

# Utilizing University Partnerships in Hazard Mitigation Planning

FEMA Region 3 Coffee Break Webinar Series | November 23, 2022

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Lisa Iulo, Associate Professor of Architecture, Director, Hamer Center for Community Design, Penn State Initiative for Resilient Communities

Virginia Silvis, Ph.D., Postdoctoral Scholar, Earth and Environmental Systems Institute, Pennsylvania State University

Have you partnered  
with higher education  
institutions on planning  
efforts?



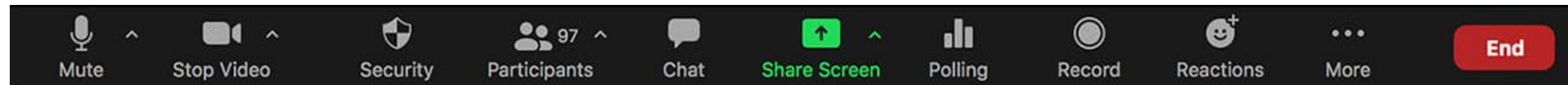
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# Zoom Technology Tour

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# Welcome and Overview

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- Presentation Agenda
  - FEMA Overview
  - A State's Perspective (Pennsylvania Emergency Management Agency)
  - West Virginia University Supporting Hazard Mitigation Projects
  - University of Maryland's Crisfield Flood Adaptation Assessment for Enhanced Community Resilience
  - Penn State Initiative for Resilient Communities
- Wrap-Up and Q&A
  - Future Coffee Break Webinars
  - Receiving Professional Credits



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# Mari Radford

Community Planning Section Supervisor

Mitigation Division

FEMA Region 3

## Higher Education Institutions and Mitigation Planning

- Bringing the right resources to the table is vital to your hazard mitigation plan.
- Higher education institutions have unique resources (labor, data, financial) to assist with plan development and implementation.
- Include colleges and universities on your hazard mitigation planning team.



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# Five Year Hazard Mitigation Plan Lifecycle

- Include universities early in the planning process.
- Year 1-3: Action-oriented to reduce risk, prioritize actions, associate funding streams, and find responsible people and agencies.
- Year 4-5: Links key planning partners to find vulnerabilities, capabilities, and overall risk.



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## Collaborating During Plan Development

- Have faculty/students, programs, data and current studies that reflect highly-relevant specialized knowledge:
  - Natural and man-made hazards
  - Population, housing, and employment
  - Economics
  - GIS and data management
  - Visualizations
  - Land use and development
  - Security, public safety, and emergency management





## Partnering During Plan Implementation

- Hold annual plan reviews.
- Work together on presentations at related conferences or events.
- Provide educational trainings that help to carry out actions.
- Make use of online presence for hazard mitigation information and resources.
- Use academic financial resources.
- Utilize existing data to drive mitigation actions.



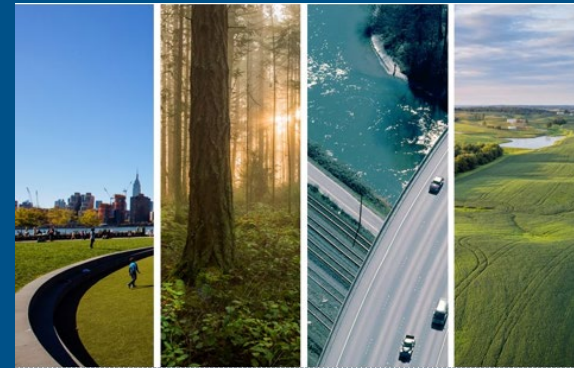
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## Put Them on Your Team!

- The new [Local Mitigation Planning Policy Guide](#) has new requirements, including:
  - Giving organizations that represent socially vulnerable populations a chance to participate (page 13).
  - Giving academic stakeholders a chance to participate (page 19).
  - New language about climate change and equity (pages 5 and 23).



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### State Mitigation Planning Policy Guide

FP 302-094-2

Released April 19, 2022, Effective April 19, 2023

OMB Collection #1660-0062



### Local Mitigation Planning Policy Guide

FP-206-21-0002

Released April 19, 2022, Effective April 19, 2023

OMB Collection #1660-0062



# Poll Question

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- How have you partnered with a higher education institutions on your hazard mitigation planning efforts?
  - A. Hazard Identification and Risk Assessment (HIRA)
  - B. Mitigation strategies
  - C. Climate change and adaptations
  - D. Economic and development trends
  - E. Demographic projections
  - F. I have not worked with a university, but I plan to in the future.
  - G. I have not worked with a university.
  - H. Other (*please put in the chat!*)



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# Tom Hughes

State Hazard Mitigation Officer, Emergency Management Director

Insurance and Resilient Communities (MIRC) Office

Pennsylvania Emergency Management Agency (PEMA)

# Background: Keystone Emergency Management Association Annual Conference

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- The conference is a fact-finding workshop and information exchange. Attendees came from a wide range of disciplines. They work in mitigation, academia, recovery and resilience in Pennsylvania.
- This conference was born out of the 2022 Pennsylvania/FEMA Risk Reduction Consultation Meeting. It brought together researchers and practitioners.
- Penn State University, Pennsylvania Emergency Management Agency (PEMA), Carnegie Mellon, Millersville University Collaboration shared examples of local and state teamwork.
- Wanted to replicate Dr. Peek's work out of the University of Colorado-Boulder's Natural Hazard Center to be Pennsylvania-specific.



# Keystone Emergency Management Association Annual Conference (Altoona, Pennsylvania)

- Held on October 24, 2022. PEMA and the Department of Community and Economic Development (DCED) hosted it.
- Universities, colleges and junior colleges were invited.
- Sessions gave opportunities to talk about how communities throughout the state grow more resilient to climate change in ever-changing economic environments.
- Practitioners/Professors/Universities' Students:
  - Discussed roadblocks and challenges.
  - Opportunities.
  - Communication mechanisms (current/future).
  - Local grant application support needs for low-capacity and underserved communities.
- Next steps beyond county hazard mitigation planning activities.



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# Bucknell University – 17th Annual Susquehanna River Symposium

- Held November 5, 2022: PEMA/Department of Conservation and Natural Resources (DCNR) educational session.
- “Speed dating/lightening round.”
- Talked about state climate change plans.
- Classroom to practical outside activities for resume.
- Funding and grants available.
- Application needs for data, GIS, technical support, and more.
- Asked for hazard mitigation and climate change input.



**Continued Monitoring of Wolf Run Farm Sites Under BMPs in Partnership with Lycoming County Conservation District**  
 Daisy R. LeBlanc, Dr. Mel Zimmerman  
 Lycoming College, 700 College Place Williamsport PA

**Introduction:**  
 Wolf Run is a tributary to Muncy Creek and the West Branch Susquehanna River (Figure 1). In 2013, Pa DEP established a Total Maximum Daily Load (TMDL) to address the agricultural impacts to the Wolf Run watershed. In 2015, the Lycoming County Conservation District identified four farm sites to implement BMPs (site 1: Arley Farm, site 2: Neece Farm, site 3: Fry Farm, site 4: site 5) (Figure 2). Stream bank stabilization, riparian buffers, manure storage, and animal equipment crossing reduction are BMPs which were suggested. From 2017 to 2019, 2,300 feet of bank stabilization was added. This includes 240 feet of mulch, 15 single log vanes, 7 multi-log vanes, and 180 feet of low logs. Stream crossing of cattle and equipment was improved as well and riparian buffers were planted (Figure 3). In 2017, the Clean Water Institute started monitoring Wolf Run to observe the changes before and after BMPs. CWI observed water chemistry, coliform sampling, electrofishing, and macroinvertebrate surveys. Identified Wolf Run as in need of nitrogen, phosphorus, sediment reduction (Figure 4).

**Methods:**  
 CWI sampling began in 2017. Water chemistry testing included pH, Conductivity, Alkalinity, Orthophosphorus, Phosphorus, Nitrate, Nitrite, Dissolved Oxygen, TDS, Turbidity, and Temperature. Coliform sample water was collected in sterile bags and 100 ml of water was filtered via membrane. All fish and insect protocols were followed for electrofishing. 100 meters were fished at each site with coverage above and below the project sites. The fish were caught, identified and released. Following PA DEP protocols, macroinvertebrates were collected with a 10 frame kick net and preserved in 10% ethanol, sorted, and identified. The Wisconsin Ranked Sum Test was used to determine significant differences.

**Results:**  
 1. The Population Density of fish at each site (Figure 5) has increased in 2022 greatly.  
 2. The Population Density of fish at each site (Figure 6) has increased in 2022 greatly.  
 3. In 2022, no trout were found. In 2022, many trout of different size classes were found.  
 4. The level of phosphorus has significantly decreased since 2017 (Figure 7).  
 5. pH, TDS, conductivity, and alkalinity were all significantly increased in the Wolf Run when compared to the first three years of the project.  
 6. Table 2 summarizes macroinvertebrate data from 2017 to 2022 with the most of 100% increase in each site.  
 7. 2022 all top soil test results improved to good water quality (water quality index) scores.  
 8. BMPs have clearly contributed to a 30% increase in water quality index scores.  
 9. BMPs have clearly contributed to a 30% increase in water quality index scores.  
 10. Table 3 shows the quantity of sediment per 100 ml of water at each site 2017-2022.

**Conclusions:**  
 1. Water chemistry  
 a. Conductivity (a 0.03, Pa-A, 2017) changed to pH, conductivity, TDS, and alkalinity from the first three years of the study to the last three years, all of which are positive changes.  
 2. Total phosphorus levels have significantly decreased, nearly due to BMPs, comparing 2017 to 2022.  
 3. Fish diversity and trout population increase  
 a. Diversity provide habitat for trout.  
 b. The number of fish species found in 2017 was 15, and in 2022 19 species were found.  
 c. Trout population density has increased, 20 trout were found in 2022 (in 200 trout per acre).  
 d. Bank stabilization contributed to Wolf Run becoming a reproducting trout stream.  
 4. Macroinvertebrate water quality and diversity  
 a. In 2022 all four sites had good water quality with only some minor pollution (primarily based on TDS).  
 b. Site 2, 3, and 4 had increased stream-of-life index scores from 2021 to 2022 indicating increased water quality and dissolved oxygen pollution.  
 c. Table 2 can be used by 200-point water quality index scores from 2021 to 2022 indicating increased water quality and dissolved oxygen pollution.  
 d. Table 3 shows the quantity of sediment per 100 ml of water at each site 2017-2022.

**Acknowledgments:**  
 CWI staff and the Lycoming County Conservation District staff. The Lycoming County Conservation District staff. The Lycoming County Conservation District staff.

**Figure 1:** Land parcel of Wolf Run. **Figure 2:** Map of Wolf Run sites. **Figure 3:** Wolf Run identified in view of watershed in need of phosphorus, nitrogen and sediment reduction. **Figure 4:** Population density of fish per acre at each site for 2017-2022. **Figure 5:** Population density of fish per acre at each site for 2017-2022. **Figure 6:** Population density of fish per acre at each site for 2017-2022. **Figure 7:** Water Chemistry trends and identified locations, comparing data from 2017 with data from 2020-2022, with related soil tests. **Table 1:** Macroinvertebrate population index. **Table 2:** Macroinvertebrate population index. **Table 3:** Water Quality Index scores per acre at each site for 2017-2022.





# Kurt Donaldson

Manager





West Virginia GIS Technical Center

West Virginia University



# WVU Faculty Supporting Hazard Mitigation Projects

*Partnerships among faculty members expand the subject matter expertise for hazard mitigation planning*

HAZARD MITIGATION PROJECT	FUNDING SOURCE	FACULTY MEMBER	ORGANIZATION & EXPERTISE	LINK
Statewide Risk Assessments	HMGP, CTP	Kurt Donaldson 	WVU GIS Technical Center (online interactive map viewing applications, <i>TEIF/TEAL<sup>1</sup> risk assessments, flood visualizations</i> )	<a href="#">WV Flood Tool</a> <a href="#">Statewide RA Products &amp; Data</a> <a href="#">WV Region 3 Plan w TEIF data</a>
Landslide Susceptibility Modeling	HMGP	Aaron Maxwell 	WVU Geography Professor ( <i>landslide modeling, machine learning, remote sensing</i> )	<a href="#">Published Landslide Paper</a>
Flood Buyouts	NRCS	Katherine Garvey 	WVU Land Use and Sustainability Law Clinic (legal and planning services)	<a href="#">Region 3 Resilience Report</a> <a href="#">WV Public Broadcasting</a>
Community Recovery and Resiliency	NSF	Jamie Shinn 	WVU Geography Professor ( <i>social science, community engagement</i> )	<a href="#">WV Public Broadcasting</a>

<sup>1</sup> Total Exposure in Floodplain (TEIF), Total Exposure Area Landslide (TEAL)



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# Example 1: Landslide Hazard Risk Assessment

## Landslide damages Washington Bottom home, threatens others

LOCAL NEWS

APR 28, 2020

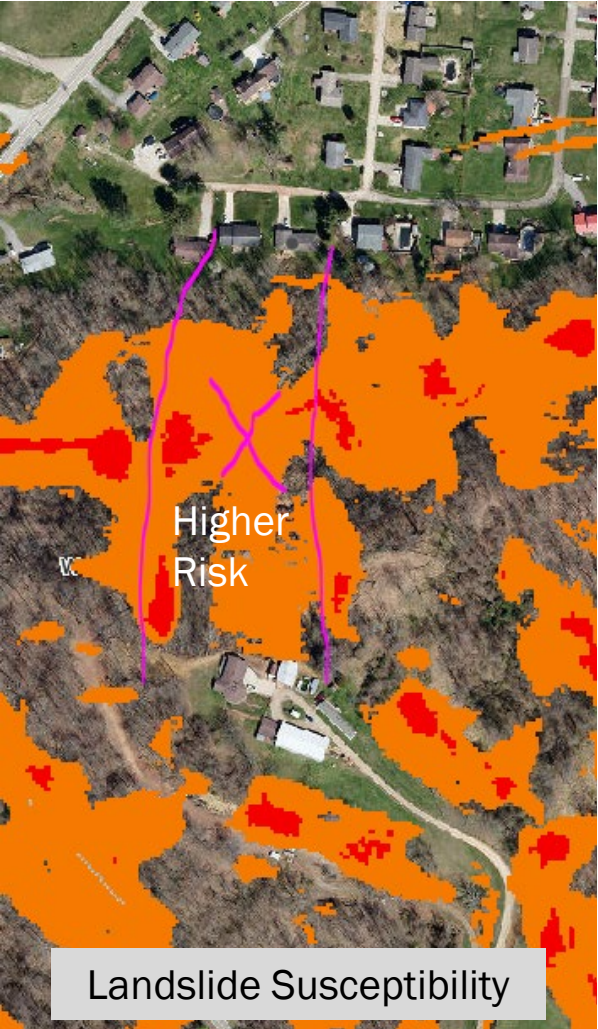
MICHAEL ERB  
Staff Reporter  
merb@newsandsentinel.com

SHARE TWEET

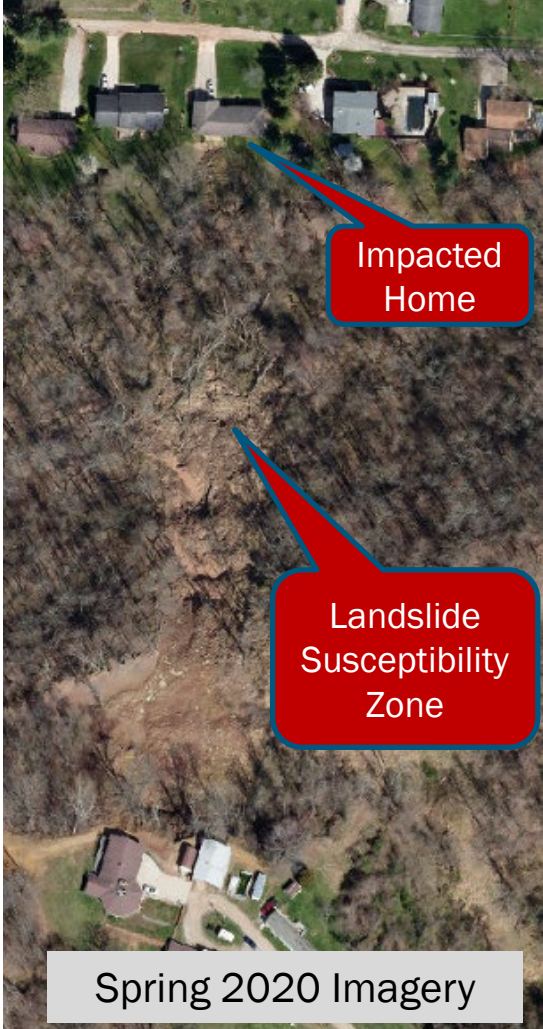


A landslide Sunday evening damaged a Washington Bottom home and forced the evacuation of several neighboring houses. (Photo by Michael Erb)

April 2020 Landslide  
Wood County, WV  
*Impacted home moved from foundation*



Landslide Susceptibility



Spring 2020 Imagery

[WV Flood Tool](#)

[WV Landslide Tool](#)

A statewide *landslide susceptibility* (high, moderate, low risk) map was created from FEMA-purchased QL2 LiDAR data

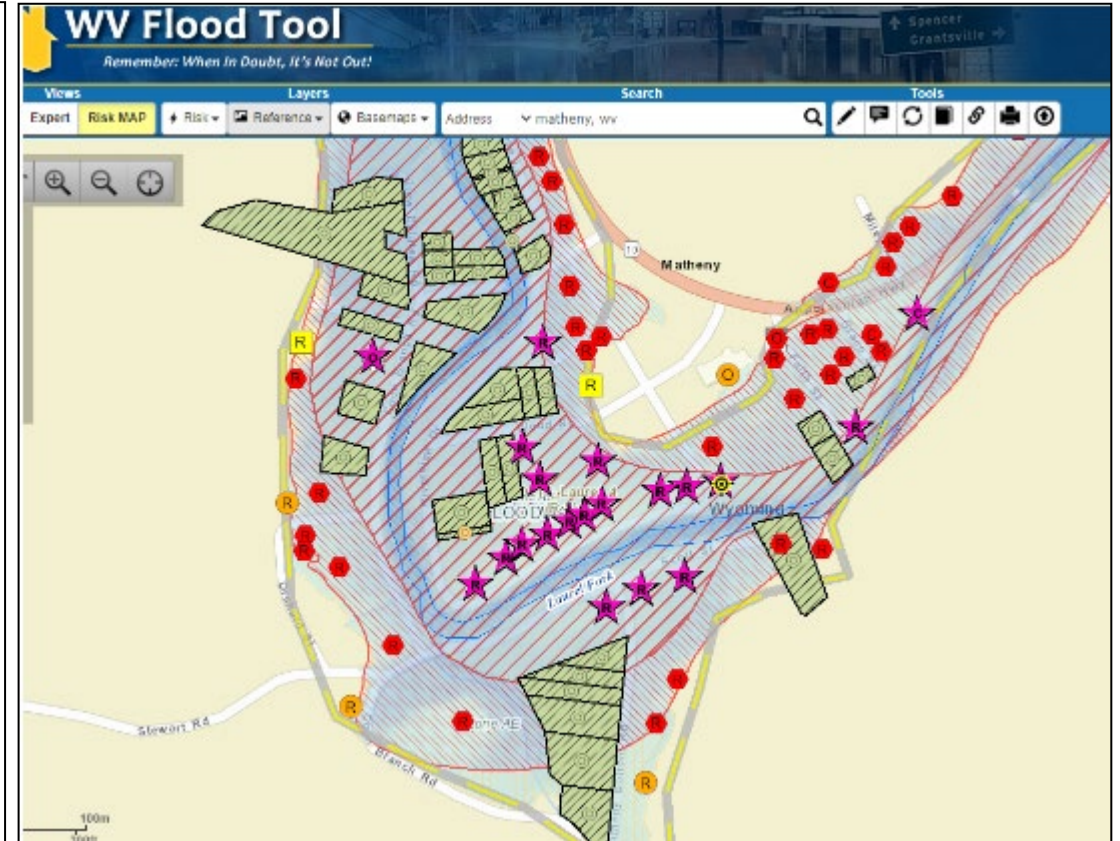
# Example 2: Voluntary Floodplain Buyout Mitigation



## Success Story: West Virginia Partnerships Drive Cost-Effective Mitigation

In 2018, the West Virginia University (WVU) Land Use and Sustainable Development Law Clinic began assisting the Natural Resources Conservation Service (NRCS) in watershed planning for McDowell County. Frequent flooding occurs in the Elkhorn Creek/Tug Fork River watershed and causes major damage to structures and infrastructure. The NRCS, the Land Use Clinic, and other local sponsors worked together to study the costs and benefits of a voluntary floodplain buyout project. Using data available through the [WV Flood Tool](#) saved time and money.

The Land Use Clinic and NRCS used data from the WV Flood Tool to identify the highest priority areas for buyouts and estimate damages to individual properties. Data gathered from the WV Flood Tool included information related to flood zones, structure type, flood depth, and real estate values. WVU also collected Total Exposure in Floodplain (TEIF) and Total Exposure Area Landslide (TEAL) structural-level data. This information helped the NRCS identify a list of 310 properties that would meet the goal of reducing flood damage. 30 properties may be eligible to participate in a voluntary buyout program.



[FEMA R3 Resiliency Report](#) | [WVPBS](#) | [Buyout Report](#)

[WV Flood Tool: Building-Level Risk Assessments](#)

*Risk assessments using FEMA's Hazus methodology helped NRCS identify 310 properties in McDowell County for flood buyouts*

## Example 3: Community Hazard Planning (Focus Group Meetings)



### ■ Feedback desired from Focus Groups:

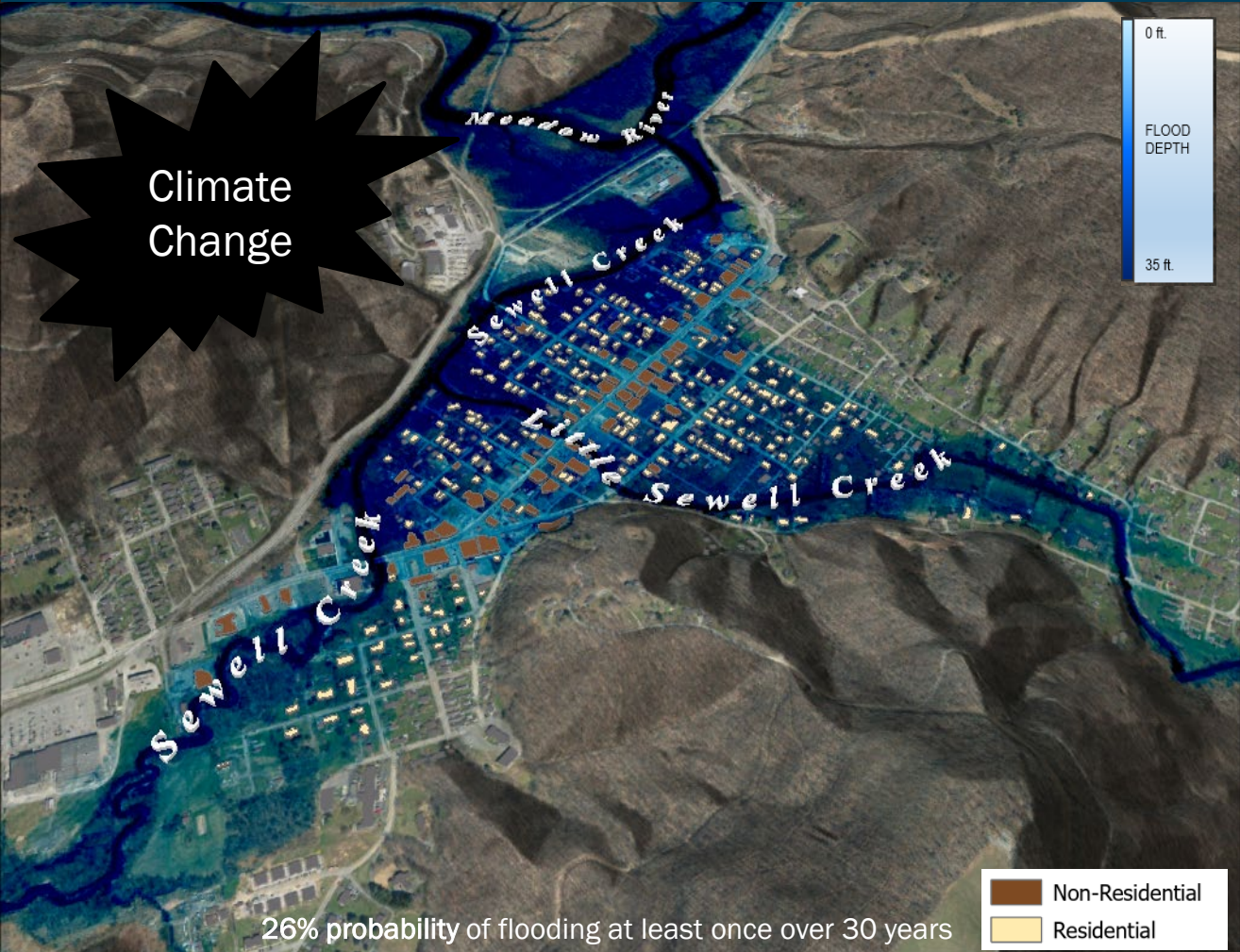
- What lessons were learned from the immediate response and longer-term recovery from the 2016 flood?
- What priorities are needed for a stronger flood response and recovery plan in the event of a future flood?

### ■ Feedback of Flood Study Products:

- Flood Characteristics and Models
- Flood Risk Assessment (vulnerability, exposure, loss)
- Mitigation Maps
- Flood Visualization Tools









# Example 3: Community Hazard Planning (Flood Characteristics)

## FEMA 1%+ Annual Chance (Rainelle, WV)



Category	Flood Characteristic (in context to 2016 Flood)	White Sulphur Springs	Rainelle
Frequency (new flood maps)	<p>Probability that a flood of a specific size will be equaled or exceeded in any given year.</p> <p>FEMA Flood Models (new): 10-, 25-, 50-, 100-, 100+, and 500-year flood elevations.</p> <p>First Street Foundation Flood Models: 5-, 20-, 100-, and 500-year flood elevations.</p>	<p><u>2016 Flood</u> Between 100- and 500-year</p> <p><u>FEMA Climate</u> BFE+6ft</p> <p><u>FSF Climate</u> 2052 or 30 years in the future</p>	<p><u>2016 Flood</u> Between 100- and 500-year</p> <p><u>FEMA Climate</u> BFE+1ft</p> <p><u>FSF Climate</u> 2052 or 30 years in the future</p>
Depth	Flood depth. Source USGS high-water marks	6 feet	8 feet
Velocity	Speed at which the floodwaters are flowing	High	Moderate
Duration	Measure of how long water remains above normal levels	24 hours	72 hours
Rise and Fall	Floodwater that rises very quickly with little or no warning	Quick Rise	Quick Rise

# Example 3: Community Hazard Planning (Risk Indicators)

Social Vulnerability Indicators White Sulphur Springs and Rainelle					Building/Parcel Exposure White Sulphur Springs and Rainelle					
Vulnerability Indicators		White Sulphur Springs	Rainelle	State Ratio	National Ratio	Category	Exposure Indicator	White Sulphur Springs	Rainelle	Ratio* in WV Incorporated Areas (2021)
	Poverty Rate	14.4%	<b>37.0%</b>	17.3%	12.9%	Buildings by Flood Zone (Count & Value)	Total Primary Building Count in Floodplain	<b>423</b> <small>(Rank***: 12<sup>th</sup>)</small>	<b>338</b> <small>(Rank: 18<sup>th</sup>)</small>	59 (Median)
	Unemployment Rate	21.4%	<b>33.6%</b>	23.8%	14.7%		Building Ratio b/w Floodplain & Community Total	<b>26%</b>	<b>34%</b>	9%
	Vulnerable Ages Ratio	<b>41.7%</b>	<b>39.8%</b>	30.8%	28.3%		Total Primary Building Value in Floodplain of Community	<b>\$40,881K</b> <small>(Rank: 16<sup>th</sup>)</small>	<b>\$16,120K</b>	\$6,417K (Median)
	Disability Ratio	17.8%	<b>26.9%</b>	18.7%	13.0%		Median Building Value in Floodplain	<b>\$49K</b>	<b>\$38K</b>	\$42K
	Population Growth Ratio	<b>-9.1%</b>	<b>-20.9%</b>	-3.2%	7.4%		Building Count in Floodway** (High Velocity)	<b>65</b> <small>(Rank: 13<sup>th</sup>)</small>	<b>9</b>	12 (Avg.)
	Renter-Occupied Ratio	<b>42.8%</b>	<b>43.0%</b>	26.8%	36.0%		Percent Building Count in Floodway** (High Velocity & Depth)	<b>15%</b>	<b>3%</b>	8%
	Housing Values Less than \$50K	3.9%	<b>37.5%</b>	16.9%	6.6%		New Maps: Bldgs. "Mapped In" SFHA	<b>72</b> <small>(Rank: 12<sup>th</sup>)</small>	<b>329</b> <small>(Rank: 3<sup>rd</sup>)</small>	19 (Avg.)
	Housing Median Value	\$125,700	<b>\$59,400</b>	\$119,600	\$229,800		New Maps: Bldgs. % Count "Mapped In" SFHA	<b>17%</b>	<b>97%</b>	14%
							New Maps: Bldgs. "Mapped Out" SFHA	<b>118</b> <small>(Rank: 8<sup>th</sup>)</small>	<b>0</b>	19 (Avg.)
							New Maps: Bldgs. % Count "Mapped Out" SFHA	<b>28%</b>	<b>0%</b>	14%

The red texts show more than 5% of difference, to the vulnerability side, from the state ratios.

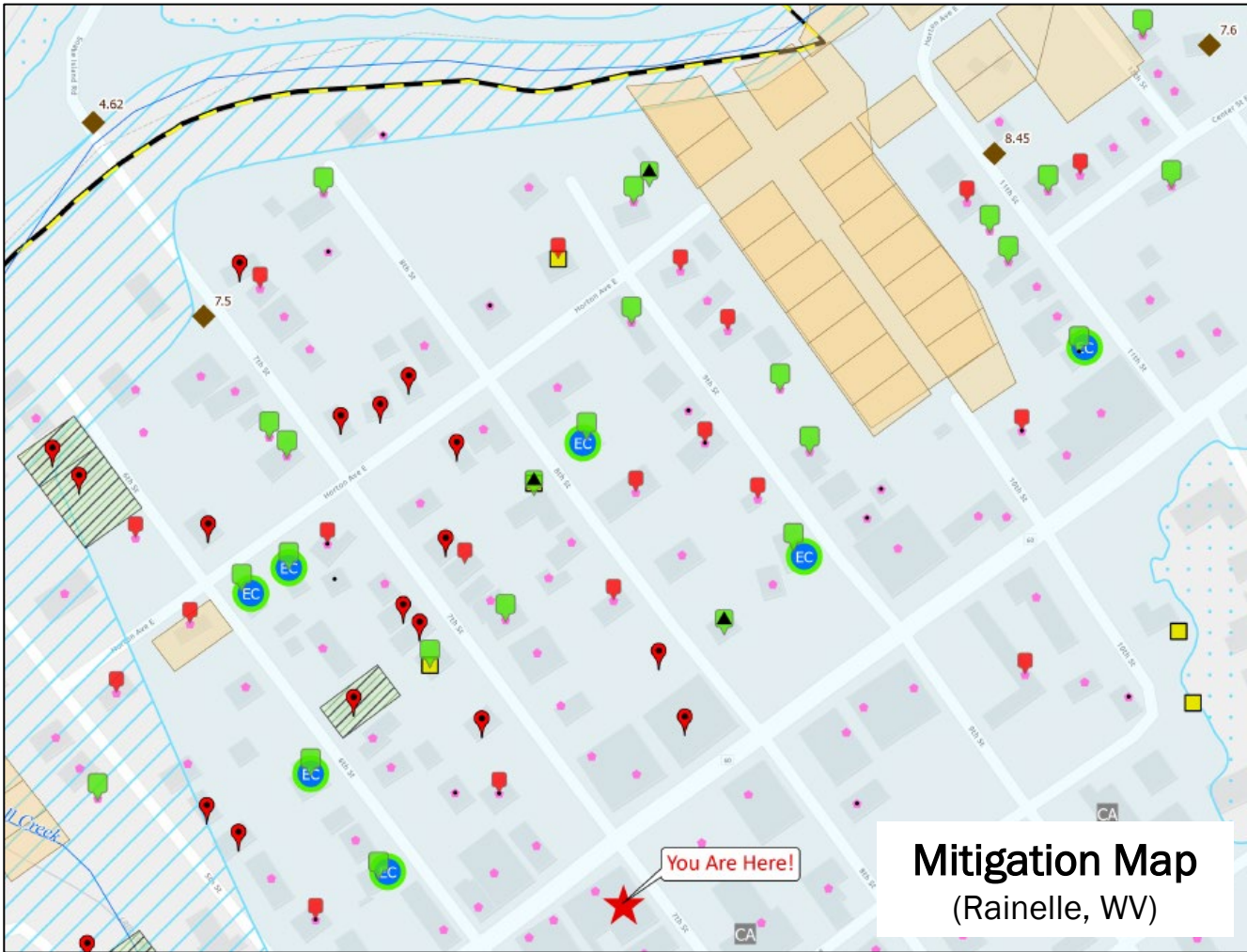
*Vulnerability, Exposure, and Hazus Loss Indicators  
for the disadvantaged communities of Rainelle and White Sulphur Springs*



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# Example 3: Community Hazard Planning (Mitigation Measures)



**Mitigation Map**  
(Rainelle, WV)

## Mitigation Measures

Category	Mitigation Indicator	White Sulphur Springs	Rainelle
Mitigated Structures	Mitigation Reconstruction or Elevated Structures to Design Flood Elevation (DFE)	15	45
	Rehabilitated/Repaired Structures	394	278
	Unmitigated Low Value Structures	14	49
	Structures Removed (vacant parcel)	394	278
Open Space Preservation	Buyout Parcels (Deed Restricted)	16	18
	Community-Owned Vacant Parcels	66	88
	Area of Open Space Preservation (OSP)	5 Acres	3 Acres
	Ratio of Open Space Preservation (OSP to SFHA)	2.6%	4.5%
Building Value Recovery	Net Value 2016-2022 Tax Assessment Value	+ \$6.1 Million	- \$1.0 Million
Loss Avoidance 100-year Flood	Loss Avoidance by Elevating or Removing Structures (preliminary results)	\$2.6 million	\$2.3 million

<p><b>Damaged or Demolished Buildings</b></p> <ul style="list-style-type: none"> <li>Structure Removed Post-2016 Flood (n=41)</li> </ul> <p><b>Mitigated Properties</b></p> <ul style="list-style-type: none"> <li>Mitigation Reconstruction to DFE* (n=35)</li> <li>Mitigation Reconstruction not to DFE* (n=6)</li> <li>Elevation Certificate (n=11)</li> <li>Buyout Property (n=18)</li> <li>Open Space Preservation (Community-Owned)** (n=88)</li> </ul> <p><b>Unmitigated Properties</b></p> <ul style="list-style-type: none"> <li>Low Building Value (n=49)</li> <li>Repaired Structure** (n=311)</li> </ul>	<p><b>Significant Structures</b></p> <ul style="list-style-type: none"> <li>Essential Facility (n=1)</li> <li>Community Asset (n=7)</li> </ul> <p><b>Vulnerable Structures</b></p> <ul style="list-style-type: none"> <li>Manufactured Home (n=14)</li> <li>Subgrade Basement (Full &amp; Part)</li> </ul> <p><b>Preliminary 1% Annual Chance Floodplain</b></p> <ul style="list-style-type: none"> <li>Zone AE</li> <li>0.2% Annual Chance Floodplain</li> <li>Zone AE - FLOODWAY</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>Stream Line</li> <li>Municipal Boundary</li> <li>2016 High Water Mark (ft) (n=32)</li> </ul>
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*Field verification and analysis of mitigation measures implemented by property owners and the community in context of the 2016 flood and local floodplain management regulations*

# Mitigation Reconstruction: Resiliency to Future Floods (Climate Change)



Flood Depths marked on Mitigated Structure

- FEMA
- First Street Foundation (FSF)
- USGS 2016 Flood High Water Mark



How well are mitigated structures protected from changing environmental factors due to climate change? The new FEMA flood maps for Rainelle reveal that the mitigated structure above is a risk for the 1%+ (100-yr) and 0.2-percent chance (500-yr) floods.





# Jennifer Egan

Program Manager

Environmental Finance Center

University of Maryland



# Stephanie Dalke

Program Manager

Environmental Finance Center

University of Maryland

# Meet the Project Team

**George Mason University**  
*Coastal Hazards Modeling*



**The Nature Conservancy |**  
**Resilient Coast Program**  
*Project Management and Conveners*



**University of Maryland**  
**Environmental Finance Center**  
*Financial Modeling and Cost-Benefits*



**EPA | Office of Research and**  
**Development**  
*Co-benefits and Capacity*  
*Assessment*



**Community Advisory**  
**Committee (CAC)**  
residents and  
community leaders



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# Project Origins

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*Community needs and knowledge and university and non-governmental organization expertise.*

- University of Maryland Environmental Finance Center – Looking for communities that need help with:
  - Assessing the costs and benefits of adaptation options.
  - Finding ways to pay for adaptation.
- The Nature Conservancy – History working on conservation in this region.
  - Lower Eastern Shore Climate Adaptation Network (LESCAN) ~ 2020.
  - Recent prioritization mapping of coastal habitats.
- George Mason University – Coastal modelers.
  - Worked with The Nature Conservancy on another project.
  - Have done other coastal modeling and studies in the mid-Atlantic.

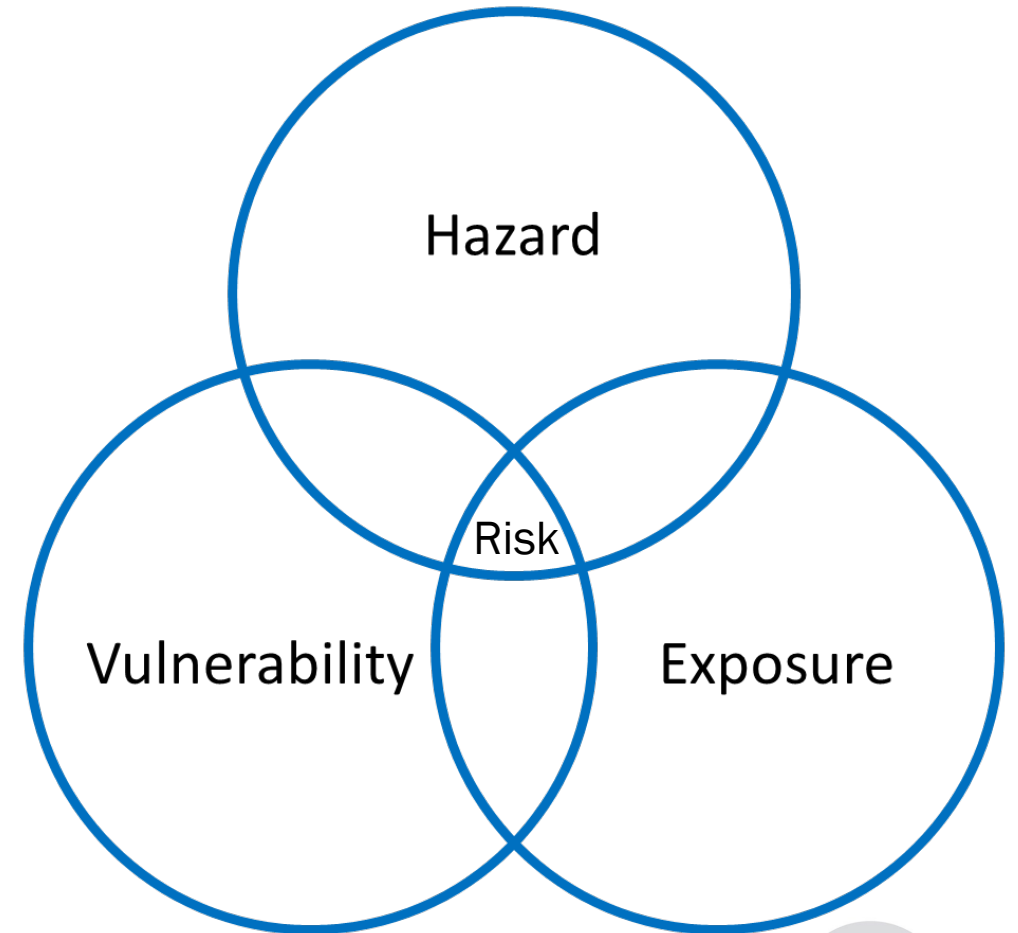


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# FEMA Coffee Break: Utilizing University Partnerships in HMPs

- Project goals for The Nature Conservancy, University of Maryland, and George Mason University:
  - Flood hazard analysis.
    - This includes sea-level rise (SLR) and potential frequency shifts.
  - Engage the community to identify assets and preferred solutions.
  - Vulnerability of assets in different scenarios (including “no-action”).
  - Community-defined, damage model-informed “tipping points.”
  - Build a framework for community decision analysis to build resilience.

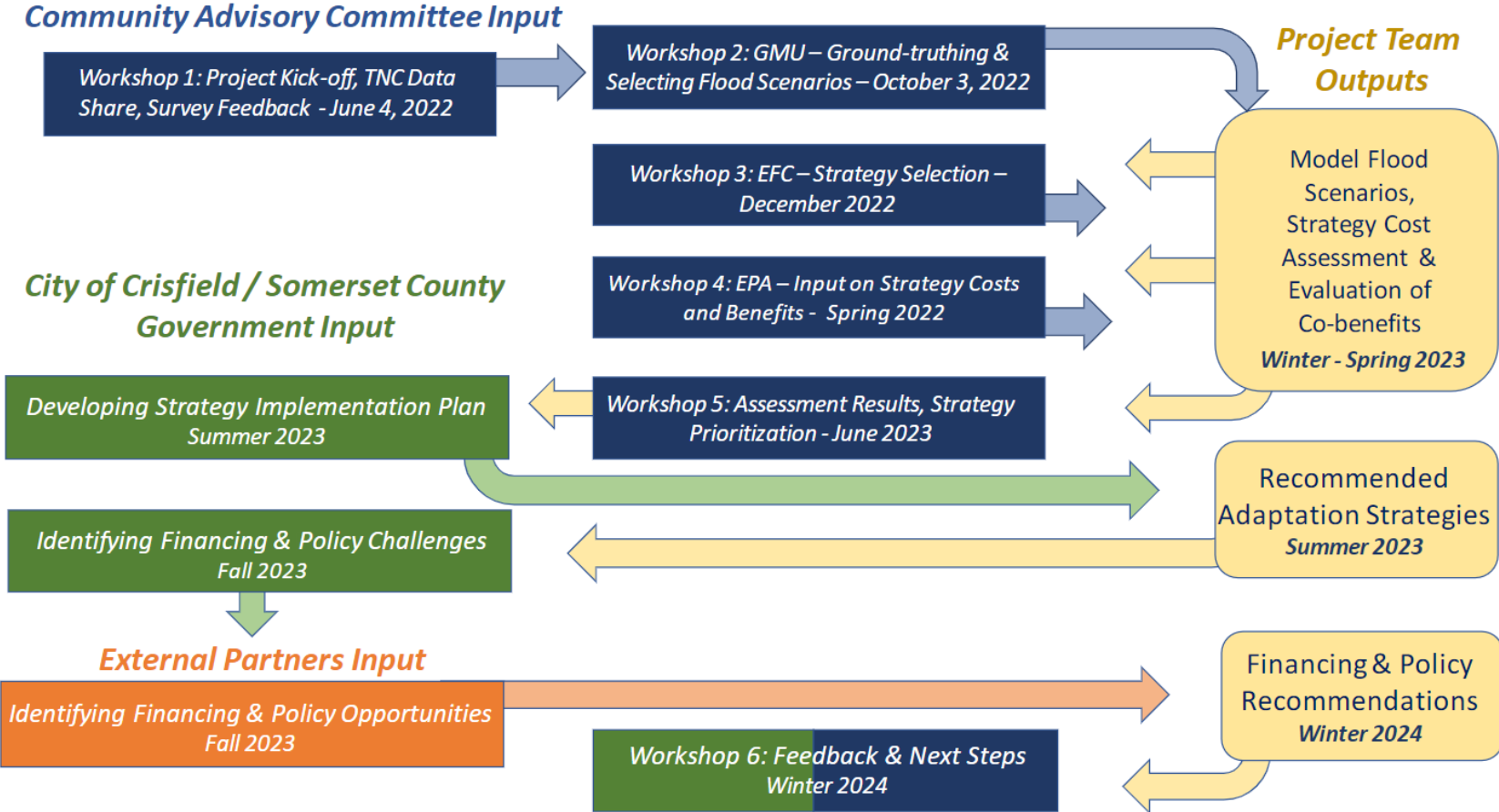


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# Interactive Community Engagement Throughout

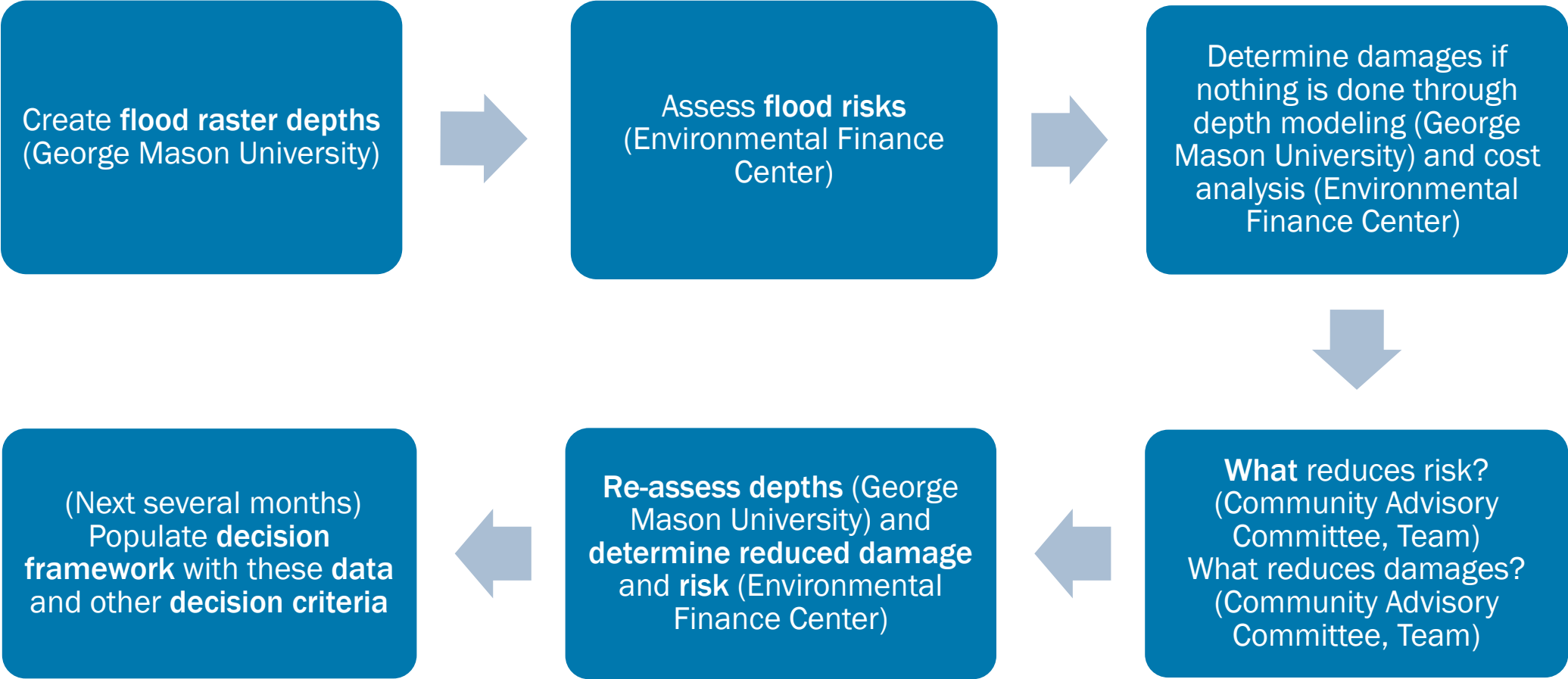
## Project Timeline



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# Process to Identify Solutions



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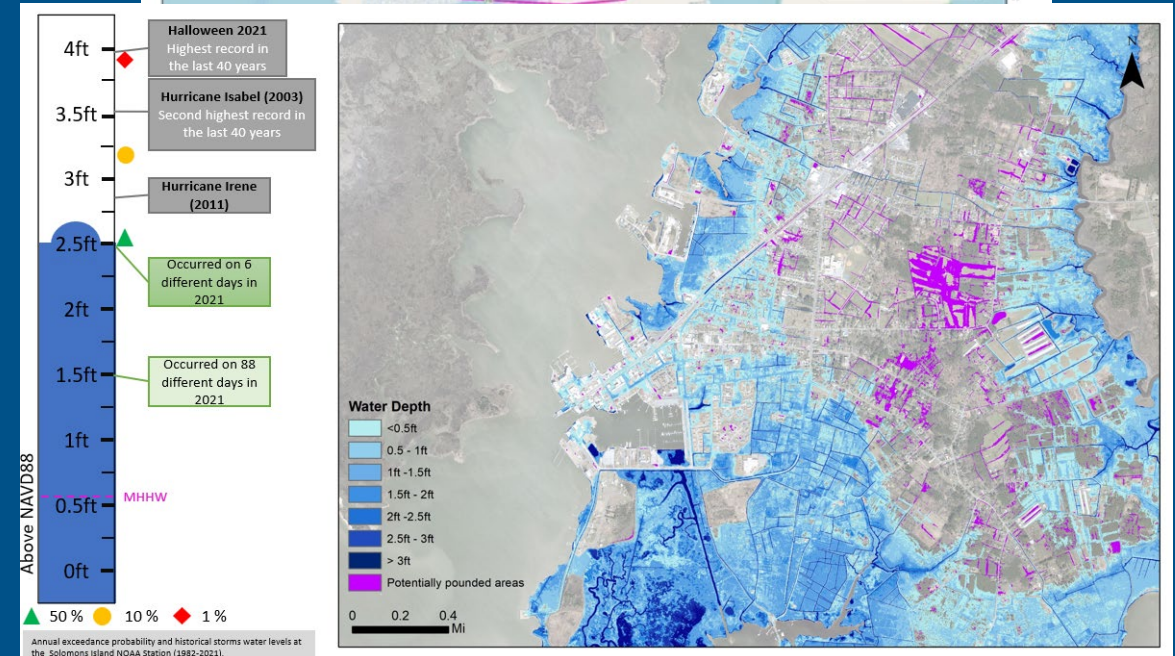


# Community Advisory Committee Identified Areas and Assets

Infrastructure – Adaptation solutions that make the community safe and secure to achieve the community’s goals.

Strategies that can help them reduce the short-term impacts of nuisance flooding, and disruptions to the community’s connectivity - the infrastructure that supports day-to-day operations of businesses and households.

### Synthesis of CAC Identified Focus Areas



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# Community Goals and Decision Framework

Build a matrix with the CAC and decision makers to assess the strategies. Use multiple criteria such as other community goals, distributional impacts, policy needs, and available funding potential.

Focus Areas	FA1: Downtown	FA2: Uptown	FA3: Down Neck	FA4: Hospital Corridor	FA5: County/Hopewell	FA6: N. Somerset Ave.	FA7: Hammock Point
<i>Community Resilience Opportunities</i>							
Flood Risk Reduction Analysis	<b>Benefit-Cost Analysis of Flood Reduction Options</b>						
Job Creation/ Training	X			X	X		
Flood Safe & Affordable Housing		X	X	X	X		X
Recreational opportunities	X	X	X	X	X	X	
Social/Cultural Spaces	X	X			X	X	
Youth Development	X	X	X			X	
<i>Community Resilience Vulnerabilities</i>							
Flood Vulnerability	High	High	High	High	Low	Low	Low but not accessible during flooding
Desired Timeline of Adaptation Benefits	Near-term	Near-term	Near-term	Near to mid/long-term	Long-term	Mid- to long-term	Mid- to long-term

## Other Decision Criteria

Estimated # of People who Benefit	Estimated # of Underserved People who Benefit	Life Span (Short Medium Long term)	Policy Change Needs	Funding and Financing Opportunities and Challenges



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## Lisa Iulo

Associate Professor of Architecture

Director, Hamer Center for Community Design

Penn State Initiative for Resilient Communities



## Virginia Silvis, Ph.D.

Postdoctoral Scholar

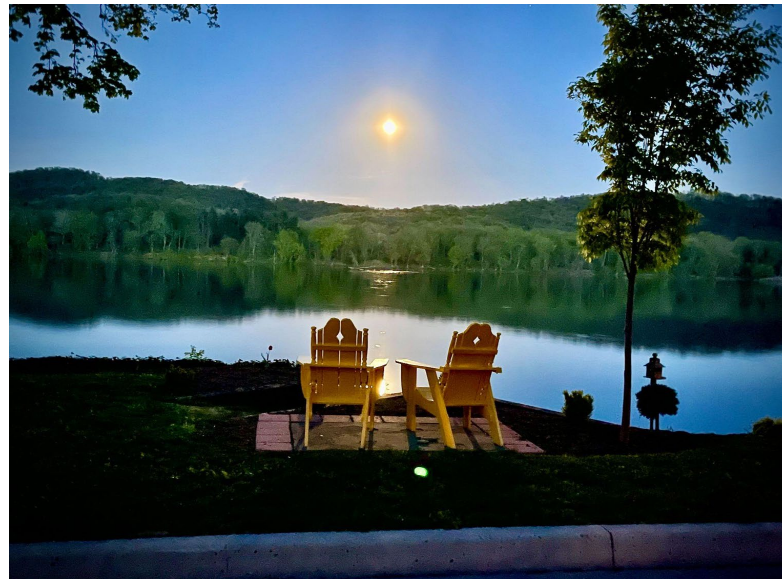
Earth and Environmental Systems Institute

Pennsylvania State University

# Community-University Partnership for Flood Resilience



2006 Plan for Selinsgrove Borough, PA



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# Community-University Partnership for Flood Resilience



**PSIRC** Penn State Initiative for Resilient Communities  
Establishing Priorities for Pennsylvania Community Flood Resilience White Paper

Outcomes from 27 September 2019 Workshop, Selinsgrove, PA



Prepared by:  
**The Penn State Initiative for Resilient Communities (PSIRC)**

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**Abstract:** This white paper provides an overview of priorities related to community resilience to flooding that emerged during a 27 September 2019 meeting with local, regional and state representatives in Selinsgrove, Pennsylvania. The document compiles workshop details, participants and a summary of discussions and outcomes. It does not, however, attempt to provide a comprehensive listing of every topic raised by participants. In addition, this workshop was held before the advent of covid-19; the impacts of this pandemic are not addressed in this document.

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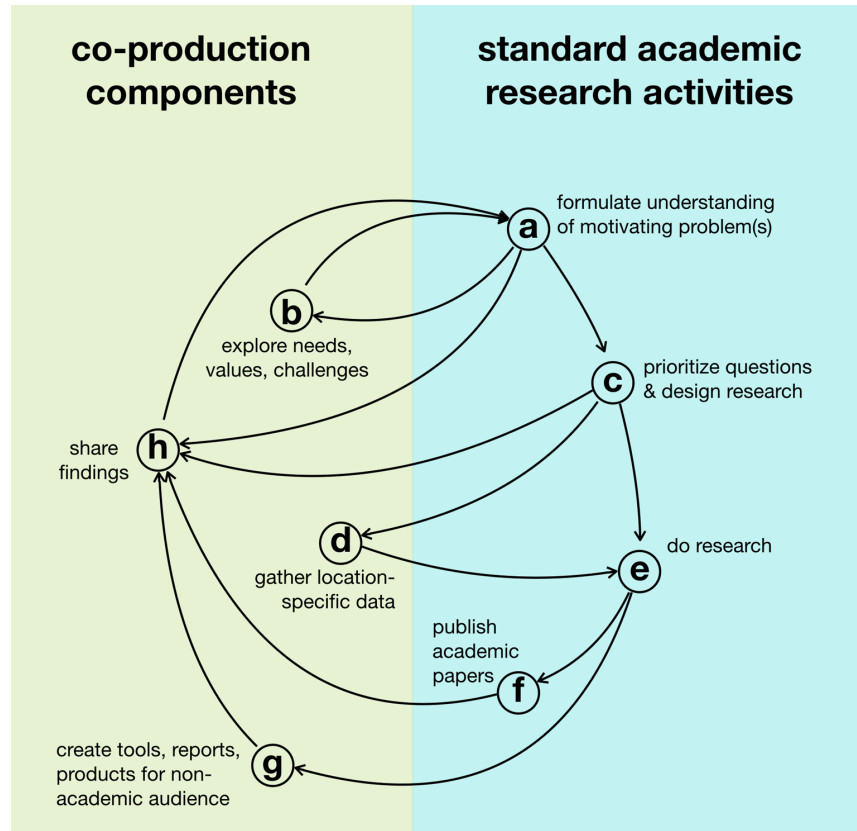


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**PSIRC**  
Penn State Initiative for Resilient Communities



# Community-University Partnership for Flood Resilience



Citation: Casey Helgeson

2019



photo credit:  
Scoping meetings w/  
key partners

2020



photo credit:  
Team visits, data collection,  
surveys, and interviews

2021



Undergraduate  
class projects

2022



photo credit: Brian Reed  
Focus group feedback  
Flood Resilience Fest



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# Community-University Partnership - Goals to Outcomes

## Selinsgrove Impact

- Reviewed flood hazard map changes in Selinsgrove; shared with PA Dept. of Auditor General to characterize climate hazards in PA.
- Assessed future flood and stormwater risks under climate change projections.
- **Evaluated houses for flood risk mitigation.**
- Reviewed Selinsgrove flood-related ordinances/codes and the First Street data evaluation.
- Conducted several working groups and roundtables; **developed a values-informed mental model.**

## Regional Impact

- Engaging with stakeholders and decision-makers about flood resilience in Pennsylvania's riverine communities in the Susquehanna River Basin.
- Researching PA flooding and stormwater regulation and opportunities for managing them together.
- Developed method for determining Green Infrastructure (GI) placement.
- **Coordinate studies and plans across scales to achieve multiple goals.**
- Presented at the Bucknell Annual Susquehanna River Symposium 2019-2021 & PAFPM Annual Meeting 2019 and 2022.
- Hosted workshop and worked with SEDA-COG on a report of cost and strategies for home flood mitigation.

## National/International

- Explored data analysis and visualization of NFIP data (two million flood insurance claims).
- Reviewed public disclosure requirements for flood risk and impacts.
- Participated in PEMA/FEMA green/natural infrastructure solutions training program.
- Published and presented 8 papers; 4 in development; 15 oral and poster presentations; 1 dissertation.



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# Community-University Partnership for Flood Resilience

- County hazard mitigation plans can be difficult to locate.
- All-PA HMP tool (<https://www.psirc.psu.edu/hmptool>).
- Tool helps decision makers view planned mitigation activities in neighboring counties.

psirc.psu.edu/hmptool

## Pennsylvania County Hazard Mitigation Plans (pre-release beta)

Statewide Hazard Mitigation Plan for the Commonwealth of Pennsylvania

**Centre County, PA**

Hazard Mitigation Plan  
year updated: 2021  
climate change considered: Yes  
Hazard Mitigation Website

emergency manager: Jeffrey A. Wharran  
email: jawharran@centrecountypa.gov

View larger map

POPULATION: 161,496 (2020)  
LAND AREA: 1,110 sq. mi.

County Website | Flood Hazard Layer |  
Community Climate Outlook | Wikipedia Entry

Learn more about Hazard Mitigation Planning from [PEMA](#) and [FEMA](#).

The Hazard Mitigation Plans provided via this tool are PDF files, many of which are quite large. Please be patient, as downloads for some files may be slow, particularly over connections with limited bandwidth.

*This resource created by Kelsey Ruckert, Virginia Silvis, Matthew Lisk, and Robert Nicholas (2022).*



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# Community-University Partnership - Example Products



## Inland Flood Risk & Your Home

*Penn State Initiative for Resilient Communities // psirc.psu.edu*

Floodwaters and sewer backups can cause sizable property damage, requiring drywall, carpet, furniture, and appliances to be replaced.

**41 million people** in the US live in a 100 year floodplain based on recent research. According to the Federal Emergency Management Agency (FEMA), a 100-year floodplain has at least a 1% chance of certain levels of flooding each year. Repeat flooding can occur in such areas.

Flooding happens when rivers and streams overflow their banks. Heavy rain can also cause flooding outside of a floodplain and overwhelm stormwater systems.

### Understanding Flood Risk & Mitigation Benefits

1. Are you located in a floodplain?
2. Extreme weather events are projected to increase. How can you protect your home during stronger storms?
3. Can FEMA or local grants help pay for mitigation?
4. Will your flood insurance costs go down if you choose any flood protection measures?
5. How long do you plan to be in your home and how does this affect the flood protections you might choose?
6. What are the costs of inaction? How costly would it be if your home flooded? Which items would you need to replace? Where would you live during repairs? How long would you be out of your home?

### Protect Your Home

There is no one-size-fits-all solution to protect your home. Each method involves different costs and can change your flood insurance rate. The options you choose depend on your budget and how much risk you are willing to accept.

	Elevating your utilities & appliances	Filling in your basement	Elevating your home to FEMA's recommendation	Elevating your home above FEMA's recommendation
<b>Pros</b>	<ul style="list-style-type: none"> <li>Protects important parts of home from flooding and reduces repair costs</li> </ul>	<ul style="list-style-type: none"> <li>Less expensive than elevation</li> <li>No change to external appearance</li> </ul>	<ul style="list-style-type: none"> <li>Better protection than other methods</li> <li>Eligibility for grant money</li> </ul>	<ul style="list-style-type: none"> <li>Most protection from extreme floods</li> <li>Lower cost per extra foot once elevated</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>Ground floor remains at risk to more extreme floods</li> </ul>	<ul style="list-style-type: none"> <li>Lose basement access</li> <li>Ground floor remains at risk to more extreme floods</li> </ul>	<ul style="list-style-type: none"> <li>This is a minimum standard and does not consider future changes in risk</li> <li>More expensive</li> </ul>	<ul style="list-style-type: none"> <li>Most expensive strategy in the short-term</li> <li>The ideal height is unclear</li> </ul>

*This is based on research from the Penn State Initiative for Resilient Communities. You can read that research online. Consider contacting your city or county for more flood protection information.*

**Does elevating my house pass a cost-benefit test?**

Zarekarizi, M., Srikrishnan, V., & Keller, K. (2020). Neglecting Uncertainties Biases House-Elevation Decisions to Manage Riverine Flood Risks. *Nature Communications*. <https://doi.org/10.1038/s41467-020-19188-9>



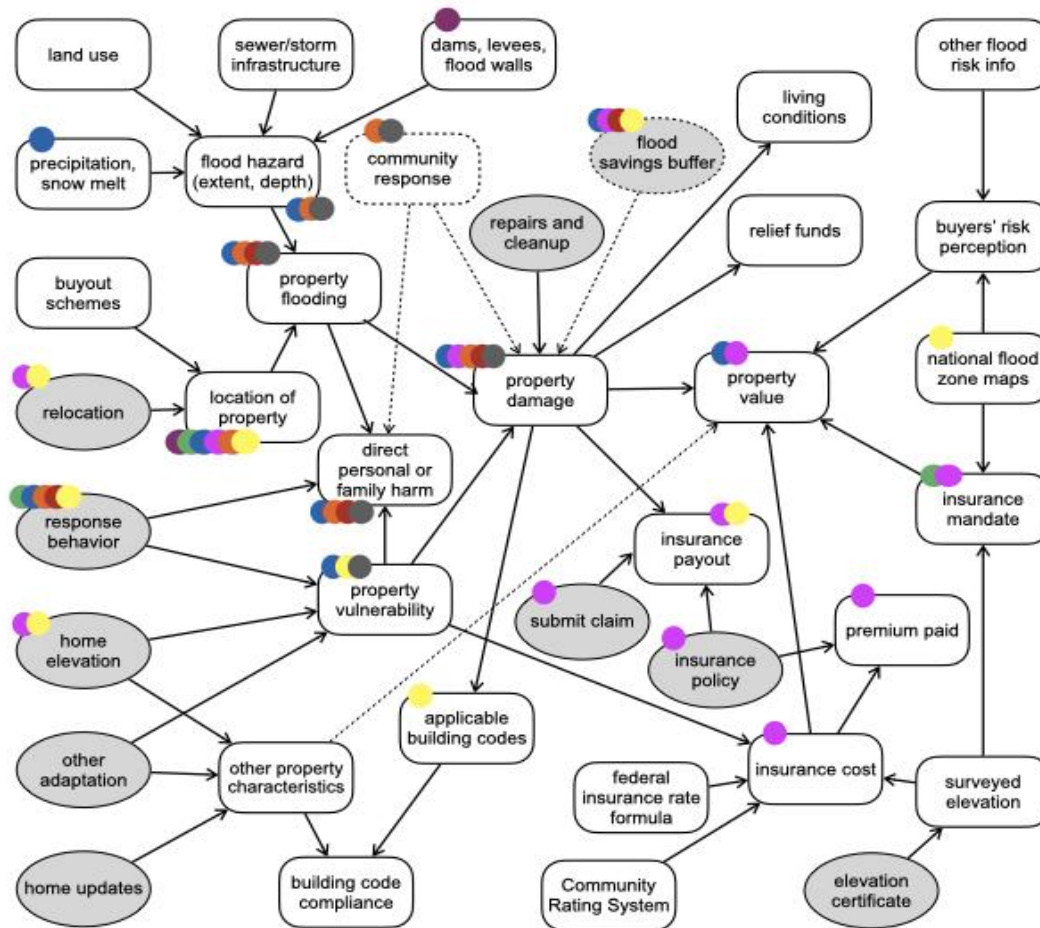
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# Community-University Partnership for Flood Resilience



## Value

- Aesthetics (home or landscape)
- Autonomy
- Loss (material or financial)
- Personal finance
- Place attachment (experiential, genealogical, or neighborly)
- Safety (health or injury)
- Time or effort
- Not specific



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# University-Community Partnerships - Lessons Learned

- Work with community partners to define more consequential research questions & identify data needs
- Improve communication with communities and between decision makers
- Improve data sharing platforms e.g., county plans, green infrastructure systems
- Conduct research to inform and analyze implementation...Sound design decisions and decision support



Flood Resilience Fest, May 2022.

Photo Credit: Stuckeman School, Brian Reed



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# Thank you!

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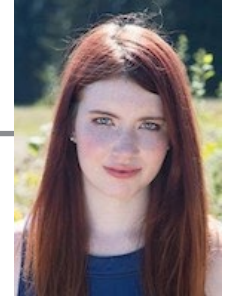
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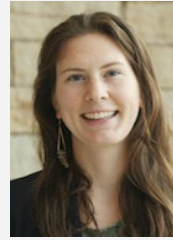
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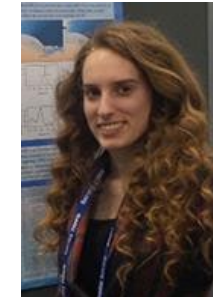
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SCAN ME

<https://www.psirc.psu.edu>

**PSIRC**  
Penn State Initiative for  
Resilient Communities

# Resources

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- [FEMA State Mitigation Planning Policy Guide](#)
- [FEMA Local Mitigation Planning Policy Guide](#)
- [Pennsylvania State Hazard Mitigation Plan](#)
- [Pennsylvania Climate Action Plan](#)
- [Climate Change Adaptation Plan Final \(August 2018\)](#)



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# Upcoming FEMA Region 3 Coffee Break Webinars

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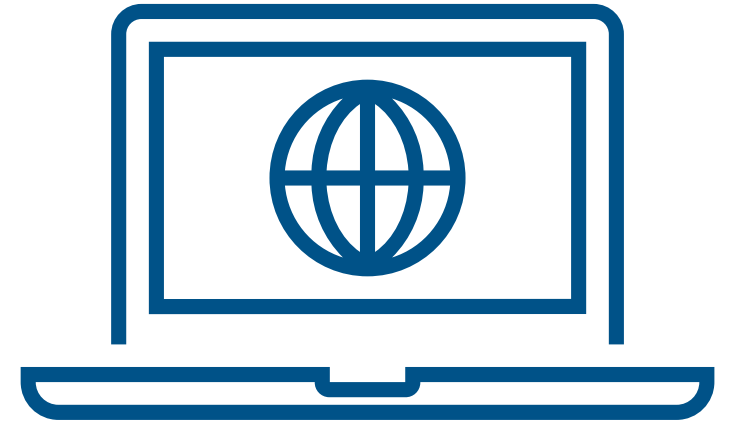
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# FEMA Sign-Up Links

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- Stay tuned for **upcoming FEMA Region 3 Coffee Break webinars**:  
<https://femaregion3coffeebreaks.eventbrite.com>.
- Sign up for the **Region 3 Resilience Report Newsletter and Coffee Break announcements**: <https://bit.ly/FEMA-Region-3>.
  - Please send article suggestions or announcements you would like to see featured in an upcoming newsletter to [fema-r3-hm-planning@fema.dhs.gov](mailto:fema-r3-hm-planning@fema.dhs.gov).
- Join the **Resilient Nation Partnership Network** for upcoming webinars: <https://www.fema.gov/business-industry/resilient-nation-partnership-network>.



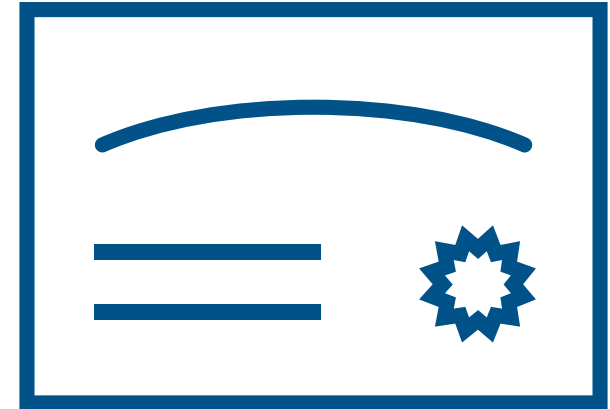
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# You May Be Eligible for Professional Credits

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- Participation certificates will be sent to everyone who attended the whole session and answered polling questions:
  - One Association of State Floodplain Managers (ASFPM) Certified Floodplain Manager Continuing Education Credit.
  - One American Institute of Certified Planners (AICP) Certification Maintenance. Credit course number: [#9259757](#).



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Thank you for participating today!

To request technical assistance, please email:  
[fema-r3-hm-planning@fema.dhs.gov](mailto:fema-r3-hm-planning@fema.dhs.gov)



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