Preparing for the Next Storm

Lessons Learned from Hurricane Helene

March 2026

Cover Photo: Smoky Park Supper Club in Asheville, NC, inundated by the French Broad River. Photo courtesy of MountainTrue.

Introduction

Hurricane Helene reached Western North Carolina and East Tennessee on September 27, 2024, creating devastating flooding, landslides, and tree fall. The storm killed at least 108 people in North Carolina and 18 people in Tennessee and resulted in nearly $60 billion in damage in North Carolina and at least $1.2 billion in Tennessee.[1,2,3,4] Impacted counties in North Carolina include more than 40% of the state's population and account for 45% of the state's GDP.[3]

Rainfall during two days leading up to the arrival of Hurricane Helene worsened the impacts of the storm by increasing river levels and reducing the land's capacity to absorb water. Helene dropped 20 or more inches of rain across large portions of Western North Carolina, and as much as 30 inches fell in some locations.[5] Over 2,000 landslides occurred.[3] The storm brought winds as high as 100 miles per hour. North Carolina and Tennessee together had over one million acres of trees significantly damaged.[6,7]

Though this storm was historic by any account, the area is familiar with flooding. The French Broad watershed flooded significantly in 2004 when Western North Carolina was hit with the remnants of three Hurricanes – Frances, Ivan and Jeanne – in the month of September. Frances cut off drinking water to the City of Asheville when a slide damaged the pipeline from the North Fork Reservoir. One landslide caused by rainfall from Ivan killed five people in Macon County.[8] During Tropical Storm Fred in 2021, six people died in Haywood County, NC due to flooding in the Pigeon River watershed. Fred caused over a billion dollars in damage across the Southeast.[9] Central Appalachian counties range from medium to "red flag" levels of risk of extreme rainfall, according to analysis of historic flooding, future flood risk, and likely economic losses.[10] Flooding is becoming far more common – and remains extremely deadly – across the mountain regions of North Carolina, Tennessee, Virginia, Kentucky and West Virginia.[11] Over the last decade (2016-2025), there have been 40 federally declared flooding disasters across Kentucky, North Carolina, Tennessee, Virginia, and West Virginia.

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[1] North Carolina Department of Health and Human Services. Hurricane Helene Storm Related Fatalities. https://www.ncdhhs.gov/assistance/hurricane-helene-recovery-resources/hurricane-helene-storm-related-fatalities
[2] Knox News. Hurricane Helene flooded parts of East Tennessee. What was the final death count? https://www.knoxnews.com/story/news/local/2024/12/10/how-many-people-died-in-tennessee-in-hurricane-helene/76859059007/
[3] North Carolina Office of State Budget and Management. Hurricane Helene Recovery. Dec. 13, 2024. https://www.osbm.nc.gov/hurricane-helene-dna/open
[4] Tennessee State of the State Address. February 2025. https://www.tn.gov/governor/sots/2025-state-of-the-state-address.html
[5] National Oceanic and Atmospheric Administration. National Hurricane Center Tropical Cyclone Report: Hurricane Helene (AL092024). https://www.nhc.noaa.gov/data/tcr/AL092024_Helene.pdf
[6] Tennessee Department of Agriculture. Hurricane Helene: Timber Damage Assessment. Nov. 13, 2024. https://www.tn.gov/agriculture/forests/protection/hurricane-helene-timber-damage-assessment.html
[7] North Carolina Department of Agriculture. North Carolina Forest Damage Appraisal Hurricane Helene September 2024.https://www.ncagr.gov/divisions/nc-forest-service/NCFS-HurricaneHelene_DamageAssessment.pdf/open
[8] North Carolina State Climate Office. A Tropical Trio in September 2004 Tested the Mountain Terrain. 2019. https://climate.ncsu.edu/blog/2019/10/a-tropical-trio-in-september-2004-tested-the-mountain-terrain/
[9] National Oceanic and Atmospheric Administration. Tropical Storm Fred. https://satlib.cira.colostate.edu/event/tropical-storm-fred-2
[10] American Communities Project. Mapping Climate Risks by County and Community. 2021. https://www.americancommunities.org/mapping-climate-risks-by-county-and-community/
[11] First Street Foundation. The 8th National Risk Assessment: The Precipitation Problem. 2023. https://report.firststreet.org/8th-National-Risk-Assessment-The-Precipitation-Problem.pdf

Because these extreme weather events are becoming more frequent and costly, both in terms of lives lost and economic impact, we must improve how we prepare for and respond to them. The goal of this report is to illuminate lessons learned from the experience of, and recovery process from, Hurricane Helene.

We organized our findings into seven primary categories: emergency preparedness and response management, immediate storm response, local governance, floodplain management and flood insurance, rebuilding housing, economic impacts, and land and water impacts. Common themes arose across categories. Disaster preparedness, including training, planning, and supplies organization, that takes place long before a disaster occurs and is reviewed regularly will have immense benefits when a disaster occurs. Coordination across different levels of government and with non-governmental organizations and volunteer groups can be challenging, but is critical for providing an adequate response to a large disaster. Incorporating disaster resilience into roads, public buildings, utilities, and housing can lessen storm impacts and save lives. Incorporating resilience into construction should be incentivized through favorable loans, grants, and/or savings on insurance premiums, and should be required through regulation in some cases. Well-functioning floodplains are critical to flood resilience. Large floods and other disasters can negatively impact wildlife and ecosystem function. Disaster recovery activities further environmental impacts; efforts should be made to reduce these impacts.

These findings can inform policy recommendations at the local, state and federal level. In 2024, a coalition of groups across Appalachia, including the Appalachian Citizens' Law Center, released Flood Resilience in Appalachia – a policy report that identified four main areas of concern and potential policy solutions.[12] We hope to continue building upon these policy recommendations based on lessons learned following Hurricane Helene so that other organizations and governments can use these recommendations to improve the region's resilience to flooding.

Methodology

Following Hurricane Helene, the Appalachian Citizens' Law Center began a listening project to learn about the storm's impacts, community needs, novel solutions to recovery and resilience planning, and any remaining policy gaps. The long-term goal of this report is to build upon the existing flood policy platform by adding insights from people in Tennessee and North Carolina that experienced Helene first-hand. This report is intended to summarize major lessons learned, especially where there may be an associated federal policy opportunity. Some issues identified in this study may also provide local- or state-level policy solutions. We hope that other community groups and agencies will use this report to identify opportunities for such improvements at all levels of government.

Our methodology for gathering the information contained in this report relied on interviews with a diverse group of stakeholders involved in the disaster recovery process. We requested interviews with local government officials, nonprofit organizations, and volunteer groups involved in disaster response

[12] Flood Resilience in Appalachia: Policy Recommendations. 2024. https://reimagineappalachia.org/wp-content/uploads/2024/05/Appalachian-Flood-Resiliency-Federal-Policy-Platform-May-2024.pdf

and recovery across North Carolina and Tennessee. We created a list of potential interviewees based on geographic location and their relationship to the storm (local official, nonprofit staff, key volunteer) and sent requests for an interview to all. We then asked interviewees to assist us in identifying and connecting with additional potential interviewees. In all, we sent 65 interview requests and ultimately conducted 44 interviews across 16 counties in North Carolina and Tennessee (Table 1). Most interviewees were from North Carolina, due to the fact that the storm had a much larger impact, over a larger geographic area, than it did in Tennessee. While we requested interviews from individuals in almost every North Carolina county significantly impacted by Helene, some requests received no response. Buncombe County was the most heavily represented, due to the number of government officials and other professionals who live in that county. The report author conducted all interviews. Most interviews occurred in-person, though a small number were held via telephone or video conference. When possible, the author visited impacted areas referenced in each interview.

Table 1: Interview Statistics

Type of Interviewee	Number of Interviewees
Nonprofit staff	19
Government staff or elected officials	20
Volunteers/community leaders	5
Total Number of Interviewees (38 in North Carolina, 6 in Tennessee)	44

We created a list of potential interview questions we would use, adjusting which questions were asked depending on the role and experience of the interviewee. We prompted interviews with questions that generally followed a timeline – storm preparation, immediate storm response, and long-term recovery. We encouraged participants to tell their stories organically and share what felt most important to them. We asked some specific questions most likely to result in answers that could inform federal policy, including questions about experiences with the Federal Emergency Management Agency (FEMA) and other federal agencies, successes and problems with long-term recovery planning and funding, and experiences with flood insurance claims

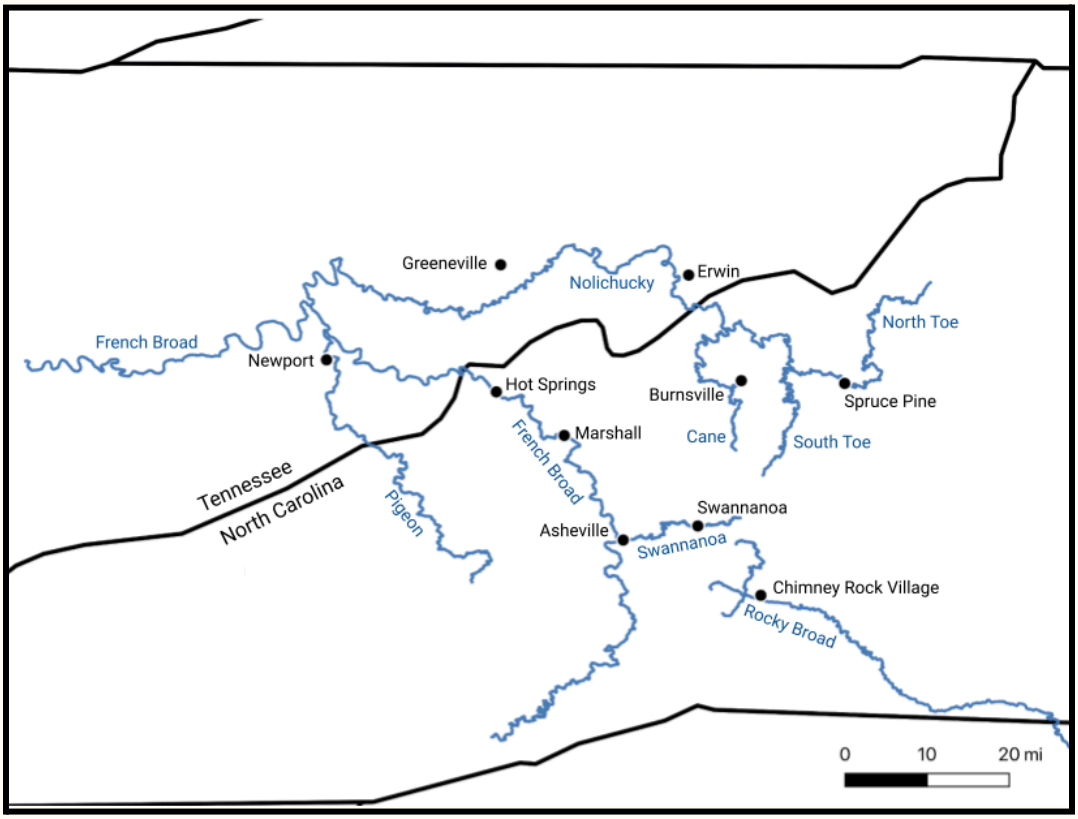
Emergency Preparedness and Response Management

We interviewed four emergency management personnel across several counties in both North Carolina and Tennessee. Emergency management agencies were critical for storm response across the region. Multiple respondents noted the importance of data in their preparation for Helene. Rainfall and river level predictions allowed officials to warn residents, encourage evacuation where necessary, and reduce casualties. Additional communication tools such as radios and sirens, accompanied by public education campaigns are necessary to improve the ability to warn residents of impending weather events and how to take shelter during those emergencies. After the storm, in spite of the availability of skilled volunteers, search-and-rescue efforts were difficult to coordinate. Advanced planning for

deploying volunteers and coordinating between local agencies and FEMA may help improve the efficacy and efficiency of search and rescue efforts. Last, the interviews also revealed large variation in funding and capacity across agencies in different counties, often revealing that they are short-staffed and under-funded.

Weather, Stream, and Landslide Monitoring

Several emergency management officials noted that the National Weather Service (NWS) provided crucial and accurate information regarding Hurricane Helene's path and likely rainfall. They stressed the importance of sufficient funding for the NWS. One county official noted, "the NWS saved our bacon."



Simplified map of major rivers that flooded significantly during Hurricane Helene.

The National Water Prediction Service provided crucial information about predicted river rise. Though predictions often fell short of the actual historic flooding that occurred, they were sufficiently accurate to warn local officials and residents to expect a record-setting event. One official in Madison County, NC, noted that the French Broad was originally predicted to reach 10 feet, but the prediction was later updated to 19 feet, which was 2 feet lower than the previous record set in 1916. The river eventually crested at 21.36 feet.[13] The Swannanoa River was predicted to reach 21 feet, but rose to 27 feet.[14] The

[13] National Water Prediction Service. French Broad River above Rollins Rd, 1 SE Marshall. https://water.noaa.gov /gauges/MARN7

[14] Asheville Watchdog. It's official: Helene's rainfall, flooding broke all-time records. Oct. 4, 2024. https://avlwatchdog.org/its-official-helenes-rainfall-flooding-broke-all-time-records/

Nolichucky River was predicted to reach 22 feet, but eventually reached 33.88 feet.[15,16] The prediction for the Nolichucky was an underestimate likely because the watershed covers a large geographic area and it was difficult to predict that *all* of the major Nolichucky headwater rivers – the North Toe, the South Toe, and the Cane – would receive some of the highest rainfall of the storm.

Heavy rain not only results in flooding, but can also trigger landslides in steep Appalachian terrain. In North Carolina, 23 people died due to landslides. The North Carolina Geological Survey runs a Landslide Hazards Program, which maintains an inventory of landslides and a susceptibility map. The model used for the susceptibility map caught 100% of fatal debris flows and 92% of all debris flows, indicating that this map can be used effectively for public safety and decisions regarding future building sites. The model indicates that determining when and where landslides start is possible – in Western North Carolina, the model indicates a high likelihood of slides when 5 inches or more of rain falls within 24 hours.

Several respondents in downstream communities in both North Carolina and Tennessee noted that they received relatively little rainfall, so it was not immediately clear how bad flooding would soon become. Upstream river and rain gauges, gauge alert systems, and effective communication between various emergency management agencies are critical in alerting downstream communities of impending flooding. Respondents raised the need for more rain and river gauges further upstream in watersheds. Currently, only one staff person from the United States Geological Survey (USGS) covers operation of all stream gauges across North Carolina. In addition, funding for stream gauge operation and maintenance is often limited, with individuals and nonprofit groups needing to step in to fill gaps in federal funding. One emergency management employee noted installation of rain and stream gauges on land designated as Wilderness can be especially difficult. Such installation requires the approval of the Forest Supervisor or District Ranger.[17]

Warning Systems, Evacuations, and Communication

Different counties use different strategies for communicating with their residents, providing warnings, and orchestrating evacuations. Informed by weather and river rise predictions, prior to Helene, several counties undertook door-knocking operations, speaking with residents in-person, showing flood maps, distributing fliers, and encouraging evacuations where necessary. Some counties experienced some flooding and minor landslides almost 36 hours before the main hurricane arrived, which led them to accelerate door-knocking efforts and encourage everyone to move away from rivers and streams. One county official noted that younger and newer residents were more likely to take warnings seriously. Several issues limited the extent to which evacuation orders were used. First, officials are often reluctant to tell residents to leave, or to say anything that might create panic. Second, it is logistically more difficult to evacuate rural, mountainous areas without major interstates, and with no obvious place to evacuate to. This is in contrast to coastal areas where marine flooding locations are more predictable and there are available interstates to move people away from the coastline. With these

[15] WGRV. Nolichuckey River Now Expected To Reach Second Highest Level In Over 100 Years. Sept. 27, 2024. https://wgrv.com/2024/09/27/nolichuckey-river-now-expected-to-reach-second-highest-level-in-over-100-years/
[16] National Water Prediction Service. Nolichucky River at Embreeville. https://water.noaa.gov/gauges/embt1
[17] 36 § 293.15(c)

limitations on the efficacy of evacuation, one emergency management officer stressed the need to figure out how to keep people safer in place.

Various forms of communication are an important part of public education and disaster response. One respondent noted that community members typically respond better to multiple touchpoints. Recent research on communication regarding extreme weather events in Central Appalachia identified several of the same issues raised during this project – distrust of government agencies, "numbness" to warnings combined with a culture of extreme self-reliance, and poor internet and cell service.[18] Several respondents lifted up the use of radio. Radio is a very resilient form of communication and can still reach many listeners. Some public officials joined local radio shows to disseminate information and to gain public buy-in for storm preparation through trusted community voices. One county is pursuing grant funding to distribute weather radios to all residents. If necessary, officials can utilize weather channels to share other information as well. One respondent noted that there is often a focus on money for emergency management equipment, but relatively little for community education. If more money was put toward staffing and materials for community education, fewer rescues might be required.

In addition to radio as a form of communication, a few counties and municipalities either have or are planning to install sirens. The cost of siren warning systems varies depending on the number of sirens needed and other factors. Siren systems can cost over $1 million – a price tag that may be out of reach for many rural counties. Respondents noted that data about the effectiveness of warning systems is mixed. If systems are over-used in non-emergent situations, residents become desensitized to the warnings. One respondent noted the importance of utilizing rain and river data to carefully calibrate when flood warning systems should be triggered. Alternatively, residents may not understand what to do in response to a siren; for example, moving to higher ground in response to a flood siren versus finding cover in response to a tornado siren. Public education is critical to making warning systems effective.

Multiple emergency management personnel mentioned the importance of translation services. Emergency management staff shared an ethos of "do not leave anyone behind," and stated that agencies are obligated to serve communities that do not speak English as a first language, even if the agency is not mandated to do so. There is a federal effort to provide Wireless Emergency Alert (WEA) messages in the 13 most commonly used languages in the United States. The Federal Communications Commission has approved this update to the WEA system and set a compliance date of June 12, 2028 for wireless providers..

Search and Rescue

Search and rescue efforts began as soon as flooding began, which in some locations was during heavy rain on Thursday, the day before Helene arrived in the area. Many local government agencies, nonprofit organizations, and religious groups conducted wellness checks, sometimes in conjunction with aid distribution. Due to widespread power, internet, and cellular service outages, accounting for impacted residents was extremely difficult and required time-intensive on-the-ground efforts. It was also

[18] Khan, A. et al.Extreme Weather Events and Risk Communication Challenges in Central Appalachia: A Qualitative Inquiry. 2025. Journal of Contingencies and Crisis Management.

challenging to track reports of missing and found individuals. Communities and organizations used a number of methods, including social media, online data sheets, and county register of deeds.

Several respondents noted that FEMA conducted search and rescue operations well. Local emergency responders noted cooperation with FEMA, but had mixed experience regarding how well the coordination worked. Coordination across various agencies and volunteer groups was a common issue, regardless of FEMA's involvement. Tracking missing person reports and coordinating in overlapping jurisdictions posed challenges. One trained search and rescue volunteer noted that they wanted to be redeployed by FEMA to continue recovery efforts, and they were not sure why that did not happen. The same respondent, as well as others, noted that so many people wanted to help that it often was not clear how to deploy even skilled volunteers.

Emergency Management Resources and Training

Respondents working directly for emergency management or related government agencies universally identified a lack of staff and lack of funding as primary issues in their ability to respond to and recover from disasters. Few county emergency management agencies had sufficient technical support staff, such as GIS or communication specialists. Multiple counties reported extremely high turnover in emergency management leadership, both before and after Helene. Respondents attributed the high turnover to multiple factors: low salaries, pressure from local elected officials to be personally present at every accident, and lack of capacity and resources. One respondent noted that historically, emergency response services such as fire departments and rescue squads had more staffing through volunteer service, but that volunteer service has declined in many communities. This respondent suggested that more employers should give paid time off for regular volunteer service within their local community, which could help to bolster volunteer numbers both in general and during natural disasters. One county emergency management agency reported that they had completed a capacity study which demonstrated that they needed 15 staff in order to sufficiently serve the community– they have 3. Some agencies also reported that they did not have a dedicated emergency operations center for the county. Despite typically being short-staffed and underfunded, some emergency management agencies were leading their county not only in emergency management, but also in storm recovery, including applying for FEMA public assistance.

Multiple respondents stressed the need to establish strong relationships and adequate training before a disaster hits. County emergency management agencies often rely on neighboring counties for assistance following a large-scale natural disaster; however, Hurricane Helene impacted so many counties that few local emergency management agencies in Western North Carolina or East Tennessee had the capacity to help other neighboring counties. Several counties brought in emergency management personnel from Eastern North Carolina or from other states. In most of these cases, they had established relationships with "sister" agencies in these other locations. Interviewees explained that these relationships are often built through shared trainings and conferences. Several respondents spoke to the value of taking part in training offered by FEMA regularly and before disasters occur. They appreciated the value of being able to train alongside emergency management agencies from big cities because it offered them the ability to receive the same high-quality, technical training that larger agencies receive, and gave them an opportunity to learn directly from those agencies. But interviewees

also noted that it was difficult to arrange some FEMA classes that require a minimum number of in-person participants because rural areas may not have enough participants to justify the cost and other resources needed to plan such classes. Emergency management personnel noted the importance of federal support, stating that many local emergency management agencies rely on federal funding for relationship-building and preparation: the federal government not only provides funding for rescue equipment, but can also provide the resources and funding necessary for large-scale trainings that bring multiple agencies together. However, respondents also noted that federal funding to programs like the Homeland Security Grant Program, which provides funding for emergency management preparedness and cross-state collaboration, were being cut under the Trump administration.

Lessons Learned

- Accurate weather forecasts, flood-level forecasts, and river and rain gauges are critical to keeping community members safe and emergency management personnel well-informed.
- Landslides pose significant risks to human life; accurate landslide modeling provided to public officials can be used to inform evacuations.
- Having paper maps available and knowing how to use them are critical when power and internet outages occur.
- Well thought out warning systems can be useful, but over-used warning systems can desensitize community members and warning systems deployed without public education campaigns are not likely to be effective.
- Evacuation orders from trusted community members are effective; multiple touch points are often more effective than a single point of communication.
- Provide local evacuation locations so that people living in flood-prone areas can move to safety easily and lessen congestion on rural evacuation routes.
- Search and rescue, and wellness checks, were hampered by lack of cell, telephone, and internet service; coordinating between agencies was challenging.
- Emergency management agencies are often under-resourced. Creating partnerships with other agencies creates redundancy, but does not make up for lack of staff.

Short-Term Recovery

Rescue is the most obvious response needed in the immediate aftermath of a disaster. In addition, meeting the day-to-day needs of local people is also immediately necessary. These needs include food, water, shelter, and sanitation. Across both East Tennessee and Western North Carolina, response efforts came from a combination of sources: county emergency management, local government, nonprofit organizations, mutual aid organizations, and individual community members. The depth of need and breadth of the service area stretched these organizations thin. These actors worked hard to manage volunteers, distribute aid, and support communities coping with the loss of water and sewage services. Moving forward, support for communities to identify and develop disaster resilient buildings that can serve as storage and hubs for aid distribution and contingency plans for going weeks without utilities is necessary to better prepare for disasters.

Aid Distribution

The need for large buildings for supplies storage and distribution, as well as meeting space, was listed as a need by 9 out of 44 respondents (20%). As seen with many disasters, aid in the form of goods (bottled water, nonparishable food, cleaning supplies, etc.) began to arrive in the region within days after the storm. While useful, these supplies require organizing, storage and distribution. How communities and local governments met this supply distribution need shared common threads. Nonprofit organizations with storage space and/or means of transportation (large vans, etc.) took on some of this work, typically coordinating with local government entities and large national organizations (e.g. United Way, etc.), especially where they had pre-existing relationships. Other communities utilized community college buildings or local government buildings. In some cases, large buildings had to be cleared of debris (flood debris, landslide debris, or downed trees) before a community had a suitable building to store supplies.

Managing and distributing supplies required extensive capacity, which was filled by local agency and nonprofit staff, local volunteers, and out-of-state volunteers. Several respondents noted that nonprofit and mutual aid organizations had more flexibility to act quickly, distributing cash for immediate needs, buying supplies that were most needed, and swiftly distributing donations. But nonprofit groups also noted that they lacked sufficient capacity for the work that needed to be done. Many groups were taking on much more work than they were equipped for and were being run by staff that were directly impacted by the hurricane. Some respondents also noted that managing volunteers – including managing expectations and emotions – took considerable capacity. At least one local nonprofit expressed that local government and larger aid organizations asked the local group to conduct aid distribution for them, but did not offer much in return. This can deplete the already thin capacity of local nonprofits, without building any long-term capacity or funding. Larger national nonprofits and government agencies should consider providing direct financial support to local nonprofits, which would allow these groups to partner more effectively, increase staffing, and address specific local needs.

Utilities

Municipalities and counties across Western North Carolina experienced damage and disruption to utility services, including electricity, internet, cellular services, drinking water systems, and sewer systems. These disruptions caused a cascade of issues in some communities.

Drinking water was disrupted for many reasons - damage to pipes and intakes, excessive siltation in reservoirs, lack of sufficient water to maintain pressure in systems, and a lack of power to run private and municipal wells. Some respondents noted the need to shut down municipal water systems so as not to deplete reserves in wells and storage tanks, and depressurize the system. Pressure loss creates multiple issues – from public safety due to lack of water to fight fires, to drinking water contamination through pipe infiltration. Smaller towns sometimes rely on wells to provide drinking water. Respondents reported that well monitoring systems could not report water supply data due to lack of power and connectivity, well generators that provide backup power ran out of fuel, and personnel had to hike to wells to refuel generators. Many municipal sewer systems were also damaged, which impacted

businesses and schools. Some municipalities had to spend large amounts of money pumping sewage and installing temporary sewage processing facilities.

Portions of the City of Asheville were without water for more than 50 days. This not only impacted drinking water for residents, but forced businesses and schools to remain closed, and created sanitation issues because there was no water for flushing toilets. The city, nonprofit groups, and state and federal agencies addressed these issues through distributing drinking water, providing sanitation centers to bathe and do laundry, and sending volunteer "bucket brigades" to flush toilets. Impacts to Asheville's water system have been long-term: the North Fork Reservoir, which historically had very low turbidity, experienced turnover water stratification, resulting in extreme turbidity following the storm. Extensive tree loss within the watershed has led to ongoing turbidity issues.

Over a million customers in North Carolina and over 100,000 customers in Tennessee were without power in the immediate aftermath of the storm.[19,20] South Carolina had the most power outages, at 1.3 million, followed by Georgia with 1.1 million outages.[19] Many residents in North Carolina and Tennessee were without power for 2 weeks or more, especially in rural areas.[21] One respondent noted, "we underestimated the severity of wind, so we weren't ready for weeks without power."

Damage to communication networks posed many challenges for government agencies, nonprofit agencies, and community members. Lack of power disabled internet systems, and cell service was unreliable. In some cases, cell towers were directly damaged by wind or treefall. In other cases, emergency generators powering cell towers ran out of fuel and reaching the towers to refuel generators was difficult. Cell towers are also connected to the main network by landlines, known as backhaul, which are copper or fiber wire. Some of these connections were damaged by landslides or recovery efforts. Given the widespread power and internet issues, internet provided through Starlink proved invaluable. The Starlink network is relatively new, so many government agencies did not have the technology before the storm. The federal government and private individuals donated Starlink receivers to agencies and community members after the hurricane, and Starlink provided free connectivity for 30 days.

Lessons Learned

- Before a disaster happens, identify available large, resilient buildings that can be used for supplies storage and distribution, and for office and meeting spaces; consider hubs throughout a county; outfit these buildings with disaster-resilient infrastructure, like solar panels, battery storage, satellite internet, etc.
- Plan for coordination between various aid groups and government agencies, so that supplies needs can be identified in different communities and resources can be shared.

[19] US Department of Energy. Hurricane Helene Situation Report #12. Oct. 8, 2024. https://www.energy.gov/sites/default/files/2024-10/Hurricane%20Helene%20Situational%20Report%20%2312.pdf
[20] Tennessee Emergency Management Agency. Flash Report #3 Hurricane Helene. Sept. 27, 2024. https://www.tn.gov/tema/news/2024/9/27/flash-report--3---hurricane-helene.html
[21] Knox News. Crews have the people and equipment to restore power in Tennessee. What's taking so long? Oct. 14, 2024. https://www.knoxnews.com/story/news/local/2024/10/14/what-it-takes-to-restore-helene-power-outages-east-tennessee/75587145007/

- Providing cash to local, reputable aid organizations, and local governments gives these groups the best ability to meet communities' immediate needs.
- Develop contingency plans for extended disruption to power, drinking water supply, and sewer services.
- Damage to communication networks can happen in a variety of ways and may not be fixed quickly during a large-scale disaster; implement redundant and resilient communication strategies before disasters happen, for example, solar and battery power, satellite internet, and radio communication.

Local Governance

While disaster response and recovery requires assistance from state and federal agencies, as well as nonprofit organizations, local governments are integral to these efforts. Local governments at the municipal and county level are needed to coordinate rescue, outreach, clean up, and rebuilding efforts. State and federal funds are often applied for and distributed through local governments as well. Even where individuals apply for direct state or federal funding, local government officials often act as liaisons, providing information and application assistance. All of these efforts greatly increase the normal workload of local government staff.

Respondents indicated that response and recovery efforts led by local governments could be improved by providing additional capacity and proactive, pre-disaster training opportunities to prepare existing staff for worst case scenarios. Federal-level improvements are also necessary to enhance local government's ability to deploy funding for recovery. These improvements include: clearer, consistent, and effective points of contact at FEMA, improved pathways for using FEMA Public Assistance funds to build back more resiliently, expediting the availability of federal funding, and more quickly approving FEMA funding for use on various projects to avoid delaying implementation of other federal funding sources due to issues regarding duplication of benefits.

Local Government Agencies

Local government staff and officials, which includes Emergency Management staff, are some of the most important people in disaster response and recovery. Many go above and beyond their job descriptions helping their communities recover, even while most of these individuals are impacted community members themselves.

Just as Emergency Management teams are underresourced, many respondents noted that local government as a whole is chronically understaffed and extremely underresourced when responding to disasters. In many cases, local governments shifted staff to new roles that fit their individual skills and knowledge. One local government respondent noted that they wanted to see a system where government staff from communities not impacted by the disaster could travel to impacted municipalities to assist. Another noted they wanted a smaller number of highly skilled people coming to help, rather than many people with little to no local government experience. Respondents suggested typical top-down management sometimes stifled innovation; they suggested that staff need to be given space to collaborate and move ideas from the bottom up.

State and federal governments provided personnel to many local governments, which respondents were generally grateful for. However, several respondents noted that these individuals left in a relatively short time period, taking knowledge with them and leaving a lot of administrative burden. The League of Municipalities, Council of Governments, and the North Carolina School of Government all helped with administrative capacity, but only in the short-term. Instead, several respondents wanted a system that creates more long-term, local capacity.

For many local governments, Hurricane Helene highlighted the need for better preparation for future disasters. Respondents noted the need for state and federal support in disaster training, development of alternative communication systems, understanding FEMA documentation and procurement policy, etc. Respondents emphasized the need for training for non-emergency staff, and suggested identifying "disaster roles" for these staff prior to disasters occurring. Municipal staff also suggested several measures to make it easier for staff to work following a disaster – providing guaranteed gas supply so that employees can get to and from work, creating a phone tree to check on staff immediately following a disaster, and providing mental health support.

Local government staff and officials had many recommendations for other municipalities facing similar disasters. Several respondents urged officials to maintain focus on the needs of the public, rather than government infrastructure or work. Several governments figured out how to ease financial burdens on community members by delaying water and other utility bill due dates (which couldn't be legally waived), or found donations to cover tax bills of damaged properties (because bills are based on the value of the property at the beginning of the calendar year, before the storm). The state of Tennessee delayed collection of certain taxes in impacted counties, and offered a sales tax refund of up to $2,500 on major appliances, residential furniture, or residential building supplies.[22]

Rebuilding - Infrastructure & Business

In interviews, municipal staff encouraged looking at infrastructure systems at a regional level and ensuring those systems have redundancies – road access to communities, communication systems, government staffing, etc. Infrastructure in many rural Appalachian communities is often old and lacks redundancy. For example, many culverts are old, dating back as far as the 1950s, though many are supposed to have only a 25 year lifespan. In addition, these culverts are often undersized for the water conveyance they need to handle given current weather patterns. Road networks often lack redundancy, so damaged roads often need to be repaired quickly or community members can be left stranded. Many Appalachian downtowns are in floodplains, because this was where available flat land was located and many of these downtowns cannot be moved. Instead, some communities and businesses are taking a "let the creek in, let the creek out" approach – forgoing drywall, placing wiring high up, and having fewer, more moveable items in buildings.

[22] Tennessee Office of the Governor. Gov. Lee Announces Tax Relief for Communities Impacted by Hurricane Helene. Oct. 9, 2024. https://www.tn.gov/governor/news/2024/10/9/gov--lee-announces-tax-relief-for-communities-impacted-by-hurricane-helene.html

The Rocky Broad River and a temporary bridge between Chimney Rock Village and Chimney Rock State Park more than a year after Hurricane Helene. While the Village and Park are open to the public, extensive repairs are still needed for roads, river banks, and buildings.

FEMA Public Assistance (PA) is the primary federal funding for local governments and nonprofits to rebuild and restore public infrastructure. It is separated into the following categories:[23]

Emergency Work
- Category A: Debris removal
- Category B: Emergency protective measures

Permanent Work
- Category C: Roads and bridges
- Category D: Water control facilities
- Category E: Public buildings and contents
- Category F: Public utilities
- Category G: Parks, recreational, and other facilities

Respondents involved in FEMA PA applications noted several issues with the program. They noted that applications involve many steps that involve many FEMA staff, but that these staff do not always seem to talk with one another. They noted that the PA Program Delivery Manager (PDMG) doesn't seem to have decision making power. Instead, many different staff had power at different points – damage inspections, cost estimates, etc. Respondents also noted that sending a large team to each site is not

[23]Federal Emergency Management Agency. Public Assistance Fact Sheet. Oct. 2019. https://www.fema.gov/sites/default/files/2020-07/fema_public-assistance-fact-sheet_10-2019.pdf

efficient or cost effective, so they suggested empowering PDMGs to play a larger role in decision making. Respondents also noted that FEMA staff turnover is high, which created challenges for communication and continuity. One respondent noted that PA currently has a lot of grey area and could benefit from more specific regulations on rebuilding activities that "shall be eligible." Several respondents felt that PA is not set up to easily improve infrastructure or make it more resilient. One noted, "we're paying to recreate what was a problem."

The state of North Carolina also established a cash flow loan program, to distribute nearly $150 million in interest-free loans to local governments for disaster response activities.[24] The program is intended to bridge federal funding gaps. The application process was streamlined by assessing loan amounts based on FEMA PA Project Worksheets submitted by local governments.

Other Federal Funding

While FEMA funding is a main source of federal funding for recovery and rebuilding following a disaster, several other federal programs can also provide funding. Community Development Block Grant–Disaster Recovery (CDBG-DR) funding is available through the Department of Housing and Urban Development (HUD) to assist with disaster recovery. It is intended to fill gaps not funded by FEMA, the Small Business Administration (SBA), or insurance. A minimum of 70% of CDBG-DR must benefit low- to moderate-income communities. The Community Development Block Grant–Mitigation (CDBG-MIT) program provides funding for mitigating risk and improving resilience for future disasters. Both CDBG-DR and CDBG-MIT funds are available to state, tribal and local governments after presidentially declared disasters. One issue raised by several respondents was that low-capacity governments do not have the capacity to apply for and administer CDBG grants. One respondent noted that delays in FEMA funding decisions can have a ripple effect on other funding sources, like CDBG, because it delays certification of duplication of benefits required by both FEMA and the CDBG program. Another respondent noted that both CDBG-DR and CDBG-MIT funding move slowly because of the need for Congress to allocate funding, as well as structural aspects.

The American Relief Act of 2025 provided $60 million to the EPA to assist states in EPA Regions 3 and 4 with water emergencies from Hurricanes Helene and Milton. Respondents noted that the program is very beneficial, but also challenging to administer for small governments and nonprofits. The money can be used in conjunction with FEMA PA funding, for example to move a sewer out of a floodplain. In some cases, because the two programs cannot duplicate benefits, EPA funding is held up until FEMA determines how much funding will be provided through its programs. Similar issues exist for the Economic Development Administration (EDA) Disaster Supplemental Grant Program. The fiscal year 2025 program provides grants for economic recovery from areas that received major disaster declarations in 2023 and 2024. In areas where disasters occurred earlier, local governments are further along in recovery, planning, and receiving decisions on FEMA funding. This means that the counties hardest hit by Hurricane Helene, which happened late in 2024, are not as prepared to apply for these EDA grants.

[24]General Assembly of North Carolina. Session Law 2024-57, Senate Bill 382. https://www.ncleg.gov/EnactedLegislation/SessionLaws/HTML/2023-2024/SL2024-57.html

Lessons Learned

- Ensure that local governments have sufficient staffing and resources; empower and train staff to take on specific roles that may be different from their day-to-day roles during a disaster.
- Have plans for adding capacity — from state government, federal government, and other unaffected towns and counties; but also find ways to increase local capacity and knowledge, so that gaps are not left when extra help leaves.
- Increase opportunities for disaster training for all government staff; these trainings also provide good opportunities for networking between counties and towns that can provide increased capacity during a disaster; state and federal funding and capacity are usually necessary to make these trainings happen.
- Road networks in Central Appalachia often lack redundancy, which can result in communities being cut off for long periods of time.
- Some Appalachian business centers will not be able to relocate from floodplains — in these cases, create strategies for building resilience and other general improvements (e.g. better roads, bikelanes, public space, etc.).
- Multiple funding sources are necessary for rebuilding - bridge loans are an important tool for filling funding gaps.
- Funding should incentivize resilience to flooding and other likely disasters for public infrastructure.
- Local governments benefit from assistance in applying for funding, navigating different funding sources, etc. An improvement to federal assistance would be to ensure that local governments have clear, consistent, and effective points of contact at FEMA.
- The need to not duplicate federal benefits is currently creating delays and barriers for applicants, because funding decisions from multiple federal agencies, but especially FEMA, can take a long time.

Floodplain Management and Flood Insurance

Living in close proximity to water carries risks, but in Appalachian communities, steep terrain often forces people to build homes and businesses near rivers and creeks. Accurate flood risk mapping, instituting effective floodplain regulations, and purchasing flood insurance can help to mitigate flood risks and improve the recovery process.

Floodplain Mapping

Floodplain maps serve multiple purposes: they can inform where to build or not build, where to implement hazard mitigation on existing buildings, where flood insurance is likely necessary, and perhaps most importantly, they can help keep people safe. North Carolina is one of the few states that conducts its own floodplain mapping, in coordination with FEMA. In many cases, including in North Carolina, floodplain maps are out of date. They may be inaccurate due to the use of old modeling science and/or due to actual landscape changes.

Several people reported that the power, or velocity, of floods in the mountains does not seem to be well understood. Some respondents noted that flood models are often based on coastal areas, and may not be well-suited to mountainous regions. One respondent reported that during Hurricane Helene, some buildings not located in the current floodplain map were still inundated by several feet of water. Another respondent noted that current maps were wrong in both ways – some buildings predicted to flood were spared, while others not predicted to flood were damaged. That respondent noted that in some cases streams have shifted up to 100 feet away from their mapped location following Hurricane Helene. Streams also naturally shift from historical locations gradually over time and/or due to other flood events. Several government staff noted that North Carolina was already in the process of updating floodplain maps when Hurricane Helene occurred. Now some question whether it would be best to release maps based on the pre-hurricane landscape and knowledge and provide updates later, or whether to delay release of maps altogether in favor of a more accurate update. As one county employee noted, "adhering to floodplains that aren't accurate isn't helping anyone."

Floodplain Ordinances

Ordinances at the municipal, county, and state levels can help encourage smart building and reduce impacts from future flooding. Floodplain regulations are important not just for decisions regarding whether a building can be constructed in a certain area, but also whether there are evacuation routes. The need for adequate routes away from the building was apparent at the Erwin, TN hospital – patients, staff, and emergency responders had to be evacuated by helicopter when the only road away from the hospital was inundated. The hospital (which did eventually flood) was built on a 500 year floodplain, but the only road accessing the building was built on a 100 year floodplain.

Maintaining floodplains without fill or development not only keeps people away from flood-prone areas, but also directly mitigates flooding risk. Well-functioning floodplains and wetlands can absorb more rainfall during large rain events, whereas filled areas push flooding into downstream areas. Floodplains can also help to reduce floodwater velocity and filter pollutants that enter water during floods. One respondent noted that farmland preservation can also serve as floodplain preservation. While some crops can be damaged or lost due to flooding, smart planning regarding what crops to plant can mitigate this risk. With proper management and planning, floodplains can also be suitable areas for public parks and green spaces, or livestock rearing.

Respondents noted wide variation among flood-related ordinances across different jurisdictions. They noted that decision-makers can have short memories regarding the need for flood-related ordinances, and that at the local level, one property or business owner can have an outsized impact on reducing building restrictions. Several respondents noted that at the state level, home builders and realtors are powerful lobbying groups against state building restrictions. Both Tennessee and North Carolina are Dillon's Rule states, meaning that local government authority must be delegated by the state legislature. There are some exceptions to this for certain municipalities in Tennessee. Some respondents noted that North Carolina often overrides local governments' attempts to restrict building beyond state statute. In contrast, some local ordinances, for example fill regulations, cannot be *less* restrictive than state law; however, local governments can still choose to have *no* ordinance.

Flood Insurance

Flood insurance must typically be purchased separately from other homeowners insurance, due to high potential loss and difficulty assessing risk. To encourage purchasing flood insurance and encourage communities to adopt floodplain regulations, the federal government offers flood insurance through the National Flood Insurance Program (NFIP). The policies are sold through private insurance companies, with the federal government underwriting the risk, or directly through the federal government, via NFIP Direct. In order to be eligible to purchase insurance through the NFIP, the property must be located in a community that has adopted FEMA-approved floodplain management ordinances. Any property in such a community is eligible for purchasing flood insurance, including those not in the floodplain. Flood Insurance Rate Maps determine insurance rates and building requirements. Property owners whose property is in a community that has not adopted FEMA-approved floodplain management ordinances can buy flood insurance through private insurance companies, but this insurance is not federally backed.

FEMA also offers the Community Rating System (CRS), a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Several local government officials shared that FEMA is not doing CRS reviews this year. They recommended that such reviews continue to be completed annually for two related reasons: 1) communities making improvements to flood resilience will not be able to acquire a lower CRS score until the next review, and 2) other communities do not have an incentive to make improvements. Other local officials argued that the savings for policy holders are not enough to justify regulations put on them through the CRS.

Several county officials noted that more people need to purchase flood insurance, even those in lower-risk areas. But others said that a lot of people cannot afford to purchase flood insurance. Others noted that flood insurance is both prohibitively expensive, but also undervalues property in claims, or denies claims altogether.

Lessons Learned

- Flood maps need updating; even in a state with a robust mapping program, flood maps were out of date and/or inaccurate.
- There may be a need for better modeling of riverine flooding in mountainous areas.
- Ensure that community members are aware of areas that are prone to flooding and what they can/should do in response, including purchasing flood insurance and installing mitigation measures.
- Local and state ordinances can reduce risk to human life and destruction of buildings from floods and landslides during extreme rain events; the different levels of government must work together to make smart, resilient development decisions; farmland preservation and floodplain protections can work hand-in-hand and increase public support.
- Flood insurance is often prohibitively expensive; some property owners are unclear whether they should or if they can buy flood insurance. Some property owners may feel that flood insurance is not worth the expense due to low payouts.

- The Community Rating System seems to have mixed success in incentivizing communities to undertake and maintain floodplain management practices.

Rebuilding Housing

Hurricane Helene was an extremely destructive storm – it caused over $13 billion in damage to housing in North Carolina and Tennessee.[25,26] Responding to housing needs is particularly important, as shelter is a basic human necessity. Recovery must balance the need to ensure that people have adequate shelter immediately with the opportunity to build more resilient housing. In some cases, rebuilding housing in its original location is not advisable because of its location in flood-prone areas. In these cases, government acquisition of the property is an available option, but can be challenging for homeowners, and for the local governments who are then responsible for owning and managing the land. Respondents voiced mixed opinions about the efficacy of volunteer groups offering clean-up and rebuilding services and noted a deficiency in the local economy to be able to supply sufficient contractor capacity for rebuilding. Aid provided by FEMA was difficult to access and undervalued damaged property.

Rebuilding and Housing Mitigation

Rebuilding houses is a critical need following many natural disasters, including Hurricane Helene. Rebuilding residential buildings can pose unique challenges: the need is spread across many individuals and often spread across a wide landscape, many entities are often involved, including government agencies, insurance companies and nonprofits, and people need housing immediately. One respondent noted that those rebuilding housing should, "make sure things don't just become band aids, but sometimes band aids are the right answer if they keep someone from becoming homeless." Several respondents also noted the need to minimize gentrification – Appalachian community members often own beautiful land passed down through generations, but may not otherwise be well off and may be unable to rebuild without significant assistance.

Housing rebuilding efforts should carefully balance multiple, at times competing, needs. People want to rebuild right away, but rushed efforts often are done poorly, or miss opportunities for improvement and mitigation. Without incentives, many rebuilding efforts will follow the shortest, cheapest route.

"When people lose something, they just want what they used to have; but if you give them better alternatives, that can help a lot."

Federal agencies and other organizations often "want to get people back to where they were the day before the storm," but this mindset can create problems – it favors people with adequate documentation of their home and belongings, further perpetuating inequalities. It also may ignore the fact that pre-storm housing may have already been substandard or poorly located, keeping people in a precarious situation. Several people noted that mobile homes were particularly hard-hit – damaged by

[25] North Carolina Office of State Budget and Management. Hurricane Helene Recovery. Dec. 13, 2024. https://www.osbm.nc.gov/hurricane-helene-dna/open
[26] FEMA. Tennessee Tropical Storm Helene DR-4832-TN. https://www.fema.gov/disaster/4832#funding-obligations

wind, rain, and eventual mold growth, and often located in flood-prone areas. They noted a desire to move these residents while keeping them in the community.

Many renters were displaced due to damage to rental properties. Western North Carolina already faces a housing shortage and Helene exacerbated this challenge. One respondent noted that renters in Buncombe County, NC, were disproportionately impacted because 50% of housing units lost in the county were rentals, even though rentals make up only 30% of the total housing stock. Rental assistance was and continues to be needed in many areas, but FEMA limits rental assistance to a maximum of 18 months from the date of the disaster. Municipalities, counties, and the North Carolina General Assembly each allocated money toward rental assistance, but overall, not enough rental assistance was available. Some noted that systems for distributing rental assistance needed improvement. Several respondents noted that an eviction moratorium was probably needed, but was politically infeasible in North Carolina. Rental properties are not eligible to be repaired or rebuilt through FEMA individual assistance. One respondent noted that local or state programs for rental property owners might be politically infeasible because people do not like giving money to landlords; however, the renters are the people who bear the burdens of these decisions.

There were mixed opinions regarding cleanup and rebuilding assistance from nonprofit organizations and volunteers. Several respondents noted that nonprofits sometimes moved more quickly than local governments could, which created documentation problems for valuation and substantial damage assessments. But others noted that in some cases, the lack of documentation was not an issue, because the labor and materials were donated, and therefore outweighed the importance of trying to get FEMA funding.

There were some concerns that volunteer groups offered cleanup and rebuilding services that did not end up getting provided. It was unclear if these situations represented actual fraud, or just poor communication. There was agreement among respondents that basic cleanup efforts by volunteers were largely beneficial. Several nonprofits interviewed reported that they focused on rebuilding where FEMA individual assistance and insurance money did not cover the complete cost of rebuilding. These nonprofits struggled with a lack of capacity and with burnout. They also struggled to provide upfront payments for subcontractors needed for skilled work, like HVAC repair. One nonprofit noted a need for governors to accept reciprocity from other states for skilled work that require state-specific licenses for their trade (HVAC, plumbing, etc.), to ensure enough capacity and allow those who might be willing to donate labor to do so.

FEMA Individual Assistance

FEMA individual assistance refers to federal grants available to individuals impacted by federally declared disasters. These grants are available to cover home repair or replacement, temporary housing costs, other property replacement, and more. The program is meant to provide funding for costs that a person's insurance does not cover, and is not intended to be the sole source of funding for disaster recovery. The maximum amount of assistance allowed following Hurricane Helene was $42,500 for housing assistance and an additional $42,500 for other needs assistance. These amounts were

increased to $43,600 for disasters that occurred on or after October 1, 2024. Eligible homes must be the homeowner's primary residence.

Multiple respondents, including community members and professional staff, had various complaints about the process of applying for individual assistance. A top complaint is that applications were routinely denied, and next steps to address denials were unclear. Many community members did not understand that a denial is not necessarily a permanent decision, and that they should likely apply again. Denials were often issued for mistakes on applications. For example, stating that a homeowner has "minor damage" rather than "major damage" may disqualify the application, but homeowners were often unclear regarding what constituted major or minor damage. Respondents noted that impacted community members sometimes struggled to maintain records after the storm, especially during a FEMA appeals process, because documents were lost during the storm or due to other challenges after the storm. At least 3 professionals assisting with applications reported that anything unusual about property ownership, like unusual or missing deeds, death of a spouse, or inconsistencies on documents, often led to denials. Even where FEMA employees directly assisted with filling out an application, there were problems. FEMA intends for there to be a uniform process in evaluating applications, deciding which properties need an inspection by FEMA staff, and ultimately which homeowners receive funds, but in practice, uniformity is lacking.

Communication with FEMA through the application process also presented several issues. Local attorneys noted that the online upload tool did not adequately report whether documents were successfully uploaded. They recommended applicants mail hard copies of applications and supporting documents. Others noted that disseminating information about how to apply for individual assistance is difficult in rural and older communities, and in communities with damage to power, internet, and cellular service. One respondent noted that elderly people are constantly reminded to be wary of telephone scams, which then made them reluctant to give information to FEMA employees over the phone. Homeowners are supposed to be present for FEMA inspections, but in practice this does not always happen, due to poor communication. Homeowners may not insist on being present, because they believe FEMA professionals know what they are doing. In reality, respondents reported high variability in the competence and effectiveness of FEMA staff, and noted that staff turnover was high. County staff and attorneys attempting to provide application assistance reported extreme difficulty in receiving information. One official stated that federal law prevented FEMA from sharing information with local government, unless government staff took part in a 4 hour training with an attorney. Others reported filling out the required "Authorization for the Release of Information Under Privacy Act Form", but never actually received the requested information.[27]

FEMA offers direct case management, usually in partnership with a local Long Term Recovery Group or other nonprofit group. Case management is meant to provide on-going recovery support to individuals, including assessing needs, planning recovery, and connecting people with resources. Following Helene, case management was often handled by a variety of people – local volunteers, local government officials, state and federal employees. Several respondents noted that if the federal government could

[27]Federal Emergency Management Agency.Authorization for the Release of Information Under Privacy Act Form. https://www.fema.gov/sites/default/files/documents/fema_form_ff-104-fy-21-118.pdf

include more money in immediate disaster response, this funding could be used to pay volunteers who were already doing case management and had trust within the community. Likewise, a respondent noted that the state of North Carolina was developing their own case management, but that there was a disconnect between state and local case management efforts and developing a state-based system may not be the best use of money. One respondent suggested that FEMA could provide more of a support role, and allow local leaders to lead.

Even if individuals are successful in navigating the application process, four respondents noted that when funds were granted, FEMA often severely undervalued property. One homeowner lost all possessions, but received only $15,000. Others observed that homeowners likely had to lose their entire house to qualify for the full $42,500.

In summary, there were several shared sentiments regarding the FEMA individual assistance program: Respondents felt the program was too slow, too bureaucratic, and did not meet the needs of survivors. Several people expressed that FEMA is overly concerned with preventing fraud. Applicants often gave up after receiving denials, and several respondents felt FEMA was intentionally trying to out-wait people.

"How do you tell someone who doesn't have a roof over their head and is trying to feed kids that their application may take 90 days?"

State Funding

The state of North Carolina also appropriated funding and created programs to assist with home rebuilding following Hurricane Helene. The governor created the Division of Community Revitalization within the Department of Commerce, which launched the RENEW NC program. The program will utilize $1.4 billion in funding from the federal Community Development Block Grant Disaster Recovery (CDBG-DR) program to fund five programs that address three areas of recovery: housing, infrastructure, and economic revitalization. The funds are meant to address needs unmet by other assistance. The state also provided $9 million in state funding to 14 nonprofit organizations to fund rebuilding efforts.[28] One respondent noted that community members may not always realize that nonprofits receive state funding, so they may not believe the state is responding adequately. Another respondent noted that some applicants to the RENEW NC Single Family Housing could not qualify due to missed mortgage payments following the storm.

Private Bridges

Hurricane Helene damaged a large number of private bridges. Due to geographic and cultural reasons, the Appalachian region has more private bridges than other areas of the country. Some respondents felt that FEMA was not well prepared to address the need to rebuild private bridges. The need to replace bridges so that residents were not stranded and the lack of a consistent plan regarding how to meet

[28]North Carolina Office of Governor. Governor Stein Announces $9 Million In Grants To 14 Nonprofit Volunteer Organizations Helping to Rebuild Western North. Oct. 2, 2025. Carolinahttps://governor.nc.gov/news/press-releases/2025/10/02/governor-stein-announces-9-million-grants-14-nonprofit-volunteer-organizations-helping-rebuild

this need was a huge problem in the early days following the storm. In many cases, local people were resourceful and created temporary bridges themselves. While this was probably necessary in some cases, it created associated problems, like further damage to rivers.

Respondents expressed the need for a simple template for applying for a temporary bridge. Typically FEMA requires those pursuing a bridge rebuild to show whether the project will cause a downstream rise. Respondents noted that many bridges were very old and did not have this type of assessment on record, which made it more difficult to obtain for the new bridge. FEMA did issue Disaster-Specific Guidance in North Carolina to allow the issuance of floodplain development permits for the emergency repair or replacement of private roads and bridges without the immediate requirement for a "no-rise" certification.

Several local government officials also expressed that some temporary bridges should be allowed to become permanent – in many cases, the temporary bridge was an improvement on decades-old bridges that had been damaged, and met required standards, like accommodating fire engines. Allowing appropriate temporary bridges to become permanent could also save FEMA public assistance dollars. Local governments also worked with communities to negotiate bridge sharing between multiple property owners.

Local communities were quickest in establishing programs for private bridges. Residents in Ashe County established a new nonprofit, Lansing's Bridge to Recovery, that assists residents in Lansing, NC, and surrounding areas in constructing new bridges.[29] Later, North Carolina established the Private Road and Bridge Program to provide replacement or repair of roads and bridges, prioritizing those that provide sole access to primary homes, recreation, and commercial facilities.[30]

Land Acquisition

In some cases, rebuilding housing, even with flood mitigation measures, is not sufficient to address future flooding risk. In these cases, property acquisition through FEMA is an available option. Following Hurricane Helene, requests for acquisition have occurred due to flood risk and landslide risk. Respondents from several counties reported roughly 10-33% of acquisitions were due to landslides.

Property acquisitions can be a difficult subject for communities, as many impacted residents understandably want to return to what they had before the storm. In addition, in Appalachia in particular, land is often passed down through multiple generations – it can comprise the majority of the wealth held by a family, provide stability in their lives, and root them in their community. Though the government typically offers pre-disaster fair market value for acquired properties, based on appraisals, property taxes, and other data, this may not actually provide enough funding for a homeowner to relocate. In addition, Southern and Central Appalachia's steep terrain limits the amount of available buildable land. Many downtowns are located in floodplains and are not feasible to relocate.

[29]Lansing's Bridge to Recovery. https://www.lansingbtr.org/
[30]North Carolina Department of Public Safety. Tropical Storm Helene Private Road and Bridge Program. https://www.ncdps.gov/Helene/PRB

Local governments have approached property acquisition discussions with extreme care, disseminating information, but not necessarily pushing for a specific outcome. One county sent informational mailers to properties that have experienced repeated flooding.

While property acquisitions are typically funded through the federal government, and organized by the state, local governments typically end up in possession of the land. In some cases, this provides clear benefits to the local community – e.g. providing land to build a flood-resilient public greenway along a river, or community agriculture land. In several cases, regional nonprofits have been advocating for local governments to accept as many acquisitions as possible and offering to partner with the government to manage the land. In other cases, the land is less useful and represents a burden to local governments – e.g. small patches of non-contiguous land, or land prone to further landslides. At least one county is advocating that property owners pursue FEMA hazard mitigation funding to address slide issues, rather than applying for an acquisition, because the county does not want to own this land.

As of late October 2025, the state of North Carolina reported that no acquisitions have been approved by the federal government.[31] In some cases, the slow pace of acquisitions has meant that homeowners are paying a mortgage and other bills for a property that they can no longer live in. The extended timeline can also result in property owners abandoning their acquisition applications, decreasing the number of floodprone properties that can be repurposed for more flood-resistant uses.

Lessons Learned

- Minimize displacement by adjusting local regulations to allow for more types of temporary housing.
- Provide incentives for building housing back well, making improvements, including disaster mitigation and energy efficiency improvements.
- People who rent housing are often more impacted by severe storms because rental properties may be disproportionately affected, may not be repaired as quickly, and may not be eligible for as many funding sources.
- Applying for FEMA individual assistance was difficult for many, for a number of reasons: lack of help in filing out the application, lack of access to communication (phone, internet), lack of knowledge or motivation regarding reapplying following a denial.
- Private bridges seem to be more common in Appalachia than in other regions, which made it difficult for government agencies to be prepared to address widespread private bridge damage. State and federal funding should be available for private bridge repair or replacement.
- Approach land acquisitions with care and cultural understanding; ensure that residents have appropriate information about the acquisition processes; speed up processing of acquisition applications, so that property owners can be paid in a timely manner and do not have to continue paying bills for a property that is no longer livable.
- Consider creative uses of locally acquired land, for example community agriculture projects, or projects that reestablish natural water flows and other ecological processes.

[31] North Carolina homeowners in limbo as they await FEMA buyouts after Helene. October 31, 2025. The Charlotte Observer. https://www.charlotteobserver.com/news/politics-government/article312694933.html

Economic Impacts

Large-scale disasters have a multitude of economic impacts. The most well-known impacts include damage to buildings, infrastructure, land, and waterways. Other impacts include the need for individuals to replace lost food and personal belongings, lost wages, and lost business revenue. While there is some support for these losses, they are less well-funded than other types of impacts and assistance can be difficult to access. Aid available to businesses is often in the form of loans and, in the wake of a disaster, there may be too much economic uncertainty for business owners to feel comfortable taking on additional debt.

Individual Impacts

Community members faced economic hardship due to impacts to homes, but also due to lost wages and lost personal possessions. Many community members reported losing food due to a lack of refrigeration where power was unavailable for multiple days or weeks. Many businesses remained closed for weeks due to lack of power, water, sanitation service, and/or road access. Some community businesses that remained open were able to give shifts to employees from businesses that could not reopen. Others were unable to work due to children being out of school.

FEMA offered a $750-per-household payment through the "Serious Needs Assistance" program. The program is meant to cover immediate, essential needs such as food, water, and baby supplies. While useful, some respondents noted that people were denied this assistance for unclear reasons. The Disaster Supplemental Nutrition Assistance Program, or DSNAP, also provided food assistance. But respondents noted multiple issues – DSNAP cards were not activated quickly, people did not know about the program or that they might be eligible, the application window was very short, and some applications may not have been uploading properly. A number of respondents advocated for giving impacted residents cash, via direct deposit, and without restrictions. They urged the federal government to be less concerned with fraud and cut bureaucracy that might be driving program costs up. One respondent noted that unhoused people have significant challenges in getting assistance. Though being unhoused should not technically disqualify applicants from programs like Serious Needs Assistance, in practice, the lack of a permanent address seems to prevent at least some applications from moving forward. Here too, there seems to be variation in how different FEMA staff handle the problem.

Business Impacts

Businesses were impacted through direct damage to buildings, damage to infrastructure such as roads, water, and power, damage to crops (especially at Christmas tree farms), a decrease in customers, and a decrease in fall tourism and related events. Funding was needed to repair buildings, replace goods, and replace lost revenue.

Loans were available from both the Small Business Administration (SBA) and from private capital. A local, well-known Community Development Financial Institution (CDFI), Mountain BizWorks, was chosen as the liaison to distribute funding from the Golden Leaf Fund, a foundation established in 1999

to receive a portion of North Carolina's funding from the 1998 Master Settlement Agreement with cigarette manufacturers. Mountain BizWorks offered loans at 1% interest and interest-only payments for 24 months.

SBA loans were also available, though the application deadline has now passed. Respondents reported that the SBA disaster loan program ran out of money within several weeks following Helene, and that funding was not restored until passage of the American Relief Act of 2025 two months later. Once more funding became available, businesses could only apply for one funding source, so many businesses withdrew SBA applications in favor of loans available through the WNC Strong fund.

There were several issues that prevented businesses from taking advantage of loans. The most common concern reported by respondents was that small businesses were unwilling to take on loans they were unsure they could pay back. Loans may not have had flexible enough terms and interest rates. One respondent noted that loans pose a lot of risk for entrepreneurs, especially those leasing space. SBA staff did work on the ground in some communities, but one respondent noted that they did not receive many applications because they may have come too soon and for too short a time. In addition, many businesses were still recovering from impacts due to the COVID-19 pandemic and were reluctant to take on additional loans.

A number of CDFIs, foundations, and government agencies formed the WNC Strong coalition to support businesses impacted by the hurricane. The coalition provides information about a number of grants available to businesses in North Carolina. At least one municipality created a grant program for small businesses in the municipality and surrounding county. Other grants were available through multiple CDFIs, foundations, and through state funding. Many of these grants prioritized direct physical damage before revenue loss. The general consensus was that these grants were immensely beneficial, but distribution of even more grant money was needed.

Lessons Learned

- Many community members are impacted by an inability to work due to business, road, and school closures or extra demands on time (e.g. storm cleanup); in addition, community members may experience significant costs for food replacement or other storm-related expenses.
- For both federal SBA loans and state business loan programs, consider extending favorable loan terms, including when payments begin and interest-free terms; extend low interest rates and/or increase interest rates gradually.
- Advocate for business grants, rather than solely relying on loans.
- Fund revenue loss and wage replacement whenever possible.

Land and Water Impacts

Hurricane Helene led to both short and long-term impacts to land and waterways, including numerous landslides, countless downed trees, extensive debris deposition across land and rivers, and major changes to river paths. These impacts had immediate effects on people who live on or utilize the land

(e.g. hiking trails were damaged, rivers were impassable) and long-term implications for future flood safety and fire risk. The hurricane also impacted wildlife, especially aquatic wildlife. Flooding and landslides damaged habitat, and moved high sediment loads and pollutants into rivers and streams. Extensive debris cleanup and rebuilding efforts were needed and are on-going. Some debris cleanup, especially in rivers and streams, have created more deleterious impacts to the ecosystem. Debris removal was conducted through various local, state, and federal programs. The state of North Carolina offers a voluntary program to preposition debris contracts, so that debris removal contracts are identified and payment structures are solidified *before* a disaster occurs. Local staff encouraged participating in these contracts. Changes to how the federal government conducts debris cleanup and changes to the type of land and timespan within which federal cleanup assistance is offered could help local communities recover fully functional landscapes.

Waterway Debris Removal

The mountainous terrain of the region creates an extensive network of rivers and streams. Many of these waterways were extensively impacted by flood water and landslides, Floodwaters impacted communities many miles downstream, even when those communities did not receive much rain. The flood waters filled many rivers with both natural and manmade debris. The need to clean up manmade debris is obvious. However, the extent to which natural debris, such as downed trees, should be removed, and the extent to which riverbeds should be graded or otherwise reworked is a more controversial question.

Respondents shared mixed opinions on waterway debris removal. Several respondents expressed the need to remove debris, including natural large woody debris, to prevent damming in future floods. This concern is well-founded from a public safety and infrastructure perspective. For example, Hot Springs, NC, a small town along the French Broad River, was much more heavily damaged by Spring Creek, a tributary of the French Broad. A large debris dam, formed mostly by woody debris, on a bridge near the center of town impeded downstream flow and pushed water further into town.

Other respondents were very concerned about the impacts of excessive debris removal. This issue arose not only via this listening project, but was also widely discussed in local news and social media. Respondents reported the removal of live leaning trees, root balls beneficial to bank stabilization, and large woody debris that was stable and had been in place for years prior to the disaster. Respondents also expressed concern that excessive dredging and operating heavy equipment in riverbeds damages and destroys aquatic species and their habitat. Excessive dredging and removal of boulders, as well as straightening stream channels can increase instream water velocity, which can have multiple impacts, including streambank incision, channel widening, and increased downstream flooding.

“It’s been like a second disaster, but it’s too late to do anything. The best we can do is learn for next time,” said one respondent, regarding river cleanup.

Example of small but stable downed trees from Helene flood event that actually stabilize the riverbank and will naturally breakdown over time. This is an example of what engineers try to recreate with man-made revetments to control erosion.

Debris removal is often organized through the Army Corps of Engineers and funded through FEMA, but the work is contracted out to disaster recovery companies. FEMA guidance dictates that only storm-related debris removal will be reimbursed. However, contracts often base payments on the weight or volume of debris removal, which incentivizes contractors to remove the largest, heaviest material. The result, according to numerous firsthand accounts, is that companies routinely remove logs that predate the storm, root balls that stabilize riverbanks, and even live trees. Some of the same respondents reported that large amounts of man-made debris was left behind by debris removal contractors. One respondent reported that a professional crew has removed over 13,000 pounds of trash *after* federal contractors completed their debris removal on a Western North Carolina river.

Some respondents noted that oversight of river cleanup operations was hampered by excessive bureaucracy. If counties arranged debris removal through the Army Corps, rather than managing the work directly, addressing issues typically required that county officials contact FEMA, which would then contact Army Corps, which would then contact the contractors. This created excessive delays – the work and damage were often done before contractors were actually contacted. In addition, county officials were often understaffed and dealing with multiple other issues.

Land Debris Removal

In many cases, county governments led debris removal from public roads and residential land. In other cases state agencies led specific types of debris removal. For example, some respondents noted where the state Department of Transportation conducted road cleanup, it went faster. According to county officials, FEMA coordinated with counties to remove debris. Both FEMA and county officials were concerned with debris as fraud: if people put out material for collection that was not storm-related, the counties would typically not pick it up. County officials reported that the rules around what types of debris was allowed changed several times, starting out broad, becoming more restrictive, and then becoming broad again.

Many counties needed to identify available areas to consolidate and process woody debris. The amount of debris overwhelmed some existing processing facilities. Several debris processing facilities had debris piles spontaneously combust. These fires were extremely difficult to put out and damaged surrounding air and water quality due to smoke and runoff.

Federal Regulation

Several respondents involved with land and water cleanup expressed concerns with enforcement of federal regulations following Hurricane Helene and other disasters. In Appalachia, rivers are often heavily impacted by both disasters and rebuilding. Rivers are affected by flooding, landslides, fires, tree fall, etc. during many types of disasters. Roads, powerlines, and buildings are often built very close to rivers in steep terrain, so rebuilding also impacts rivers.

Road rebuilding, railway rebuilding, and debris removal all heavily damaged rivers in both North Carolina and Tennessee following Hurricane Helene. Respondents noted that there is almost no protection for riverbeds. Most activity impacting rivers during road or rail rebuilding is covered by a Nationwide Army Corps 404 permit, instead of an individual permit, which provides only basic regulations, rather than site-specific regulations. Respondents noted that federal agencies have a bias toward pre-flood conditions, leading them to rebuild infrastructure where it was and attempt to "put the river back." In addition some regulators had the view that rivers were already so heavily impacted, that heavy-handed approaches to cleanup and rebuilding were inconsequential.

One respondent noted that citizen enforcement of Clean Water Act regulations requires a 60-day notice period, but often the activities causing damage to rivers are done within that period, so community organizations need regulators to step in. But respondents felt that politics override regulations following a disaster – agencies won't implement their own regulations; they're ok with getting sued, and unwilling to slow down recovery.

One respondent noted that dam safety was a regulatory bright spot. Relatively few dams broke during Hurricane Helene. The Federal Energy Regulatory Commission (FERC) Office of Dam Safety is viewed as rigorous in inspection and enforcement of safety standards. The office completed a nationwide review and required operators to run their spillways following the damage to the Oroville Dam spillway in California in 2017. However, not all dams are subject to FERC inspections, because, for example, the dam does not produce hydropower, are in waterways deemed non-navigable, or are regulated by authority (for example the Tennessee Valley Authority). The University of North Carolina Asheville National Environmental Mapping & Application Center notes that many dams are decades, or even a century old, and were built with limited knowledge of downstream hazards. While there is good information regarding large dams, there is relatively little information on medium and small dams. North Carolina has over 649 dams classified as being a "significant hazard," and 1,652 dams classified as "high hazard." Tennessee has 348 dams classified as being a "significant hazard," and 277 dams classified as "high hazard."[32]

Increased Fire Risk

Historically Western North Carolina and East Tennessee have had relatively low wildfire risk, as compared to other areas of the country. However, this risk has been increasing due to drier conditions

[32]US Army Corps of Engineers. National Inventory of Dams. https://nid.sec.usace.army.mil/nid/#/

between rain events, even prior to Hurricane Helene. North Carolina has the highest acreage of wildland urban interface in the country, indicating that wildfire could have severe consequences for residents.[33]

Hurricane Helene exacerbated fire risk by dramatically increasing fuel loads, filling natural fire breaks like streams and clearings with woody debris, and damaging access roads. The North Carolina Geological Survey reported that 50% of the forest in Mitchell County and 30% of the forest in Ashe and Watauga were destroyed by Hurricane Helene. One respondent with expertise in mapping reported that 800,000 acres across Western North Carolina have significant tree damage. The Tennessee Department of Agriculture estimated that 215,000 acres of public and private forest land was moderately to severely damaged.[34] The respondent noted that many of the downed trees are oaks and hickories, which last much longer on the ground than pine. Another respondent noted that some FEMA cleanup efforts on public land made fire risk worse, because they used a cut and toss method to clear trails, which further concentrated fuel loads.

In the Spring following Hurricane Helene, Western North Carolina experienced elevated instances of wildfire. Polk and Henderson Counties experienced several wildfires, collectively referred to as the Black Cove Complex, that resulted in evacuations, burned at least 14 structures, and included 7,670 acres.[35] Transylvania County also experienced several fire complexes. The Rattlesnake fire burned approximately 1,800 acres. The Table Rock Complex, which burned into South Carolina as well, burned approximately 15,200 acres. Swain County, NC, which received relatively little impact from Hurricane Helene, also had one fire that burned 1,500 acres and damaged one structure.[36] These fires occurred while counties were deep in storm cleanup activities. In rural counties, like Polk, only a few staff people handle much of the county management work. Some respondents noted that oversight of river cleanup operations was hampered both by excessive bureaucracy (described above in the "Waterway Debris Removal" section) and by the need to focus on fire containment and fire evacuations.

Lessons Learned

- Public education is needed regarding proper river and floodplain management – there is often local pressure to "put the river back," dredge rivers, and/or remove all large woody debris, but this is typically not supported by current research or professional opinion.
- States and counties should put preposition debris contracts in place prior to disasters to decrease the burden of deploying cleanup crews following disasters.
- While some debris should be removed expeditiously, other cleanup could take place over a longer time period, allowing for more thoughtful planning, accurate bidding, and careful work.
- Cleanup crews should be monitored by professional, independent scientists and engineers.
- State and federal agencies should more stringently enforce environmental regulations during disaster cleanup and repair, especially for projects that are less time-sensitive. Though road

[33]Stewart, S. et al. Characteristics and Location of the Wildland-Urban Interface in the United States. January 2003.
[34]Tennessee Department of Agriculture. Hurricane Helene: Timber Damage Assessment. Nov. 13, 2024. https://www.tn.gov/agriculture/forests/protection/hurricane-helene-timber-damage-assessment.html
[35]North Carolina Department of Agriculture & Consumer Services. Final update on the Black Cove Complex in Polk and Henderson counties. April 3, 2025. https://www.ncagr.gov/news/press-releases/2025/04/03/daily-update-black-cove-complex
[36]National Interagency Fire Center. Incident Management Situation Report Monday, March 31, 2025 – 0730 MDT. https://www.nifc.gov/sites/default/files/NICC/1-Incident%20Information/IMSR/2025/March/IMSR_CY25_0331202.pdf

repair is often critical, many of these projects still take multiple years to complete – projects of this scale should follow environmental regulations and not miss opportunities to improve on future disaster resilience and lessen environmental impacts.

- Due to heavy forest cover and steep terrain, all Central and Southern Appalachian states should identify places to consolidate storm debris, both manmade and natural, and best practices for managing and processing debris for several years following a disaster, before disasters occur.
- Wildfire may become more common in Central and Southern Appalachian states, especially following large storms. Government officials and community organizations should work to increase community wildfire preparedness, including maintaining defensive space around buildings, plans for managing fires, and work to maintain a healthy fire regime in forests.

Conclusion

The impacts of large-scale disasters like Hurricane Helene vary depending on disaster type, geography, and population density, among other factors. But they share commonalities that can inform how preparation, response, and recovery are handled. These patterns – from the need to provide immediate relief supplies, to the ways to best rebuild more resilient infrastructure – can help us better prepare for future disasters. Immediate, medium-term, and long-term community needs are all best addressed when local communities, local governments, state government, and federal agencies work together cooperatively. A common theme lifted up through this listening project is that local leaders, whether local officials or community organizers, understand the needs of their communities best and federal agencies are uniquely positioned to help these leaders meet those needs. Unfortunately local governments and emergency management teams are often under-resourced, making it difficult to address the scale of the need.

Undertaking preparedness planning and projects can greatly reduce damage and loss of life in the event of a disaster. Disaster preparedness is important not only for communities that have already experienced disasters, but for all communities. Many communities are becoming more prone to multiple types of natural disasters. Resources are needed to conduct local trainings, create disaster response plans, hire adequate local government staff, and install resilient public infrastructure. These types of activities could be incentivized through state and federal funding programs.

The federal government serves a critical role in providing information and data that keep people safe in Appalachian communities and other communities prone to flooding. Accurate flood maps not only allow people to know if they should purchase flood insurance, but also help inform residents of when evacuation might be necessary. Stream and rain gauges can help activate warning sirens, provide emergency responders with information critical to determining when evacuations are necessary, and provide accessible information to the general public. The National Weather Service is also instrumental in providing advanced warning to officials and community members.

Following a disaster, the opportunity to rebuild in a better and safer way can provide some hope in an otherwise terrible situation. However, lack of sufficient funding and the understandable desire to build back as quickly as possible can hamper efforts to rebuild in ways that are more resilient to future

disasters, or ways that include improvements in efficiency, health, etc. Providing more grants and loans with favorable terms can help, as can providing more long-term low or no-cost temporary housing. While many state and federal funding sources exist, people often forgo some programs for housing or businesses because applications become too difficult to manage. In particular, the need to not duplicate benefits often creates a situation where people must wait for extended periods for a decision on one funding source before being able to apply to another. This often means people miss application deadlines, or do not even try to apply to multiple grant or loan programs.

Smart development decisions and sound natural resource management can improve flood resilience in communities and protect wildlife and ecosystems during disasters. Floodplains provide critical flood resilience, allowing rivers to behave naturally by moving within the floodplain. Following a disaster, prompt cleanup following disasters can be necessary, it still must be done with care. Cleanup activities can kill sensitive aquatic wildlife and further damage habitat. Extensive treefall can worsen wildfire risk because of the increased fuel load, but logging and clearing activities can further damage forests and increase erosion and landslide problems.

The federal government is uniquely situated to positively influence disaster preparedness and to create robust, streamlined response programs. As the risk and severity of disasters increase across the country, it is critical that the federal government develop and provide an effective, accessible, and consistent process to support local and state governments in this herculean task. The lessons learned from Hurricane Helene provide a critical perspective towards that end.

Author Details

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