



Flood Risk in the Mid-Atlantic - Goddard Forum 2025

Date: September 10, 2025

Location: Penn State Harrisburg, Madlyn L. Hanes Library, Morrison Gallery Space

Purpose: To discuss and share flood risk experience in the Mid-Atlantic, with a focus on prediction, preparation, operations, and recovery. The forum was preceded by site visits on the afternoon of September 9th to the Susquehanna River Basin Commission, City Island in Harrisburg, and to Middletown at the Swatara Creek - Susquehanna River confluence, which brought real flood risk challenges to the participants.

Introduction

The Goddard Forum 2025 brought together a diverse group of experts, practitioners, and community members to address the multifaceted challenges of flood mitigation and resilience. Christopher Scott, Goddard Chair at Penn State University, highlighted that while floods are an enduring hazard, the approaches to assess and reduce risk are evolving. This evolution is emphasizing a shift from solely structural solutions to a blend of physical infrastructure, human preparedness, and technological innovation. A central theme that emerged throughout the day was the critical need to build trust and partnerships and improve communications across different sectors, from government agencies and academic institutions to local communities and individuals.

Key Highlights and Discussion Themes

1. Preparedness, Operations, and Recovery

- **Preparedness:** Tom Hughes of the PA Emergency Management Agency (PEMA) stressed that a community's ability to handle a disaster depends on its preparedness. This includes having weekly stand-up calls, holding briefings for hurricane season, and using tools like the PA Emergency Information Reporting System (PEIRS). Messaging for individual readiness should include preparing to be self-sufficient for 72 hours, with essentials like medications, cash, and fuel. A major challenge in this area is the difficulty of getting timely information on microbursts due to their unpredictable nature.
- More broadly, Prepare PA is an initiative presented by Christine Kirchhoff of Penn State University Park, that aims to help Pennsylvania thrive in a changing climate through innovation and partnership. The initiative builds on an established network of partners to assess needs, align activities, and connect communities with the knowledge, tools, and resources for climate adaptation and resilience. Prepare PA's mission focuses on three key areas: mitigation (reducing harmful emissions), adaptation (building resilient

communities), and fostering connection and collaboration. The primary activities of the program include outreach and engagement, an annual conference, education, and developing a clearinghouse of science-based data and information.

- **Operations:** During a flood event, an official proclamation or local/county declaration may be issued, and a management team can be built to fill local gaps. For immediate recovery, damage assessments are conducted. A significant issue in Pennsylvania is the lack of substantial damage determinations (SDEs) being done at the local level, which are required for homes with 50% or more damage to be elevated to code and to access federal funding.
- **Recovery:** If a federal declaration is not granted, communities will not receive federal funds. However, the Small Business Administration (SBA) may have funds available, and National Flood Insurance Program (NFIP) grants can be an option, outlined by Teri Provost of Department of Community and Economic Development, although there is a low rate of policy uptake in Pennsylvania. It was noted that many communities only begin the recovery planning process after a disaster, whereas it would be more effective to have these plans in place beforehand.

2. The Challenge of Communication

David Curtis of West Consultants shared the experience and some lessons learned from the Guadalupe River flood over the July 4th 2025 weekend in Kerr County, Texas.

- Accurately forecasting where and when a flood will occur remains a challenge. Curtis highlighted that the tension between meteorologists and hydrologists regarding spatial definition and timing are some of the most critical problems in flood forecasting. He spoke at length on the Guadalupe River Basin floods on July 4, 2025, when a "flood monster" of water, described as a 5-mile wedge, rose at a rate of 1-2 feet per minute. This event illustrated the difficulty of getting timely information for microbursts and how quickly flood conditions can change. If the key issue for the first mile is overcoming accuracy problems to make informed decisions, the last mile is about communicating the forecast and motivating people to take action, especially during a fast-moving event like a flash flood. A major hurdle is that warnings are often issued in the middle of the night, when people are asleep, and cellular service may be unreliable. **"Warning fatigue"** occurs when too many flash flood warnings make it difficult for people to know which one to act on. He stressed the need to convey the risk of floods that have not been seen before and the importance of visualization tools to help people internalize and believe in the event they are facing.
- Ultimately, the goal is to build trust in communities so that they will act on the information provided by trusted officials.

3. Data, Tools, and Technology for Flood Resilience

- **Forecasting and Modeling:** Alaina MacFarlane and Craig Evanego from the National Weather Service explained their operations – hurricane and river flooding by the Middle Atlantic River Forecast Center (MARFC) and flash flood guidance by the Weather

Forecast Office in State College, using 72-hour quantitative precipitation forecasts, and providing briefings for expected events. Ben Pratt from the Susquehanna River Basin Commission (SRBC) discussed stage-based flood inundation maps and flood warning systems for the Susquehanna. Discussion moderated by Lara Fowler, Penn State University Park, centered on the need for flood communication and response efforts to focus on converting data into actionable information that better informs the response. Since flooding cannot be completely eliminated, the focus should shift to adding value to protective measures without getting discouraged, starting with small, manageable steps. This includes using forecast warnings and inundation maps to protect communities and guide the response, as well as identifying and bridging disconnects in understanding, especially with emergency managers. It is also important to recognize successes by acknowledging lives saved during responses. To be effective, efforts must identify and protect communities most prone to events and address the specific needs of vulnerable populations by providing translation services and partnering with agencies that connect to groups such as the undocumented and the elderly. Building partnerships, including with academia, and proactively educating children are crucial for a long-term strategy. Finally, addressing the challenge of misinformation and promoting cost-effective, non-structural solutions over expensive levees and dams are key components of a comprehensive approach to flood resilience.

- **Visualization:** Maurie Kelly, Patrick Dudas, Peter Stempel, and Robert Nicholas, all of Penn State University Park, presented on advances with visualizing flood risk. Tools like the PA Flood Risk Tool and 3D pilot projects use data such as aerial photos, drone images, and building footprints to help people understand their risk. Stempel highlighted the value of connecting scientific data with familiar places and contextualizing it with photos to make it meaningful. In a related session to consider potential future impacts, Alfonso Mejia and Kaleigh Yost of Penn State University Park presented on the use of modeling systems to assess solutions, including nature-based infrastructure and the challenges posed by aging levee systems

4. Social and Community Dimensions

- **Trust and Partnerships:** A recurring theme throughout the forum was the need to build trust and partnerships. This includes building relationships with communities before a disaster strikes and during smaller, more frequent events to establish credibility. It was noted that a political environment that breeds mistrust in science is a significant challenge.
- **Community Engagement:** Shirley Clark of Penn State Harrisburg presented research on a densely developed urban area highlighting the emotional and financial challenges faced by residents, many of whom were unaware they lived in a flood risk area. Teri Provost of the Department of Community and Economic Development emphasized the importance of working with community members to build local capacity and form flood task forces to navigate complex policies and secure funding.
- **Equity:** The forum's discussions included addressing the needs of vulnerable populations, such as those with language barriers or undocumented status, and the

importance of partnering with agencies that serve these groups. The loss of traction on equity review in county plans was also noted as a concern.

5. Scenario Planning and Future Actions

Breakout sessions explored different scenarios, contrasting outcomes with improved vs. deteriorated preparedness.

- **Deteriorated Preparedness:** These scenarios led to reduced communication, delayed decision-making, overwhelming response efforts, and a breakdown of trust.
- **Improved Preparedness:** In these scenarios, high-accuracy maps and a cultural shift led to effective warnings and a better response, putting communities in a stronger position.

Breakout Group Reports

Group 1 (Hurricane Agnes-strength Event with High Emergency Preparedness, Report by Lara Fowler)

- Know who is likely to be impacted, what they should do and when
- Communication plan from a trusted source
- Better public safety and land use planning, better systems for water management and improved public transit and available data/info
- Annual drills and training
- Maps, deployable flood walls, signage
- Partnerships with other states, and strong federal funding and support
- Up-to-date public health and street cleaning to be done later

Group 2 (Hurricane Agnes-strength Event with Low Emergency Preparedness, Report by Digant Chavda, Penn State University Park)

- Limited staffing, no evacuation alerts, inaccurate gages
- Rumors/misinformation, lack of trust in officials
- First responders disconnected
- During flood: citizens caught off guard, authorities and first responders unable to organize
- Future preparedness levels deferred to later decisionmaking

Group 3 (Flash Flooding Event with High Emergency Preparedness, Report by Lauren McPhillips, Penn State University Park)

- High accuracy warnings and maps
- Well-planned visualization using researchers and GIS
- Cultural and community engagement
- Valuation of green spaces

- Decisions to be made: who to evacuate, will there be buyouts? Are there enough spaces for people to evacuate to?

Group 4 (Flash Flooding Event with Low Emergency Preparedness, Report by Peter Stempel, Penn State University Park)

Federal activity pulls back, leads to lack of communication and instruction

- Undermined authority and increase of rumors and misinformation
- Post-flood anger at lack of help
- Infrastructure damage persists long term

The forum concluded with a commitment to disseminating the final report and continued engagement through events like the PAFPM conference and the Penn State Climate Solutions Symposium. Key needs identified for the future include:

- Better communication about flood insurance
- Partnerships with K-12 education
- Greater emphasis to considering health risks of flooding
- Using storytelling to reach people
- The need for seamless statewide and county-authored assessment data at the parcel level that can be used to facilitate better hazard mitigation planning and, when needed, damage assessment across boundary lines (identified by Scott Drzyzga, State Geospatial Coordinating Board).

Annex 1. Goddard Forum 2025 program

Flood Risk in the Mid-Atlantic – Goddard Forum 2025

Venue: *Penn State Harrisburg, Madlyn L. Hanes Library, Morrison Gallery Space*

<https://maps.app.goo.gl/VcDoWzXQefQgZv2s5>

Parking: https://maps.app.goo.gl/4duSzByLFoBJTB1E9?q_st=a

September 10 Flood Risk in the Mid-Atlantic - Goddard Forum

- 8:30 AM Registration, coffee
- 9:00 Welcome, introductions, and overview - Christopher Scott, Goddard Chair, Penn State University Park
- Hybrid participation (9:00 am and 4:45 pm sessions) - <https://psu.zoom.us/j/97098434987>*
- 9:30 “Hurricane and tropical storm impact - Preparation, operations, and recovery efforts” - Thomas Hughes, PA Emergency Management Agency
- 10:00 “Learning from other recent experience: Challenges of the first mile and last mile of flood warning systems,” including reflections from Kerr Co. Texas - David Curtis, West Consultants
- 10:30 Break, networking
- 11:00 “Flood prediction and response: Federal, state, and regional roles” - Panel moderated by Lara Fowler, Penn State / Dickinson Law
- 11:05 “Overview of Middle Atlantic River Forecast Center” - Alaina MacFarlane, National Weather Service
- 11:20 “National Weather Service Flood Operations” - Alaina MacFarlane & Craig Evanego, National Weather Service
- 11:30 “Susquehanna River Basin Commission Flood Management” - Benjamin Pratt, SRBC
- 11:35 Panel discussion
- 11:45 Audience questions/discussions
- 12:00 Potential next steps - Lara Fowler
- 12:10 “Playing the hand we’re dealt: Challenges of flood mitigation in an older, densely-developed urban area” - Shirley Clark, Penn State Harrisburg
- 12:30 Lunch and interaction time
- Patrick Dudas, College of Information Science & Technology, Penn State University Park

- 1:00 “Seeing is believing: Visualizing flood risk” - Session moderated by Maurie Kelly, with Peter Stempel and Rob Nicholas, Penn State University Park
- 2:00 “PREPARE PA” - Christine Kirchhoff, Penn State University Park
- 2:30 “Intersections of Flood Events and the Built Environment: Pennsylvania Perspective” - Teri Provost, Department of Community and Economic Development, introduced by Lisa lulo, Penn State
- 3:00 Break
- 3:15 “Building flood resilience in the Susquehanna River Basin” - Alfonso Mejía, Kaleigh Yost, Penn State University Park
- 3:45 “Scenario planning for future flood risk” - Breakout groups moderated by Christopher Scott
- 4:45 Report-back, synthesis and next steps
- Hybrid participation (9:00 am and 4:45 pm sessions) - <https://psu.zoom.us/j/97098434987>*
- 5:00 Adjourn

Contact: Christopher Scott, cascott@psu.edu
 Goddard Chair and Professor, Dept. of Ecosystem Science & Management,
<https://ecosystems.psu.edu/directory/cvs6145>
 Associate Director, Institute of Energy & the Environment, iee.psu.edu

Flood Risk in the Mid-Atlantic – Goddard Forum 2025

- September 9 Susquehanna River and Swatara Creek Flood Risk Site Visit**
- 11:30 AM Participants arrive at Penn State Harrisburg
Parking https://maps.app.goo.gl/4duSzByLFoBJTB1E9?q_st=a
- 12:00 PM Lunch
- 12:30 Depart for site visit, engagement with stakeholders *[Penn State will provide mini vans]*
- 1:00 Arrive at Susquehanna River Basin Commission (4423 North Front Street)
- 1:15 SRBC Remarks
- 2:00 Depart SRBC office
- 2:15 Arrive on City Island
- 2:15 Presentations, Harrisburg Fire Chief Brian Enterline
 Rebecca Vollmer, City of Harrisburg
- 4:00 Depart City Island
- 4:15 Arrive Middletown Boat Launch
- 5:00 Depart Middletown for quick trip back to campus
- 5:30 Hotel check-in *[Accommodation for those who requested this in advance]*
 Fairfield by Marriott Inn & Suites Harrisburg International Airport
 4 Terminal Dr, Middletown, PA 17057
- 6:30 Networking dinner *[Meal & non-alcohol covered]*
 River House Scratch Kitchen + Bar
 2495 E Harrisburg Pike, Middletown, PA 17057
 (717) 930-8700
<https://maps.app.goo.gl/eeww3C5vGB6oNftK8>

Note: The main Goddard Forum will be held September 10, 8:30 AM – 5:00 PM

Speaker/ committee bios (of those who provided this information)

Christopher Scott is Maurice K. Goddard Chair and Professor of Ecosystem Science and Management at Penn State. He is also Associate Director of the Institute for Energy and the Environment and Director of the Americas Water-Energy-Food (WEF) Nexus Alliance. His work focuses on water security, the WEF nexus, and transboundary waters. He was Director of the Udall Center for Studies in Public Policy and Professor of Geography at the University of Arizona (2006-21), worked for the National Weather Service (2000-01), and as a FEMA contractor (1985-87). He earned his PhD and MS at Cornell University, PE in New York state, BS and BA at Swarthmore College, and attended K-12 at Woodstock School, India. He is a Fellow of the American Association for the Advancement of Science and Fellow of the International Water Resources Association.

Tom Hughes was the Commonwealth of Pennsylvania's State Hazard Mitigation Officer (SHMO) from 2009-2023; employed with PEMA since 1993. Now, as the Director of the EM Mitigation, Insurance and Resilient Communities (MIRC) Office, he is responsible for the oversight of all 67 FEMA required county Hazard Mitigation Plans, 14 State System of Higher Education (state colleges) Disaster Resistant University Plans the State Enhanced Hazard Mitigation and State Pre Disaster Recovery Plans. Additionally, the office gained the oversight FEMA's National Flood Insurance Program and the Resilience Office. His office has over 350 working through 7 FEMA and HUD/State/Locally funded disaster and non-disaster Hazard Mitigation funding streams. He served as President of the National Hazard Mitigation Association (NHMA) and is the Training and Certification Chair, co-chairs the nationally recognized Pennsylvania Silver Jackets Team (USACE Silver Jackets Team of the Year in 2023), completed his assignment with FEMA's Hazard Mitigation Assistance External Stakeholder Working Group (ESWG) and now fills a mentorship/alumni role for that national group. Working with 7 Recovery Support Functions, completed a tour with the COVID-19 and Tropical Storms Ida and Debby State Long-Term Recovery Task Force activities.

David C. Curtis, PhD, PH, F.EWRI - Dr. Curtis has more than 5 decades of experience designing, implementing, operating, and maintaining flood warning systems across the US and around the globe. Most recently, he contributed to the "Alternative Flood Early Warning System Guide" for the Texas Water Development Board and provided the rain gage network design for a new all hazards warning system for Peru. Dr. Curtis holds engineering degrees from Penn State, Univ. of Maryland, and the Massachusetts Institute of Technology. An ardent Penn Stater, his family connections to Penn State span 3 centuries.

Alaina MacFarlane is a Senior Hydrologist at the Middle Atlantic River Forecast Center in State College, PA. She holds both a bachelor's and a master's degree in Meteorology from Penn State and focuses on river forecasting, developing forecasting techniques, and working on ensemble modeling systems.

Craig Evanego is the Senior Service Hydrologist (SSH) at the National Weather Service (NWS) forecast office in State College, Pennsylvania. Originally from Westmoreland County, Pennsylvania, Craig earned a bachelor's degree in Meteorology from Millersville University of Pennsylvania and a master's in Geographic and Cartographic Science from George Mason University. Craig joined NWS State College as a meteorologist in 2007 and assumed the role of SSH in 2024. Craig is responsible for the NWS State College forecast office's hydrology program, including flood and flash flood warning operations.

Teri Provost is the Community Development Block Grant Program Manager with the PA Department of Community and Economic Development (DCED). Prior to joining DCED, she served as Chief of the SEDA-Council of Governments Community Services Division, where she spent 17 years in various leadership roles, including Interim Director of the Community Development Program and Director of

Housing Rehabilitation and Flood Resiliency. She has extensive experience with programs administered by the Federal Emergency Management Agency and the U.S. Dept. of Housing and Urban Development. A Certified Floodplain Manager, Ms. Provost has overseen numerous state- and federally funded projects, including property buyouts and residential elevation initiatives in flood-prone communities. She served as a District 2 Director (2022–24) for the Association of State Floodplain Managers and also served as both past chair and vice chair of the PA Association of State Floodplain Managers board. She earned her bachelor's degree in Psychology and Sociology from Clarion University in 2002.

Benjamin Pratt, PE, CFM, serves the Susquehanna River Basin Commission (Commission), located in Harrisburg, PA, as a Water Resources Engineer in the Planning and Operations Program. He is responsible for management of projects related to flood hazard mitigation through early warning, drought preparedness, water conservation, and water management policy. Ben is a graduate of the Pennsylvania State University and a licensed Professional Engineer in the Commonwealth of Pennsylvania. With more than 20 years of experience, Ben has been integrally involved in projects that have driven the evolution of web based geospatial products, enabling wide scale access to and understanding of critical life-saving information. Ben has multiple professional affiliations and is a long standing member of the National Hydrologic Warning Council, currently serving as Conference Chair for NHWC's 16th Biennial Conference, to be held in June 2027 in Charlotte, North Carolina.

Maurie Kelly is the Director of Informatics at Penn State's Institute for Energy and the Environment where she manages multiple data projects and programs. She is the director of Pennsylvania Spatial Data Access (PASDA) and her team also manages the PA Flood Risk Assessment Tool, the PA Mine Map Atlas, PennPilot, and other geospatial data projects. Her research includes big data, and crisis/resilience with a particular interest in flood disaster community response. In recent years, her interests focused on environmental topics and crisis leadership, in particular leadership at times of extreme natural disasters such as Hurricane Katrina.

Patrick Dudas is an Associate Teaching Professor at the Penn State College of Information Sciences and Technology. He previously served as the associate director of the Center for Immersive Experiences at Penn State. Dudas holds a doctoral degree in information science from the University of Pittsburgh. He is passionate about creating data visualizations and storytelling methods to help researchers understand their underlying data and make their results more accessible and comprehensible. In collaboration with Cambria County, Dr. Dudas developed the 3D PA Flood Risk experience for the PA Flood Risk Assessment Tool.

Kaleigh Yost, PhD, is the L. Robert and Mary L. Kimball Early Career Assistant Professor in the Department of Civil and Environmental Engineering at Pennsylvania State University. Her expertise is site characterization and numerical methods for geotechnical hazard applications and she is particularly interested in how geohazard engineering research is implemented in policy and practice. Kaleigh received her Ph.D. from Virginia Tech, her M.S. from the University of Texas at Austin, and her B.S. from the University of Notre Dame. Prior to pursuing her Ph.D., Kaleigh worked as a geotechnical engineer in the Washington D.C. area, and contributed to over 15 international projects on four continents.

Nathan Weyandt is the Project Coordinator at Penn State for the SustainFood network, an NSF funded research grant focused on network-to-network building in the Water-Energy-Food Nexus system across the US and Africa. Nathan got his Wildlife and Fisheries degree at Penn State, with focuses on avian and fisheries research.

Annex 2. Participant List

Goddard Forum 2025 Participant List

First Name	Last Name	Organization
Bishwodeep	Adhikari	Penn State Harrisburg
	Bak	
Anthony	Buccitelli	Penn State Harrisburg
John	Balay	Susquehanna River Basin Commission
Natasha	Baumgartner	Penn State
Gale	Blackmer	DCNR Bureau of Geological Survey
Ali	Bowling	PA Department of Conservation and Natural Resources
Poulomi	Chakraborty	Pennsylvania State University
Digant	Chavda	The Penn State University
Shirley	Clark	Penn State
Jonathan	Conville	PADEP Flood Protection Program
Nichole	Cronce	National Weather Service
David	Curtis	WEST Consultants
Lindsay	Dewar	Penn State University Park
Scott	Drzyzga	State Geospatial Coordinating Board
Patrick	Dudas	Penn State University
Shane	Erdman	PA DEP - Bureau of Waterways Engineering & Wetlands
Craig	Evanego	National Weather Service
Dudley	Ewen	PA Insurance Dept.
Rachel	Fedorko	Susquehanna River Basin Commission
Ellen	Fehrs	DCNR

Lara	Fowler	Penn State
KAUSIK	Ghosh	Pennsylvania State University
Dave	Gorman	DEP
Kelsey	Green	County of Lycoming
Eliza	Gross	U.S. Geological Survey
Madeleine	Hedrick	Penn State University Park (EEFE Graduate Student)
Tom	Hughes	Pennsylvania Emergency Management Agency
Erica	Husser	PSU Nese College of Nursing
Lisa	Iulo	Penn State
Maurie	Kelly	Penn State
Christine	Kirchhoff	Penn State
Teri	Lea Provost	Commonwealth of Pennsylvania, DCED
Alaina	MacFarlane	Middle Atlantic River Forecast Center (MARFC)
Lauren	McPhillips	Penn State (University Park- Civil & Enviro Eng/ Ag & Bio Eng)
Alfonso	Mejia	Penn State
Rob	Nicholas	Earth & Environmental Systems Institute, Penn State University
Ben	Pratt	Susquehanna River Basin Commission
Heather	Preisendanz	Penn State/SAFES
Teri	Provost	Commonwealth of Pennsylvania, DCED
Cibin	Raj	Penn State
Domenic	Rocco	PA DEP/ Bureau of Waterways Engineering and Wetlands
Christopher	Scott	Penn State Dept. of Ecosystem Science & Management
Virginia	Silvis	HDFS & SSRI - Penn State University

Mathy	Stanislaus	The Environmental Collaboratory @ Drexel University
Peter	Stempel	Penn State University
Steve	Travis	National Weather Service MARFC
Nathan	Weyandt	Penn State University
Sarah	Whitney	Pennsylvania Sea Grant/Penn State
Kaleigh	Yost	Penn State - University Park
Katherine	Zipp	Penn State