Hurricane Helene Flood Communication Research

Prepared by

Noelle Siegfried
Schuyler DeBree
Katie van Werkhoven
Bryan Luukinen
Sarah Sheff
Kathy Vu
Serena Gilson
Jill Brown

RTI International
3040 E. Cornwallis Road
Durham, NC 27713-2852
www.rti.org

Jessica Janc
Jonathan Hartsell

Blue Ridge RC&D
31 Cross Street, Suite 215
Spruce Pine, NC 28777
www.blueridgercd.com

May 2026

Hurricane Helene Flood Communication Research

Prepared by

Noelle Siegfried
Schuyler DeBree
Katie van Werkhoven
Bryan Luukinen
Sarah Sheff
Kathy Vu
Serena Gilson
Jill Brown

RTI International
3040 E. Cornwallis Road
Durham, NC 27713-2852
www.rti.org

Jessica Janc
Jonathan Hartsell

Blue Ridge RC&D
31 Cross Street, Suite 215
Spruce Pine, NC 28777
www.blueridgercd.com

May 2026

Contents

Executive Summary

Executive Summary

Motivation

Hurricane Helene produced catastrophic and historically unprecedented flooding across Western North Carolina (WNC), resulting in extensive loss of life and widespread destruction of homes, infrastructure, and critical services. The flooding was compounded by thousands of landslides and extreme wind damage, leading to downed trees and power lines that crippled transportation, power, and communication networks. In total, more than 100 lives were lost in NC, and hundreds of thousands of residents were directly affected through displacement, power outages, water outages, damaged homes, and prolonged community isolation.

In the weeks following the storm, RTI staff living and recovering in the impacted region observed a disconnect between the dire warning messages issued ahead of the storm and the risk perceptions later described by many residents. Despite strong and urgent messaging from the National Weather Service (NWS) and other trusted sources, numerous community members reported that they did not fully grasp the magnitude of the threat. Recognizing the importance of better understanding this disconnect for flood warning effectiveness, and the limited window to capture insights while experiences were fresh, RTI made the strategic decision to conduct a rapid post-event study. This initiative allowed our team to move quickly, leveraging our expertise in flood forecasting and communication, to investigate how flood warnings were received, interpreted, and ultimately translated into action across WNC during Hurricane Helene.

Approach

Building upon a previous flood warning communication study conducted by RTI under the NOAA Cooperative Institute for Research to Operations in Hydrology (CIROH) (DeBree et al., 2024; Taylor et al., 2025; RTI International & University of Vermont, 2025), the research team designed and implemented a series of interviews and listening sessions. RTI staff based in the region led the effort and partnered with a trusted local nonprofit, the Blue Ridge Resource Conservation and Development Council, to expand local capacity and regional coverage. The team conducted 36 interviews and two community listening sessions across eight of the most impacted counties in WNC to examine flood warning communication before and during Helene. Participants represented five audience segments: emergency responders (ERs), health and human service (HHS) organizations, local authorities, community-based organizations, and the public.

The interviews focused on how participants accessed information before and during the storm, how they interpreted the level of risk, and how those interpretations shaped protective actions across different audience segments, while also identifying barriers that influenced these processes. After completing the interviews, the team held two listening sessions—one in Boone and one in Spruce Pine—to reflect on preliminary findings and explore how perceptions of flood risk had shifted since Helene. During these sessions, community representatives across different audience segments discussed changes in awareness and preparedness, ongoing challenges, and ideas to increase resilience ahead of the next major storm.

Key Findings

This study provided insight into how flood warning information was accessed, interpreted, and acted upon across WNC during Hurricane Helene, and how community awareness, ongoing challenges, and resilience have evolved in the storm's aftermath. While it reflects a relatively small sample, weighted toward individuals who were able and willing to participate—many of whom were not among the most severely impacted—consistent and informative patterns nevertheless emerged across audience segments. The findings reveal a progression from broad awareness of an approaching storm to reactive decision-making as impacts intensified. Overall, the results illuminate how information access and risk perception shaped protective action.

Access was widespread but uneven

Most participants became aware of the storm several days in advance and described receiving warnings through multiple channels, including weather apps, local and national news, NWS updates, social media, automated alerts, and interpersonal communication. Participants generally reported trusting the information they received from official sources. Emergency responders and local officials received structured briefings through formal emergency management channels. However, access across the broader community was not uniform. County alert systems were often opt-in and not universally enrolled; alerting practices varied across jurisdictions; some messages were issued but not successfully transmitted; and in certain areas, power and cellular disruptions limited access even before peak impacts. While warnings were widely issued and received by many, infrastructure limitations and enrollment gaps meant they did not reach all communities reliably.

Awareness did not translate into perceived risk

Although official messages were widely described as urgent and generally trusted, the intensity of the warnings did not consistently translate into perceived personal risk. Many participants recalled hearing messages describing "catastrophic" or "historic" flooding but did not internalize that such impacts would occur in their specific location. This gap in risk interpretation was driven by several factors. Prior storm experience served as a mental benchmark and since prior events were less severe, many underestimated Helene's severity. Even emergency responders reported preparing based on historical "worst-case" scenarios that were insufficient. Frequent flood warnings had also normalized alerting, thus reducing the urgency to act. While messaging was credible, it often lacked localized context, limiting its ability to convey what the risk meant for specific locations, especially in an area as geographically diverse as WNC. Misconceptions, such as that the mountains would block the storm or that flooding occurs only within mapped floodplains, further reinforced underestimation. For many, risk perception shifted only once direct observation—rising rivers, landslides, and washed-out roads—confirmed the severity of conditions. In practice, generalized warnings were difficult to translate into personally meaningful risk before catastrophic impacts unfolded.

Action was driven by observation

Before the storm, participants reported receiving limited specific or locally tailored guidance. Recommendations tended to emphasize general preparedness (e.g., secure supplies, prepare

for power outages, etc.). Some participants took proactive measures on their own, such as stocking water and fuel, moving vehicles to higher ground, preparing medical supplies, or packing evacuation bags, but these actions were largely self-initiated. Others did not escalate preparations because evacuation or shelter-in-place messaging was fragmented, delayed, unclear, or not received at all. During the storm, widespread power and communication outages further constrained official guidance. As a result, most decisions were reactive and driven by real-time observation. Individuals evacuated after seeing water rise rapidly or chose to shelter in place when roads became impassable. Communication collapse in some areas forced reliance on neighbors, word-of-mouth networks, and personal judgment rather than official instruction.

Helene reinforced that resilience is built locally

In the aftermath, Helene fundamentally reshaped regional risk perception. The event has become a new benchmark for flood risk. Communities report a deeper understanding of their local watershed, topography, and infrastructure vulnerabilities, though barriers to risk comprehension persist. A consistent theme emerged that resilience depends less on the volume of information available and more on clarity, localization, redundancy, and trusted relationships. Communities identified the need for locally grounded emergency action plans, early warning systems, redundant communication infrastructure, updated risk mapping, and sustained funding and staffing of critical services. Participants emphasized that effective warning and preparedness is rooted not only in technology, but in ongoing capacity building, relationship-building, and trusted communication channels established well before the next storm.

Implications

The findings of this study underscore that flood resilience depends on the strength of the entire warning-to-action chain. The implications below highlight considerations for forecasting operations, local communities, and broader resilience efforts.

For the Forecasting Enterprise: Sustained Investments in IDSS are Crucial

The findings reinforce the importance of impact-based forecasting and decision support services (IDSS). In complex terrain, regional warnings can lack local resonance, suggesting a need for localized impact framing where feasible. Continued advancement of local consequence-based communication—within the limits of forecast uncertainty—may support stronger risk internalization. Clear differentiation of rare, high-consequence events from routine flood alerts is also critical in regions where frequent warnings can normalize risk and reduce urgency. Overall, the findings align with ongoing efforts in IDSS and reinforce the need for sustained investment to integrate hazard information with impact information tailored to partners and core users.

For Local Communities: Clear Protocols and Capacity Building are Essential

While forecasts originate within the national forecasting enterprise, protective action ultimately depends on local systems, relationships, and infrastructure. The findings suggest that communities are better positioned to translate hazard information into action when there are clear evacuation thresholds, watershed-specific guidance, and shared understanding of what actions to take as conditions escalate. Fragmented or delayed evacuation and shelter

messaging contributed to reactive decision-making, underscoring the importance of consistent local protocols for issuing and reinforcing directives. Widespread power and cellular outages during Helene revealed the vulnerability of communication systems and the importance of redundant pathways capable of functioning during infrastructure failures. In addition, sustained public education to interpret flood information and trusted community networks can reinforce baseline risk understanding and preparedness before disasters occur. Together, these measures can strengthen the link between flood information and protective action at the community level.

For Broader Flood Resilience: Strengthening the Full Warning-to-Action Chain is Key

Hurricane Helene underscores that warning effectiveness depends not only on forecast accuracy, but on how hazard information is localized, interpreted, and translated into protective action. Across interviews and listening sessions, participants expressed high trust in official forecasts, however many underestimated the scale of impacts and made reactive decisions as conditions intensified. These findings reinforce the importance of strengthening the full warning-to-action chain—from credible forecasting to localized interpretation, clear decision cues, and resilient communication systems. Breakdowns at any point in this chain can shape outcomes, even when forecasts are timely and technically sound. Strengthening flood resilience therefore requires coordinated investment across forecasting, emergency management, infrastructure, and community capacity-building.

Recommendations

While this study reflects insights from a relatively small regional sample, the findings reveal consistent patterns that point to several priority actions requiring coordinated investment and collaboration across organizations working along the warning-to-action chain:

Improve Risk Interpretation

Key collaborators: NOAA, social science researchers, emergency management partners, and community organizations

- Refine how high-severity terms (e.g., “catastrophic”) are communicated by pairing them with concrete, impact-based examples that better convey personal risk. Inform this with research to better understand how individuals interpret high-severity terms and terminology that may better motivate action.

Mitigate Alert Fatigue

Key collaborators: NOAA, social science researchers, emergency management partners, and the public

- Define escalation language and decision cues that clearly differentiate routine alerts from rare, high-consequence events, and pair each alert level with prescribed protective actions. Ground this approach in research—engaging local emergency management partners and the public—to better understand how repeated flood messaging affects attention, trust, and behavioral response.

Expand Localized Messaging

Key collaborators: NOAA, social science researchers, and emergency management partners

- Expand watershed- and place-based messaging by incorporating local thresholds and known impact points to make forecasts more actionable. Develop and publicize watershed-specific evacuation thresholds, standardize triggers for action, and coordinate messaging protocols across jurisdictions.
- Expand and modernize real-time observational networks to increase coverage across the highly varying terrain and conditions in the region, improve situational awareness, and enable more accurate, reliable triggers for localized action.

Strengthen Communication Resilience

Key collaborators: state and local governments, emergency management partners, utility and telecom providers, community organizations

- Invest in a mix of high-technology (e.g., broadcast alerts, satellite messaging) and low-technology (e.g., sirens, radio, door-to-door networks) and formalize cross-sector partnerships and strategies to ensure message continuity during infrastructure failure.

Build Public Understanding and Local Capacity

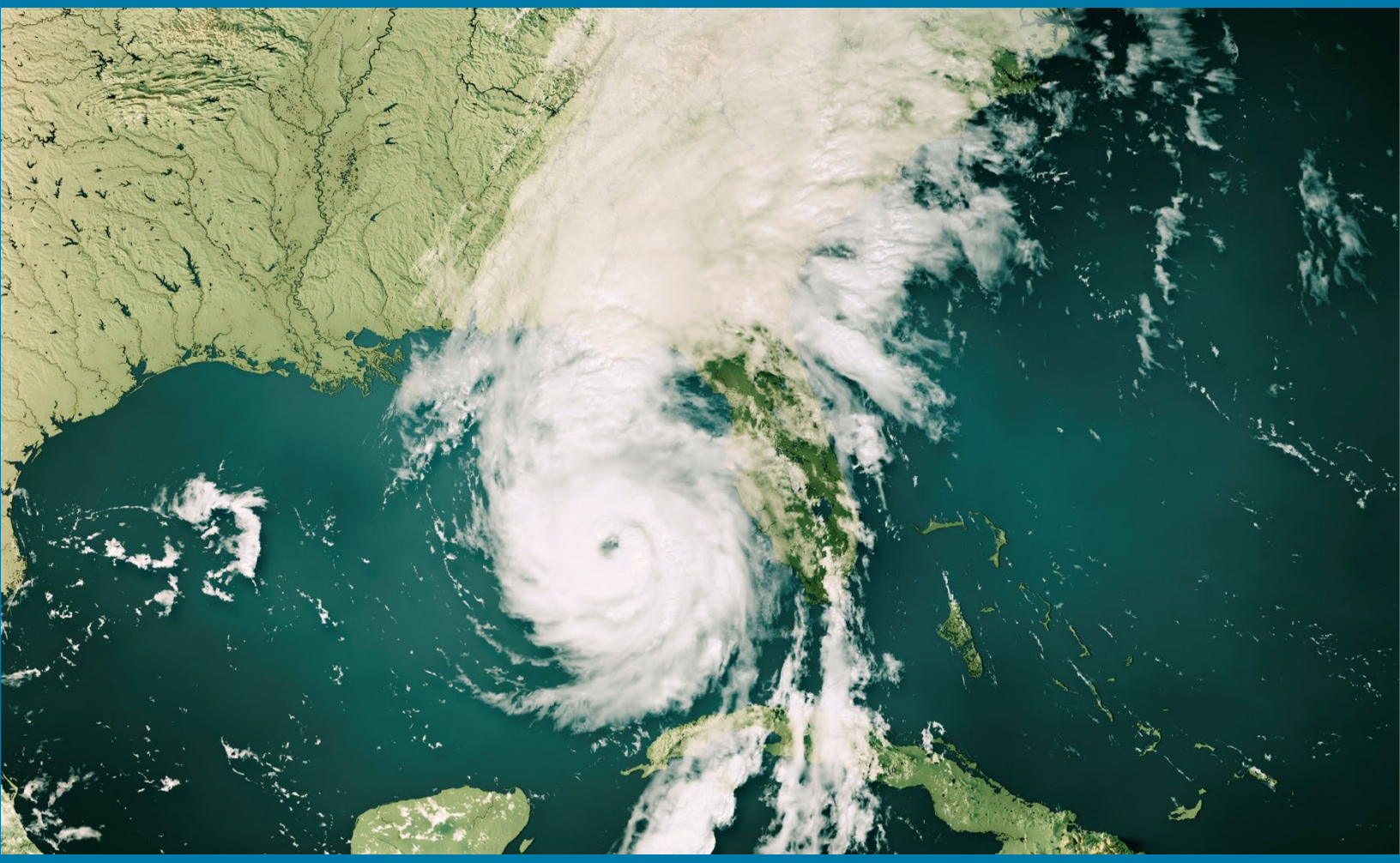
Key collaborators: state and local governments, social science researchers, community organizations

- Implement sustained public education on flood risk, including how to interpret warnings and identify personal thresholds for action. Pair this with community exercises ("flood drills") and support for trusted neighborhood networks and community liaisons to reinforce pre-disaster preparedness and resilience.
- Strengthen cross-sector coordination by building relationships, establishing standard operating procedures (e.g., roles, handoffs, communication norms), and conducting exercises focused on shared understanding across the warning-to-action chain.
- Establish regional hubs for flood research, data synthesis, and resilience to coordinate education, preparedness, and community engagement efforts.

Key Takeaway

Hurricane Helene exposed both the strengths and vulnerabilities of the region's flood warning ecosystem. Forecasts were credible and widely trusted, yet gaps in localization, risk interpretation, and communication resilience shaped how warnings translated into protective action. Strengthening flood resilience therefore requires coordinated investment across forecasting, emergency management, infrastructure, and sustained community capacity-building. Reinforcing the full warning-to-action chain will better position communities to act decisively when the next storm arrives. RTI's rapid post-event initiative reflects our commitment to pair our technical forecasting and communication expertise with grounded community insight to drive practical, actionable improvements in flood resilience.

Section 1: Introduction



1. Introduction

1.1 Hurricane Helene and Its Impacts

In late September 2024, Hurricane Helene caused catastrophic flooding across Western North Carolina (WNC). The meteorological setup that led to Helene's devastation was a near-worst-case scenario. A predecessor rain event dropped up to 8 inches of rain across the region in the days prior to Helene's arrival (Figure **1**). By the time Helene moved inland, flooding was already underway. Helene brought additional, intense rain and extreme winds. Over the combined three-day event, rainfall exceeded 20 inches across much of WNC, with a maximum of 30.8 inches recorded in Yancey County (Figure **2**). Rivers across the region rose at extraordinary rates and at least 63 gauges broke historical flood records (Hagen et al., 2025).

	Wednesday, September 25	Thursday, September 26	Friday, September 27
Helene Status	Category 2 hurricane off the coast of Mexico	Category 4 hurricane approaching the FL coast	Tropical storm reaches the Appalachian Mountains
WNC Weather Conditions	Heavy rainfall begins due to the predecessor event, one confirmed tornado	Steady rain from the stalled front continues, flooding in common flood prone areas	Extreme rain and wind from Helene, widespread extreme flooding and landslides
WNC Warnings	NWS begins warning of "catastrophic" flooding	Warnings from all sources grow urgent and dire	Power and cell outages disrupt messaging

Figure 1 – Approximate timeline of Hurricane Helene location, WNC conditions, and warnings

The scale and spatial extent of Helene's inland flooding was unprecedented. While WNC has experienced extreme floods in the past, Helene is distinguished by the multi-state, multi-county extent of compound devastation. In addition to extreme flooding, more than 2,000 landslides were documented and extreme winds led to extensive forest damage in high-elevation counties, e.g., approximately 50 percent of trees were lost or damaged in high-elevation counties (GROW NC, 2025).

The human toll was severe. More than 100 lives were lost in WNC alone. Hundreds of thousands of residents across the region were directly affected through displacement, power outages, water outages, damaged homes, and prolonged community isolation. More than 1,000 high-water rescues took place in WNC during the event and state reports estimate that more than 125,000 housing units across western North Carolina were damaged or destroyed (GROW NC, 2025). In some mountain counties, power outages were nearly total, isolating communities for days or weeks as transportation corridors were severed and communications networks failed.

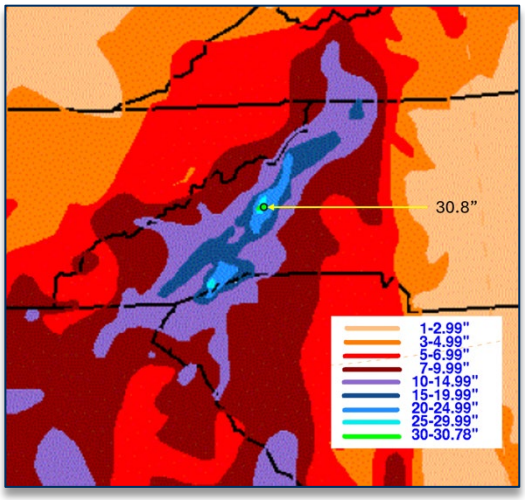


Figure 2 – Total Helene rainfall across the Appalachian region. Adopted from Hagen et al., 2025.

Section 2: Methods

2. Methods

2.1 Data Collection

Starting in February 2025, five months after catastrophic flooding caused by Hurricane Helene, RTI conducted interviews to understand how flood information was communicated and perceived before and during the storm. Four months after interviews concluded, and eleven months after the storm, RTI held listening sessions in August 2025 to validate interview findings and understand how flood risk perceptions had changed after Helene (**Figure 3**).

Figure 3 – Data collection timeline relative to Hurricane Helene

2.1.1 Interviews

In February through April 2025, the research team conducted 36 semi-structured interviews with a wide range of community members across 8 counties in WNC (Error! Reference source not found.). These interviews aimed to characterize how flood-related information was communicated before and during Hurricane Helene. Participants were selected from five primary audience segments:

Audience Segment	Description	Examples
Emergency Responders	People in the community whose job is to prepare for and respond to emergencies.	Fire, police, county or state emergency services
Local Authorities	Leaders within the community who plan and implement policies or structures that impact local organizations and residents or are direct communicators of important local information.	County or town government, public works, parks
Health and Human Services Organizations	Organizations in the community that provide services used by other organizations or residents, especially for vulnerable populations.	School districts, universities, hospitals, health services
Community Interest Organizations	Organizations in the community that may have an influence on residents.	Faith-based organizations, employers, homeowners' associations

Audience Segment	Description	Examples
General Public	Anyone who lives in, works in, or was visiting the affected communities at the time of Hurricane Helene and subsequent flooding.	Homeowners, renters, people who commute into the area

Recruitment was carried out in collaboration with the Blue Ridge Resource Conservation and Development Council and leveraged connections through local networks and snowball sampling techniques.

The study focused on communities in 8 counties in WNC that were hard hit by Hurricane Helene. Within each audience segment, the team aimed to interview 10 to 15 individuals (approximately 60 total), though the final numbers in each segment and distribution across the counties were constrained by participants responses and project team locations. The audience segmentation allowed researchers to explore differences in information sources, actions taken in response to flood warnings, and barriers to accessing or acting on flood-related information.

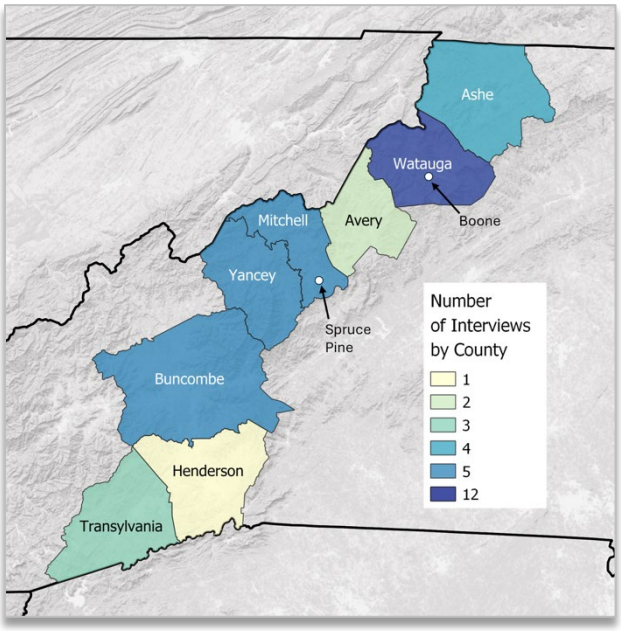


Figure 4 – Interview count by participating WNC counties and listening session locations

Each interview lasted approximately 45 minutes and followed a semi-structured guide. Interviews were conducted in person and began with an introduction to the research team and the purpose of the study, followed by a series of questions covering how participants received information about Hurricane Helene, the timing and impact of that information, and any challenges they faced in responding. The questions were partitioned for periods “before the storm” and “during the storm” to distinguish differences in perceptions and actions resulting from warnings in advance of the storm versus those resulting from information conveyed as the storm was underway or had passed. All interviews were recorded with the participants’ consent.

2.1.2 Listening Sessions

Two listening sessions were held in August 2025—one in Boone and one in Spruce Pine—to reflect on preliminary findings and explore how perceptions of flood risk had shifted since Helene. Select interview participants were invited across each of the five audience segments, as well as other recommended community members, with a goal of hearing a range of perspectives. Each session included between 5-10 participants, lasted approximately 2 hours, and took place in neutral locations offered by community organizations. In these sessions, community members discussed changes in awareness and preparedness, ongoing challenges, and ideas to increase resilience ahead of the next major storm.

2.2 Data Analysis

2.2.1 Interviews

All interviews were audio-recorded and transcribed verbatim. Transcripts were imported into NVivo (QSR International) to facilitate data management and coding. Data were analyzed using a primarily deductive thematic analysis approach guided by the study's conceptual framework and research objectives. Prior to coding, the research team developed an initial codebook based on key constructs from the conceptual framework and domains reflected in the interview guide. Codes included definitions and application guidelines to support consistent use across coders.

To refine the coding framework, two members of the research team independently applied the preliminary codebook to a subset of transcripts and met to compare coding decisions and resolve discrepancies. The codebook was revised accordingly, with redundant codes consolidated and additional codes incorporated inductively when new concepts emerged from the data.

The finalized codebook was then applied to the full dataset using NVivo. Coded excerpts were examined within and across codes to identify patterns and broader thematic categories reflecting participants' experiences related to the study objectives. Representative quotations were selected to illustrate each theme and to ensure that findings were grounded in participants' perspectives.

2.2.2 Listening Sessions

Listening sessions were audio-recorded, and a qualitative researcher used the recordings to conduct manual coding of the data. The researcher developed an analysis spreadsheet that grouped participant feedback by listening session location and conversation guide questions, which enabled identification of similarities and differences in participant responses. The patterns in participant insights were summarized into themes and organized to follow the moderator guide questions chronologically. Listening session moderators reviewed and validated the analysis findings.

Section 3: Findings

3. Findings

3.1 Interview Findings

3.1.1 Communication Before and During Helene

In This Section (hyperlinks to each subsection)

What Participants Heard

Before the storm, most participants were aware that the storm was coming but did not grasp its severity due to shifting forecasts, vague messaging, and lack of local precedent. During the storm, communication broke down entirely in many areas, leaving some without updates and others overwhelmed by normalized alerts that failed to convey the catastrophic scale of the unfolding disaster.

Before the Storm

Most participants first became aware of the storm several days to a week before landfall, but the seriousness of the threat was not clear to many until closer to the event. A few noted that they initially thought Western North Carolina would only get heavy rain or be on the storm's outskirts, with the worst impacts expected elsewhere. This misperception was due to shifting forecasts in some parts of the region and a lack of local precedent for a storm of this scale.

Some participants received flood warning alerts starting as early as Wednesday prior to the storm's main impact. One participant noted that while the messaging used more severe language than usual, it would take significant experience with such alerts to recognize or quantify the increased risk. Another participant recalled hearing from a friend who had been evacuated from her home due to potential flooding. Someone else received a "shelter in place and do not travel unless absolutely necessary" message the day before the storm, but they did not interpret it as urgent, describing it instead as a "routine message."

Some groups received more structured or detailed updates. Emergency responders and local officials got regular briefings from the NWS and state-level emergency management office as part of planned emergency response communications, with warnings that escalated from comparisons to past storms to language like "catastrophic" and "historical." A few participants heard limited information about possible school and business closures or canceled community events like meetings and sports games. The issuance of local alerts was sporadic and inconsistent across different counties, leaving some gaps in awareness. Further, many county-

level alert systems are opt-in systems, so only people who had signed up for the alert system received those notices.

During the storm

During the storm, people received different amounts and types of information, with some getting flood warnings while others did not receive any official warnings due to outages. Some local authorities and residents reported receiving emergency text alerts about flash flooding, road closures, and life-threatening conditions. However, these warnings were sometimes dismissed because flash flood alerts had become common and the observed conditions were rarely as severe as what ultimately occurred. One person explained that the repeated alerts over time created a sense of "normalization," leaving them unprepared for the unprecedented scale of the flooding.

During the storm, some people experienced a complete collapse of communication systems. Widespread power outages, downed cell towers, and failures of landlines, two-way radios, and even 911 systems left some residents with no way to receive updates. Some could not confirm the safety of family or coworkers for more than a day, underscoring how isolating and disorienting the communication breakdown was.

Emergency responders had somewhat more access to structured updates. Emergency operations centers relayed information about rescues, vulnerable residents on home oxygen, and infrastructure issues like breached spillways. Tools like Starlink provided connectivity for some responders after other equipment was damaged, enabling them to share real-time updates about flooding and resource needs. Still, even these channels were fragile, and responders had to rely on partial information to guide their actions.

Other pieces of information received during the storm included road closures and blocked routes. While some alerts reached participants through county emergency alert systems or Viper radios, others only learned of road closures from delayed navigation apps or by driving into hazardous conditions themselves. A few participants received "shelter in place" messages or instructions not to travel unless fleeing an area subject to flooding or under an evacuation order.

Information Source

Before the storm, people relied on a broad mix of formal and digital information sources—news, weather apps, official alerts, and social media—to assess risk and prepare, but during the storm, widespread power and network failures forced a shift to hyperlocal, informal communication through radios, neighbors, and word-of-mouth as the primary means of staying informed and connected.

Before the storm

People used a mix of sources to assess risk and prepare for the storm. Many relied heavily on traditional news outlets, weather apps, and social media to track the storm's path and severity. Local meteorologists, along with The Weather Channel and NWS, were considered trusted sources, though some participants noted confusion caused by differences in forecasts from different sources.

Local authorities and emergency services also played an important role in pre-storm communication. Some communities received text alerts, automated calls, or updates through county or state systems (e.g., VIPER alerts). These provided warnings such as flood watches and evacuation notices, but participants noted that not everyone was enrolled in such systems or that messages were sometimes missed. For health and emergency workers, updates often came through fire department radio channels or coordination with emergency management offices.

On the community level, neighbors, family, and friends were essential for sharing and validating information. Some people described receiving calls or messages from relatives in other states or even overseas, who were watching national or international coverage of the storm. Others checked in with neighbors in person, particularly to prepare for potential flooding or power outages. Word-of-mouth and local networks helped bridge gaps when official information was delayed or unclear.

During the storm

Severe communication challenges were faced during the storm. Power outages and downed cell towers left many without access to television, internet, or phone service. In these circumstances, emergency personnel relied heavily on two-way radios, while community members often turned to word-of-mouth, neighbors and to social media (if they had cellular service), to gather critical updates. For many, communication breakdowns meant that they received little or no official guidance in real time, creating confusion about risks, road closures, and evacuation needs.

Emergency responders described using two-way radios, fire department radio channels, and in some cases, Starlink internet connections at operations centers to stay informed. However, even with these systems, communication was fragile, depending on a small number of functioning towers or vulnerable equipment. Yet not all information reached the public. For instance, "shelter-in-place" directives circulated among emergency staff but were not consistently communicated to households due to power and cellular outages and other communication challenges.

> *"There was no source of information really shouting, 'You're at risk!'"*
> *— Community Interest Organization*

Community members' experiences were more fragmented. Some received emergency alert system texts before power and cell service failed, while others had to rely entirely on neighbors or personal observation. In a few cases, outside contacts—family or friends in other states or countries—were the first to alert residents to the severity of the disaster, based on news reports unavailable within the affected area. For those who had access to cellular service, social media also played a role, with people sharing storm tracks, river level updates, and videos that conveyed the scale of flooding.

Despite the hardships, the collapse of formal communication networks fostered neighbor-to-neighbor, hyperlocal communication and collaboration, particularly after the storm. People walked, biked, or used ATVs to check on each other, share updates, and help clear roads to

restore access to information and critical supplies. Informal networks, such as children delivering handwritten notes between households or hand-written signboards posting community updates, became an improvised but vital form of communication.

Decision-Making Amid Multiple Information Sources

Before the storm, people received information from multiple sources but faced minor inconsistencies and uncertainty in interpreting forecasts, whereas during the storm, information was more consistent across channels, yet firsthand observation became the most trusted means of understanding the unfolding situation.

Before the storm

Before the storm, nearly everyone reported receiving information from multiple sources, including weather apps, news outlets, and social media, which generally conveyed consistent messages that the storm would be severe, though the full scale of its impact was not anticipated. Emergency personnel primarily relied on the NWS as their most trusted source, often comparing forecasts from the Greenville-Spartanburg and Blacksburg stations to prepare for worst-case scenarios, despite minor variations that created a “no man’s land for forecasting.” Some participants noted challenges in determining which sources to trust, describing it as a “guessing game” when forecasts differed slightly across platforms.

During the storm

During the storm, people continued to access multiple sources, but unlike before, the information was largely consistent across channels, reinforcing the seriousness and severity of conditions. For many, however, firsthand observation became the most reliable form of information, providing a clear understanding of the situation that surpassed external updates or forecasts. While official sources remained important, direct experience and real-time observation played a critical role for individuals in assessing the storm’s impact.

Trust

Before the storm, participants generally trusted official forecasts and alerts despite some uncertainty, while during the storm, trust remained high and was reinforced by firsthand observations, though the relevance of some information varied across locations.

Before the storm

Most participants expressed that they generally trusted the information they received in the days leading up to the storm. This trust often stemmed from reliance on established sources like the NWS, local meteorologists, and official alerts. Some participants emphasized that forecasts were believed to reflect the “best available knowledge,” even though they acknowledged the inherent uncertainty of weather prediction, particularly in mountainous regions where conditions are widely variable and can shift dramatically within a few miles.

A few of the participants mentioned that while they trusted the sources, their personal experiences of past storms shaped how seriously they interpreted the warnings.

> *"I trusted the information largely because it coincided with my own observations, so I don't think there was any credibility issue before or during."*
> *— Community Interest Organization*

During the storm

During the storm, participants reported that they generally trusted the information they received, especially when it came directly from emergency personnel, trusted friends or colleagues, or official sources. Trust was often reinforced when the information aligned with what individuals were observing on the ground, such as rising water levels or local damage. For many, firsthand experience validated the credibility of messages. Respondents highlighted that while they did trust much of the information, the accuracy and relevance sometimes fell short. For example, water safety flyers issued by city officials did not apply to all county residents, leaving some uncertain about what guidance was meant for them.

Communication Channels

Before the storm, people accessed information through a broad mix of formal and digital channels—including emails, alerts, news, and personal messages—while during the storm, communication became more immediate and localized, relying on radios, limited text alerts, and word-of-mouth as power and connectivity failed.

Before the storm

Participants accessed information through a wide range of traditional and digital communication channels. Emergency responders and local authorities primarily received emails from the Emergency Management Coordinator and North Carolina Emergency Management, while HHS organizations also distributed and shared email communications regarding forecasts and preparedness. Community members relied on multiple outlets, including local radio, television, newspapers, and weather alerts from websites such as Weather.com. Automated notifications, such as Avery County's Reverse 911 system, flood watch alerts, Google alerts, and CNN push notifications, provided additional updates. Personal communication, including phone calls and text messages from family members, further supplemented these formal sources.

During the storm

During the storm, as conditions worsened, communication shifted toward real-time updates and situational awareness. An energy utility sent texts and emails to customers with service updates, while emergency responders relied on Starlink, VHF and handheld radios, and county radio systems to maintain connectivity. Slack messaging was used in organizational contexts. Emergency alert texts for flood watches and warnings were issued overnight (Thursday 9/26 to Friday 9/27 as the storm arrived in the region), though participants noted that the reliability of these alerts depended on location and cell service. Limited personal communication via text and phone calls continued (in some locations), with family and friends checking in on one another. Word-of-mouth served as an important informal channel for several.

Understanding the Information

Before the storm, information was generally clear but often too broad or nonspecific to guide local action, whereas during the storm, messages became more urgent and impact-focused but still challenged people's ability, especially those unfamiliar with such events, to interpret the severity and translate instructions into concrete decisions.

Before the storm

Prior to the storm, participants generally reported that the information they received was clear and easy to understand. Some appreciated the simplicity of the messaging; however, a few noted that the ease of comprehension often reflected a lack of detailed content. Emergency responders highlighted that standard weather summaries and alerts tend to be broad, often covering entire states or regions, which limits their usefulness for local planning. Geographic variability within counties further complicates the applicability of generalized forecasts. Local authorities noted that early predictions often included speculative elements regarding the storm's impact, and confidence in these forecasts, and in their own readiness, only increased as the event drew closer. Despite clear messaging, some participants reported feeling unprepared for the actual conditions they encountered.

During the storm

> *"It was only easy to understand because there wasn't actually much information to process."*
> *— Emergency Responder*

During the storm, communications primarily focused on impacts rather than instructions. Participants described receiving urgent messages, although concerns were raised about the clarity of language in some written materials, particularly about language barriers. For individuals experiencing such a weather event for the first time, comprehending the severity proved challenging, even when basic instructions were clear. Notably, urgent directives, such as immediate evacuation to higher ground, were communicated effectively and emphasized the critical importance of prompt action. Overall, while participants found the information generally understandable, challenges remained in interpreting the severity of the event and translating broad guidance into actionable measures (e.g., what does higher ground mean for an individual, where is it safe to go?), particularly for unprecedented weather scenarios in the region.

Actions Recommended and Taken

Before the storm, participants received little to no specific or locally tailored guidance and instead relied on generic preparedness advice or personal judgment, whereas during the storm, the absence of official instructions forced people to depend entirely on real-time observation and instinct to decide whether to evacuate or shelter in place.

Before the storm

Participants reported limited guidance regarding specific actions to take in anticipation of the storm. Several individuals stated that no actions were recommended at all, while others recalled receiving only general instructions focused on basic storm preparations, rather than guidance tailored to Hurricane Helene. For example, an energy utility posted on Facebook advising

residents to prepare for potential power outages. Other general recommendations included securing water and necessities (e.g., flashlights and candles) and following basic preparatory guidance from sources such as The Weather Channel. Participants noted that these messages were similar to typical winter storm advisories and did not address the unique challenges posed by severe weather in mountainous regions. A few participants reflected that, in hindsight, their preparations would have been different had more specific guidance been provided.

Despite the lack of tailored recommendations, several participants reported taking proactive measures on their own. Common actions included preparing for power loss, ensuring refrigeration for medications, stocking fuel, water, and food, moving farm equipment and vehicles to higher ground, securing outdoor items, packing bags for potential evacuation, and readying emergency equipment such as chainsaws and rescue boats.

During the storm

Participants reported receiving no actionable guidance while the storm was ongoing (likely due to widespread outages). Nonetheless, individuals took critical actions based on direct observation and situational awareness. Some evacuated after observing a river rising significantly above normal levels, while others chose to hunker down and remain in place.

> *"There was not any official source that came out and said, 'Y'all are about to get the crap kicked out of you—do these things.'"*
> *— Community Interest Organization*

Sharing Information

Before the storm, communication was organized, proactive, and relied on multiple structured channels to share forecasts and preparedness guidance, whereas during the storm, it became reactive and fragmented, depending on radios, improvised tools, and face-to-face exchanges to maintain even minimal information flow amid widespread power and network failures.

Before the storm

Before the storm, information was shared across multiple channels and audiences, though approaches varied by role and context. Local authorities and emergency responders reported relaying official updates, forecasts, and preparedness guidance through Facebook posts, emails, word-of-mouth, and departmental communications. One emergency responder described a proactive manual outreach to ensure critical safety information reached those living in areas at highest risk for flooding. Police and firefighters went door-to-door, used loudspeakers, and distributed one-page notices to deliver evacuation instructions. Efforts focused on flood-prone areas, including homeless encampments and vulnerable communities. Health and school organizations relied on established protocols such as phone trees, email systems, messaging apps, and school websites to reach staff, students, and parents. At the community level, individuals shared information more informally through text messages, phone calls, social media posts, and in-person conversations with family, neighbors, and colleagues.

The type of information shared generally included weather forecasts, flood risks, road conditions, and precautionary measures such as school closures, canceling community events, or preparing for power outages. While much of this information was sourced from official

forecasts or emergency management communications, some participants described simply reinforcing what others already knew, often to encourage action.

Almost no challenges were noted with being able to share information before the storm. Use of the Reverse 911 system in Yancy County was minimally utilized due to the small number of residents who were signed up for the service.

During the storm

Information sharing during the storm focused on real-time conditions, safety updates, and coordination needs. The types of information exchanged included weather conditions, flood levels, road closures, shelter availability, and evacuation needs. Emergency responders and local authorities shared updates with colleagues, partner agencies, and the public, while community members shared information within households, neighborhoods, and social networks.

Information sharing occurred through a combination of formal communication systems, improvised tools, and highly manual, face-to-face methods. Emergency responders relied heavily on public safety radio systems, including VHF and VIPER channels, to coordinate with dispatch, strike teams, and partner agencies when cell service and internet were unavailable. Some agencies had contingency systems in place, such as Starlink satellite connections and emergency operations plans that followed a PACE model (primary, alternate, contingent, emergent), which allowed them to maintain at least limited communication throughout the event.

Community-level sharing was often more limited and informal, relying on texts or phone calls while service lasted, and shifting quickly to word-of-mouth or in-person conversations once power and cell networks failed. In some cases, neighbors checked on each other directly, while others used platforms such as WhatsApp or Facebook to post updates when digital connections were intermittently available. Faith-based organizations and community groups also played a role by using existing networks to distribute information and, later, through donated Starlink devices that allowed them to resume online messaging about available relief resources.

Challenges were common and often stemmed from infrastructure failures. Power outages, cell phone disruptions, and internet loss severely limited communication, forcing many to rely on radios or face-to-face updates. Some participants noted delays in receiving official updates or challenges relaying information quickly enough to support decision-making. Geographic isolation and impassable roads further complicated communication, leaving some communities without timely access to critical updates.

Taken together, these findings show that before the storm, communication was structured, proactive, and relatively reliable, while during the storm, it became reactive, fragmented, and constrained by infrastructure failures. Despite these barriers, both formal and informal networks played a vital role in ensuring information continued to circulate under rapidly changing and hazardous conditions.

Barriers

Before the storm, most participants felt adequately informed though some noted gaps in outreach, clarity, and accessibility, whereas during the storm, widespread power and network outages left many completely cut off—unable to receive updates or communicate—highlighting how fragile information access became once modern systems failed.

Before the storm

Most people reported that, overall, they received the information they needed. However, one participant expressed concern that communication could have been stronger. They felt there should have been more direct outreach, such as knocking on doors to notify residents that they needed to evacuate. In their view, the evacuation orders came too late, and not everyone was adequately informed. They also pointed out that language barriers posed challenges for some community members.

From the perspective of emergency management, one official noted that it can be difficult for cities to access critical updates because information is distributed primarily at the county level. Another emergency manager emphasized the need for more precise details, particularly about how high the floodwater was expected to rise.

During the storm

During the storm, only one person explained that they were able to maintain limited cell service throughout the storm, which allowed them to access social media for updates and to see what was happening. For most others, though, there were significant barriers to receiving information.

> *"And then once the power went out, we were totally cut off. We had no internet, no anything, so we had no communication, and our bridge was out so we couldn't leave." — Health and Human Services Organization*

Power, cell phones, and internet outages left many residents cut off, and because the worst of the storm hit during the early morning hours, most people were asleep when critical updates were issued. In some communities, neighbors live far apart, making word-of-mouth communication difficult. Even the radios used by emergency personnel were hard to operate and hear over the sounds of the storm.

Several participants reflected on how vulnerable the loss of communication made them feel. In a digital age where power and internet are taken for granted, the outage left them with no way to connect with the outside world. One participant described it as if time had reversed: *"It felt like we turned the clock back a hundred years…."*

Misunderstandings

Before the storm, misunderstandings and underestimation of the storm's severity led some to delay preparedness, whereas during the storm, participants generally reported high attention to warnings and minimal confusion, with most taking the situation seriously.

Before the storm

A few participants described misunderstandings related to information and preparedness. An emergency responder highlighted limitations in forecasting tools, particularly models that did not

account for water already held in reservoirs and dams. This created gaps in understanding about downstream flooding, as rainfall estimates alone underestimated the true volume of water that would impact communities. They noted that clearer messaging about watershed dynamics and cumulative water flow would improve preparedness. At the community and household level, many underestimated the storm's severity, delaying evacuation or preparedness actions due to disbelief or comparisons with past storms. This skepticism, sometimes within families, combined with forecasting limitations to create misunderstandings that shaped how people prepared.

During the storm

Across accounts, most participants reported that misunderstandings or disbelief in storm information were minimal. Local authorities, emergency responders, and community members generally agreed that people were attentive and took the warnings seriously, with one person describing it as one of the few times when "everybody listened."

3.1.2 General Communication Insights

In This Section (hyperlinks to each subsection)

Typical Information Sources and Channels

Findings across interviews indicate that people rely on a mix of official forecasts, personal networks, and digital tools when seeking weather information. The most common sources were weather apps and websites such as the Weather Channel, AccuWeather, Weather.com, and local platforms like Ray's Weather. A few participants also mentioned using radar features or layered approaches—checking quick app forecasts first and then moving to more detailed sites like NOAA or the NWS when conditions appeared more severe. These apps and sites provided daily forecasts, radar visuals, and alerts that shaped both everyday planning and storm preparedness.

Local television and radio stations also remained important channels, especially for those who listened to NPR, local news broadcasts, or tuned into regional weather updates. For some, these outlets offered additional credibility and context beyond what phone apps provided. Several participants reported paying closer attention to TV weather forecasts when storms were imminent, while others turned to radio updates during commutes. In parallel, automated alerts such as reverse 911 systems and wireless emergency notifications on phones provided another critical layer of communication, particularly when the storm intensified.

Social media and word-of-mouth exchanges filled another key role. Many individuals described checking Facebook, Twitter, or local community feeds for updates from trusted meteorologists, city and county officials, or even friends and neighbors. Family members were often cited as a source of reminders or warnings, sometimes prompting individuals to take the threat more

seriously. This interpersonal channel was particularly relevant when official messaging was delayed or when people wanted reassurance from trusted peers.

Overall, the picture that emerges is one of layered information-seeking, where individuals combined quick-access tools like apps with official government or media reports, while also paying attention to local networks. This blending of digital, broadcast, and interpersonal sources reflects both the accessibility of multiple channels and the importance of cross-verifying forecasts. It also highlights how people tailor their information-seeking based on context—using casual checks for daily weather but moving toward more robust and diverse sources when facing a major storm.

How Communication Was Different During Helene

Across participants, most reported that the way they received information about Hurricane Helene was broadly similar to how they normally obtained weather updates—through standard channels such as the NWS, local media, weather apps, and social media. However, several noted that the storm's classification as a hurricane prompted them to follow updates more closely than usual, with some turning to specialized sources like hurricane trackers, Mike's Weather Page, or social media briefings from NWS offices in Greenville-Spartanburg and Blacksburg. A few individuals also described relying on friends or family who actively monitored weather models, as well as local officials who issued unusually urgent warnings.

At the same time, the experience revealed limitations in traditional communication. While the forecasts repeatedly warned of "catastrophic flooding," many participants said they did not fully grasp the severity or believed the event might pass quickly, comparing it to previous storms that had produced less damage. Some reflected that weather apps significantly underestimated rainfall totals, contributing to a false sense of security. Others observed that the lack of a local television station, inconsistent use of text alert systems, and reliance on fragmented sources like Facebook made consistent messaging difficult. Overall, while the mechanisms for learning about Helene were largely familiar, the intensity of the storm and shortcomings in communicating its true scale left many underprepared.

Prior Hurricane and Flood Experience

Nearly all participants described some prior experience with hurricanes, tropical storms, or flooding, though most emphasized that none matched the scale or devastation of Hurricane Helene. Many referenced well-known regional events such as Hurricane Hugo (1989), the back-to-back storms of Ivan and Francis (2004), the 1998 flood in Mitchell County, and the devastating 1977 flood. These events were often recalled in vivid terms—washed-out roads, damaged homes, or temporary isolation from surrounding communities—though several participants noted that their memories were fragmented or rooted in childhood. Others drew on experiences from coastal states, including Florida, South Carolina, or eastern North Carolina, where storms such as Irene, Bertha, or Katrina shaped their understanding of preparedness, prompting habits like storing water, cash, or fuel in advance of landfall.

Despite this familiarity with hurricanes and flooding, participants consistently emphasized that none matched the scale or devastation of Hurricane Helene. Many had experienced storm remnants that produced heavy rain, brief power outages, or limited creek flooding. For some, prior impacts amounted to nuisance-level damage (e.g., flooded vehicles, minor water intrusion, or yard damage) rather than widespread displacement, destroyed homes or infrastructure failure. A small number had never experienced flooding at all before Helene. Collectively, these accounts highlight that while residents were familiar with flooding to varying degrees, Helene's intensity and widespread impact were unprecedented in their personal and community histories.

Information about Evacuating and Shelter in Place

Across interviews, most participants reported that they did not receive clear or direct evacuation or shelter-in-place orders before the storm. While a few local authorities mentioned issuing public messages through county Facebook pages or alert systems urging residents to "stay home" or "keep their heads down," these communications were not consistently received across communities. In some cases, official systems—such as reverse 911 alerts—were prepared but never successfully transmitted, even to emergency operations centers that were fully online. Others recalled only hearing general warnings not to go near creeks or low-lying areas or receiving routine "don't travel" guidance typical of any severe weather event rather than explicit instructions to evacuate.

A small number of participants did report some localized efforts. For example, one community member noted that nearby campgrounds were evacuated in advance, and another described hearing that police used loudspeakers and patrol cars to warn neighborhoods during active flooding. A university sent an email to students advising them to go home if possible, and a few residents heard "go to higher ground" messages through word-of-mouth or local fire departments. However, most residents, emergency responders, and health and human service organizations said they received no official evacuation or shelter-in-place alerts or were unaware of them if they were issued. Several participants felt that clearer or earlier evacuation messages could have saved lives or reduced harm, while others acknowledged it is unclear if evacuations would have helped or made outcomes worse. Overall, the communication of evacuation and shelter guidance was fragmented, unevenly distributed, and in some cases arrived too late to follow the guidance.

Timing of Information

Across interviews with local authorities, emergency responders, HHS organizations, and community members, perceptions of whether key information about the storm arrived in time to prepare varied widely. Several participants acknowledged that while alerts and warnings were issued by the NWS and local authorities, the magnitude and severity of the storm were difficult to anticipate. For instance, some residents described having heard warnings about potential flooding or high rainfall but struggled to translate those forecasts into concrete preparation actions, noting that historical events like the 1916 flood were only anecdotal references rather than lived experiences. Others indicated that while they received general information in

advance, it was insufficient for the unexpected scale of damage, particularly regarding power outages, landslides, and flooding.

Emergency responders and local authorities generally felt they received information early enough to act, but they highlighted logistical challenges in responding to community needs, such as distributing limited medical oxygen supplies or navigating blocked roads. Some noted that their preparedness was based on standard emergency operations plans and expectations of a "typical worst-case scenario," yet the storm exceeded those assumptions. HHS representatives and some community members pointed out that while warnings were available, public perception and personal denial sometimes delayed action, reflecting a gap between information dissemination and behavioral response.

Overall, the narrative we captured from participants reveals a tension between timely information delivery and effective preparation. Most participants agreed that alerts were issued. However, uncertainty about the storm's severity, combined with unusual and rapidly changing circumstances, like landslides and extended power outages, meant that preparations to manage impacts were often reactive rather than proactive. In some cases, individuals who actively sought out information felt sufficiently prepared, while others found the guidance abstract or underestimated the risks. This highlights the challenge of communicating not just that a storm is coming, but also the specific, tangible impacts it may have on communities and actionable steps for preparation and response.

Risk Perception

Across multiple interviews with community members, local authorities, emergency responders, and HHS organizations, a consistent theme emerged: the magnitude of the storm was widely underestimated. Emergency personnel described preparing for scenarios involving hundreds of downed trees and minor flooding, only to face thousands of trees blocking roads and bridges washed out by unprecedented rainfall. Many participants shared that while they trusted sources such as the NWS, local forecasts, and meteorologists, the severity of impacts, including landslides, infrastructure damage, and prolonged power outages—was not fully anticipated. Even experienced responders noted that their planning was based on prior events, like Hurricane Ivan, or localized floods, which did not compare to the scale of Helene.

Community members echoed this underestimation. Residents reported a sense of "we'll see what happens" in the days leading up to the storm, despite warnings labeled as "catastrophic." Many indicated that early alerts, including app notifications or standard flood warnings, lacked urgency or specificity, which contributed to under-preparation. Some participants highlighted the difficulty of visualizing the storm's potential severity without prior experience, noting that even strong messaging about life-threatening conditions, such as landslides, might not have been fully heeded until the event unfolded.

Emergency responders described challenges with using maps and logistical tools once cell service and internet went down, highlighting gaps between the information provided and actionable planning due to widespread outages. Others suggested that the normalization of flood warnings and severe weather alerts may have desensitized the public, reducing the

perceived risk. Overall, the narrative across these accounts suggests that while accurate information was available from trusted sources, both the public and some authorities underestimated the storm's potential impact, and the communication of urgency, severity, and actionable guidance was insufficient to match the scale of Helene's unprecedented effects.

3.1.3 Interview Participant Recommendations

Five months after Hurricane Helene, residents, emergency responders, health and human service organizations, local authorities, and community members in Western North Carolina shared lessons learned, with a focus on what happened before and during the storm. Across interviews, participants emphasized that resilience depends not only on technical systems, but also on sustained preparedness culture, trusted relationships, and redundant communication pathways. Participant recommendations are summarized in additional detail below.

Before the Storm: Strengthening Preparedness and Risk Communication

Participants consistently emphasized the need for earlier, clearer, and more locally grounded preparedness efforts.

Actions Before the Storm	Participant Recommendations
Use clearer, locally tailored warnings with actionable guidance	Replace vague or generic alerts with messages that specify what residents should do, when they should do it, and what impacts are expected locally.
Convey urgency in ways that overcome normalization	Flood alerts have become routine for some residents and are often tuned out. More distinct language, clearer cues, and post-event validation of impacts may help counter warning fatigue.
Develop pre-scripted, rapidly deployable emergency messages	Similar to Amber Alerts, participants recommended emergency notifications that can reach all devices before networks fail.
Expand community-based outreach before disasters	Leverage churches, schools, universities, hospitals, neighborhood networks, and community-based organizations to amplify warnings and preparedness messaging.
Build public capacity to interpret flood risk information	Develop educational programs and initiatives around flood forecasts, probabilities, and technical terminology to improve how warnings are understood and acted upon.
Encourage household-level preparedness	Encourage household preparedness by maintaining 72-hour emergency supply kits, keeping gas tanks full during hurricane season, owning battery-powered or weather radios, and knowing how to access county alerts.
Embed preparedness in organizational culture	Conduct regular drills, test equipment, and maintain visible reminders to prevent loss of institutional memory as personnel change.
Strengthen inter-agency planning and coordination	Pre-assign radio frequencies for major events, update printed contact lists and paper maps, and ensure local emergency action plans incorporate input from community-based organizations.

During and After the Storm: Ensuring Resilient Communication

Once power and cellular networks failed, communication breakdowns became one of the most significant challenges described across interviews. Participants recommended ideas to address the potential for infrastructure disruption.

Actions During and After the Storm	Participant Recommendations
Invest in redundant, low-tech communication systems	Systems must function independently of cellular or internet infrastructure. Suggested investments included: ▪ Two-way radio infrastructure (e.g., Viper and related systems) ▪ Broadcast AM/FM radio capacity ▪ Portable satellite systems (e.g., Starlink) ▪ Mobile cell towers powered by generators
Formalize partnerships with local radio stations	Traditional broadcast radio emerged as a critical lifeline during outages. Participants recommended strengthening coordination between emergency management and local stations before disasters occur.
Decentralize shelter and resource coordination	Develop multiple community-based shelter sites and stronger local resource networks that can operate without connectivity.
Maintain analog backups	Paper maps, printed contact lists, and other non-digital tools proved essential once digital systems failed.
Strengthen cross-sector relationships	Trusted relationships among county departments, nonprofits, emergency responders, and residents enabled information flow when formal systems broke down.

3.2 Listening Session Findings

Eleven months after Hurricane Helene, and four months after interviews concluded, select interview participants participated in two listening sessions to reflect on preliminary findings and discuss how flood risk perception had shifted. In both listening sessions, participants highlighted meaningful shifts in flood risk perception within their communities, including perception changes within specific audiences, and barriers to accurate risk perception. Participants offered clear recommendations and next steps to improve risk communication, increase flood resilience, and secure resources. Listening session findings often overlap or support interview findings, suggesting that interview findings still resonated with participants after the four months between data collection phases. In the sections below, when a listening session finding is particularly relevant to an interview finding in the sections above, we note the section where there is overlap or complimentary information to support cross-referencing.

3.2.1 Risk Perception: Changes in Risk Perception Post-Helene

Overall Changes in Risk Perception

In our listening session data, we identified patterns within and across communities of risk perception changes following Helene. Some risk perception changes were associated with a specific audience (see "Audience-Specific Changes in Risk Perception" below), whereas the following are general community perceptions that emerged or shifted after Helene. See Section *3.1.2: Risk Perception* for interview findings about flood risk perceptions before Helene.

Community Perception Change	Findings
Helene is the new benchmark for flood risk	People will compare all future flood risk in Western North Carolina to Helene, for better or for worse. Helene has also provided a useful comparison to prepare for other risks (e.g., wildfire).
Historical flood information must be shared	There is a new appreciation for the need for historical flood context to improve risk understanding and preparedness. There is a need to better educate people about previous flood events and responses. New people moving into the area who did not experience Helene (e.g., students) and people with inaccurate flood perceptions (e.g., people who think something like Helene will never happen again) are priority audiences for historical information. *Relates to Section 3.1.2: Prior Hurricane and Flood Experience*.
Higher demand and urgency for flood risk planning	There is increased demand and new urgency for flood risk planning. Communities realized they need to better plan for future flood risks. There is a cross-community desire to capture new understanding of flood risk that has developed since Helene while it is still fresh, such as creating community emergency action plans.
Local watershed understanding increased	People have a better understanding of their local watersheds and topography, and their associated flood risks.
Spontaneous solutions are important	Communities acknowledged that spontaneous solutions came together effectively during Helene. These solutions offer paths for future preparedness plans to follow. Implementing approaches that were successful during Helene into preparedness and response plans can provide tested solutions for responding to future events.
Awareness of potential infrastructure loss and solutions grew	People better understand how to handle loss of critical infrastructure, especially for communications. During Helene, cell towers did not work, internet service was out, and two-way radio was unusable. Starlink provided a valuable way to maintain connectivity when traditional infrastructure was unavailable. *Relates to Sections 3.1.1: What Participants Heard and Information Source*.
Centralized communication is key	Communities have a greater awareness that a centralized communication center is important during crisis events to share consistent and coordinated information. During the response to Helene, in-person stakeholder meetings were held at the fire department, a senior center, and at the local college, and were key to coordination. Participants noted that communities without a clear central communication hub (e.g., university), response and recovery were more difficult.
Established relationships drive resiliency	Helene showed people that the key to success in flood preparedness and resilience is established relationships. Knowing who is good at what and delegating responsibility across teams is important for moments of crisis.

Audience-Specific Changes in Risk Perception

Across audience segments impacted by Helene, participants in both listening sessions described distinct shifts in flood risk perception.

Risk Perception Changes: Emergency Responders (ER)

Community Perception Change	Audience-Specific Perception	Findings
Helene is the new benchmark for flood risk	**Helene could have been worse**	As with everyone, Helene is the new benchmark for ERs. However, unlike some audiences, ERs understand that Helene could have been worse and something like it could happen again. Participants in ER roles shared that they think Helene could have been worse if it had been dark during the flooding, or if the rain had continued for more hours. ERs are preparing for the next event to be worse than Helene.
Historical flood information must be shared	**ERs can be data integration champions**	Compared to other audience groups, ERs were more focused on integrating information from past events into emergency plans and preparedness education. They recognized they would be likely lead data integration efforts.
Higher demand and urgency for flood risk planning	**Build redundancy into roles**	In a crisis, many ER roles demand 24-hour attention. To prevent burn-out, and ensure essential services are delivered, there needs to be 3+ people who can do each job.
Local watershed understanding increased	**Mudslide risk awareness has increased**	ER staff have more understanding that heavy rain events can produce mudslide risk. There is still a limited understanding of how to predict where landslides will occur.
Awareness of potential infrastructure loss and solutions grew	**Floods can cut off ERs from responding to communities**	During Helene, many community members were cut off from help, including services and communication. ER staff are now hyper-aware of how quickly flooding events can prevent them from providing emergency care to those in need.
Centralized communication is key	**Flood communication is challenging**	Participants in ER roles expressed that their appreciation for how difficult flood risk communication is increased after Helene. They cited rapidly changing risk levels, audience message and channel tailoring needs, and infrastructure damage as some of the sources of communication difficulty. *Relates to Section 3.1.1: Sharing Information.*

Risk Perception Changes: Local Authorities

Community Perception Change	Audience-Specific Perception	Findings
Demand and urgency for flood risk planning	**Change is already happening to increase resiliency**	Local authorities shared that changes are already occurring to increase flood resilience. More preparedness roles are being added to local government and local authorities are creating contingency plans and making investments in more resilient infrastructure.

Risk Perception Changes: Health and Human Services (HHS)

Community Perception Change	Audience-Specific Perception	Findings
Higher demand and urgency for flood risk planning	**Buildup of supplies was a challenge**	Over-accumulation of supplies (e.g., bottled water, diapers, food) was a problem for HHS Organizations after Helene. Plans for future crisis events should address ways to effectively manage, store and distribute very large volumes of donated supplies.
Centralized communication is key	**Tailoring communication to specific audiences is hard and important**	HHS organizations learned that flood messaging and response needs to be tailored to their unique audiences. For example, local schools and universities struggled to tailor risk messaging for students with high risk tolerance, whereas other organizations that served older adults found it difficult to find the right communication channels to reach their audience.

Risk Perception Changes: Community-Based Organizations (CBO)

Community Perception Change	Audience-Specific Perception	Findings
Higher demand and urgency for flood risk planning	**Risk planning at the organization-level is effective**	CBOs and businesses will better plan for flood risks and crisis response, including through organization-level emergency action plans. Businesses have a new understanding of how flood risk directly and indirectly impacts them and their role in preparedness and recovery efforts. For example, businesses mentioned adding flood preparedness into required employee safety training and recognize how risks like internet loss can disrupt orders and customer service calls.
Established relationships drive resiliency	**CBOs know their role**	CBOs have a better understanding of their role in flood preparedness and recovery, which centers on their ability to leverage existing relationships. Participants agreed that faith-based organizations are important distribution centers for information and supplies due to the established trust in their communities and networks.
Spontaneous solutions are important	**Creativity and agility of CBOs are key**	CBOs recognized their ability to rapidly and spontaneously respond to community needs in an emergency. Their strengths in creatively serving their communities, combined with established relationships and partnerships, position them to respond effectively to flood emergencies.

Risk Perception Changes: Public

Community Perception Change	Audience-Specific Perception	Findings
Higher demand and urgency for flood risk planning	**Risk planning at the neighborhood-level is effective**	Communities are developing emergency action plans at community and neighborhood scale (e.g., creating escape routes, collecting supplies and medical equipment, acquiring alternative communication tools), to prepare for the next event, whether it is wildfire or flooding. Participants shared that everyone who experienced Helene has a better understanding of their role in preparedness and recovery.

Community Perception Change	Audience-Specific Perception	Findings
Spontaneous solutions are important	**Community members came together**	Participants described a strong and positive community response, demonstrating collective capacity. Many people in affected communities helped neighbors to clear roads with chainsaws and supported one another through neighbor-to-neighbor assistance, fostering meaningful connections. *Relates to Section 3.1.1: Information Source.*
Historical flood information must be shared	**First-hand experience increased risk perception**	Many participants noted that prior to Helene there was a belief that "something like Helene couldn't happen here." That perception shifted, with a broader understanding of the severity of flooding and what is at risk. Individuals who lost, or almost lost, loved ones are especially aware of risks.

3.2.2 Risk Perception: Barriers

During both listening sessions, participants identified the following barriers to accurate flood risk perception within their communities. See *Section 3.1.1 Barriers* for general barriers communities encountered before and during Helene as identified by interview participants.

Barrier	Findings
Collective stories that misrepresent risk	Many people thought a disaster like Helene could never happen in their area, some due to generational stories that the mountains provided protection. Participants highlighted previous flood events that happened before Helene but were not widely recognized or remembered by community members.
Lack of understanding of flood dynamics	Participants noted that many community members lacked an understanding of hydrology and floodwater dynamics. People thought that flooding could not impact them unless they were close to a body of water. There was a lack of understanding of risk associated with mudslides, groundwater, and infrastructure impacts.
Low flood risk literacy	Flood risk maps should be updated, and the "100-year flood" terminology should be re-evaluated to improve clarity and accuracy, as the concept of flood likelihood expressed in years is widely misunderstood.
Historical events or non-events	People's understanding of flood risk is swayed by their previous experience with flood events or lack of events. People become numb to warnings if events do not materialize. Others may be hyper aware or experience mental health challenges because of prior exposure to flooding or other environmental hazards. Some participants identified past "trauma" as a reason for inaccurate risk perception. Many participants also said that perception of risk diminishes as time passes.
Low trust due to political polarization	Some participants noted a "top down" dynamic influenced by political alignment. Regardless of which political party is in control of the federal government, half the population may distrust elected leaders and government institutions.
Apathy and denial of flood risks	Some people refuse to evacuate or heed flood warnings, regardless of the information they receive. This may be due to "willful ignorance," prior experiences with non-events, or low trust in information sources. Others may be too busy with daily responsibilities and work to acknowledge or act on flood risk.
Social media is a barrier and tool	Participants identified social media as a barrier to understanding flood risk, stating that algorithms feed people what they are looking for but not necessarily the truth about flooding. Participants felt that misinformation is rampant on social media, especially leading up to and during hazardous events. However, participants also acknowledged that social media is a potential solution to generate more understanding, connectivity, and trust. *Relates to Section 3.1.2: Typical Information Sources and Channels.*

3.2.3 Listening Session Participant Recommendations

Improving Flood Communication

Participants in both listening sessions identified the following recommendations to improve flood communication.

Communication Improvements	Participant Recommendations
Tailor messages	Tailor messages by adapting content, language, and channels to specific audiences. Different audiences have different perceptions, contexts, and levels of understanding, and therefore need different, tailored communication to be effectively reached.
Include impacts	Make communications more pertinent to decision-making by including potential impacts from flooding.
Build trusted channels	Strengthen the use of trusted information sources and communication channels for flood-related messaging by using them consistently to build familiarity and credibility over time. Prioritize proactive, in-person engagement during non-emergency periods, bringing together local experts (e.g., firefighters, swift water rescue personnel, law enforcement, weather forecasters) to build trust and improve community understanding before a crisis occurs.
Use multiple channels	Adopt a diverse mix of communication channels (e.g., email, phone, text, in-person outreach, social media, radio) to increase the likelihood that messages reach all community members. Promote preparedness measures, including encouraging households to obtain and use hand-crank radios to access local broadcasts when communication infrastructure is disrupted during emergencies.
Increase frequency	Increase the frequency of community conversations about flooding, ensuring they are action-focused, include diverse stakeholders and subject matter experts, and are designed to build trusted channels for flood-related information.
Incorporate real-time data	Integrate real-time, on-the-ground data, such as river gauge readings or traffic conditions, into flood communication to better support decision-making.
Talk about uncertainty	Use strategies to reduce warning fatigue by providing clear, contextualized messaging about uncertainty and potential impacts. Reinforce the credibility of warnings by sharing real-world examples and visuals from areas where impacts occurred, helping communities understand the seriousness and relevance of the risk.

Communities' Next Steps to Improving Flood Resilience

When asked what actions are needed to maintain resilience in the event of future flood events, listening session participants identified the following priorities.

Next Steps	Participant Recommendations
Build relationships	Prioritize building relationships by engaging with community organizations, making face-to-face connections, and strengthening ties within local neighborhoods.
Write community-level action plans	Write (or update) preparedness action plans at the neighborhood level, with a focus on redundancy and reliability of systems. The plans will help with community relationship-building and provide clarity into roles and responsibilities during floods.
Gather digital and physical resources into a central location	Create a central location for digital resources (e.g., weather forecasts, flood inundation maps, emergency action plans, emergency contacts), and provide support for community members to gather key physical resources for future events (e.g., hand-crank radio, emergency provisions, printed emergency plans)

Next Steps	Participant Recommendations
Develop and implement flood education programs	Develop and implement tailored, creative education programs on floods, mudslides, and landslides that are audience-specific and consistently delivered. Use engaging approaches such as relatable characters like “Smokey Bear” or interactive tools that allow users to visualize localized risk (e.g., showing how rainfall could impact individual homes) to improve understanding. Enhance and share clear, accessible flood and landslide risk maps, and reinforce awareness over time through ongoing communications, including milestone reminders (e.g., annual anniversaries of major events like Helene). Ensure messaging reflects the specific needs and vulnerabilities of different populations to improve preparedness and response.

What Communities Need to Take Action

To take the next steps towards improved flood resiliency, listening session participants identified the following resource needs.

Resource Needs	Participant Recommendations
Workforce capacity	Communities need more paid and volunteer staff to prepare for and act on flood risks, such as emergency responders, administrators, and risk communication personnel.
Preparedness funding	Communities need funding to host resilience-focused meetings and events, build communication platforms, develop educational programs and materials on disaster preparedness, and purchase resources and equipment (e.g., generators, two-way radios, Starlink).
Flood risk mapping	Communities need updated flood risk maps to share risk information accurately.
Community action planning capacity	Communities need to develop community action plans but may lack the resources to do so independently. They require additional staff or volunteers, access to data, and expert support or guidance to create effective plans.
Communication infrastructure investment	Communities need to build resilient communication systems, requiring sustained resources, funding, and coordination, including access to backup technologies such as Starlink when traditional communication infrastructure is damaged.
Early warning systems	Communities need stronger early warning systems and technology that do not rely solely on cell phones or door-to-door alerts. This includes support for clear, actionable communication that tells people when to evacuate and where to go, enabling timely protective action.
Flood risk education and outreach	Communities need expanded capacity for flood risk education and communication, including tools, programming, and training to improve understanding and interpretation of flood information. This includes access to GIS-based tools for visualizing risk, development of education initiatives that engage schools and families, and mechanisms to capture and share community experiences from past events. There is also a need for clearer guidance and education on how to interpret flood risk metrics and forecasts. In addition, emergency responders need dedicated training resources, such as tabletop exercises, to prepare for scenario-based decision-making.

Section 4: Conclusions

4. Conclusions

The widespread impacts and unprecedented disruption caused by Hurricane Helene demonstrated that even credible, widely trusted warnings do not guarantee timely protective action. Across Western North Carolina, gaps in localization, risk interpretation, and communication resilience limited how effectively warnings translated into decisions, with many individuals relying on direct observation as conditions worsened.

Strengthening flood resilience requires coordinated investment across the full warning-to-action chain—linking forecasting, emergency management, infrastructure, and community capacity. Priorities for organizations working across this chain include more localized and impact-based communication, clearer decision cues, and resilient, redundant communication systems that function during disruptions.

By reinforcing these connections, while refining and strengthening communications, communities will be better positioned to act earlier and more decisively in future events. RTI's rapid, post-event initiative revealed opportunities for strengthening the warning-to-action chain through a commitment to translating these insights into practical, scalable improvements in flood resilience.

References

References

DeBree, S. H., Southwell, B. G., & Brown, J. A. (2024). How health risk communication best practices can improve community flood risk communication. *Journal of Public Health and Emergency*, *8*(0). https://doi.org/10.21037/jphe-24-27

Governor's Recovery Office for Western NC (GROW NC). (2025, March 24). *Reducing Wildfire Risk and Economic Loss in Mitchell County*. https://www.wncrecovery.nc.gov/blog/2025/03/24/reducing-wildfire-risk-and-economic-loss-mitchell-county

Hagen, A. B., Cangialosi, J. P., Chenard, M., Alaka, L., & Delgado, S. (2025). Hurricane Helene. *National Hurricane Center Tropical Cyclone Report*. https://www.nhc.noaa.gov/data/tcr/AL092024_Helene.pdf

RTI International & University of Vermont. (2025). *Optimizing flood warning information sharing for local stakeholders through science communication research: Project analysis report*. HydroShare.https://www.hydroshare.org/resource/600c3501824f4c47a6ac8fbb27569ced/data/contents/Reports/CIROH_Flood%20Warning%20Info%20Sharing_Report.pdf

Taylor, L. E., Brown, J. A., Jefferson, A. J., Doran, E. M. B., DeBree, S., Johns, C., Luukinen, B., Milazzo, J., Motes, H., van Werkhoven, K., Van Houtven, G., & Southwell, B. (2025). Applying the IDEA model to flood risk communication. *Crisis and Risk Communication*, *1*(1–2), 218–240. https://doi.org/10.1080/29986907.2025.2561036