human communities in mountain settings.



## Project Approach, Participation, and Partnerships

### WHAT IS THIS NSF PLANNING GRANT?

It supports community-driven research partnerships on Earth system hazards to develop actionable solutions that reduce risk and increase social and ecological resilience.

This planning grant brings together University of Vermont, Penn State University, and West Virginia University to build on momentum in these states and across institutions to accelerate the integration of river science, prediction tools, and nature-based solutions deployment. We focus on two types of work: convening activities and compilation of relevant flood damage data.

Our approach involves learning, partnership development, relationship building, co-production of research questions, and the ideation of appropriate models, tools, and solutions to build resilience to flooding, using three states (PA, VT, WV) in the Appalachian Mountains as the testbed.

This project aims to build partnerships across academia, NGOs, and governance and planning entities.



### Join Us

We invite interested conservation organizations, community members and leaders, emergency management personnel and others to join us in this effort.



#### Virtual Roundtables

Kicking off in January 2025. An opportunity to learn and contribute ideas on needs to advance resilience to flood hazards, conducted via [online webinars and discussions](#).



#### Field Trips

Planned for summer (in Vermont) and fall (in West Virginia) 2025. Engage with communities and decision makers on flood experiences in mountain settings.



#### Workshop

Planned for January 2026. Contribute to the development of plans to integrate river science, flood prediction tools, and nature-based solutions deployment in mountain settings.

### Principal Investigators and Project Leads

*This project is supported by the National's Science Foundation's new program: Confronting Hazards, Impacts, and Risks for a Resilient Planet.*

**Beverley Wemple**, University of Vermont, lead PI -- [beverley.wemple@uvm.edu](mailto:beverley.wemple@uvm.edu)

**Robert Nicholas**, Penn State University, PI -- [rob.nicholas@psu.edu](mailto:rob.nicholas@psu.edu)

**Nicolas Zegre**, West Virginia University, PI -- [nicolas.zegre@mail.wvu.edu](mailto:nicolas.zegre@mail.wvu.edu)

*Indicate your interest in joining this effort by email to the principal investigators or write to [wri@uvm.edu](mailto:wri@uvm.edu) and place SAFER Apps in the subject line.*