Preparing for Floods at Institutions of Higher Education

Introduction

"Flooding is the most common natural hazard in the United States, affecting more than 21,000 local jurisdictions and representing more than 70 percent of Presidential disaster declarations."[i] In 2018, there were 19 major disaster declarations for flood-related emergencies in the United States. A total of 12 states in the South, Midwest, West, and East Coast and 2 tribal nations were affected. In 2016, there were $4 billion inland flood events and, in 2017, there were $2 billion inland flood events.[ii] According to the Federal

Source: https://www.fema.gov/media-library.

Emergency Management Agency's (FEMA's) research on historical flood risk, 98 percent of U.S. counties have been impacted by a flooding event.[iii] Not only do flood event occur in and impact all regions of the United States, but they are also costly. Therefore, it is in the interest of communities for institutions of higher education (IHEs) to prepare for floods and participate in mitigation, protection, prevention, response, and recovery efforts.

Flooding can occur due to heavy rain and severe storms, including those in coastal areas that result in storm surges, rapid melting of heavy snow, tsunamis, hurricanes, tropical cyclones, and even dam failure. Flash floods are a specific type of flooding that are dangerous, sudden, and violent—developing in as little as a few minutes—and can even occur in areas where there is no rainfall. The National Weather Service (NWS) issues a variety of information statements related to flood events, including the following: Flash Flood Warnings, Flood Warnings, and Flood Advisories, which the public is encouraged to "take action" upon receipt; and Flash Flood Watches and Flood Watches, which the public is encouraged to "be prepared" upon receipt. Flash Flood Warnings are issued by NWS via the Wireless Emergency Alert system.
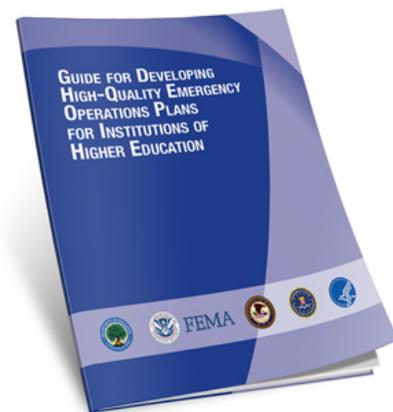
Be Aware[iv]	Be Prepared[v]	Take Action![vi]
Flood Advisory: Conditions could potentially cause a significant inconvenience and those in flood-prone areas should exercise caution. Issued when flooding warrants notification, albeit less urgent than a warning.	**Flash Flood Watch:** Current or developing conditions are favorable for flash flooding.	**Flash Flood Warning:** Flash flooding is occurring, imminent, or highly likely and those in flood-prone areas should move to higher ground immediately. Typically issued minutes to hours in advance of the onset of flooding.
	Flood Watch: Current or developing conditions are favorable for flooding.	**Flood Warning:** Flooding is occurring, imminent, or highly likely and those in flood-prone areas should move to higher ground immediately. Typically issued hours to days in advance of the onset of flooding.

Flood water can have lasting effects on buildings, such as saturation damage, mold growth, wood decay, metal corrosion, moisture issues, erosion, wall destabilization, and warped floors. Items and contents can also be damaged by flood water, such as furniture, cabinetry, computers, files, books, food items, and equipment. Additionally, floating debris, such as trees, trash containers, outdoor furniture, and remnants of manmade structures can also contribute to the damage of buildings, and debris and sediment can accumulate on sites. Flood water can also damage utility systems, such as the electrical system, water system, sewer system, and HVAC system. Several hazards can occur because of flooding: food can become contaminated from the flood water, hazardous materials (e.g., gas) can leak, power outages can occur, mold and other contaminants can grow in buildings and its contents, infectious disease outbreaks can occur, toxic materials present in laboratories can leak, and water failure can result from a contaminated water supply.

Incorporating Flooding in Emergency Operations Plans (EOPs)

Years of work in higher ed emergency management planning culminated in the development of the [Guide for Developing High-Quality Emergency Operations Plans for Institutions of Higher Education](#) *(IHE Guide).* Released jointly by six Federal agencies, including the U.S. Department of Education (ED), U.S. Department of Justice, Federal Bureau of Investigation, U.S. Department of Homeland Security, FEMA, and U.S. Department of Health and Human Services, this guidance contains best practices in higher ed preparedness, and its six-

step planning process can be used by IHEs as they plan for before, during, and after flood events.

Step 1: Form a Collaborative Planning Team

Members of the core planning team should include a variety of personnel at the IHE; student and family representatives; representatives of individuals with disabilities and/or access and functional needs; individuals representaing diverse racial, ethnic, linguistic, and religious backgrounds; representatives of international student populations; and community partners. In relation to flood planning, it is integral that the following representatives are members of or coordinate with and contribute to the core planning team:

Planning Team Members From IHEs		Planning Team Members From Community Partners
• Emergency Managers • Transportation Managers • Facility Managers • Campus Public Safety Officials • Environmental Health and Safety Department • Facilities and Operations Department	• Information Technology Department • Public Safety Operations Department • Residential Life Department • International Student Services Office • Administration	• Emergency Managers • Floodplain Administrators

Step 2: Understand the Situation

The planning team develops a comprehensive list of possible threats and hazards by consulting a variety of data sources. Such sources include assessments, such as site assessments, culture and climate assessments, behavioral threat assessments, and capacity assessments, as well as information from local, state, and Federal partners and the higher ed community. State education agencies (SEAs) or other state-designated agencies may provide IHEs a list of statewide hazards and threats.

Information on the hazard of flood in your community will most likely come from local agencies such as your city or county emergency management office. You may also find information from historical flood databases and other GIS/mapping platforms from state or Federal agencies (listed in Resources on Preparing for Floods at Education Agencies). Communities that participate in the National Flood Insurance Program (NFIP) are required to adopt a flood hazard map. These maps, which are updated as new data and studies become available, are excellent sources of information for planning teams and can be accessed by contacting the local emergency manager or floodplain administrator. Additionally, NFIP participating communities

will have a local hazard mitigation plan, which will contain the geographic areas affected by floods, their strength or magnitude and duration, a history of previous occurrences, and the possibility of future events. The planning team will also evaluate the risk of each threat and vulnerabilities of each hazard, such as floods, using a risk assessment matrix. Your IHE will then be able to prioritize hazards and threats accordingly.

Step 3: Determine Goals and Objectives

Using the comprehensive and prioritized list of threats and hazards, IHE planning teams will develop goals and objectives to be addressed in the higher ed EOP. SEAs and/or other state-designated agencies may provide statewide goals and objectives for statewide threats and hazards to IHEs through a plan generator tool or another technical assistance resource. Similarly, IHE systems with multiple campuses can develop systemwide goals and objectives for systemwide hazards and threats and share those with their campuses. Of course, individual campuses and their IHE planning teams can always develop their own goals and objectives for hazards and threats in their higher ed EOPs. Below are a list of sample goals and objectives.

- **Ensure that the IHE can receive notification of local weather conditions and alerts, including flood watches and flood warnings.** (Goal 1: Before)
- **Protect and keep students, faculty, staff, and visitors safe during a flood.** (Goal 2: During)
  - Keep all students, faculty, staff, and visitors away from fast-moving or swift water, including creeks, streams, rivers, or flood channels. (Objective 2.1)
  - Cancel any extracurricular activities. (Objective 2.2)
  - Move or secure any outdoor equipment or items that could float away. (Objective 2.3)
  - Relocate the the campus bus stops if there are any road closures or flooding in such areas. (Objective 2.4)
  - If it is no longer safe for students, faculty, staff, and visitors to remain on campus, evacuate to an off-campus location. See Evacuation Annex. (Objective 2.5)
- **Restore the physical conditions of the buildings and grounds and remediate any damage caused by the flooding.** (Goal 3: After)

Step 4: Plan Development

Planning teams will develop courses of action for accomplishing the goals and objectives identified in the previous step. These courses of action are the specific procedures used to accomplish goals and objectives and address the what, who, when, where, why, and how for each hazard. Using scenario-based planning can help planning teams imagine the different ways that flooding may unfold and the steps your IHE and community partners should take. Possible considerations for flood planning include:

- How will the IHE be notified of Flood Warnings and Flood Watches?
- How will weather conditions be monitored?
- How will students, faculty, staff, and/or families be notified?
- How will the IHE decide when to close?
- How will students, faculty, and staff be accounted for before, during, and after a flood?
- How will continuity of learning, continuity of business services, etc., be ensured if the IHE is closed?
- How will food and medical supplies on campus be protected in the event of a power outage that results from the flood?

Always have different ways to get informed during an emergency.

#BeInformed

Ready.

Source: https://ready.gov.

You will most likely need to add references to any functional annexes that are applicable to a flood emergency. For example, you could add a note for when the IHE has received notice of a flood warning: "If NWS issues a flood warning, see the Alerts, Communications, and Warning Annex on how to notify students, staff, and parents." Other functional annexes that relate to flooding include the Accounting for All Persons Annex; Continuity of Operations Annex; Evacuation Annex; Family Reunification Annex; Public Health, Medical, and Mental Health Annex; and Recovery Annex.

Furthermore, you may need to add references to other threat- or hazard-specific annexes that that may result from flooding. For example, hazardous materials may accidentally be released from within an IHE due to flood water. In this case, a team would note procedures for after a flood emergency in the Flood Annex: "Conduct a site assessment of the building and grounds. If spilled chemicals, mold, or other hazardous materials are found, activate the Hazardous Materials Annex." Other threat- or hazard-specific annexes that relate to flooding include the Contaminated Food Outbreak Annex, Infectious Disease Annex, Power Failure Annex, Toxic Materials Present in Laboratories Annex, and Water Failure Annex.

Step 5: Plan Preparation, Review, and Approval

The planning team now formats the material of the plan into a draft higher ed EOP. Using the traditional EOP format, a Flood Annex will be in the Threat-or Hazard-Specific Annexes section of the higher ed EOP. The team will also draft the Basic Plan section and format the Functional Annexes section. You may need to update any threat- or hazard-specific annexes that could cause or result in flooding and add references to the Flood Annex. For example, if your IHE has

**READINESS AND EMERGENCY
MANAGEMENT FOR SCHOOLS
REMS
TECHNICAL ASSISTANCE CENTER**

If you have questions or need additional assistance, please contact the REMS TA Center at
(855) 781-REMS (7367) or info@remstacenter.org.
@remstacenter   https://rems.ed.gov

a Winter Precipitation Annex, then you could add a note for after winter precipitation occurs: "If snow melts at a rate which causes flooding, see the Flood Annex." Other hazard-specific annexes that relate to flooding include the Hurricane Annex, Dam Failure Annex, and Tsunami Annex.

Once the draft higher ed EOP is prepared, the planning team reviews the higher ed EOP for both plan content and writing conventions, revises the plan accordingly, obtains official approval of the plan from leadership, and shares the plan with community partners. Consider sharing the Flood Annex with community partners who have a responsibility in flooding such as first responders and local emergency management staff.

Step 6: Plan Implementation and Maintenance

Finally, stakeholders are trained on their roles and how to exercise the plan. Consider conducting drills and exercises that practice the Flood Annex, visiting on- and off-campus evacuation sites, and posting key information on floods throughout buildings. Whenever possible, conduct a debriefing after the drill or exercise to identify gaps and address those areas of improvement during plan revisions.

Flood-Related Preparedness Activities

The following activities may be utilized by nonpublic and public IHEs, including 4-year and 2-year IHEs, before, during, and after flood events. This list is not comprehensive but offers IHEs ideas and suggestions.

Before

Conduct mitigation activities. IHEs can take steps to eliminate or reduce the loss of life and property damage by lessening the impact of flooding on their IHE community. This may range from ensuring that valuable equipment and supplies are stored up high off the floors to relocating electrical lines and other fire-prone instructure so that they are adequately protected. FEMA's Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards contains actions that you may use. You may also view our archived Webinar Mitigation and Resiliency Strategies for Schools and Institutions of Higher Education. Other mitigation resources are listed in the Key Resources section of this document.

Document the condition of buildings and grounds. This information is imperative to capture before an emergency event, such as flooding, so that your IHE may be reimbursed for any damages. The REMS TA Center's SITE ASSESS mobile application (app) allows users to capture and upload images directly into the app and export those images in a Word document, in addition to collecting data on the status of the IHE's buildings and grounds.

Develop a Flood Annex. IHEs can develop goals and objectives for a flood, as well as identify courses of actio using scenario-based planning.

Practice the Flood Annex. Practicing the plan allows stakeholders to act more effectively during a real emergency event, as well as the planning team to identify gaps and weaknesses in the plan and strengthen it accordingly. IHEs can conduct tabletop exercises, drills, functional exercises, and full-scale exercises to practice the Flood Annex, and should consider the costs and benefits of each before selecting an exercise type. When practicing the flood annex, IHEs should include their community partners such as local emergency management staff and first responders who would play a role in a flood emergency. FEMA's Prepare Your Organization for a Flood Playbook contains a sample tabletop exercise with a flood scenario.

Create a culture of flood preparedness on your campus. IHEs can become a StormReady® or TsunamiReady® college or university through NWS, which offers these voluntary programs to increase communities' preparedness for weather and flood emergencies and tsunamis, respectively, and create a Weather-Ready Nation. IHEs can participate in statewide flood and severe weather awareness campaigns, such as an annual Flood Preparedness

Source: https://www.weather.gov/wrn/.

Week or Month, with targeted messaging on flood preparedness and flood safety. Check the NWS Awareness and Preparedness Calendar for any flood safety campaigns in your state.

Incorporate flood preparedness into the curriculum. Faculty can integrate flood preparedness and flood science lesson plans into course curricula. IHE administrators, faculty, and/or staff can join SKYWARN®, a voluntary program offered by NWS to train severe weather spotters. These materials and programs directly connect to science, technology, engineering, and math (STEM) and career and technical education (CTE) initiatives. Also, faculty can use their substitute plans as a foundation for their continuity of teaching and learning planning. By creating a unit plan with a few lesson plans that complement and supplement the existing curriculum, faculty can be prepared for 5-10 days of classes.

Ensure that your communications/notifications systems are in place and working properly via regular testing. All IHEs should have at least two ways to receive weather information and

If you have questions or need additional assistance, please contact the REMS TA Center at (855) 781-REMS (7367) or info@remstacenter.org.

 @remstacenter   https://rems.ed.gov

warnings, as well as at least two ways to communicate/relay warnings. IHEs can receive weather information directly from the nearest NWS office via a [NOAA Weather Radio](#), as well as warning and post-event information for floods and other emergencies.

Build community partnerships. These relationships can be established formally via agreements, such as memorandum of understanding (MOUs) or memorandum of agreement (MOAs), or informally. IHEs should maintain a close relationship with the city/county emergency management office so that coordination and integration is possible before, during, and after an emergency. IHEs should know whom to contact in their locality to access information about road closures due to flooding. IHEs may even consider staffing some of their personnel at the city/county emergency operations center (EOC).

Prepare to shelter students, including on-campus residents. It is possible that flooding may result in the cancellation of classes; so, IHEs should be prepared to keep on-campus residents and other students, staff, and visitors who have remained on campus safe and busy during the closure. Residential life, student affairs, and food services departments may play an important role in providing services during an emergency.

During

Maintain communication with the locality and other support agencies. This can be accomplished via citywide meetings. It is imperative to lead a coordinated effort with community partners before, during, and after flooding events.

Monitor the weather conditions in the surrounding community and adjust the schedule of classes accordingly. IHEs may need to cancel classes and close the campus during inclement weather. It may be unsafe for some students already on campus to travel home, which is why it is imperative to give as much warning as possible; so, IHEs may need to shelter these students until road conditions have improved and flooding is no longer occurring.

After

Implement the recovery annex. Depending on the impact of the flood, IHEs may need to engage in various types of recovery: physical and academics recovery; structural recovery; business functions recovery; and social, emotional, and behavioral recovery. IHEs may need to contact their SEA or state or local EOC after a flood event to provide a status update of your site and receive the appropriate resources. It often takes IHEs months, if not years, to recover from emergency events such as floods. Recovery resources are listed in the Key Resources section of this document.

Provide support services to displaced students and families. After a flood, IHEs may no longer be able to provide basic needs to displaced families, receive an influx of students from

neighboring and nonlocal IHEs and systems, and see an increase in the need for support from local students and families. IHEs should foster community partnerships and create MOUs for sharing data, as needed, between IHEs and other organizations. It is important to ensure that IHE leadership understands McKinney-Vento. For more information, view our archived Webinar [Supporting Displaced Students and Families During and After Emergency Events](#).

Manage donations and volunteers effectively. After a flood, the local community as well as individuals from across the nation may show up at your site to volunteer or send/drop off donations without any requests. To utilize these resources effectively, IHEs should designate key local points of contact, create MOUs and MOAs with key agencies and organizations, develop systems to support information management, and determine which higher ed departments will be needed to support the process. It is important for IHEs to develop protocols for utilizing IHE staff, resources, volunteers, and donations; set up systems to manage donations and volunteers for the long term; and confirm tracking/inventory requirements. Additionally, IHEs may need to manage event memorialization if there were any lives lost during the flood. For more information, view our archived Webinar [Managing Donations and Volunteers Before, During, and After Major Emergency Events](#).

Assess the damage of and then repair and clean up buildings and grounds. It is important to document all damage to buildings and grounds prior to commencing repair for reimbursement purposes. Documentation may be completed using the REMS TA Center's [SITE ASSESS](#) mobile app, which allows users to capture and upload photos directly within the app. IHEs may be eligible to receive funds from FEMA's [Public Assistance Program](#) to help repair, restore, and clean up education facilities that have been damaged during a disaster, including a flood. For more information, view our archived Webinar [How Schools and Higher Ed Institutions Can Access FEMA's Public Assistance Program](#).

Keep students, staff, and visitors safe from damaged and/or flooded areas of your campus. IHEs may need to create a barrier around flooded areas using cones, tape, or other supplies. In the case of damaged residence halls, resident students may need to move to pre-determined temporary shelter or temporary off-campus housing accommodations. If there is a lack of access to any education facilities or if they have been destructed, the IHE may need to use pre-determined alternate facilities where institutional activities can be conducted.

Key Resources

[Resources on Preparing for Floods at Education Agencies](#), REMS TA Center. This resource list contains planning resources on Flood Annex development; data sources for floods; flood mitigation; flood alerts, communications, and warnings/notifications; creating a culture of flood preparedness; physical and structural recovery from floods; and general flood safety.

[Planning for Natural Hazards That May Impact Students, Staff, and Visitors](#), REMS TA Center. This topic-specific Web page contains resources from the REMS TA Center, ED, and other Federal agencies related to planning for natural hazards, which includes floods.

[Mitigation and Resiliency Strategies for Schools and Institutions of Higher Education Webinar](#), REMS TA Center and ED with FEMA, Orange County Department of Education in California, and Georgetown University in the District of Columbia. This archived Webinar presents key considerations for mitigation, the process for including mitigation activities in planning efforts, how IHE mitigation and resiliency plans integrate with those at the local and state level, and practical examples of how IHEs have made their campuses more resilient to emergencies.

[How Schools and Higher Ed Institutions Can Access FEMA's Public Assistance Program Webinar](#), REMS TA Center and ED with FEMA. This archived Webinar shares information about grants available to educational facilities following a presidentially declared major disaster that involves a public assistance cause.

[Managing Donations and Volunteers Before, During, and After School and Campus Emergency Events Webinar](#), REMS TA Center and ED with FEMA and Joplin School District in Missouri. This archived Webinar describes operational considerations for managing donations and volunteers from the Federal and local perspective and shares lessons learned from Hurricanes Harvey and Irma and the 2011 tornado that impacted Joplin.

[Supporting Displaced Students and Families During and After Emergency Events Webinar](#), REMS TA Center and ED with ED's National Center on Homeless Education. This archived Webinar provides a basic overview of why providing supports for homeless and displaced students and families during and after emergencies is important. It also provides insight that can help SEAs and local education agencies, with their emergency management agency partners, understand how they can support students and families displaced from homes, communities, and education agency settings due to a natural disaster, such as a flood.

---

[i] Federal Emergency Management Agency (FEMA) (2010, December). Chapter 5: Making schools safe from flooding. *Design guide for improving school safety in earthquakes, floods, and high winds.* Retrieved from https://www.fema.gov/media-library-data/20130726-1531-20490-0438/fema424_web.pdf.

[ii] Smith, A. B. (2018, January 8). 2017 U.S. billion-dollar weather and climate disasters: A historic year in context [Blog post]. Retrieved from https://www.climate.gov/news-features/blogs/beyond-data/2017-us-billion-dollar-weather-and-climate-disasters-historic-year.

[iii] FEMA (Unknown). Data visualization: Historical flood risk and costs. Retrieved from https://www.fema.gov/data-visualization-floods-data-visualization.

[iv] NWS (Unknown). Flood warning vs. watch. Retrieved from https://www.weather.gov/safety/flood-watch-warning.

[v] NWS (Unknown). Flood related products. Retrieved from https://www.weather.gov/safety/flood-products.

[vi] NWS (Unknown). Flood related products. Retrieved from https://www.weather.gov/safety/flood-products.

READINESS AND EMERGENCY MANAGEMENT FOR SCHOOLS

REMS TECHNICAL ASSISTANCE CENTER

If you have questions or need additional assistance, please contact the REMS TA Center at (855) 781-REMS (7367) or info@remstacenter.org.

@remstacenter · https://rems.ed.gov