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NOAA Hurricane Preparedness Summit 2023 Report

CRRC

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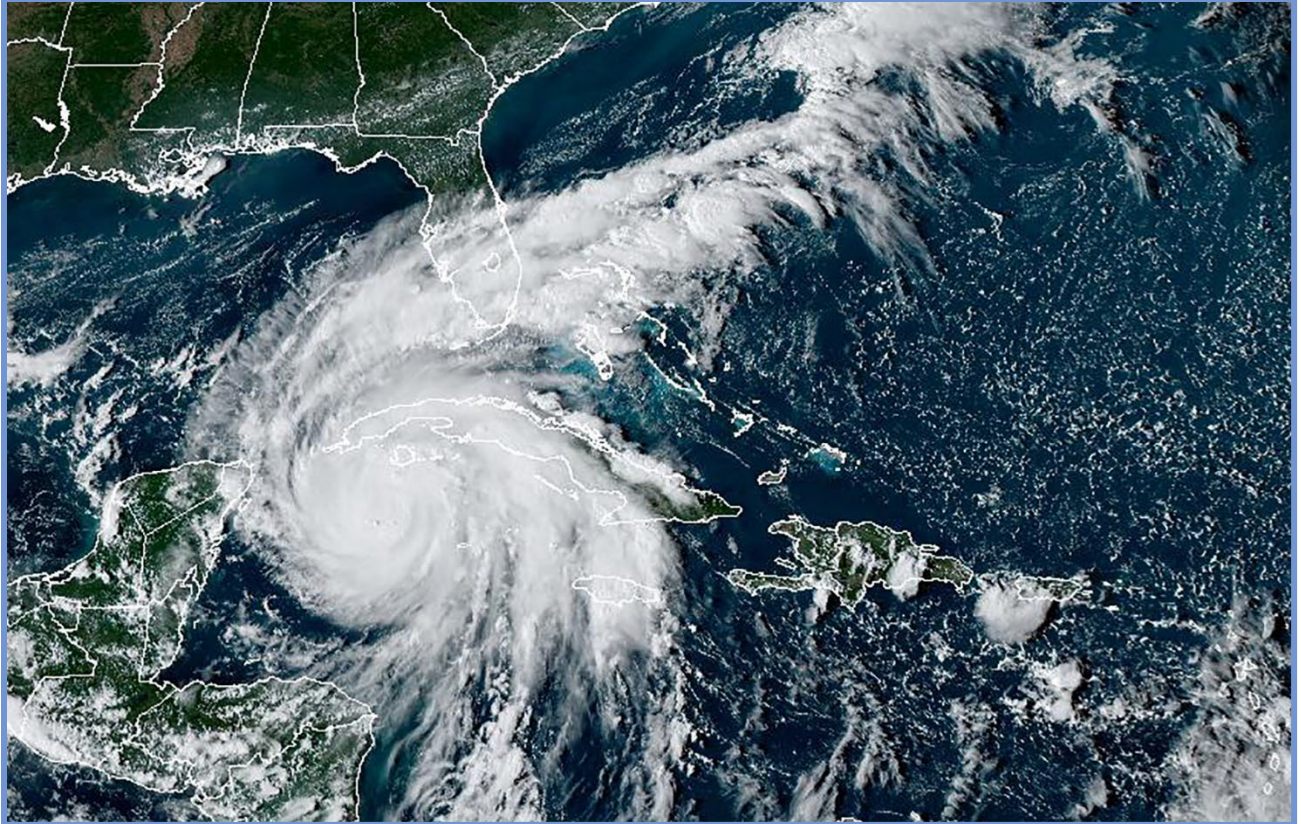
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NOAA Hurricane Preparedness

Summit 2023

April 19 & 20, 2023

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II. Acronyms

BMP	Best Management Practice
CAPT	Captain
CONOPS	Concept of Operations
COOP	Continuity of Operations Plan
COP	Common Operating Picture
CRRC	Coastal Response Research Center
DPP	NOAA Disaster Preparedness Program
ENS	Emergency Notification System
ERMA ®	Environmental Response Management Application
ESF	Emergency Support Function
FEMA	U.S. Federal Emergency Management Agency
FHO	Flood Hazard Outlook Product
FIM	Flood Inundation Mapping
FL	Florida
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information System
HSPO	NOAA Homeland Security Program Office
IMT	Incident Management Team
ICC/ICP	Incident Command Center/Post
IT	Information Technology
JIC	Joint Information Center
LCDR	Lieutenant Commander
LO/PO	Line Office/Program Office
MPH	Miles Per Hour
NASA	National Aeronautics and Space Administration
NGS	NOAA National Geodetic Survey
NHC	NOAA NWS National Hurricane Center
NHD	National Hydrologic Discussion
NMFS	National Marine Fisheries Service
NOAA	U.S. National Oceanic and Atmospheric Administration
NOS	NOAA National Ocean Service
NWS	NOAA National Weather Service
ONMS	NOAA Office of National Marine Sanctuaries
OR&R	NOAA Office of Response and Restoration
PMI	Personnel, Mission, and Infrastructure
PPE	Personal Protective Equipment
PTSD	Post-Traumatic Stress Disorder
RSF	Recovery Support Function
SLT	State, Local, and Territorial
SMT	Senior Management Team
TAFB	Tropical Analysis & Forecast Branch
UNH	University of New Hampshire
U.S.	United States
USCG	U.S. Coast Guard
WebEOC	A Web-Based Crisis Management System
WFO	Weather Forecast Office

III. Acknowledgements

This summit and report were supported by the National Oceanic and Atmospheric Administration's (NOAA) Office of Response and Restoration (OR&R) Disaster Preparedness Program (DPP) and the University of New Hampshire's (UNH) Coastal Response Research Center (CRRC). The content for the summit was developed in cooperation with NOAA's DPP and the following Organizing Committee members:

- **Nancy Kinner**
UNH | Coastal Response Research Center
- **Charlie Henry**
NOAA | OR&R | Disaster Preparedness Program
- **Bradford Benggio**
NOAA | OR&R | Emergency Response Division
- **Kyla Breland**
NOAA | OR&R | Disaster Preparedness Program
- **Matthew Chasse**
NOAA | Office for Coastal Management
- **John McGowan**
NOAA | NOAA Operations Center
- **Capt. Chris "Bubba" Sloan**
NOAA | Homeland Security Program Office
- **Lisa Symons**
NOAA | ONMS | Florida Keys National Marine Sanctuary

This summit was facilitated by Nancy Kinner, UNH co-director of CRRC. CRRC (www.crrc.unh.edu) is known globally as an independent intermediary that brings all stakeholders to the table to develop and implement viable and trusted solutions to complex problems related to environmental disasters. CRRC has conducted 70+ workshops that bring together practitioners, researchers, and scientists of diverse backgrounds (e.g., industry, academia, government, NGOs) to discuss and develop solutions to marine pollution and disaster problems.

A special thank you to the following special guests for providing the opening remarks and welcome during the summit:

- **Jainey Bavishi**, *Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy Administrator*
DOC | National Oceanic and Atmospheric Administration
- **Scott Lundgren**, *Director*
NOAA | Office of Response and Restoration

We would like to thank each of the speakers/moderators for their participation in the workshop:

Charlie Henry, *Director*

NOAA | OR&R | Gulf of Mexico Disaster Response Center

John Cangialosi, *Senior Hurricane Specialist*

NOAA | National Hurricane Center

Chris Landsea, *Chief*

NOAA | NHC | Tropical Analysis and Forecast Branch

Dr. Stephan Smith, *Director*

NOAA | NWS | Office of Science & Technology Integration

Jonathan Rizzo, *Warning Coordination Meteorologist*

NOAA | NWS | Weather Forecast Office Key West

Shannon Davis Weiner, *Director*

Monroe County, Florida | Emergency Management

Brian LaMarre, *Meteorologist-in-Charge*

NOAA | NWS | Weather Forecast Office Tampa Bay

Cathie Perkins, *Director*

Pinellas County, Florida | Emergency Management

Paula Miano, *Service Coordination Hydrologist*

NOAA | NWS | Water Prediction Operations

John McGowan, *Director*

NOAA | NOAA Operations Center

Savannah Turner, *Health & Safety Officer*

NOAA | OR&R | Disaster Preparedness Program

Todd Stiles, *Mgmt. and Program Analyst*

NOAA | National Marine Fisheries Service

LCDR George Mitzner, *Behavioral Health & Wellness*

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Kyla Breland, *SE Regional Preparedness Coordinator*

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Florida Fish & Wildlife Conservation Commission

Paul Williams, *Emergency Services Branch Director*

FEMA | Region 4 | Response Division

Richard Lavigne, *Incident Management*

U.S. Coast Guard | Seventh District

Sally Palmer, *Communications Manager*

University of Texas | Marine Science Institute

Jonathan Gordon, *IT Manager*

NOAA | Office of National Marine Sanctuaries

Alyson Finn, *Emergency Planning Specialist*

NOAA | OR&R | Disaster Preparedness Program

Jessica White, *Deputy Director*

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Autumn Lotze, *Recovery Specialist*

NOAA | OR&R | Disaster Preparedness Program

Jay Coady, *Spatial Data Branch*

NOAA | OR&R | Assessment & Restoration Division

Russell Jackson, *Senior Coastal Hazards Specialist*

NOAA | Office for Coastal Management

Lisa Symons, *Regional Response Coordinator*

NOAA | ONMS | FL Keys National Marine Sanctuary

Matt Chasse, *Coastal Management Specialist*

NOAA | Office for Coastal Management

A special thank you to (1) Kathy Mandsager (UNH CRRC), and Lauren Courtemanche (UNH CRRC) for their efforts in coordinating the virtual summit, and (2) Tori Sweet (UNH CRRC), and Wesley Lambert (UNH CRRC) for their notetaking during the event.

IV. Executive Summary

NOAA's DPP partnered with CRRC to facilitate webinars on two consecutive days focusing on NOAA's hurricane preparedness and readiness for personnel (people), mission, and infrastructure (PMI). The virtual event entitled "NOAA Hurricane Preparedness Summit 2023," helped put NOAA in a better posture for the 2023 hurricane season by identifying best practices and lessons learned from the 2022 season, recognizing and discussing challenges related to climate change and extreme weather events, and socializing tools and resources available to support different stages of response.

The summit included plenary presentations from federal and state agency representatives outlining topics such as: storm specific lessons learned, communication of severity of risk, working smarter and safer, maintaining wellness during response, contingency planning, and available tools and resources.

Summit Theme

Advance NOAA's ability to adapt and respond to the effects of a changing climate and extreme weather events.

Summit Objectives

- Identify innovative solutions and strategies for improvement, including those that address challenges identified in previous hurricane seasons.
- Fortify NOAA's capacity across Personnel, Mission, and Infrastructure (PMI) to support hurricane preparedness, response, and recovery.
- Facilitate effective hurricane preparedness and response through improved coordination across NOAA and with federal, state, local, territorial, and tribal partners.

Key Messages

Key messages from the presentations and discussions emerged during the summit including:

- **Partner Coordination:** NOAA products and support services provide valuable information for decision making, coordination, and implementation of emergency plans across state, local, and territorial (SLT) partners.
- **Innovative Solutions and Strategies:** NOAA is at the forefront of scientific and technological innovations. Models are the best they have ever been, which has led to an increase in warning time. Communication strategies are evolving to address the needs of the communities served, including those that are historically underserved. There are more technological advancements on the horizon.
- **Personnel Mission and Infrastructure:** NOAA continues to work across line and program offices (LO/PO) to increase the organizational capacity of PMI through enhanced coordination and information sharing. Safety and wellness of all NOAA staff remain a top priority.
- **Climate Change:** The pace and severity of disasters is increasing, decreasing the timeline between the shocks and stressors within communities. Historically, the emergency preparedness cycle has served well to focus on immediate needs, but the connection to longer term resilience is becoming more apparent.

- **Personal Planning:** Experience sets the precedent; people will build plans and make decisions based on what they have gone through, good or bad. Communication plans are an important component of personal plans.
- **Technological Support:** NOAA has a range of tools and online resources that integrate environmental data and enhance communications to support preparedness, response, and recovery activities of staff and partners.

Summit Agenda

The summit agenda can be found in [Appendix A](#).

V. Day 1: Coordination, Innovation, and PMI Summary

The first day of the summit, held on April 19, 2023, focused on partner coordination, innovative solutions and strategies, and PMI. There were 109 attendees. Participants represented academia, and federal, state, and local agencies.

Polling Results

Two polls were conducted during the first session to understand the impacts participants experienced from the 2022 Atlantic Hurricane Season. The polls were conducted to establish a foundation for later discussions and presentations.

The polls and answers can be found in [Appendix B](#).

Presentation Summaries

Presentation slides can be found in [Appendix C](#).

Welcome and Summit Objectives

Nancy Kinner (UNH CRRC) provided the opening statements. Scott Lundgren (OR&R) provided a welcome and his perspective on the upcoming hurricane season. Charlie Henry (OR&R) reviewed the summit objectives.

Setting the Stage

“An Overview of the 2022 Hurricane Season and What’s New at NHC for 2023”

John Cangialosi, *Senior Hurricane Specialist*, NOAA | National Hurricane Center

Cangialosi set the stage for the summit by providing an overview of the 2022 hurricane season. There were 14 named storms, of which eight became hurricanes and two intensified into major hurricanes during the Atlantic season. He provided some context on the rising costs of storms in 2022 (~\$114B Hurricane Ian, ~140 deaths) vs storms from 1980-2022 (\$1.1T, ~\$20.5B/event, 310 events, 6,697 deaths). There were 19 total named storms during the East Pacific season. Of those 19 storms, 10 developed into hurricanes and four intensified into major hurricanes. Enhanced by the effectiveness in technology, the NHC forecast tracks and intensity are becoming more precise. There has been significant progress in the last decade forecasting rapid intensification. Cangialosi gave an update on what is new at the National Hurricane Center for the 2023 season. The Tropical Weather Outlook will

be issued four times per day from May 15th through November 30th and will now include a 7-day outlook (previously 5-day).

“Providing Impact-based Decision Support Services to the U.S. Coast Guard During the Hurricane Season”

Chris Landsea, *Chief*, NOAA | NHC | Tropical Analysis and Forecast Branch

Landsea shared insight on how NOAA supports the USCG and the blue economy during hurricane season. In 2018, the blue economy was valued at \$373B and that is expected to triple by 2030. The growth in the blue economy has guided the framework for the development of new products. Marine accidents associated with storms are very costly, financially and in lives lost. In 2015, 33 lives were lost during one of the worst US maritime disasters when the SS El Faro steamed into Hurricane Joaquin and sank. In 2019, 11 lives were lost when the offshore tug Bourbon Rhode sank after experiencing heavy weather from Category 4 Hurricane Lorenzo.

The USCG does not have meteorologists; NOAA is tasked with providing that information. The NHC routinely briefs USCG Districts and participates in USCG training and exercise events. During Hurricane Ian, the NHC Tropical Analysis & Forecast Branch (TAFB) provided 18 live briefings which provided USCG District 7 with valuable information to protect their assets. In recent years, the NWS and NHC have shifted their communication strategy for marine and coastal communities to emphasize the size of the storm and impacts versus focusing on the cone and the “black line.”

Communication of Risk

“Equitable Services for a Weather-Ready Nation”

Dr. Stephan Smith, *Director*, NOAA | NWS | Office of Science & Technology Integration

Smith's Communication of Risk presentation focused on NOAA's efforts to provide equitable services for a Weather-Ready Nation. He emphasizes the importance of equality versus equity, by which the NWS, means customizing services based on the unique vulnerabilities of different communities. By applying social and behavioral science methods, the NWS can provide valuable information to the most vulnerable communities that trigger action. The key to applying social and behavioral science is to understand what Smith described as the “last critical mile” understanding the influence of the messaging beyond the forecasts and the warnings. The NWS is gathering information post storm through surveys to determine what actions and preparedness measures are undertaking and how behaviors are being modified by the weather and forecast information that NWS provides. In addition to survey data, the NWS is using the Social Vulnerability Index to better understand communities and their vulnerabilities to inform appropriate messaging. Smith noted that there are two types of warnings: long, which come hours to days before, and short which come minutes before. Even with these warnings, Smith noted that there are still challenges associated with the feasibility of evacuation. Some of the main challenges include: (1) not everyone wants to evacuate even when properly informed, (2) not everyone has proper access to information and warnings, and (3) there can be a lack of safe places to shelter should they try leave. Additionally, there are challenges when communicating in a variety of languages. He articulated the fundamental need for “trusted agents” to get information out to historically underserved communities. In some instances, those agents can translate messaging into local languages.

Hurricane Ian: Lessons Learned

“The National Weather Service Florida Keys Perspective”

Jonathan Rizzo, *Warning Coordination Meteorologist*, NOAA | NWS | WFO Key West

Rizzo discussed the communication challenges, and subsequent lessons, the Florida Keys Weather Forecast Office (WFO) experienced during Hurricane Ian. He noted communicating potential storm surge in Florida Keys was difficult as the public focused heavily on the track cone and not the warnings and potential threats. As a hurricane approaches landfall, the cone gets narrower, but the path has a one in three chance of straying outside of the cone. In some instances, the width can be a 200-mile area of potential impact. Rizzo noted that effective communication of risk, threat and vulnerability, must be included and tailored for the target audience. Three of the components of effective risk communication include: (1) identifying vulnerable populations, (2) engaging with the target audience using trusted members of the community, and (3) having educational events in the environment of the people who live there. He identified an example of a vulnerable population in the Florida Keys as those who are “liveaboards”. If they have not sought shelter prior to winds reaching 25 knots (29 MPH) it is too late.

“Hurricane Ian – Monroe County Lessons Learned”

Shannon Davis Weiner, *Director*, Monroe County, Florida | Emergency Management

Weiner discussed what lessons Monroe County learned during Hurricane Ian. The biggest lesson learned was the importance of timely and straightforward communication of the “whole story”. Weiner focused on the communication of surge warnings. During Hurricane Ian, surge flooding was messaged clearly from NWS, but it still took the Monroe County community by surprise. She attributed some of that surprise to the lack of consistent messaging to/from the Joint Information Center (JIC) to local and state partners, (municipalities, county/FWC/USCG/NWS). Like Rizzo, Weiner concluded that partners and the public tend to focus on the hurricane’s cone and category, rather than the potential impacts of wind, rain, flooding and surge. For this season, Monroe County plans to provide a series of public service announcements about storm surge risks. Weiner stressed the importance of using mass notification systems to communicate information. During the after-action and improvement process, Monroe County has improved communication plans to provide storm warnings, surge and shelter information in-person, when needed.

“Hurricane Ian: Decision Support and Shared Experiences”

Brian LaMarre, *Meteorologist-in-Charge*, NOAA | NWS | WFO Tampa Bay

LaMarre focused on the *Billion Dollar Storms*. Since 2017, there have been six Category 4 and Category 5 storms that have impacted the Gulf of Mexico, many of which have had billion-dollar impacts. Hurricane Ian damage costs are estimated at \$114B. LaMarre discussed weather decision support services, which focus on the four elements of response: preparedness, planning, response, and recovery. NWS Tampa Bay conducts routine briefings and webinars to provide stakeholders with the necessary information to inform their decisions. Post storm, staff from the WFO may visit the community to assess the damage and talk to the people impacted by the storm. Three to five days leading up to the storm, WFO Tampa Bay conducts briefings on the broader scale. By one or two days before impact, the focus on the briefings narrows to watches and warnings. LaMarre stressed the importance of stakeholders understanding the distinction between the forecasted cone and the

forecasted impacts. A small shift of the forecasted track can result in a significant change to forecasted impacts. For example, during Hurricane Ian, a 20-mile shift in the forecasted track resulted in a change of impacts for 125 miles down the southwest Florida coast. WFO Tampa Bay developed innovative ways to message these threats during Hurricane Ian.

“Pinellas County Hurricane Ian Lessons Learned”

Cathie Perkins, *Director*, Pinellas County, Florida | Emergency Management

Perkins explained the role of the local emergency manager is to prepare the community and partners for a storm by effectively conveying messages to the public. In Pinellas County, they have established procedures to assess the best, middle, and worst-case scenarios with local stakeholders to inform protective measures, including evacuation. As the storm gets closer, she discussed how the messaging shifts to encourage the public to look at the bigger picture. Perkins provided a day-by-day overview of the evacuation messaging and progress during Hurricane Ian. Communication challenges resulted in a lack of community response and preparedness/protective measures. The community was more focused on the cone as opposed to concerns about winds, rain, and surge. There was significant confusion about storm surge information regarding the height of impacts and how that translated to localized impacts. This led to many vulnerable populations refusing to evacuate, which could be increasingly problematic in the future. To address this issue, Perkins noted that guidance will be evolving, specifically on how to communicate risk. Additionally, the storm surge graphics will be changed to show what the surge looks like in each zone, stressing the timing of evacuation, and planning for the challenges (e.g., debris, contracting).

National Water Center

“NOAA’s National Water Center: Hurricane Ian Response and Future Capabilities”

Paula Miano, *Service Coordination Hydrologist*, NOAA | NWS | Water Prediction Operations

Miano of the National Water Center discussed her role in the Water Prediction Operations Division. This division has the capacity to operate 24 hours/day during major events. It is comprised of a GIS and software engineering team and includes experimental products and services such as a national GIS map viewer and a flood hazard outlook. Miano discussed the Tropical FHO, which is a zoomed in version of the area of interest, and it is issued twice per day at 2100h and 1130h. The National Hydrologic Discussion (NHD) gives an overview of the National Water Model that uses all available resources and forecaster knowledge. Flood Inundation Mapping provides prototype services, analysis, and short and medium range forecasts. It also provides NWS FIM support to field offices and gives FEMA a 5-day FIM. Miano concluded with discussing the tools and services that will be widely available soon: FIM will be available to the public within the next few years with NWPS providing it, and a new total water level forecasting mapping will be released late summer.

Focus on Personnel

“Cross-LO/PO Coordination: Lessons Learned and NOS Incident Management Team”

Charlie Henry, *Director*, NOAA | Gulf of Mexico Disaster Response Center

Henry discussed the NOAA National Ocean Service (NOS) Incident Management Team (IMT) and how information is coordinated within the agency. NOS is a large organization with 1,945 staff and

affiliates spread across the U.S. The wide geographic distribution of NOAA personnel and the diversity of expertise, equipment and impacts from events can make the coordination of information regarding impacts to Personnel, Mission, and Infrastructure (PMI) challenging. Henry discussed the PMI preparedness cycle. It uses a pyramid concept to feed information through the different levels of the organization in a way that helps things flow smoothly. Furthermore, NOS has developed an internal incident information system that is used in near real time to help the IMT track impacts, needs, and deployments of personnel and equipment. This server has an archive that allows access to all past reports, lessons learned, and additional information.

“Updates and Overview from Homeland Security Program Office”

John McGowan, *Director*, NOAA | NOAA Operations Center

McGowan is the principal point of contact for NOAA’s Executive Management regarding homeland security activities. He discussed the NOAA Homeland Security Program Office and Operations Center (HSPO), which was established shortly after September 11, 2001. HSPO is the primary point of contact for NOAA’s executive management regarding incident management for events that impact more than one line office. The NOAA Operations Center establishes communication pathways between the offices and NOAA leadership. The Emergency Notification System (ENS) is used for conveying critical information on a local level (e.g., active shooter), and regional personnel accountability queries once a severe storm has passed. The HPSO Operations Center has four levels of activation levels, with a last Level 1 activation occurring during the pandemic. McGowan noted that re-branding is being considered to bring in a 24/7 watch team and change the operations center to a coordination center.

“Working Smarter and Safer”

Savannah Turner, *Health & Safety Officer*, NOAA | OR&R | Disaster Preparedness Program

Turner discussed the evolution of protecting responders during the pandemic. She outlined a hierarchy of controls: elimination, substitution, engineering controls, administrative controls, and PPE. She noted that at the beginning of the pandemic, the focus was on eliminating the hazards to staff and responders that were deployed, as a result, many people worked remotely. This in turn limited in-person training and staff turnover. All of this compounded and led to a major impact on in-person training and a negative impact on personnel readiness. As the COVID-19 Public Health Emergency diminishes, NOAA is relying on a more layered approach to their protective measures and classifying measures to reduce risk. In March, OR&R held a week-long Safety Academy at the Gulf of Mexico Disaster Response Center. This provided an opportunity for field staff across OR&R to complete the necessary safety training to maintain field readiness.

“CONOPS Coordination”

Todd Stiles, *Mgmt. and Program Analyst*, NOAA | National Marine Fisheries Service

Stiles discussed how the National Marine Fisheries Service (NMFS) addresses PMI during emergencies. There are approximately 4,200 staff that include federal employees and contractors across 235 locations, including larger facilities associated with the science centers and regional offices. He discussed the NMFS Continuity of Operations Plans (COOP) and Emergency Operations Plans (CONOPS) in place. These plans identify key information for general operations and timely and effective recovery. The plans include orders of succession, identify members of the Senior Management Team (SMT), and resumption of full services provided by NMFS. The SMTs are widely

known throughout NMFS facilitating information flow to management when local personnel are dealing with response and recovery. Emergency coordination within NMFS and between NMFS and other NOAA LOs is evaluated and adjusted after each hurricane season.

“Maintaining Wellness During Response”

LCDR George Mitzner, *Behavioral Health & Wellness*, U.S. Public Health Service

Mitzner discussed mental and physical health challenges faced by responders. He outlined the DSM-5 Diagnostic Criteria for PTSD, which states that first responders are at a higher risk (i.e., the base rate for PTSD is 5%, on average for first responders it is 10%). The factors influencing an individual’s response include rumination and self-blame, trauma and health history, and linkage to the event (e.g., in the responder’s hometown). Mitzner also highlighted some important self-care habits and activities that include talking to others, engaging in positive activities, adequate sleep, healthy meals, exercise, keeping a normal routine, using relaxation methods, and taking breaks. Additionally, he provided things to avoid such as excessive alcohol, drugs, gaming, gambling, and other high-risk activities. Mitzner concluded with talking about what organizations can do to help responders be more resilient. This includes limiting shifts to 12 hours maximum and encouraging breaks, rotating responders, training on stress management, training on mental health awareness, and access to support services during all phases of response. He highlighted the additional deployment of Public Health Service Officers to each of the NOAA LOs.

VI. Day 2: Partnerships, Planning and Innovation Summary

The second day of the summit, April 20, 2023, focused on partnership and coordination, contingency planning, and the current technological innovations, tools and resources. There were 102 attendees. Participants represented academia, and federal, state, and local agencies.

Polling Results

Two polls were conducted on the second day to provide a basis for the coming discussion. These polls focused on Mission Essential Functions (MEF) and the status of engagement with relevant partners.

The polls and answers can be found in [Appendix C](#).

Presentation Summaries

Welcome

Jainey Bavishi, *Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy Administrator*, DOC | National Oceanic and Atmospheric Administration

Bavishi discussed how critical the support that NOAA provided during Hurricane Sandy (NWS, NRTs, NGS and OR&R) was to the response and recovery efforts. She emphasized the importance for NOAA to continue to work across offices when responding to hurricanes and continually adapt to executive NOAA’s core mission. She focused on the effort to have connectivity to support resilience and adaptation within the agency.

Presentation Summaries

Partnership and Coordination

Jennifer McGee, *Marine Debris Coordinator*, Florida Fish & Wildlife Conservation Commission

McGee discussed marine debris coordination efforts between NOAA and the Florida Fish and Wildlife Conservation Commission. The FWC Marine Debris Program works agency-wide and facilitates and coordinates marine debris efforts. Marine debris is a complicated issue that is only exacerbated by hurricanes; thus, adaptive management is key. FWC uses aerial imagery from NOAA, pre- and post-hurricane imagery, and side scan sonar. It generates GIS maps indicating marine debris targets and sensitive habitats. For Hurricane Ian, the ESF-10 best management practices (BMPs) were provided to contractors. Unlike in previous storms, Natural Resource Advisors were not routinely deployed to initiate BMPs so FWC had to implement additional training in the use of the BMPs focused on debris removal contractors. Once the ESF-10 response effort was concluded, a second multi-agency coordination team was created specifically to address marine debris removal. McGee noted that the debris removal from Hurricane Ian is continuing with deep mangrove vessel removal and monitoring of impacts. She noted that pay structures for contractors that focus on weight tends to result in more Styrofoam and plastics being left in the marine environment. As plastics break into smaller pieces or shreds they become more difficult to remove. A unique challenge is that anything over 50 years old is considered to be historical and can cause additional hurdles for removal of debris.

Paul Williams, *Emergency Services Branch Director*, FEMA | Region 4 | Response Division

Williams is a FEMA Remote Sensing Coordinator who has monthly working group meetings with NOAA and NASA. During an incident response, there are daily coordination calls with the agencies on remote sensing. While FEMA typically has adequate support, that becomes more problematic when storms occur over multiple regions and states. During responses, there is heavy reliance on NOAA's remote sensing imagery. All the NOAA resources were being used for data collection in Louisiana which left limited resources for impacts to Mississippi. To ensure that NOAA is aware of FEMA Region 4 activities and to improve coordination with the NOAA SSCs, three NOAA preparedness personnel have joined a FEMA working group to determine the level of assistance needed.

Richard Lavigne, *Incident Management*, U.S. Coast Guard | Seventh District

Lavigne discussed the importance of having relationships established among USCG, NWS, NOAA, and other agencies. He explained that during severe weather events USCG receives at least two briefs a day, NWS provides spot forecasts, and NOAA Scientific Support Coordinators are involved regularly for hurricanes and other topics. Lavigne noted that once an ESF-10 mission assignment is issued to USCG, NOAA is the primary partner for data collection, and ERMA dashboards are used to brief senior leadership. During Hurricane Ian, the ESF-10 assignment for NOAA was issued 14 days before the USCG assignment. Lavigne also discussed how NOAA helps with consultations and BMPs and provides Resource Advisor training to help expedite recovery operations. Two challenges were mentioned: (1) data is needed earlier to expedite recovery operations, and (2) a central repository is needed where everyone can access the same information as imagery and other information gets stored on multiple platforms. A consistent Common Operational Picture like ERMA would be useful as interoperability is limited. He also noted that cross-agency hotwashes would be helpful in making progress rather than coming up with the same observations year after year, response after response.

Contingency / COOP Planning

Sally Palmer, *Communications Manager*, University of Texas | Marine Science Institute

Palmer of University of Texas Marine Science Institute (MSI) discussed the impact of Hurricane Harvey on their personnel and facilities. Harvey was a fast and furious hurricane that began as a tropical storm and intensified quickly. MSI only had one day to prepare before sending personnel home. The campus was at the eye of the storm and the impacts from the wind and the rain caused \$50M in damage, \$5M to scientific instruments. Facilities are still being rebuilt. In addition to physical building damage, there were research, education impacts, and outreach impacts. The rehabilitation program and facilities sustained a lot of damage, with some losses for the seabirds and sea turtles when generators failed. The loss of student housing and overall impacts to the facility resulted in six students delaying graduation. The university benefitted by having a severe weather action plan, as well as good partnerships and coordination with city and county authorities. The University had resources in Austin that were out of the hurricane zone that facilitated response and recovery contractor deployments. MSI was able to use an equipment inventory to help characterize losses. Experienced staff were able to write \$20M in grants to supplement insurance payouts. Palmer noted that better photo documentation of lab equipment and requiring desk and cabinet drawers to be locked before evacuating, would have decreased losses of smaller items like cameras.

Jonathan Gordon, *IT Manager*, NOAA | Office of National Marine Sanctuaries

Gordan characterized the challenges associated with coordinating preparedness, response and recovery activities over a system that is geographically dispersed, spread from American Samoa to Florida with 17 buildings and 11 visitor centers. He discussed the ONMS need to operationalize a centralized communication network and contingency planning for a broad range of events. Each site has its own mission and various occupancy agreements. They are dealing with wildfires, vandalism, storms, frost, and flooding. ONMS is developing tools that are role based and customizing reporting technology through NOAA's systems and GIS that integrates with an interactive incident management dashboard available to all levels of management. Information must be processed and made useful to decide resource allocation and requests. NOAA ENS was tested during safety week. Many devices were used to respond to the test. Additionally, reports were provided on those who did not respond, and staff directories were updated. ONMS has moved away from hardware-based IT towards cloud-based technology.

Alyson Finn, *Emergency Planning Specialist*, NOAA | OR&R | Disaster Preparedness Program

Finn discussed the importance of having a plan, proactively updating and testing it on a regular basis before a natural disaster. She noted that the aftermath of a storm can be just as horrible as the storm itself. Post storm, many businesses never re-open, and of those that do, 25% fail after 1 year and 90% fail within 2 years. Finn discussed how in 2019, she created a checklist to help guide the development of a COOP plan. In 2020, a NOAA national level COOP working group was established. The working group has seven goals related to continuity plans, policies, and procedures. It recommends organizations have more than one COOP location identified. Finn discussed the NOS Ready Self-

Assessment Tool, created to gauge annual readiness, and the NOS NHC liaison established in June 2022 to better connect NOAA and create relationships with NHC.

Jessica White, *Deputy Director*, NOAA | Gulf of Mexico Disaster Response Center

White is spearheading a workshop to discuss preparedness at NOAA facilities across the country. The workshop will focus on effective management, IT data flow, safety, mutual aid, and communications. The workshop will occur before the year's end.

Showcase Technological Innovations, Tools, and Resources

“ERMA In Depth Review”

Jay Coady, *Spatial Data Branch*, NOAA | OR&R | Assessment & Restoration Division

Coady provided an overview of the Environmental Response Management Application (ERMA®). ERMA is an online mapping tool that is used for response. It provides publicly available and restricted data. ERMA can be used to identify infrastructure that may be located in areas of concern and map power outages. Information is gathered from NGS, USCG, and Civil Air Patrol photos.

Debris can be identified from imagery and sensitivity shown on the map. Coady explained how ERMA dashboards can be customized, and how the user can interact with the map and see information for each location. He provided live demonstrations on how to use ERMA for various functions, and where to access training videos on specific functions.

“Review of ENS – Suite of Hurricane Response Tools”

John McGowan, *Director*, NOAA | NOAA Operations Center

McGowan discussed the NOAA Emergency Notification System (ENS). ENS is a tool used to deliver mass notifications (e.g., emergency messages). It is designed to deliver messages to all NOAA staff across various platforms (e.g., phones, email, text messages). A report can be generated from ENS to determine who received the message. McGowan noted that it is not designed to be a general administrative message form, to avoid staff fatigue with excessive messaging. There are several vendors that provide ENS services, but some agencies created their own. McGowan discussed that the ENS can be used for broadcast and polling messages. The information from the ENS system indicates which facilities and members are in the area of impact.

“NOAA Recovery Coordination”

Autumn Lotze, *Recovery Specialist*, NOAA | OR&R | Disaster Preparedness Program

Lotze discussed the Federal recovery support landscape. There are six RSFs that serve as the coordinating mechanism. These are counterparts to the ESFs. Each RSF is led by a coordinating agency and NOAA is most closely engaged with economic support, natural and cultural resources, and community assistance. NOAA engages in disaster recovery operations at the request of FEMA, RSF Coordinating Agencies, States or Tribes. Lotze discussed the Disaster Recovery Activity Tracker and the Disaster Recovery Distribution Lists, where offices self-identify their interests and relevant points of contact for policies. In May 2023, there will be a request to NOAA Offices and Programs to update POCs in the Distribution Lists. In September 2023, the *You Don't Know What You Don't Know* webinar series will cover Recovery Support 101.

“Coastal Flood Exposure Mapper in Depth Review”

Russell Jackson, *Senior Coastal Hazards Specialist*, NOAA | Office for Coastal Management

Jackson provided a short demonstration of the Digital Coast mapper. The mapper contains stories from the field explaining how people have used it and how it can be modified. It also includes information on related training and an interactive course on how to use the tool. Jackson showed various maps on the screen and the use of the tool. He demonstrated how to: save maps for subsequent use, how to download/export them as images, and send URLs or a whole collection of saved maps. A user can interact with other data sets (e.g., population density, poverty, critical facilities) and click on sites with potential pollution sources. Jackson noted that the URLs can be used to go back to a saved map even if the browser is closed or a long time has elapsed since it was saved.

VII. Summit Findings and Recommendations

Findings were identified during the summit and the Summit's Steering Committee made recommendations to improve NOAA's hurricane preparedness and response capabilities.

1. **Finding:** Better cross-agency common operating picture is needed to make more informed decisions. Different platforms are being used that do not communicate with each other.
 - a. **Recommendation:** Continue to build relationships with partners to gain insight and awareness of available tools.
 - b. **Recommendation:** Identify agency-wide COP for consistent use across all line offices and federal agencies (e.g., Web EOC, ERMA).
 - c. **Recommendation:** Develop a cache of COP tools to be housed/available on the NOAA Disaster Coordination Dashboard and the HSPO ICC/ICP.
 - d. **Recommendation:** Foster development of cross-agency hotwashes

2. **Finding:** Communication is an ongoing challenge and is not effective if it is not tailored to the target audience. This can disproportionately impact communities with little to no outreach, resulting in an underserved population, (e.g., those who live aboard vessels in the Florida Keys). By tailoring key messages to underserved communities, NOAA can mitigate hurricane impacts to them.
 - a. **Recommendation:** Identify underserved and vulnerable communities through various tools (e.g., CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI) for targeted outreach to determine appropriate communication channels and messages.
 - b. **Recommendation:** Identify trusted agents within communities that can serve as ambassadors to extend the reach of messaging (e.g., communication channels, pre-scripted messages) for identified underserved and vulnerable communities.

3. **Finding:** NOAA continues to improve and develop new tools and data sets. Internal staff and partners may not always be aware of these updates and capabilities, (e.g., availability of pre-storm baseline imagery from NOAA Remote Sensing Division).
 - a. **Recommendation:** Develop perpetual outreach practices to communicate new tools and data sets.
 - b. **Recommendation:** Analyze the use of the tools (i.e., data analytics) to determine if tools are being utilized during a storm event. For tools that require login credentials, analyze user database and traffic, where possible.

4. **Finding:** Quick and efficient notification to NOAA staff is critical for consistent information sharing during an emergency. NOAA's ENS is limited by the accuracy of data and contact information uploaded into the system.
 - a. **Recommendation:** Evaluate the accuracy of contact information within ENS.
 - b. **Recommendation:** Agency level push to keep NOAA locator information current.

5. **Finding:** Risk communication continues to be a challenge within coastal communities. Local emergency managers noted their residents habitually focus on the direction and size of the storm (i.e., the cone uncertainty and forecast track) and not on the key messages provided on

the full range of potential impacts. Potential risks and impacts to communities have to be communicated effectively and empower individuals to make informed decisions best for them.

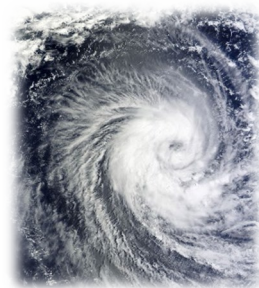
- a. **Recommendation:** Communication plans and message development should be done in close partnership with local/regional NWS WFO and local municipalities to ensure communities can interpret risk and be empowered to take action.
6. **Finding:** Personal preparedness and personal protective measures continue to be an important component of avoiding the negative impacts of disasters.
 - a. **Recommendation:** Improve communication and coordination among NOAA and state, local and territorial partners on refining storm surge and flood impact messaging.
 - b. **Recommendation:** Continue to provide resources for staff and community members to develop personal preparedness plans.
 - c. **Recommendation:** Identify local resources through partnerships with the local emergency management community to reiterate the local preparedness messages.
 7. **Finding:** NOAA can learn from coastal partner's experience and knowledge to improve facility and staff resilience from hurricane impacts.
 - a. **Recommendation:** Institute consistent and regular opportunities for exchanging information and processes about facility and staff resilience between NOAA staff and partners. This will increase NOAA's understanding of effective on the ground resilience and improve staff relationships with a range of coastal partner organizations.

VIII. Appendices

A. Summit Agenda

NOAA HURRICANE PREPAREDNESS SUMMIT

AGENDA



**2023 Summit Theme:
Advance NOAA's Ability to Adapt and Respond to the Effects of a
Changing Climate and Extreme Weather Events.**

2023 Summit Objectives:

- Identify innovative solutions and strategies for improvement, including those that address challenges identified in previous hurricane seasons.
- Fortify NOAA's capacity across Personnel, Mission, and Infrastructure (PMI) to support hurricane preparedness, response, and recovery.
- Facilitate effective hurricane preparedness and response through improved coordination across NOAA and with our federal, state, local, territorial, and tribal partners.

April 19, 2023 (Day 1)

1:00 – 5:00 pm (ET)

1:00 **Opening, Overview and Logistics**

Nancy Kinner, Coastal Response Research Center (CRRC)

1:05 **Welcome**

Scott Lundgren, NOAA Office of Response and Restoration (OR&R)

1:15 **Summit Objectives and Context**

Charlie Henry, NOAA OR&R, Gulf of Mexico Disaster Response Center

1:25 **Setting the Stage**

"An Overview of the 2022 Hurricane Season and What's New at NHC for 2023"

John Cangialosi, NOAA National Weather Service, National Hurricane Center

"Providing Impact-based Decision Support Services to the U.S. Coast Guard During the Hurricane Season"

Chris Landsea, NWS/NHC

2:00 **Communication of Risk**

"Equitable Services for a Weather-Ready Nation"

Dr. Stephan Smith, NOAA NWS, Office of Science and Technology Integration

2:15 **Hurricane Ian: Lessons Learned**

Jonathan Rizzo, NWS, Weather Forecast Office Key West

Shannon Davis Weiner, Monroe County (FL) Emergency Management

Brian LaMarre, NWS, Weather Forecast Office Tampa Bay

Cathie Perkins, Pinellas County (FL) Emergency Management



This event is made possible through the partnership with NOAA's Office of Response and Restoration (OR&R), Disaster Preparedness Program (DPP) in cooperation with the Coastal Response Research Center.



- 3:05 **Q&A / Participant Discussion**
- 3:15 **BREAK**
- 3:25 **National Water Center**
Paula Miano, NOAA, National Water Center, Water Prediction Operations Division (WPOD)
- 3:40 **Q&A / Participant Discussion**
- 3:45 **Focus on Personnel**
"Cross LO/PO Coordination and IMT"
Charlie Henry, NOAA DPP
"Updates and Overview from Homeland Security Program Office (HSPO)"
John McGowan, NOAA Operations Center
"Working Smarter and Safer"
Savannah Turner, NOAA OR&R Disaster Preparedness Program (DPP)
"CONOPS Coordination", Todd Stiles, National Marine Fisheries Service
"Maintaining Wellness During Response"
LCDR George Mitzner, U.S. Public Health Service
- 4:40 **Q&A / Participant Discussion**
- 4:50 **Wrap Up**
Kyla Breland, NOAA OR&R, DPP
- 5:00 **ADJOURN**



This event is made possible through the partnership with NOAA's Office of Response and Restoration (OR&R), Disaster Preparedness Program (DPP) in cooperation with the Coastal Response Research Center.



April 20, 2023 (Day 2)

1:00 – 5:00 pm (ET)

1:00 **Opening, Overview and Logistics**

Nancy Kinner, Coastal Response Research Center (CRRC)

1:05 **Welcome**

Jainey Bavishi, Assistant Secretary of Commerce for Oceans and Atmosphere, Deputy NOAA Administrator

1:15 **Partnerships and Coordination**

*Aaron Parker, NOAA OR&R, Emergency Response Division
Jennifer McGee, Florida Fish & Wildlife Conservation Commission, Marine Debris Coordinator
Paul Williams, FEMA Reg 4, Emergency Services Branch
Richard Lavigne, U.S. Coast Guard D7, Incident Management Preparedness*

1:50 **Q&A / Participant Discussion**

2:00 **Contingency/COOP Planning**

*Sally Palmer, University of Texas, Marine Science Institute
Jonathan Gordon, NOAA Office of National Marine Sanctuaries (ONMS)
Alyson Finn, NOAA OR&R DPP
Jessica White, NOAA Gulf of Mexico Disaster Response Center*

3:00 **BREAK**

3:15 **Showcase Technological Innovations, Tools and Resources**

Behind the Scenes Coordination Tools:

- *“Review of ENS – Suite of Hurricane Response Tools”
John McGowan, NOAA Homeland Security Program Office (HSPO)*
- *“NOAA Recovery Coordination”
Autumn Lotze, NOAA OR&R DPP*

“ERMA In Depth Review”

Jay Coady, NOAA OR&R Spatial Data Branch

“Review of ENS – Suite of Hurricane Response Tools”

John McGowan

“Coastal Flood Exposure Mapper In Depth Review”

Russell Jackson, NOAA Office for Coastal Management (OCM)

4:35 **Q&A / Participant Discussion**

4:50 **Wrap Up and Path Forward**

Lisa Symons, NOAA ONMS and Matt Chasse, NOAA OCM – (Steering Committee members)

5:00 **ADJOURN**

For more information: <https://crrc.unh.edu/resource/noaa-hurricane-preparedness-summit-2023>



This event is made possible through the partnership with NOAA's Office of Response and Restoration (OR&R), Disaster Preparedness Program (DPP) in cooperation with the Coastal Response Research Center.



B. Poll Results

Session One

Two polls were held during the first session to understand the impacts participants experienced from the 2022 Atlantic Hurricane Season. The polls were conducted to establish a foundation for later discussions and presentations. The polls and answers can be seen below.

Poll Question 1: Were you impacted by the 2022 hurricane season?

- A. 15% Yes, significantly
- B. 32% Yes, to some extent
- C. 53% No, we were lucky**

Poll Question 2: Did you/your office/site/agency have unexpected impacts from the 2022 hurricane season?

- A. 19% Significant
- B. 30% Minor
- C. 51% None**

Session Two

Two polls were held during the second session to set the stage for the coming discussion. These polls focused on Mission Essential Functions and the status of engagement with relevant partners. The polls and answers can be seen below.

Poll Question 1: Does your program have a Mission Essential Function or ESF?

- A. 69% Yes**
- B. 13% No
- C. 17% Unsure
- D. 2% I don't know

Poll question 2: Has your coordination/engagement with local/state/federal partners improved from season to season?

- A. 36% Yes, it is working well
- B. 56% Yes, but continued improvement is needed**
- C. 4% No, coordination has degraded from previous years
- D. 16% COVID made coordination difficult
- E. 7% Covid had little impact to coordination

C. Summit Presentations

NOAA Hurricane Preparedness Summit 2023

Nancy E. Kinner, Facilitator
Coastal Response Research Center (CRRC)
University of New Hampshire

April 19, 2023



Coastal Response Research Center

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COASTAL RESPONSE RESEARCH CENTER (CRRC)

- Partnership between NOAA's Office of Response and Restoration and the University of New Hampshire
- Since 2004
 - UNH Co-Director – Nancy Kinner
 - NOAA Co-Director – Troy Baker



Coastal Response Research Center

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Coastal Response Research Center (NOAA \$)

Center for Spills and Environmental Hazards (All Other \$)

- Conduct and Oversee **Basic** and **Applied** Research and Outreach on Spill and Other Environmental Disaster Response and Restoration
- Transform Research **Results into Practice**
- Serve as **Hub for Spill and Environmental Disaster R&D**
- **Facilitate Interaction** Among Spill/Environmental Disaster Community (All Stakeholders)
- **Educate/Train Students for** Careers in Response and Restoration



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Hurricane Summit 2023 STEERING COMMITTEE

Charlie Henry, NOAA OR&R GoM DRC
 Lisa Symons, NOAA ONMS
 Matthew Chasse, NOAA OCM
 Brad Benggio, NOAA OR&R ERD
 Chris Sloan/John McGowan, NOAA HSPO
 Kyla Breland, NOAA DPP
 Nancy Kinner, UNH CRRC



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HOW TO PARTICIPATE

- **Attendees:** Muted & camera off
- **Panelists:** Unmute & camera on ONLY when speaking
- **Interactive Polls:** Please vote. Input is helpful to us
- **Questions for Panelists:** Please put them in the chat
- **Download GoToWebinar** application vs. online browser
- **If you have access issues, please contact Lisa Lisa.Symons@noaa.gov, cell 301-529-1860 or Kathy at kathy.mandsager@unh.edu, cell 603.498.8010**



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Q&A Tool

- **Type questions in Chat as you think of them**
 - No need to wait until the Q&A session in the agenda
- Located in main tool bar
- Q&A will be monitored and collated
- Questions may be read aloud or addressed in the Q&A Tool

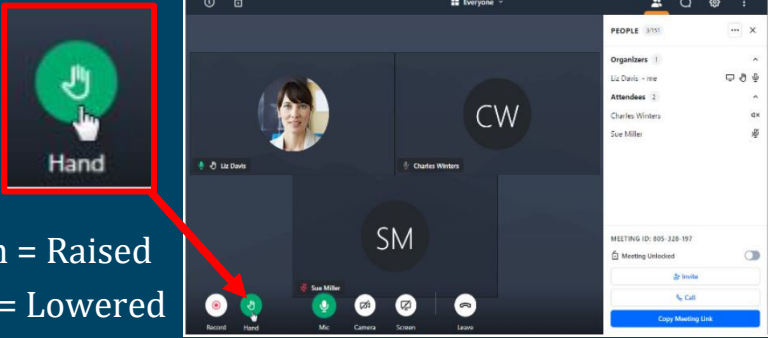


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Raise "Hand"



- Green = Raised
- Gray = Lowered

Photos: <https://support.goto.com/meeting/help/how-do-i-raise-my-hand-during-a-meeting#:~:text=To%20raise%20your%20hand%2C%20click,by%20you%20or%20the%20organizer.>

If you wish to ask your question verbally, use the "raise hand" tool in your tool bar.



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THANK YOU FOR LISTENINGAnd Away We GO.....

<https://crrc.unh.edu/resource/noaa-hurricane-preparedness-summit-2023>



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2023 NOAA Hurricane Summit Day 1 Agenda

1:00	Opening, Overview and Logistics
1:05	Welcome
1:15	Summit Objectives and Context
1:25	Setting the Stage <i>"An Overview of the 2022 Hurricane Season and What's New at NHC for 2023"</i> <i>"Providing Impact-based Decision Support Services to USCG During Hurricane Season"</i>
2:00	Communication of Risk <i>"Equitable Services for a Weather-Ready Nation"</i>
2:15	Hurricane Ian: Lessons Learned




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2023 NOAA Hurricane Summit Day 1 Agenda

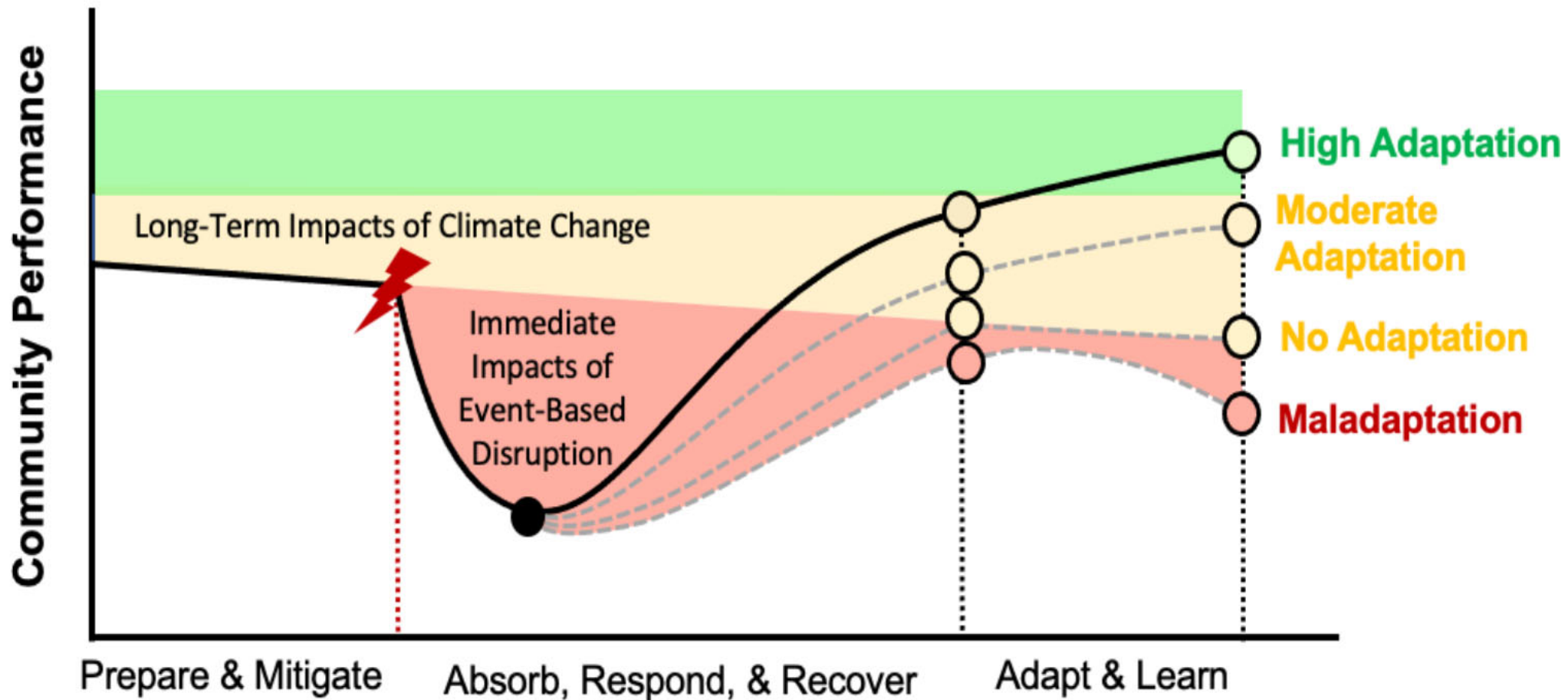
3:15	<i>BREAK</i>
3:25	National Water Center
3:45	Focus on Personnel <i>"Cross LO/PO Coordination and IMT"</i> <i>"Updates and Overview from Homeland Security Program Office (HSPO)"</i> <i>"Working Smarter and Safer"</i> <i>"CONOPS Coordination"</i> <i>"Maintaining Wellness During Response"</i>
4:50	Wrap Up
5:00	<i>ADJOURN</i>




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Actions to Reduce Impacts from Hazard Events and Climate Change

4th Annual NOAA Hurricane Preparedness Summit: OBJECTIVES AND CONTEXT

Context and Objective

Charlie Henry
Director, NOAA's Disaster Response Center
Mobile, Alabama



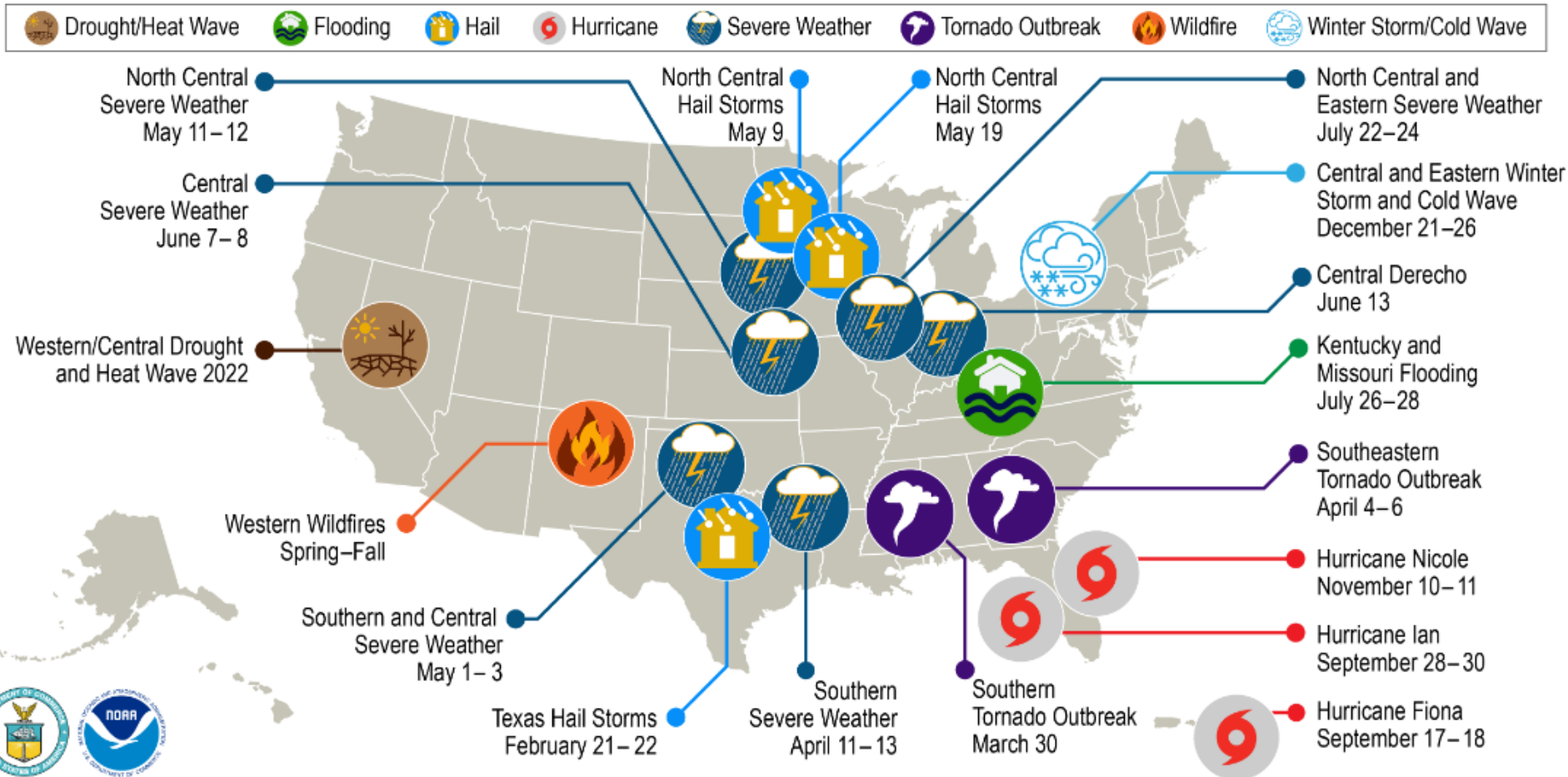
Why do we prepare?

“Preparation through education is less costly than learning through tragedy.”

Max Mayfield

2022 Billion-Dollar Weather and Climate Disaster Estimates

U.S. 2022 Billion-Dollar Weather and Climate Disasters



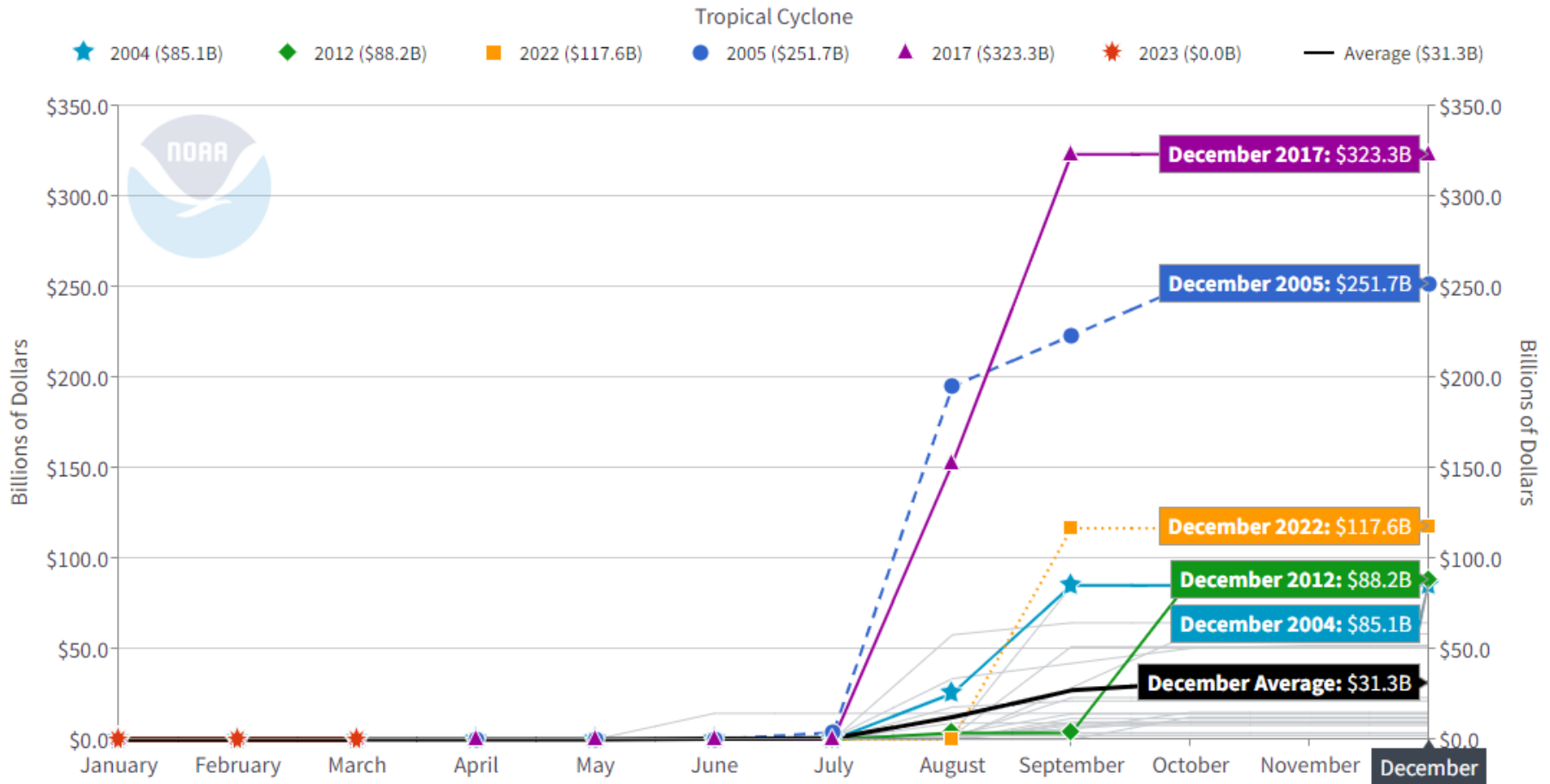
This map denotes the approximate location for each of the 18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.



Hurricanes are Costly... Financial Cost Will Likely Increase

Tropical Cyclones

1980-2023 United States Billion-Dollar Disaster Event Cost (CPI-Adjusted)

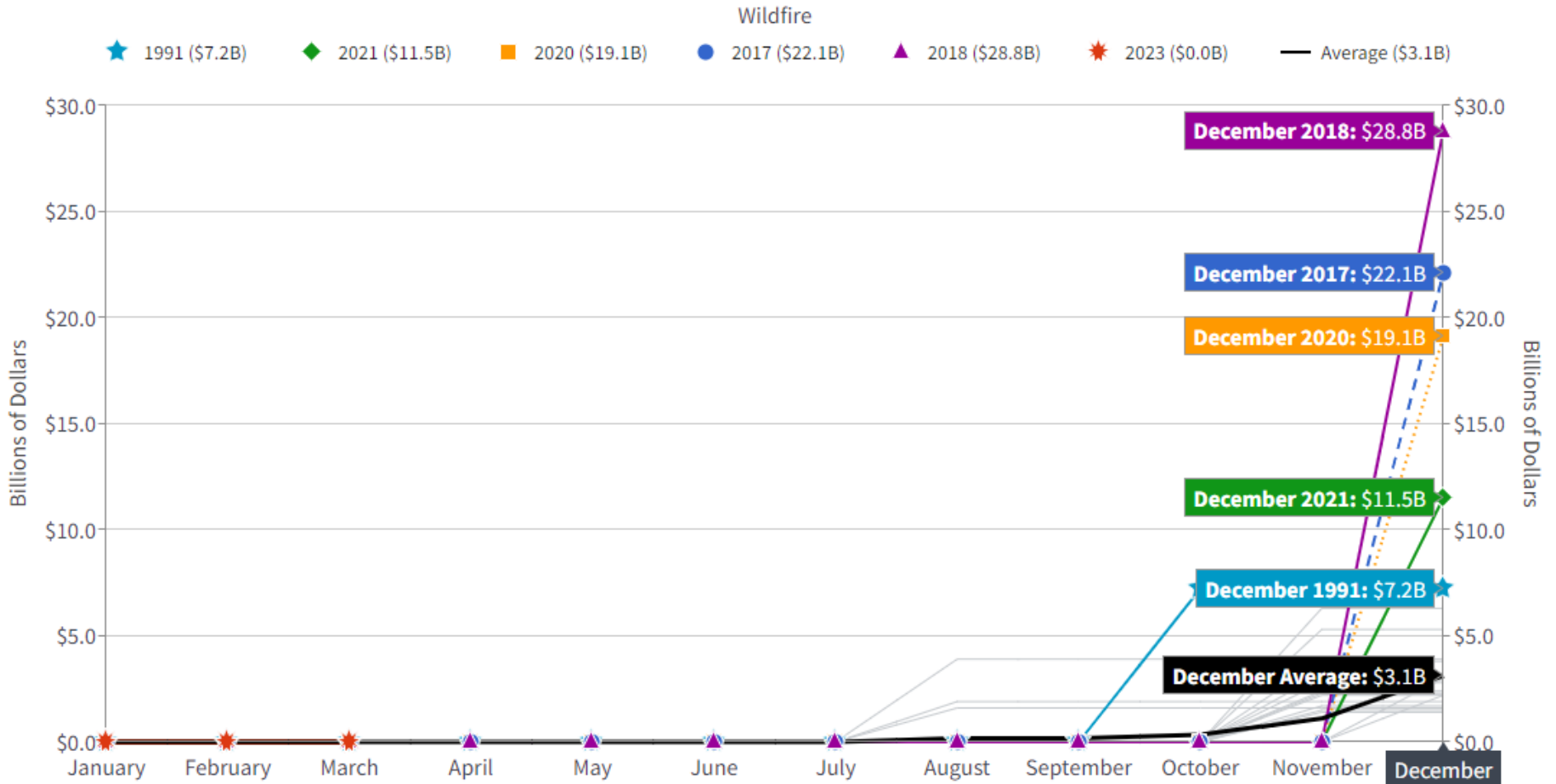


NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2023). <https://www.ncei.noaa.gov/access/billions/>, DOI: [10.25921/stkw-7w73](https://doi.org/10.25921/stkw-7w73)

Wildfires are Costly...

Wildfires

1980-2023 United States Billion-Dollar Disaster Event Cost (CPI-Adjusted)



Event statistics are added according to the date on which they ended. Powered by ZingChart

NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2023). <https://www.ncei.noaa.gov/access/billions/>, DOI: [10.25921/stkw-7w73](https://doi.org/10.25921/stkw-7w73)

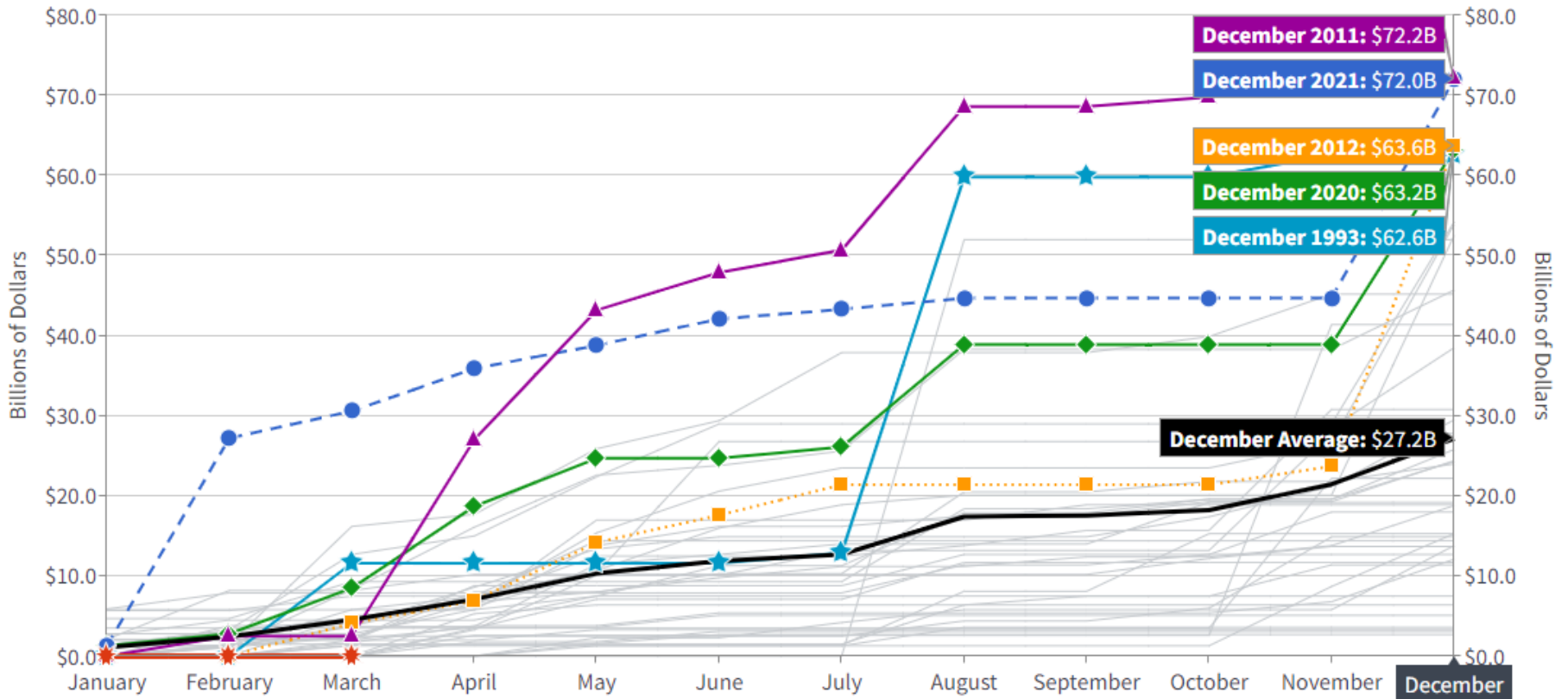
Hurricanes are the Most Costly:

Drought, Flooding, Freeze, Severe Storm, Wildfire, and Winter Storm

1980-2023 United States Billion-Dollar Disaster Event Cost (CPI-Adjusted)

Drought, Flooding, Freeze, Severe Storm, Wildfire, Winter Storm

★ 1993 (\$62.6B) ◆ 2020 (\$63.2B) ■ 2012 (\$63.6B) ● 2021 (\$72.0B) ▲ 2011 (\$72.2B) ✱ 2023 (\$0.0B) — Average (\$27.2B)



Updated: April 10, 2023

Event statistics are added according to the date on which they ended. Powered by ZingChart

“What might be lost in this is the accumulated total of all of the less than billion dollar events, but this is true also for tropical weather as well.”

Hurricanes are Most Costly... and the Cost far Exceeds \$

Of the 310 billion-dollar weather disasters between 1980 and 2022, hurricanes have caused the most damage: over \$1.1 trillion total, with an average cost of \$20.5 billion per event.

(It's not just the \$, and for me the money is far less the reason we prepare.)

- These events are also responsible for the highest number of weather related deaths: 6,697 between 1980 and 2021 (and this is only for the billion dollar events).
- For comparison, the 1900 Galveston Hurricane may have taken up 8,000 lives and left another 10,000 homeless.

So, why do we prepare?



“But measuring the long-term economic impact on individual disaster victims has been challenging. The Labor Department stopped tracking Katrina evacuees in 2006, and the data ignored New Orleanians who stayed behind.”

<https://www.aeaweb.org/research/new-orleans-katrina-long-term-recovery-income>

Theme/Goal:

Advance NOAA's ability to adapt and respond to the effects of a changing climate and extreme weather events.

Objectives:

- **Identify innovative solutions and strategies for improvement, including those that address challenges identified in previous hurricane seasons.**
- **Fortify NOAA's capacity across Personnel, Mission, and Infrastructure (PMI) to support hurricane preparedness, response, and recovery.**
- **Facilitate effective hurricane preparedness and response through improved coordination across NOAA and with our federal, state, local, territorial, and tribal partners.**

NOAA People, Missions, and Infrastructure (PMI)



***Are we ready
for the
2023
Hurricane Season?***

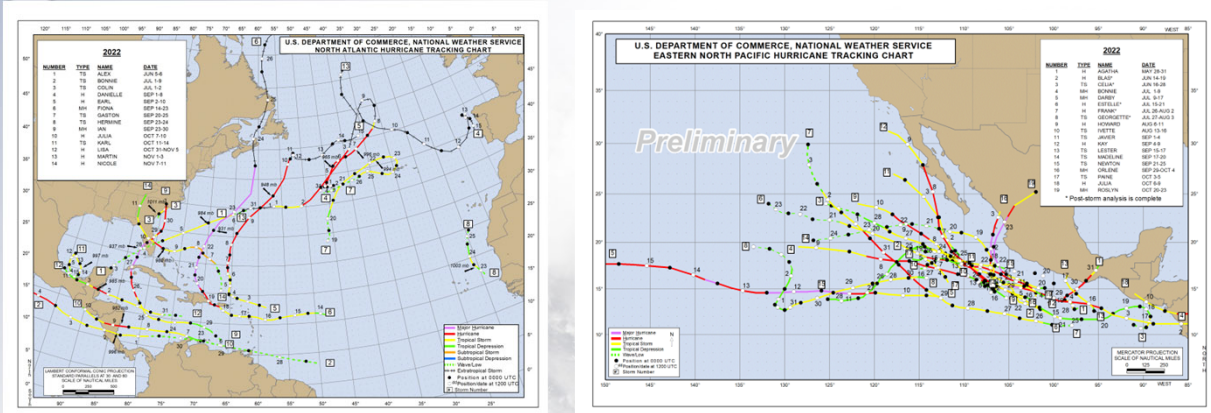
Remember



Storm surge damage to Texas coast after Hurricane Ike. Photo: NOAA.

...we are planning for a humanitarian mission.

An Overview of the 2022 Hurricane Season and a Look Ahead to 2023



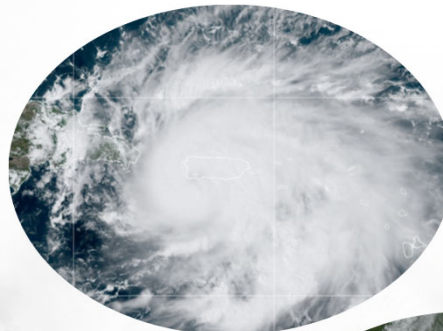
John Cangialosi
National Hurricane Center



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Atlantic Season Summary

- 14 named storms
- 8 hurricanes (2 major)
- ACE: 94.8
- United States Impacts
 - 1 Tropical Storm: Colin (SC)
 - 3 Hurricanes: Fiona (PR), Ian (FL, SC), Nicole (FL)
- International Hurricane Impacts
 - Fiona (Dominican Republic, Turks & Caicos, Canada)
 - Ian (Cuba), Julia (Nicaragua), Lisa (Belize), Nicole (Bahamas)



Fiona

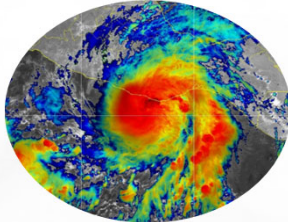


Ian

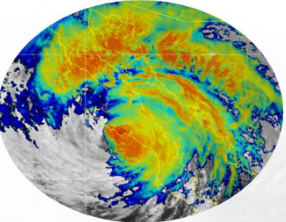
2

East Pacific Season Summary

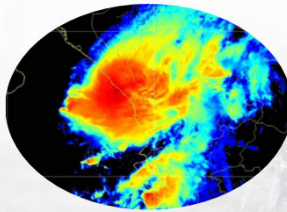
- 19 named storms
- 10 hurricanes (**4 major**)
- ACE: 115.6
- Mexico Impacts
 - 4 hurricane landfalls: Agatha (Oaxaca), Kay (Baja California Sur), Orlene (Sinaloa), & Roslyn (Nayarit)
- 2 Atlantic storms moved from the Caribbean across Central America and into the Pacific as TCs (Bonnie & Julia)



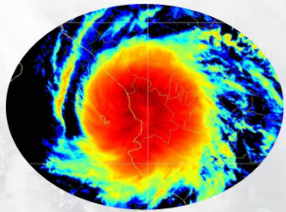
Agatha



Kay



Orlene

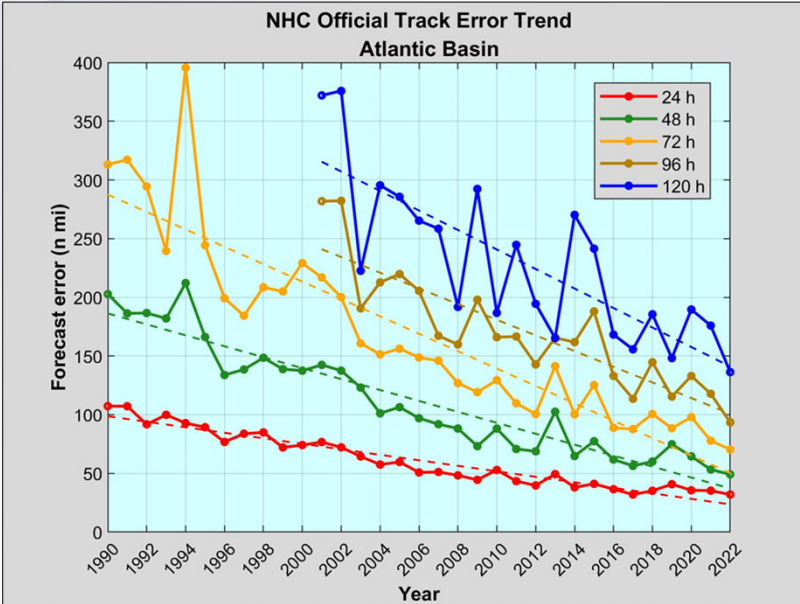


Roslyn

3

Atlantic Track Error Trends

**NHC Official Track Error Trend
Atlantic Basin**



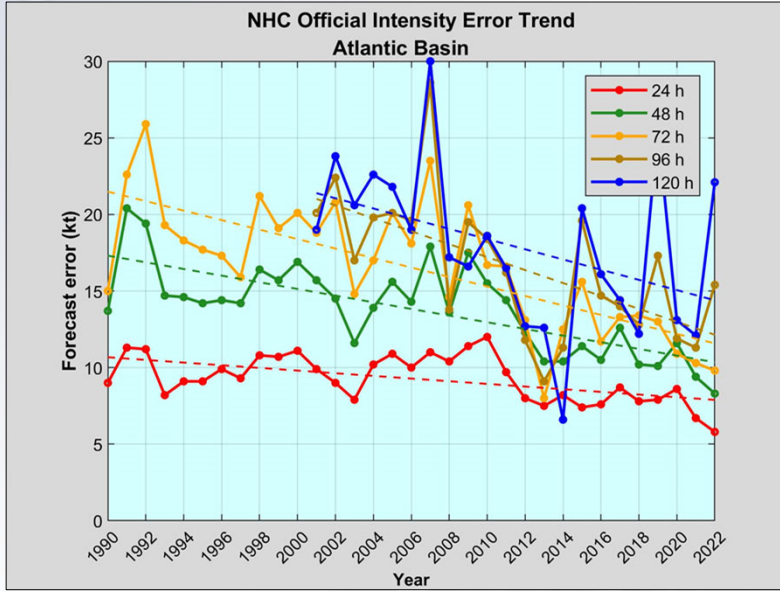
Errors nudged down again in 2022; pronounced long-term improvement trends

Track records broken in 2022

Time	N	Track
000	255	6.6
012	227	21.1
024	200	31.3
036	173	41.6
048	151	52.5
060	132	65.3
072	114	78.1
096	80	98.7
120	56	126.2

4

Atlantic Intensity Error Trends



Errors dropped from 24–72 h with strong downward long-term trends

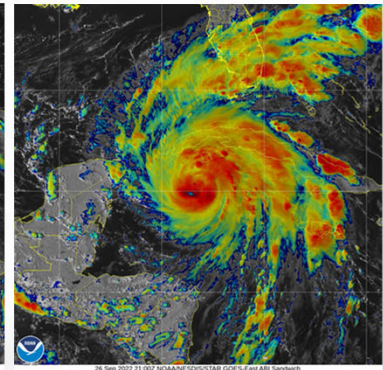
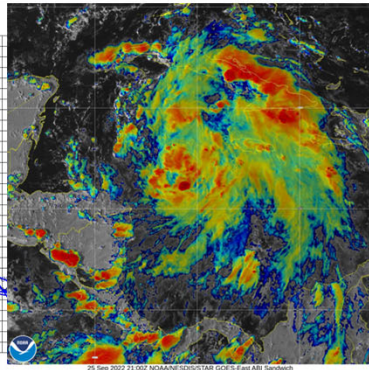
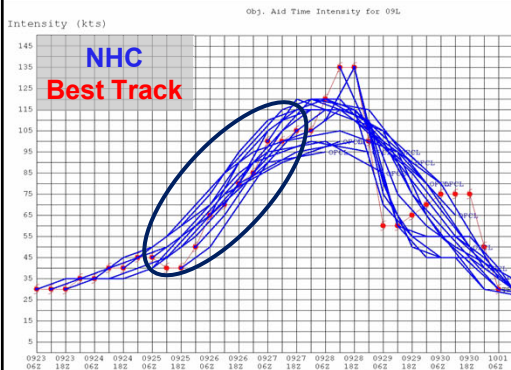
Intensity records broken in 2022

Time	N	Intensity
000	255	0.5
<u>012</u>	227	<u>4.8</u>
<u>024</u>	200	<u>5.8</u>
<u>036</u>	173	<u>7.2</u>
<u>048</u>	151	<u>7.9</u>
<u>060</u>	132	<u>9.0</u>
072	114	10.0
096	80	16.4
120	56	21.1

5

Hurricane Ian – Rapid Intensification

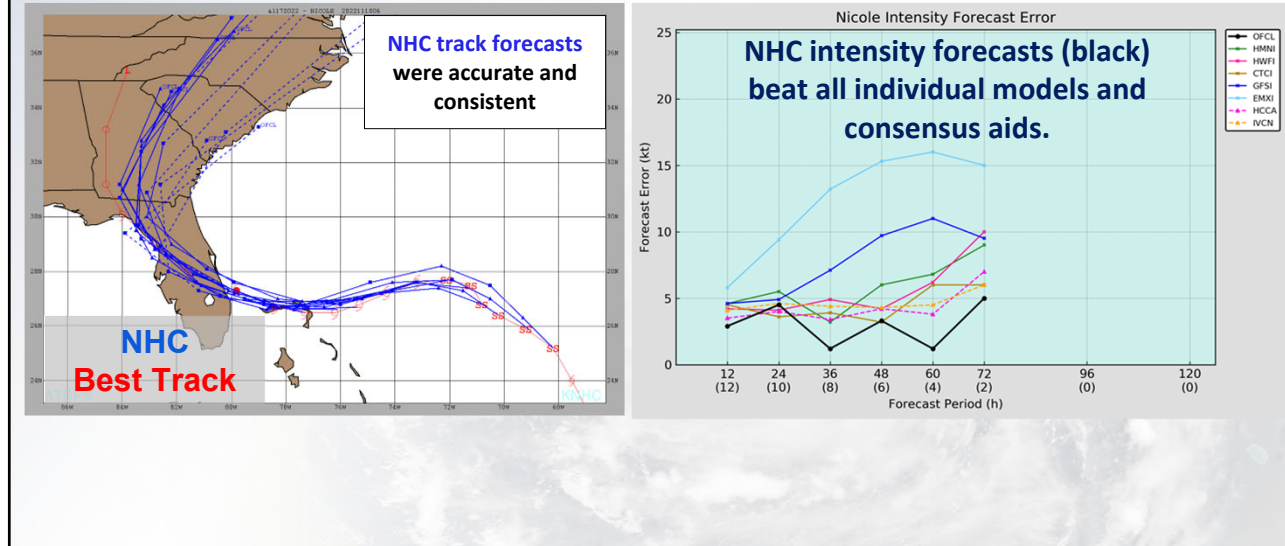
NHC explicitly forecast Ian’s rapid intensification



NHC’s average intensity forecast errors were 10-25% lower than the intensity consensus from 12 through 48 h, and more than 30% lower than consensus at 72 h

6

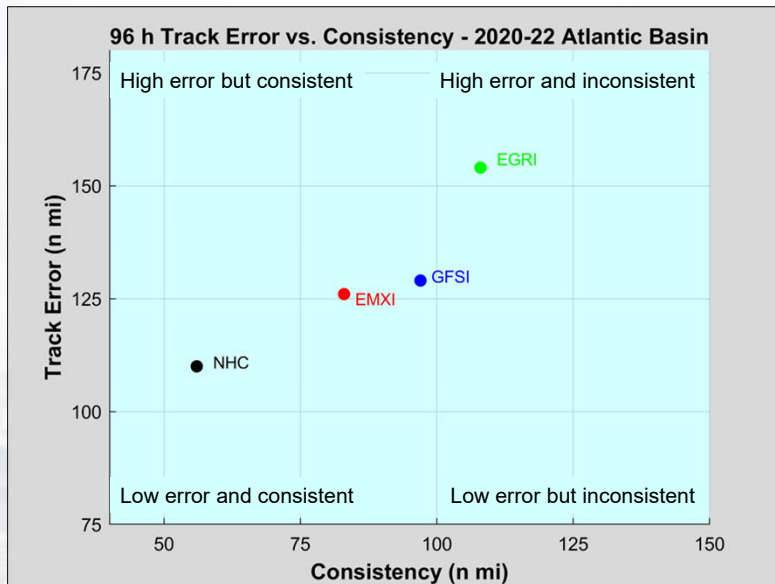
Hurricane Nicole – Track and Intensity



7

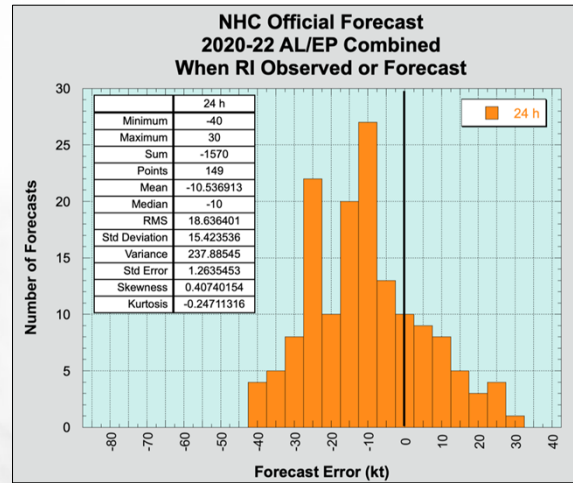
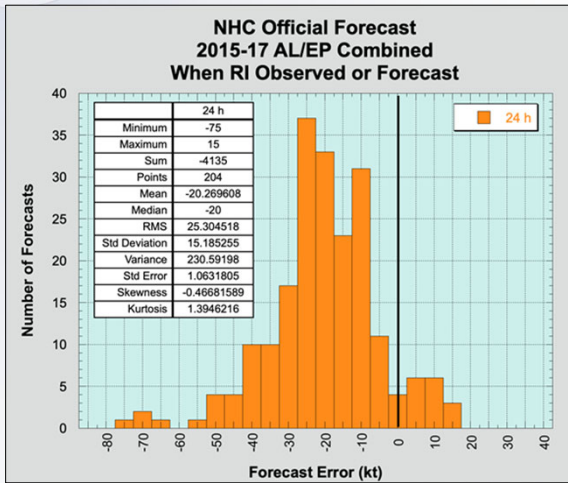
NHC Grand Challenge: Stop Model Hugging

NHC's track forecasts have lower average error and are more consistent than any individual model



8

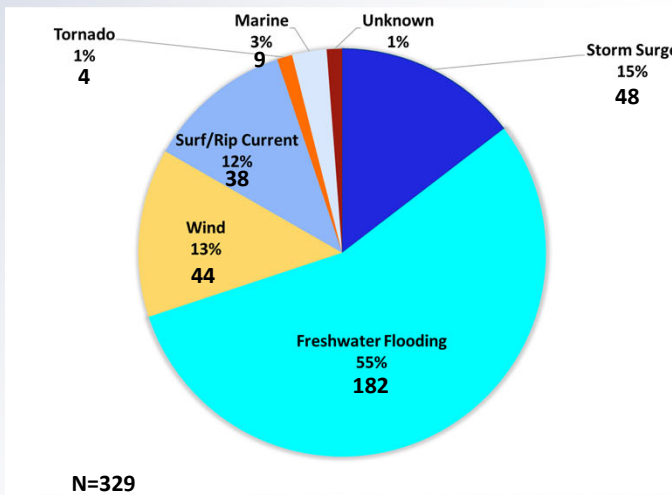
Progress in Forecasting Rapid Intensification



NHC's 24-h intensity error during rapid intensification events has been cut in half since 2017 – 10 kt compared to 20 kt
 Largest under-forecast error reduced by 46% (40 kt compared to 75 kt)

9

CONUS Atlantic Direct TC Fatalities – 2017-2022



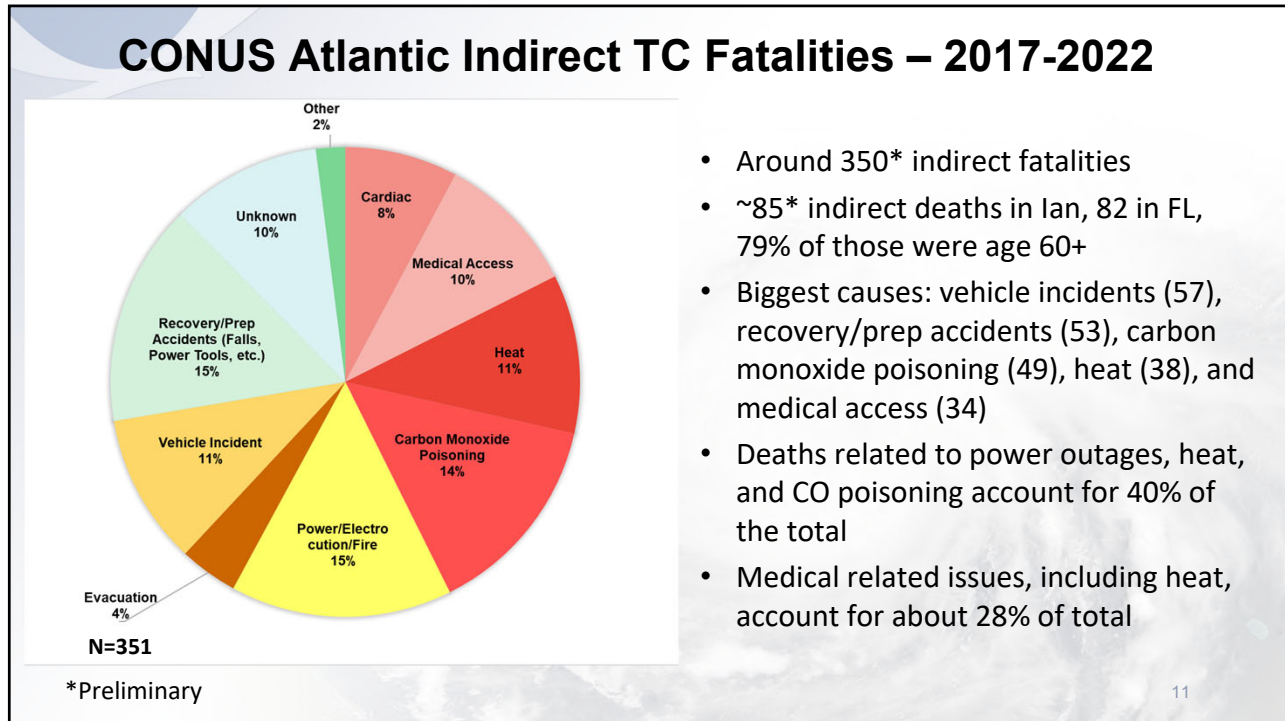
N=329

*Preliminary

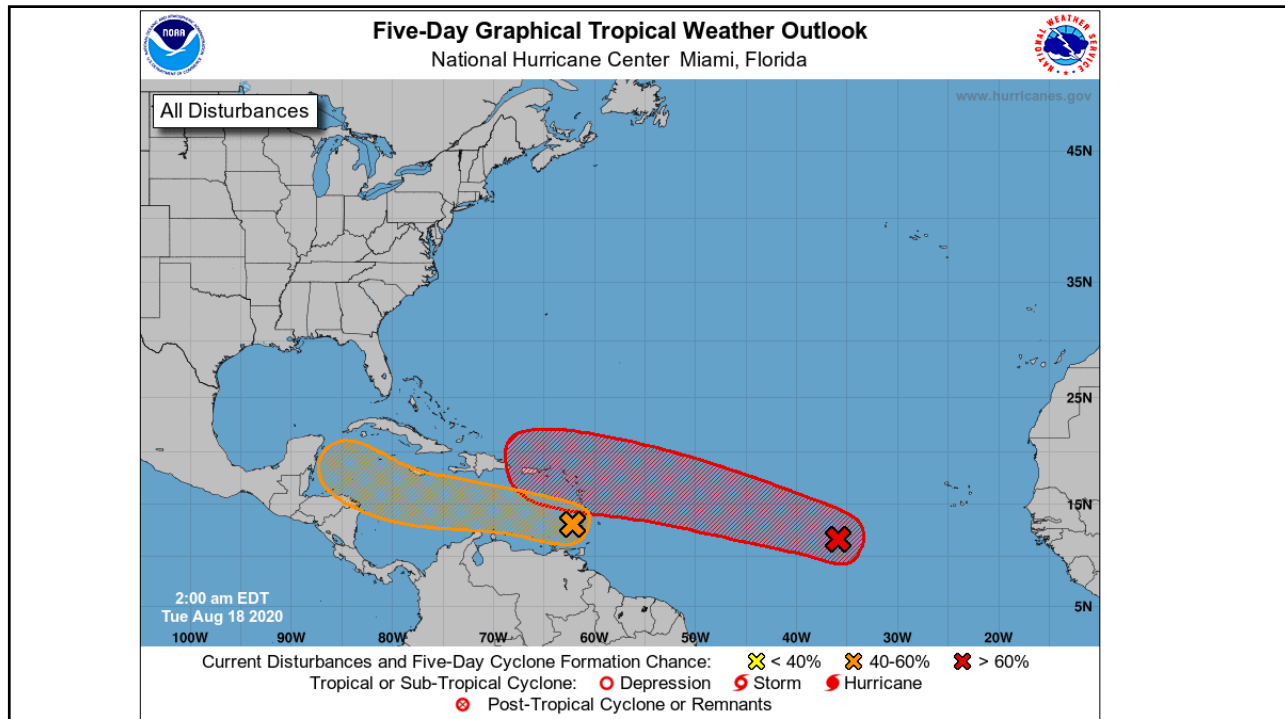
- 329* direct fatalities
- 64* in Ian (63 in FL and 1 in NC)
- Freshwater flooding responsible for 55% of the direct deaths - Harvey and Ida responsible for 116 (66%)
- 48 storm surge fatalities (15% of direct deaths) - 40* from Ian in Florida (83%)
- 12% due to surf/rip currents, many from storms well away from the U.S.
- 13% due to wind – many tree related scattered across multiple storms

10

10



11



12

NHC Tropical Weather Outlook Changes and Reminders

- Issued 4 times daily from May 15 to November 30
 - 2 AM, 8 AM, 2 PM, 8 PM EDT
- Discusses areas of disturbed weather and their potential for development during the next 7 days*
- Probabilities of formation are provided for the next 48 hours and the entire 7-day* period
- Special Outlooks can be issued at any time to discuss important changes with an area of disturbed weather

Tropical Weather Outlook
 800 PM EDT Wed Sep 21 2022
 For the North Atlantic...Caribbean Sea and the Gulf of Mexico:

Active Systems:
 The National Hurricane Center is issuing advisories on Hurricane Fiona, located several hundred miles southwest of Bermuda, and on another system.

1. Southeastern Caribbean Sea:
 Showers and thunderstorms associated with a tropical wave located over the far southeastern Caribbean Sea have changed little in forecast to become more conducive for development, and a tropical disturbance is likely to form within the next couple of days. The eastern Caribbean Sea during the next day or two, and be over the island of Puerto Rico on this weekend. Westward of development, the ABC Islands region, and northern Venezuela, northern Colombia, and the ABC Island chain during the next couple of days. An Air Force Reserve reconnaissance aircraft is currently surveying the system, and data from this mission will be assimilated into a forecast model.
 * Formation chance through 48 hours...high...70 percent.
 * Formation chance through 5 days...high...50 percent.

2. Eastern Tropical Atlantic:
 Showers and thunderstorms located near the west coast of Africa are associated with a tropical wave that is forecast to move over the far eastern Atlantic waters on Thursday. The forecast environmental conditions are forecast to be conducive for some development, and a tropical depression could form by this weekend while the system moves slowly northward, between west Africa and the Cabo Verde Islands.
 * Formation chance through 48 hours...medium...50 percent.
 * Formation chance through 5 days...medium...40 percent.

East Central Tropical Atlantic:
 The area of low pressure located several hundred miles southwest of the Cabo Verde Islands continues to produce slow development of this system. Despite a dry environment, there is some slow development of this system. Despite a dry environment, there is some slow development of this system. Despite a dry environment, there is some slow development of this system.
 * Formation chance through 48 hours...low...20 percent.
 * Formation chance through 5 days...low...10 percent.

*New for 2023

13

2023 Update: Latest Cone Size

- Cone is based on circles “drawn” around each forecast point based on the 67th percentile of the NHC track error over the past 5 years
- 2023 cone largely unchanged from the previous several seasons

Information about the NHC cone and reminders

2003 CONE
2013 CONE
2023 CONE

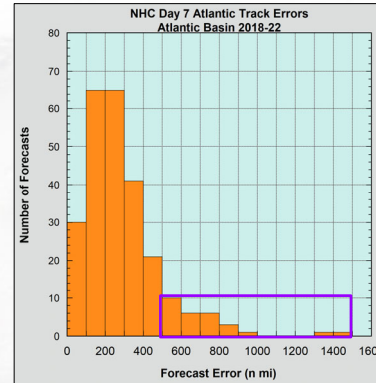
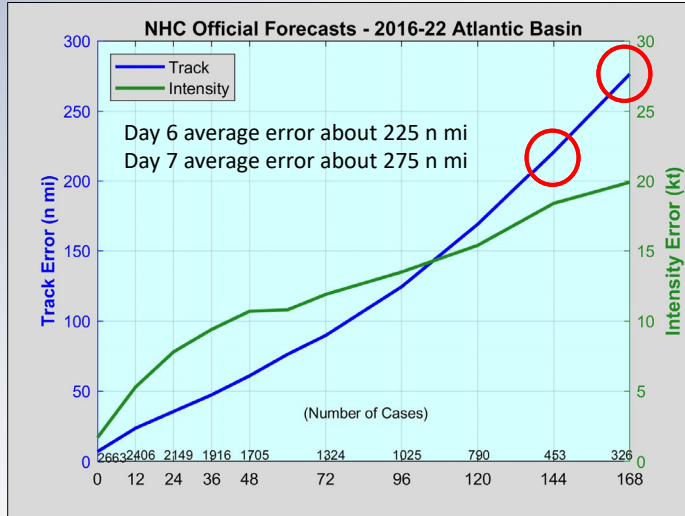
+5day +4day +3day +2day +1day

@BMcNoldy

Image courtesy: Brian McNoldy, University of Miami

14

Possible Future Enhancements 6 & 7 day Track and Intensity Forecasts



Average track error at day 7 is about 275 n mi, however ~10% of forecasts have errors ≥ 500 n mi (about the distance from Miami to Myrtle Beach!)

15

2023 Hurricane Season Outlook

- Will be issued next month, remember it only takes one.
- 2022 goes down as a average to below average season, but a deadly one!

16

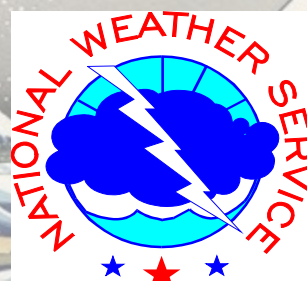
16

“Providing Impact-based Decision Support Services to the U.S. Coast Guard During Hurricane Season”

NOAA Hurricane Preparedness Summit
April 19th, 2023

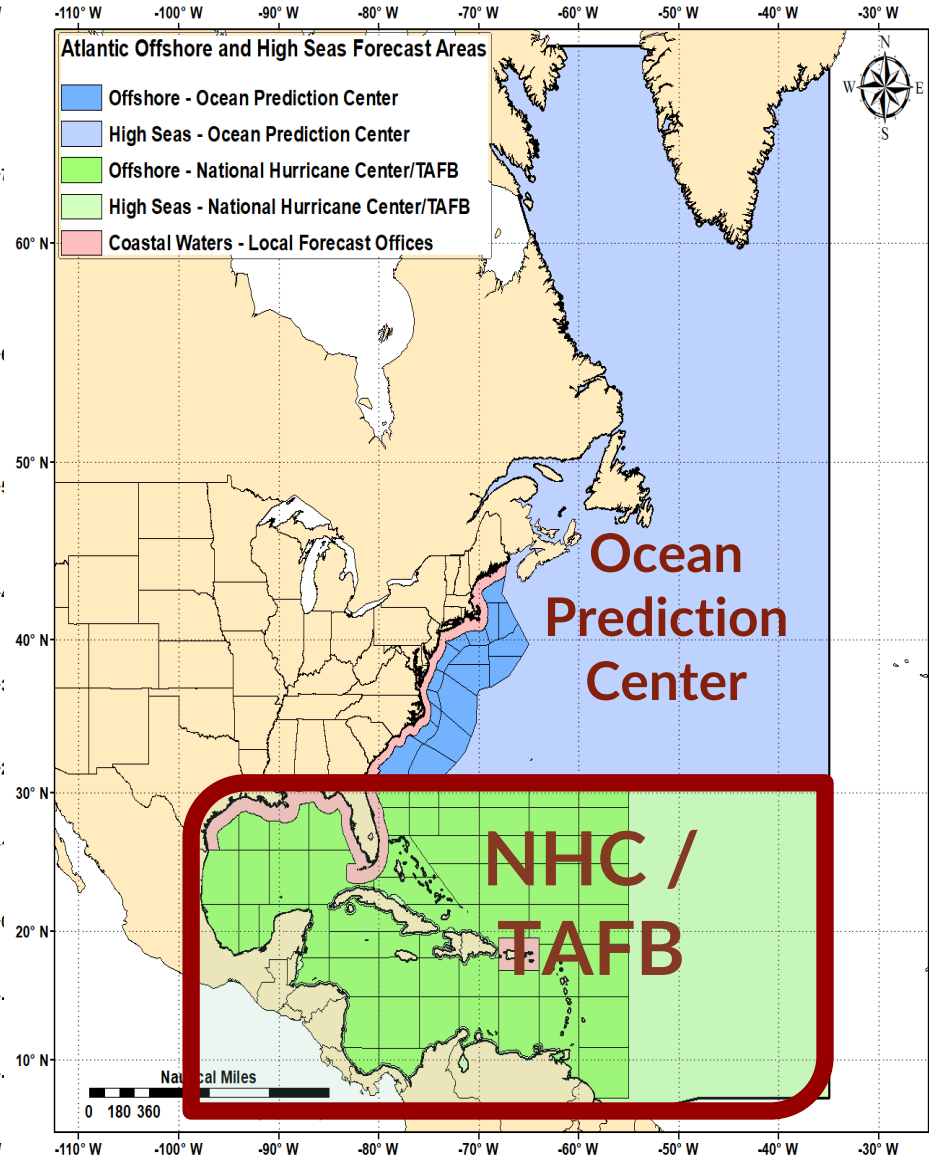
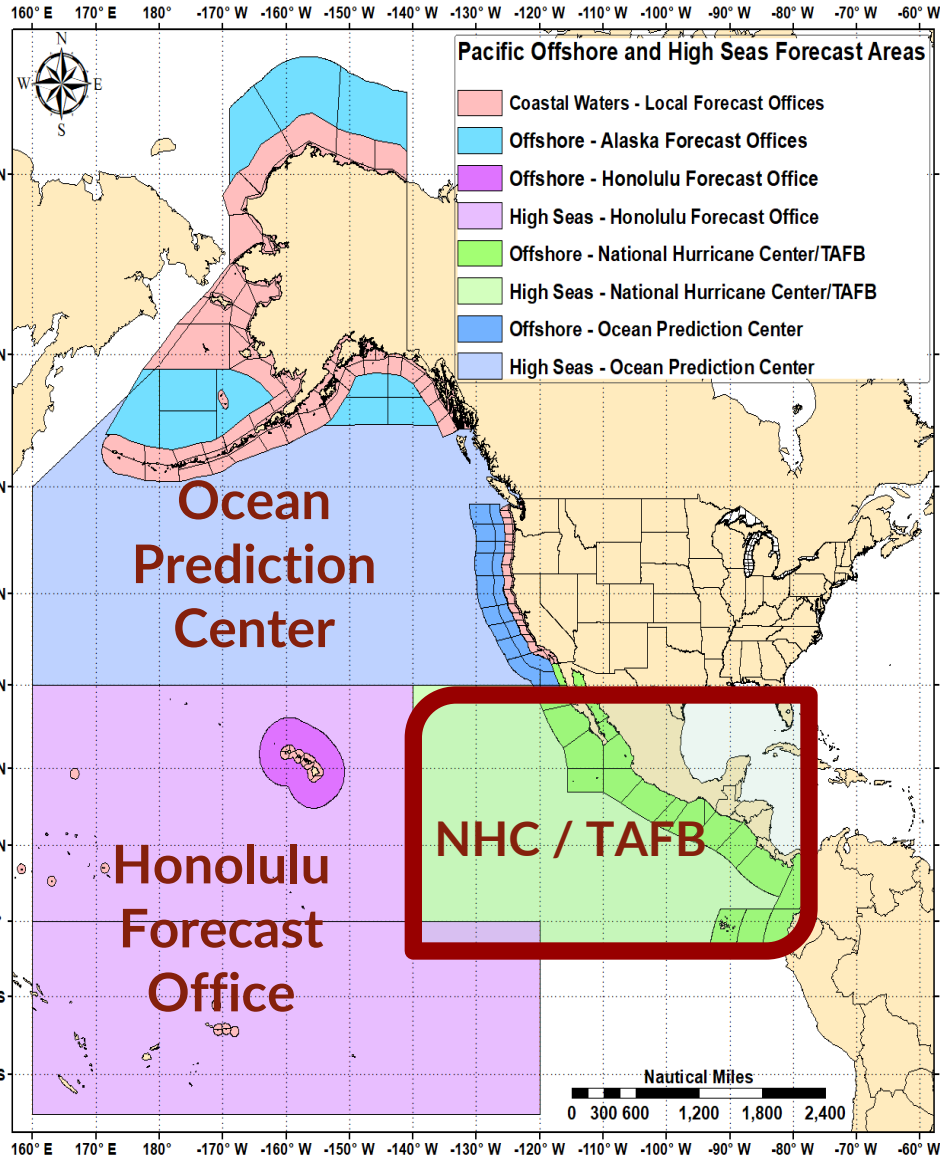
Chris Landsea
Chris.Landsea@noaa.gov
NHC/TAFB Branch Chief

To provide meteorological analysis, forecasts and warnings over the tropical and subtropical oceans for the protection of life and property





NHC/TAFB - Areas of Responsibility



Impact of the U.S. “Blue Economy”

- 80% of all traded goods globally are carried by sea
- In 2018, the American Blue Economy contributed \$373 billion to the nation’s Gross Domestic Product (GDP), supporting 2.3 million jobs
- Maritime commerce is expected to triple by 2030











NOAA FY22-26 STRATEGIC GOALS SUMMARY



**ACCELERATE GROWTH IN AN
INFORMATION-BASED BLUE ECONOMY**

Diverse Industries.

Ten Ocean Sectors Sales in 2018

	Tourism and Recreation	\$227 Billion
	Defense and Public Administration	\$190 Billion
	Offshore Oil and Gas	\$80 Billion
	Transportation	\$59 Billion
	Fisheries and other Bio-products	\$26 Billion
	Shipbuilding	\$19 Billion
	Power Generation	\$6.8 Billion
	Construction	\$4.4 Billion
	Research and Education	\$4.2 Billion
	Professional and Business Services*	\$51 Million

Tools – Incorporating NHC’s Tropical Storm/Hurricane Forecast



Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



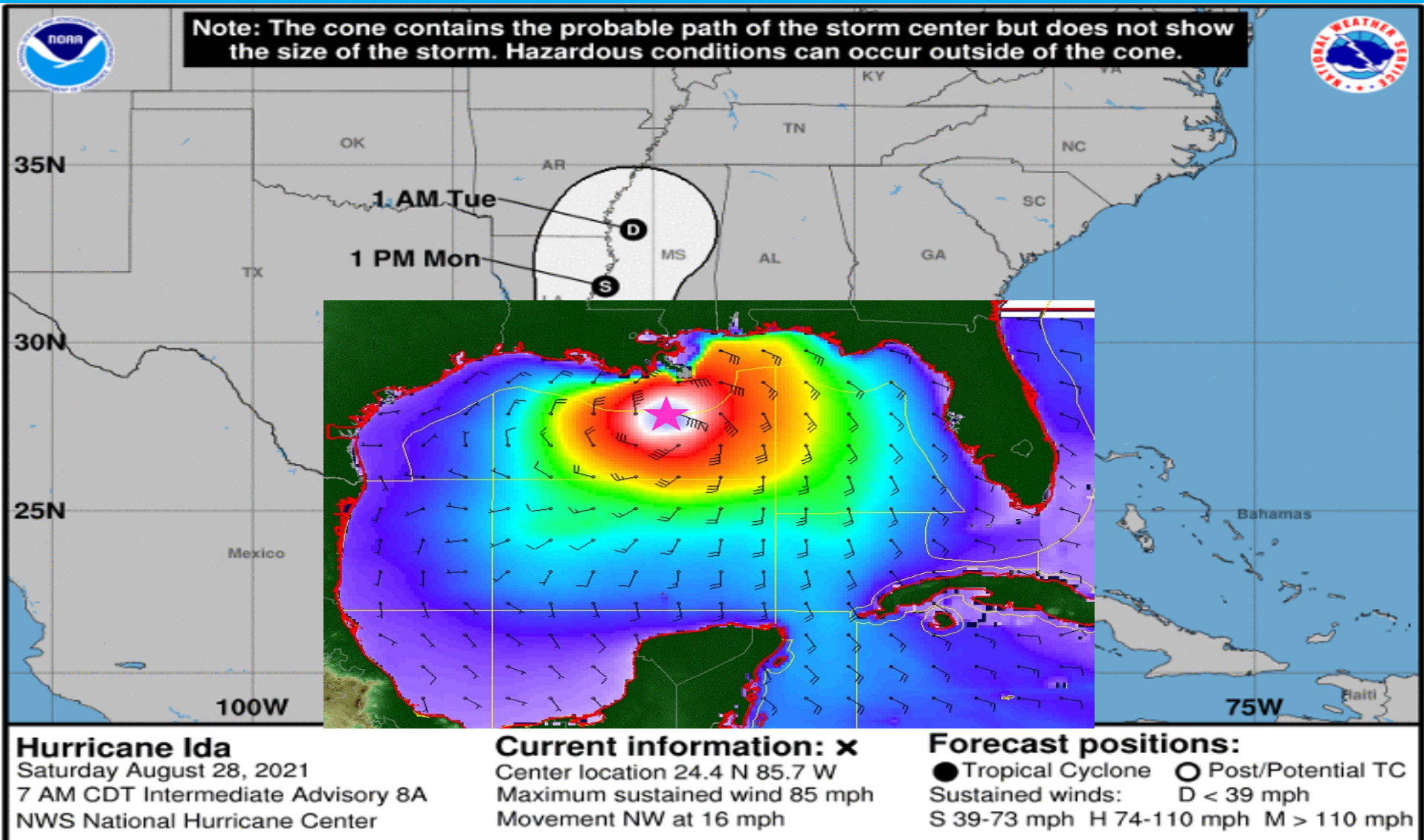
Hurricane Ida
 Saturday August 28, 2021
 7 AM CDT Intermediate Advisory 8A
 NWS National Hurricane Center

Current information: x
 Center location 24.4 N 85.7 W
 Maximum sustained wind 85 mph
 Movement NW at 16 mph

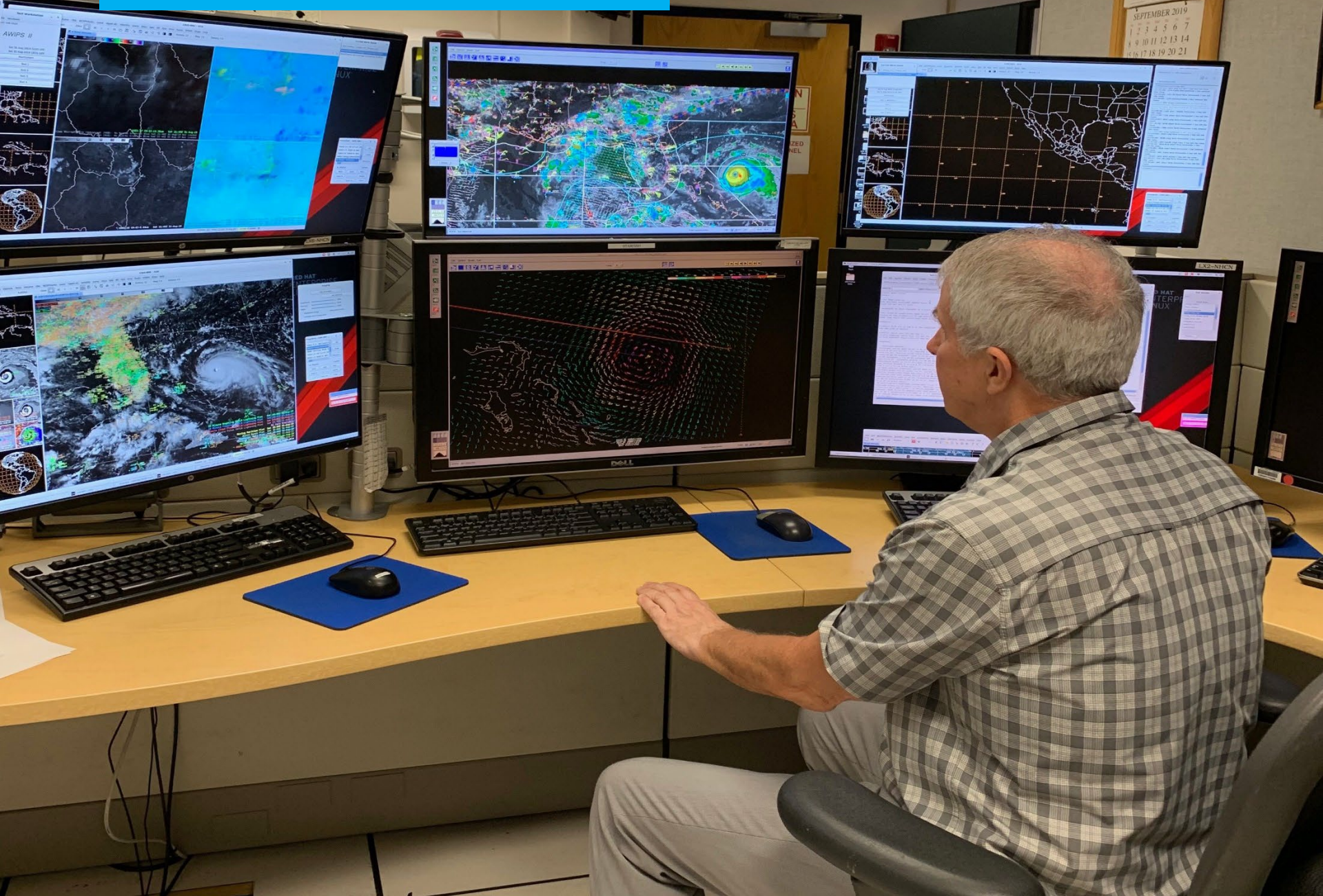
Forecast positions:
 ● Tropical Cyclone ○ Post/Potential TC
 Sustained winds: D < 39 mph
 S 39-73 mph H 74-110 mph M > 110 mph

Potential track area: Day 1-3 (white outline), Day 4-5 (dotted outline)
Watches: Hurricane (pink), Trop Stm (yellow)
Warnings: Hurricane (red), Trop Stm (blue)
Current wind extent: Hurricane (brown), Trop Stm (yellow)

Tools – Incorporating NHC’s Tropical Storm/Hurricane Forecast



Tools - Workstations



NHC/TAFB Wind and Wave Forecasts

High Seas and Offshores Text Forecasts

HIGH SEAS FORECAST
NWS NATIONAL HURRICANE CENTER
1030 UTC FRI OCT 02 2015

SUPERSEDED BY NEXT ISSUANCE IN 6 HOURS

SEAS GIVEN AS SIGNIFICANT WAVE HEIGHT...WHICH IS THE AVERAGE HEIGHT OF THE HIGHEST 1/3 OF THE WAVES. INDIVIDUAL WAVES MAY BE MORE THAN TWICE THE SIGNIFICANT WAVE HEIGHT.

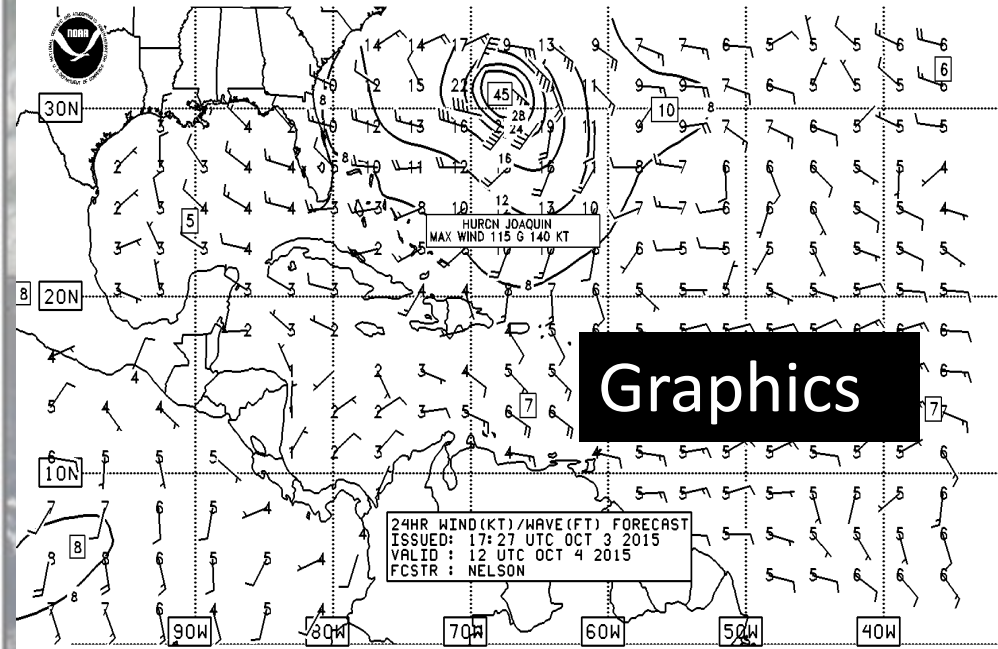
PAN PAN

ATLANTIC FROM 07N TO 31N W OF 35W INCLUDING CARIBBEAN SEA AND GULF OF MEXICO.

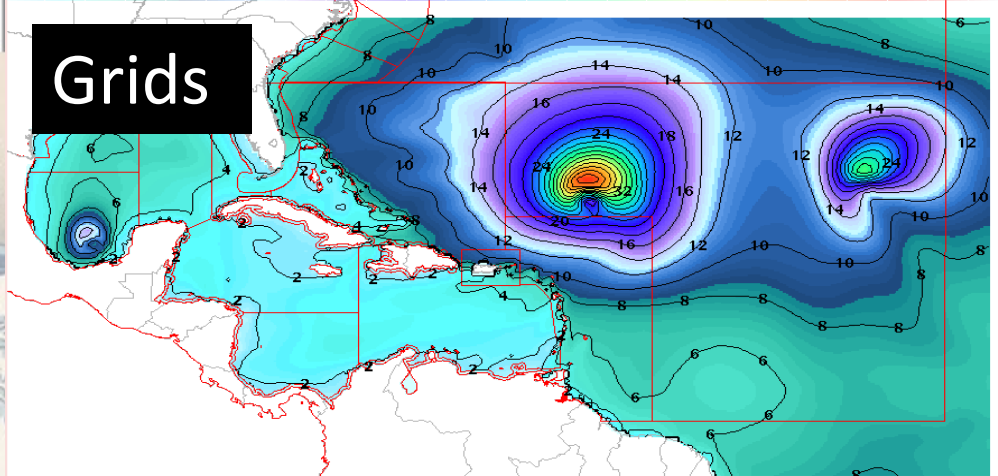
SYNOPSIS VALID 0600 UTC FRI OCT 02.
24 HOUR FORECAST VALID 0600 UTC SAT OCT 03.
48 HOUR FORECAST VALID 0600 UTC SUN OCT 04.

.WARNINGS.

...HURRICANE WARNING...
.HURRICANE JOAQUIN NEAR 23.3N 74.7W 935 MB AT 0900 UTC OCT 02 MOVING NW OR 315 DEG AT 3 KT. MAXIMUM SUSTAINED WINDS 115 KT GUSTS 140 KT. TROPICAL STORM FORCE WINDS WITHIN 160 NM W SEMICIRCLE...140 NM NE QUADRANT AND 180 NM SE QUADRANT. SEAS 12 FT OR GREATER WITHIN 400 NM NE QUADRANT...150 NM SE QUADRANT...120 NM SW QUADRANT...AND 300 NM NW QUADRANT WITH SEAS TO 39 FT. ELSEWHERE S OF 28N BETWEEN 70W AND 78W WINDS 20 TO 33 KT. SEAS 9 TO 12 FT. N OF 28N BETWEEN 70W AND 75W E WINDS 20 TO 25 KT SEAS 8 TO 10 FT. REMAINDER OF AREA N OF 21N BETWEEN 65W AND 78W AND OUTSIDE OF THE BAHAMAS WINDS 20 KT OR LESS. SEAS 8 TO 11 FT IN MIXED SWELL.



Graphics



Significant Wave Height (ft) Valid 17 Sep 2010 0000 GMT

EL FARO

33 fatalities when it sank in Hurricane Joaquin (2015)



BOURBON RHODE

11 fatalities when it sank in Hurricane Lorenzo (2019)

BOUNTY

2 fatalities when it sank in Hurricane Sandy (2012)

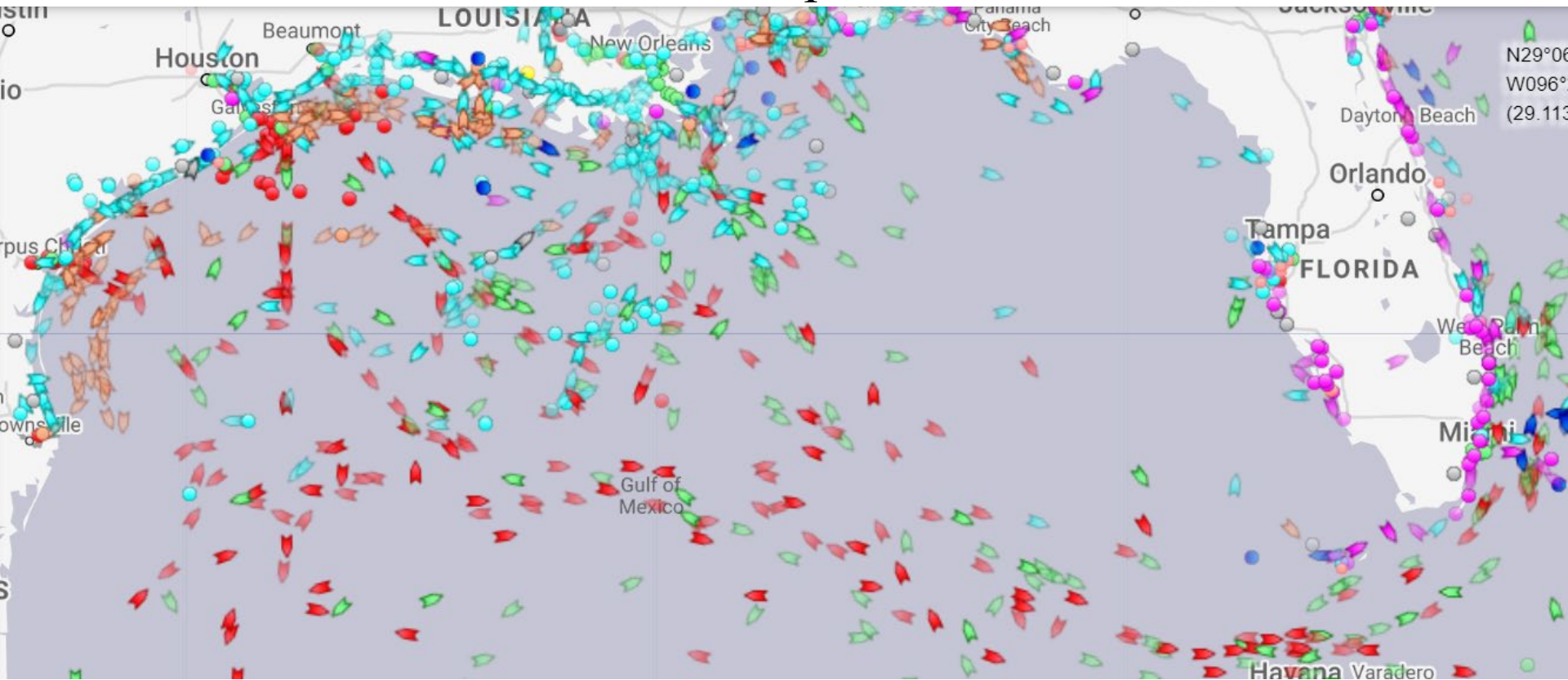
FANTOME

31 fatalities when it sank in Hurricane Mitch (1998)

Hurricane Delta - 2020

Weather Avoidance by Ships

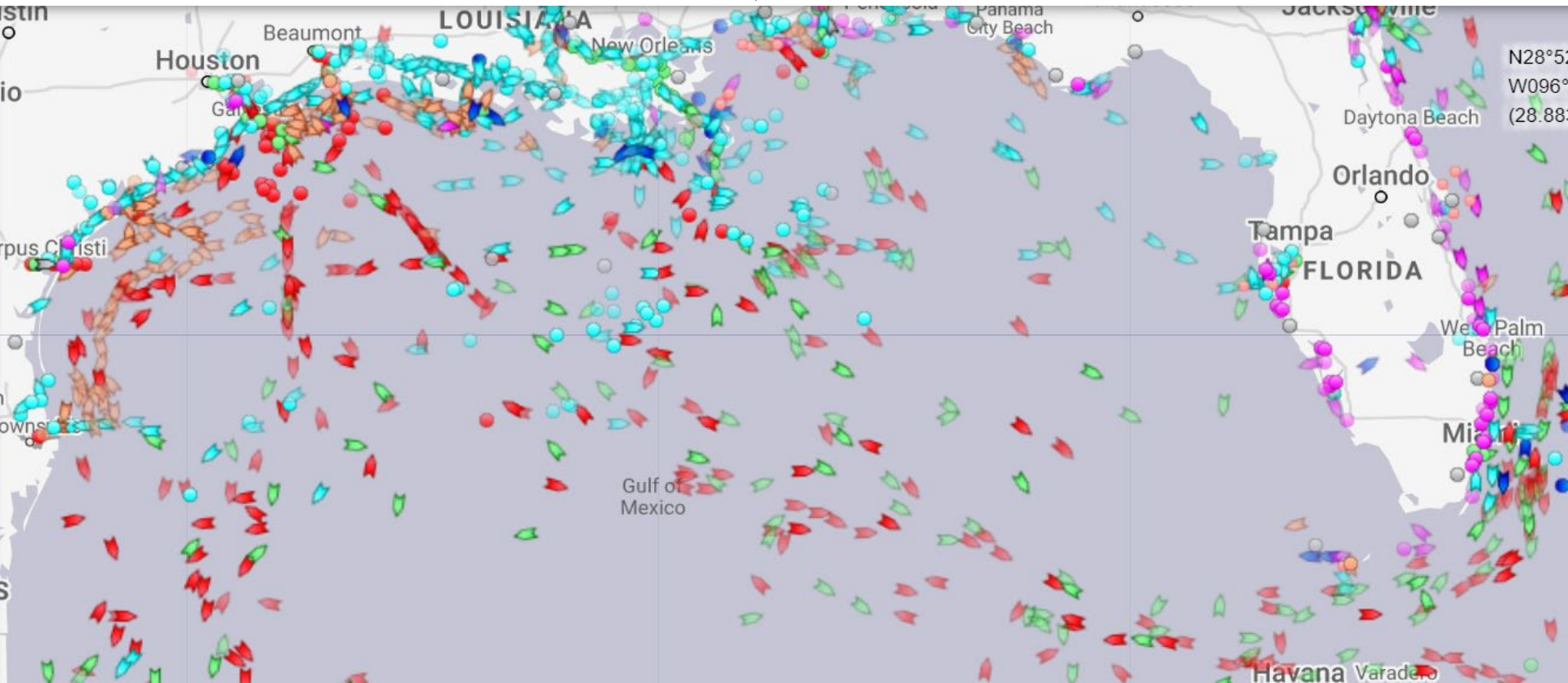
October 6th, 2pm EDT



Hurricane Delta - 2020

Weather Avoidance by Ships

October 7th, 9am EDT

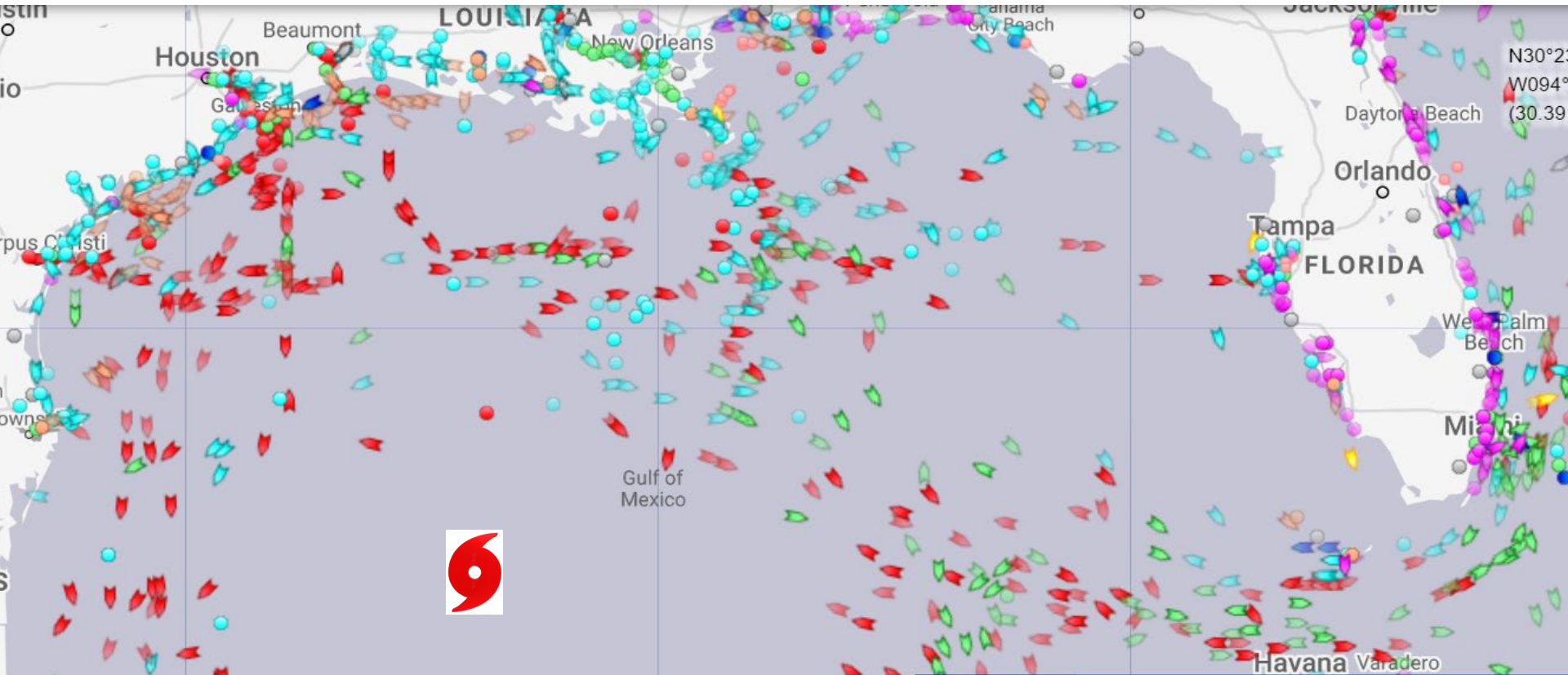


marinetraffic.com

Hurricane Delta - 2020

Weather Avoidance by Ships

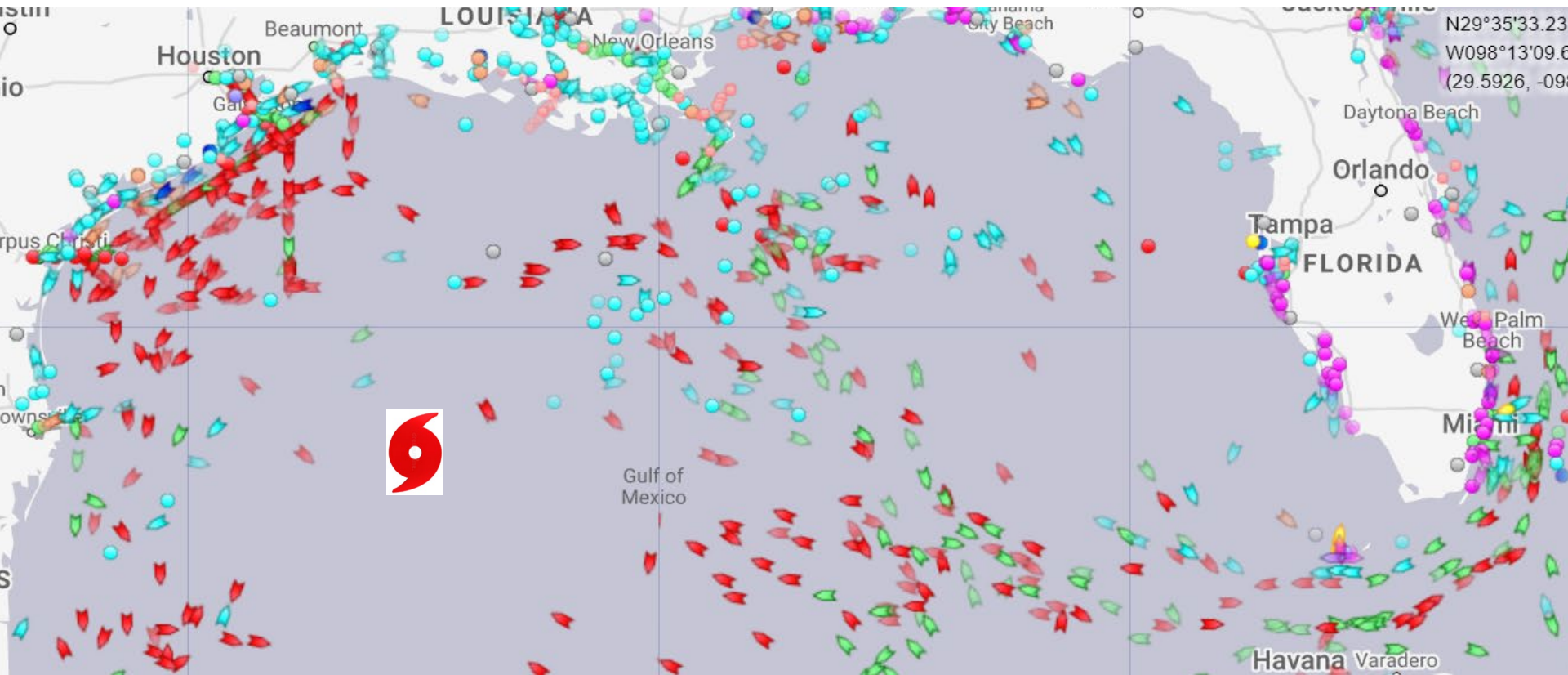
October 8th, 9am EDT



Hurricane Delta - 2020

Weather Avoidance by Ships

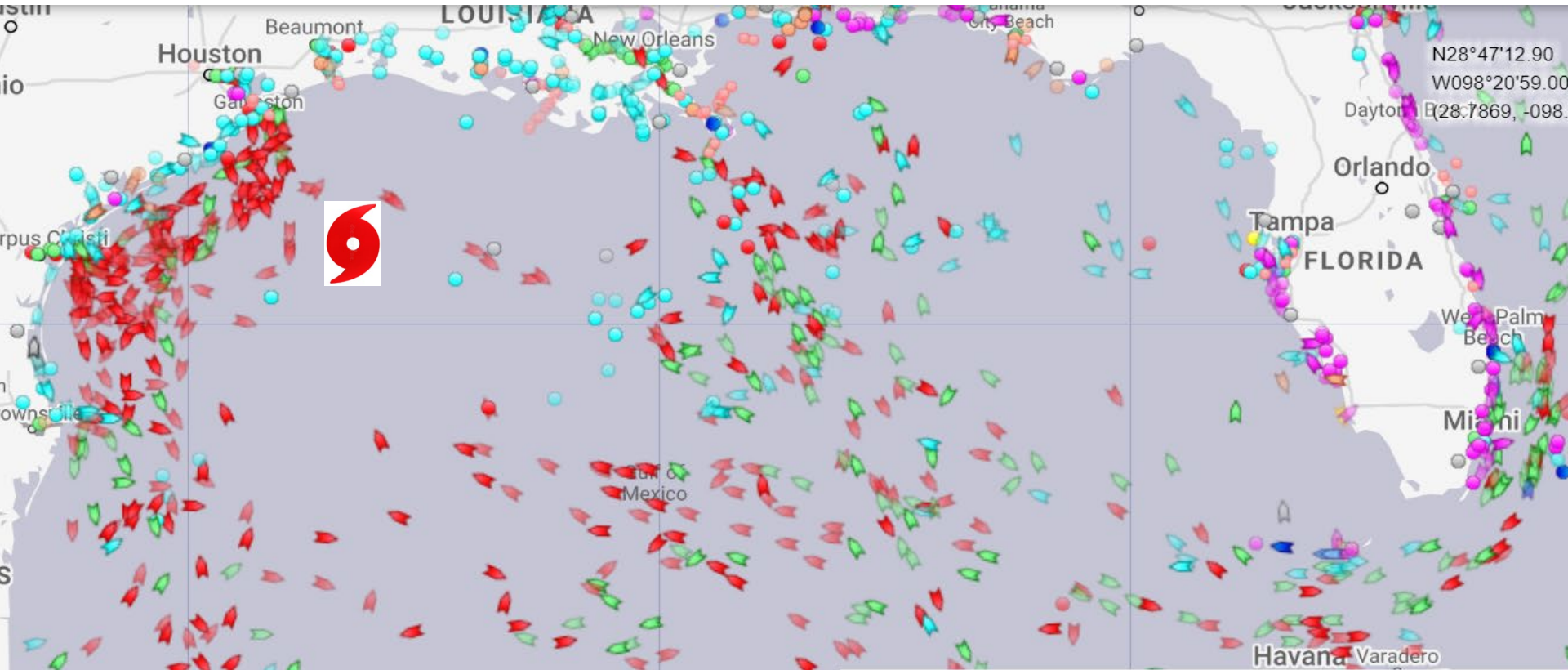
October 8th, 5pm EDT



Hurricane Delta - 2020

Weather Avoidance by Ships

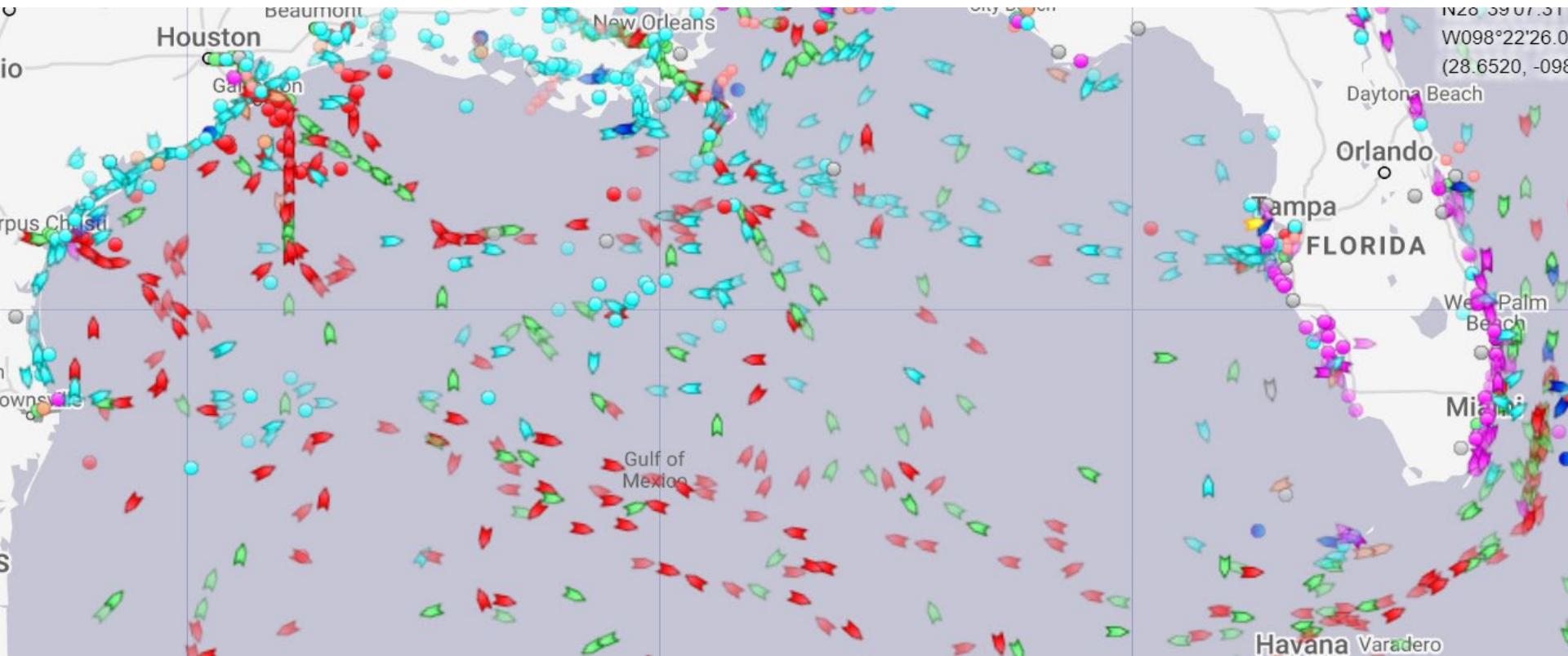
October 9th, 9am EDT



Hurricane Delta - 2020

6
October 10th, 1pm EDT

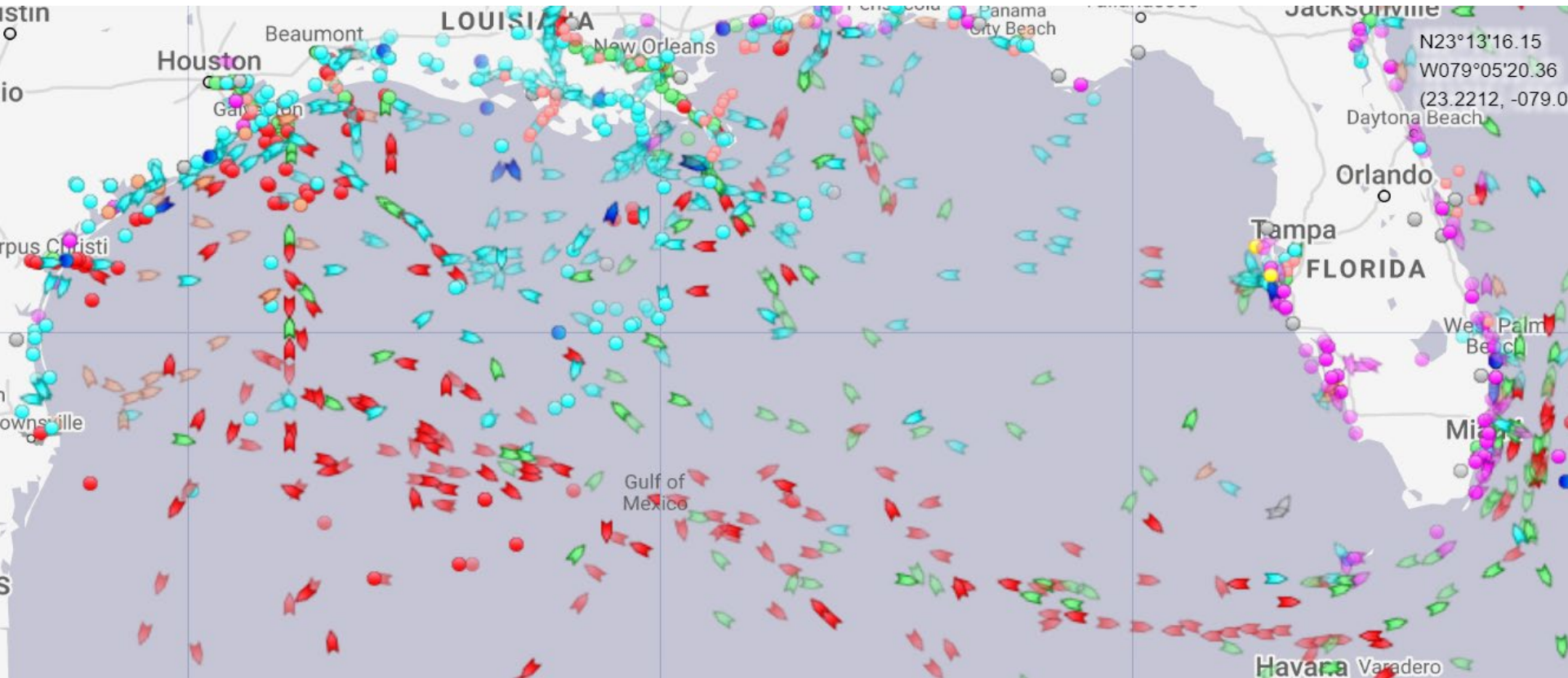
Weather Avoidance by Ships

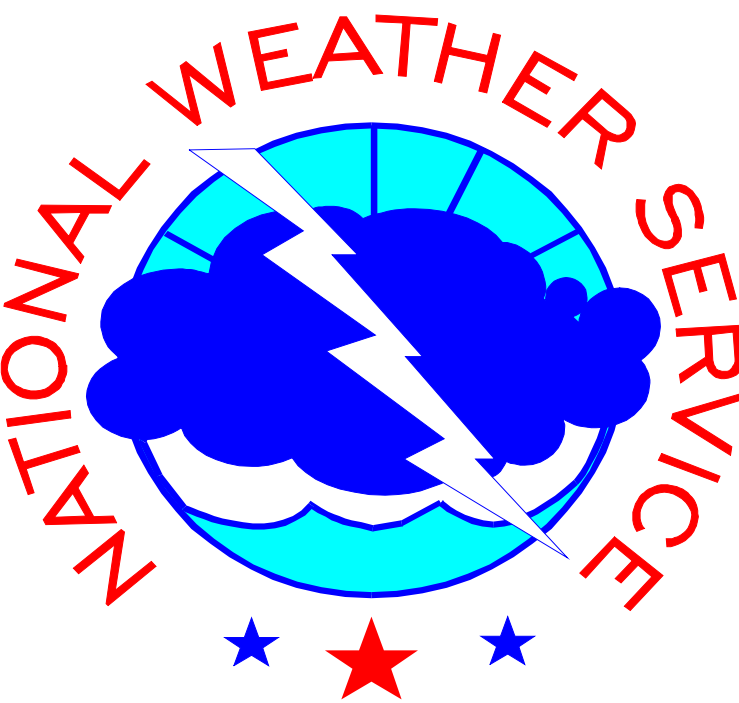


Hurricane Delta - 2020

Weather Avoidance by Ships

October 11th, 7am EDT





**MEMORANDUM OF AGREEMENT
BETWEEN
THE UNITED STATES COAST GUARD
AND
THE NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
REGARDING
THE MANAGEMENT OF MARINE
WEATHER INFORMATION**

APPROVED: 03/30/2020

APPROVED: 3/31/20

Louis W. Uccellini

Louis W. Uccellini
NOAA Assistant Administrator
for Weather Services

RV Timme

Richard V. Timme
Rear Admiral, USCG
Assistant Commandant for
Prevention Policy



2022 Impact-based Decision Support Services to U.S. Coast Guard Districts by Tropical Analysis and Forecast Branch (TAFB)/ National Hurricane Center (NHC)



54 Spot Forecasts by NHC/TAFB for 2022 U.S. Coast Guard District Operations





2022 Impact-based Decision Support Services to U.S. Coast Guard Districts by Tropical Analysis and Forecast Branch (TAFB)/ National Hurricane Center (NHC)



USCG District 8 Hurricane Tabletop Exercise April 20-21, 2022

Planning

- Stephen Konarik led the TAFB team with Andrew Hagen and Amanda Reinhart
- Began planning with USCG District 8 in January 2022
- Two separate, simultaneous hurricanes impacting District 8/Gulf of Mexico (Texas coast and Florida Panhandle/Mobile Bay)
- Alexandria Andonian (Storm Surge Unit) provided the Storm Surge forecasts

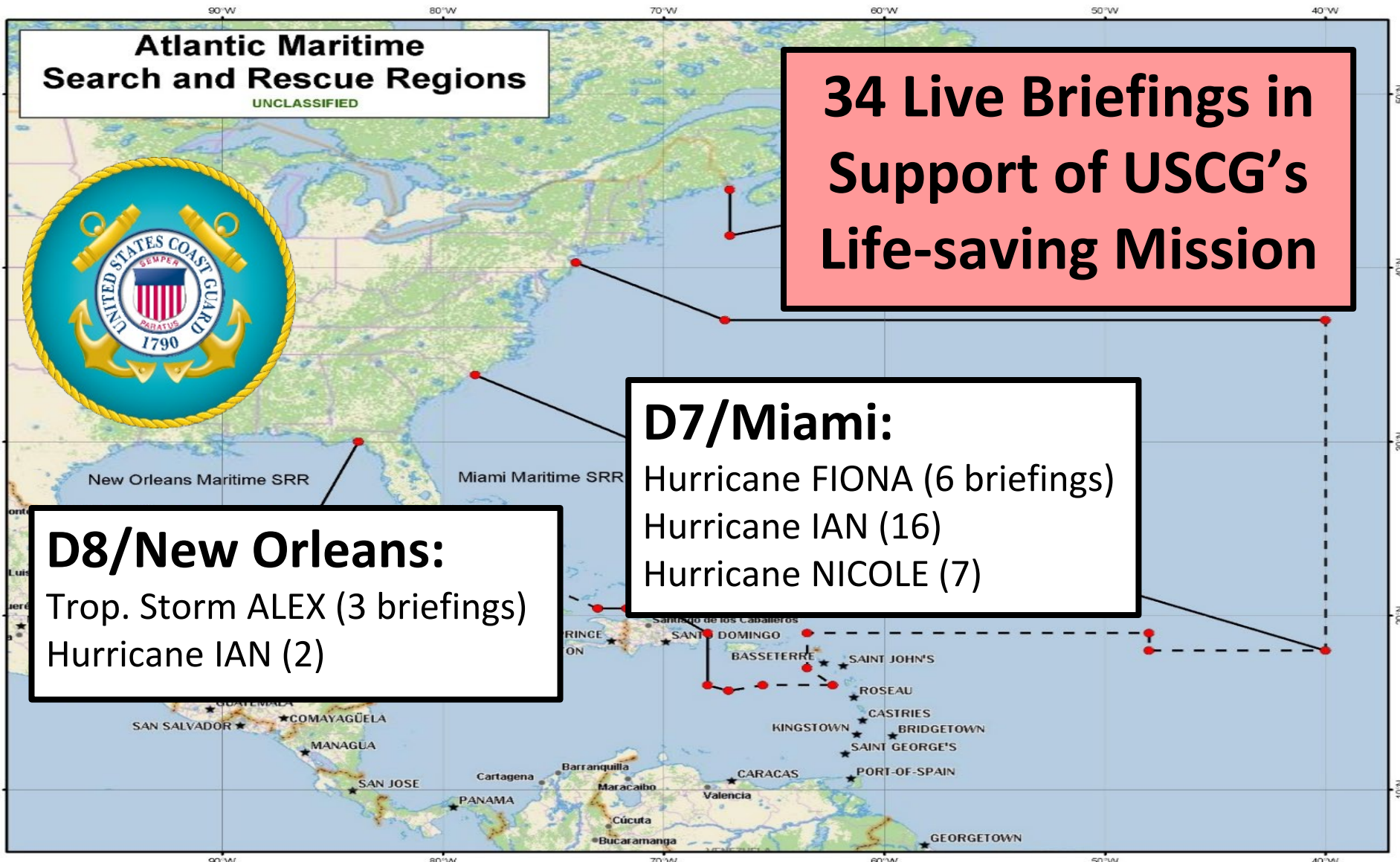
Exercise

- Organized 5 full briefings with each having 2 “mini” briefings within them (24 separate briefings altogether)
- On May 8, Chris Landsea, Stephen Konarik, Amanda Reinhart, Brad Reinhart, and Aidan Mahoney toured D8 facilities in New Orleans and provided additional training





2022 Impact-based Decision Support Services to U.S. Coast Guard Districts by Tropical Analysis and Forecast Branch (TAFB)/ National Hurricane Center (NHC)



Atlantic Maritime Search and Rescue Regions
UNCLASSIFIED



34 Live Briefings in Support of USCG's Life-saving Mission

D8/New Orleans:
Trop. Storm ALEX (3 briefings)
Hurricane IAN (2)

D7/Miami:
Hurricane FIONA (6 briefings)
Hurricane IAN (16)
Hurricane NICOLE (7)

Geographic labels on the map include: SAN SALVADOR, COMAYAGÜELA, MANAGUA, SAN JOSE, Cartagena, PANAMA, Barranquilla, Maracaibo, Cúcuta, Bucaramanga, Valencia, CARACAS, GEORGETOWN, PORT-OF-SPAIN, SAINT GEORGE'S, BRIDGETOWN, CASTRIES, ROSEAU, SAINT JOHN'S, BASSETERRE, SANTO DOMINGO, and Santiago de los Caballeros.



USCGSoutheast
@USCGSoutheast

.@USCGSoutheast cutters are strategically placed in the #FloridaStraits to respond to offshore search and rescue while avoiding the worst of Hurricane #Ian. #DontTakeToTheSea #SAR



3:57 PM · Sep 28, 2022



USCGSoutheast
@USCGSoutheast

In just 1 week, @uscg members rescued 1,007 Floridians in distress following #HurricaneIan.

We are grateful for the support from units across @uscglantarea & @uscgpacarea that surged into Florida to help. We continue to assist federal, state & local partners in recovery efforts.



4:58 PM · Oct 7, 2022

2022 Impact-based Decision Support Services to U.S. Coast Guard Districts by Tropical Analysis and Forecast Branch (TAFB)/National Hurricane Center (NHC)

Hurricane Ian

NHC/TAFB provided 18 live briefings to US Coast Guard Districts 7 (Miami) and 8 (New Orleans)

“NHC team,



The forecasts and support you and your team provide [during Hurricane Ian] were excellent and were heavily relied on to make operational decisions to move aircraft and cutters. The flexibility of your team to meet CG meeting schedules was greatly appreciated.

Once again NHC has exceeded expectations and enabled the Coast Guard to make informed decisions to best protect resources and respond to those in distress. Thank You”

CAPT Aaron Ortenzio
CG District Seven Chief of Incident Management

TROPICAL ATLANTIC MARINE WEATHER BRIEFING



Sunday, January 1, 2023

VALID THROUGH Friday, January 6

Prepared by:
Dylan Flynn

*Tropical Analysis and Forecast Branch
NWS National Hurricane Center*



Play (k)

0:21 / 5:34

Tropical Atlantic Marine Weather Briefing - January 1st, 2023

[NHC/TAFB Marine Briefings](#)

Notification by email or
twitter.com/NHC_TAFB

National Hurricane Center/Tropical Analysis and Forecast Branch

<https://www.nhc.noaa.gov/marine/?atlc>

1-305-229-4424 –Atlantic/Gulf/Caribbean 1-305-229-4425 –Pacific Twitter: [@NHC_TAFB](https://twitter.com/NHC_TAFB)





NOAA

Equitable Services for a Weather-Ready Nation

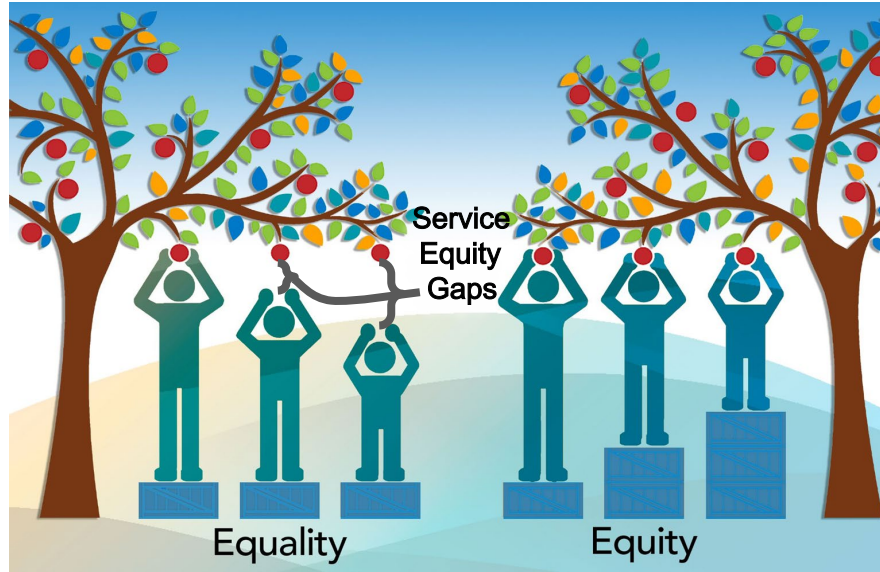
*NOAA Hurricane Preparedness Summit
April 19, 2023*

Dr. Stephan Smith,
Director, NWS Office of Science and Technology Integration



Equitable Services for a Weather-Ready Nation

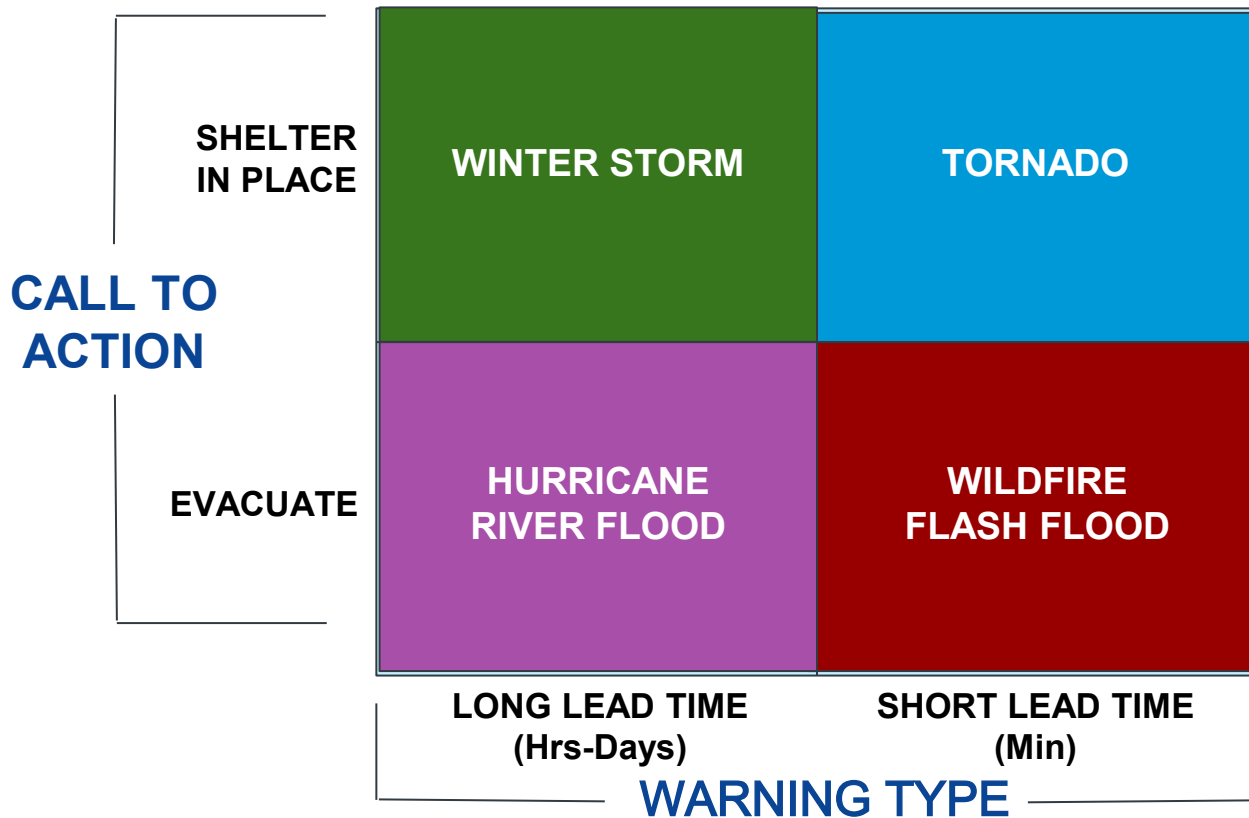
“Building a Weather-Ready Nation, One Community at a Time”



“One-Size” Services
□ Unequal Outcomes

Equitable Services □
Equality of Outcomes

Transforming Services from (One-Size-Fits-All) HAZARDOUS WEATHER & FLOOD PROTECTION MATRIX



CORE ASSUMPTIONS:

1. People can receive the warning
2. People can understand the warning
3. People can act upon the warning
4. People are able and willing to evacuate
5. People have a safe shelter

Delivering Our Services Equitably is Core to the NWS Mission



SPECIAL REPORT **NEWS**
U.S. NEWS

Ian was one of the most lethal hurricanes in decades. Many of the deaths were preventable.

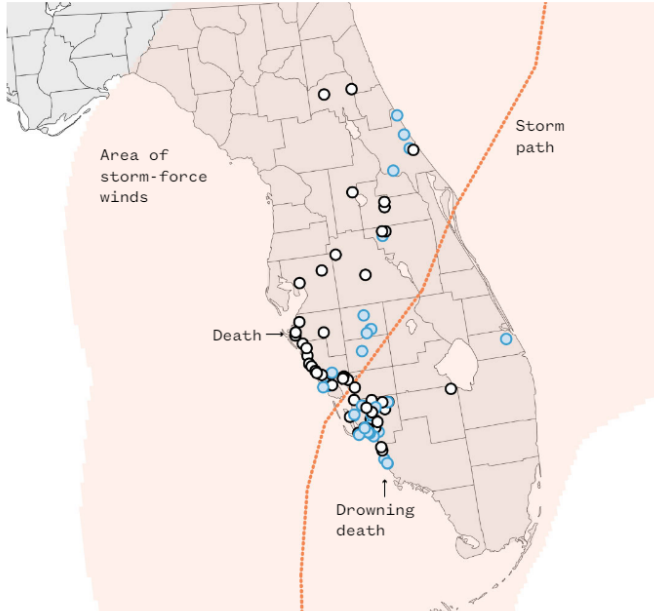
Hurricane Ian illustrated the challenges of protecting densely populated waterfront communities and exposed shortcomings in how local governments respond, an NBC News investigation found.

Vulnerable and overlooked, many older people stayed home



Where Hurricane Ian killed

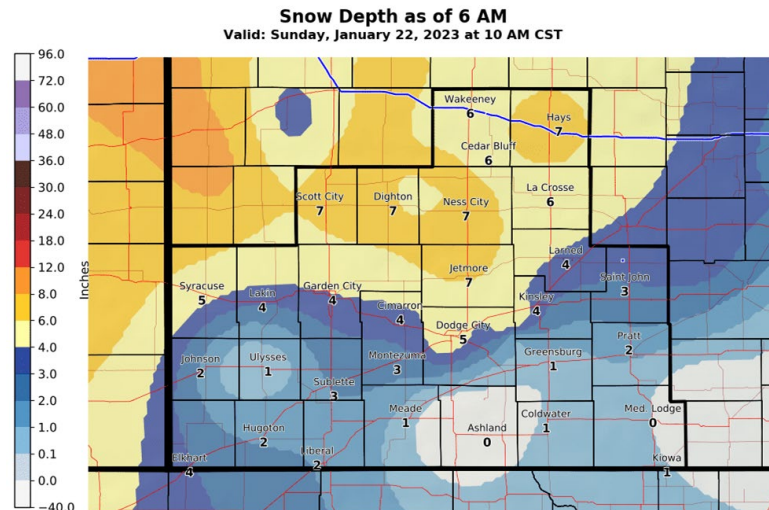
More than 140 people died because of Hurricane Ian. Here is where 86 of those deaths took place.



Source: Staff reporting, Florida Department of Law Enforcement
Graphic: Nigel Chiwaya / NBC News

Snow Storm Impacting an Indigenous Guatemalan Event in Dodge City, Kansas (January 23, 2023)

- Alce Su Voz (“Speak Out”) had been planning for several months to hold a meeting in Dodge City, KS, on Jan 23 with 50-60 local community members plus about 10 facilitators, interpreters, community health workers & liaisons.
 - Main audience was indigenous Guatemalan immigrants who speak primarily Mayan dialects. Many participants would be driving 1 to 2.5 hours to attend.
- On Jan 18, the Dodge City NWS office alerted Alce Su Voz that expected snowfall totals had dramatically increased over previous forecast cycles - they were now expecting 6-8” at Dodge City the day of their event
- **Alce Su Voz made the decision to cancel the event.**
- Forecast snowfall totals verified. Highway conditions surrounding Dodge City were treacherous that entire day.
- This was the biggest snow storm of the season so far for Dodge City.
- **Alce Su Voz told NWS, “It was very helpful to have your input”**

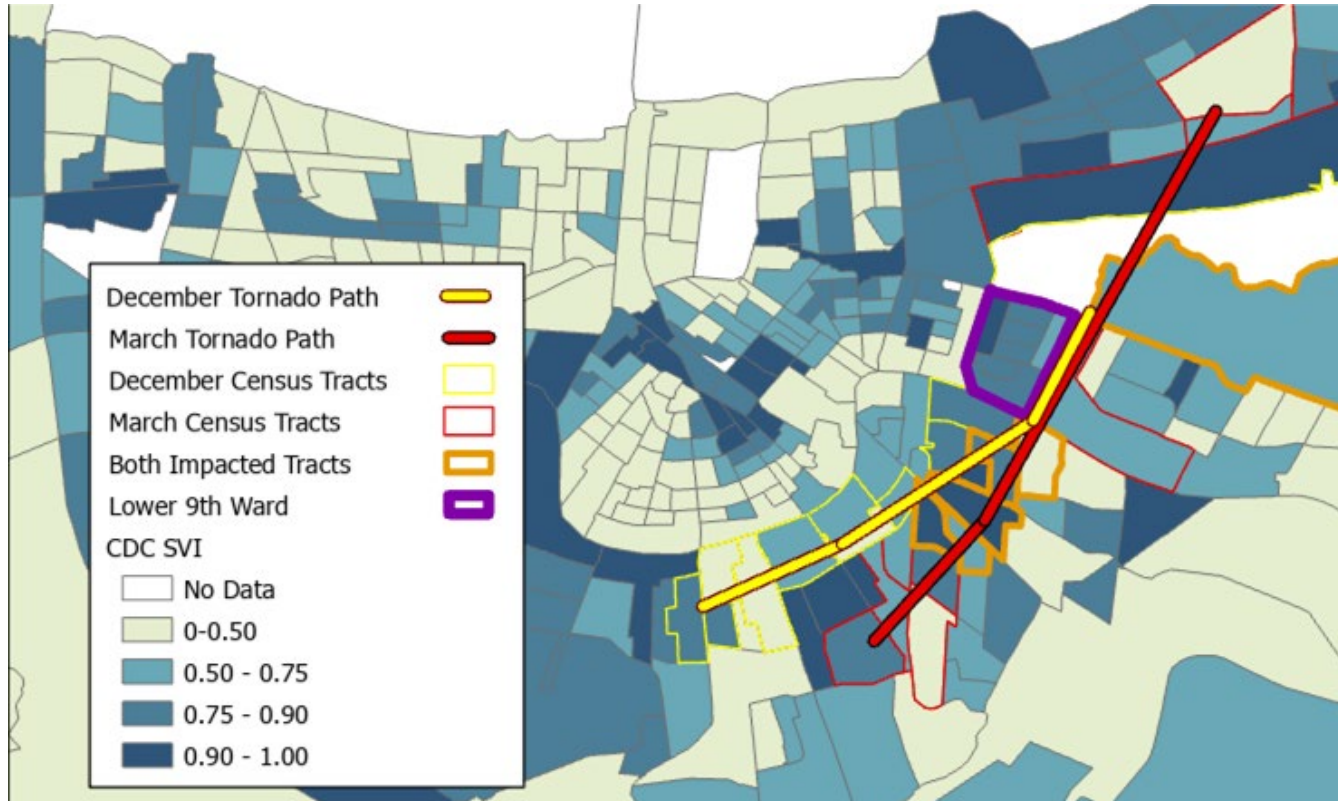


National Weather Service
Dodge City Kansas
01/22/2023 10:05 AM CST

Follow Us:   
weather.gov/ddc

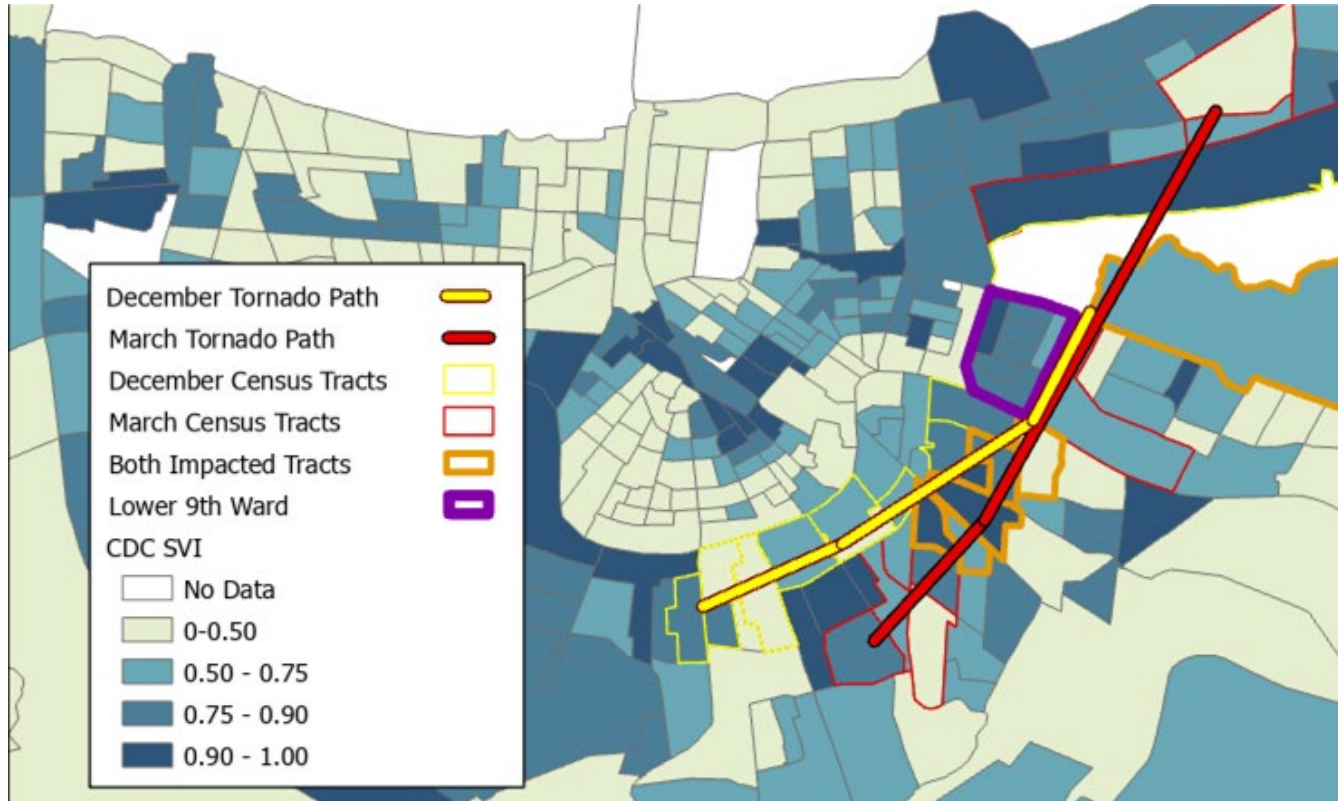
Case Study: Arabi, LA Tornadoes

March 22 and December 14, 2022



Case Study: Arabi, LA Tornadoes


March 22 and December 14, 2022




Flash Flood Emergency


Valid Until
11:00 PM EDT Wednesday
April 12, 2023

Safety Information

 Move immediately to higher ground!

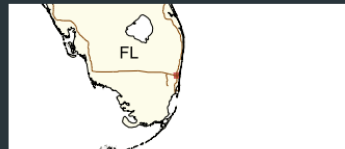
 Avoid walking or driving through flood waters!

Potential Exposure

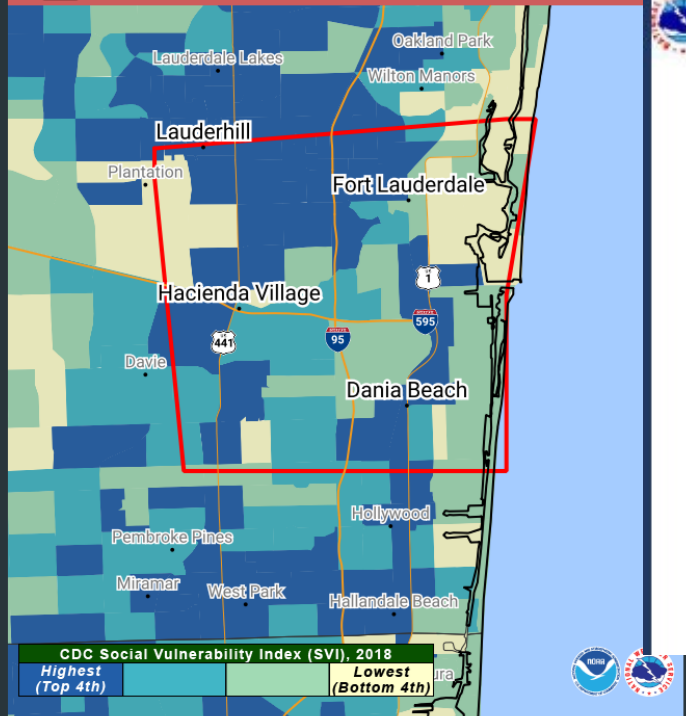
 Population: 255,690
Schools: 57
Hospitals: 5

Social Vulnerability Index

 SVI Max: 0.9928
SVI Min: 0.0025
SVI Avg: 0.5851



 This is a life threatening situation. Seek higher ground now



NWS Miami @NWSMiami · 1m

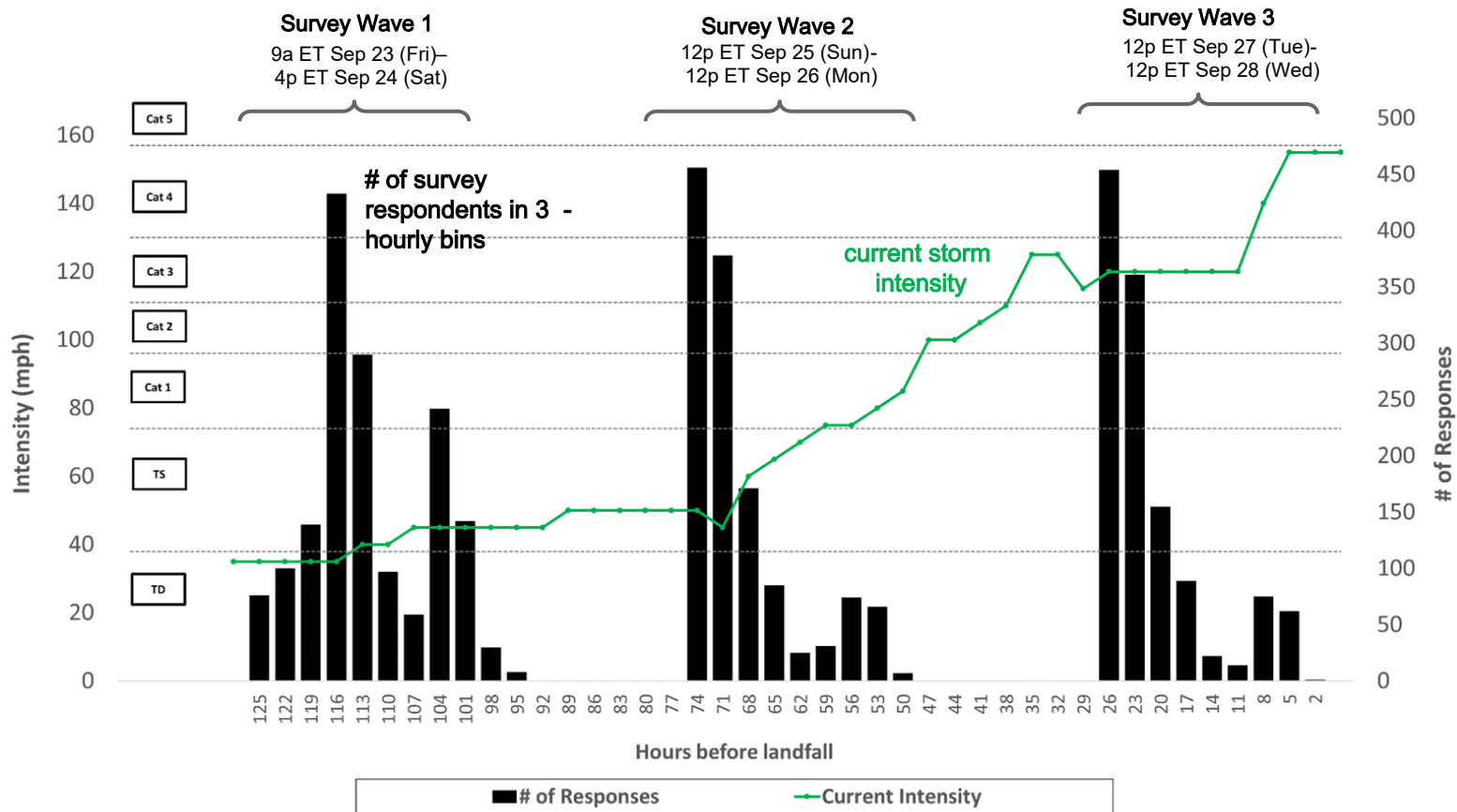
From the FLL airport. It's a dangerous situation around the Fort Lauderdale area this evening. Please stay home and don't venture out. #TurnAroundDontDrive #flwx

Brooke Silverang @WPBF_BROOKE · 3m

Fort Lauderdale Airport (pics from a friend of a friend) @NWSMiami

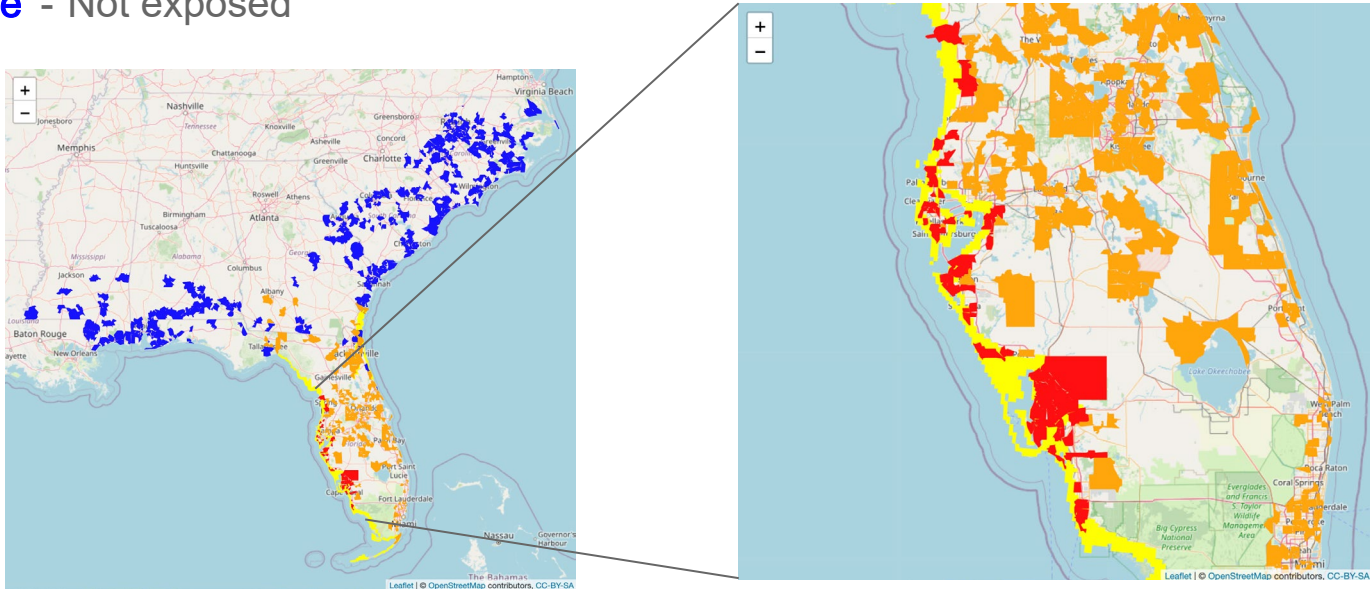


Timeline of survey waves for Ian (2022)



Exposure levels: To look at highest risk areas

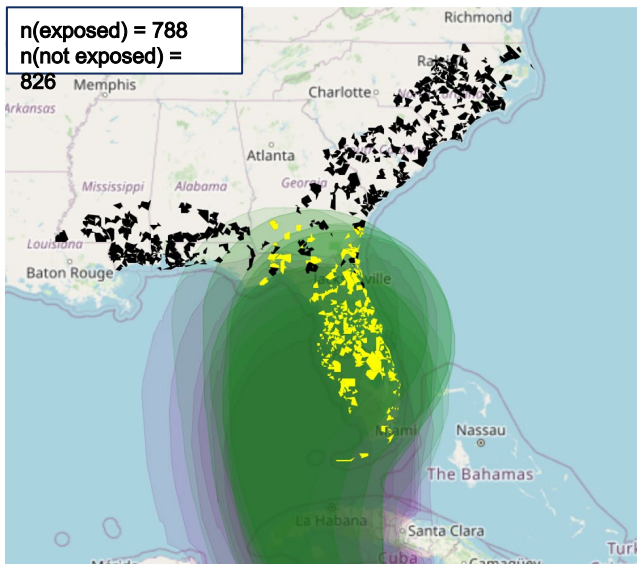
- **In red** - West Florida who were in a storm surge watch or warning at any time (**WFL SSWW**)
- **In orange** - All other exposed (cone, TS-force wind speed probabilities, hurricane or TS watch or warning), mutually exclusive from WFL SSWW
- **In blue** - Not exposed



Exposure levels: Exposed vs. not

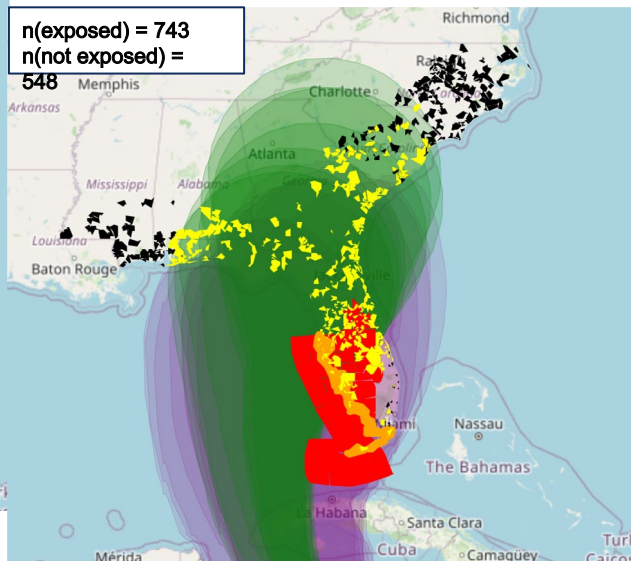
Wave 1 survey

9a ET Sept 23 (Fri)- 4p ET Sept 24 (Sat)



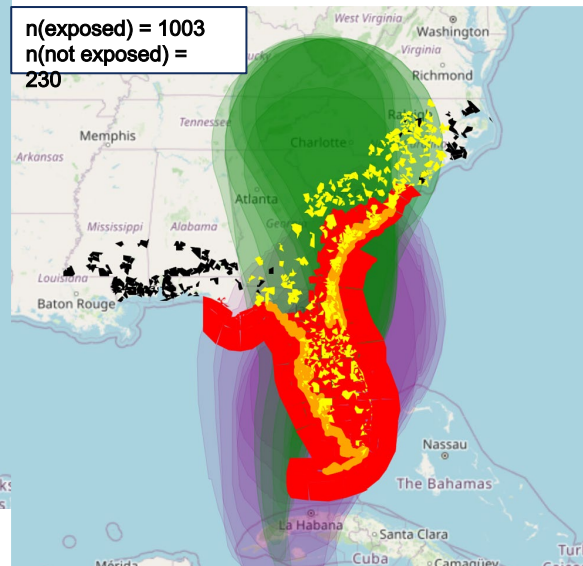
Wave 2 survey

12p ET Sept 25 (Sun)- 12p ET Sept 26 (Sun)



Wave 3 survey

12p ET Sept 27 (Tues)- 12p ET Sept 28 (Wed)



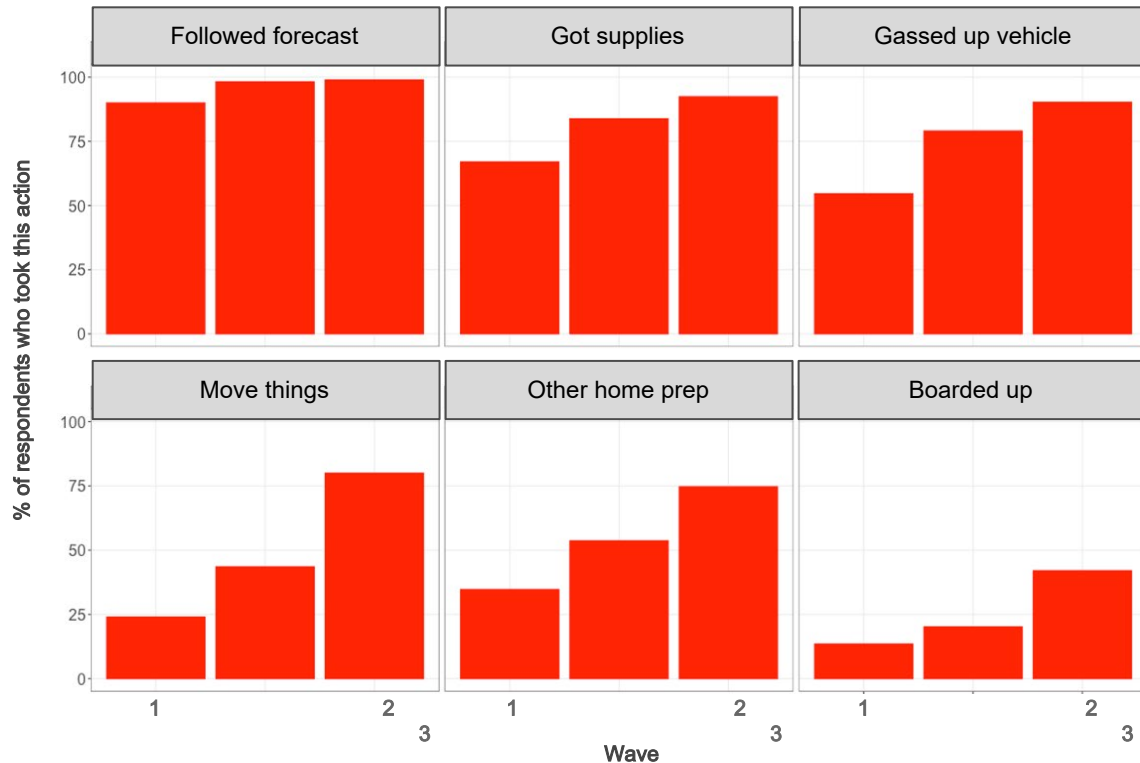
Green = Cone
Purple = WSP34kt > 30%

Red = TS or hurricane watch/warning
Orange = Surge watch/warning

Yellow = Exposed
Black = Not exposed

TS = tropical storm
WSP = wind speed probability

Focusing on WFL SSWW subset: Actions taken (% of respondents)



Key takeaways

- Following the forecast for updated information is a critical action taken by nearly everyone
- Most people get supplies, gas up vehicles by Waves 2 and 3
- $\frac{3}{4}$ or more of people took more effortful actions of moving things and home prep by Waves 2 and 3
- ~40% of people boarded up by Wave 3



Thank You!
Questions?

Hurricane Ian: Lessons Learned

The National Weather Service Florida Keys Perspective

Jonathan Rizzo
Warning Coordination Meteorologist
NOAA / NWS Florida Keys



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Recognizing Challenges & Developing Messaging Solutions

- Challenges in communicating potential storm surge in the Florida Keys
- Tropical storms: More variation than most Saffir Simpson Hurricane Wind Categories
- Vulnerable populations: Not just for landlubbers
- Preparation message development for liveaboards

Hurricane Ian Recap – Florida Keys

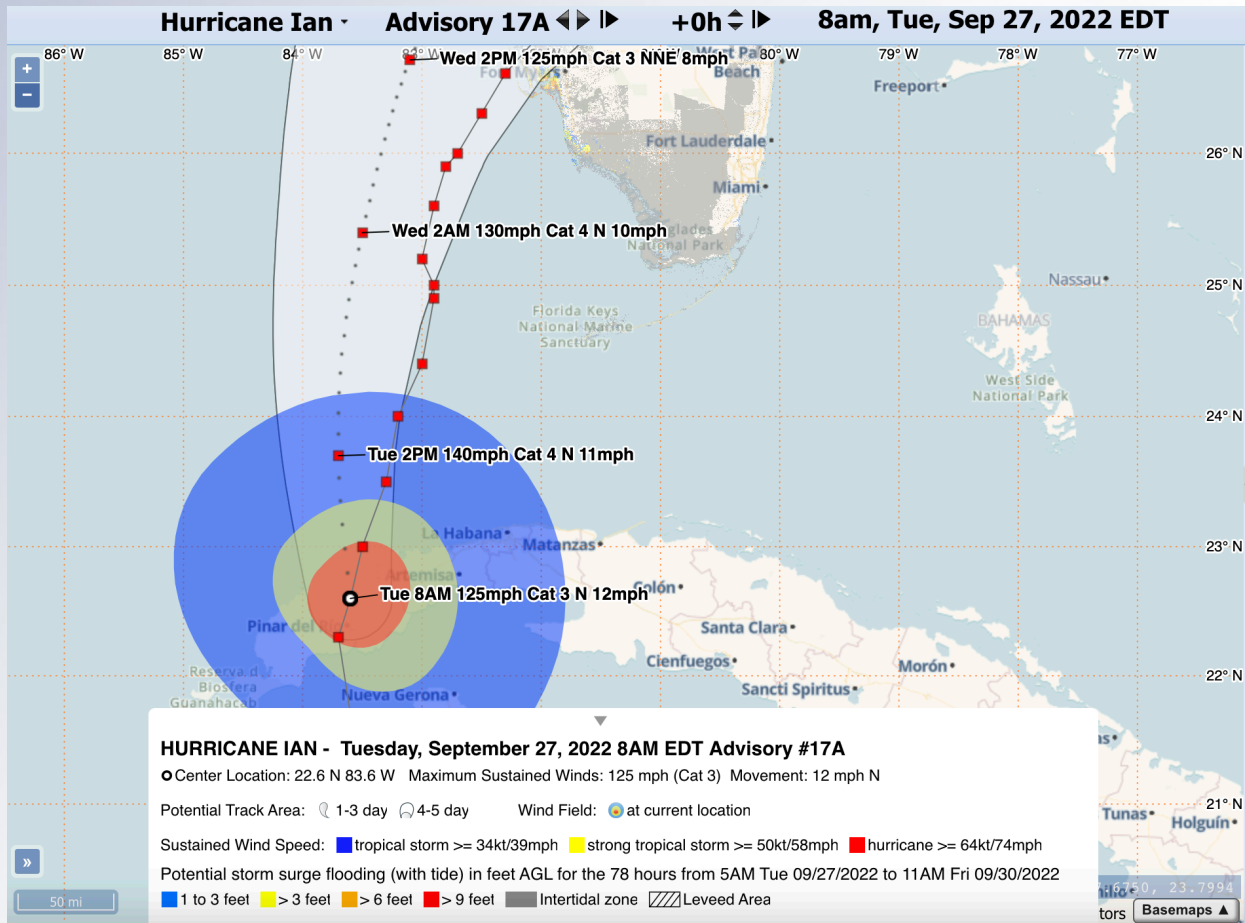


Public focused on the “track cone” and NOT on the warnings nor potential threats

Even threats and warnings are not the “whole story”

RISK, which includes THREAT + VULNERABILITY, must be included, and this will be different for each resident and business owner

Hurricane Ian Recap – Florida Keys

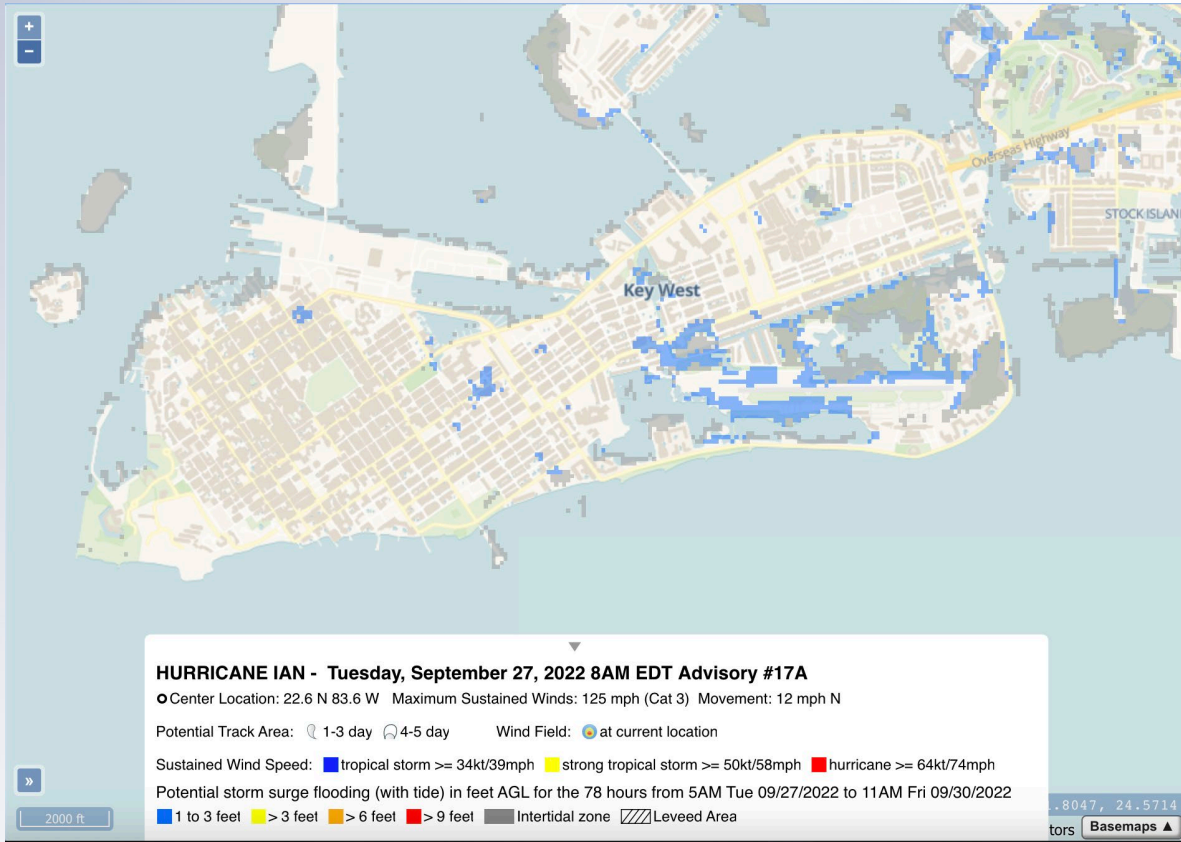


Note the actual track (ahead) – solid line with red boxes – strays outside the track cone.

All this means is that Ian took the 1/3 chance of leaving the forecast cone.

Ian's center and radius of hurricane-force winds passed closer to the Florida Keys than had been forecast as of early Tuesday morning

Limitations of Potential Storm Surge Maps over Complex Terrain



Potential Storm Surge Flood Map
(Top 10% probability of forecast
water level height)

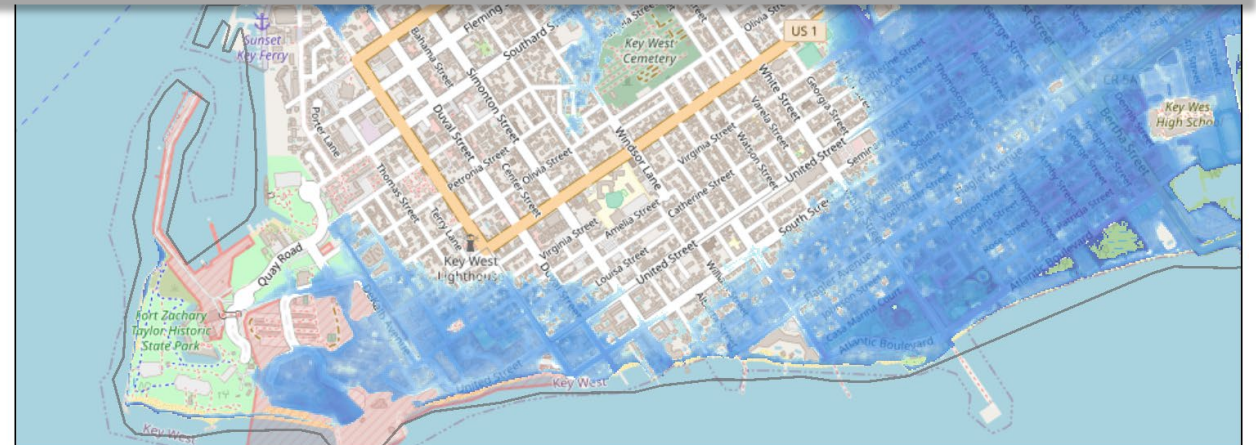
1 to 3 feet was indicated – but did
not indicate much flooding much of
the south central / southwest part of
Key West

Representing the Surge via “Out-of-the-Box” Means

NOT AN ACTUAL IAN SURGE OBSERVATION MAP!!

“Kludge” from Sea Level Rise Scenario for 4.3 feet above Mean Higher High Water

Photo Below: David Ross, NWS Florida Keys



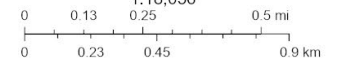
October 25, 2022

SLR Depth Inches (2070 N5) Low : 0

High : 102

RSLR by County (2070 N5)

1:18,056



© OpenStreetMap (and) contributors. CC-BY-SA

Me
Copyright 2016

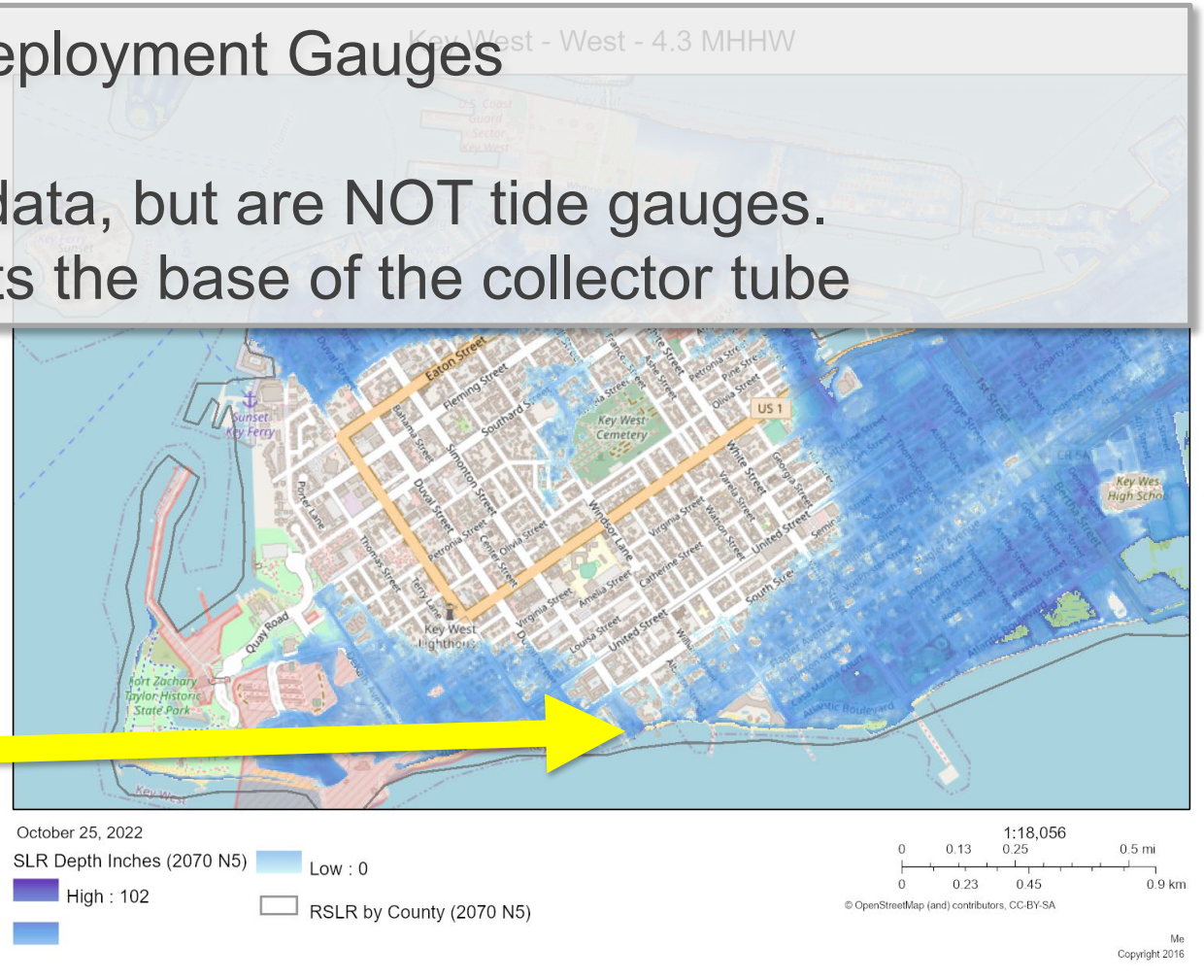


Representing the Surge via “Out-of-the-Box” Means

USGS Rapid Deployment Gauges

Can provide near-realtime data, but are NOT tide gauges. They activate when water hits the base of the collector tube

The Simonton Street Rapid Deployment Gauge (RDG) activates at a water level of 3.1 NAVD88



Learning from Offshore Measured Sea Heights

Station 42095 - Satan Shoal, FL (244)

Owned and maintained by [U.S. Army Corps of Engineers](#)

Data provided by [Scripps Institution of Oceanography](#)

Waverider Buoy

24.407 N 81.967 W (24°24'26" N 81°58'1" W)

Site elevation: sea level

Air temp height: 2 m above site elevation

Sea temp depth: 0.46 m below water line

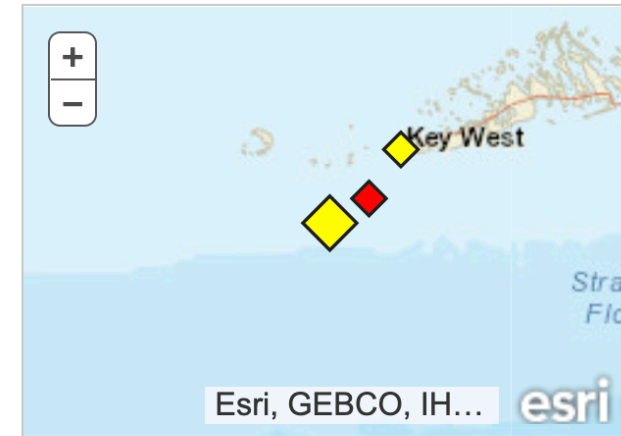
Water depth: 99.1 m

[Latest NWS Marine Forecast](#)

[Search And Rescue \(SAR\) Data](#)


[Meteorological Observations from Nearby Stations and Ships](#) 

Map Type:




Large icon indicates selected station. [Disclaimer](#)

 Stations with recent data

 Stations with no data in last 8 hours
(24 hours for tsunami stations)

Peak significant wave height (highest 1/3 of waves) of 26 feet with a dominant period of 10 seconds from 187 degrees (just west of due south) at 10:00 pm EDT Tuesday Sep. 27th

This was within one hour of the day's higher high tide – 2 days past the new moon phase (spring tide) – a “perfect storm” to maximize water level



Until USGS Coastal Run-Up and Dune/Barrier Breach Modeling is Complete for the Florida Keys...

Use of Sea Level Rise (SLR) potential maps as internal “kludges” to help communicate potential flood depth for at-risk communities

The meaning of measured sea heights at Satan Shoal when directed towards Key West – do we consider adding 1/10 the *forecast* sea height as a reasonable top 10% “enhancement” of south shore water level?

CAUTIONS: In lieu of a forecast flood map, the kludges themselves are hazardous for public consumption without having in-person, subject matter expert providing context for decision-makers.

They *may* have use for tactical weather intelligence references, and more for municipality or military installation rather than county-wide use.

Tropical Storms – Wide Variation of Potential Impacts

Category	Sustained Winds
1	74-95 mph 64-82 kt 119-153 km/h
2	96-110 mph 83-95 kt 154-177 km/h
3 (major)	111-129 mph 96-112 kt 178-208 km/h
4 (major)	130-156 mph 113-136 kt 209-251 km/h
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher

The Tropical Storm classification with sustained winds of 39 to 73 mph (a range of 34 mph) makes it one of the largest wind categories outside open-ended Category 5.

Strong tropical storm force winds of 50 knots or greater essentially have hurricane-force wind gusts

Extended duration, such as being outside the eyewall of a major hurricane moving slowly past, will eventually duplicate the damage of a Category 1 hurricane.

It also can move **a lot** of seawater!

Vulnerable Population – Live-aboards



Marine Environment: Increased daily risk due to multiple hazards

Social Isolation: Cultural and geographic

Economic Situation: Boat as affordable housing; multiple jobs

Overlooked: Small percent of population, centered in clusters



Vulnerable Population – Live-aboards

Marine Environment: Increased daily risk due to multiple hazards

Social Isolation: Cultural and geographic

Economic Situation: Boat as affordable housing; multiple jobs

Overlooked: Small percent of population, centered in clusters





Vulnerable Population – Live-aboards

Engagement: Connecting, listening, understanding

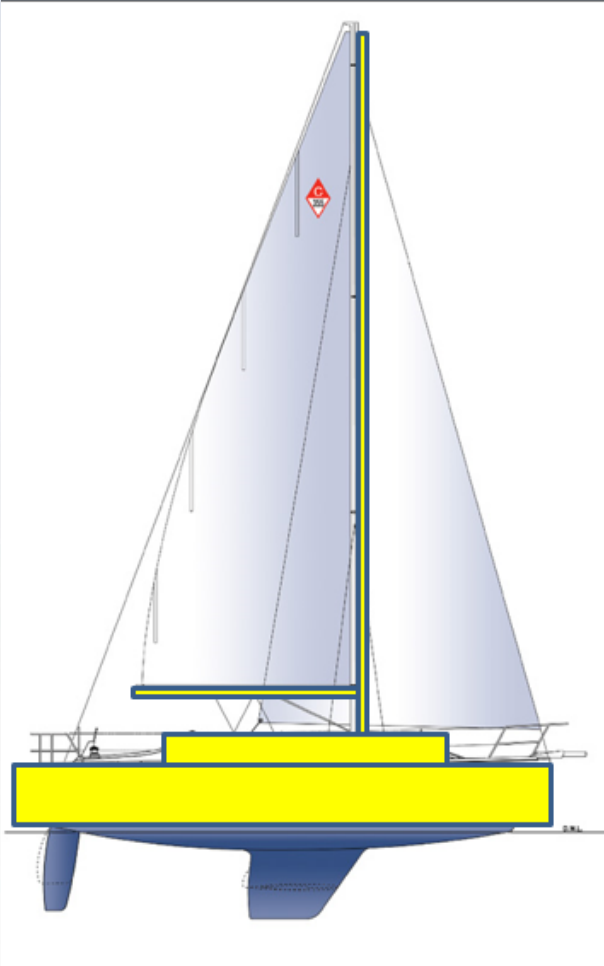
Working with Partners: Establish familiarity, trust, confidence

Science: Education, sharing knowledge; learn; inform

Service: Meet them where they are (NOAA All Hazards Weather Radio-VHF marine radio, low-bandwidth options, information relayed via partner e-mails)

Messaging Initiatives – An Example of Public Seminar Content

A boat is no place to be in a hurricane!



Quick calculations on a standard 36'
Catalina, which weighs 14,000 lbs

Total cross sectional area including mast
and boom: 266 sq.ft

Messaging Initiatives – An Example of Public Seminar Content

A boat is no place to be in a hurricane!

Category 1 force= 7,980 lbs (30lb/ft²)

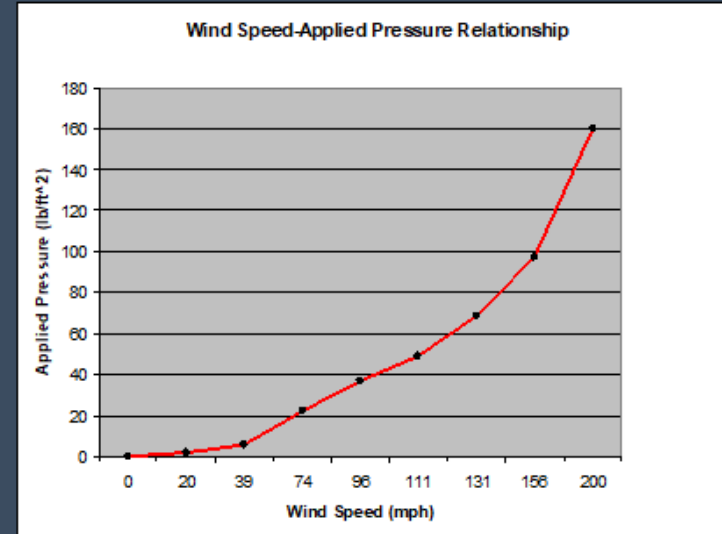
Category 2 force= 13,300 lbs (50lb/ft²)

Category 3 force= 18,620 lbs (70lb/ft²)

Category 4 force= 23,940 lbs (90lb/ft²)

Category 5 force= 34,580 lbs (130lb/ft²)

A Category 2 hurricane's wind force is nearly the weight (14,000 lbs) of the boat!



Messaging Initiatives – An Example of Public Seminar Content

A boat is no place to be in a hurricane!



Messaging Initiatives – An Example of Public Seminar Content

A boat is no place to be in a hurricane!



The square footage of one mast is 48 sq.ft.

A furled jib would nearly equal the cross-sectional area of a mast.

- 1: 1440 lbs
- 2: 2400 lbs
3. 3360 lbs
4. 4320 lbs
5. 6240 lbs

What about fenders, solar panels, biminis, coiled rope, etc.?

Messaging Initiatives – An Example of Public Seminar Content

A boat is no place to be in a hurricane!



Furled jib (48 sq.ft) +
Solar Panel (12 sq.ft) +
Bimini (20 sq.ft) +
Gas Cans (4.5 sq.ft) +
Fenders (4 sq.ft) +
Main (15 sq.ft)
= 103.5 sq.ft of windage

	“Naked” Boat	With Windage
1: 3105 lbs	7,980 lbs	11,085 lbs
2: 5175 lbs	13,300 lbs	18,475 lbs
3: 7245 lbs	18,620 lbs	25,865 lbs
4: 9315 lbs	23,940 lbs	33,255 lbs
5: 13455 lbs	34,580 lbs	48,035 lbs

~40% increase in load!



Key Message Development for Monroe County

Use Trusted Sources of Information: Share & self-police

Connect the 34-knot Time-of-Arrival with 25 knots: EARLIEST REASONABLE arrival time of 34-knot may be the MOST LIKELY arrival time for 25-knot winds. *If it's a 25-knot blow, it's dinghy no-go.*

Preparation: Reduce windage, ensure bilge pumps are functioning, scuppers clean, portholes & windows watertight, chafing gear, have a go-bag, and once the winds are there, no USCG response.

“A Boat is No Place to Ride Out a Hurricane!”

Hurricane Ian: Lessons Learned

The National Weather Service Florida Keys Perspective

Jonathan Rizzo
Warning Coordination Meteorologist
NOAA / NWS Florida Keys



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C: (305) 240-0248



Shannon Davis Weiner, Director Monroe
County Emergency Management

Hurricane IAN – Monroe
County Lessons Learned

HURRICANE IAN-LESSONS LEARNED - TIMELINE

Monday Sept 26th – TS Warning Dry Tortugas – 7 Mile Bridge , Surge Watch issued Card Sound-KW

Tuesday, Sept 27th – General Population Shelter open at noon-KW

Wednesday, Sept 28th – 0200 Hurricane Ian passes the Dry Tortugas 110 knot winds, Surge Warning issued Big Pine Key-Key West

Thursday, Sept 29th 0800 General Population Shelter demobilization



HURRICANE IAN-LESSONS LEARNED - IMPACTS

Wednesday, Sept 28th – Lower Keys event including
electric, down powerlines, trees, surge flooding



HURRICANE IAN-LESSONS LEARNED -COMMUNICATION

Best Information for Decision Making:

Wind, Rain, Surge – Probabilities, maps, visuals, timing

What can we do better?

Public communication – wind, rain, surge “the whole story”

Arrival and departure times

PSA, Social Media, Radio, JIC communications, Mass Notification Systems

Liveboards

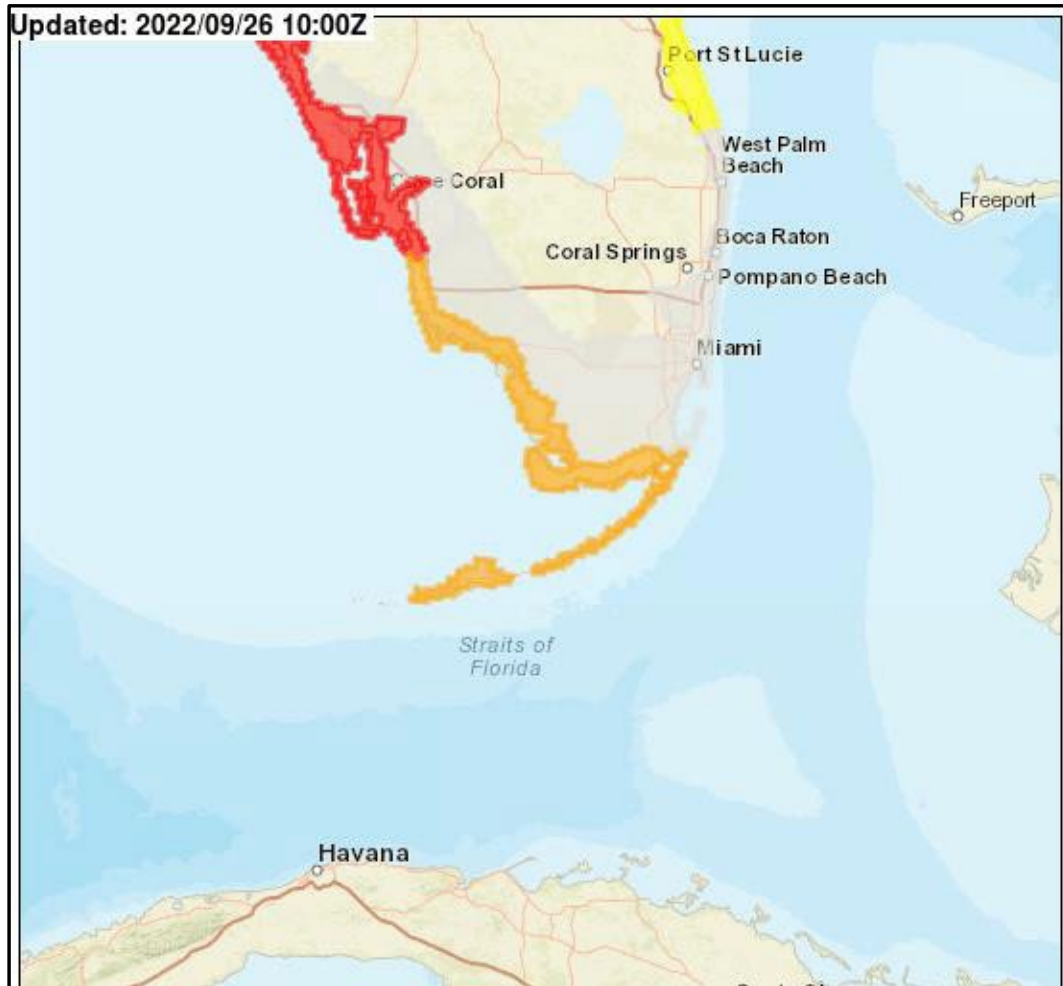
What worked?





Potential Storm Surge Impacts

Hurricane IAN



Storm Surge Threat

Potential for storm surge flooding greater than 9 ft above ground	Potential for storm surge flooding greater than 6 ft above ground	Potential for storm surge flooding greater than 3 ft above ground	Potential for storm surge flooding greater than 1 ft above ground	Little to no storm surge flooding
---	---	---	---	-----------------------------------

Prepare for the potential for significant storm surge impacts from storm surge 1 to 3 feet above normal high tides. This equates to 2 to 4 feet above ground level right at the immediate coast. The highest storm surge will occur **after** Ian has passed the Florida Keys to the west.

Potential impacts include:

- Flooding compounded by wave action, including damage to unelevated (ground slab) homes and businesses. Low-lying coastal streets and roads may be impassable for a few blocks in from shore.
- Major beach erosion.
- Damage to marinas, docks, boardwalks, and piers. Several small craft may break away from moorings, especially where exposed directly to wind and wave action.



Key Points

Hurricane IAN

- A Tropical Storm Warning is in effect for the Lower Florida Keys, from the west end of the Seven Mile Bridge through Key West, and west through the Dry Tortugas.
 - Tropical storm force winds may begin as early shortly after midnight Monday night.
 - Preparations for damaging wind gusts from fast-moving rain squalls should be complete by late Monday evening.
- A Storm Surge Watch is in effect for all of the Florida Keys from Key West to Ocean Reef.
 - There is the potential for storm surge flooding 1 to 3 feet above normal high tides.
 - Note that the highest storm surge is likely to occur well AFTER the center of Hurricane Ian passes west of the Florida Keys Tuesday night over the Gulf and Bayside of the Florida Keys. The Bayside of the Upper Keys possibly could have coastal flooding persisting through Thursday or even Friday morning.
- Hurricane Ian is expected to intensify rapidly for the next day or so, and forecast to become a major hurricane tonight when it is near western Cuba, and well before passing west of the Florida Keys late Tuesday.
- Other potential weather hazards include:
 - Locally flooding rainfall of 4 to 6 inches with isolated higher amounts, falling mainly from later Monday through at least Wednesday
 - The threat of a few tornadoes in rain squalls, mainly from late Monday night through at least Wednesday
- Preparedness actions should be completed by late this evening.

HURRICANE IRMA-LESSONS LEARNED-COMMUNICATIONS



What can we do better?

Public communication – wind, rain, surge “the whole story”

PSA, Social Media, Radio, JIC communications

What worked?

Timing

Evacuation/Re-entry

Mass notification systems





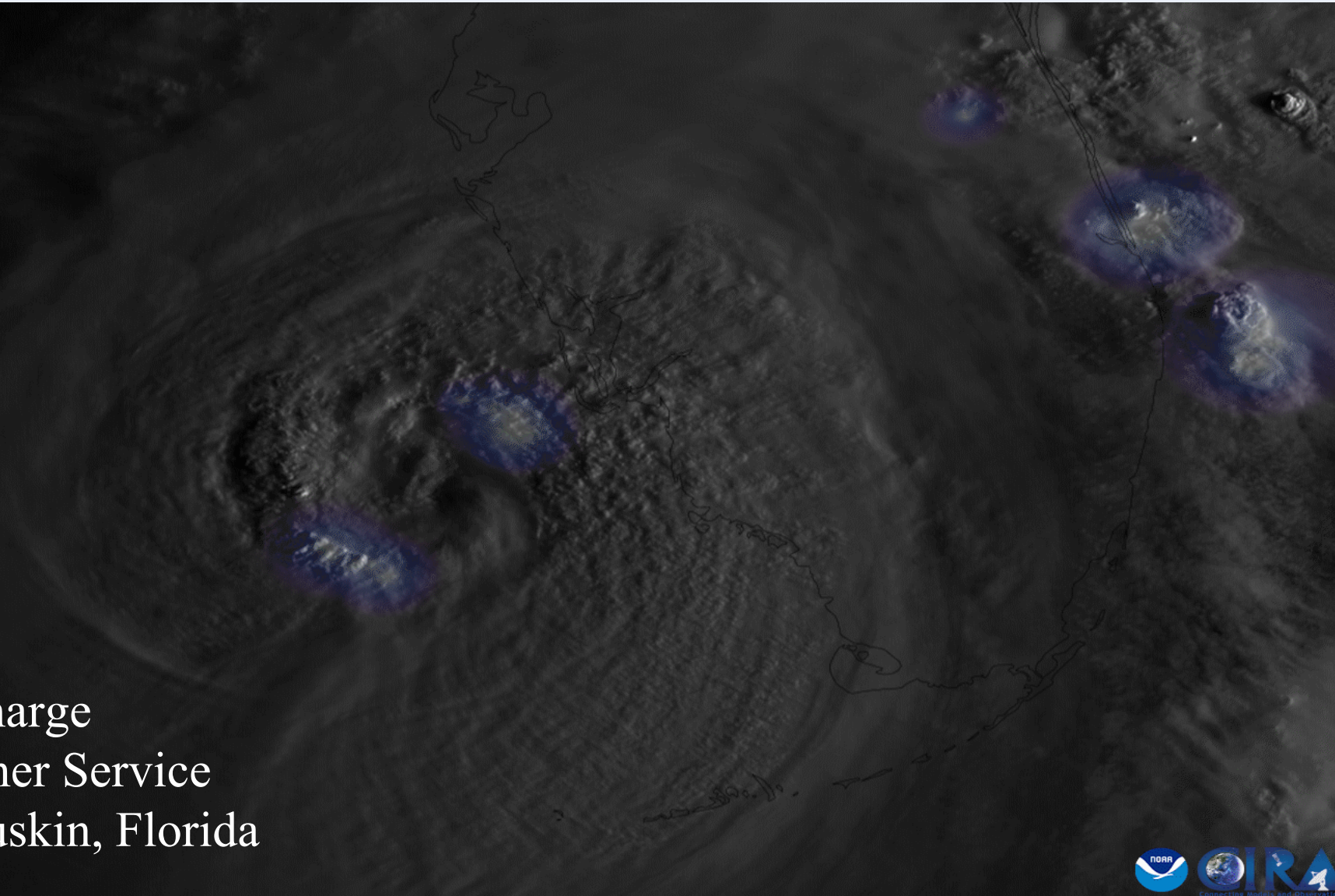
Hurricane IAN – Monroe County Lessons Learned

Shannon Davis Weiner, Director Monroe County Emergency Management

305.797.1167

Weiner-Shannon@monroecounty-fl.gov

Hurricane Ian: Decision Support and Shared Experiences

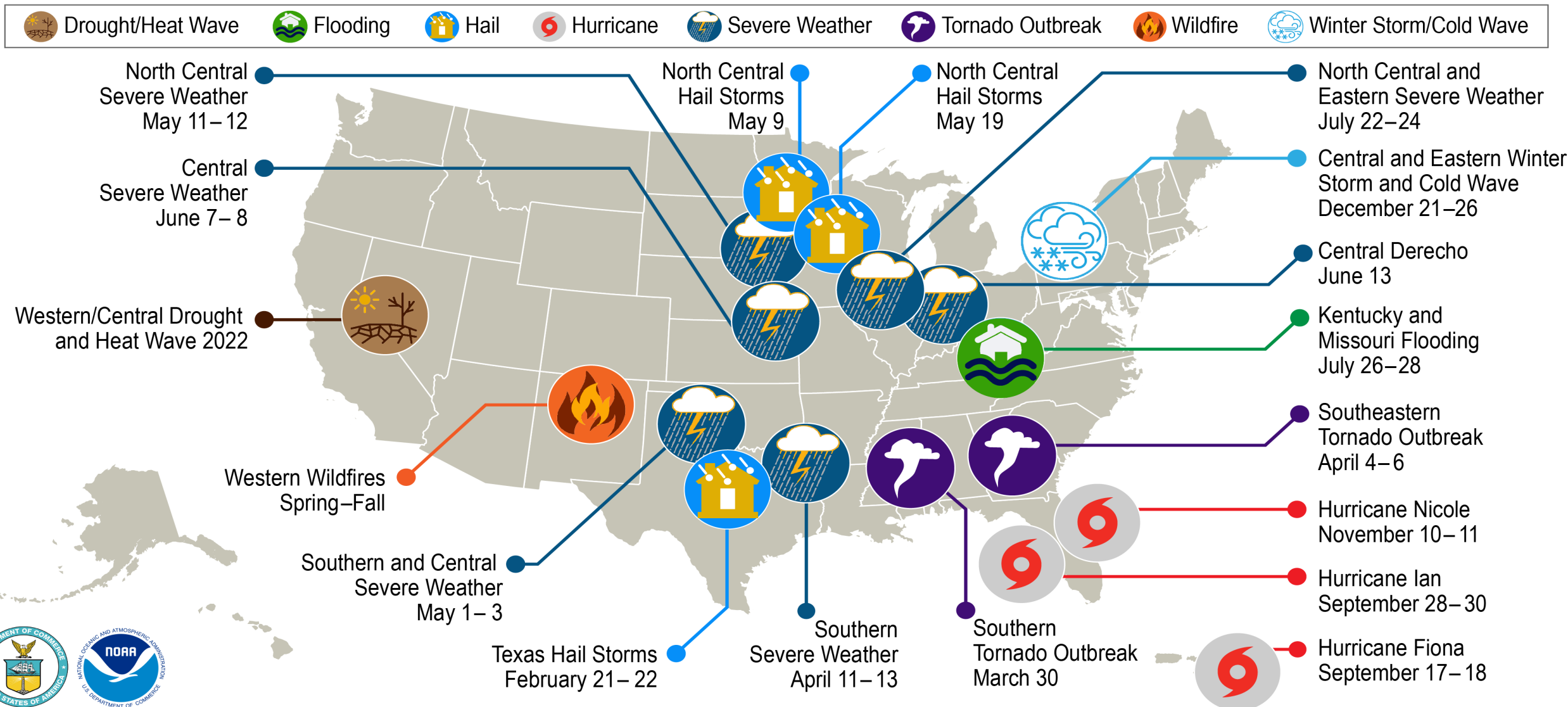


Brian LaMarre
Meteorologist-in-Charge
U.S. National Weather Service
Tampa Bay Area/Ruskin, Florida



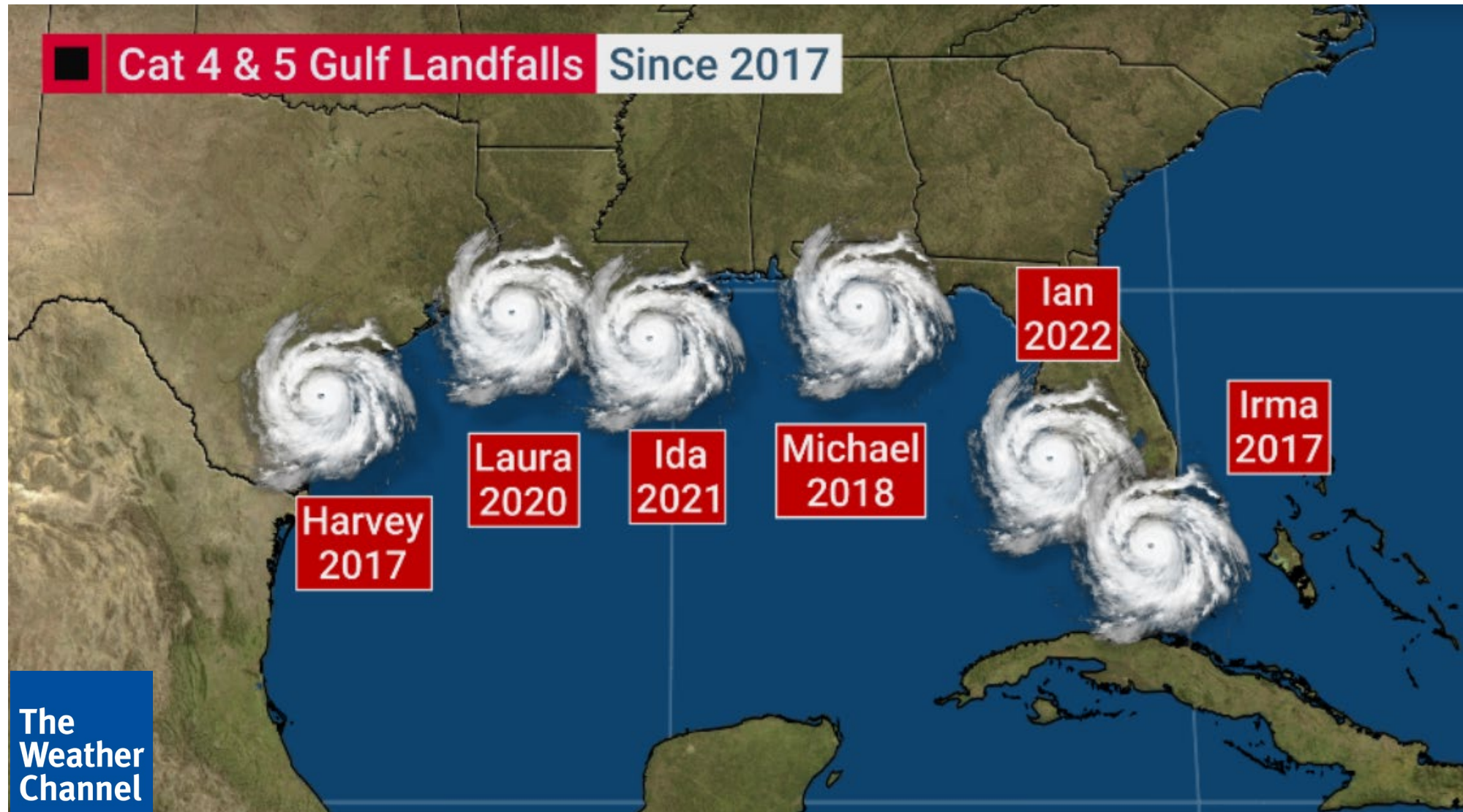
2022 Billion-Dollar Weather Disasters: 18 Disasters

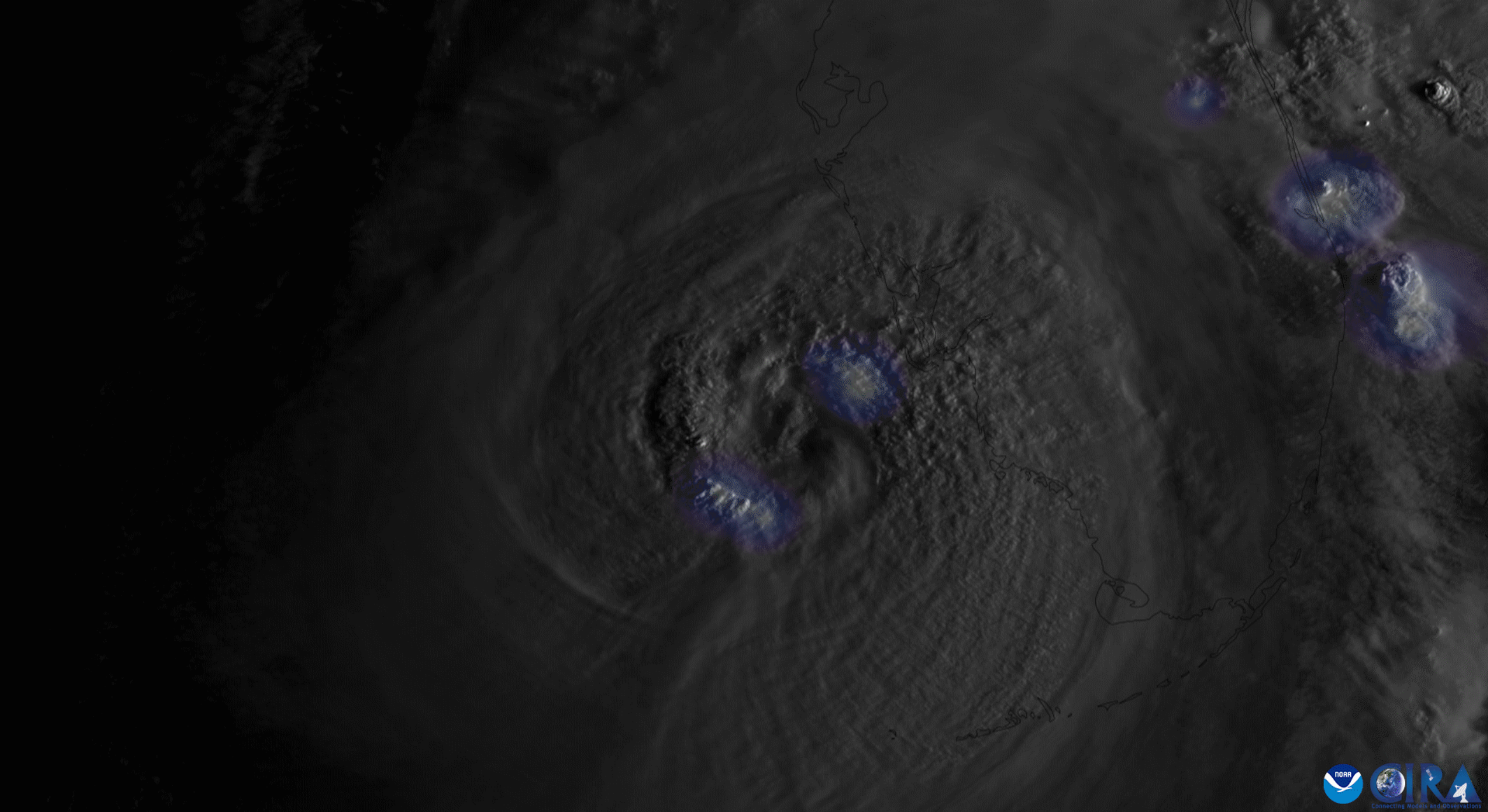
U.S. 2022 Billion-Dollar Weather and Climate Disasters

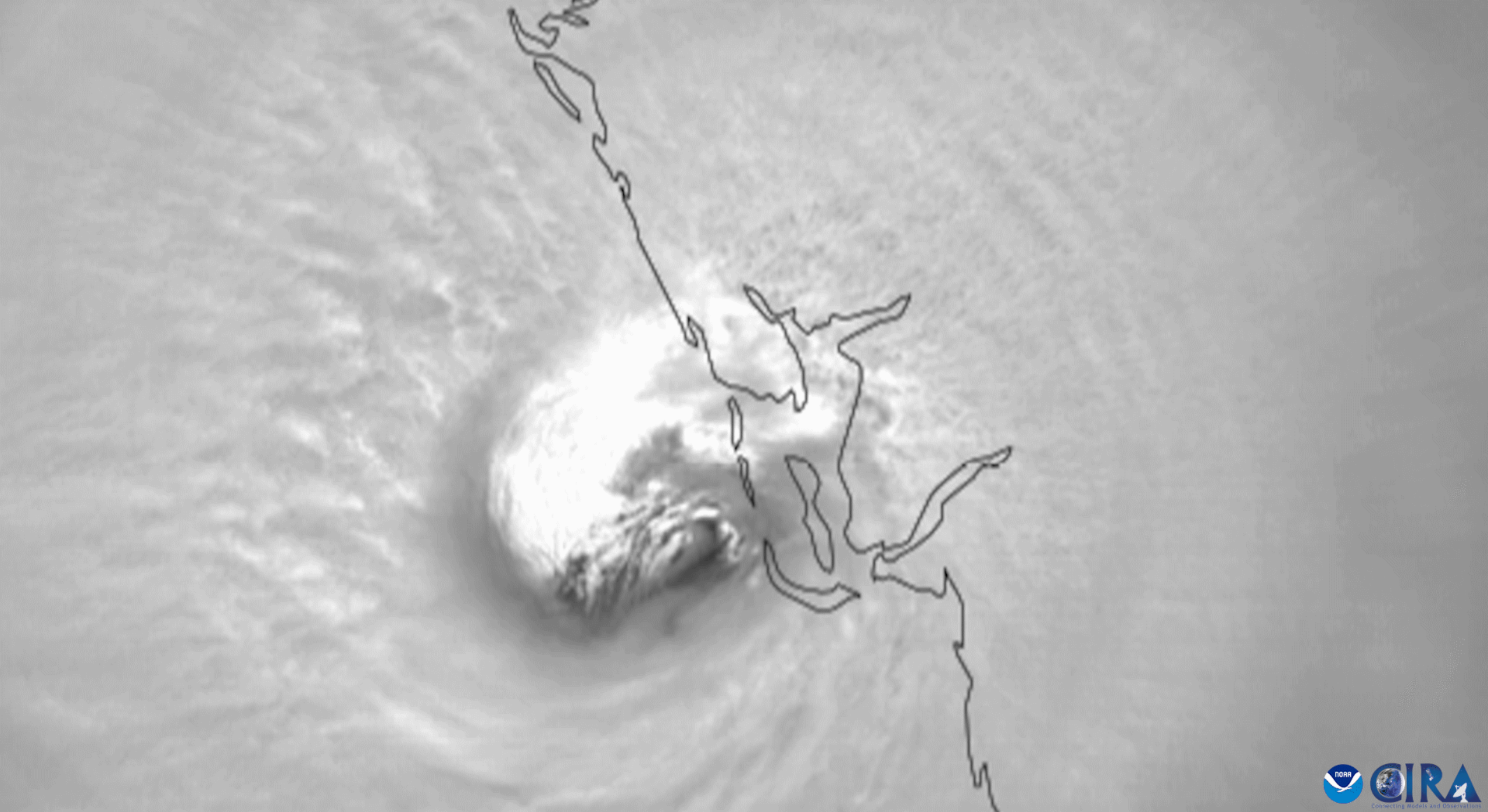


This map denotes the approximate location for each of the 18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.

Gulf of Mexico: Category 4 and 5 Hurricanes Since 2017



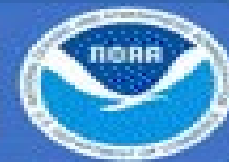






Hurricane Ian – 28 September 2022

1:30 – 4:00 PM EDT



weather.gov/tampa



@NWSTampaBay



@NWSTampaBay

Weather Decision Support Services

Table-Top Exercises
Severe Weather Drills
Tropical Classes
Safety Expos



Threat Identified & Monitored
Resource 'Shuffle' & Engagement
Shelter Considerations
Structure Protection
Evacuation Considerations

Resources Engaged
Evacuations
Rescues

Assessments
Restoration



Pre-Event Training & Exercises
Preparedness Phase

Event Briefings & Services
Planning Phase

Remote & On-Site Support
Response Phase

Ongoing Support Post-Event
Recovery Phase

Routine Weekly Briefings

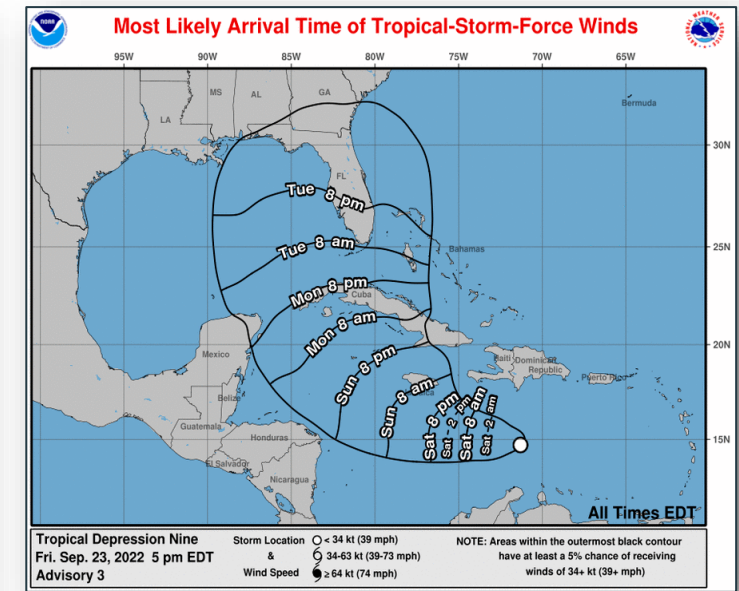
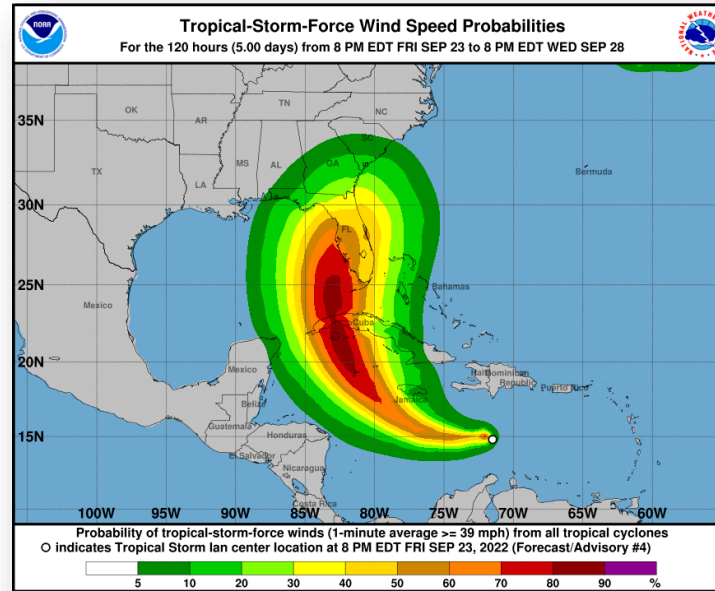
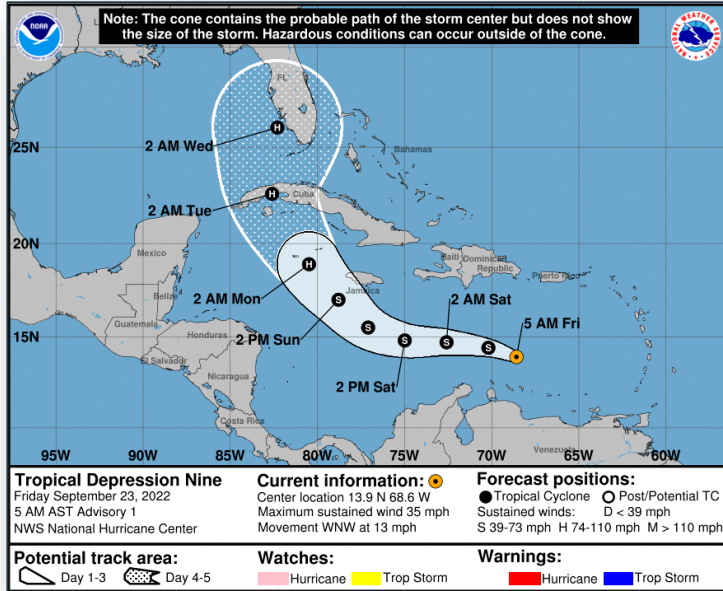
Emails & Webinars
NWS Support
Coordination



NWS Fully Engaged
Onsite or Virtual Support
NWS Chat / Google Chat

Recovery Forecasts
'Eye in the Sky'

3-5 Days Before Impact



National Weather Service

Major Hurricane Ian BRIEFING

1:00 PM ET
Wednesday, January 11, 2023

What has changed: Surge threat increases for SW Florida

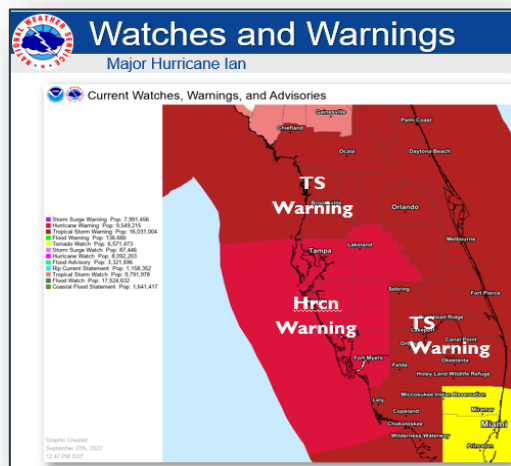
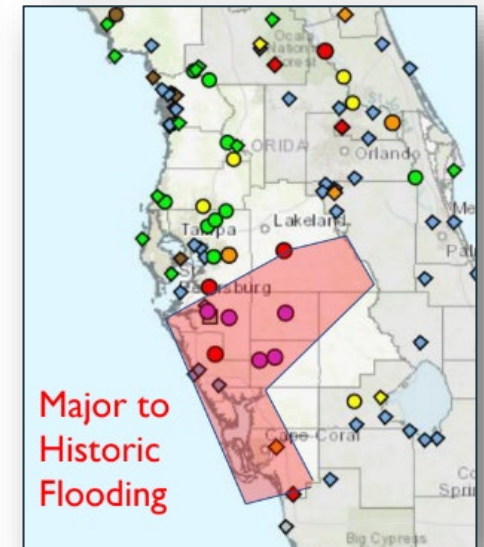
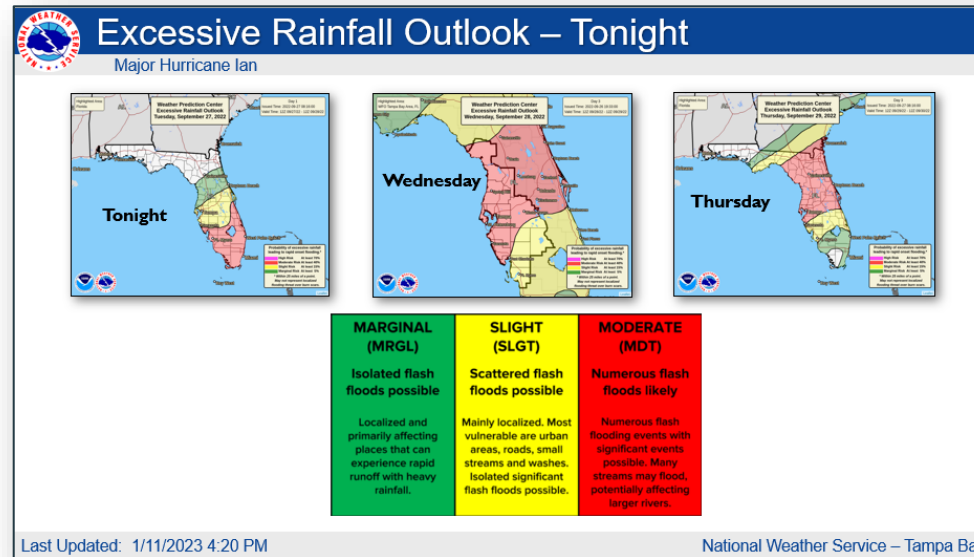
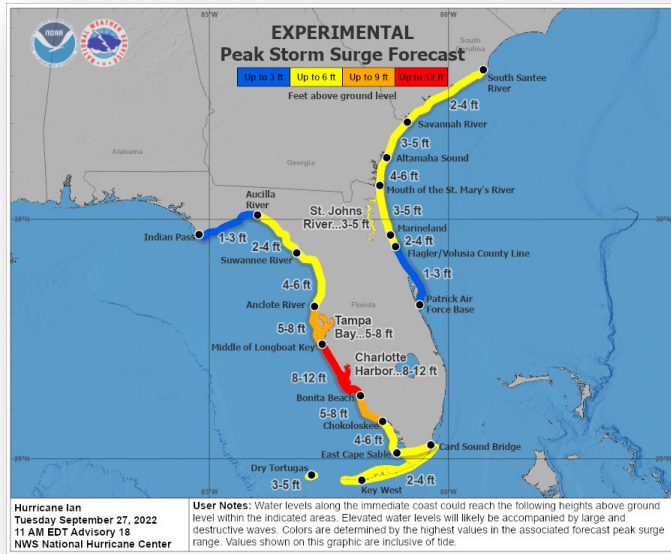
Next Briefing: Tuesday, September 27, at 7 PM ET

Disclaimer: The information contained within is time-sensitive. Do not use after 5pm EDT Tuesday

Tropical Email and/or Webinar briefings begin from NWS Tampa Bay (Ruskin) to both the local Media and Emergency Management

Briefing Times: 7 AM, 1 PM, 7 PM, 1 AM

1-2 Days Before Impact



National Weather Service

Major Hurricane Ian BRIEFING

1:00 PM ET
 Wednesday, January 11, 2023

What has changed: Surge threat increases for SW Florida

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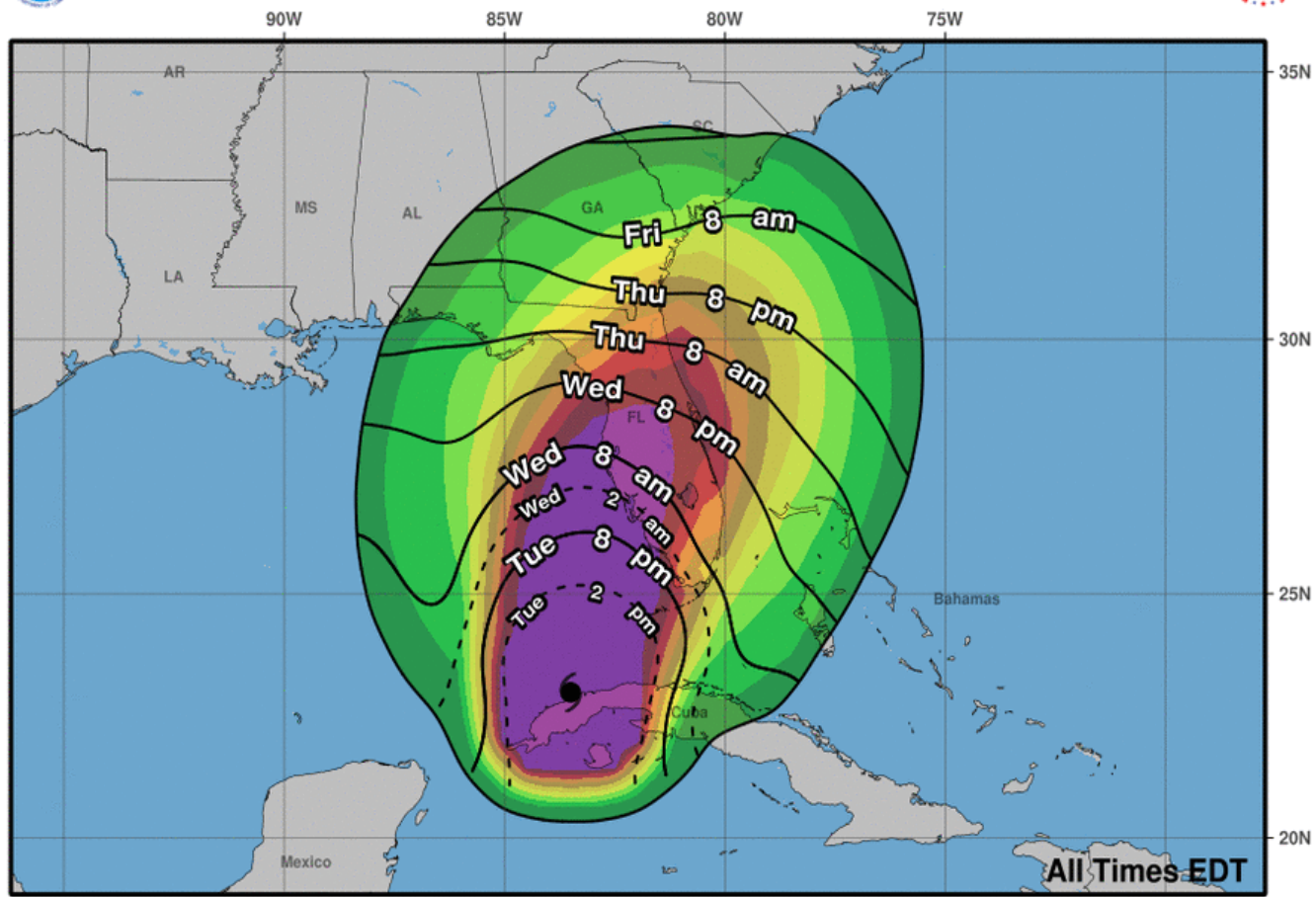


Time of Arrival of Tropical Storm Force Winds

Major Hurricane Ian



0-3 Day Most Likely Arrival Time of Tropical-Storm-Force Winds



Hurricane Ian
 Tue. Sep. 27, 2022 11 am EDT
 Advisory 18

Storm Location & Wind Speed
 ○ < 34 kt (39 mph)
 ○ 34-63 kt (39-73 mph)
 ● ≥ 64 kt (74 mph)

3-day chance of receiving sustained 34+ kt (39+ mph) winds
 5 10 20 30 40 50 60 70 80 90 100 %

All Times EDT

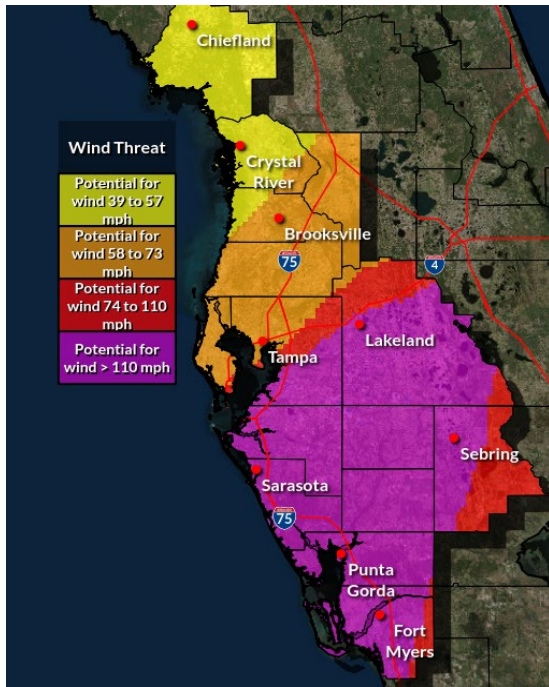
County	Earliest Arrival	Most Likely
Lee	8 pm Tue	11 pm Tue
Charlotte	7 pm Tue	10 pm Tue
Sarasota	10 pm Tue	1 am Wed
DeSoto	1 am Wed	5 am Wed
Hardee	1 am Wed	5 am Wed
Highlands	3 am Wed	7 am Wed
Manatee	12 am Wed	4 am Wed
Pinellas	1 am Wed	6 am Wed
Pasco	2 am Wed	8 am Wed
Hillsborough	2 am Wed	8 am Wed
Polk	4 am Wed	8 am Wed
Sumter	5 am Wed	1 pm Wed
Hernando	3 am Wed	7 am Wed
Citrus	5 am Wed	11 am Wed
Levy	7 am Wed	3 pm Wed



Hurricane Ian – Potential Impacts

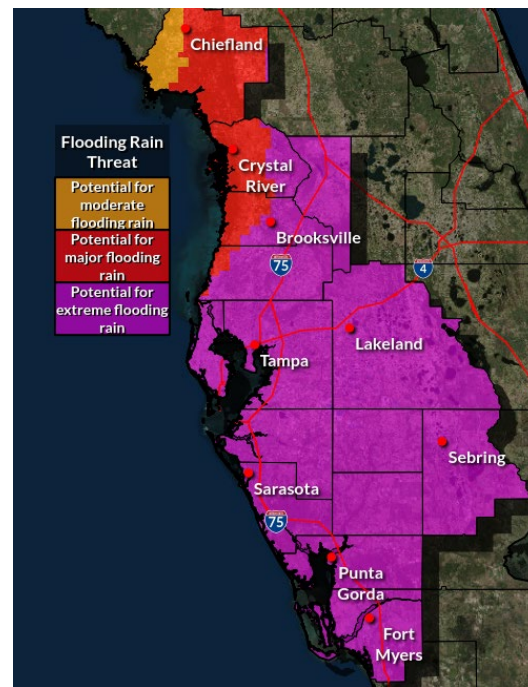
National Weather Service – Tampa Bay (Ruskin) – Impacts will continue through Thursday

Wind



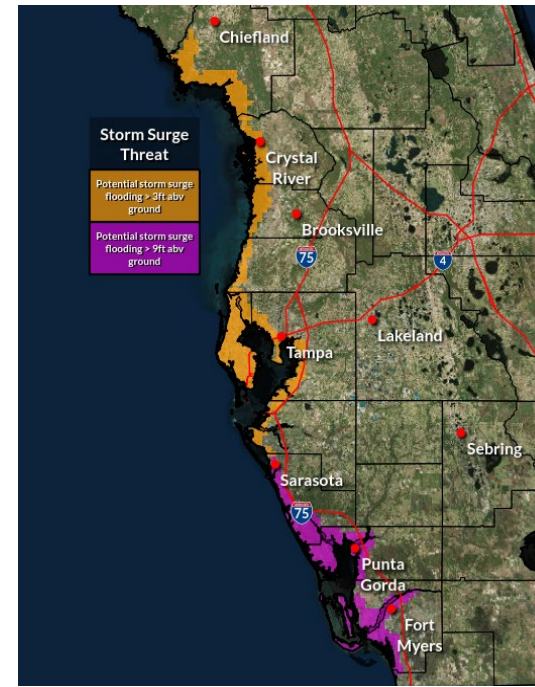
- Potential 110 mph or greater max winds.
- Wall and roof failure to some buildings.
- Destruction of mobile homes.
- Numerous trees down and debris blocking roads and bridges.
- Widespread power outage.

Flooding Rain



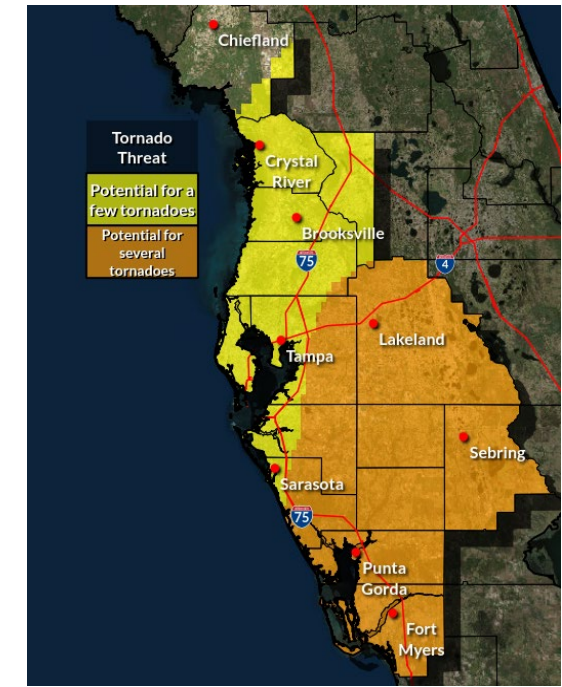
- Widespread 10"- 15", potential isolated totals greater than 20".
- Major flooding at or near historic levels.
- Widespread inundation covering roads.
- Storm drains/retention ponds overflow.
- Flood waters will affect buildings and homes and may prompt evacuations.
- Rescues may be necessary.

Surge



- 5 – 10 ft with low-lying escape routes severely flooded. Water possibly reaching several miles inland. Extreme beach erosion.
- Many large sections of near-shore roads washed out.
- Extensive damage to marinas, docks, and piers.

Tornado



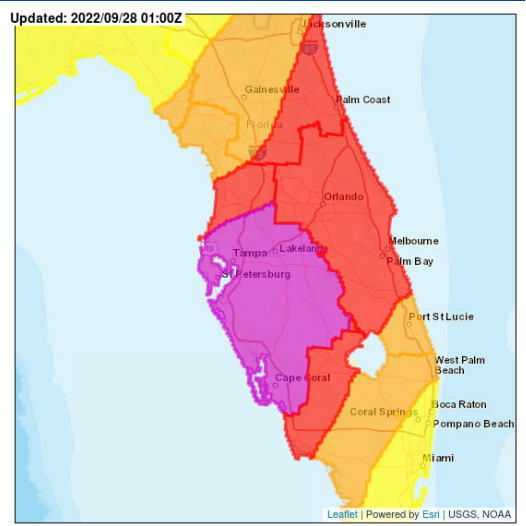
- Isolated tornadoes and waterspouts.
- A few locations could see roofs peeled off buildings, mobile homes pushed off foundations, and large tree tops and branches snapped off.
- Isolated power and communication disruptions.



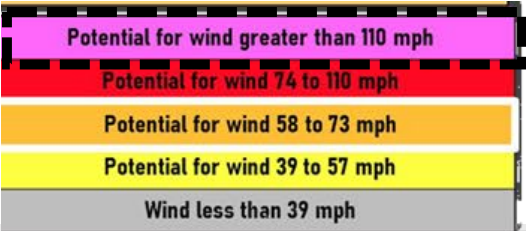
Huracán Ian – Prepárese para Estos Posibles Impactos

Servicio Nacional de Meteorología – Bahía de Tampa (Ruskin) – Impactos se esperan desde esta tarde hasta el jueves

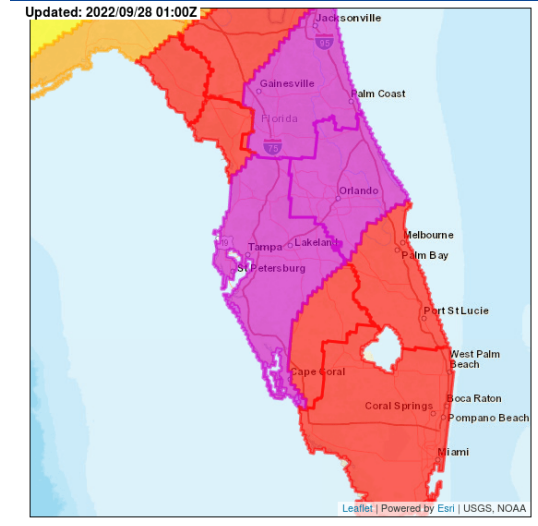
Viento



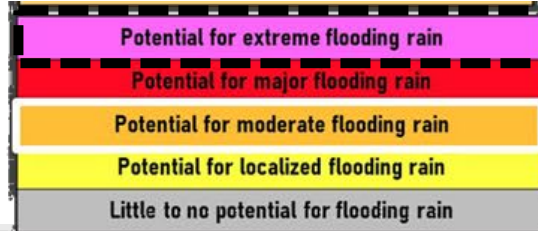
- Potencial para vientos de 110 mph.
- Colapso de paredes y techos en algunos edificios.
- Destrucción de casas móviles.
- Numerosos árboles caídos y escombros bloqueando caminos y puentes.
- Múltiples apagones.



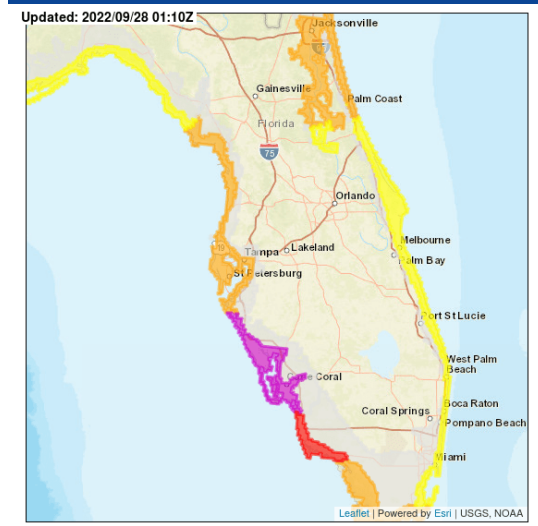
Inundación



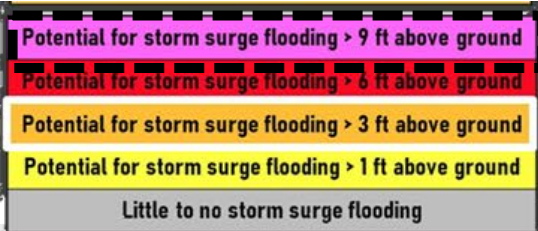
- Cantidades comunes entre 10"- 15", con máximos sobre 20".
- Inundaciones significativas en o cerca de niveles históricos.
- Inundaciones cubriendo carreteras.
- Desbordamiento de desagües.
- Inundaciones pueden afectar estructuras y provocar evacuaciones.



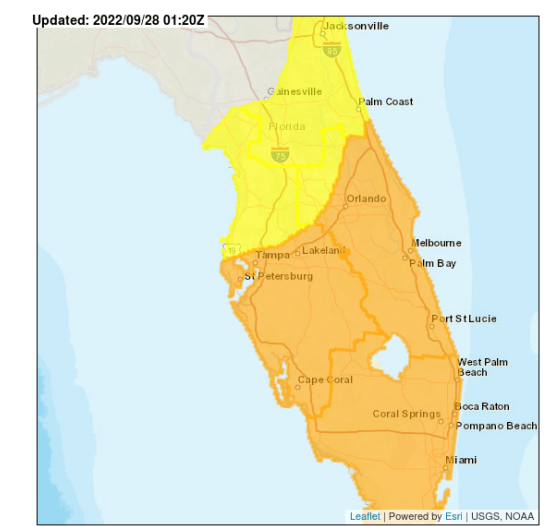
Marejada Ciclónica



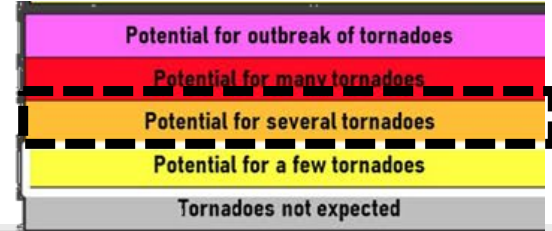
- 5 – 10 pies rutas de escape bajas severamente inundadas. Es posible que el agua entre varias millas tierra adentro. Erosión extrema en las playas.
- Muchos tramos grandes de carreteras cercanas a la costa arrasados.
- Daños extensos a marinas, muelles y embarcaderos.



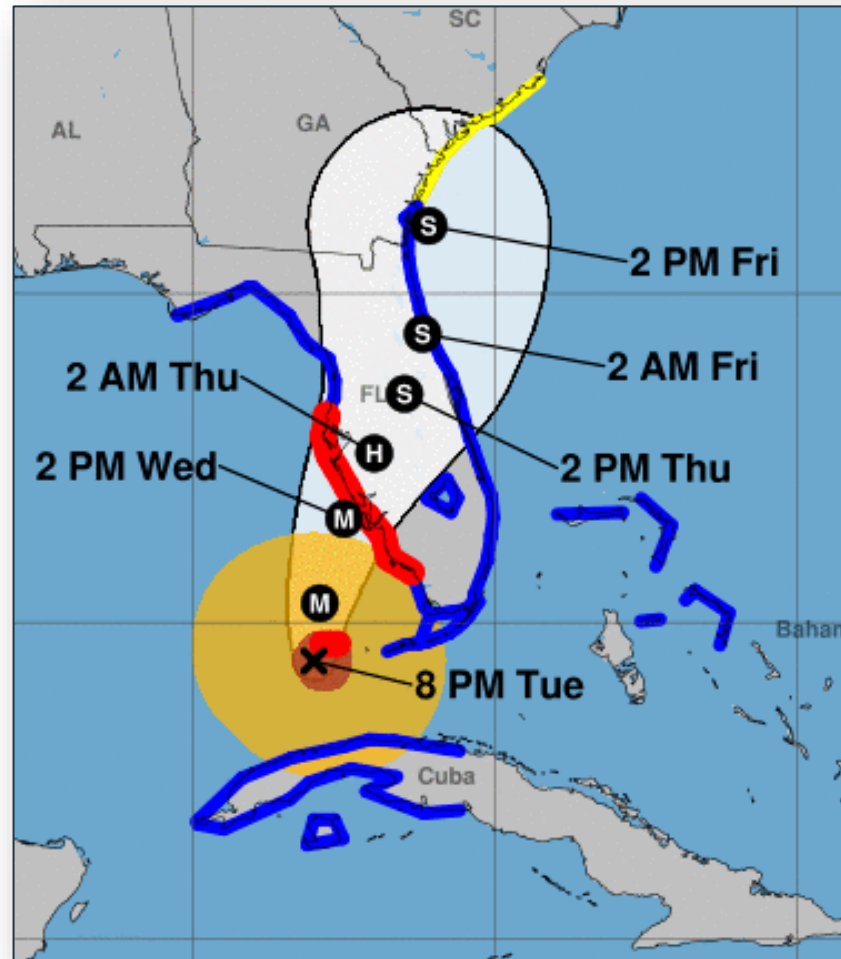
Tornado



- Tornados y trombas marinas aisladas.
- Algunos lugares podrían ver techos desprendidos de edificios, casas móviles arrancadas de los cimientos y ramas de árboles grandes arrancadas.
- Interrupciones aisladas de energía y comunicación.



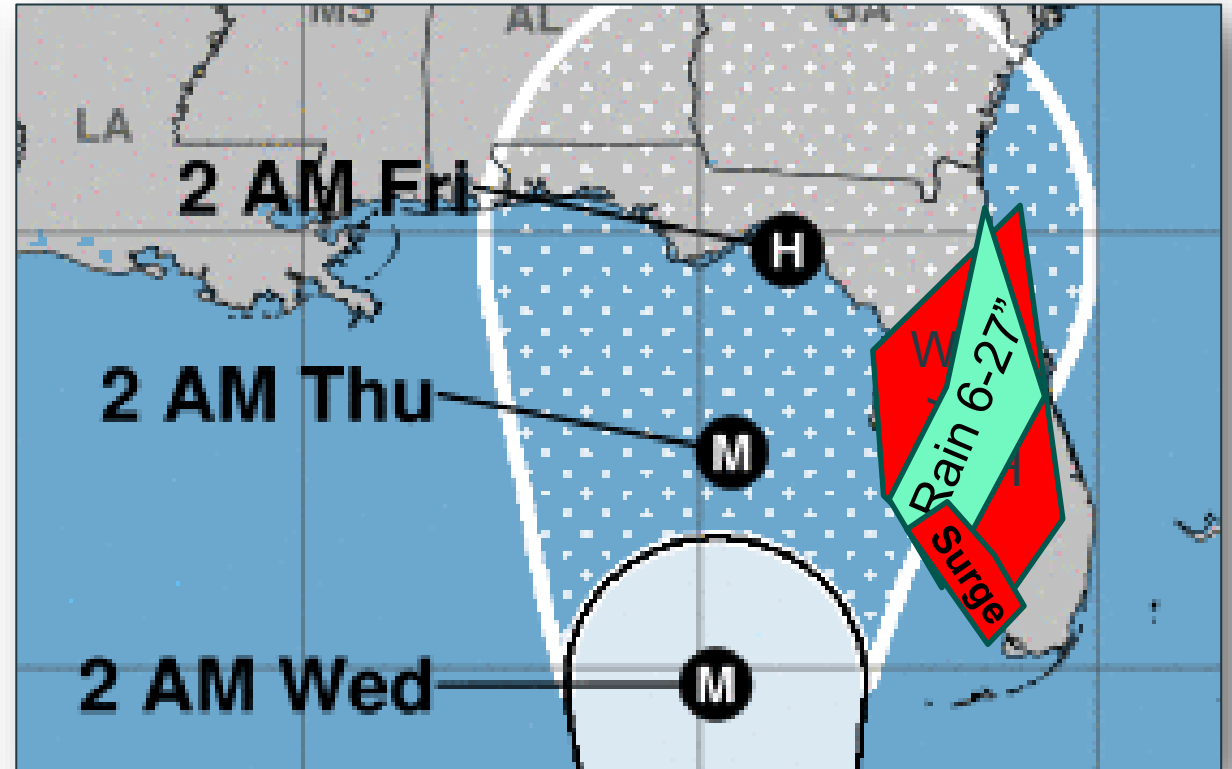
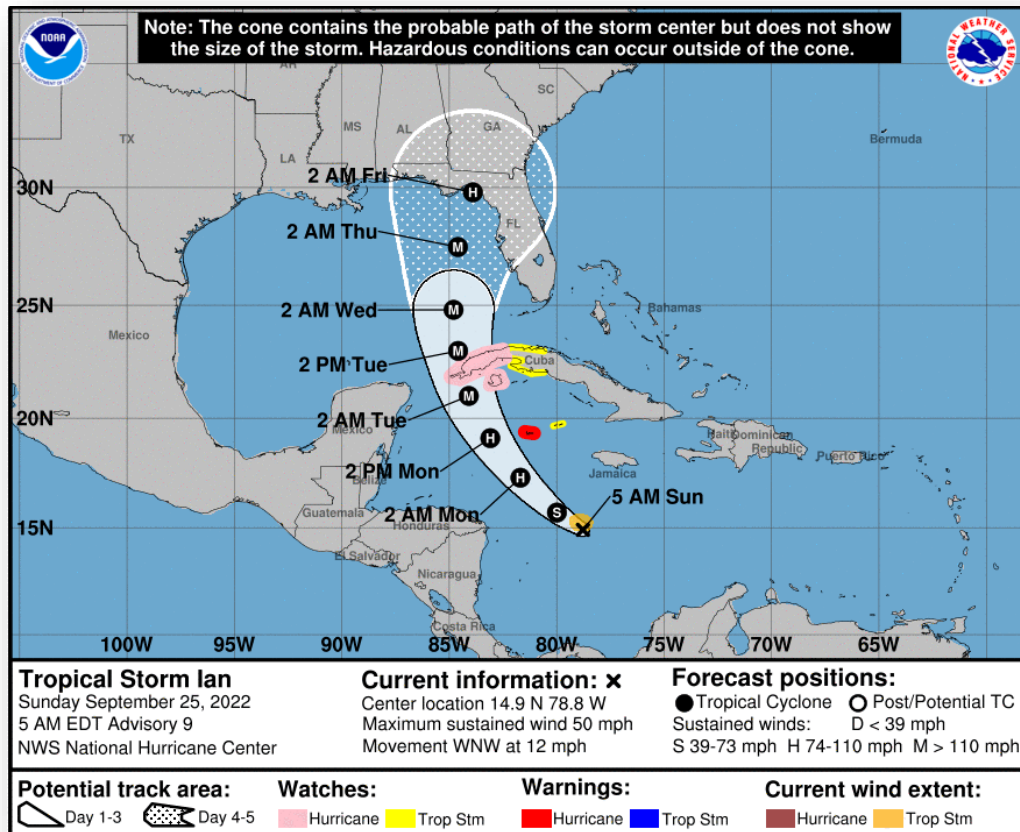
Be Careful with the Forecast Cone vs Impacts



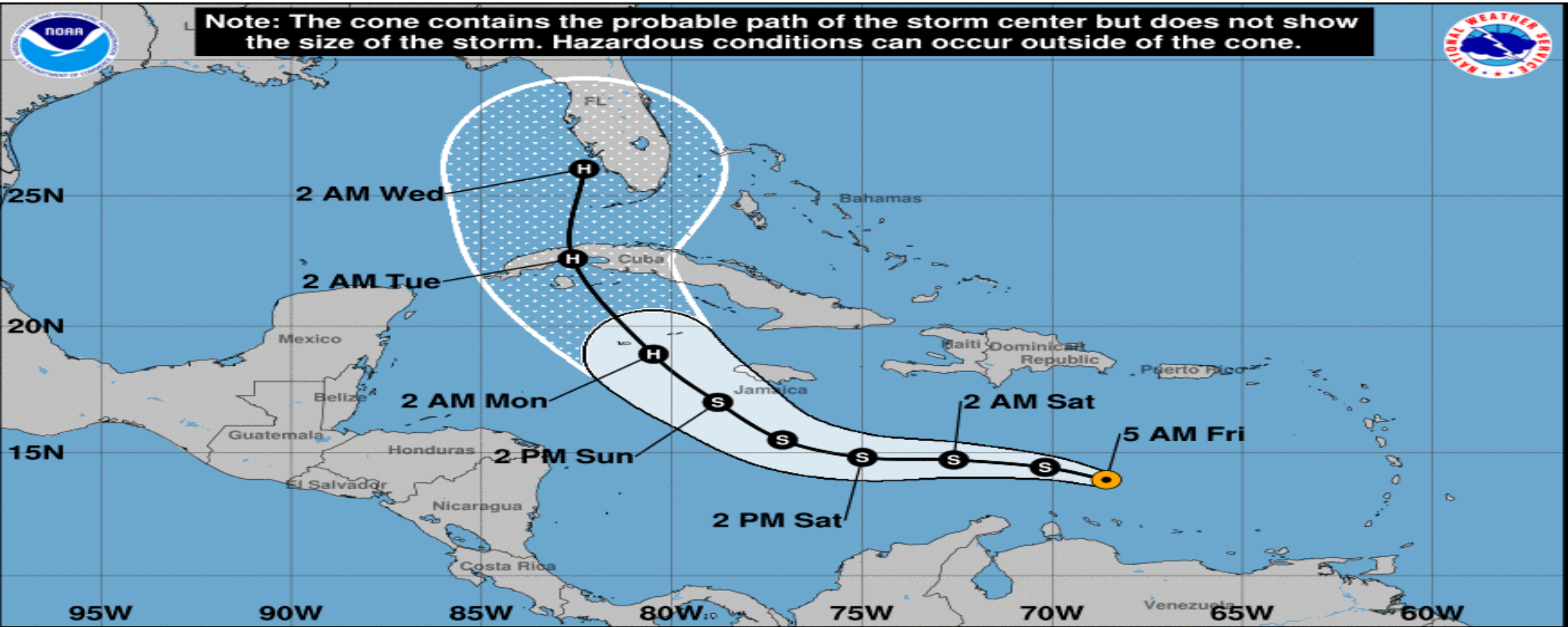
The Cone of Uncertainty provides one piece to a much larger puzzle of threats and impacts.

Note how watches and warnings are in effect outside the Cone of Uncertainty.

Be Careful with the Forecast Cone vs Impacts



Advisory 1 from the National Hurricane Center: Ian



Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



Tropical Depression Nine
 Friday September 23, 2022
 5 AM AST Advisory 1
 NWS National Hurricane Center

Current information: ●
 Center location 13.9 N 68.6 W
 Maximum sustained wind 35 mph
 Movement WNW at 13 mph

Forecast positions:
 ● Tropical Cyclone ○ Post/Potential TC
 Sustained winds: D < 39 mph
 S 39-73 mph H 74-110 mph M > 110 mph

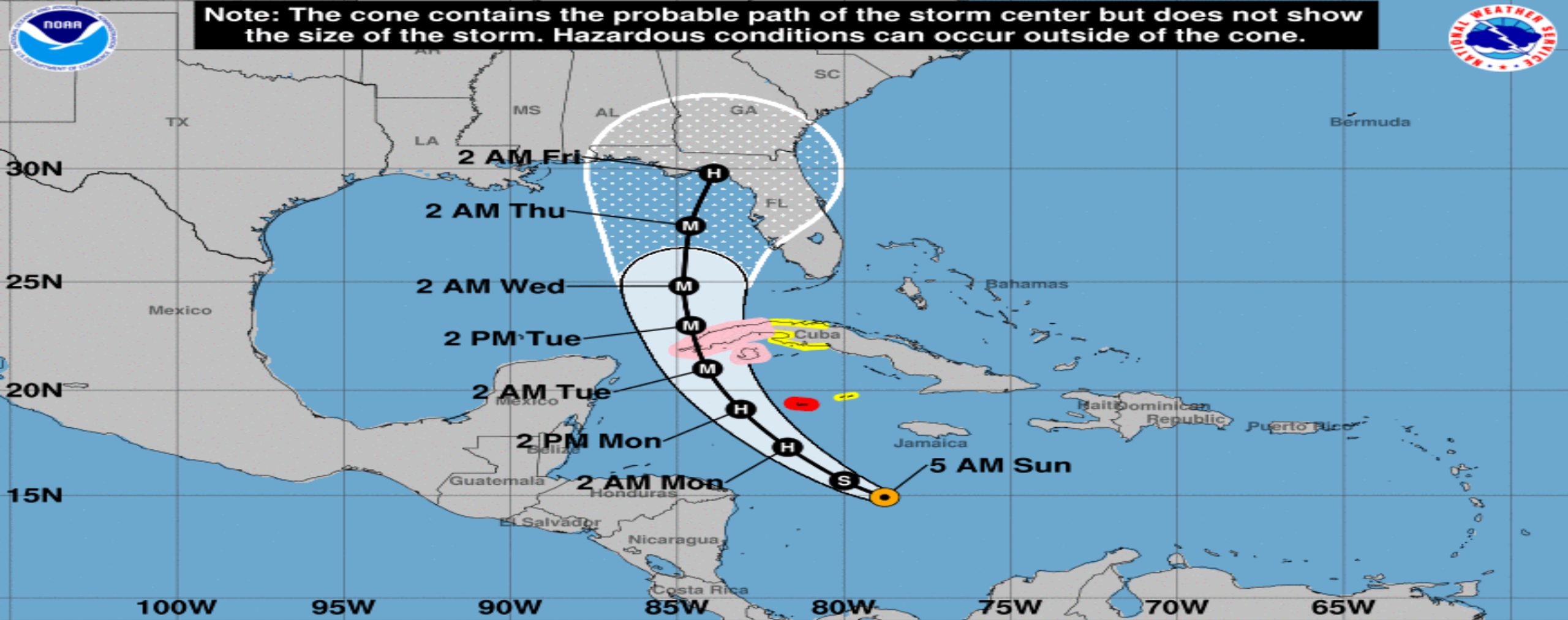
Potential track area:
 Day 1-3 Day 4-5

Watches:
 Hurricane Trop Storm

Warnings:
 Hurricane Trop Storm

Sunday 9/25/2022 at 5 AM Tropical Storm Ian

Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



Tropical Storm Ian
 Sunday September 25, 2022
 5 AM EDT Advisory 9
 NWS National Hurricane Center

Current information: ●
 Center location 14.9 N 78.8 W
 Maximum sustained wind 50 mph
 Movement WNW at 12 mph

Forecast positions:
 ● Tropical Cyclone ○ Post/Potential TC
 Sustained winds: D < 39 mph
 S 39-73 mph H 74-110 mph M > 110 mph

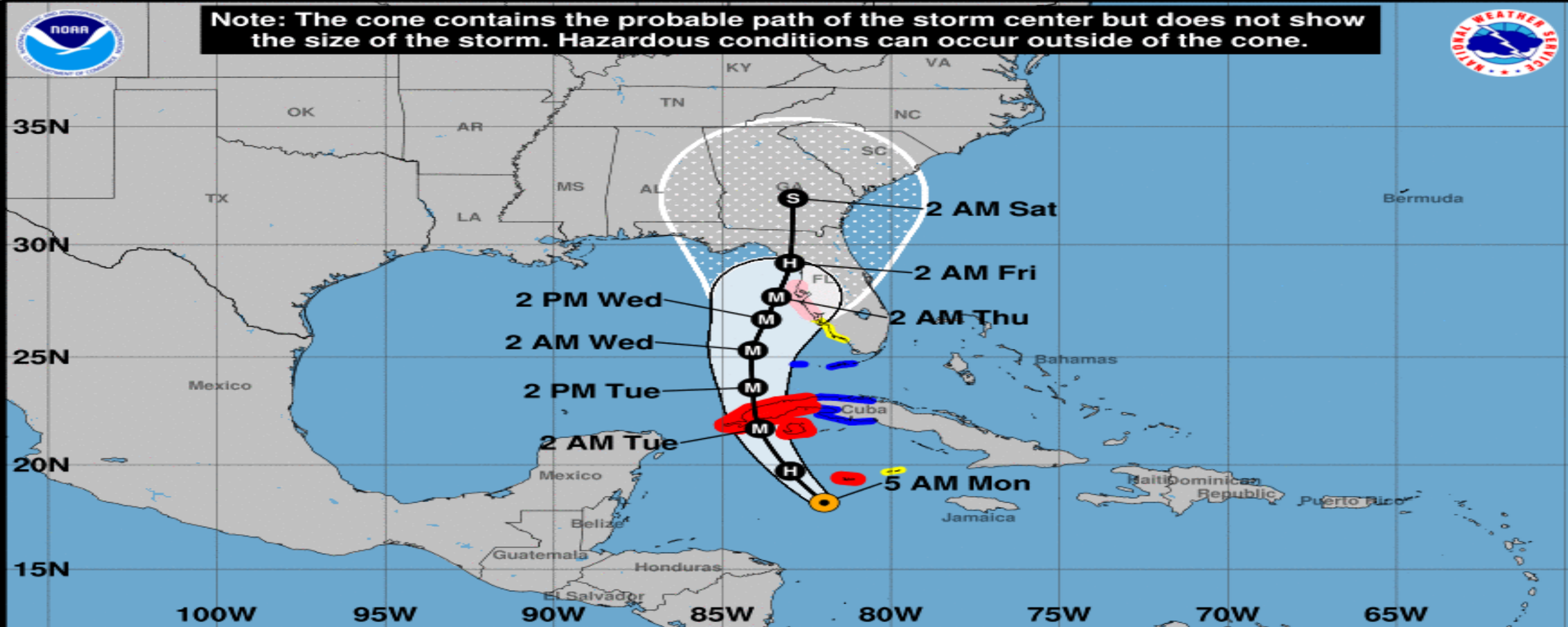
Potential track area:
 Day 1-3 Day 4-5

Watches:
 Hurricane Trop Storm

Warnings:
 Hurricane Trop Storm

Monday 9/26/2022 at 5 AM Hurricane Ian

Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



Hurricane Ian
Monday September 26, 2022
5 AM EDT Advisory 13
NWS National Hurricane Center

Current information: ●
Center location 18.2 N 82.0 W
Maximum sustained wind 75 mph
Movement NW at 14 mph

Forecast positions:
● Tropical Cyclone ○ Post/Potential TC
Sustained winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110 mph

Potential track area:
▭ Day 1-3 ▭ Day 4-5

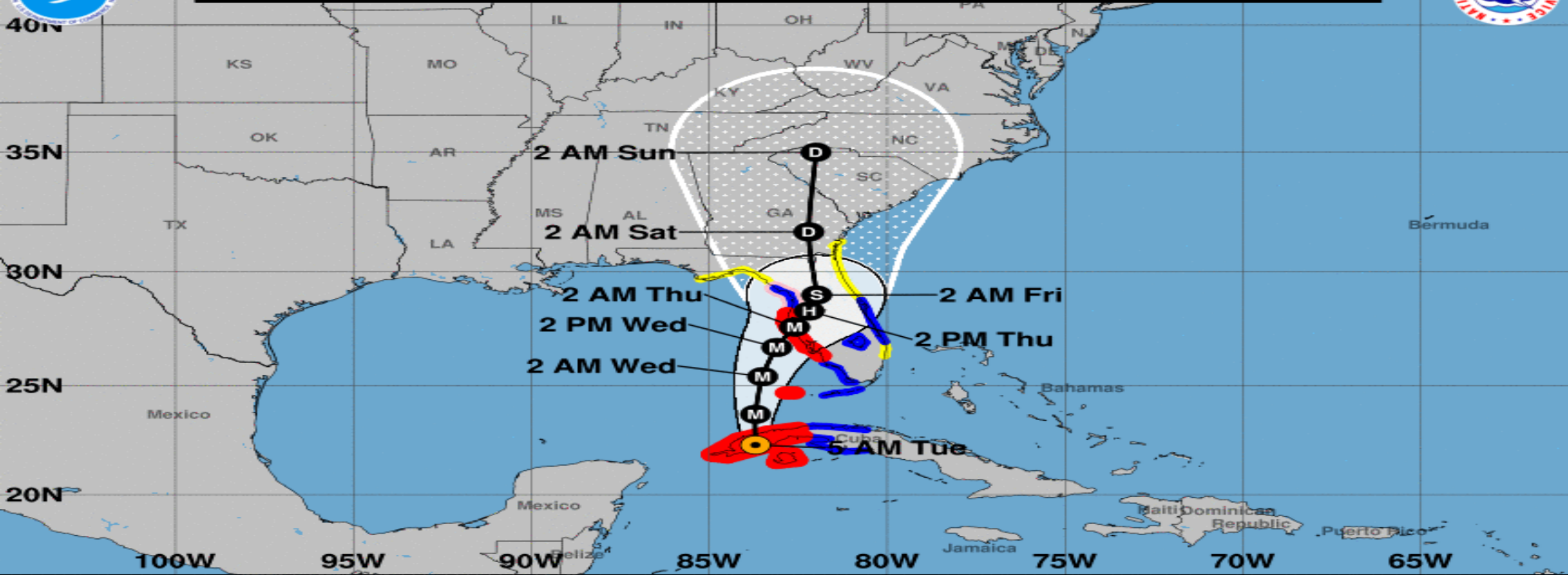
Watches:
▭ Hurricane ▭ Trop Storm

Warnings:
▭ Hurricane ▭ Trop Storm

Tuesday 9/27/2022 at 5 AM Hurricane Ian



Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



Hurricane Ian
 Tuesday September 27, 2022
 5 AM EDT Advisory 17
 NWS National Hurricane Center

Current information: ●
 Center location 22.3 N 83.7 W
 Maximum sustained wind 125 mph
 Movement N at 12 mph

Forecast positions:
 ● Tropical Cyclone ○ Post/Potential TC
 Sustained winds: D < 39 mph
 S 39-73 mph H 74-110 mph M > 110 mph

Potential track area:
 Day 1-3 Day 4-5

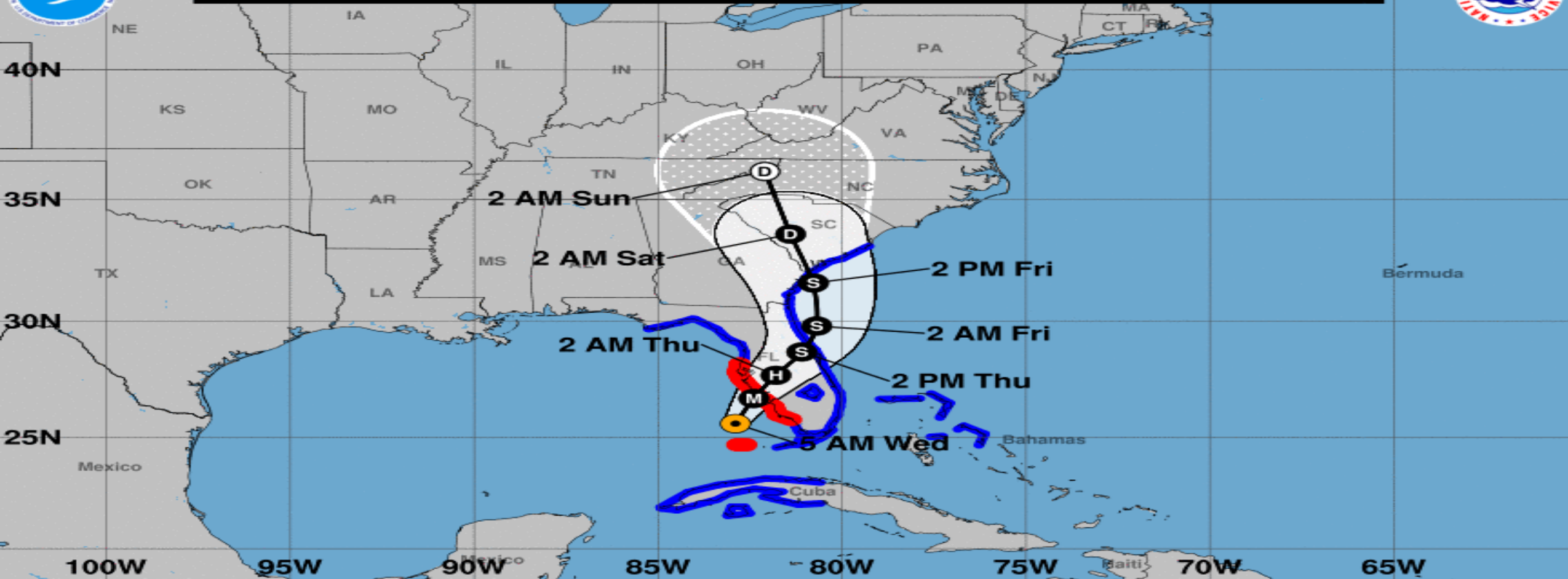
Watches:
 Hurricane Trop Storm

Warnings:
 Hurricane Trop Storm

Wednesday 9/28/2022 at 5 AM Hurricane Ian



Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



Hurricane Ian
 Wednesday September 28, 2022
 5 AM EDT Advisory 22
 NWS National Hurricane Center

Current information: ●
 Center location 25.6 N 82.9 W
 Maximum sustained wind 140 mph
 Movement NNE at 10 mph

Forecast positions:
 ● Tropical Cyclone ○ Post/Potential TC
 Sustained winds: D < 39 mph
 S 39-73 mph H 74-110 mph M > 110 mph

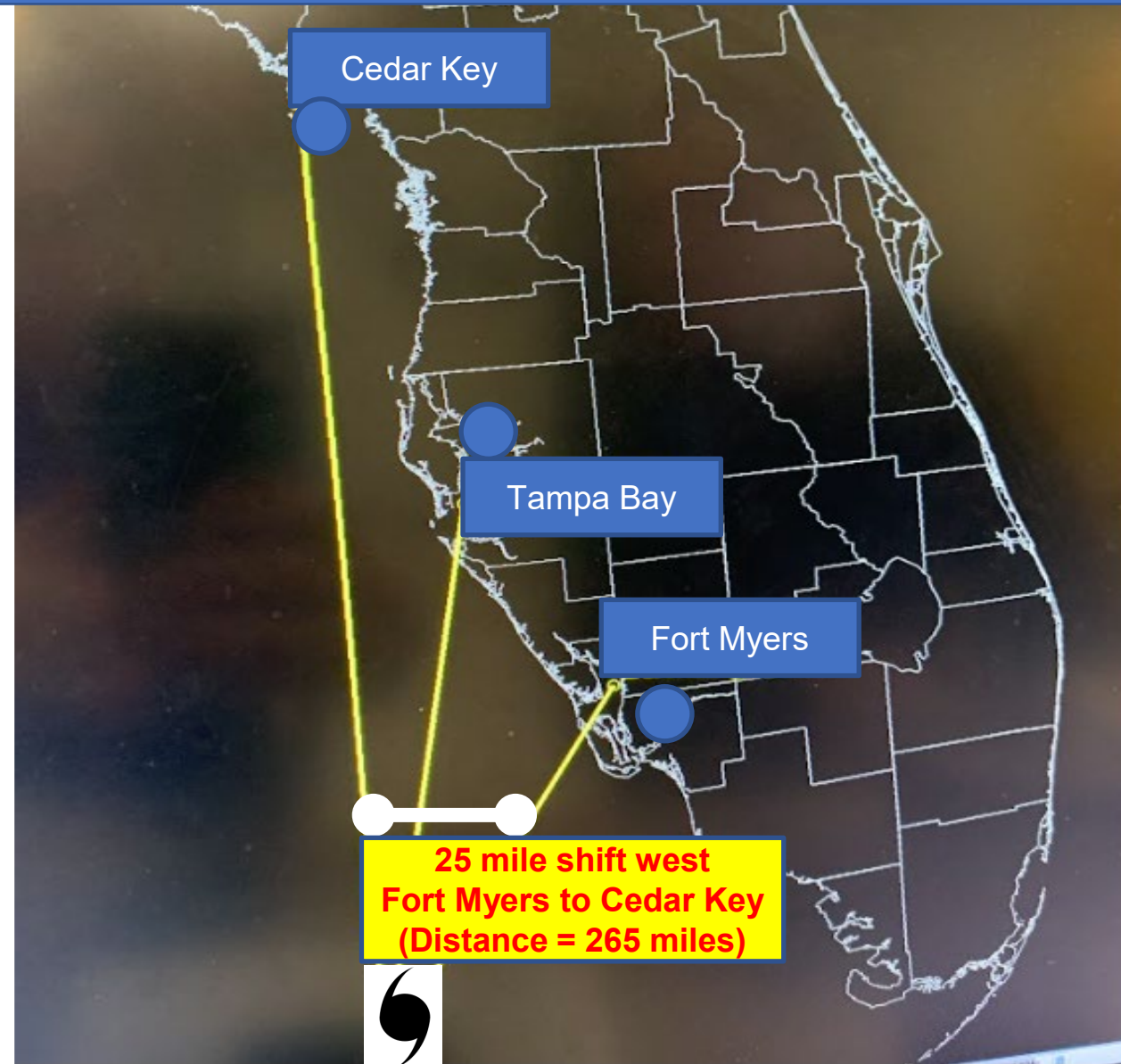
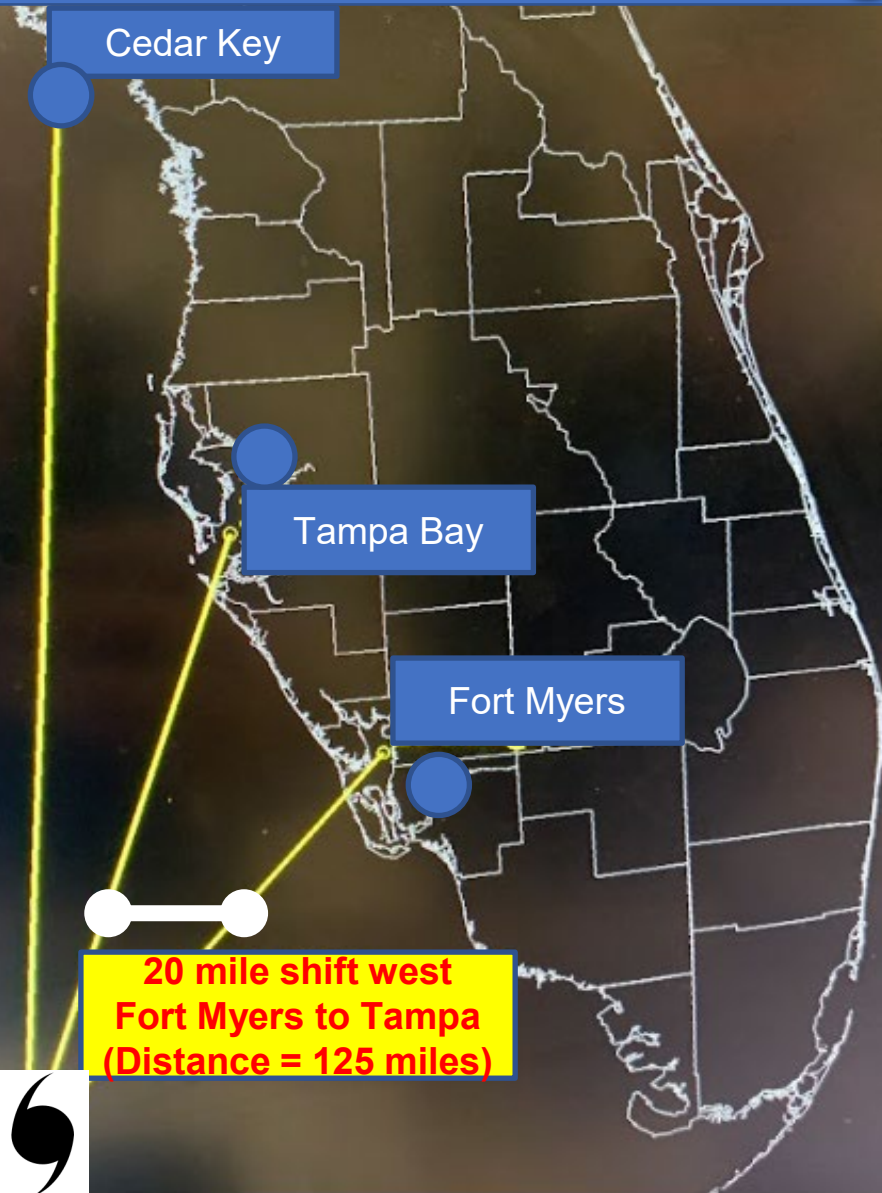
Potential track area:
 ▽ Day 1-3 ▨ Day 4-5

Watches:
 ■ Hurricane ■ Trop Storm

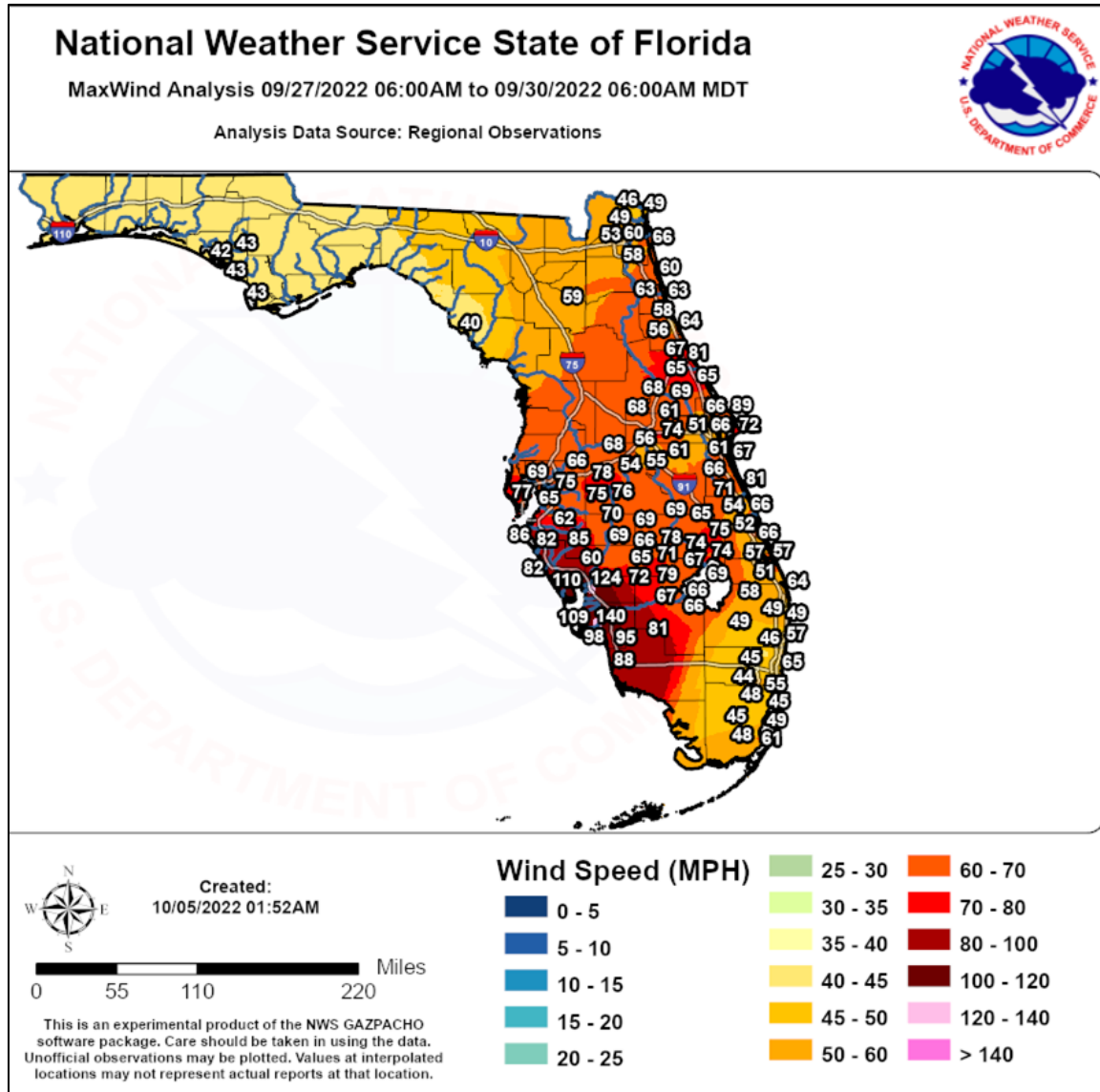
Warnings:
 ■ Hurricane ■ Trop Storm

When can 20 miles = 125 miles? (Fort Myers to Tampa)

Shifts in Track along a north-south coastline

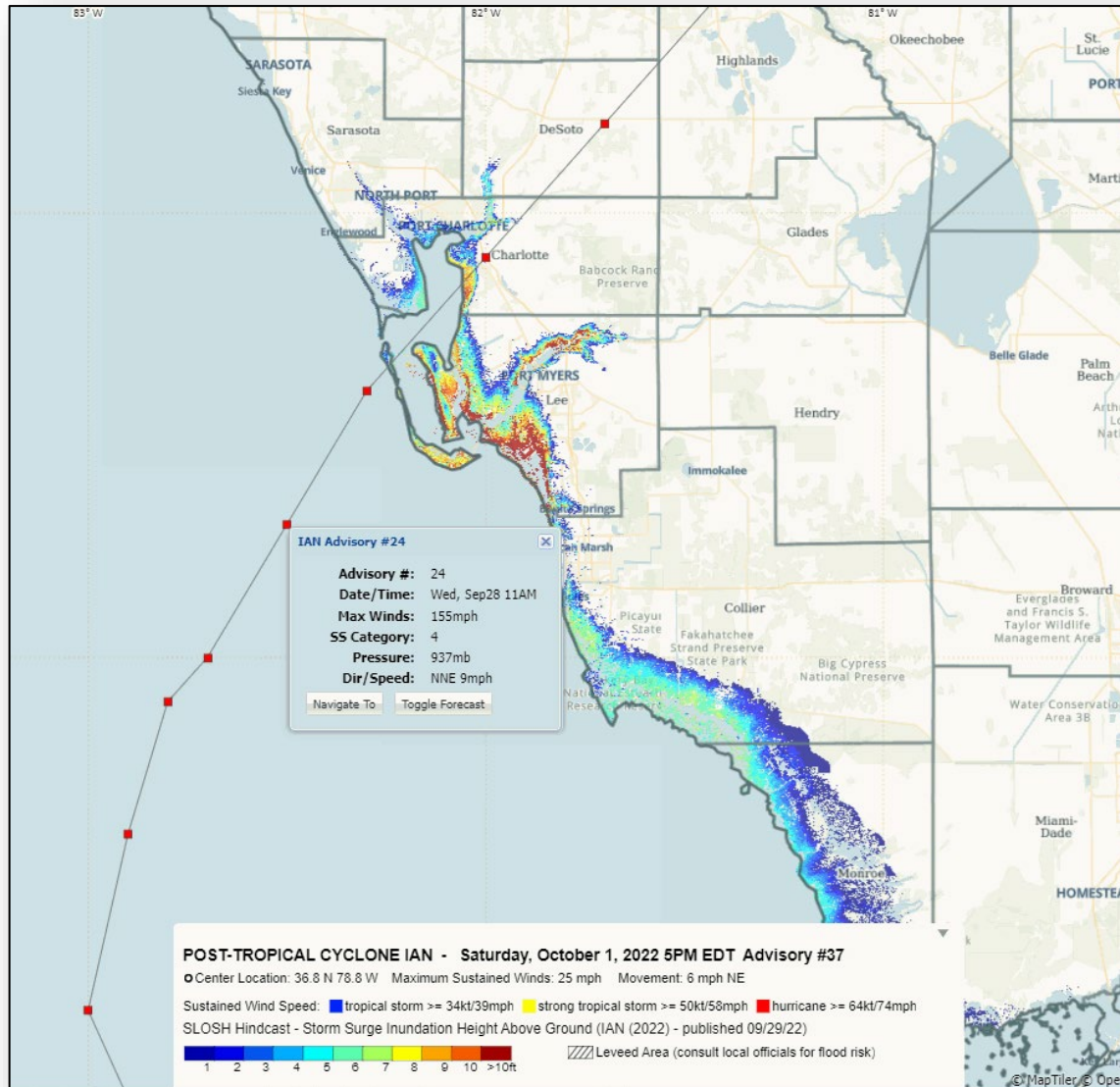


2022 Major Hurricane Ian – Max Wind Gust



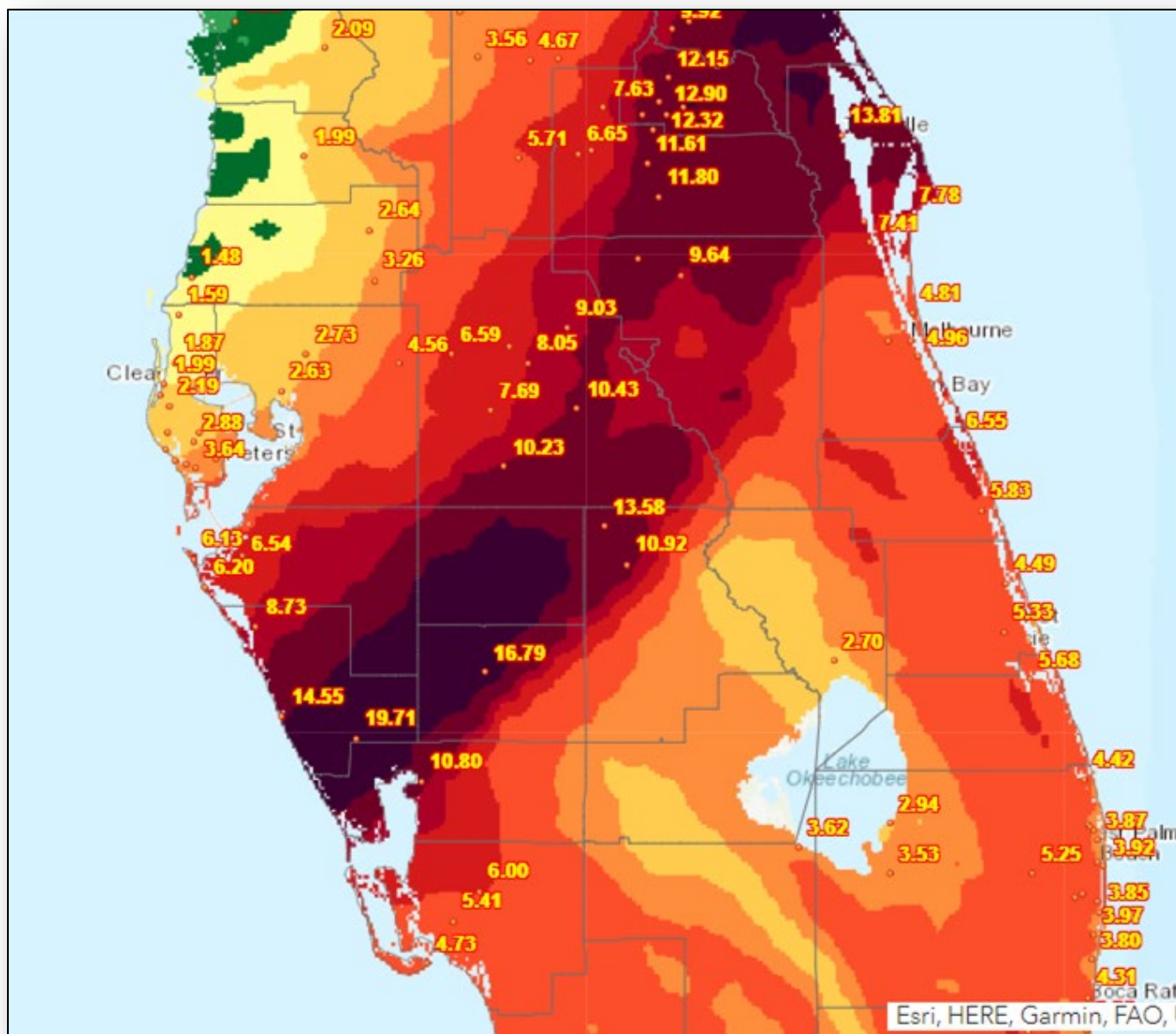
- Landfall is when the *center* of the eye wall crosses the beach
- Landfall at Cayo Costa - 305 PM ET Wed Sep 28, 2022
 - CAT 4, 150 mph, 940 mb
- Mainland Florida Landfall - Near Punta Gorda at Pirate Harbor
 - CAT 4, 435 pm Wed Sep 28, 145 mph, 942 mb
- Max Recorded Wind - 140 mph in Cape Coral

2022 Major Hurricane Ian - Storm Surge



- 6-10 feet water overtopped barrier islands
- Max surge 10 to 15 feet.
 - Structures washed off their foundation at locations where water was *flowing* over the barrier islands
 - Structures flooded with salt water on the inland side of the intercoastal
- Tides were 4-7 feet below normal north of the eye wall

2022 Major Hurricane Ian - Rain



C. STORM TOTAL RAINFALL FROM 1200 UTC SEP 27 UNTIL 1200 UTC SEP 30

CITY/TOWN	COUNTY	ID	RAINFALL (IN)
1 NNW GROVE CITY 26.93 -82.33	CHARLOTTE	25056	26.95
1 NW CHARLOTTE BEACH 26.94 -82.22	CHARLOTTE	25218	22.97
3 NE NORTH PORT 27.08 -82.15	SARASOTA	25835	21.45
2 S ZOLFO SPRINGS 27.46 -81.80	HARDEE	25195	20.13
3 E ZOLFO SPRINGS 27.50 -81.75	HARDEE	25172	19.97
10 WSW PINE LEVEL 27.19 -82.13	SARASOTA	25603	19.83

Top National Weather Service meteorologists scour damage zone to improve future hurricane forecasts

WGCU | By [Tom Bayles](#)

Published October 6, 2022 at 1:08 PM EDT



Tom Bayles /

Brian LaMarre, left, who is the National Weather Service's chief meteorologist in the Tampa Bay region, talks with Pablo Santos, who is in charge of the NWS in Miami-South Florida, this week along hard-hit San Carlos Island while looking for subtle clues left behind by Hurricane Ian that might help improve the forecast during future tropical cyclones

2022 Major Hurricane Ian - Impact



 **Casey Shannon**
1d · 🌐

I took this earlier today, around 4:30. This is highway 70 looking south east over the train tracks coming into Arcadia. I took some video too but I don't have a battery big enough to upload it over a mobile Hotspot. This is the highest I've ever seen the river...



👍👍👍 6 2 shares

👍 Like 💬 Comment ➦ Share

Hurricane Ian: The People and Their Stories

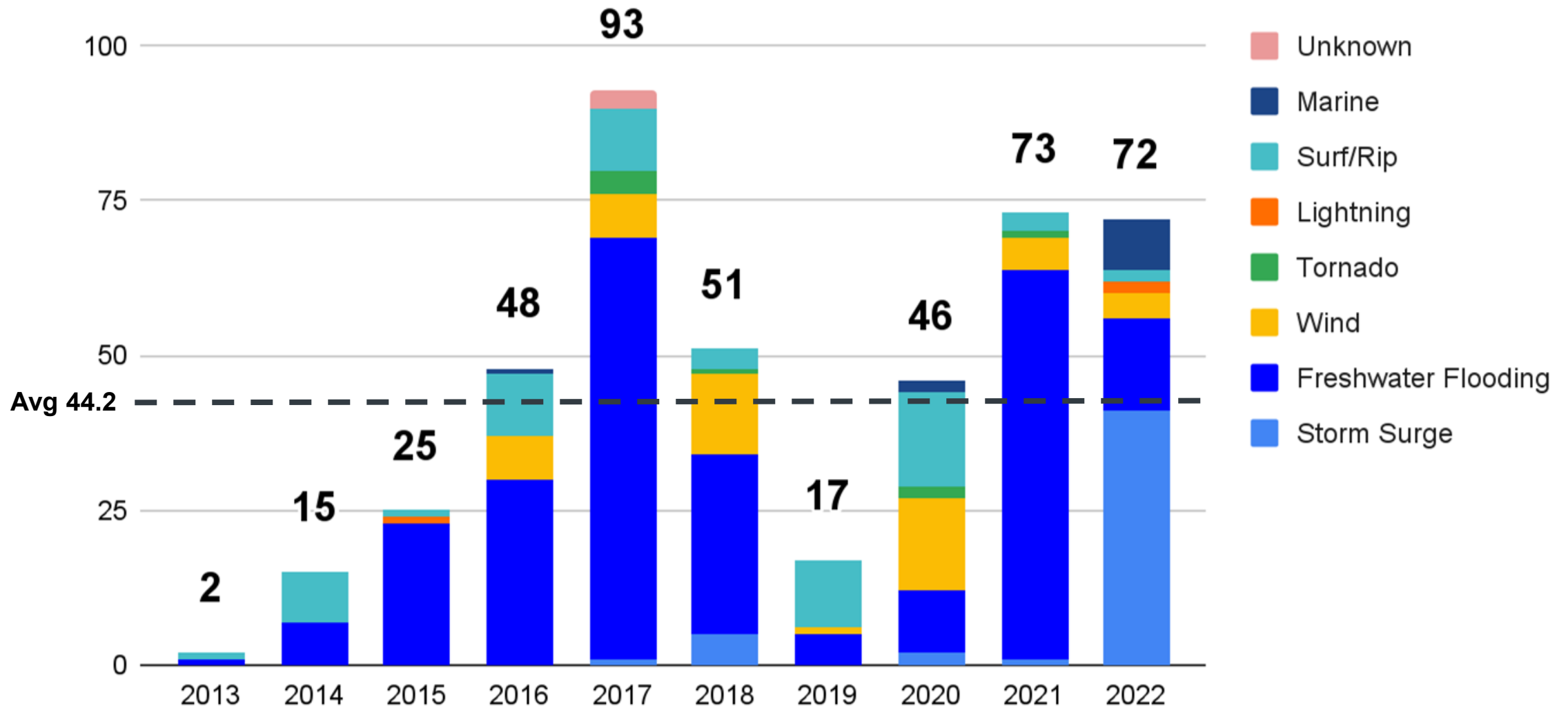


Hurricane Ian: The People and Their Stories

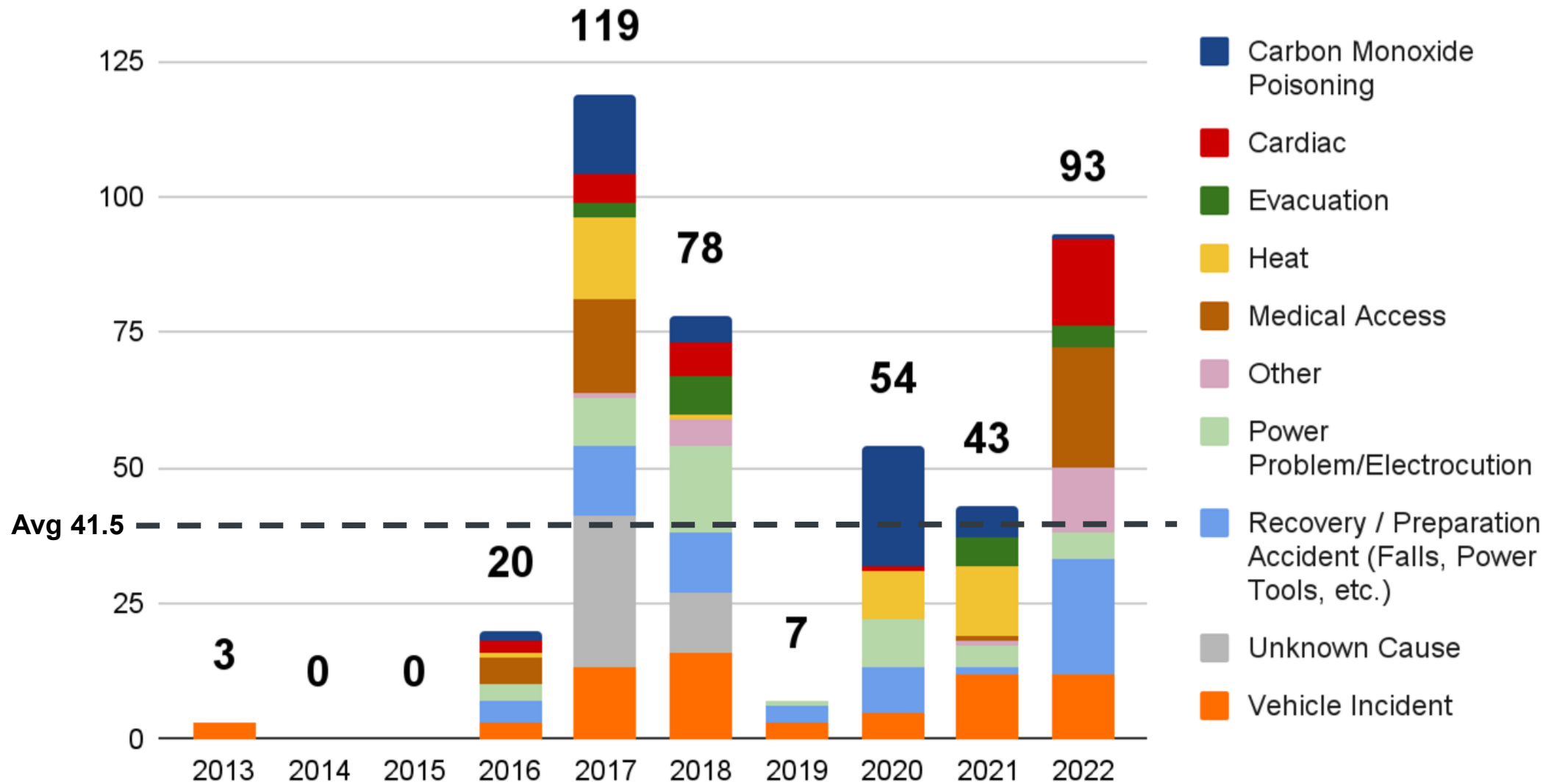




Direct Fatalities by Year - 2013-2022



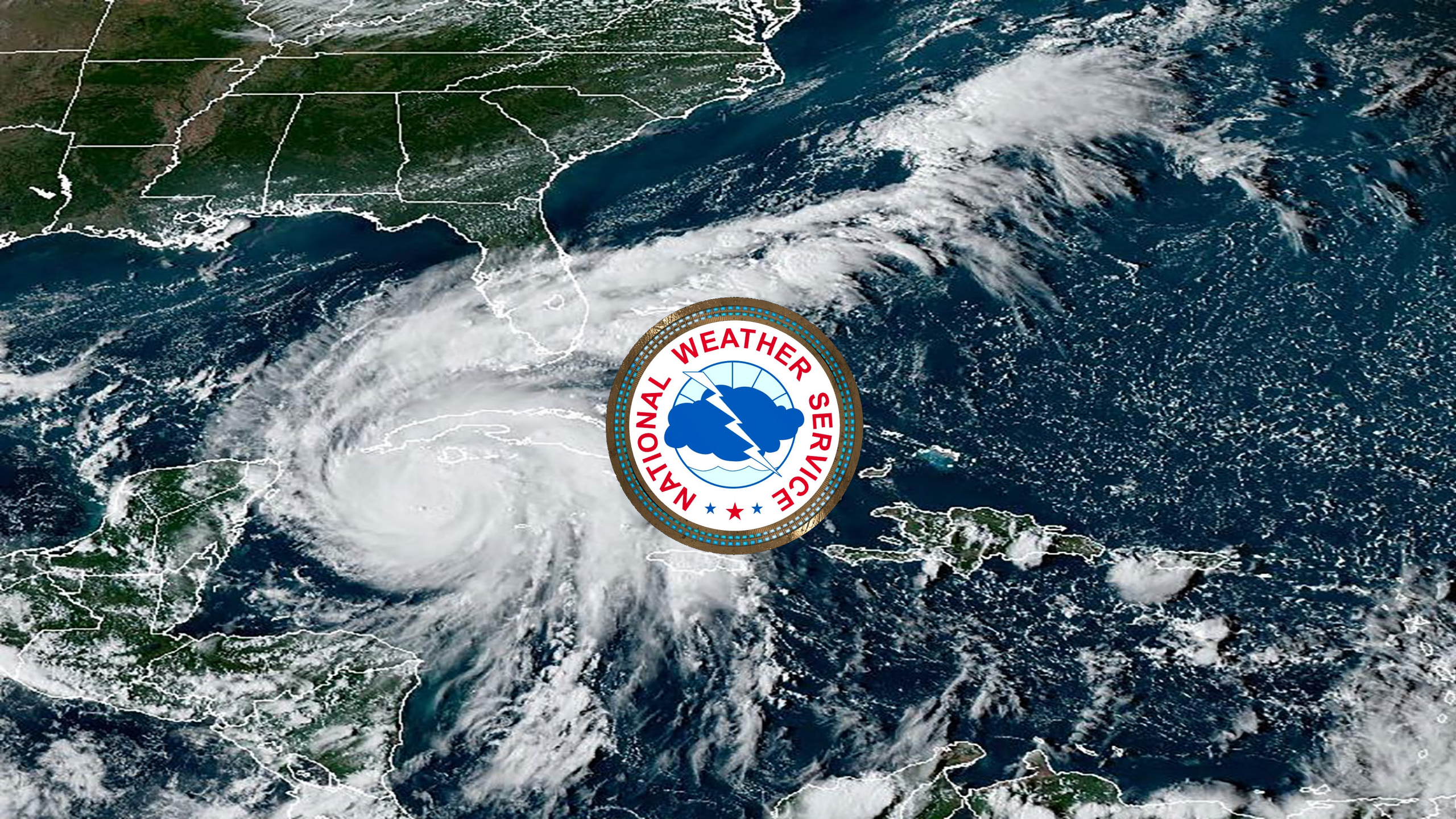
Indirect Fatalities by Year - 2013-2022

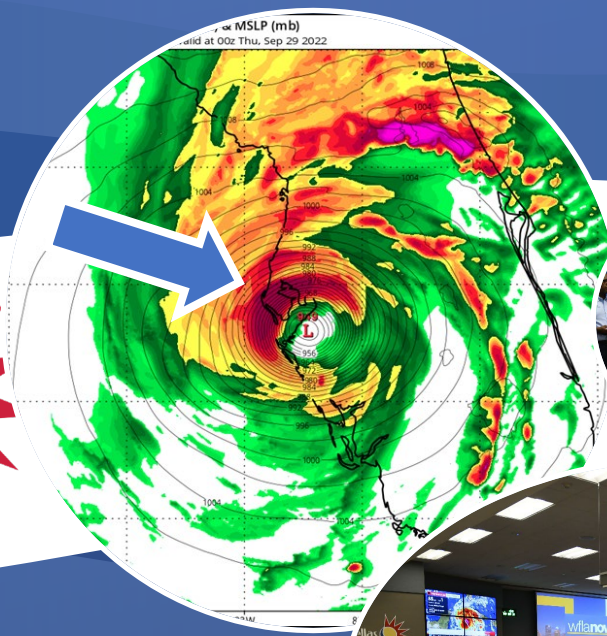


Social Science Research: Who Evacuates?

First Out 21%	Anxious and eager to leave if a hurricane is in the forecast
Constrained 14%	Aware of risks & willing to evacuate but face barriers
Optimists 16%	Doubt that a hurricane will occur but willing to evacuate
Reluctant 27%	Reluctant to evacuate but will leave if ordered to
Diehards 22%	Confident they can safely ride out hurricanes at home

Hurricane Sandy study by Jennifer Marlon, Yale University







Hurricane Ian Lessons Learned

**Cathie Perkins – Director
Pinellas County Emergency Management**

Friday, September 23

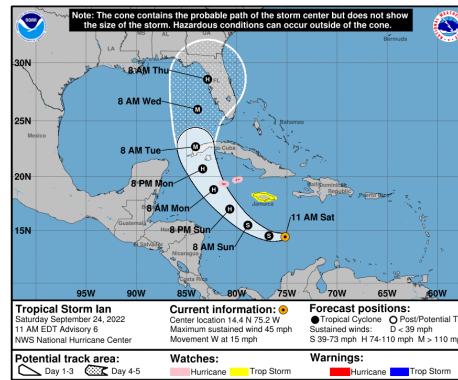


- Expected to approach FL at Major Hurricane strength
- Activated to a Level 3 – Enhanced Monitoring
- Opened WebEOC Incident
- EPG Notified, BCC Directors call held
- Command and General Staff meetings begin
- Initial messaging to Shelter Staff
- CIC supervisors briefed
- Situation Reports began, healthcare facilities notified
- Alert Pinellas, ITS, BEAS, Ready Pinellas, Homeless Outreach begins
- State of Emergency Declared for Florida (including Pinellas)

		Pinellas County Emergency Operations Center SITUATION REPORT #1	CONTACT INFORMATION Main: (727) 464-5550 FAX: (727) 464-4024 EMA@pinellascounty.org
1. INCIDENT NAME Tropical Depression #9	2. DATE 09/23/2022	3. TIME 1-15 PM	
4. EOC ACTIVATION LEVEL Level 3 – Enhanced Monitoring	5. LOCAL STATE OF EMERGENCY DECLARED? No	6. PREPARED BY EOC Planning Section	
CURRENT SITUATION		GRAPHIC	
<p>The National Hurricane Center (NHC) is issuing advisories on Tropical Depression #9, currently located in the eastern Caribbean Sea north of Venezuela.</p> <p>Tropical Depression #9 is forecast to become a tropical storm later today (09/23), and a hurricane by early Monday (09/26). Tropical Depression #9 is forecast to approach the Florida peninsula as a major hurricane by Wednesday (09/28). The next two names on the list are Hermine and Ian.</p> <p>Pinellas County Emergency Management (PCEM) recommends everyone review emergency plans and supplies, especially ahead of the weekend.</p>			
IMPACTS			
<ul style="list-style-type: none"> • It is too soon to determine what, if any, impacts Pinellas County may receive because of this system. PCEM is monitoring forecasts and is coordination with the National Weather Service. 			
COUNTY ACTIVITIES			
<ul style="list-style-type: none"> • The Emergency Operations Center (EOC) is activated to a Level 3 – Enhanced Monitoring. Use normal office numbers for PCEM Staff. • The Executive Policy Group has been briefed with the latest information. • PCEM is monitoring the situation and coordinating with partners, including coordinating with the Florida Division of Emergency Management. • PCEM will conduct Response Operations Coordination (ROC) and Emergency Management Partner calls starting tomorrow (09/24) at 3:00 PM. Notifications and invites will be sent later this afternoon. • PCEM and County Administration will conduct a Department Directors call today (09/23) at 2:00 PM. • The EOC Health and Human Services Branch will conduct a meeting today (09/23) at 5:00 PM to discuss storm scenarios and planning efforts. • Pinellas County Public Works (PCPW) has begun conducting flooding hot spot and drainage infrastructure inspections and should be completed later today (09/23). PCPW is also assessing water gages and water storage capacities if heavy rainfall occurs. • PCEM has sent general preparedness messaging to residents via Alert Pinellas and the Ready Pinellas mobile application. PCEM has also sent messaging to the Billboard Emergency Alert System, and to Roadway Dynamic Messaging Signs in coordination with PCPW. • PCEM is coordinating additional messaging with Pinellas County Communications (PCC). PCC will conduct a Regional Public Information Officer call today (09/23) at 4:00 PM. • PCEM will issue the next Situation Report on Saturday (09/24). 			
RECOMMENDED ACTIONS			
<ul style="list-style-type: none"> • Share weather forecasts and protective measure actions with your partners and communities. • Review emergency plans and supplies. • Ensure you have multiple ways to receive weather warnings, such as Alert Pinellas or Weather Radios. • Provide updates in WebEOC in the 2022 – Tropical Depression #9 incident. • Ensure your agency/jurisdiction begins documentation of infrastructure and roadways, protective measures, costs, etc. • Monitor the weather reports on a regular basis: <ul style="list-style-type: none"> a. https://www.hurricanes.gov/ b. http://weather.gov/tampa bay • Monitor Pinellas County Social Media Sites: <ul style="list-style-type: none"> a. https://mobile.twitter.com/pinellasem b. http://www.pinellascounty.org/social-networking.htm 			

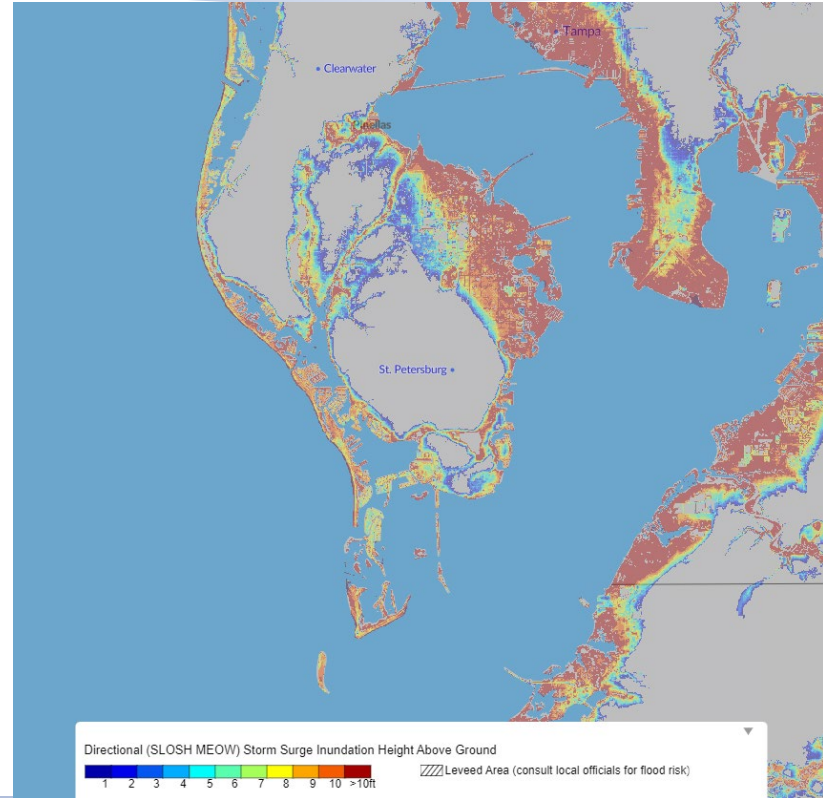
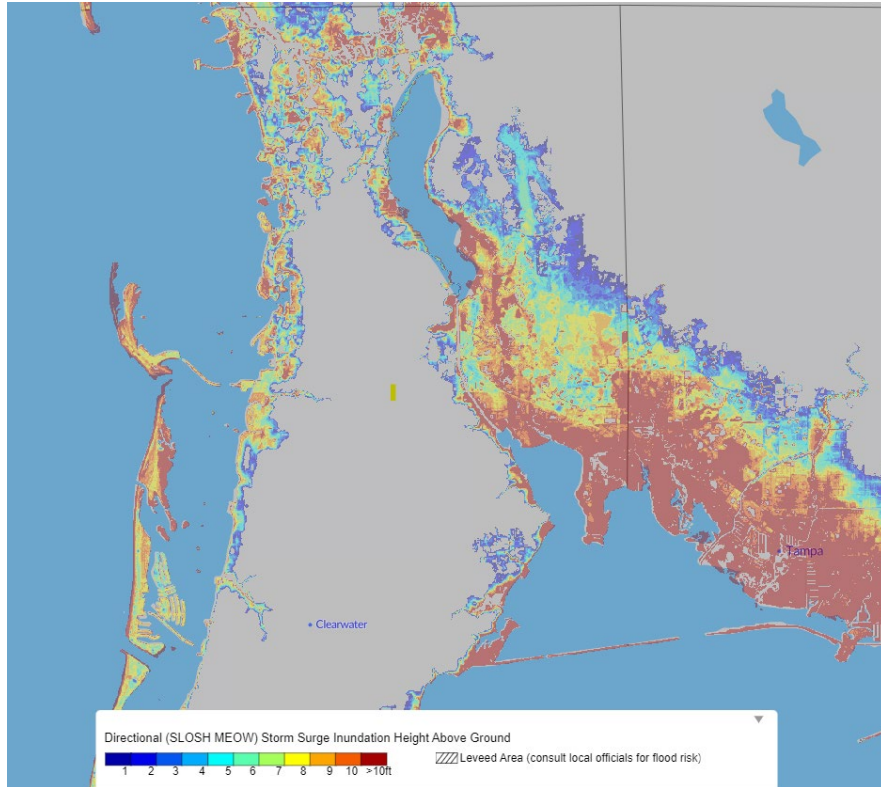
Saturday, September 24

- TD #9 becomes Tropical Storm Ian
- CIC opens at 0800
- BCC conducts emergency meeting at 1600, declared a Local State of Emergency
- FEMA issues emergency declaration
- Special needs messaging begins
- EPG, ROC and EM Partner, and Branch meetings begin



ADVISORY #:	FORECAST AND TIMING		
	BEST CASE	MID CASE	WORST CASE
1	DATE/TIME: 9/25/2022 0800		
Weather Conditions	Not For Discussion		
Wind Start Time	9/28 Wed 9:00 AM	9/28 Wed 9:00 AM	9/28 Wed 9:00 AM
Wind Exit Time	9/29 Thurs 2:00 PM	9/29 Thurs 2:00 PM	9/29 Thurs 2:00 PM
Wind Duration Time			
EVACUATIONS			
	BEST CASE	MID CASE	WORST CASE
Evacuation Level	Cat 1	Cat 3	Cat 4/5
Total Population Impacted	272,042	351,990	565,894/621,912
Total Healthcare Facilities	26	51	125/153
Clearance Time	17	20	42/50
Evacuation Start	9/27 Tues 6:00 AM	9/2 Tues 06:00 AM	Open Shelters 9/26 Mon 8:00 AM
Evacuation End	9/27 Tues 11:00 PM	9/28 Wed 4:00 AM	9/27 Tues 11:00 PM
Lockdown Duration (Stay Safe/Sheltered)			
Shelter Demand	14,119	34,831	49,233/58,599
Total Number of Shelters		25	25
General Population:		19	19
Special Needs:		3	3
Pet Friendly:		3	3
EXECUTIVE POLICY GROUP DECISIONS			
	BEST CASE	MID CASE	WORST CASE
EOC Activation Level	Level 3 9/23 0700 Level 2 -9/26 Mon 0600	Level 3 9/23 0700 Level 2 -9/26 Mon 0600 Level 1 - 9/27 Tues 0600	Level 3 9/23 0700 Level 2 -9/25 Sun 1200 Level 1 Tues 9/27 0600
CIC Activation Level	Saturday ??	Sunday 8 - 8	Sunday 8 - 8
Declare LSE By Time	Saturday 4:00 PM	Saturday 4:00 PM	Saturday 4:00 PM
BCC Meeting By Date/Time			
Media Announcements			
School Closures	tues	Mon	Mon
BCC/AA Closures	tues	mon	mon
PCSO Protective Measures			

MEOW (Cat. 3 NNE @ 10 MPH)



Sunday, September 25

- Tropical Storm Ian
- EOC Operations Desk begins staffing, CIC continues
- Sandbag sites open
- Shelter plan for opening is set
- EPG, City Managers, BCC Directors, ROC, EOC Branches continue meeting
- EOC Activation notice for Level 2 – Partial Activation on Monday, September 26 sent
- MEOW: Cat. 3 NNE @ 10 MPH – up 10' Storm Surge



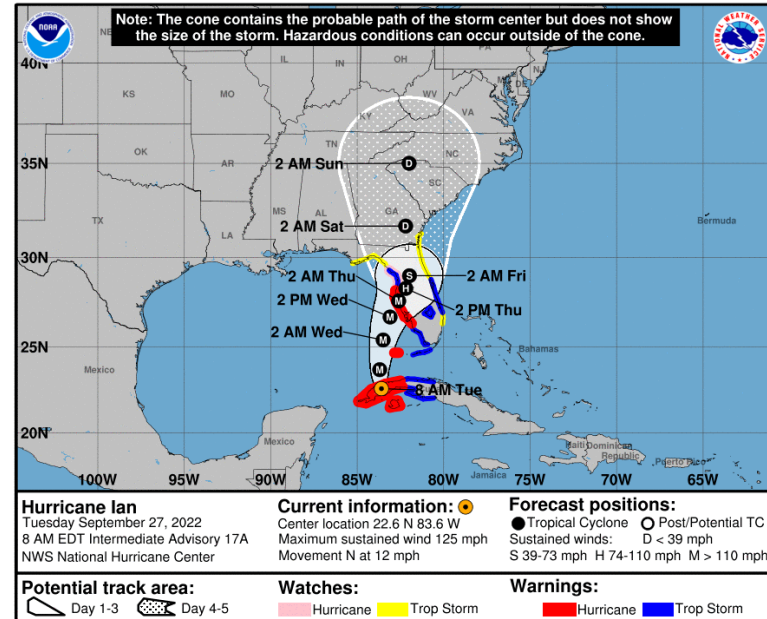
Monday, September 26

- Becomes Hurricane Ian
- Hurricane Watch, Storm Surge watch issued at 0500
- EOC activates to a Level 2 – Partial Activation
- County Press Conference at 1000
- Mandatory Evacuation Order for Healthcare Facilities in Zone A, B, and C issued 1330
- State/County press conference held at 1400
- Mandatory Evacuation Order issued for Levels A, B, and C, with Levels B and C effective the following day
- EOC activation notice for Level 1 – Full Activation sent for Tuesday, September 27
- Shelter managers meet, pick up kits
- Hurricane Warning, Storm Surge Warning issued at 1700
- 3 Special Needs and 3 General Population Shelters open at 1800



Tuesday, September 27

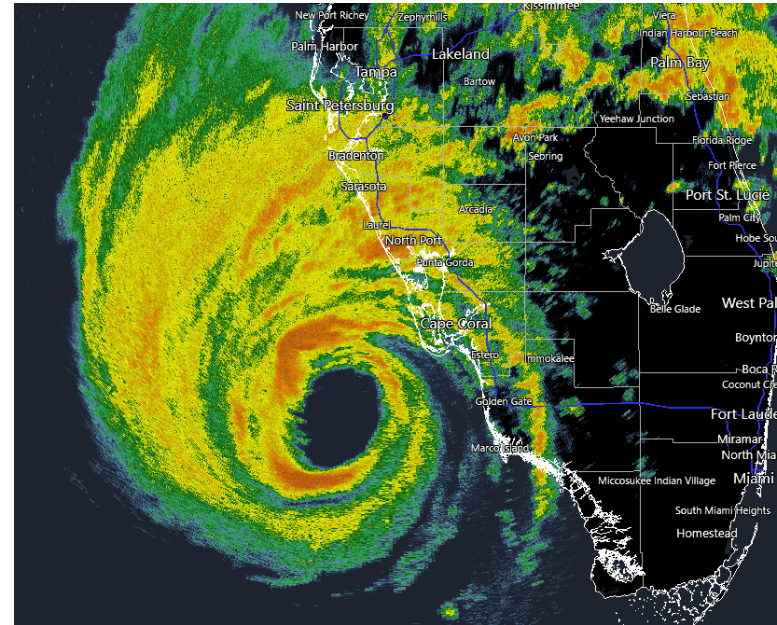
- Becomes Major Hurricane Ian
- EOC Activates to a Level 1 – Full Activation until further notice
- PCSO begins restrictions to barrier islands at 0700
- 25 Shelters (3 Special Needs, 3 Pet Friendly, 19 General Population open), PSTA suspends fares
- WEA sent for evacuation order at 0845
- All hotels reported to be evacuated by 1800
- MEOW: Cat. 3 NNE @ 10 MPH – 5 -10' Storm Surge



Wednesday, September 28

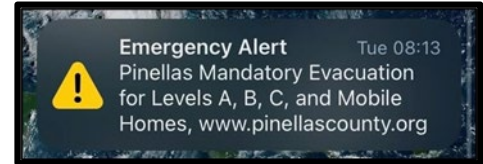


- Track begins shifting south
- EOC remains at Level 1 – Full Activation
- EOC goes into lockdown for both shifts
- Sunshine Skyway Bridge closes at 0735
- Residents advised to shelter in place as tropical storm force winds begin
- **Makes landfall Category 5 strength after 2 PM**
- Five shelters reported to be on generator at 2200
- Sporadic damage/power outages reported



Protective Measures

- **Announcement of Closures**
- **Evacuation orders**
- **Know Your Zone/Ready Pinellas**
- **Shelters**
- **Transportation**
- **Nursing Home and Hospital evacuations**



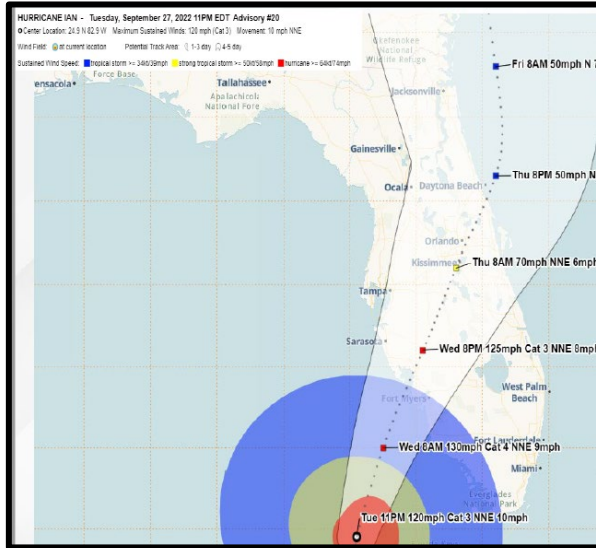
How did Ian compare to Irma?



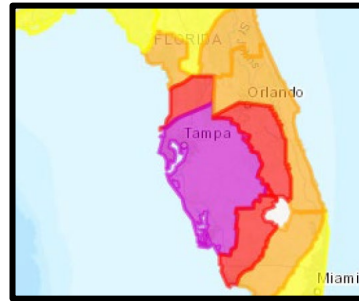
	Irma	Ian
Category	Category 1	Forecast as Category 4
Evacuation Population	350,000 (B Level)	440,000 (C Level)
Shelter Numbers	17 21,300 2000 pets	25 5,219 387 pets
Special Needs	2,053	388
Residential Healthcare Facilities asked to evacuate	49	88
CIC calls	64,490	13,957

	Irma	Ian
State	191,000	33,000
		83% reduction

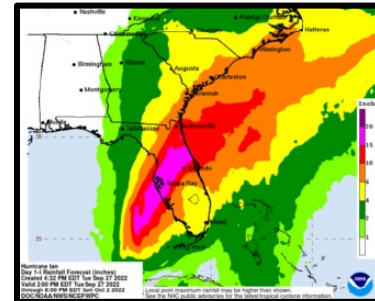
Communicating Risk



It is not about the cone.



Winds



Rain Forecast



Surge

Timing, Risk and Actions



2023 PINELLAS COUNTY HURRICANE GUIDE

READY, SET, PROTECT



This photo captures the storm surge as it was rising during Hurricane Ian in Fort Myers Beach. The estimated height of the surge was 10-15 feet along the immediate coastline. There were 58 deaths attributed to drowning. Surge of up to 8 feet was pushed 15 miles inland and up to 24 miles along rivers. Online videos show the dramatic and destructive power of storm surge.



The 2023 Pinellas County Hurricane Guide was developed in partnership with Pinellas County Emergency Management as part of Tampa Bay Newspaper in Education and includes activities to help all ages actively learn about hurricanes and what to do to get ready and stay safe.



Time is the one resource you cannot get more of.

Once a storm is threatening Pinellas County, there will be a limited amount of time for you to get ready, get set and protect yourself from impact. This guide will help you determine your risk, know what to do and what to expect.

READY: WE ARE AT RISK

Once Pinellas County is in the cone of uncertainty, there is a risk that we will be impacted by a storm. This can be in the next 3-5 days.



Page 3	Storm surge
Page 4	Wind
Page 5	Flood
Page 6	What you need
Page 7	Who to plan for
Page 8	Where to get info
Page 9	Stay or go?

SET: THE THREAT IS REAL

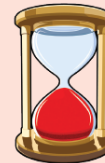
As the storm moves closer and Pinellas County is forecast to have impacts, it is time to get set. Evacuation orders could range from 17-50 hours before impact.



Page 10	Picture the threat
Page 11	Get out of the zone
Page 12	Know when to go
Page 13	Secure your home
Page 14	Evacuation options
Page 15	Shelter options

PROTECT: THE IMPACTS ARE HERE

As conditions become unsafe, you will need to shelter in place. It is not safe to move around during and immediately after a storm.



Page 16	Shelter in place
Page 17	Outages
Page 18	After the storm
Page 19	Recovery begins
Page 20	Pinellas County contacts

Timing, Risk and Actions

READY: WIND



WIND

Winds in a hurricane can range from outer bands that could be gusty winds, to devastating hurricane-force winds. The winds will impact the entire county.

- ≡ Winds can extend out for hundreds of miles (bigger than the cone).
- ≡ Tornadoes can occur in outer bands.
- ≡ Winds can last from a few hours to more than 24 hours.

ACTION: Know if your home is strong enough to stay in.

- Mobile and manufactured homes are very vulnerable to strong winds.
- Plan to evacuate to a stronger building, outside of an evacuation zone.
- Protect the openings to your home to keep the wind out.

TIMING:

Know when the winds are expected to arrive.

- Buses used to assist with evacuations will stop running at least several hours before the arrival of tropical storm-force winds.
- Other response vehicles will stop running when conditions are no longer safe due to winds.



Power can be lost in high winds. If you rely on electricity for life-sustaining medical equipment, consider options. **See who to plan for, page 7.**



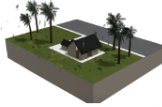
This advisory from the National Weather Service, issued as Hurricane Ian approached Florida, shows the most likely arrival of tropical-storm-force winds, which affected the entire state.

Hurricane Intensity Scale Wind Damage See animation:

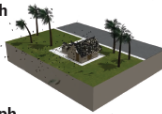
This animation shows the potential impact that strong winds could have on a home. Hurricane winds that are stronger and last longer can cause major damage or even destroy a home, especially if it is not hardened or is an older structure. Damages to roofs, unprotected windows and doors can occur. Even if you are not in an evacuation zone, you should protect the envelope of your home, if you can, or evacuate if you feel your home is not sturdy enough to withstand hurricane force winds.



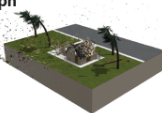
Category 1 75-95 mph



Category 2 96-110 mph



Category 3 111-130 mph



Source: COMET* Website at <http://meted.ucar.edu/> of the University Corporation for Atmospheric Research (UCAR), sponsored in part through cooperative agreement(s) with the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce (DOC). ©1997-2023 University Corporation for Atmospheric Research. All Rights Reserved.



Flooding from Hurricane Florence in 2019 inundates a neighborhood in South Carolina.



The Greater Naples Fire Rescue District responds to a flooded car following Hurricane Ian in 2022.

FLOOD

Tropical storms and hurricanes can create a lot of rain in a short period of time.

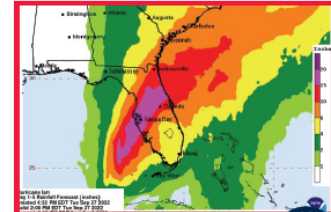
- Areas prone to flooding can be overwhelmed.
- Localized flooding can last much longer than storm surge flooding.
- Flooding can occur in areas outside of floodplains, especially with high amounts of rain over a short period of time.



Look up your flood risk at floodrisk.pinellas.gov

ACTION: Know if you are at risk for inland flooding.

- Elevate valuables in your home.
- Sandbags or other flood barriers may help keep water out of your home **only if the flooding is due to rainfall** (not storm surge).
- Know if you have flood insurance and what is covered.
- **Review information on pinellas.gov/flood-insurance.**
- If you can, check storm drains near your home and remove any loose leaves or items that may block drainage. Do this before the storm.



TIMING:

Rains can start with the outer bands of a hurricane and last for days. The slower or larger a storm is, the longer rain may fall.



READY: FLOOD



STORM SURGE

Storm surge is the water that is pushed onto land as a hurricane makes landfall.

- It can range from a few feet to over 30 feet.
- It will impact coastal areas first, then move further inland.
- Surge is life-threatening.
- It is fast-moving and fast-rising.
- Can wash away buildings and roadways.

ACTION:
Know if you are at risk from storm surge.



Courtesy of Max Olson Chasing

KNOW YOUR ZONE

There are several ways to find out your evacuation zone:

- disaster.pinellas.gov
- **Ready Pinellas** mobile app (Android, iOS)
- **272-453-3150**
 (for Pinellas County landline phones only)



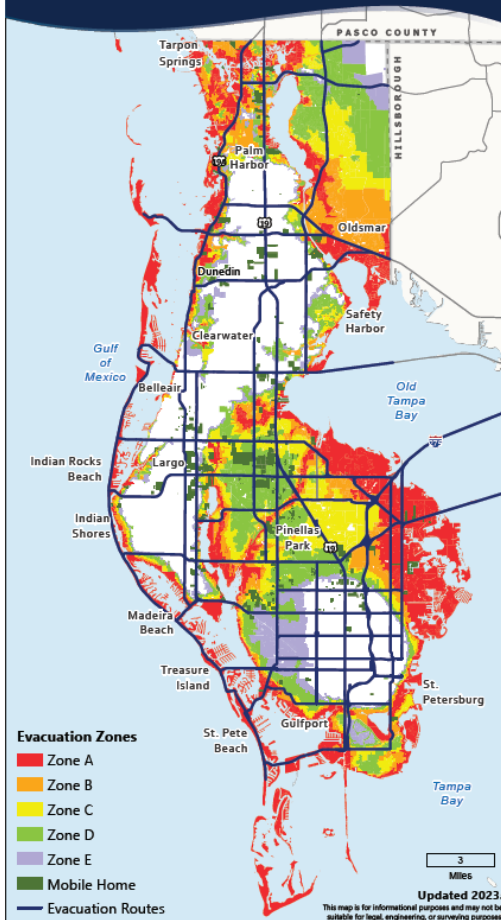
Evacuation zones are based on storm surge. This map shows the areas where storm surge could occur. See more about storm surge, page 10.

TIMING:

Storm surge and winds will start to arrive around the same time. Pay attention to when tropical storm-force winds are forecast to start. You need to be out of these areas before then.



Evacuation Zones



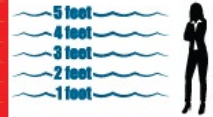
- Evacuation Zones**
- Zone A
 - Zone B
 - Zone C
 - Zone D
 - Zone E
 - Mobile Home
 - Evacuation Routes

Updated 2023.
 This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

READY: STORM SURGE



STORM SURGE AND YOU



If the weather forecast says surge height could be...

Wind will affect the entire county. Mobile home residents and residents who are dependent on electricity must always evacuate due to winds for all category hurricanes.

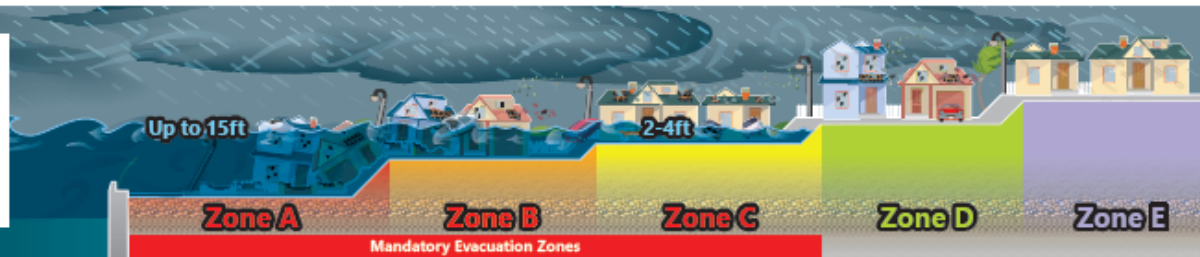
5-7 feet

- Roads are flooded; cars are flooded.
- Fast-moving storm surge may enter homes, with water above electrical outlets.
- Life-threatening conditions.



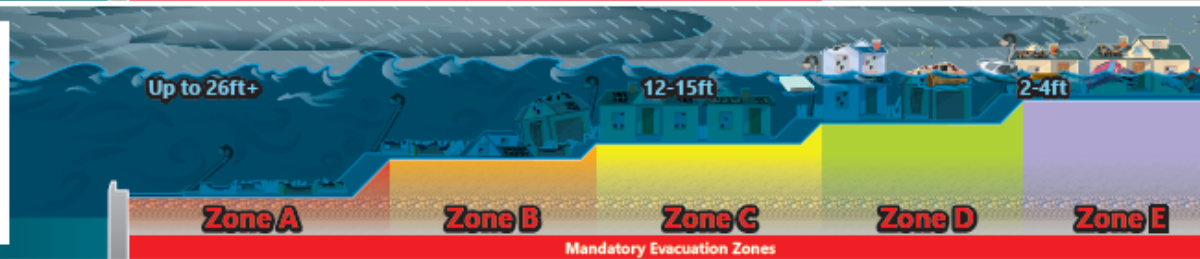
12-15 feet

- Storm surge is up to house rooflines in Evacuation Zones A and B.
- Homes can be moved from their foundations.
- You are not likely to survive this.



26+ feet

- Homes in Zones A and B may be swept off their foundations.
- Catastrophic damage along the coast.
- Extensive flooding in all zones: inside homes, cars, on roads.
- You are not likely to survive this.



Timing and Actions



SET: KNOW WHEN TO GO

THE TIMING OF EVACUATIONS

What to do and when to do it.

WHEN AN EVACUATION IS ORDERED

Evacuation orders are based on how long it might take for everyone to evacuate before the arrival of tropical storm winds.

17 hours	Zone A and mobile homes
20 hours	Zone B, Zone A and mobile homes
26 hours	Zone C, Zone B, Zone A and mobile homes
42 hours*	Zone D, Zone C, Zone B, Zone A and mobile homes
50 hours*	Zone E, Zone D, Zone C, Zone B, Zone A and mobile homes



In Pinellas County, motorists evacuate as Hurricane Ian threatens the area in 2022.

*Evacuation orders may be issued before a Watch or Warning. For a Category 4 or 5 hurricane these actions will need to occur earlier.

6 HURRICANE WATCH

Forty-eight hours ahead of the onset of tropical storm-force winds (39-73 mph):

- Fill vehicle gas tank.
- Get cash, secure papers and valuables.
- Refill medications.
- Fill containers and tubs with water.
- Secure yard equipment and furniture.
- Shutter your windows.
- See how to secure your home, page 13.
- If you are registered for special needs transportation, get your emergency kit ready. See checklist, page 6.
- Be prepared for an evacuation order to be issued at any time.
- Check updates to evacuation zones and shelter information. See where to get information, page 8.



6 HURRICANE WARNING

Thirty-six hours ahead of the onset of tropical storm-force winds (74 mph or more):

- Complete final preparations to evacuate or to shelter in your home.
- If your plan is to travel out of the area and you can leave at this point, go.
- If you are registered for a special needs shelter and will be getting transportation, be ready to leave.
- Be prepared for an evacuation order to be issued at any time.



PROTECT: SHELTER IN PLACE

Time to Protect From the Threat



In 1985, Hurricane Elena parked in the Gulf of Mexico and brought high waves into backyards and sea walls on Tampa's Culbreath Isles. The storm was estimated to have caused \$100 million in local damage. [Times (1985)]

Here are some of the conditions you may encounter and recommendations on how to best respond:

If flood water is rising in your home:

- Before you lose power, report your location to an emergency contact that is out of the area so that they can help first responders locate you after the storm.
- Shut off water service, gas service and electricity.
- Do not go outside and wade through the water.
- Remain inside.
- Move to the second floor or higher if needed.
- Stand on top of a counter or substantial piece of furniture to stay above the rising water.
- If you must go into your attic, take an axe or something strong enough to cut through your roof so that you can climb out if necessary.

If your home is being damaged by strong winds/tornadoes:

- Close interior door(s) to reduce pressure in your home.
- Go to a safe room: an interior room, closet or hallway on the lowest level of your home, preferably without undoing interior doors.
- Lie on the floor under a table or other sturdy object, or in a bathtub, if you cannot make it to a safe room.
- Curl up and cover your head with a mattress or other item if available.
- Do not leave your safe room until you are sure the storm has completely passed.
- It will seem calm as the eye passes. Be ready for severe weather to return once the eye passes.

Wait until the storm has passed to tend to any damage.

When time has run out

There will be a point in time when it is no longer safe to try to leave.

- Winds will continue to gain strength and, once they reach 40 - 50 mph, conditions will not be safe for anyone to be outside.
- Fire and Emergency Medical Services will not be able to respond to emergencies.
- It is time for everyone to shelter in place.
- Surge will start in coastal areas and push inland.



GOING BEYOND THE TEXT | THE DISASTER DODGERS

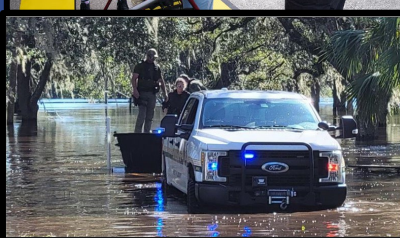
Check out the Disaster Dodgers videos to learn how to be prepared. This video - <https://youtu.be/TbzvovQYjPE> - teaches young people the difference between a disaster, emergency and hazard. Kids will also learn what types of emergencies to prepare for and what to do in order to prepare for them. Watch the video series and then write down the main points the Dodgers share. Use the cartoons in the Tampa Bay Times, create a cartoon based on the information you have learned in the video.

Planning for the Challenges

- Debris
- Contracts
- Disaster Housing
- Post Disaster Redevelopment



Amazing Partners and Employees



Hurricane Ian	
Activation to Level 1 – Full Activation (Days)	3
Activation to Level 2 – Partial Activation (Days)	2
Activation to Level 3 – Enhanced Monitoring (Days)	34
Alert Pinellas Notifications Sent	44
Alert Pinellas Registrations	20,567
County Information Center Calls	13,957
Facebook Engagement	513,638
Facebook Impressions	3,340,028
Healthcare Facilities Evacuated	99
Incident Action Plans	3
Instagram Engagement	2,724
Instagram Impressions	155,342
Know Your Zone Website Hits	1,535,939
Live Chats	3,082
Media Inquires	98
Media Releases	17 (16 in Spanish)
New Special Needs Registrations	999
NextDoor Impressions	98,914
PCEM Notifications to Partners	77
Ready Pinellas Downloads	9,884
Ready Pinellas Notifications Sent	64
Sandbags Distributed	54,080
Shelters – Total Residents Sheltered	5,218
Situation Reports Issued	25
Twitter Engagement	175,570
Twitter Impressions	1,626,104
Wireless Emergency Alerts Sent	1



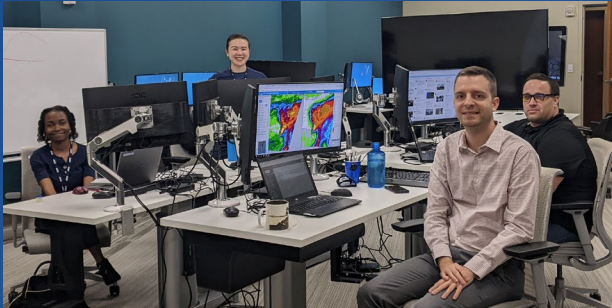
NOAA's National Water Center

Hurricane Ian Response and Future Capabilities



NOAA Hurricane Preparedness Summit, April 2023
Paula Miano (Cognitore)
Water Predication Operations Division, National Water Center
Tuscaloosa, AL

NWC & Ian



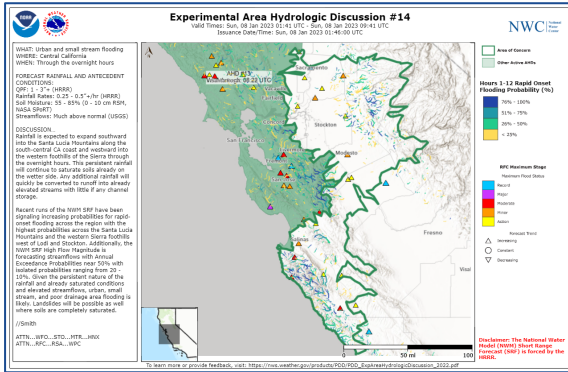
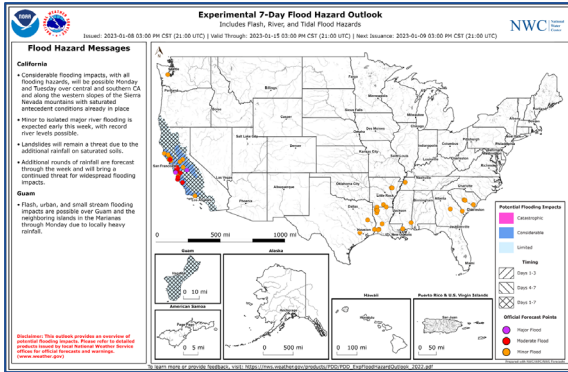
- Operations Overview
- NWC Experimental Products
- Collaboration / Coordination
- FIM Support
- Future
 - *NWS FIM CONOPS*
 - *National Water Model Enhancements*

Water Prediction Operations Division

- Current operations:
 - 50% staffed
 - 2 shifts every day (5am - 8:30pm)
 - Winter Desk (every day Nov - May)
 - Surge up to 24 hrs/day for events
- GIS and Software Engineering teams
- Full Operating Capability
 - 41 total employees
 - 24 / 7 operations



Experimental Products & Services



National Water Center Products and Services Operational and Experimental

Office of Water Prediction National Program

Water.gov > Office of Water Prediction > National Water Center Products and Services



Area Hydrologic Discussion

Experimental short range, episodic discussion and graphics which highlights locations across the nation that may be impacted by rapid-onset flooding, using National Water Model and other guidance.

AHD Product Description Document
 Provide Feedback on AHD
 AHD One-Pager



Flood Hazard Outlook

High Level graphical depiction and key messages highlighting the potential threat of inland flood hazards (flash, urban, small stream and riverine) and their associated impacts (catastrophic, considerable, and limited) for the next seven days.

FHO Product Description Document
 Provide Feedback on FHO
 FHO One-Pager



National Hydrologic Discussion

Experimental discussion of the current and forecast hydrologic conditions across the nation, including a variety of short and medium range (Days 1-10) observed and modeled hydrologic guidance.

NHD Product Description Document
 Provide Feedback on NHD
 NHD One-Pager



Significant River Flood Outlook

Operational flood outlook intended to provide a general outlook for significant (moderate and above) river flooding. It is not intended to depict all areas of minor flooding or small-scale events such as localized flooding and/or flash flooding.



NWC Visualization Services

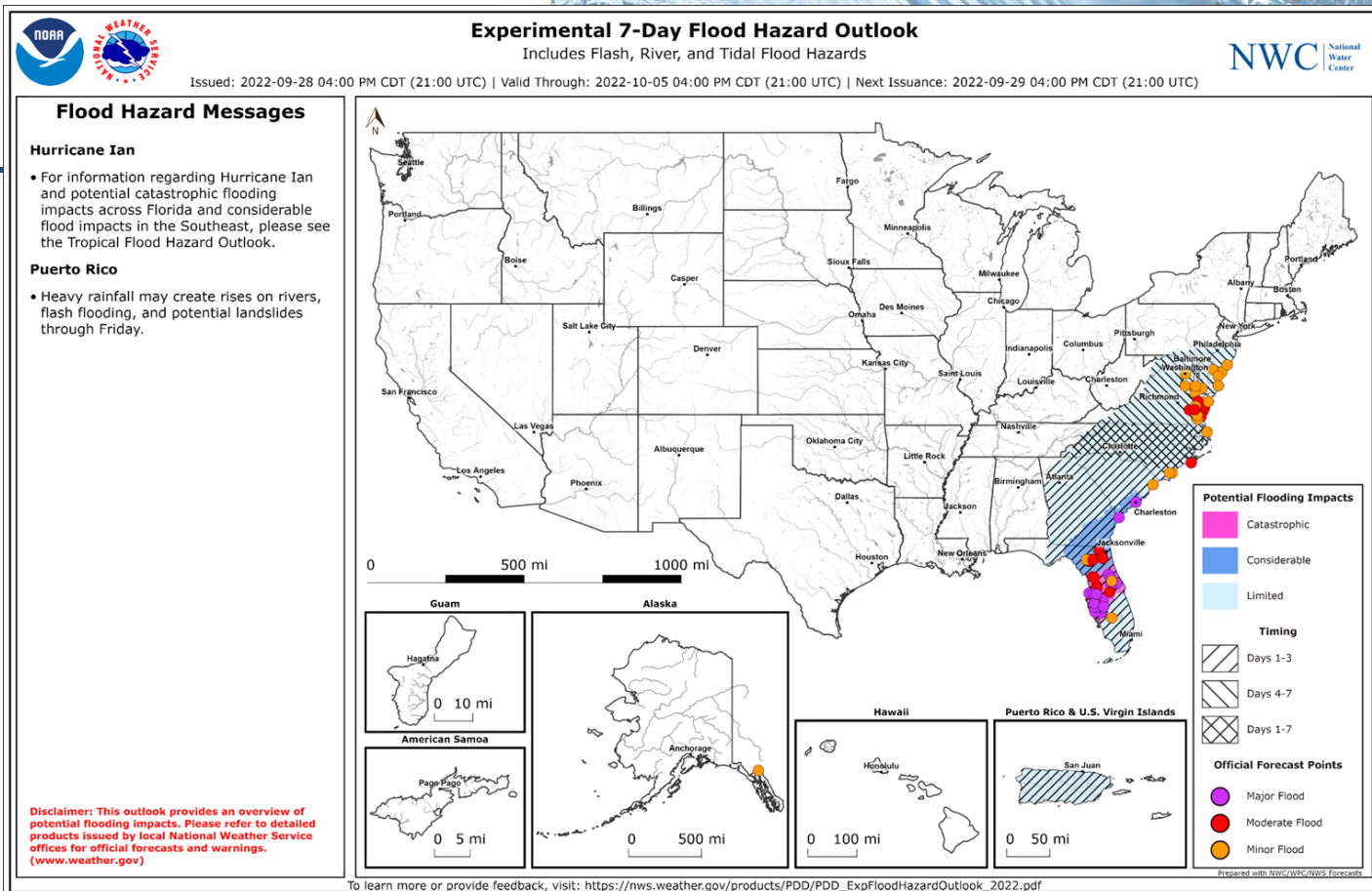
Experimental geospatial services depicting forecasts from the River Forecast Centers and the National Water Model. Services available via the prototype NWS National Map Viewer, or directly via URLs hosted on the Hydrologic Visualization and Inundation Services (HydroVIS) cloud resource. Refer to the "Public Handbook" for additional details.

NWC Visualization Services Service Description Document
 Provide Feedback on NWC Visualization Services
 High Flow Magnitude
 High Water Arrival Time
 High Water Probability
 Rapid-Onset Flooding
 Streamflow Anomaly



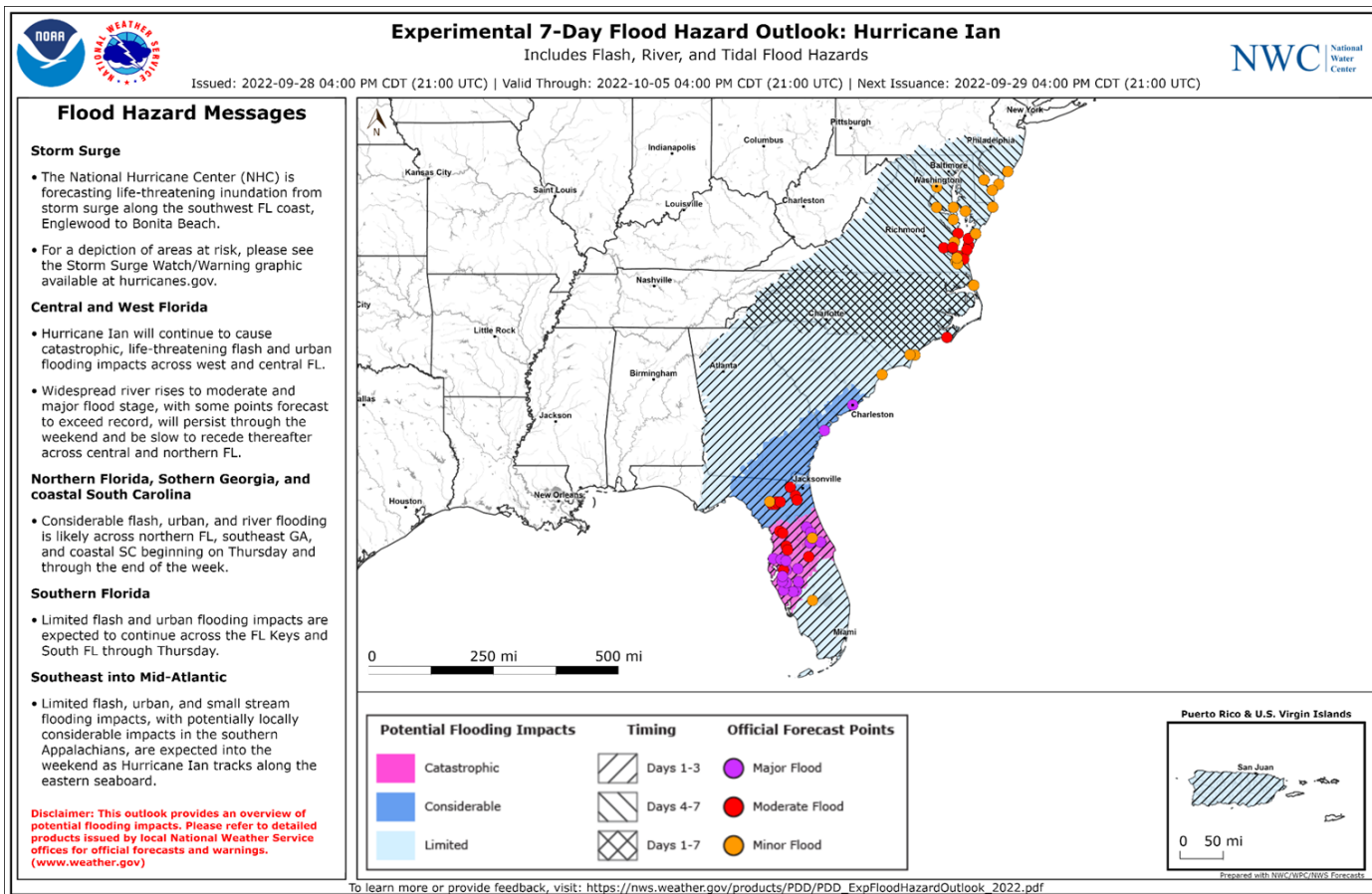
FHO

- High Level
- Heads-up
- 7-Day Outlook
- Comprehensive
- 3 Categories
- 3 Timing Bins
- 1xday* @2100Z
- Static Map
- Map Service



Tropical FHO

- More focused text
- 2x day
 - @2100Z
 - @1130Z
- Static Map
- Service



FHO

National Static Image

Tropical Static Image

Map Service

FHO GIS Service

Static Image Archives



National Hydrologic Discussion (NHD)

- **What:** Discussion for observed, modeled, and expected hydrologic conditions for the United States days 1 -10
 - NOT just a National Water Model (NWM) diagnostic discussion
 - Uses all available resources and forecaster knowledge to produce
- **Audience:** Internal & external surface water information users
- **Issuance:**
 - 1530Z
 - PIL: HMDNWC
 - <https://www.weather.gov/owp/operations> -nhd

EXPERIMENTAL DISCUSSION

National Hydrologic Discussion - EXPERIMENTAL
NWS National Water Center - Tuscaloosa AL
1015 AM CDT FRI SEP 23 2022

.Synopsis...

Isolated river flooding continues, potential impacts from Tropical Depression Nine next week in [Florida](#)... Urban and small stream flooding possible today in [Puerto Rico](#)... Isolated flash and urban flooding remains possible today in the [Southwest](#)...

.Discussion...

■.Florida...

Localized areal, urban, and small stream flooding impacts are possible for the southern half of the Florida Peninsula through day 3 (Sun) due to areas of locally heavy rainfall. Top-layer soils remain generally above 50% throughout the region this morning (0 - 10 cm RSM NASA SPoRT), suggesting soil infiltration capacity may be limited. In addition, streamflows are elevated throughout the Peninsula. That said, locations that experience intense rainfall rates will likely be the primary driver for any hydrologic impacts, especially if they occur near and in urban areas.

Isolated minor to moderate riverine flooding continues this morning in the Tampa Bay and Peace basins following several days of heavy rainfall in the Florida Peninsula. While these rivers are receding, the combination of additional heavy rainfall and overall wet antecedent conditions would leave these areas especially vulnerable to any new additional rainfall. Tropical Depression Nine, currently located in the central Caribbean Sea, is forecast to approach the Florida Peninsula early on day 6 (Wed). The latest QPF from WPC indicates increasing rainfall associated with TD 9 for the southern Peninsula on day 5 (Tue). With the general uncertainty associated with the eventual track of TD 9, it is too early to outline the location and magnitude of flooding impacts, but the Florida Peninsula would be particularly susceptible to flooding impacts from the storm. River ensemble forecasts from the MMEFS indicate that there is potential for significant river flooding, particularly in the previously mentioned central FL Peninsula basins where some rivers are already above flood stage. ■

■.Puerto Rico...

Localized urban and small stream flooding impacts are possible today as Tropical Depression Nine, passing south of Puerto Rico, will help foster the development of showers and storms which may produce locally heavy rainfall. With soils remaining near-saturated from significant amounts of rainfall associated with Hurricane Fiona, soil infiltration capacity is greatly reduced and any additional rainfall could quickly lead to flooding. A brief lull in significant rainfall is anticipated on days 2 - 3 (Sat - Sun) before rain chances increase on day 4 (Mon) and remain elevated through next week; additional flooding impacts will be possible as a result.

■.Southwest...

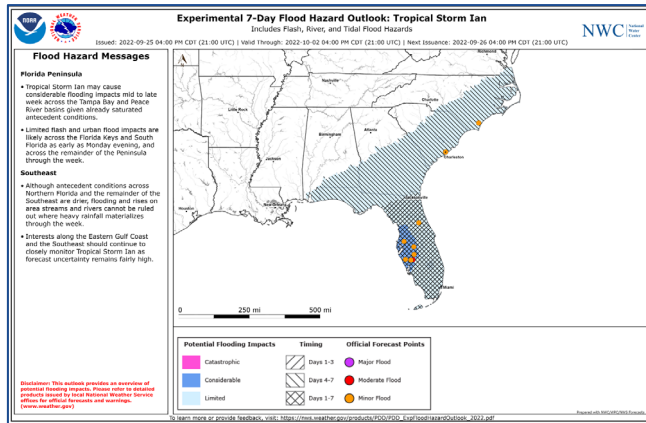
Areas of potentially heavy rainfall (up to 1") today across portions of Arizona and western New



Florida... Isolated minor to moderate riverine flooding is ongoing across parts of central FL from several days of heavy rainfall. While these rivers are all on their recession legs, **a combination of additional heavy rainfall early next week and overall wet antecedent conditions would leave this area especially vulnerable to any new additional rainfall.** The National Water Model (NWM) Medium-Range Forecast is doing a good job slowly routing the flow of these rivers.

Experimental Flood Hazard Outlook

NWC began messaging the potential for “considerable” flooding impacts across FL Peninsula.



9/22 (Thursday)

9/25 (Sunday)

9/23 (Friday)

Experimental National Hydrologic Discussion

NWC began messaging vulnerability of FL to additional flooding impacts next week due to several days of heavy rainfall and ongoing flooding

Experimental Flood Hazard Outlook

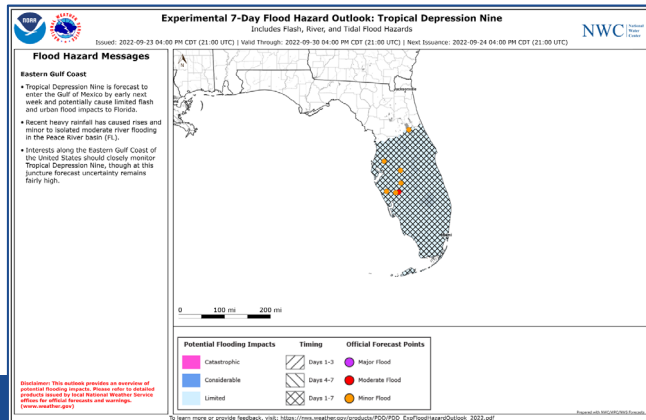
NWC began messaging potential for flooding impacts through day 7.

NWC WPOD Activation Level

Moved from 4 (Normal Operations) to Level 3 (Enhanced Operations)

Coordination/Collaboration

Joint Rainfall Statement & Key Messages begin with Weather Prediction Center (WPC) for NHC



Timeline of Products, Coordination, & Collaboration

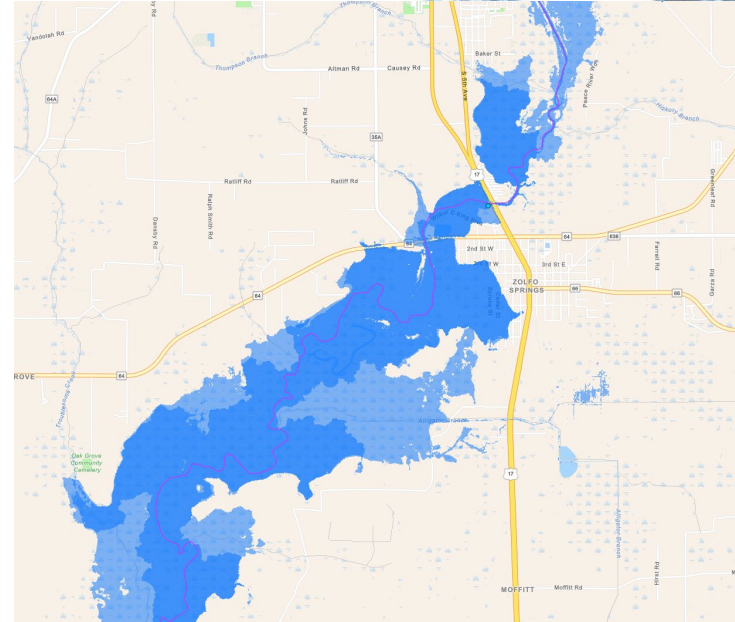
Flood Inundation Mapping



- NWS Office of Water Prediction (OWP) provides reach-back support for FIM IDSS to NWS internal partners as well as federal partners from the National Water Center in Tuscaloosa, AL.

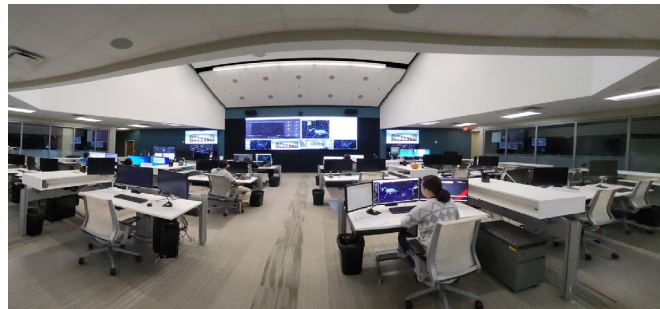
NWC Flood Inundation Mapping

- Prototype services - not yet publicly available
- Height Above Nearest Drainage (HAND) method
- National Water Model FIM
 - Analysis (based on assimilated USGS streamflow observations)
 - Short Range Forecast (HRRR QPF forcing)
 - Medium Range Forecast (GFS QPF forcing)
- River Forecast Center (RFC) FIM
 - Ingests official RFC max streamflow forecasts at forecast sites, routes flow downstream.



NWC FIM Support to NWS Field Offices

- The NWC facilitated IWRSS FIM coordination with federal partners (FEMA, USACE, USGS) during Ian through daily coordination calls.
 - Federal FIM coordination allowed NWS hydrometeorological expertise to inform federal partners with generating their FIM.
 - Example: QPF timeframes used in USACE FIM, switch from forecast to observed rainfall forcing.



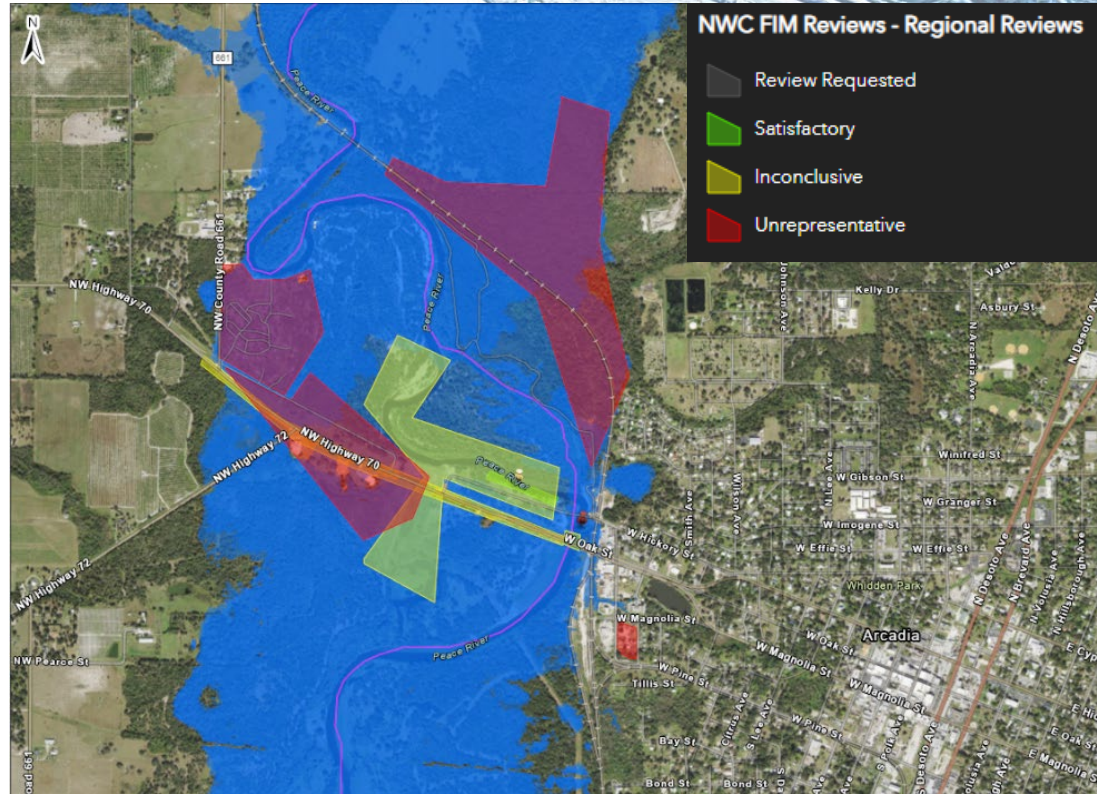
NWC FIM Support to NWS Field Offices

- NWC FIM Coordinator maintained open communication with FL WFO FIM Coordinator and SERFC throughout the event.
 - As WFOs received requests from state/local partners, the NWC provided reach-back support.
 - Evaluated NWC FIM for specific areas.
 - Advised on which NWS FIMs were seen to be performing better in specific areas.
 - Allowed the NWS to more effectively serve our partners by providing actionable information in a timely manner.



NOAA/NWS National Water Center FIM QC

- NWC hydrologists collaborate with NWS WFOs/RFCs via an internal “FIM Reviewer” web app.
- FIM performance is noted as satisfactory, inconclusive, or unrepresentative.
- Helps NWS field offices provide better IDSS to their partners.



NWC FIM Support to FEMA

- The NWC supported FEMA by providing RFC 5-Day FIM based on RFC streamflow forecasts for several rivers in northern Florida and the Carolinas, as well as NWM 5-Day FIM based on GFS forecasts across portions of North Carolina.
- Across central FL Peninsula, NWM and RFC FIM were recommended not to be used due to known limitations of the HAND method in very flat and wetland areas.
- These actions were coordinated with NWS field offices to provide additional context and caveats for FEMA's interpretation of NWC FIMs.

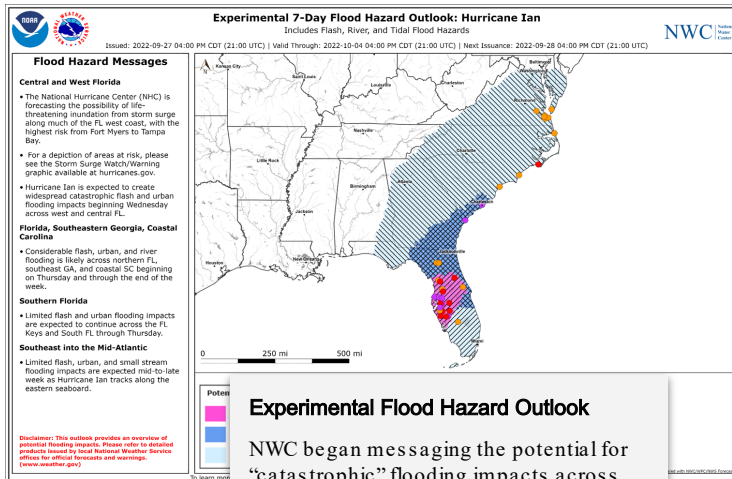


NWC Operations

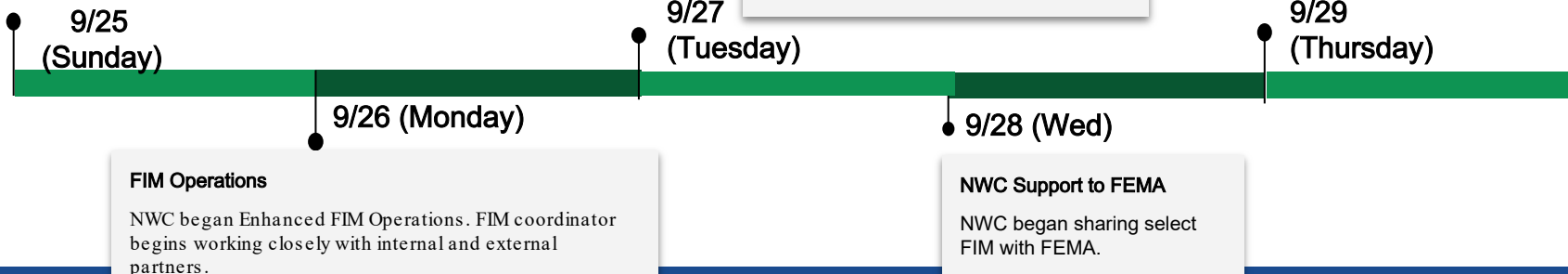
- Moved From Level3 (Enhanced Operations) to Level2 (Partial Activation), Commenced 24/7 operations.
- IC & FIM Coordinator Named.
- Coordination call held with NWS DSS Tropical Coordinator et al.

IWRSS FIM Coordination

NWC began FIM coordination calls with our federal partner agencies (FEMA, USACE, USGS).

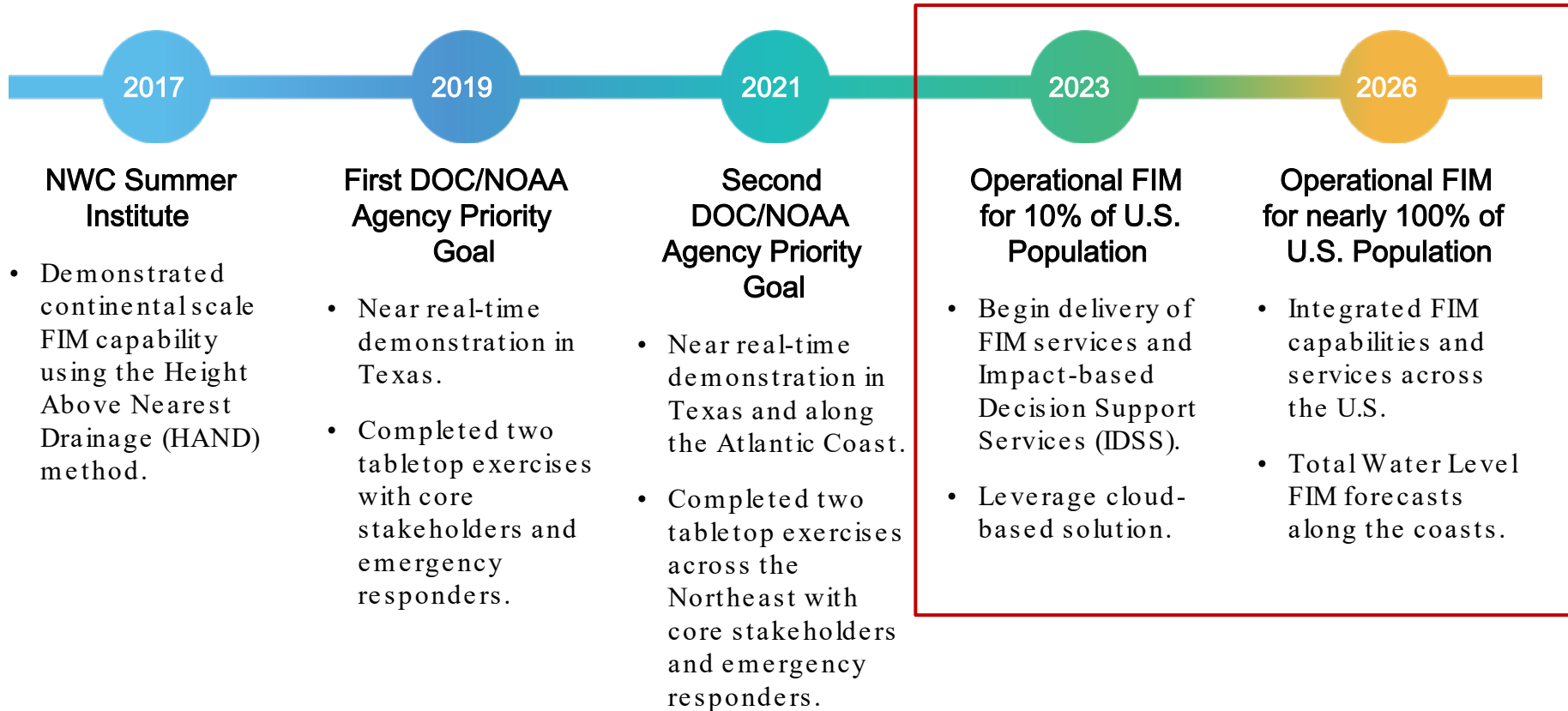


Rescue workers in Orlando, FL Image Credit: Phelan M. Ebenhack/EBENP, via Associated Press



Timeline of Products, Coordination, & Collaboration


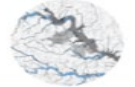

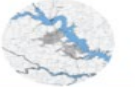
NWS Flood Inundation Mapping Timeline



Initial FIM Rollout - National Viewer

By September 30th - FIM for 10% of the U.S. population

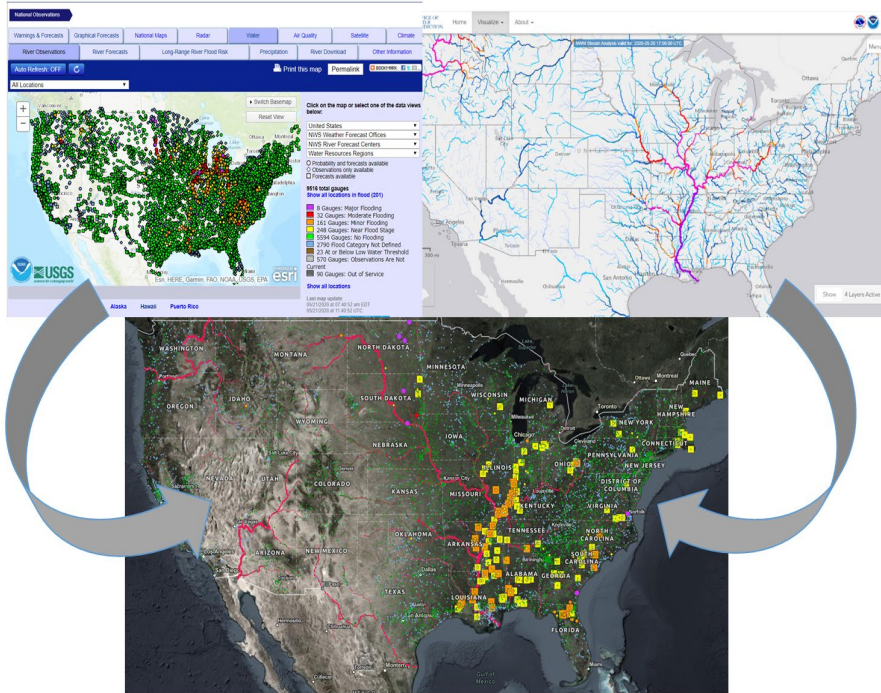
- Dissemination to commence on the NWS National Viewer
- Alongside the existing NWM visualizations
 - (<https://viewer.weather.noaa.gov/water>)
 - High Water Arrival Time, Max High Flow Forecast, & High Water Probability Forecasts
 - Rapid Onset Flooding Forecasts & Probability Forecasts

FIM Service	NWM ANA FIM	RFC 5-Day Max FIM	NWM 5-Day Max FIM
			
Data Type	Observation based simulations [precip. estimates & USGS gage observations]	Forecast [5-day RFC forecasts]	Forecast [5-day GFS]
Latency/Duration	Real time with 1 hr 20 min latency time	1 hr 55 min latency max extent for 5-days	6 hr 30 min latency max extent for 5-days
Updates	Hourly	Hourly	Every 6 hours
HAND Inputs	Flow	Flow	Flow
Threshold Source [NWM/WFO]	NWM High Water	WFO	NWM High Water
Error Sources	<ul style="list-style-type: none"> • RADAR or gage malfunctions • For ungaged reaches, errors associated with NWM & estimated precipitation • HAND errors [10m DEM resolution] 	<ul style="list-style-type: none"> • Rainfall forecast • RFC flow simulations • Routing of flow using NWM physics • HAND errors [10m DEM resolution] 	<ul style="list-style-type: none"> • GFS forecast • NWM flow simulations • HAND errors [10m DEM resolution]
Availability	Full NWM domain [CONUS, HI, PR, US Virgin Islands]	Downstream of AHPS forecast points	CONUS
Mapping Threshold	Only available for reaches that meet and/or exceeded the High Water threshold	Only available based on active RFC forecasts at or above Action Stage	Only available for reaches that meet and/or exceeded the High Water threshold
When to Use	Use if latest observed condition is important	Use when RFC forecaster input is available	Use for areas not covered by other services & have confidence in GFS forcing



National Water Prediction Service (NWPS)

“Modernizing Hydrologic Web Dissemination: AHPS to NWPS”



- Consolidates and expands features of current Advanced Hydrologic Prediction Service ([AHPS](#)) and [Office of Water Prediction](#) web services
- Mobile friendly interface
- Geospatial & API driven data services
- Improved features and user navigation
 - National Map - current/forecast status
 - Gauge pages - **enhanced hydrographs**, flood stage and impact information, probabilistic graphics and **flood inundation maps** (where available)
 - Hydrographs for all **National Water Model** locations (~2.7M)
- **Community Outreach:** User testing by internal NOAA and partners, training
- Deployment date : Q2 - FY24



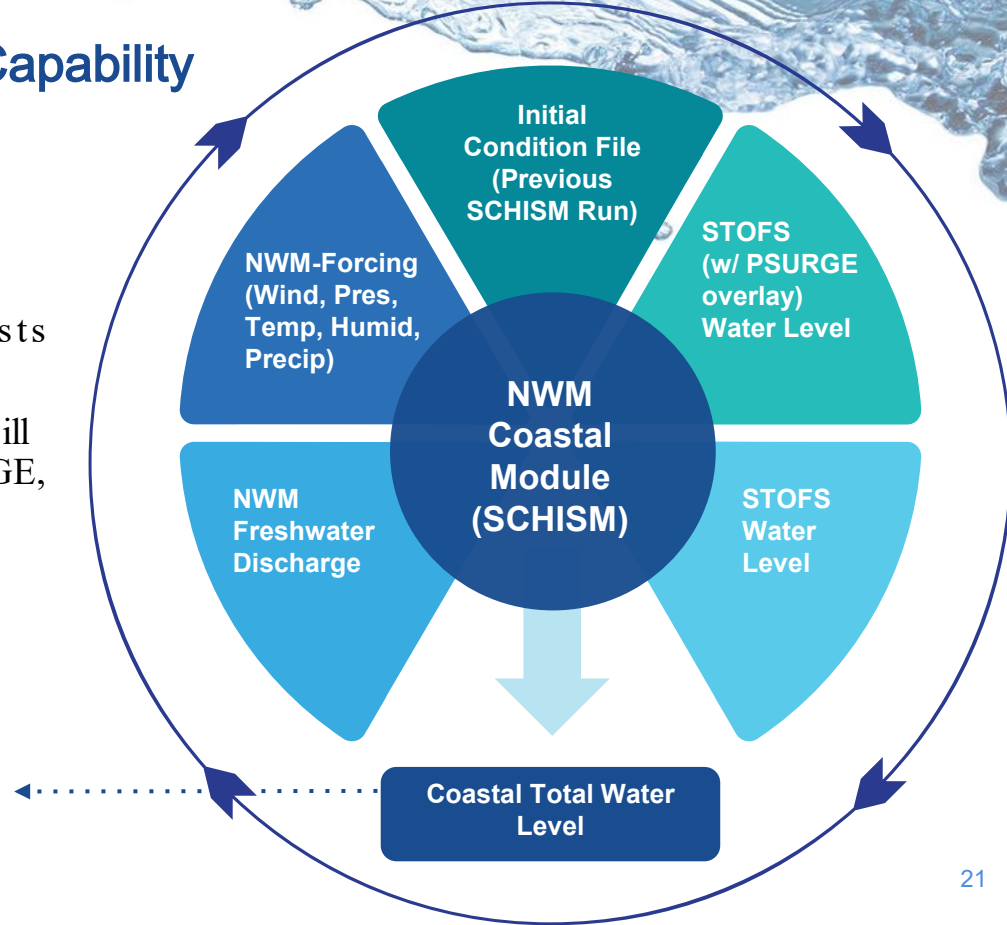
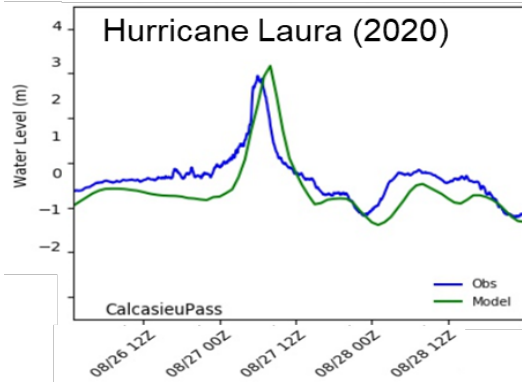
StoryMap Details:

[Modernizing Hydrologic Web Dissemination](#)

NWM v.3.0 (2023): New Total Water Level Forecasting Capability

Looking Ahead: Filling the capability gap

- TWL guidance is increasingly critical to the 100 million+ people living near the coast
- National total water level forecasts from the NWM will complement existing regional forecasts with *CONUS-wide, Hawaii, and PRVI guidance*
- This new freshwater-estuary-ocean coupling will leverage the NWM, SCHISM, ESTOFS & PSURGE, execute in both Analysis and Forecast modes.





OWP | OFFICE OF
WATER
PREDICTION



Thank You!



Paula Miano (Cognitore)



paula.cognitore@noaa.gov

paula.miano@noaa.gov



<https://water.noaa.gov>

4th Annual NOAA Hurricane Preparedness Summit:
Cross-LO/PO Coordination:
Lessons Learned and NOS Incident Management Team

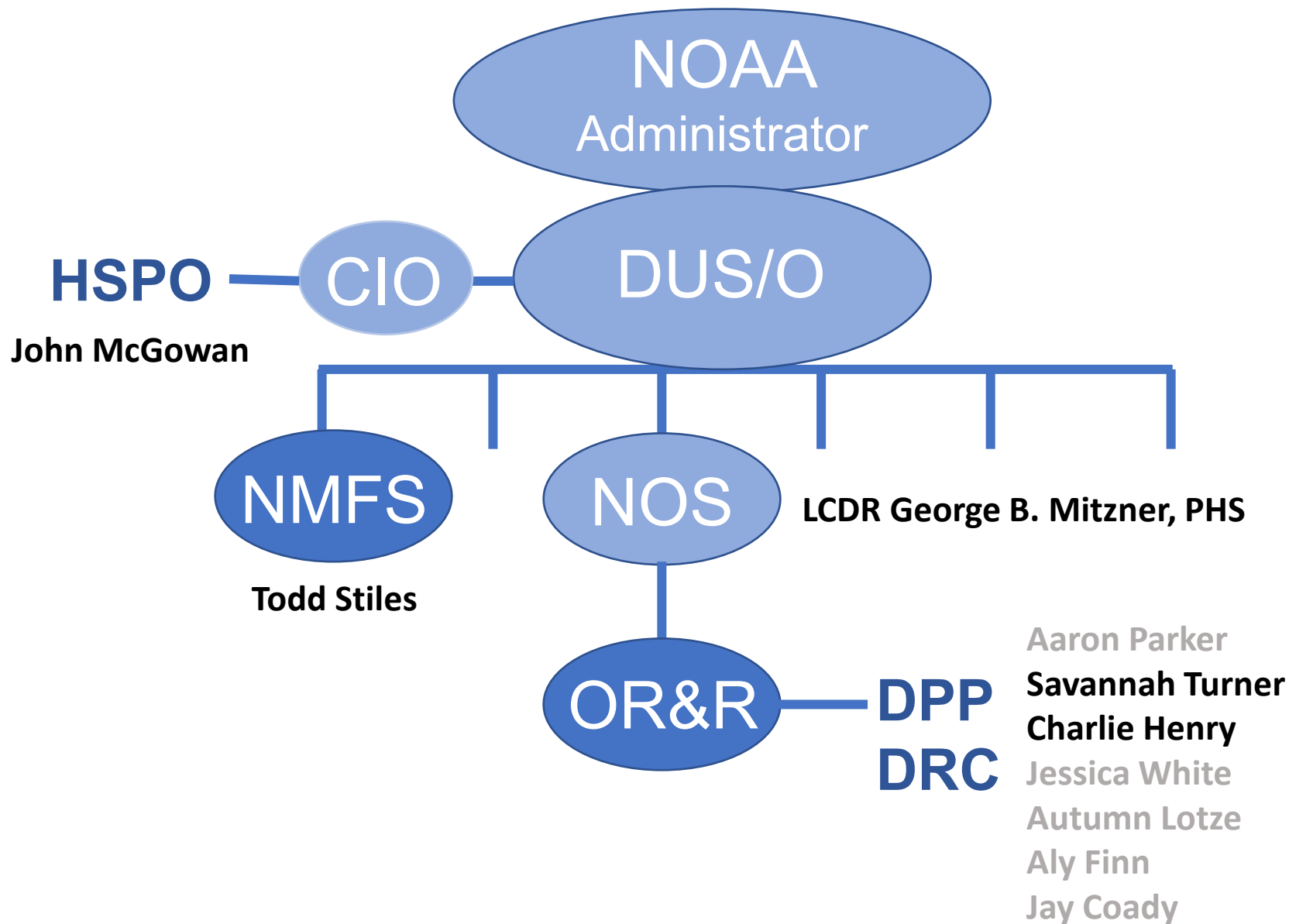
Charlie Henry

Director, NOAA's Disaster Response Center

Mobile, Alabama



2023 NOAA Hurricane Preparedness Summit: Simplified View of “Where We are in NOAA”



Disaster Preparedness Program

DPP Mission:

To ensure the National Ocean Service, partners, and coastal communities are able to effectively prepare for, respond to, and recover from all hazards, including coastal disasters.

By the numbers:

2012

2017

11.5

8, 15, 30

4

1945



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To ensure the National Ocean Service, partners, and coastal communities are able to effectively prepare for, respond to, and recover from all hazards, including coastal disasters.

By the numbers:

2012

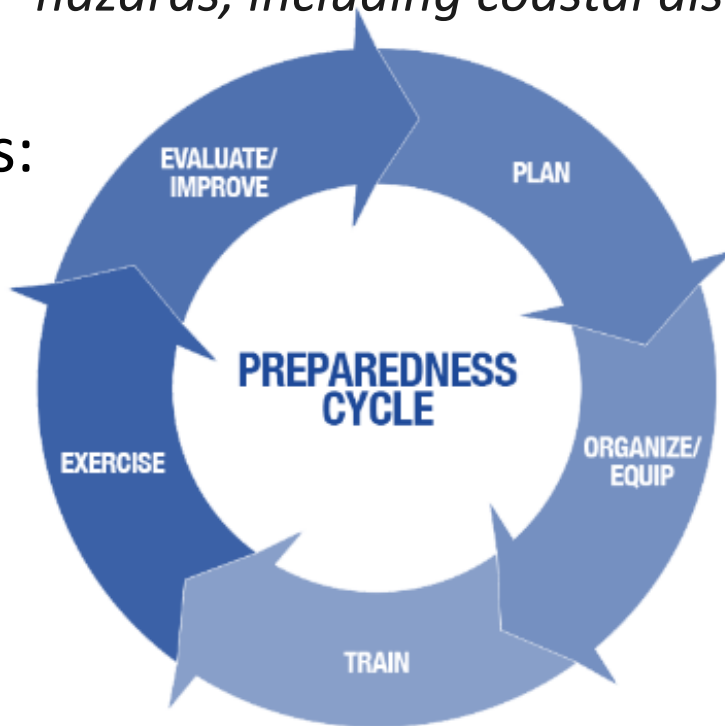
2017

11.5

8, 15, 30

4

1945



NOS Lead Senior Man. Team
NOS Incident Coordinator
NOS COOPS
EXERCISES
TRAINING
REGIONAL COORDINATION
CONT. IMPROVEMENT (AAR)
RECOVERY

CONOPS

NOS

DPP Mission:

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By the numbers:

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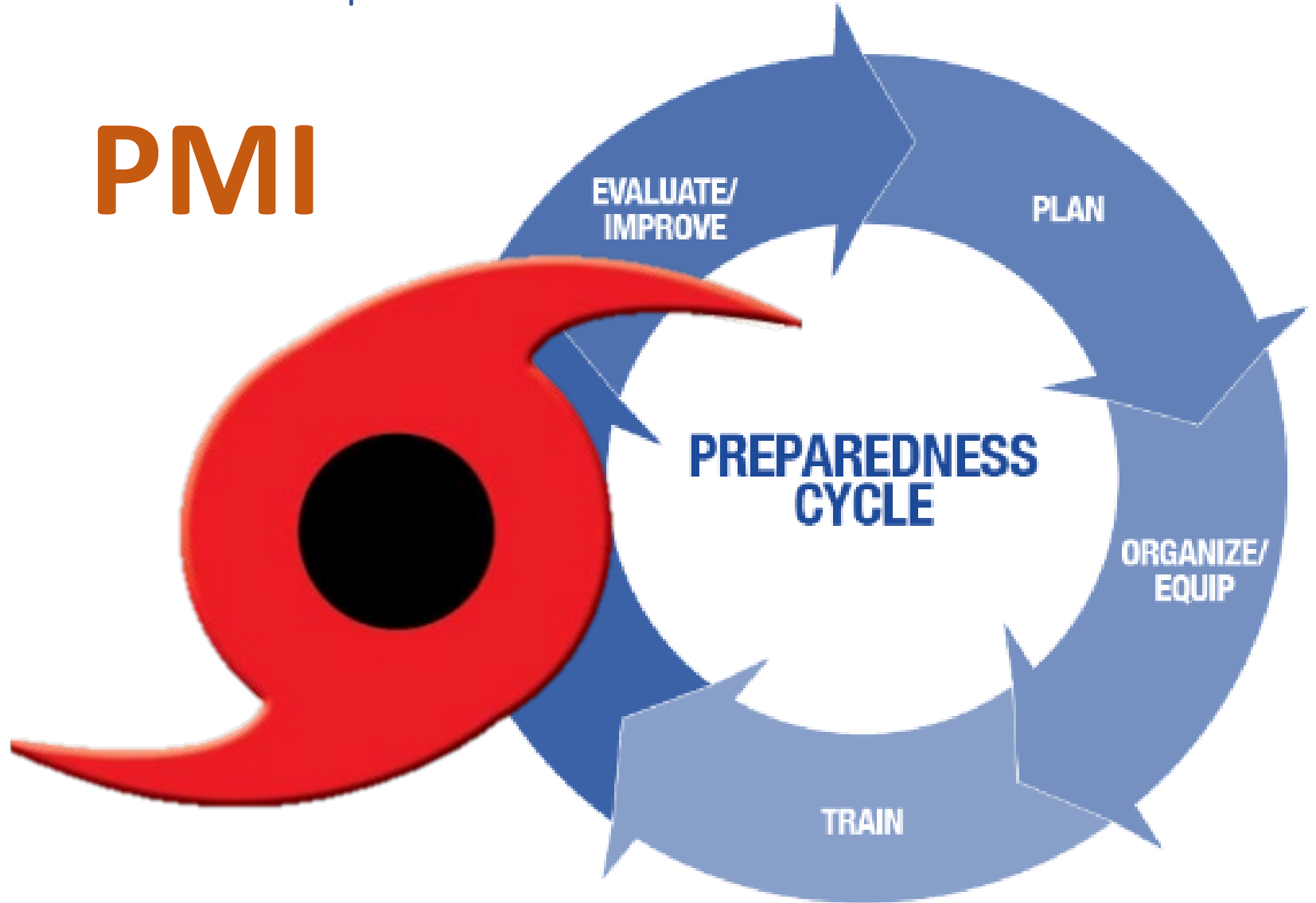
8, 15, 30

4 – NGS, COS, CO-OPS, OR&R

1945 – NOS Staff

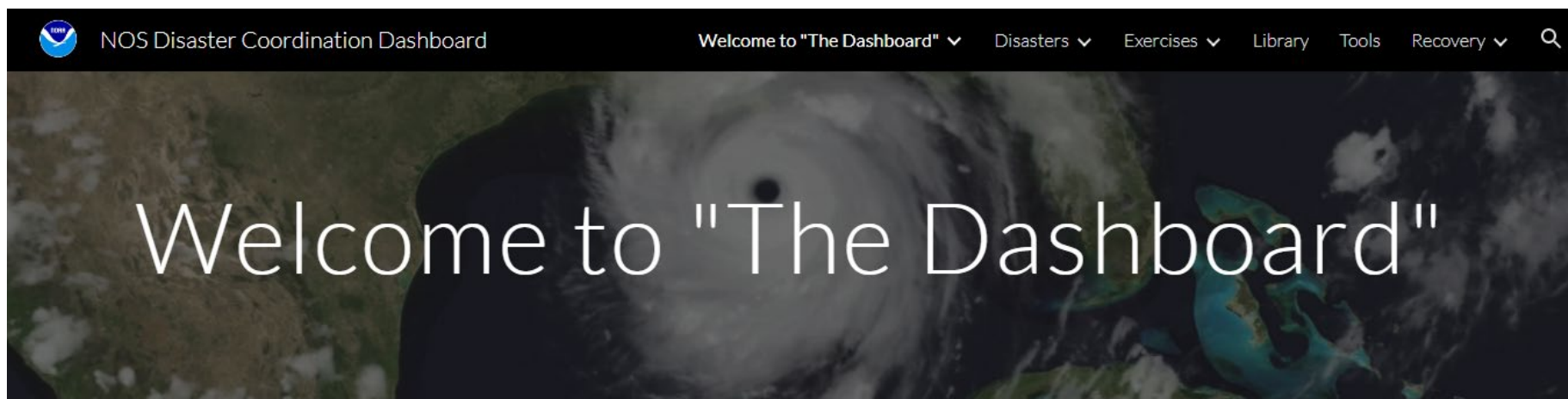
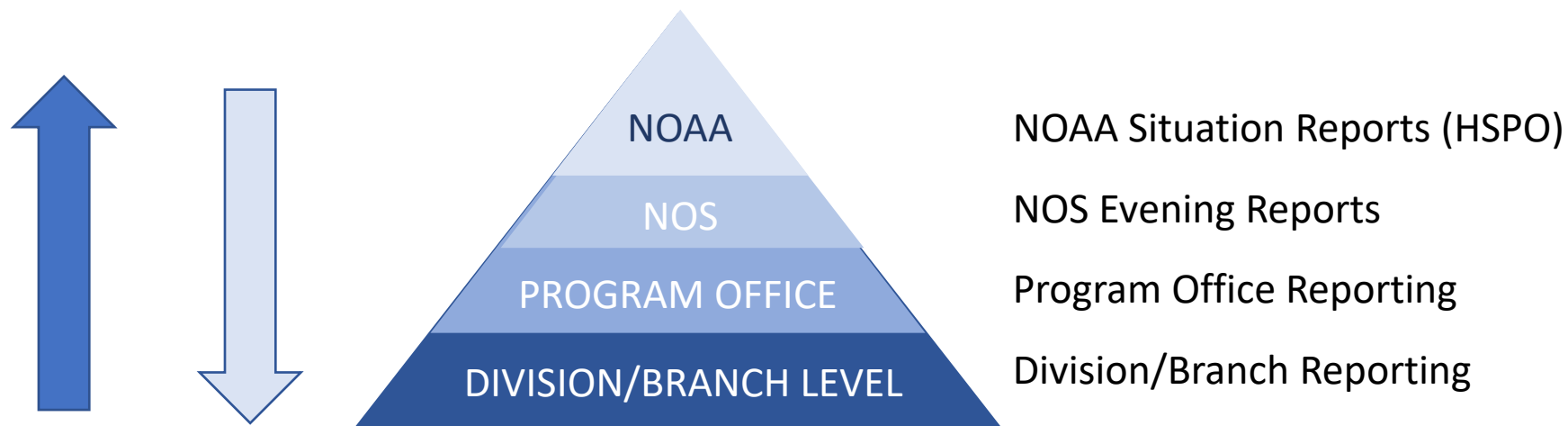


PMI



**Staff Safe? Are We Meeting Our Missions?
What about Infrastructure Impacts?**

2023 NOAA Hurricane Preparedness Summit: Origins of the Dashboard Concept



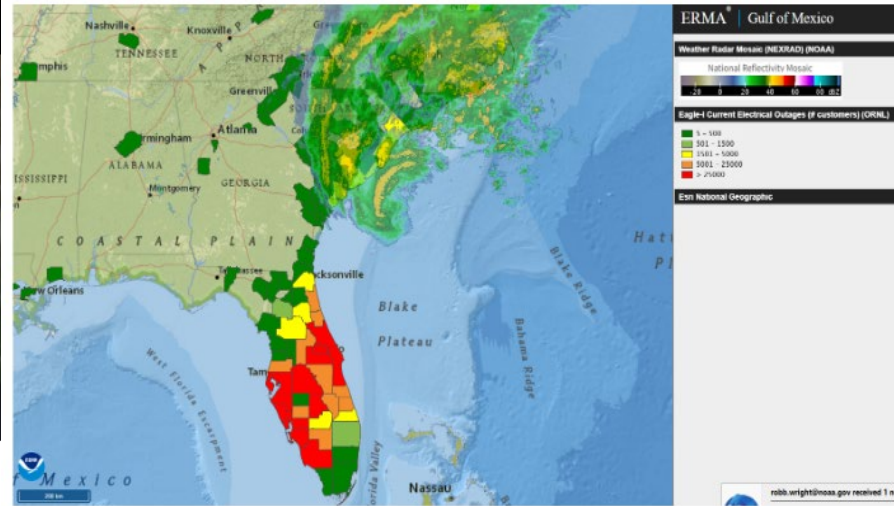
"The Dashboard" was created by the Office of Response and Restoration's (ORR's) Disaster Preparedness Program (DPP) and the Gulf of Mexico Disaster Response Center (DRC) in response to recommendations from the 2017 Atlantic Hurricane Season and the resulting After Action Report. It provides quick access to active reports, documents, and tools needed during disaster response or an exercise. It serves as a coordination platform for NOS staff and offices. During response to a disaster, it is critical that both field staff and leadership are aware of work completed and reported. The Dashboard adds accessibility, efficiency and transparency by providing opportunity to see tiered reporting. NOS Leadership will be able to view and access office- and staff-level files and staff in the field will be able to view NOS Leadership files.



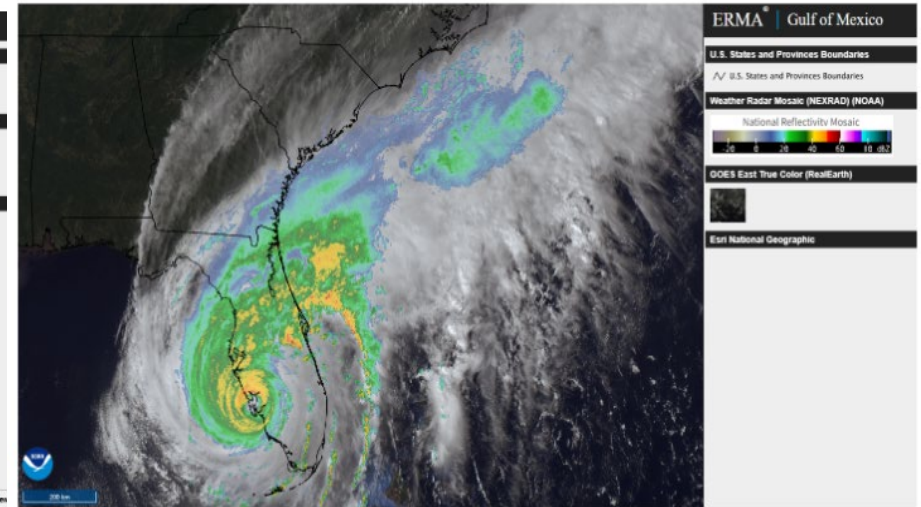
Disasters and Exercises

2023 NOAA Hurricane Preparedness Summit: NOS Disaster Coordination Dashboard

9/30 09:00 AM ET - Electrical Outages



9/28 15:30 PM ET - Landfall



Library

Within this library, you will find a number of guidance documents from NOAA and its partner agencies that are helpful during disaster response. These documents range from contact lists to FEMA policy documents. This library is arranged by topics below. Click on the topic to see the content and links to documents.

Preparedness ▾

Response ▾

Recovery ▾

Training & Exercises ▾

Incident Coordination ▾

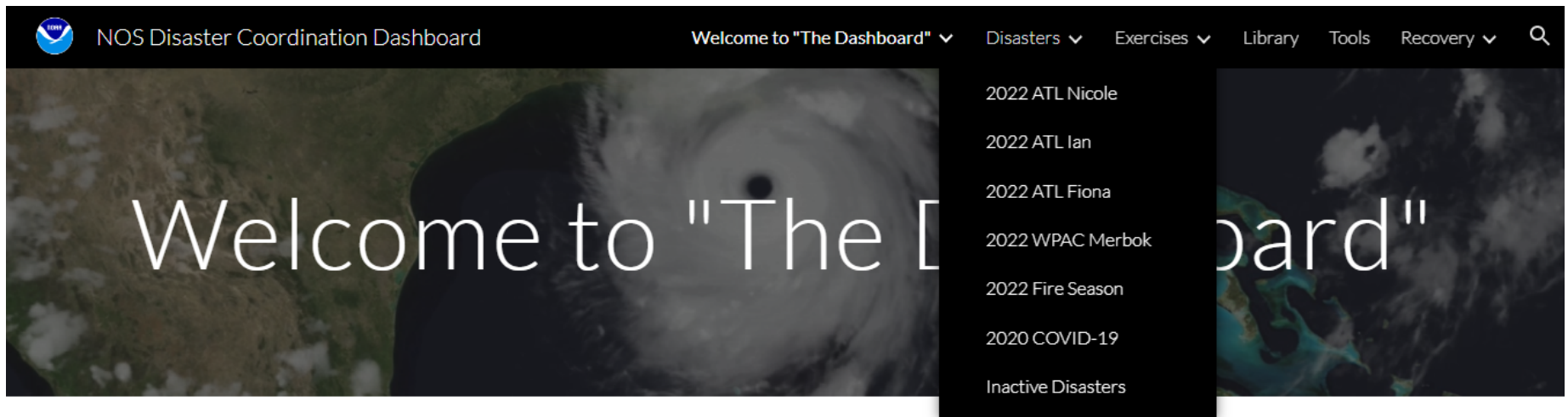
Lessons Learned ▲

(AAR = After Action Report, IP = Improvement Plan, NLE = National Level Exercise)

Past Disaster Events

- 2017 Hurricanes Harvey, Irma, and Maria [\(NOS AAR + IP Files\)](#)

2023 NOAA Hurricane Preparedness Summit: What makes it work?



"The Dashboard" was created by the Office of Response and Restoration's (ORR's) Disaster Preparedness Program (DPP) and the Gulf of Mexico Disaster Response Center (DRC) in response to recommendations from the 2017 Atlantic Hurricane Season and the resulting After Action Report. It provides quick access to active reports, documents, and tools needed during disaster response or an exercise. It serves as a coordination platform for NOS staff and offices. During response to a disaster, it is critical that both field staff and leadership are aware of work completed and reported. The Dashboard adds accessibility, efficiency and transparency by providing opportunity to see tiered reporting. NOS Leadership will be able to view and access office- and staff-level files and staff in the field will be able to view NOS Leadership files.

① Disasters and Exercises

MOST IMPORTANT

What makes the coordination work within NOS?

The roughly 50 staff from across the nearly 2000 NOS staff and contractors that are part of the Incident Management Team

Incident Coordination Team

Thank you!



NOAA Homeland Security Program Office and Operations Center



HSPO Background



- Established shortly after September 11 attacks
- Serves as the principal point of contact for NOAA Executive Management regarding homeland security activities across the Administration
- Established the NOAA OPS Center to facilitate seamless integration for NOAA during an incident as required by the National Response Framework



HSPO Authority



NOAA All-Hazards CONOPS

NAO 210-100 establishes requirements, policies, responsibilities, and authorities for the development, implementation, and oversight of the National Oceanic and Atmospheric Administration's (NOAA) All Hazards Incident Management effort through the NOAA All Hazards Incident Management Concept of Operations (CONOPS).

Primary Mission:

- Assist Leadership in maintaining the organization's PMEFs and MEFs
- Provide information which is timely, accurate and actionable
- Serve as the Department of Commerce Emergency Operations Center Liaison



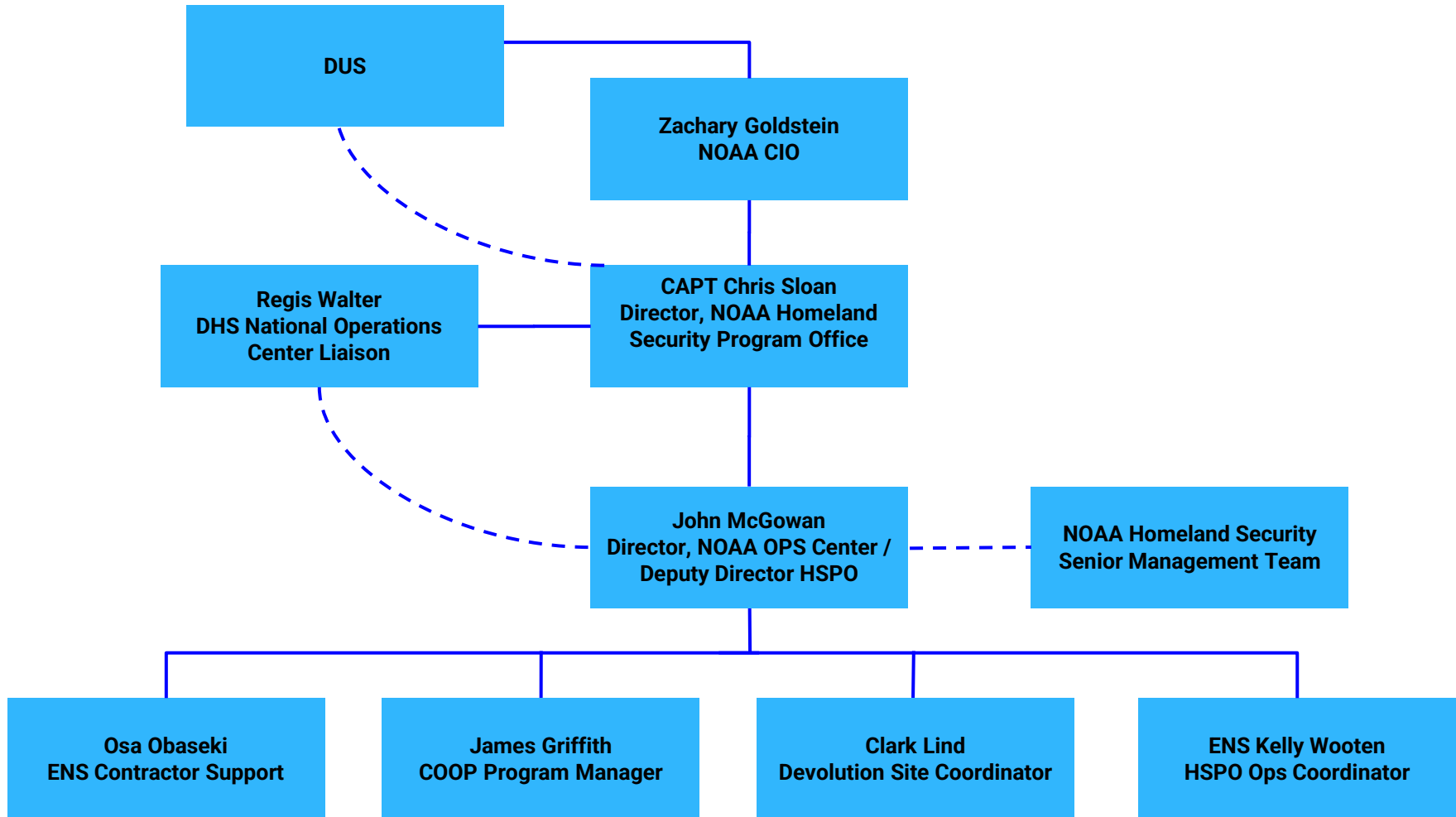
HSPPO Responsibilities



- Coordinate NOAA wide response and preparation for incidents
- Manage the NOAA Operations Center
- Coordinate and liaison with the LO/SO Homeland Security Senior Management Team members (SMT)
- Oversee NOAA's MEF/Critical Infrastructure Program
- Oversee NOAA's COOP program, including devolution
- Liaison at DHS National Operations Center
- Provide support/information to FEMA working groups and other agencies as needed



HSPPO Organization





NOAA Operations Center - Responsibilities -



The responsibilities of the NOAA Operations Center include:

- **During Steady State:**

- Maintain situational awareness for incidents and activities that may create impact to NOAA personnel, missions, infrastructure (PMI)
- Coordinate situational awareness with the DOC Ops Center and DHS National Ops Center, and other family or partner operations centers
- Provide daily (M-F) CIO status/operations brief addressing system impacts, potential vulnerabilities, and cyber/system threats with the potential for impact

- **During an Activation Period:**

- Becomes the incident focal point (one-stop-shop)
- Coordinate incident specific situational awareness with SMTs and NOAA liaisons
- Establish incident-specific impact areas of interest
- Collect/disseminate incident reporting (SITREP) to NOAA leadership and stakeholders



NOAA OPS Center Activation Levels and Reporting Battle Rhythm



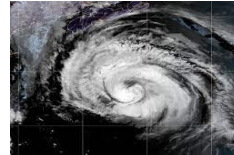
Activation Levels



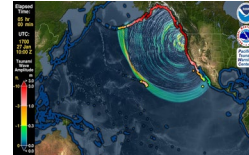
LEVEL 4



LEVEL 3



LEVEL 2



LEVEL 1



Normal Operations

No active or anticipated incidents.

Enhanced

Situation or incident beginning to develop, requiring monitoring. No known impacts. Ex.: tropical storm offshore, wildfire near NOAA locations, State of the Union

Partial

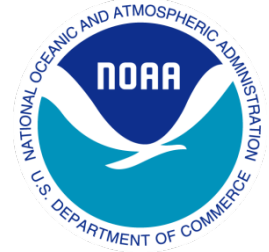
Incident has or likely to create impact to PMI. Ex.: tropical storm making landfall, natural disaster causing damage to NOAA PMI, terrorist event

Full

Widespread/national impacting event. Major impacts to PMI anticipated. Ex.: major/unstable terrorist event, natural disaster with widespread damages, global pandemic



Relationship with DUS/UNSEC



- Situational Awareness
- Incident Coordination
- General Decision Support
- Evacuation Orders
- Order of Succession



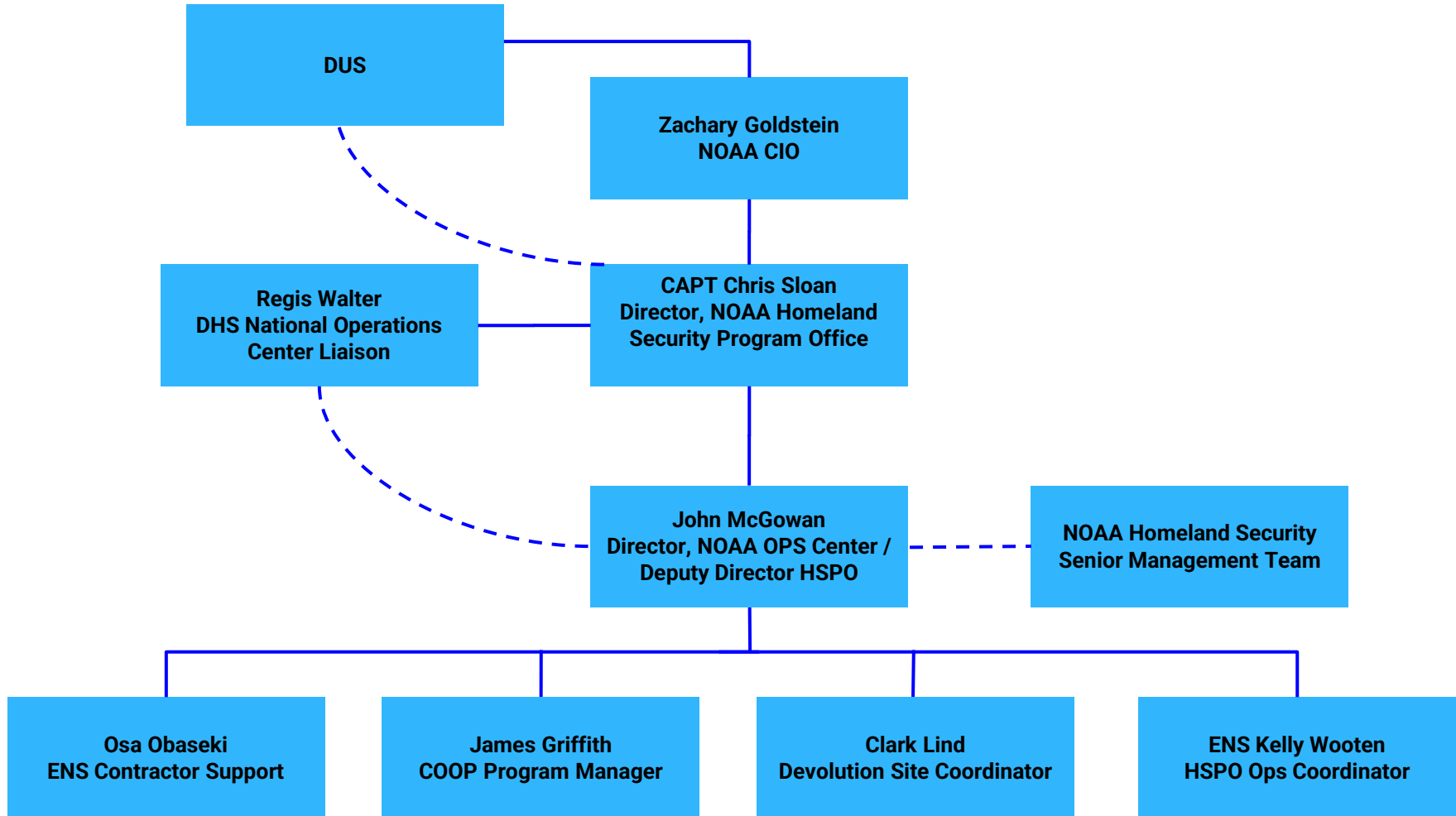
Ops Center Tools



- **The NOAA Emergency Notification System (NOAA ENS)**
 - primary mass notification tool used for all staff during an all-hazards event
 - Can be initial notification tool and used for continued follow-up and recurring messaging
- **ERMA**
 - Web-based mapping tool used to establish areas of impact (AOI)
 - Shared with OPS Center staff/SMTs for a coordinated AOI
 - Used to measure the potential impact to NOAA sites/personnel
- **Essential Records Server (ERS)**
- **Google Shared Drive / HSPO Google Site**
 - improvements and use throughout pandemic

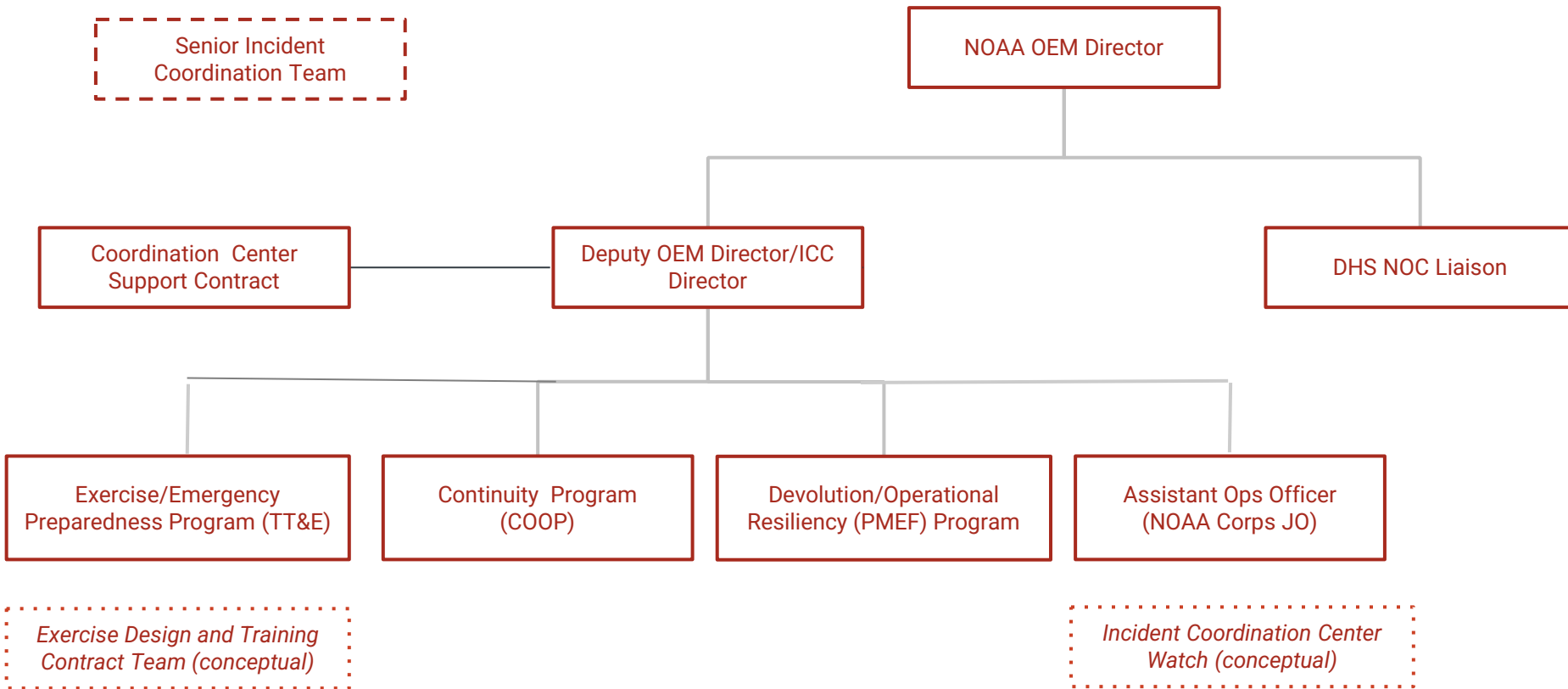


HSPO Organization(Now)



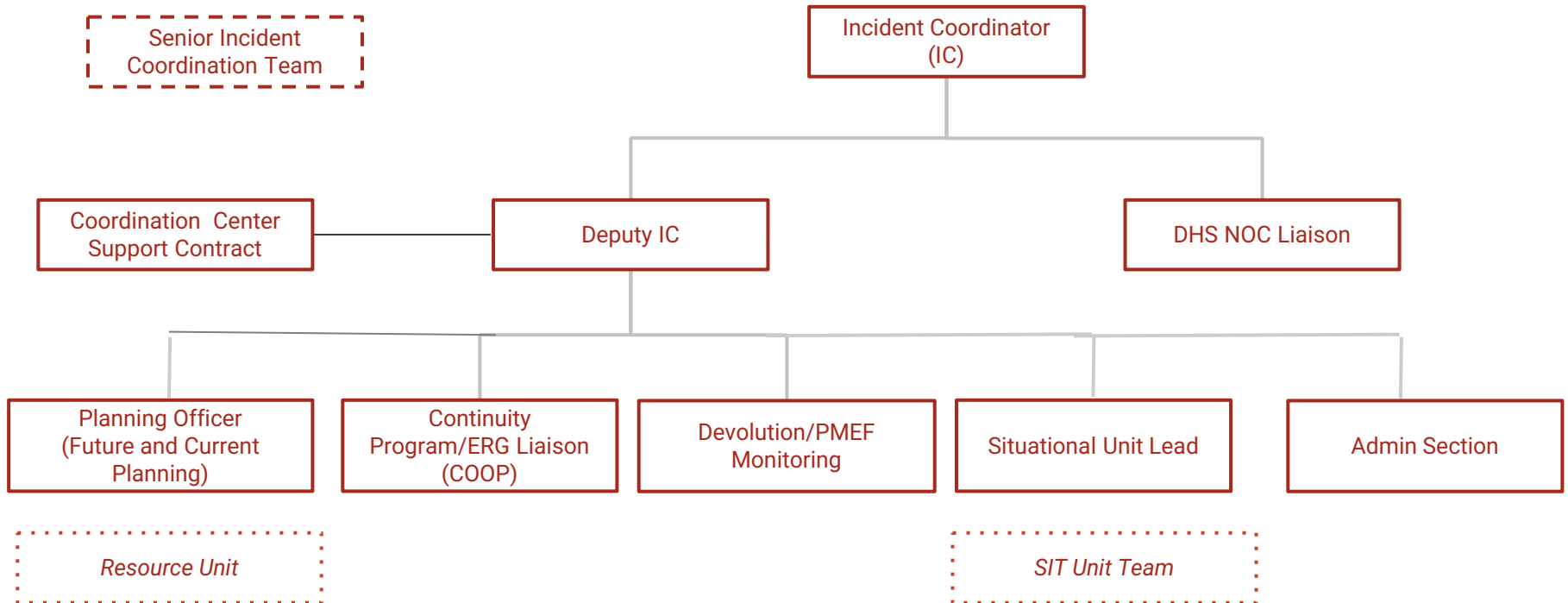


Rebranding





ICC Activation





HSPO Rebranding



- Moving towards more of an emergency management style office
- NOAA Office of Emergency Management (OEM)
- Responsibilities largely remain the same, with following additions:
 - Exercise Design and Emergency Preparedness
 - Watch Function (24/7)
 - ICS “typed” positions within the Incident Coordination Center, formerly the NOAA OPS Center (i.e. SIT Unit)



QUESTIONS & DISCUSSION

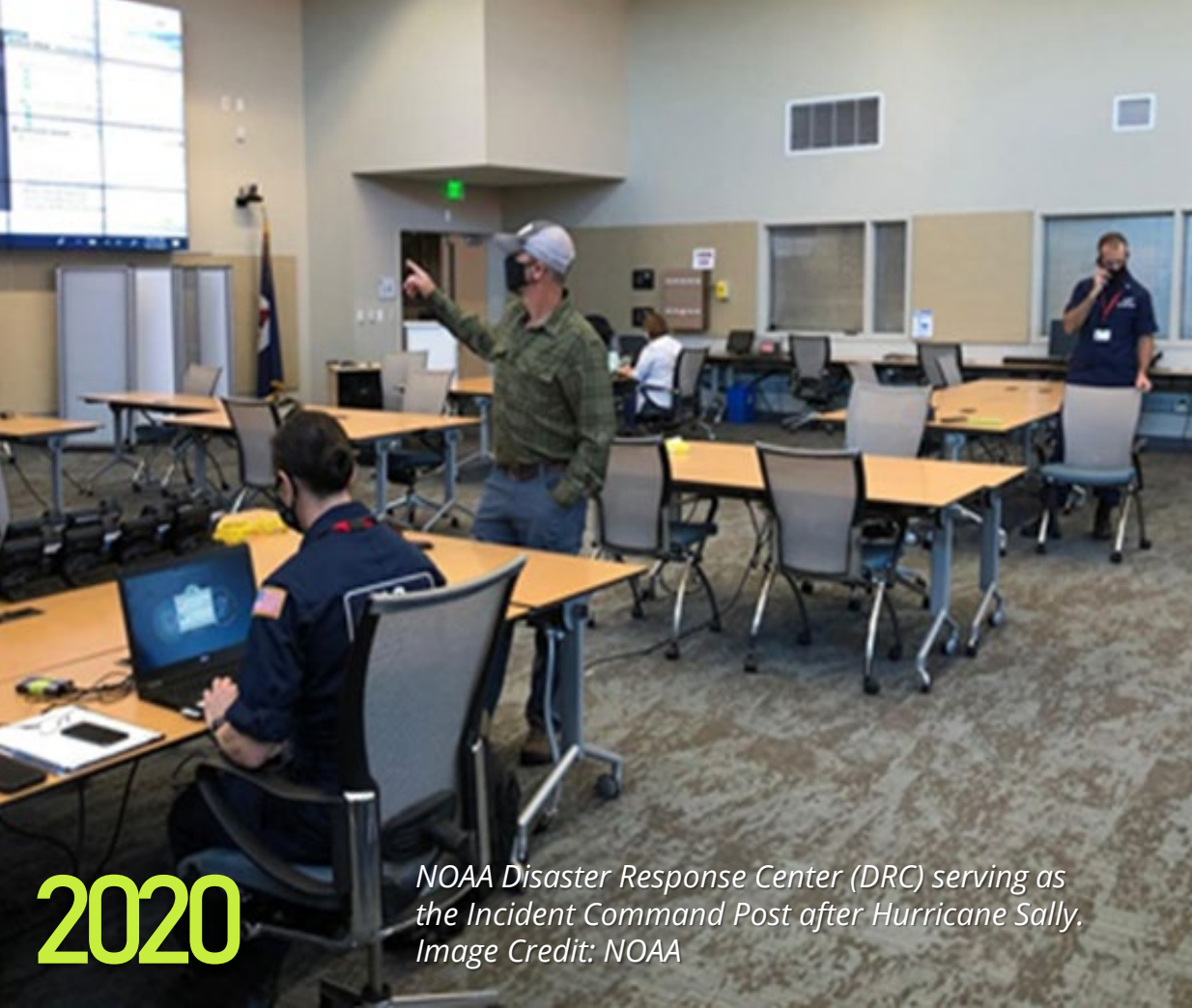
National Oceanic and Atmospheric Administration Office of Response and Restoration

Working Smarter and Safer

Savannah Turner, Safety Officer
National Oceanic and Atmospheric Administration
Office of Response & Restoration

Photo: NOAA





2020

NOAA Disaster Response Center (DRC) serving as the Incident Command Post after Hurricane Sally. Image Credit: NOAA



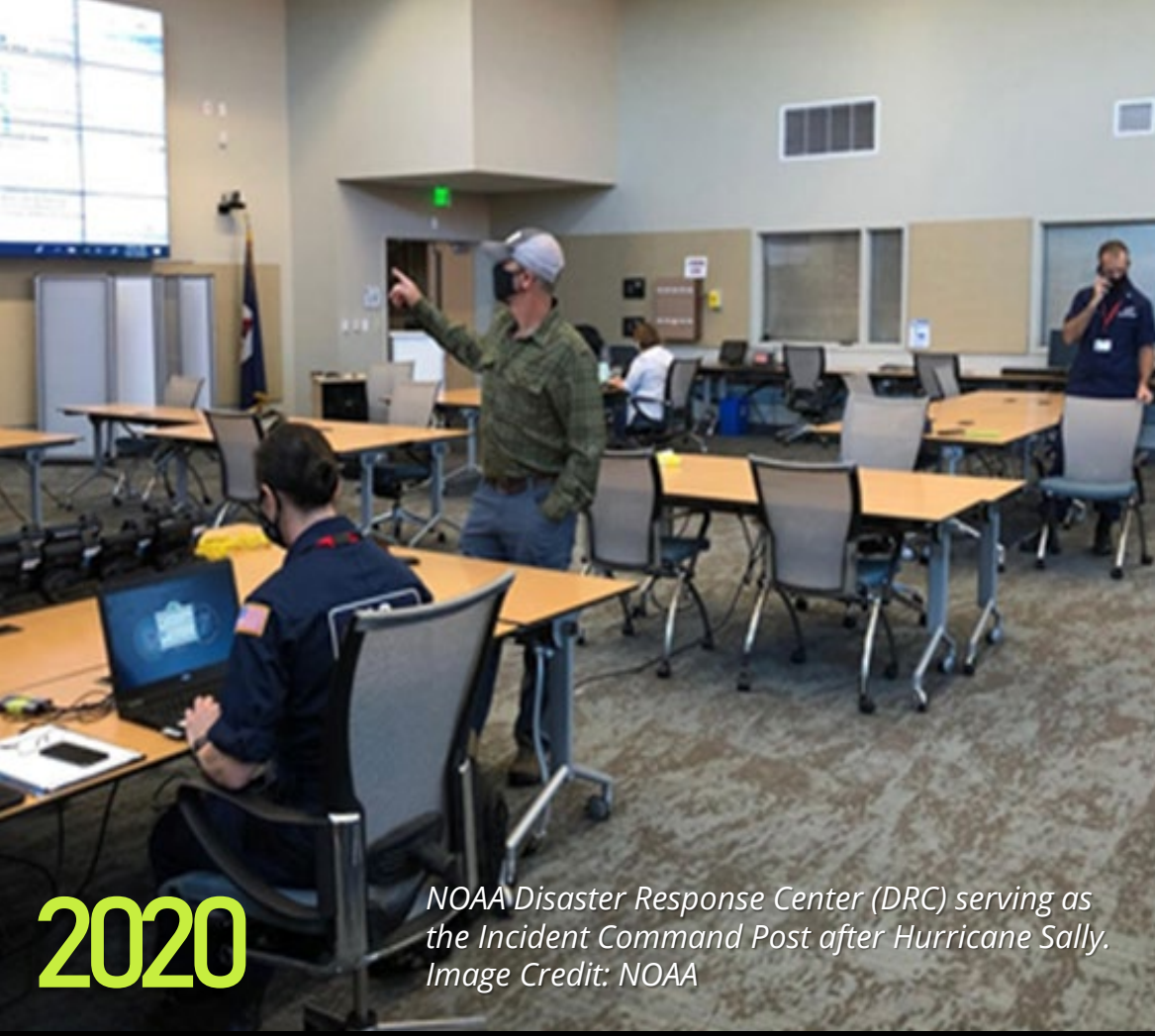
2023

2022 Hurricane Season –

Defined effective pandemic mitigation by minimizing further exposures, communicating expected behaviors in advance and providing access to resources.

2020 Hurricane Season –

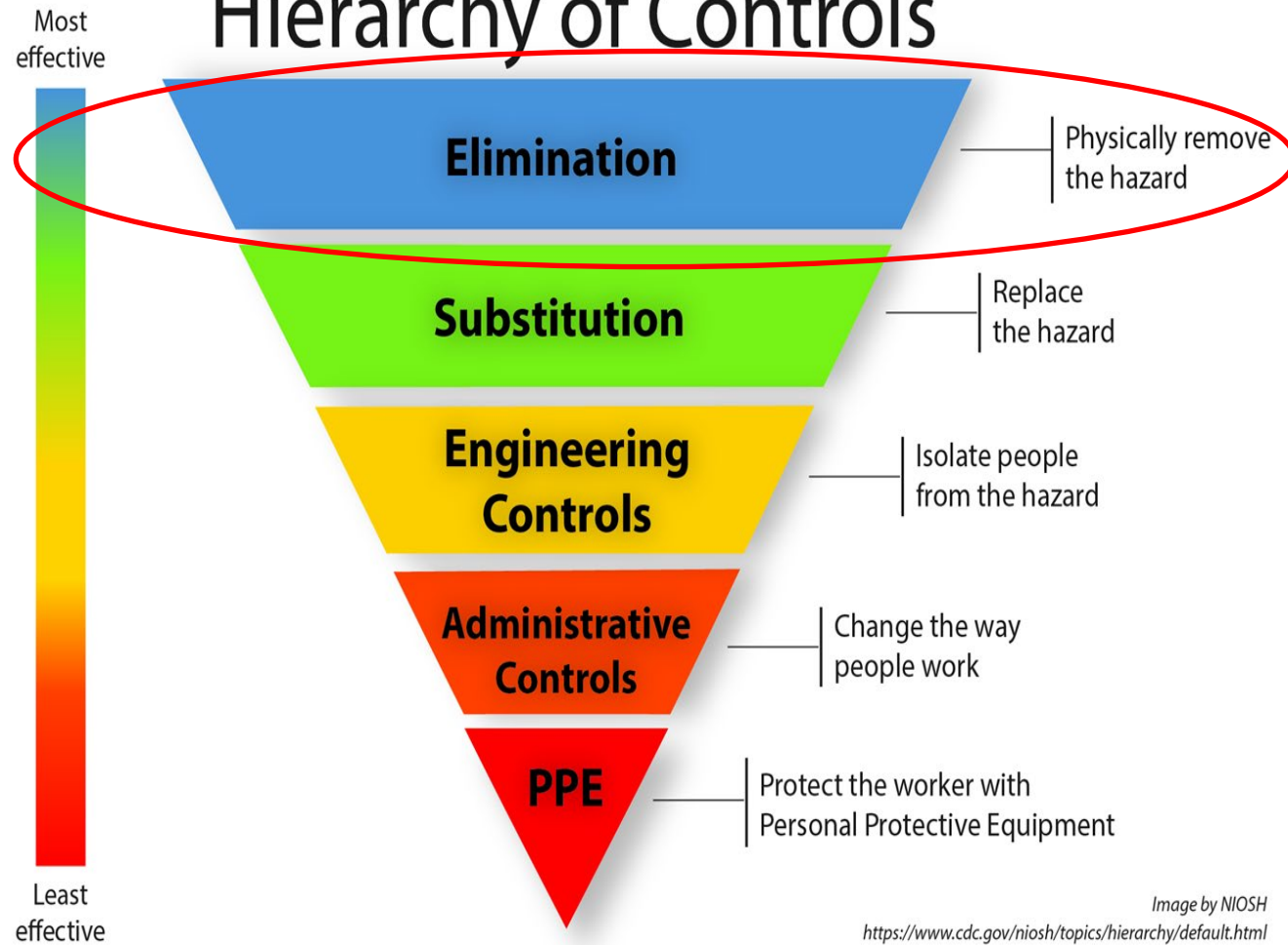
Defined effective pandemic mitigation / staff safety by no infections



NOAA Disaster Response Center (DRC) serving as the Incident Command Post after Hurricane Sally.
Image Credit: NOAA

2020

Hierarchy of Controls



2020 Hurricane Season – Eliminate the hazard

Defined effective pandemic mitigation / staff safety by no infections

Impact: Delayed and limited staff deployments; required high-cost facility engineering and/or virtual capability upgrades; supply chain issues and a resource constrained environment limited access to testing, PPE, etc.

2022 Hurricane Season Key Finding

Due to the COVID-19 pandemic's impact on in-person training activities since March 2020, there were reported observations in the reduction in readiness and trained staff capacity.

These impacts were limited in 2022 and did not cause a significant reduction in mission capabilities - Had there been multiple major storms, having an adequate number of trained staff might have been a greater capacity issue.





Hierarchy of Controls

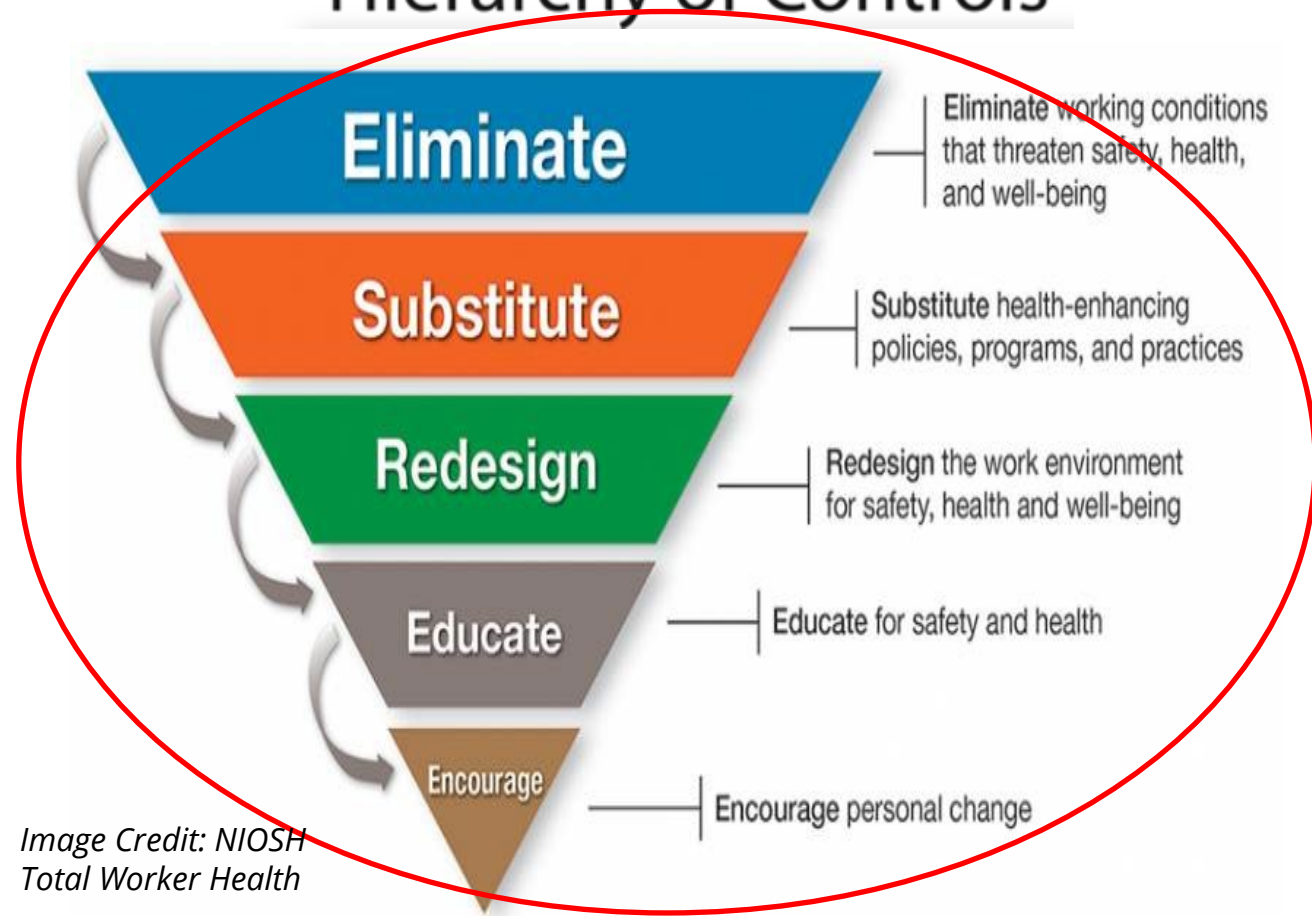


Image Credit: NIOSH
Total Worker Health

2023 Hurricane Season – A layered approach

Define effective pandemic mitigation by minimizing further exposures, communicating expected behaviors in advance and providing access to resources. Focus on influencing safe personnel behaviors and transparent communications.

Impact: Safely fortify NOAA's capacity across Personnel, Mission, and Infrastructure (PMI) to support hurricane preparedness, response, and recovery.

National Marine Fisheries Service

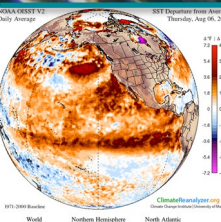
Emergency Response Coordination

Todd Stiles, NMFS Lead SMT

April 2023



NOAA FISHERIES



Who/Where We Are:

- ~4200 Staff
- 12 HQ Offices / 5 Regional Offices / 6 Science Centers

Alaska Region

Regional Office: Juneau, AK

Science Center Headquarters:

- Seattle, WA (Sand Point)

Science Center Laboratories:

- Auke Bay, AK
- Kodiak, AK
- Lena Point, AK

Pacific Islands Region

Regional Office: Honolulu, HI

Science Center:

- Honolulu, HI

West Coast Region

Regional Offices:

- Arcata, CA
- Long Beach, CA
- Sacramento, CA
- Portland, OR
- Seattle, WA

Science Center Headquarters:

- La Jolla, CA - Southwest
- Seattle, WA - Northwest

Science Center Laboratories:

- Monterey, CA
- Santa Cruz, CA
- Newport, OR
- Pt. Hammond, OR
- Manchester, WA
- Mukilteo, WA
- Pasco, WA

Southeast Region

Regional Office: St. Petersburg,

Science Center Headquarters:

- Miami, FL

Science Center Laboratories:

- Panama City, FL
- Pascagoula, MS
- Beaufort, NC (shared with NOS)
- Galveston, TX

Greater Atlantic Region

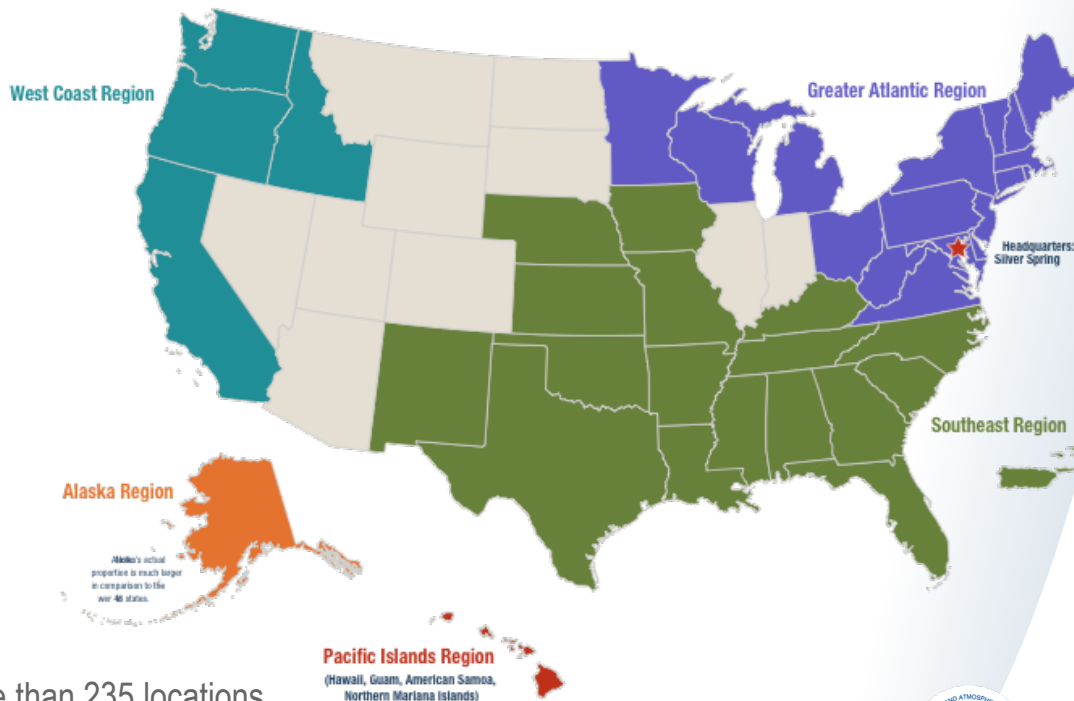
Regional Office: Gloucester, MA

Science Center Headquarters:

- Woods Hole, MA

Science Center Laboratories:

- Milford, CT
- Washington, DC
- Orono, ME
- Sandy Hook, NJ
- Narragansett, RI



Staff dispersed at more than 235 locations



NOAA
FISHERIES

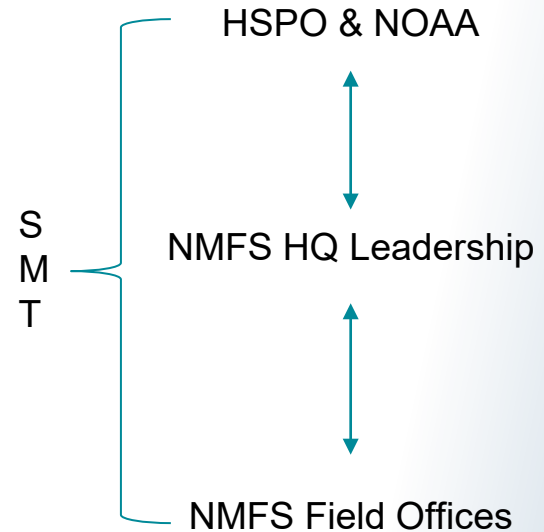
Emergency Coordination

- Several NMFS Senior Management Team (SMT) Reps:
 - Todd Stiles, Lead SMT
 - Captain Kurt Zegowitz, SMT Assist
 - Everett Baxter, OLE Deputy Director – OLE POC
- Tropical Storms, Hurricanes, Typhoons, Wildfires, Winter Storms, Tornado, Flooding, Tsunami, man-induced emergency events, etc.....
- SMTs work closely with field leadership (DD's/OMI) to capture PMI impacts



Emergency Coordination (con't)

- Coordination across multiple time zones
- COOP & Emergency Ops. Plans
- Comms Tools:
 - Staff Directory/ NMFS EOP
 - Emergency Notification System (ENS)
 - Environmental Response Management Application (ERMA),
 - Phone Tree,
 - In-person Visits



Questions?



NOAA Hurricane Summit 2023

Maintaining Wellness During Response

George Mitzner, Ph.D., M.S., ABPP
LCDR, U.S. Public Health Service
Chief, Behavioral Health & Wellness
National Ocean Service



Agenda



- **Who Responds?**
- **Impact of Response**
- **Responder Self-Care**
- **Organizational Considerations**
- **Resources**



Who Responds?

- **First responders** go to the scene of an accident or emergency to provide assistance. They *protect and preserve life, property, and the environment*.

(m-w.com; Prati et al., 2010)

- **Emergency managers** protect communities by coordinating and integrating all activities necessary to build, sustain, and improve the capability to mitigate against, prepare for, *respond to, and recover from threatened or actual natural disasters, acts of terrorism, or other man-made disasters*.

(training.fema.gov)



Impact of Response

- As such, field response carries *potential* for emotional harm
 - The DSM-5 Diagnostic Criteria for Posttraumatic Stress Disorder (**PTSD**) **A.4:** *Exposure to actual or threatened death, serious injury...in one (or more) of the following ways: ... Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g., first responders collecting human remains...)*
- Approximately 5% of U.S. adults have PTSD in any given year, but first responders endorse criteria for PTSD at 10%
 - *Most responders **are** resilient*

(ncbi.nlm.nih.gov)

(Berger et al., 2012; ptsd.va.gov)



Impact of Response (Contd.)

- Efforts to examine risk factors in this population are mixed
 - All responders groups are not the same
 - Social Desirability
- Several factors influence a general individual's response
 - Rumination and self-blame, can increase risk of psychopathology
 - Trauma/health history
 - Social support/coping
 - Geographic/psychological proximity to the event

(ptsd.va.gov; Lee et al., 2020; Warner et al., 2011; Wild et al., 2020)



Responder Self-Care – *Do these often*

- Talk to another/spend time with others
- Engage in positive distracting activities
- Make time for adequate sleep, eat healthy meals, & exercise
- Try to keep a normal routine
- Focus on what you can do in the present
- Use relaxation methods
- Take breaks



(nctsn.org)

Responder Self-Care – *Things to Avoid*

- Substance misuse or excessive gaming/gambling
- Withdrawal from others/pleasant activities
- Not taking care of yourself/Working too much
- Engaging in high risk behaviors
- Blaming others/conflict
- Unhelpful thoughts: “It would be selfish to rest”

(nctsn.org)



Organizational Considerations

- Limit shifts to no more than 12 hours and encourage breaks
- Rotate responders to balance high v. low exposure
- Encourage buddy system/peer support
- Conduct trainings on stress management practices
- Train supervisors in mental health awareness and how to respond/support their employee
- Socialize EAP, wellness/support services during all phases of response to destigmatize help seeking

(nctsn.org; Wild et al., 2020)



Resources

- LCDR George Mitzner, NOS Chief of Behavioral Health and Wellness
George.Mitzner@noaa.gov - (202) 630-9382
- <https://sites.google.com/noaa.gov/nos-for-employees-intranet/employee-resources/behavioral-health-and-wellness>
- EAP - 7 days a week, at **1-800-222-0364** or for the hearing impaired, **TTY 1-800-262-7848**, www.FOH4YOU.com.



References

- Berger, W., Coutinho, E. S., Figueira, I., Marques-Portella, C., Luz, M. P., Neylan, T. C., Marmar, C. R., & Mendlowicz, M. V. (2012). Rescuers at risk: a systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Social Psychiatry and Psychiatric Epidemiology*, 47(6), 1001–1011. <https://doi.org/10.1007/s00127-011-0408-2>
- Lee, J. Y., Kim, S. W., & Kim, J. M. (2020). The Impact of Community Disaster Trauma: A Focus on Emerging Research of PTSD and Other Mental Health Outcomes. *Chonnam Medical Journal*, 56(2), 99–107. <https://doi.org/10.4068/cmj.2020.56.2.99>
- Prati, G., Pietrantonio, L. & Cicognani, E. (2010) Self-efficacy moderates the relationship between stress appraisal and quality of life among rescue workers. *Anxiety, Stress & Coping*, 23:4, 463-470, DOI: [10.1080/10615800903431699](https://doi.org/10.1080/10615800903431699)
- Warner, C. H., Appenzeller, G. N., Parker, J. R., Warner, C. M., & Hoge, C. W. (2011). Effectiveness of mental health screening and coordination of in-theater care prior to deployment to Iraq: A cohort study. *American Journal of Psychiatry*, 168(4), 378–385. <https://doi.org/10.1176/appi.ajp.2010.10091303>
- Wild, J., Greenberg, N., Moulds, M. L., Sharp, M. L., Fear, N., Harvey, S., Wessely, S., & Bryant, R. A. (2020). Pre-incident Training to Build Resilience in First Responders: Recommendations on What to and What Not to Do. *Psychiatry*, 83(2), 128–142. <https://doi.org/10.1080/00332747.2020.1750215>



References

[https://training.fema.gov/hiedu/docs/emprinciples/0907_176%20em%20principles12x18v2f%20johnson%20\(w-o%20draft\).pdf](https://training.fema.gov/hiedu/docs/emprinciples/0907_176%20em%20principles12x18v2f%20johnson%20(w-o%20draft).pdf)

<https://www.merriam-webster.com/dictionary/first%20responder>

https://www.ncbi.nlm.nih.gov/books/NBK207191/box/part1_ch3.box16/

https://www.nctsn.org/sites/default/files/resources//pfa_field_operations_guide_appendices.pdf

https://www.ptsd.va.gov/understand/common/common_adults.asp#:~:text=About%205%20out%20of%20every,some%20point%20in%20their%20life



Questions?
Comments?
Concerns?



Marine Debris, Natural Resources, and BMPs

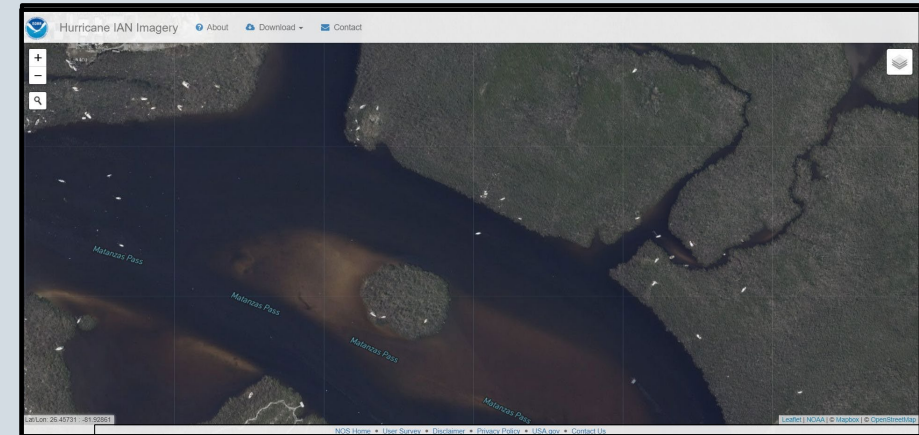
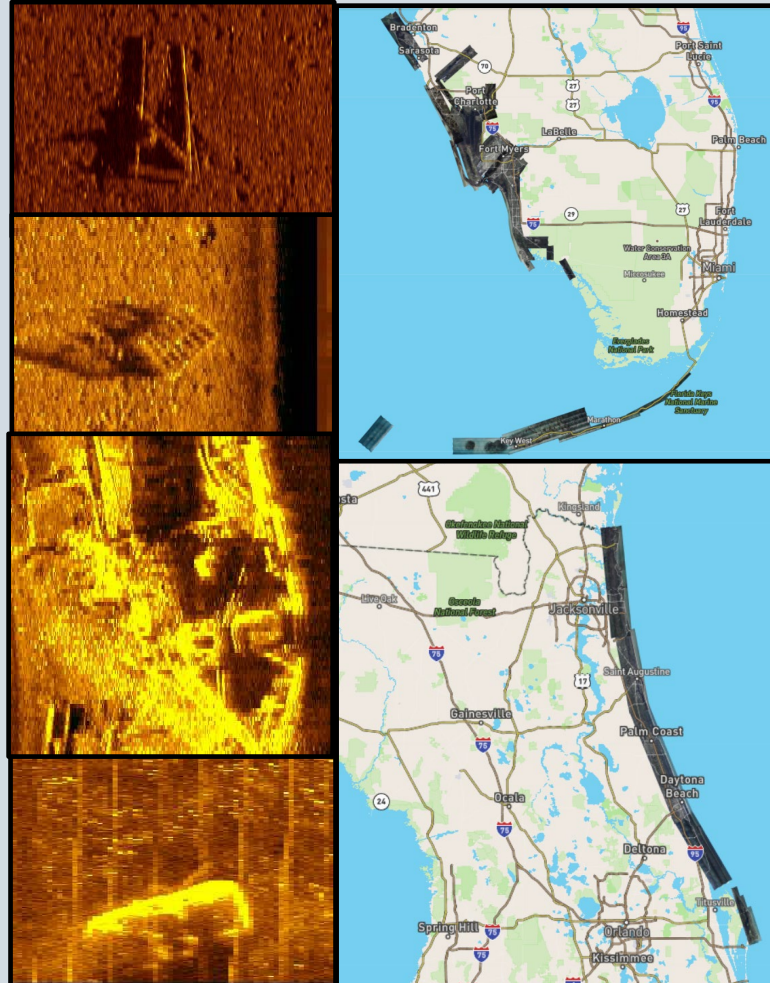
*Included but not limited to

Initial Response and Assessment

Aerial Surveys

- Pre and Post Imagery
- ### Side Scan Sonar
- Lee and Charlotte

**Partners: NOAA, FWC, NGS, RPI, QSI, FDEM, FDEP APs, FDACS, BCSO, CCSO, CCSO, FLPD, JSO, MTPD, MSO, OCSO, PPPD, GCSC/TEMPEST, Charlotte, Lee, Collier, Manatee, and Sarasota Counties, WCIND, UF/IFAS, FSG, FKNMS, FEMA, USCG*



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Marine Debris, Natural Resources, and BMPs

*Included but not limited to

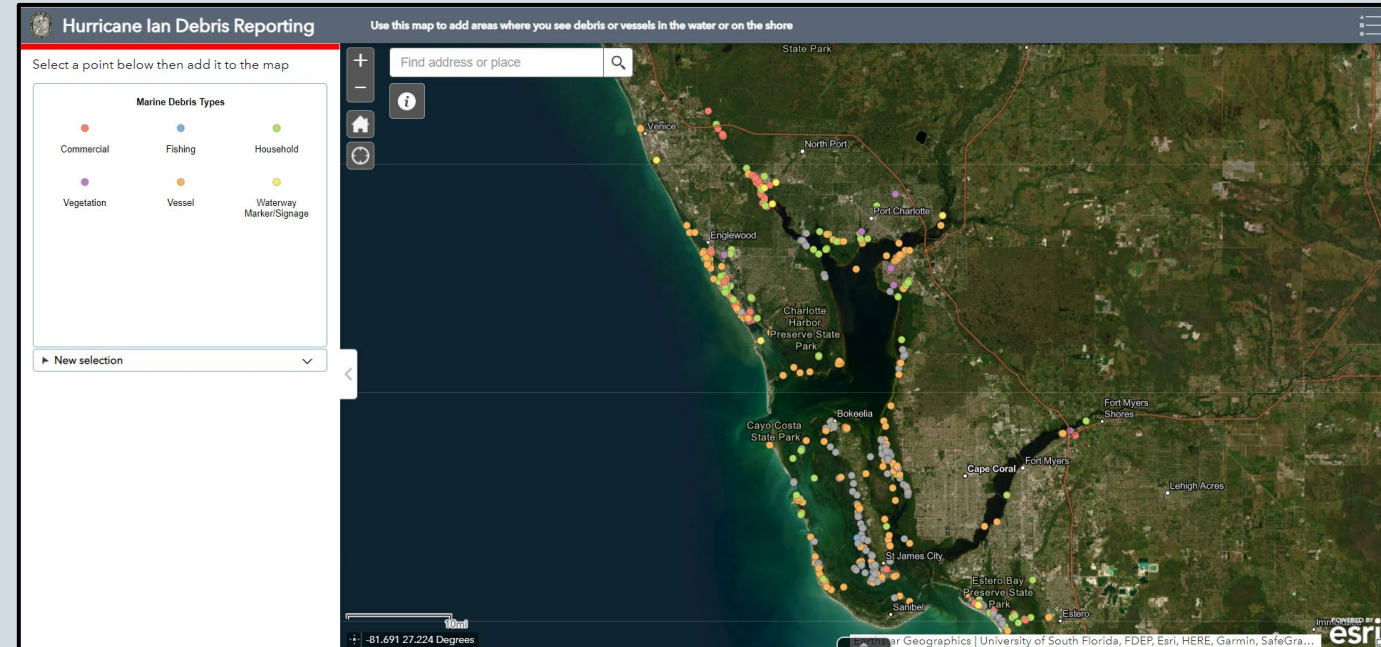
Initial Response and Assessment

Mapping/Reporting/Tracking

- Public Reporting Maps and Hotlines
- Removal Tracking, Applications, and Dashboards



*Partners: NOAA, FWC, NGS, RPI, QSI, FDEM, GCSC/TEMPEST, BCSO, CCSO, CCSO, FLPD, JSO, MTPD, MSO, OCSO, PPPD, FDEP APs, Charlotte, Lee, Collier, Manatee, and Sarasota Counties, WCIND, UF/IFAS, FSG, FKNMS



<https://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=cf83925c7f7d4bdc83a4bebafc05a4df>

*Hurricane Ian Vessel Hotline 850-488-5600
Debris Cleanup Hotline at (850) 961-2002 or
email IanDebrisCleanup@cdrmaguire.com
www.iandebriscleanup.com*



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Marine Debris, Natural Resources, and BMPs

*Included but not limited to

Removals, Natural Resources and BMPs

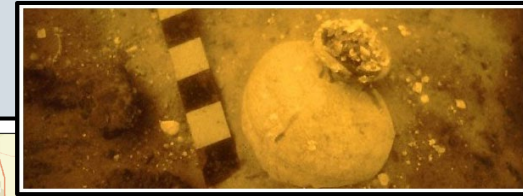
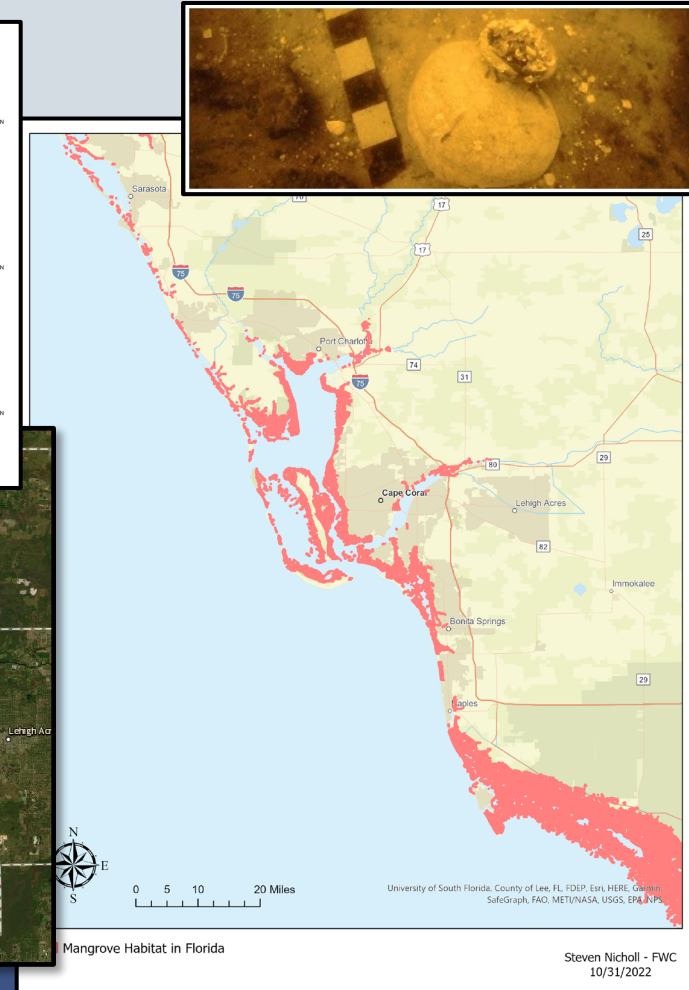
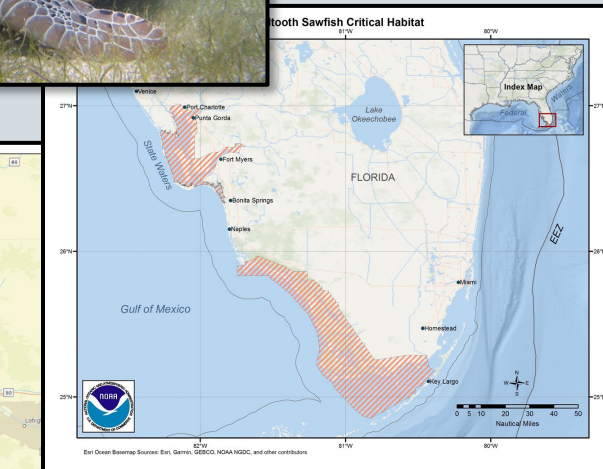
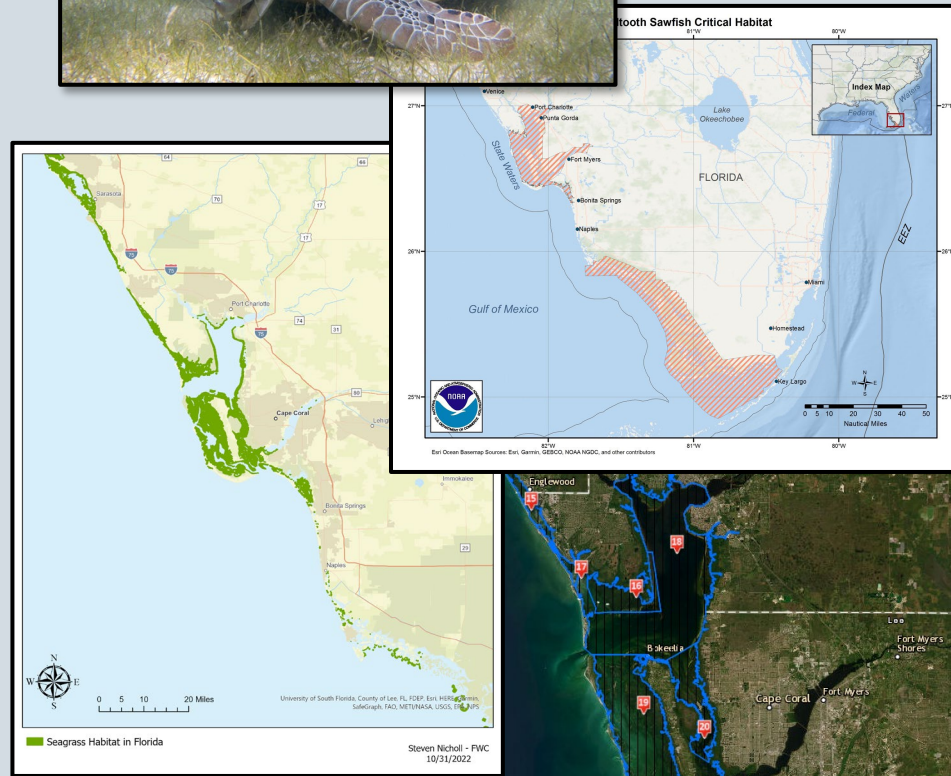
Removal Coordination

- Managed Areas
- Archaeological and Cultural Resources
- Habitat and Species

Natural Resources

- Sensitive Habitats
Mangrove, Seagrass, Tidal Marsh, Oyster
- Listed Species
Manatees, Sea Turtles, Shorebirds and Seabirds, Smalltooth Sawfish

*Partners: FDEM, FWC, FDEP APs and Compliance, Charlotte, Lee, Collier, Manatee, and Sarasota Counties, UF/IFAS, FSG, FKNMS, Contractors



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Marine Debris, Natural Resources, and BMPs

*Included but not limited to

Removals, Natural Resources and BMPs

Removal Support

- **Natural Resource Advisor Assessments**
- **Removal Planning in Sensitive Habitats**
- **Ongoing Coordination and Scheduled Communications**

Compliance and BMPs

- **Adapting BMPs**
- **Adapting RA Training**
- **Providing Contractor Training**
- **Monitoring**

***Partners:** FDEM, FWC, FDEP APs and Compliance, Charlotte, Lee, Collier, Manatee, and Sarasota Counties, UF/IFAS, FSG, FKNMS, Contractors



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Marine Debris, Natural Resources, and BMPs

*Included but not limited to

Ongoing Efforts

Continued Coordination/Ongoing Removals

- Missed Targets
- Mangrove Marine Debris Removals: Vessels and Accessible Debris
- In-Water Removals and Artificial Reefs
- CWAs
- Historical Resources

Long Term Priorities

- Remaining Debris
- Mangrove Macro- and Micro- plastics
- Entangling Debris
- Mangrove Restoration
- CWA Restoration

Future Funding

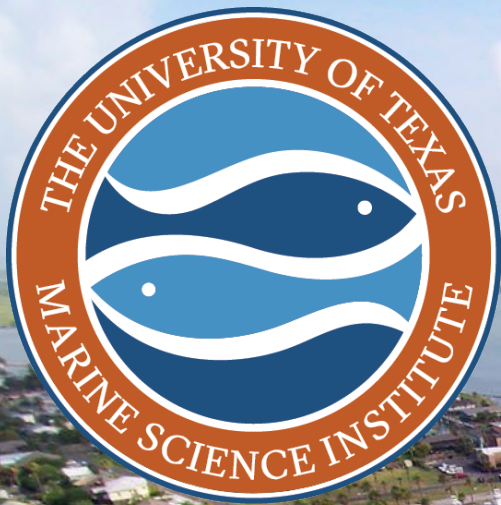
- Entanglement Prevention (FWC)
- Supplemental Hx Funding (NOAA/NFWF)



*Partners: FWC, FDEM, FDEP APs, Charlotte, Lee, Collier, Manatee, and Sarasota Counties, UF/IFAS, FSG, FKNMS, NOAA-MDP



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Hurricane Harvey

Fast and furious

132 mph winds, August 25/26, 2017





Hurricane Harvey Impacts

**Replacing roofing for 40 buildings =
approximately 3 football fields of roof**





Hurricane Harvey Impacts

**Bay Education Center in Rockport
3,300 acre conservation easement on Fennessey Ranch
Sampling infrastructure in the Mission-Aransas estuary**





Hurricane Harvey Impacts

**Relocated 80% of scientific staff to
Texas A&M University-Corpus Christi**



Research Impacts

- Destroyed research pier and two bay stations
- Submitted a National Oceanic and Atmospheric Administration supplemental
- Equipment donation from Xylem and fellow NERRs



Education Impacts



Outreach Impacts





Animal Recovery



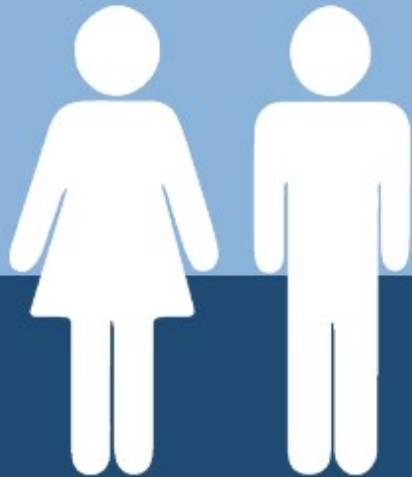


35

New laboratory
benchtops purchased
from overflow of UT
Dell Medical School

155,000

square feet of roofing
repaired (equivalent
to 3 football fields)



125

students,
researchers, faculty,
& support staff
impacted

number of days
students were in
temporary housing

205



200+

number of
kelp samples
a graduate
student
evacuated in
her tote bag

99.5%

of research
fish lost as a
result of the
hurricane



5

number of times a
lab floor sealer was
tested to make sure
it was right

The number of
research
proposals
submitted were
fewer, but had
a 34% greater
success rate
than in
previous
years



34%

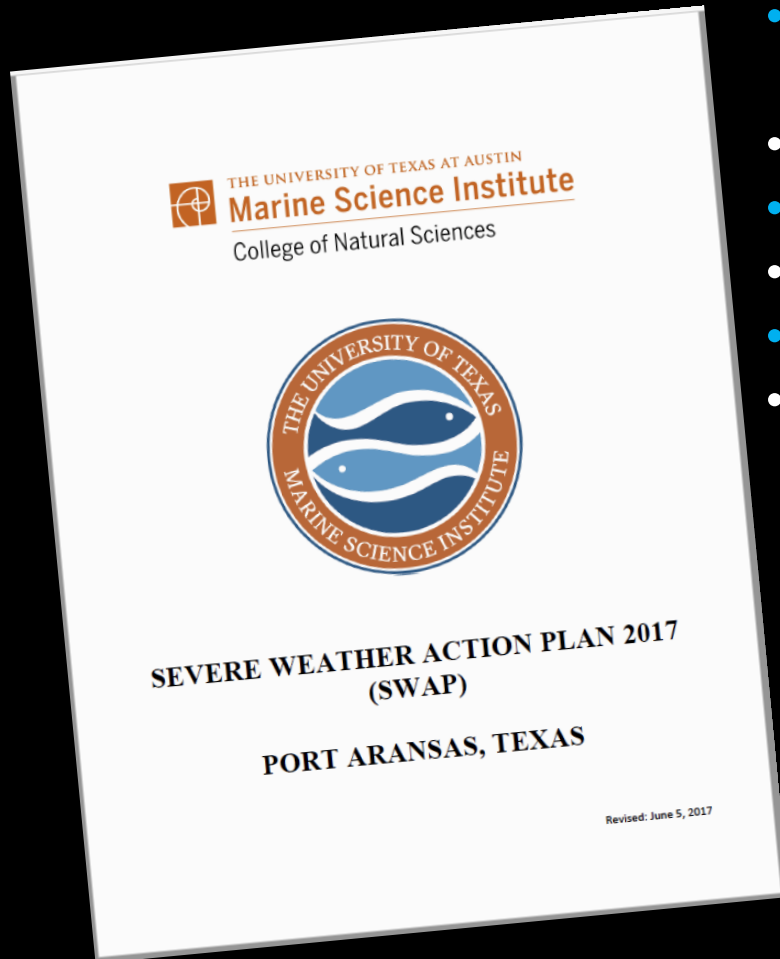


Recovery – First Response





What we did Right



- **Severe weather action plan and follow it**
- **Local Partnerships**
- **Environmental Health and Safety, UT Police Department**
- **Equipment Inventory**
- **Construction project manager on site**
- **Emergency Response Contractor**
- **Donation site**
- **Grant writer**





What we could've done better

- *Differed maintenance*
- *Photo documentation*
- *Salary documentation*
- *Thought out response*
- *Communications and cloud*





Lessons Learned - Preparation

- ***Develop a severe weather action plan and follow it***
- ***Do as many preparation activities as possible before or on June 1***
- ***Test emergency communications and have a multi-platform distribution system ready***
- ***Photo document as much as possible***
- ***Digitize essential documents***



Lessons Learned - Recovery

- *Independent FEMA adjustor*
- *Define lines of communication, responsibilities, and decision-making early*
- *Photo document as much as possible*
- *Develop volunteer needs and capability to host volunteers*
- *Rebuild with stronger envelopes*
- *Don't forget about other disasters (Winter storm Uri)*



August 29, 2017



February 20, 2018



Lessons Learned - Recovery

- *Review and develop emergency communication plans*
- *Prepare for alternative wireless communications*
- *Enable lead staff to coordinate and utilize resources*
- *Reallocate staff duties to help with recovery process*
- *Don't underestimate the amount of time to document damages, track funding resources, develop quotes and supervise repairs*
- *Be flexible*



Thank you to all our volunteers,
donors and agency support (UT,
NOAA, EDA, Tx Lege)





utmsi.utexas.edu/about/facilities

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

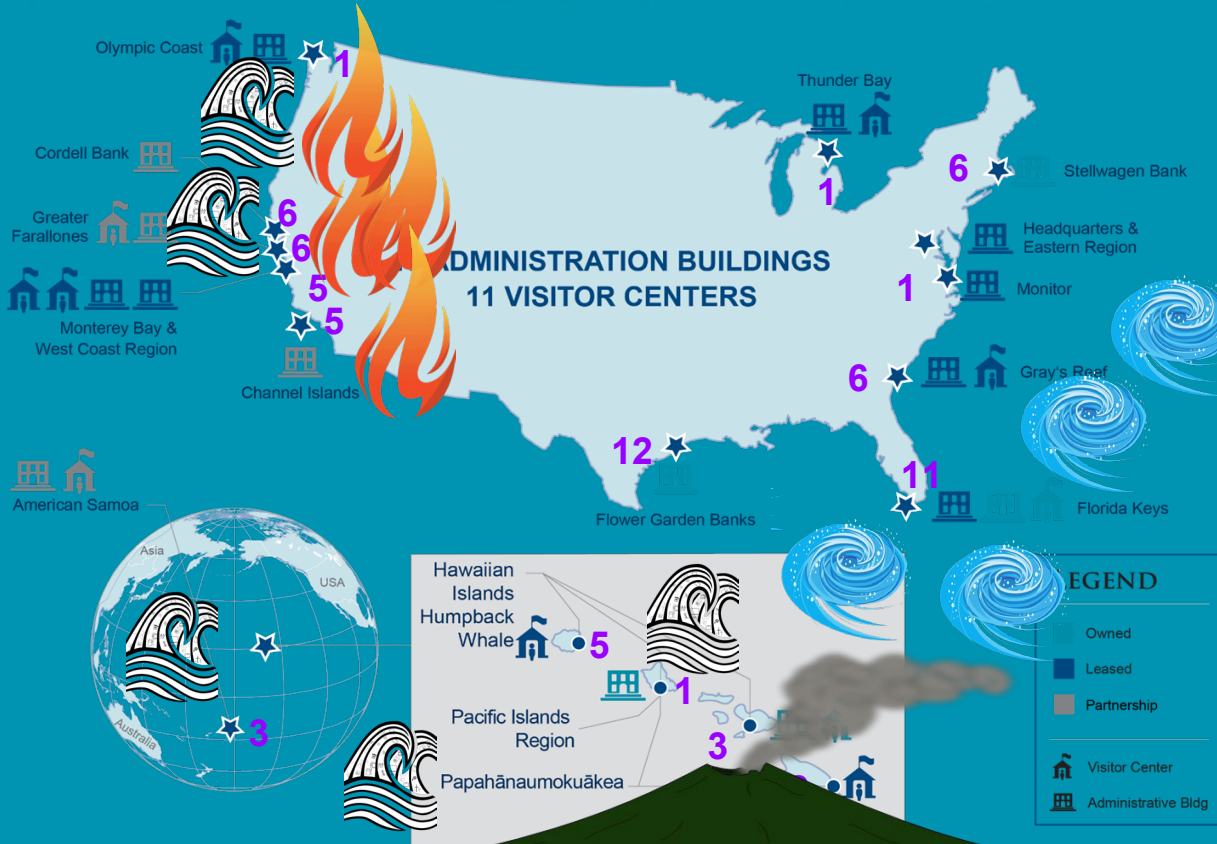


**NATIONAL MARINE
SANCTUARIES**



ONMS Contingency and Continuity Planning

Jonathan Gordon
IT Manager & Facilities Team Lead
Office of National Marine Sanctuaries
April 20, 2023



- CZU August Lightning Complex Fire
- Carmel Fire
- River Fire
- Hurricane Marco
- Hurricane Laura
- Woodward Fire
- Hurricane Sally
- Hurricane Delta
- Hurricane Eta
- 2021 California Winter Storm
- Kermadec Islands Region Tsunami
- COVID-19
- Tropical disturbance Invest 92
- Tropical Storm Elsa
- Tropical Storm Fred
- Hurricane Henri
- Hurricane Ida
- Hurricane Nicholas
- October 2021 Nor'easter
- Tonga eruption Tsunami
- Hurricane Alex
- King Tide Incident in American Samoa
- Hurricane Ian
- Moku'āweoweo Eruption
- Kihei Flooding
- 2023 California Atmospheric River Storms
- March 2023 Nor'easter





Planning and Preparedness

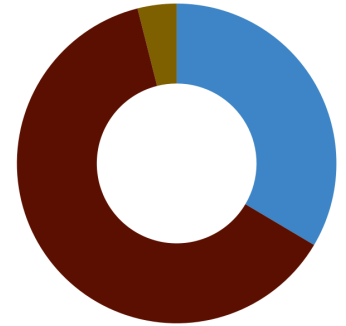
The primary focus in emergencies is accounting for the safety of personnel followed by the condition of physical assets and mission impacts

ONMS emergency notification testing showed:

- Multiple device types were used
- Two thirds of ONMS staff responded over an 8 hour period
- Next steps
 - Integration with ONMS technology
 - Expanded localized testing

ONMS ENS Test Response - March 2023

- No Response
- Response A
- Response B





Lessons Learned

- **ONMS Incident Communication Framework**
 - Important to use standardized reporting format for all incidents
 - PMI reporting to multiple levels of management
- **Streamlined Accounting for Personnel**
 - Communication tools are important - but useless without role based-training and testing
 - ENS reports are available without local managers having to follow up
- **Infrastructure and Data Recovery**
 - Know where your assets are and your relocation options



Pre-Event and Post-Event Assessment

ONMS Incident Communication Framework

ONMS Facility Closing Procedures at each location

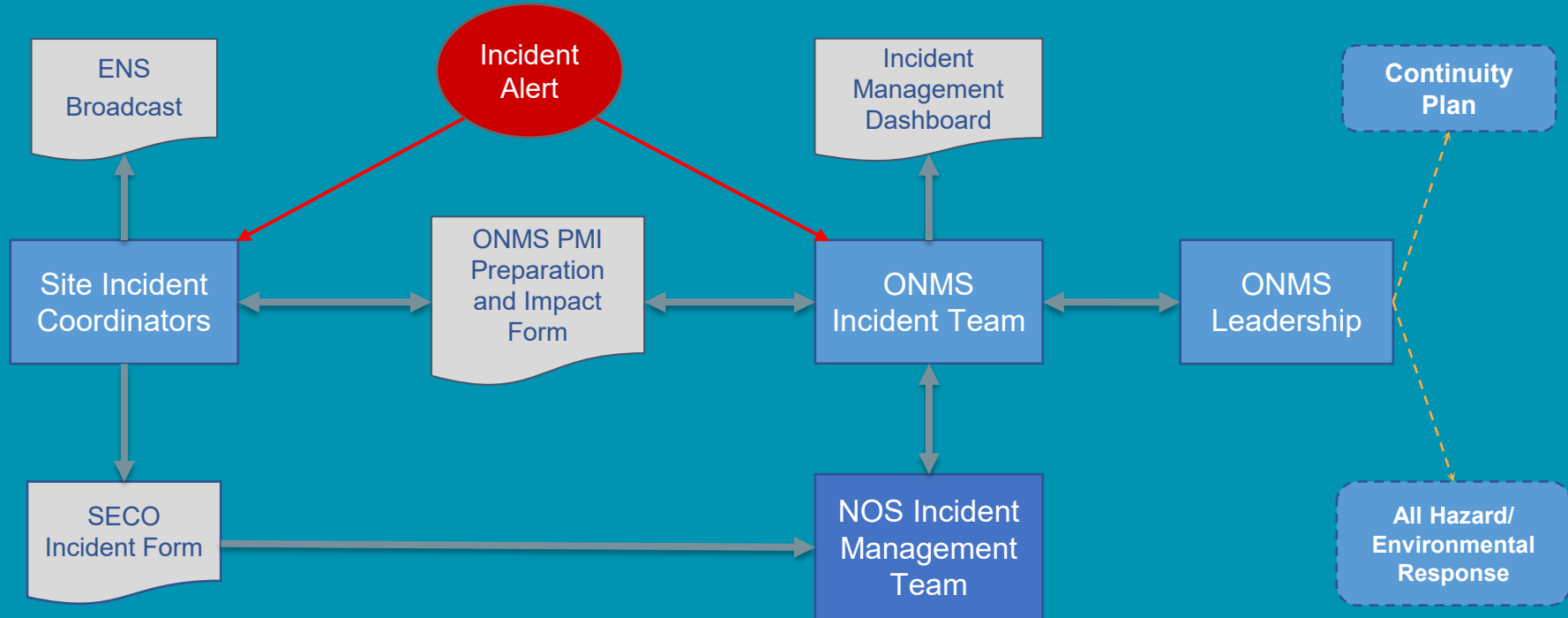
- Secures assets prior to an emergency event

ONMS PMI reporting through Google Form

- Standardized reporting format for all incident types
- Ability to attach documents and photographs
- One multi-use communication form for preparation, impact, and request for assistance
- Instant report access for multiple incident team and leadership



ONMS Incident Communication Framework





Data Infrastructure and Recovery

- 100% Cloud-based
- No servers. Storage appliances in each location connected to the ONMS Azure cloud.
- No centralized storage management removing a single point of failure.
- In an incident, each device can be relocated to another location in under 24 hours.



ONMS Interactive Incident Management

ONMS Incident Management Dashboard

COVID-19 Pandemic 2020 - 2023 **Tropical Cyclone Season** November - May **Wildfire Season** May - November **Hurricane Season** June - December

[Click Here for the Most Recent Active Incident Situation Report](#)

[Update Your NOAA Accounts Profile](#) [NOAA Staff Directory](#) [Update Your ENS Personal Contact Information](#)

Active Incident	Tracking Start Date	Tracking End Date	Impacted Site(s)
March Nor'easter	3/13/2023	3/18/2023	SBNMS NSTR
Winter Floods	03/09/2023	3/18/2023	GFNMS, CBNMS, MBNMS power outage and potentially dangerous road condit
High Winds in the Presidio	2/21/2023		GFNMS & CBNMS power outage and potentially dangerous road condit
Winter Storms	12/2023	12/2023	GFNMS High winds and power outages NSTR

Map locations: Olympic Coast, Thunder Bay, Wisconsin Shipwreck Coast, Lake Ontario, Stollwagen Bank, Hudson Canyon, Mallows Bay-Potomac River, Monitor, Greater Farallones, Cordell Bank, Monterey Bay, Chumash Heritage, Papahānaumokuākea.

- Rapid data intake from via Google Form
- Live Incident Monitoring
- Focus on PMI reporting

ONMS Incident Management Dashboard

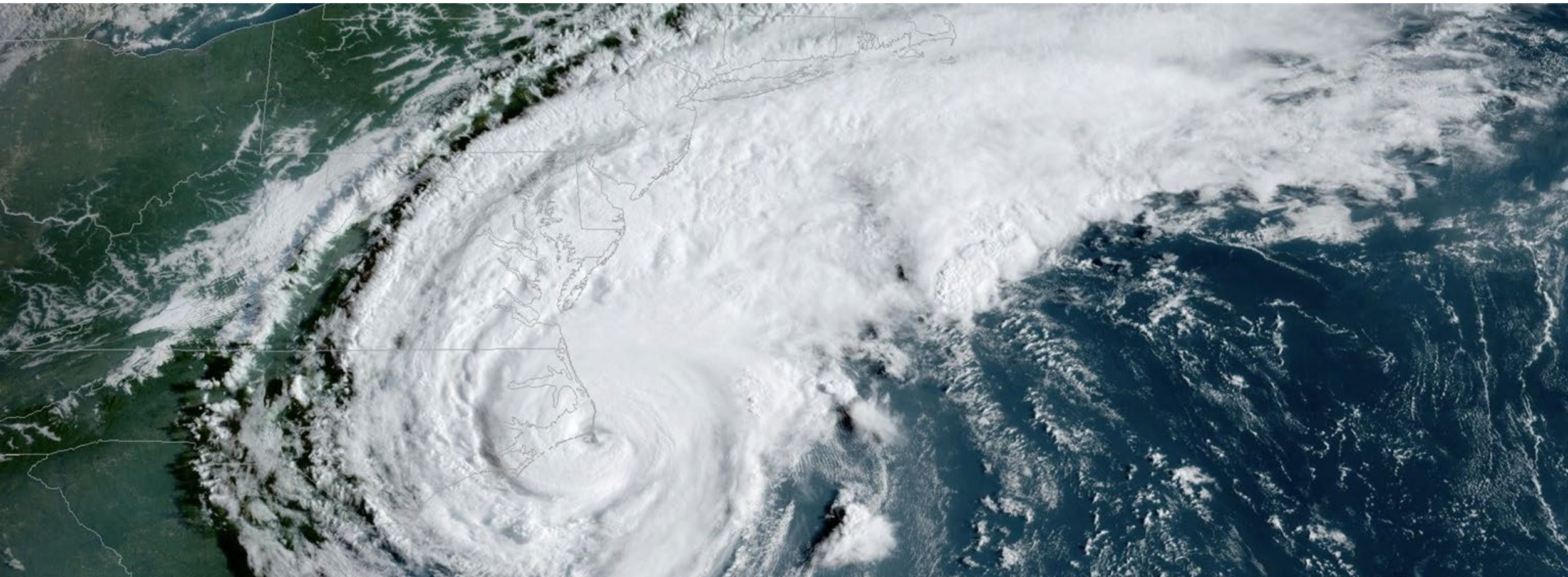
https://sites.google.com/noaa.gov/onms-incident-management/home_1

- ONMS
- Facility and Incident Networks
- HOME
- Incident Management Network
- Hazard Alerts
- Safety Week
- Facility Management Network
- Facility Condition Assessments
- Facility Security Assessments
- ASPEN NMS
- Other ONMS and NOAA Sites

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration



**NATIONAL MARINE
SANCTUARIES**



NOS Hurricane Summit

Continuity Of Operations

Alyson Finn, M.S, CEM

April 20, 2023



About Me



Alyson Finn

Emergency Planning Specialist & NOS National Hurricane Center Liaison

NOAA OR&R, Disaster Preparedness Program (DPP)

Contact Info

Email: Alyson.Finn@noaa.gov

Cell: (202) 3602595

Experience

- American Red Cross, Southern Florida – *Disaster Program Specialist*
- American Red Cross, Maine Region – *Senior Disaster Program Manager*
- NOAA Disaster Preparedness Program – *Emergency Planning Specialist*

Education

Bachelor of Liberal Arts, Professional Communications

Plymouth State University

Master of Science, Emergency Management & Public Administration

Lynn University

Professional Certifications

- **Certified Emergency Manager (CEM) – IAEM**
- **Professional Continuity Practitioner (PCP) – FEMA**

Statistics To Remember



40%

of businesses do not reopen following a disaster (FEMA)



OVER

90%

of companies fail within two years of being struck by a disaster (U.S. Small Business Administration)



ANOTHER

25%

fail within one year (FEMA)

Sources:  FEMA  SBA U.S. Small Business Administration

Access

NOS Continuity of Operations Timeline

Annual COOP Plan Updates

Each year NOS Headquarters + Program and Staff Offices submit their updated COOP Plan.

Initiated the Planning Process

Become knowledgeable with the current program.

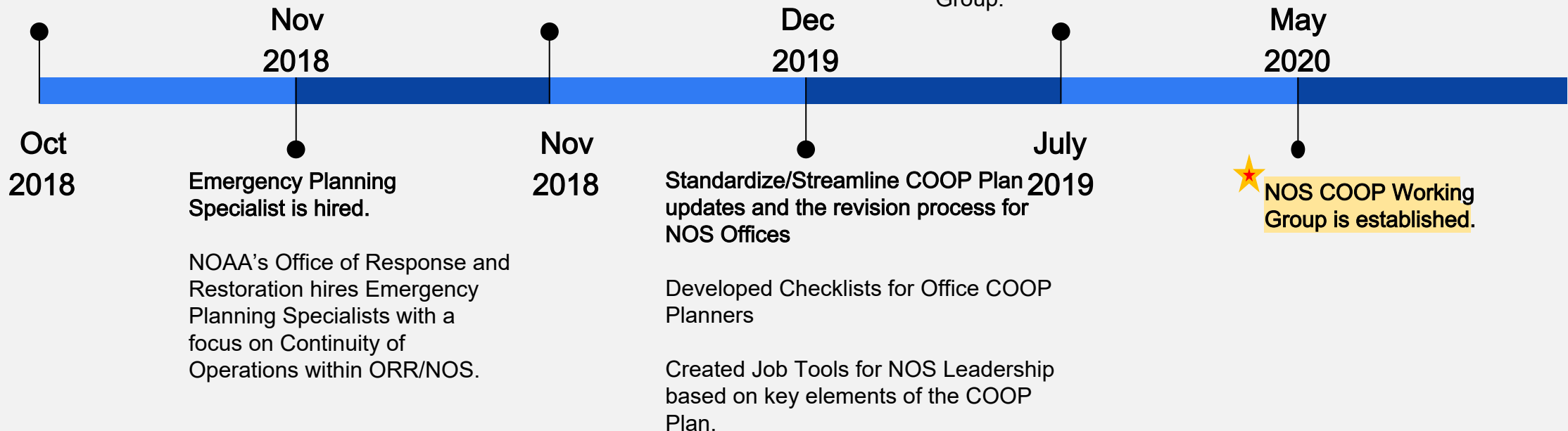
Identify guidance, requirements, or mandates (e.g., statutes) that are applicable to the program.

Develop a project plan, timelines, and milestones.

Learn the players.

NOAA COOP Working Group is established.

NOAA's HSPO in coordination with SMEs from other line offices created the NOAA COOP Working Group.



NOS COOP Working Group

- Established in May of 2020.
- The CWG Supports and promotes the development of continuity plans, policies, and procedures to ensure NOS maintains a viable and effective continuity capability.
- Membership is composed of staff from across NOS Offices.

NOS Continuity of Operations Timeline

Initiated the Planning Process

Become knowledgeable with the current program.

Identify guidance, requirements, or mandates (e.g., statutes) that are applicable to the program.

Develop a project plan, timelines, and milestones.

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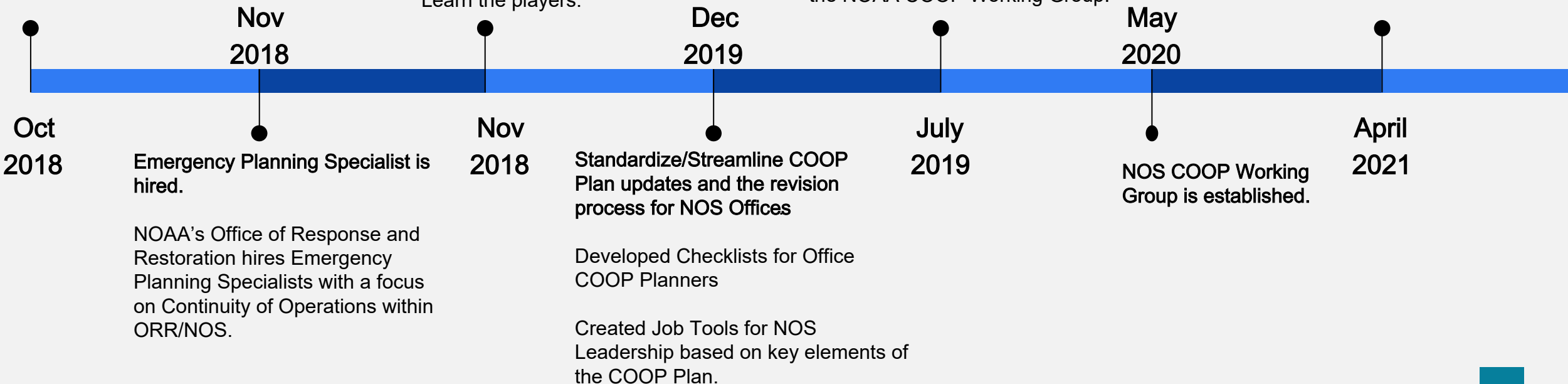
NOAA COOP Working Group is established.

NOAA's HSPO in coordination with SMEs from other line offices created the NOAA COOP Working Group.

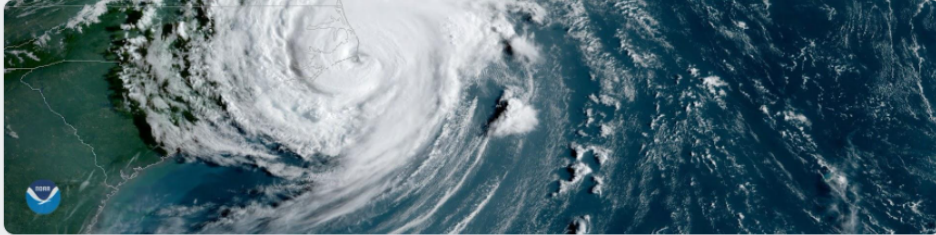
★ NOS Ready Self Assessment is developed.

Annual COOP Plan Updates

Each year NOS Headquarters & Program and Staff Offices submit their updated COOP Plan.



NOS Ready SelfAssessment Tool



NOS Office-Wide Ready Self-Assessment Form: 2023

Emergencies can strike without warning. Too many real-life examples from just the past few years remind us of the importance of being prepared.

The *NOS Office-Wide Ready Self-Assessment* is designed to help NOAA's National Ocean Service (NOS) offices better prepare for emergencies, including continuity events.

Content

This form consists of 7 sections: Participation, Emergency Planning, Continuity Capability, Communications, Safety, Facility and Equipment, Tests, Training, and Exercises. Each section contains a series of questions drawn from industry standards and best practices.

Instructions

- The *NOS Ready SelfAssessment* consists of 7 sections: Emergency Planning, Continuity Capability, Communications, Safety, Facility and Equipment, Tests, Training, and Exercises.
- Each section contains a series of questions drawn from industry standards and best practices.
- Completed on an annual basis by all NOS Offices
- Measures Offices level of preparedness and continuity capability.
- Each *Ready SelfAssessment Results Report* includes an executive summary, assessment scores, and additional preparedness recommendations.



NOS Continuity of Operations Timeline

Annual COOP Plan Updates

Each year NOS Headquarters + Program and Staff Offices submit their updated COOP Plan.

Initiated the Planning Process

Become knowledgeable with the current program.

Identify guidance, requirements, or mandates (e.g., statutes) that are applicable to the program.

Develop a project plan, timelines, and milestones.

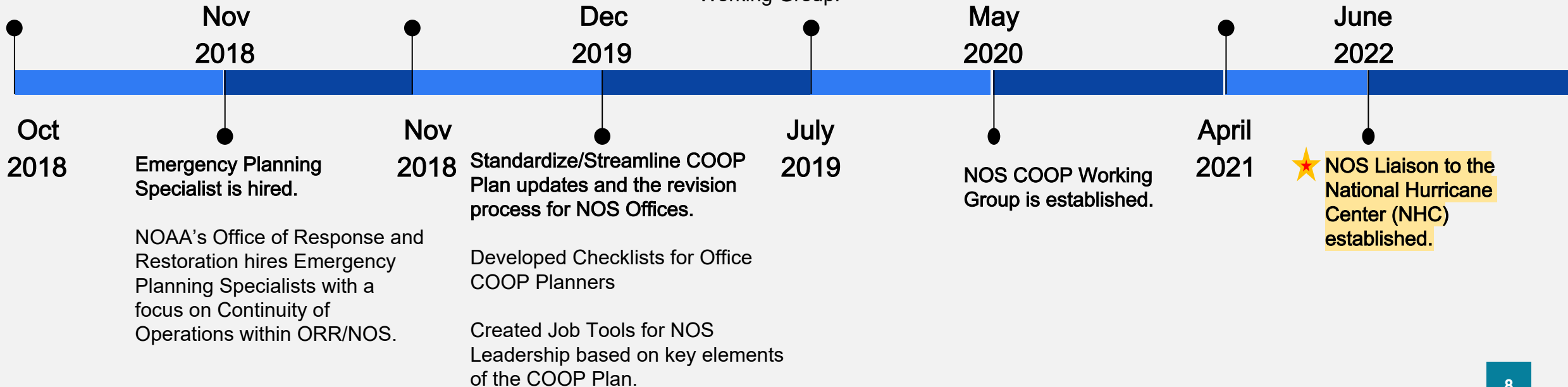
Learn the players.

NOAA COOP Working Group is established.

NOAA's HSPO in coordination with SMEs from other line offices created the NOAA COOP Working Group.

NOS Ready Self Assessment

NOAA's HSPO in coordination with SMEs from other line offices created the NOAA COOP Working Group.



NOS NHQ Liaison



NOAA's National Hurricane Center
Miami Florida

Questions?



NOAA Disaster Recovery Support

Why, How, & with What Coordination Tools

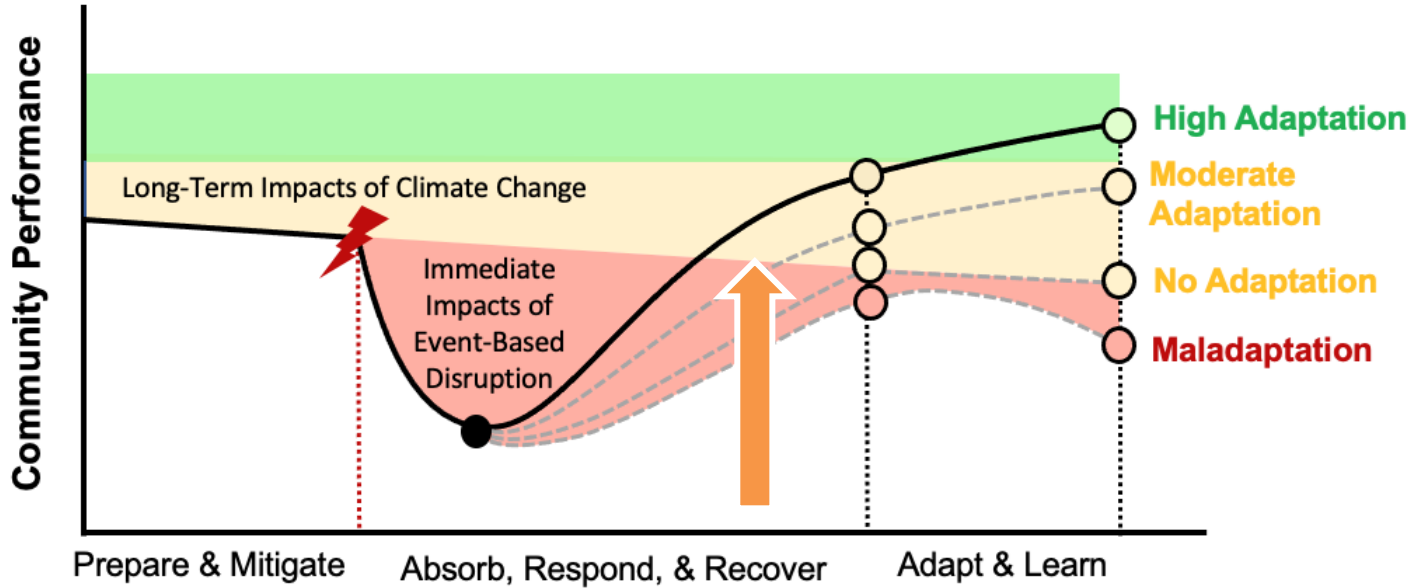
Autumn Lotze | Disaster Preparedness Program
Office of Response and Restoration



WHY

Improve Resilience of Coastal Communities and Economies

NOAA Strategic Plan: Strategic Objective 3.3



Actions to Reduce Impacts from Hazard Events and Climate Change



HOW

Federal Recovery Support Landscape & NOAA's Role



National Disaster Recovery Framework

Second Edition
June 2016



NDRF 3rd Ed. in development

Image: FEMA



CA = Community Assistance
NCR = Natural & Cultural Resources
HSS = Health & Social Services





NOAA as a Support Agency

Draws on capabilities and resources from across the agency to inform federal recovery planning and incident support needs

In an incident, engages at the request of FEMA/RSF Coordinating Agency and according to State/Tribe/Territory needs & priorities

**Current
Engagement**

- CA, NCR &
- Economic RSFs

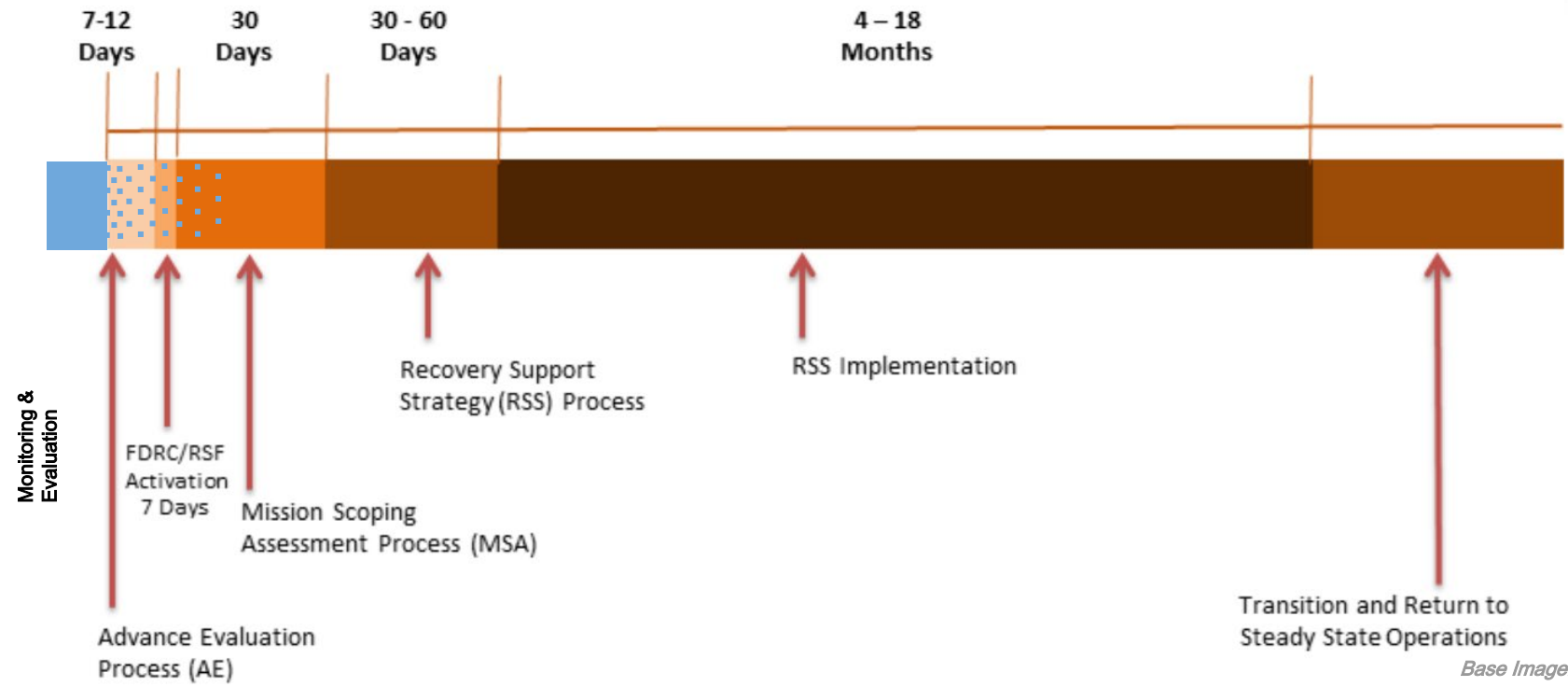


Internal Recovery Support Coordination





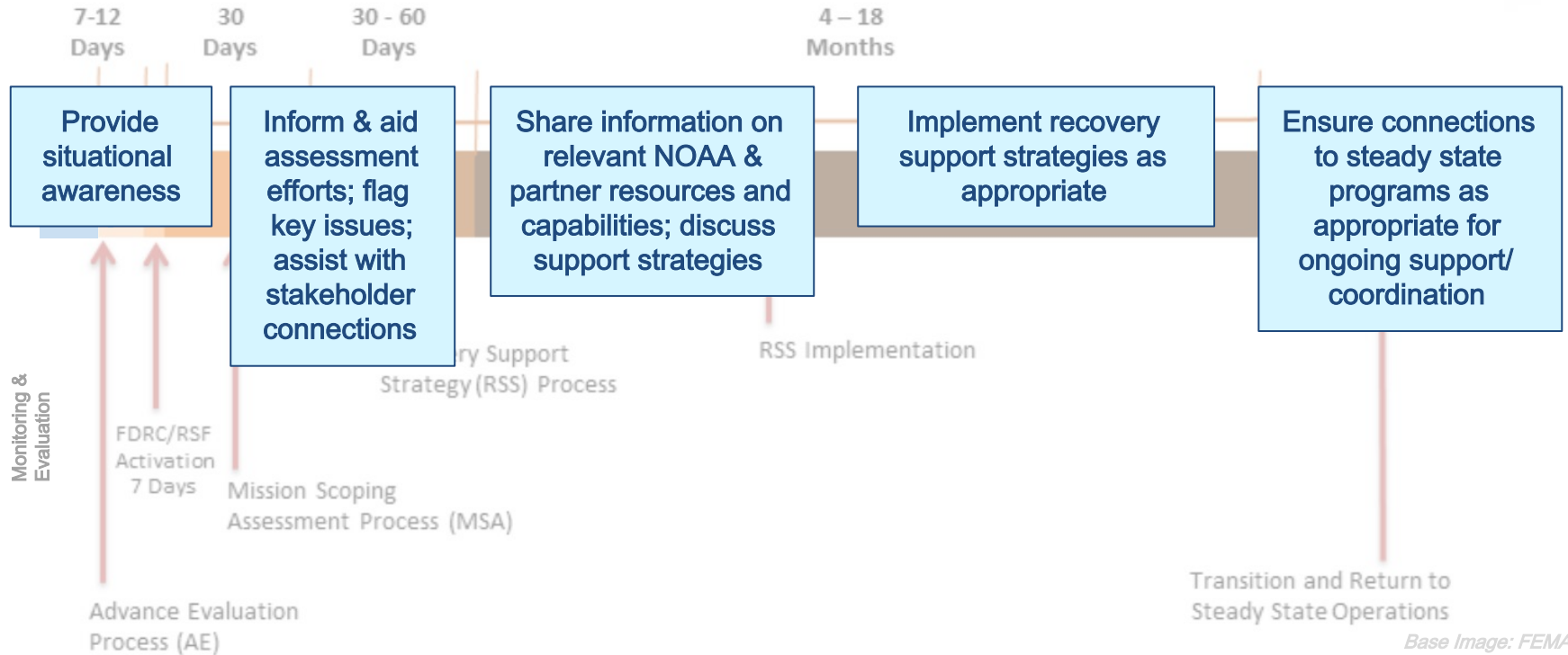
Recovery Support Operations



Base Image: FEMA



Plugging In



Base Image: FEMA



WHAT

Behind the Scenes NOAA Coordination Tools



Distros, Tracker, & Notes

Disaster Recovery Activity Tracker

Incident Tab

Overview Tab

NOAA Disaster Recovery Activity Tracker

The following tabs will be used to track information on disaster events prior to and during early stage/limited activation of **Recovery Support Functions (RSFs)** in which NOAA currently participates (i.e., Economic RSF, Natural & Cultural Resources [NCR] RSF, Community Assistance [CA] RSF). Please add any updates, recovery issues, and/or recovery notes as relevant. This information will be used to inform coordination discussions with FEMA and interagency partners.

For reference, acronyms are listed in the [Recovery Glossary](#).
Running list of NOAA Recovery Mission Assignments & Agreements [here](#).

Please contact Aturnin.Lottz with any questions/feedback/suggestions.

Recent Events

- CA **Winter Storms & Flooding (2023)** - all RSFs activated, deployed 3/1
- **Hurricanes Ian & Nicole (2022)** - RSF field coordinators deployed, recovery operation ongoing
- **Ex-Typhoon Merbok (2022)** - FEMA to initially activate NCR, Infrastructure, and Community Assistance RSFs (mid April)
- **Hurricane Fiona (2022)** - RSF activation not anticipated
- **Hurricane Saragassum (2021)** - Response operation demobilized; RSFs never activated
- **USVI Disaster (2021)** - RSFs demobilized

Disaster Recovery Distro Lists

Overview & Table of Contents

The worksheet manages (2) Internal NOAA disaster recovery distribution lists:

- National policy/practice communications (NMP/RSF Liaison)
- Incident operations (information sharing & support coordination)

Please update your officiating role as needed to ensure the appropriate team members are included in required communications. Use simple terms of "Name for This Group" as needed to help team members. Group email(s) will be used to notify you as you receive where relevant.

Question? Contact Aturnin.Lottz (Aturnin.Lottz@noaa.gov; 202-910-1676).

Key NOAA Recovery Support Coordination Resources

- [NOAA Recovery Support Coordination Resources](#)
- [FEMA/RSF Liaison List](#) (policy guidance)
- [Recovery Page, NOAA Disaster Coordination Dashboard](#)

NMP/RSF	SERO									
Key Officer Name	Last Status Date	Primary Role	Secondary Role	Emergency Contact	Officer Status	Officer Email	Officer Phone	Officer Fax	Officer Title	Officer Agency
Name	Head Office	Emergency Contact	Officer Status	Officer Email	Officer Phone	Officer Fax	Officer Title	Officer Agency	Officer Title	Officer Agency

RSF Resource & Situational Awareness Notes

NOAA RSF Updates | Hurricane Ian Recovery - 10/17/22

Plan Updates: NOAA Post Storm and Impact of severe I. Plan, SW, NE & lower SE Coast. Inactive from 10/24/2022 (10/24/2022 - 10/24/2022)

NOAAPlan: Direct use imagery from selected locations, with project completion status.

NOAAPlan: Florida Storm Damage Assessment (SDA)

NOAAPlan: National Emergency Response Plan

NOAAPlan: National Emergency Response Plan

NOAAPlan: National Emergency Response Plan

NOAA RSF Updates | Hurricane Ian Recovery - 10/6/22

Plan Updates: Florida Storm Damage Assessment (SDA)

NOAAPlan: National Emergency Response Plan

NOAAPlan: National Emergency Response Plan

NOAAPlan: National Emergency Response Plan

NOAAPlan: National Emergency Response Plan

NOAAPlan: National Emergency Response Plan



Tracker Information Elements



Event	Hurricane Ida (LA) — See also other tables	Fishery Disaster Assistance	
Declaration(s)	Ida: 201-4611 Other States (w/lo RSF activations): 201-461-1, 918-461-1, 918-461-1 State Emergency Declarations: AL, CT, VA, WV		Letter from Lt. Gov. being mailed as official request for fishery disaster determination; restoration process underway
Recovery Status Function (RSF) Status	Jan of November 2022: NOAA support scheduled; coordinated directly with LA Office of Community Development June 28/29 to secure climate partners for state planning and resilience efforts FEMA: No. 44-0000-2022-0010 State Emergency Declarations: AL, CT, VA, WV		
Supplemental Status	State Supplemental to IDA-22 includes the following external assistance-coordinated funding NOAA for 20-21 hurricanes & wildfires (not limited to Ida): - \$20M for Federal disaster assistance (DIA) - \$2M for NWIF grant funding (DCM) - \$1.62M for marine habitat assessment & removal (DNRM)		
USA Funding	Relevant NOAA Funding: - Transformalional Habitat Restoration - Habitat Restoration for Underserved Communities - Marine Oceans - Coastal Zone Management - National Coastal Resilience Fund (DCM/NWIF partnership) - FY22 NOFO Closed Other agencies: - LA to receive 21.6M in USACE funding for coastal, water input & hurricane risk reduction projects (see link) - Crisis Getting House Rebuilding Assistance - Working systems have been halted		
Interagency Notes	Coastal Protection & Restoration Working Group - No longer coordinated - See RSF Update (w/ 7/13/22) - NOAA for recovery formally concluded; EDA continuing limited operational support with steady state staff resources - EDA hosted final "TRF" (Federal Interagency Resource Exchange) event on 7/12 for Lafayette Parish area. Autumner presented by Digital Coast, Marine Oceans & USA Funding opportunities (table) - NCF RSF Update (w/ 6/29/22) - NCF for recovery formally concluded - OPR RSF Update (w/ 6/23/22) - US Community Resilience Assessment Comparative Analysis; LA Initial Community Condition Assessment Continuing ongoing support to partners requesting assistance with recovery efforts - FEMA recovery will continue for some months, potentially through January 2023		
Key Notes	- Hurricane impact on 500M+ houses in Louisiana; minimal damage to insurance over past 2 years (LMAF & Sea Grant report) (ongoing) w/ 28M+ reduced fish bills (LMAF) - Addressing LA's difficulties in recovery planning (ongoing) - Wetlands Impact & Restoration capabilities (ongoing) - Impacts to tribal communities that are state recognized but not federally recognized - Highly considerations, especially for small communities - Resource limitations (esp. re temporary housing) due to other disasters - Reduced attention to other LA areas (w/NO) recovering from prior hurricanes - Determined to explore engaging offshore and community and partners recovery strategies (link w/ 6/29/22)		
Office + POCC	Update	Recovery to Re/Sign	Note
Interagency notes summarized by subsector offices address whether you have more information to share			
NOAA/NOIC Linda Cook Katherine Sheppard	- Significant investment in the area, working with the State to assess impact - Plan to explore where restoration needs could potentially be eligible for public assistance - Emerging Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), projected budget will go to partners' leaders - Working on possibilities of Gulf Coasts engagement - Subsequent info on impact to post restoration work	- Anticipate sharing more information about 108 resilience and restoration funding opportunities in the spring (community-based habitat restoration program)	
NOAA/OP Doreen Adams	- Working through fishery disaster determination process at request of Lt. Gov.	- Fishery disaster assistance working with the state to gather data needed for, i.e., to make a determination	- Mike Travn participated in 2/15 Sea Grant Fisheries Impact Document & provided clarifying info to participants on Fishery Disaster Determination process
NOAA/NOFO EPA - Nat Consequence EPA - January Meeting NCE - Nancy Sengstad NERF - Noah Sherman	- Ongoing ESA Section 7 emergency consultations w/USCG and USACE - Engaged in regulatory reviews, have seen some emergency permits		- EDA, co. Kara Renzo - NCE, co. Brian Neugebauer, Lauren Waters - All POCCs connected to both NOAA, FEMA, DFR
NOAA/NOCS Ann Riley	- Providing data support for mapping working wetlands and natural infrastructure - FEMA/NOCS (via request 4/18) - 3 potential options submitted to LA Coast	- Science to support resilience planning - S&R resources - H2019 Coastal Monitoring and Assessment Program - Operational Habitat Monitoring and Forecast - Habitat Mapping and Characterization - Coastal Aquatic Monitoring and Impact Assessment - Socioeconomic and Community Vulnerability Assessment - Coastal Aquaculture Siting	- NOAA vulnerability index as resource for FEMA operational & repair advisor - Adjunct Internal Aquaculture Opportunity Aways 1/28 Public Meeting w/NOFO
NOA/DCM Heidi Lister	- NCF RSF information expected later this year (at minimum for FY22 amendments) - NCF w/ 6/29/22 - NCF w/ 6/29/22 - NCF w/ 6/29/22	- "NOFO" 2022 "NOFO" 2022 - Release of 2022 Sea Grant Res. Technical Report (interagency product)	- Coordinating across DCM/NOCS/DCPP on climate adaptation & data resources relevant to recovery operation and engagement w/State Recovery State Task Force (ongoing)

Incident Information

- Disaster Declaration(s)
- RSF Status & Interagency Activity
- Assistance & Funding Programs
- Key Recovery Issues

Office/Program Information

- POCs
- Activity Updates
- Relevant Resources
- Other Situational Awareness Notes



Looking Ahead

May 2023

- Request to NOAA Offices & Programs to update POCs in *Disaster Recovery Distro Lists*

September 21, 2023

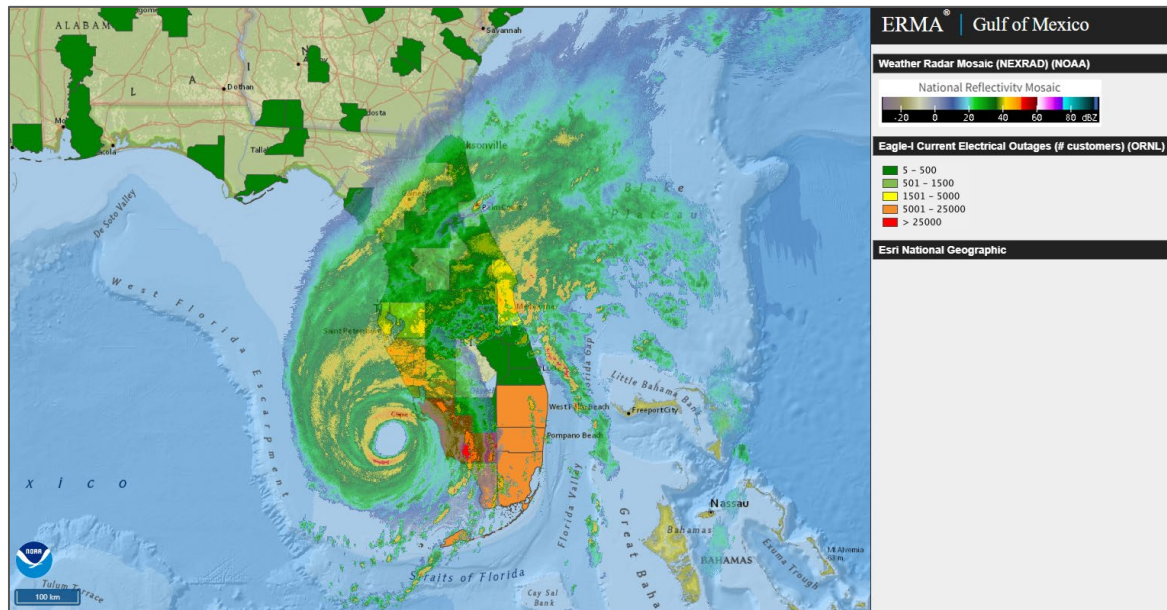
- NOAA & Partners invited to the “Recovery Support 101” edition of OR&R’s *You Don’t Know What You Don’t Know* series



THANK YOU

autumn.lotze@noaa.gov

The Environmental Response Management Application ERMA®

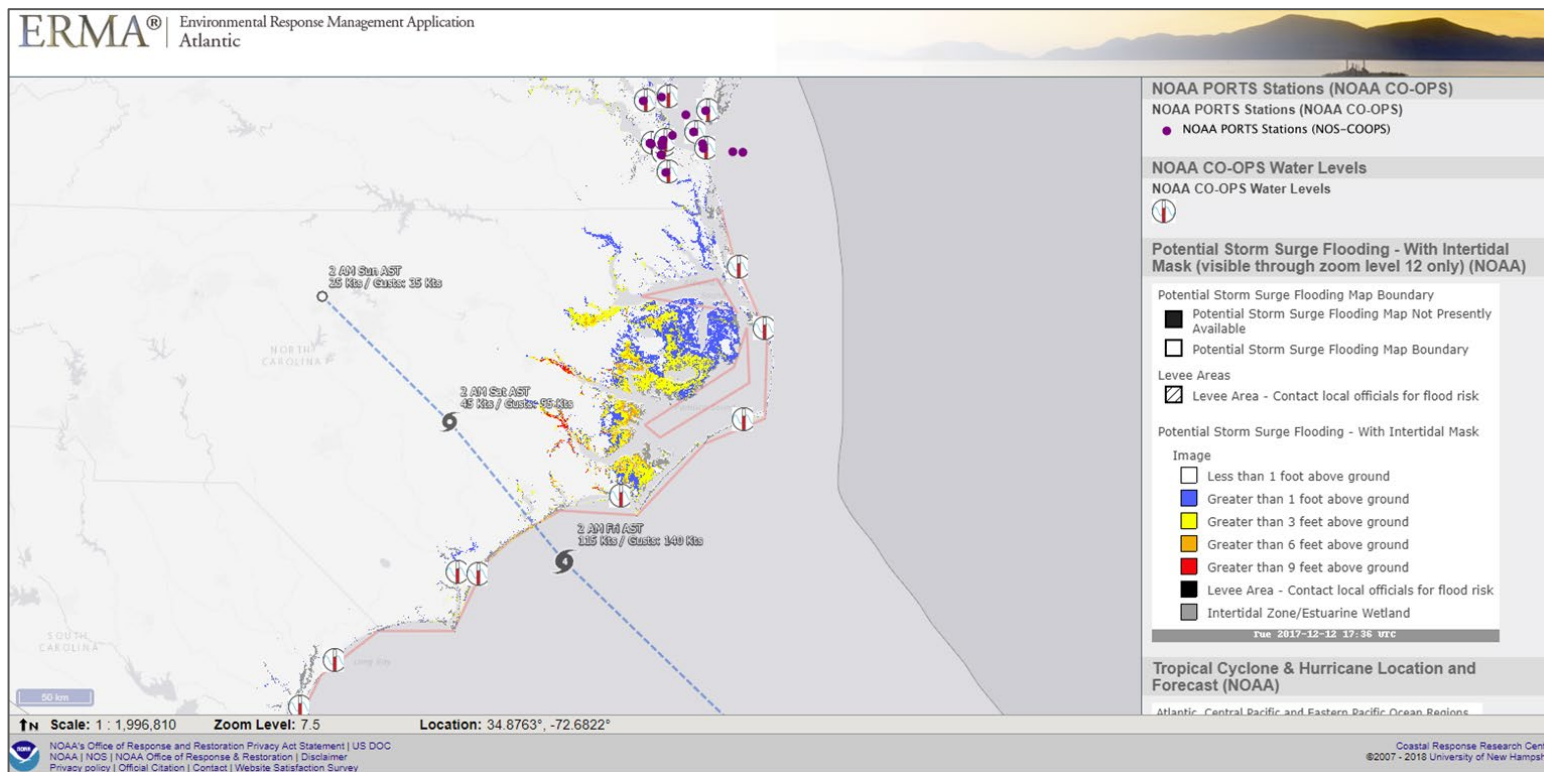


Jay Coady
Office of Response & Restoration
Assessment and Restoration Division
Spatial Data Branch

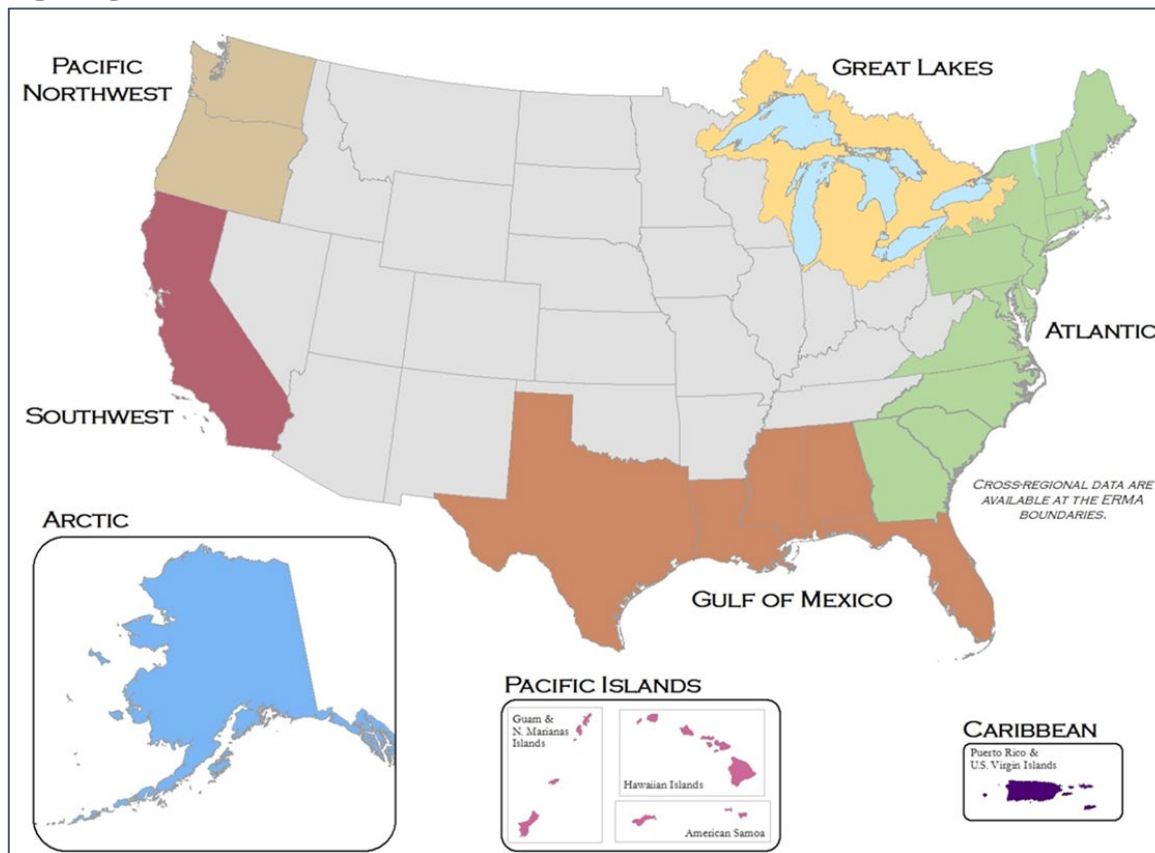
response.restoration.noaa.gov



ERMA is an online mapping tool for visualizing environmental information relevant to oil spills and natural disasters.

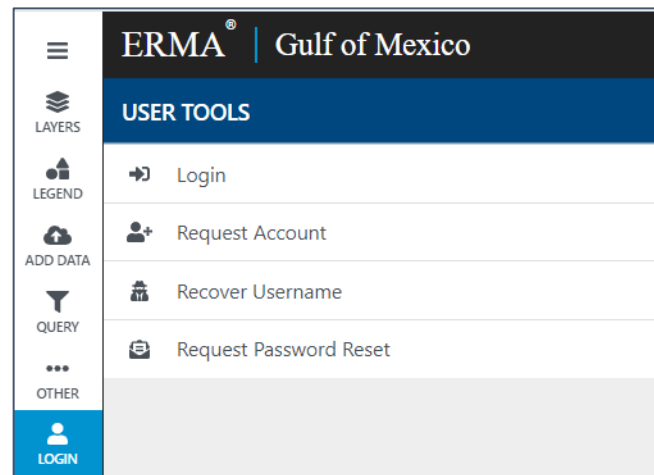


ERMA Regions



ERMA Accounts

- Public access - no login required
- Restricted accounts:
 - Verified by NOAA
 - Various levels of access
 - Active incidents
 - Sensitive datasets
 - NRDA/Trustee
 - Drills
 - Password reset 90 days; inactive accounts 6 months
 - Data available only to appropriate users and use



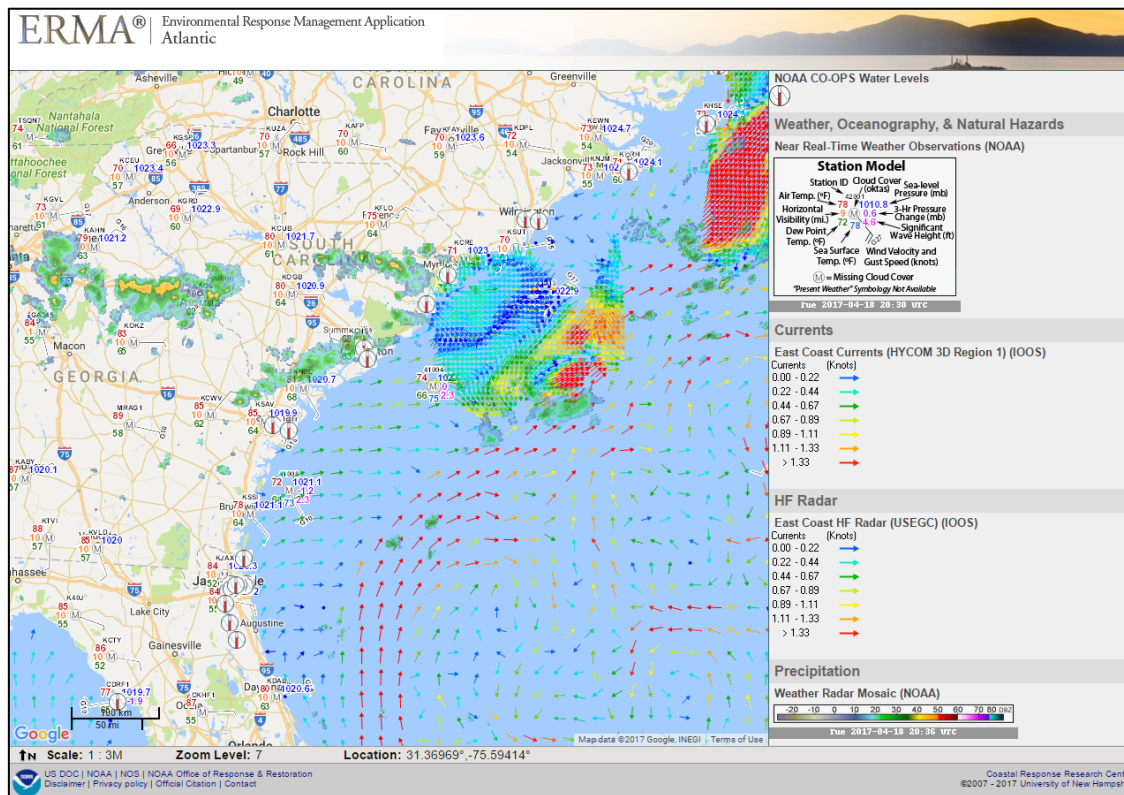
ERMA URL: <https://erma.noaa.gov/gulfofmexico>

Account Support: orr.ermaaccounts@noaa.gov

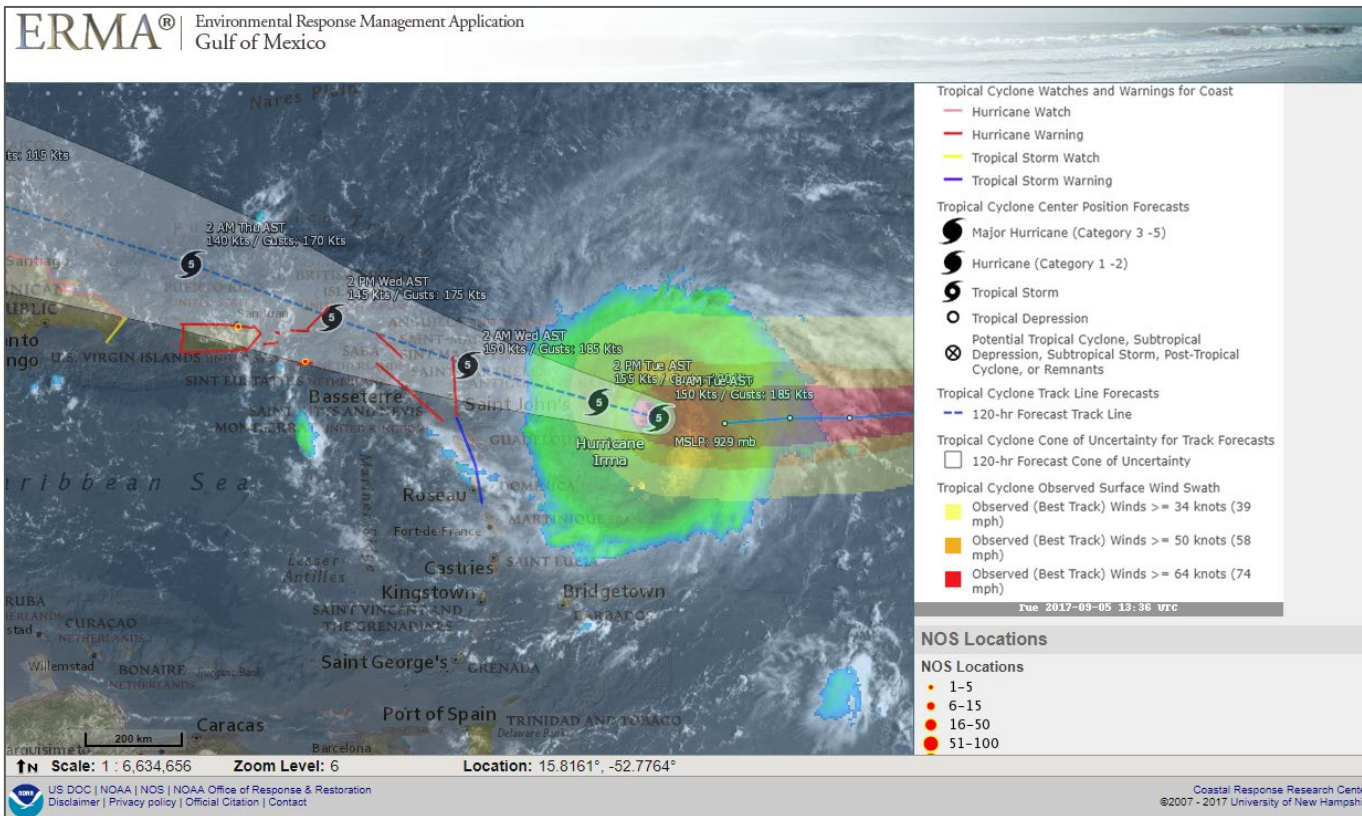
Hurricane Response With ERMA

- Base environmental data
- Live data streams
 - Storm tracking, surge modeling, current water levels, ship locations, and more.
- Critical infrastructure
- Pre/post storm imagery
- Quick turnaround post storm data
- Live tracking of ESF-10 targets
- Tools to explore data

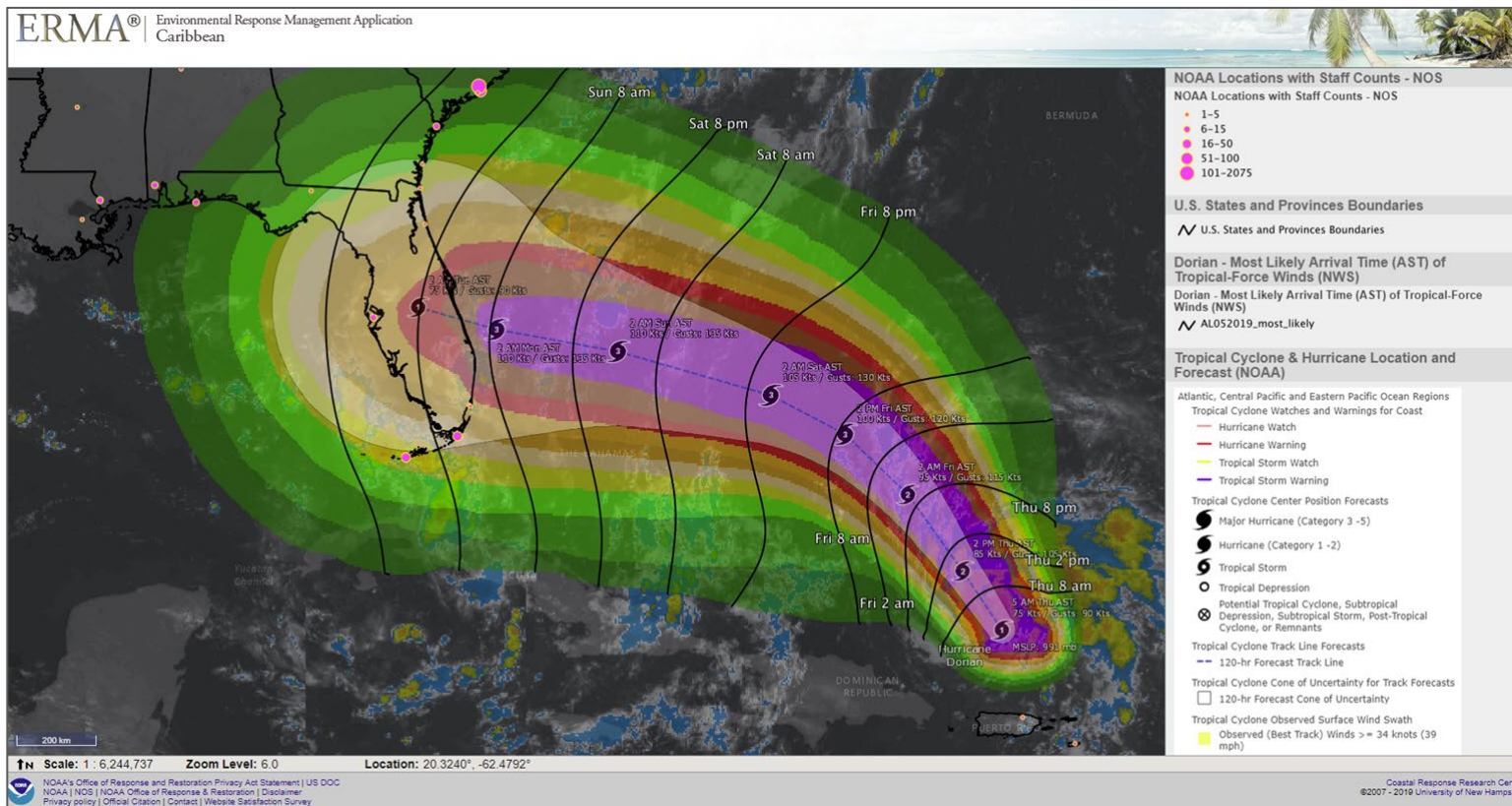
Near Real Time Weather



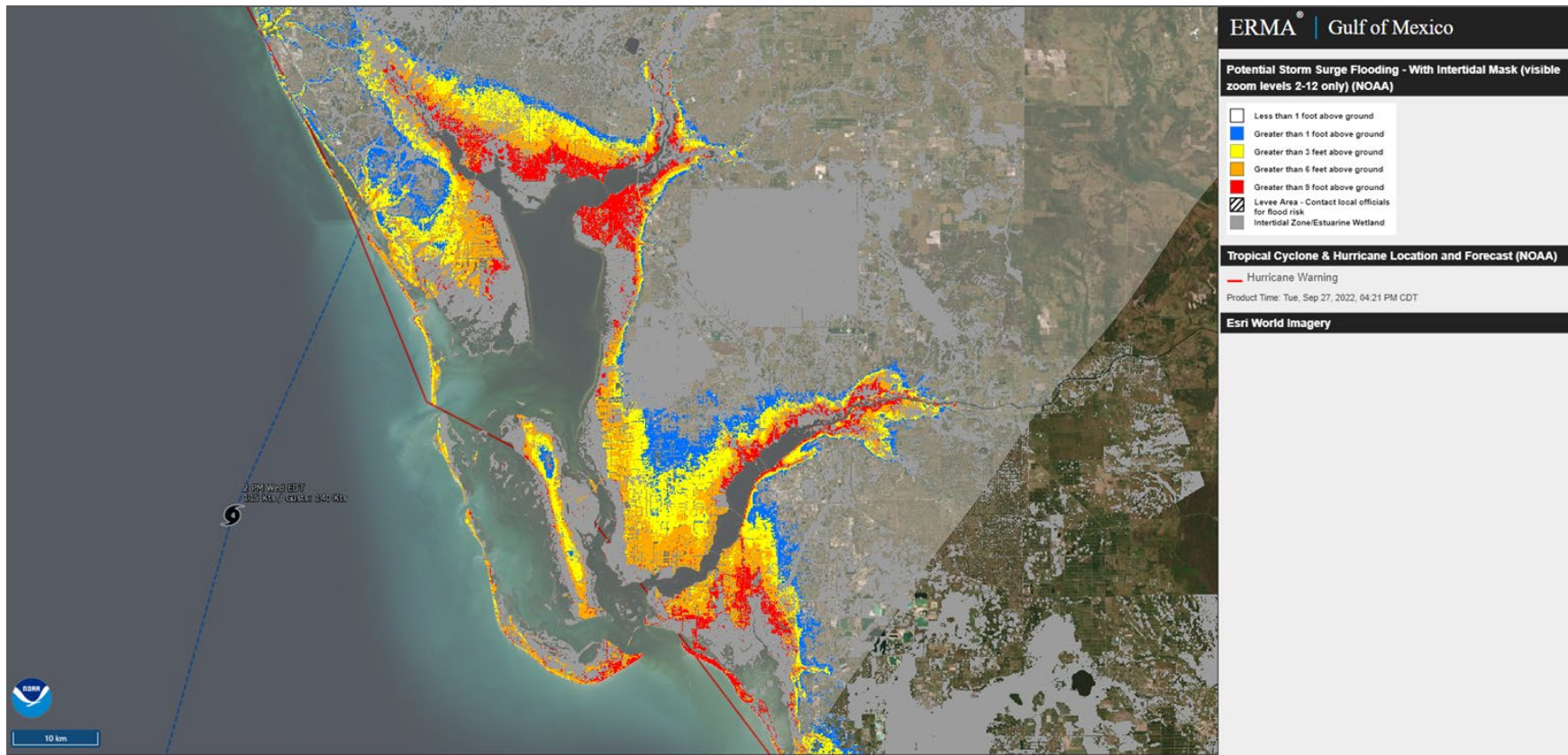
Storm Tracking



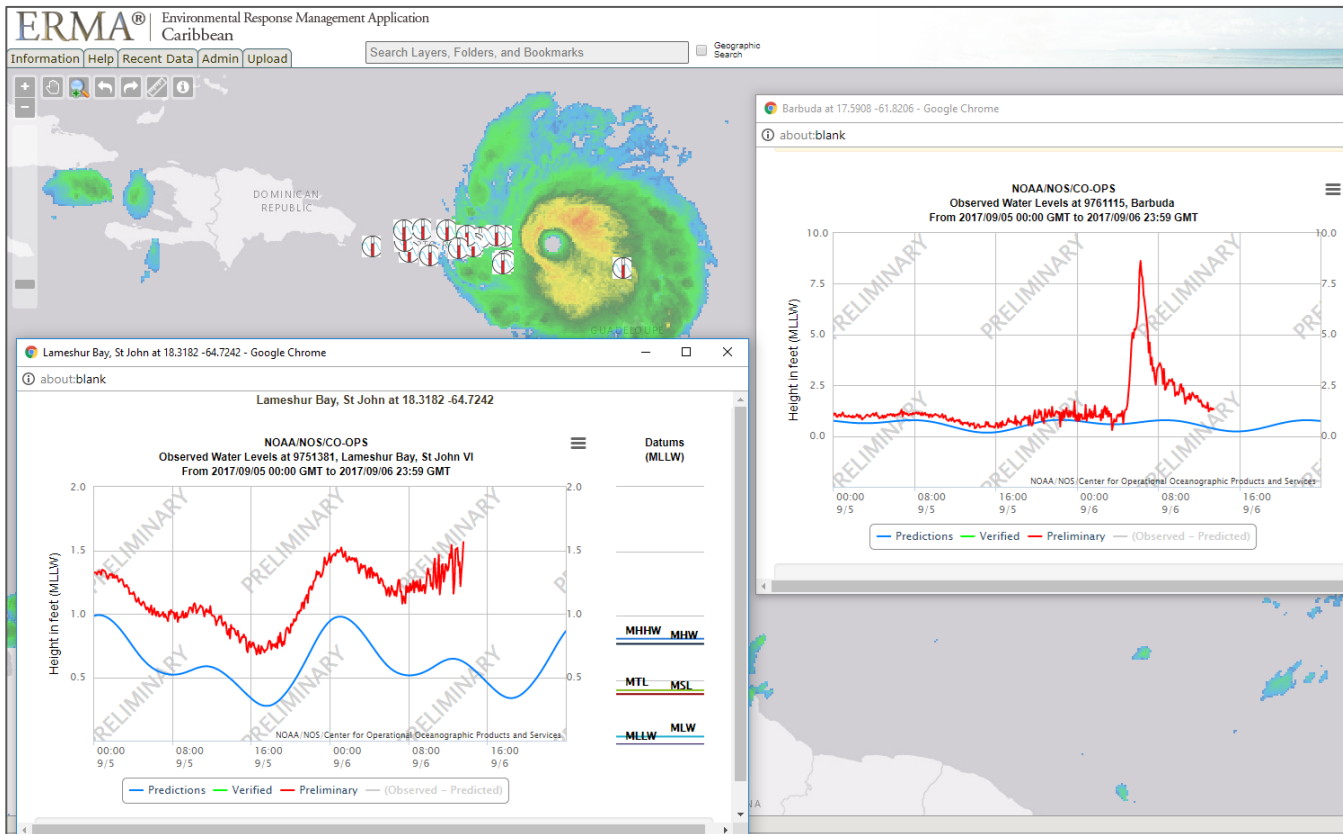
Arrival Times of Winds



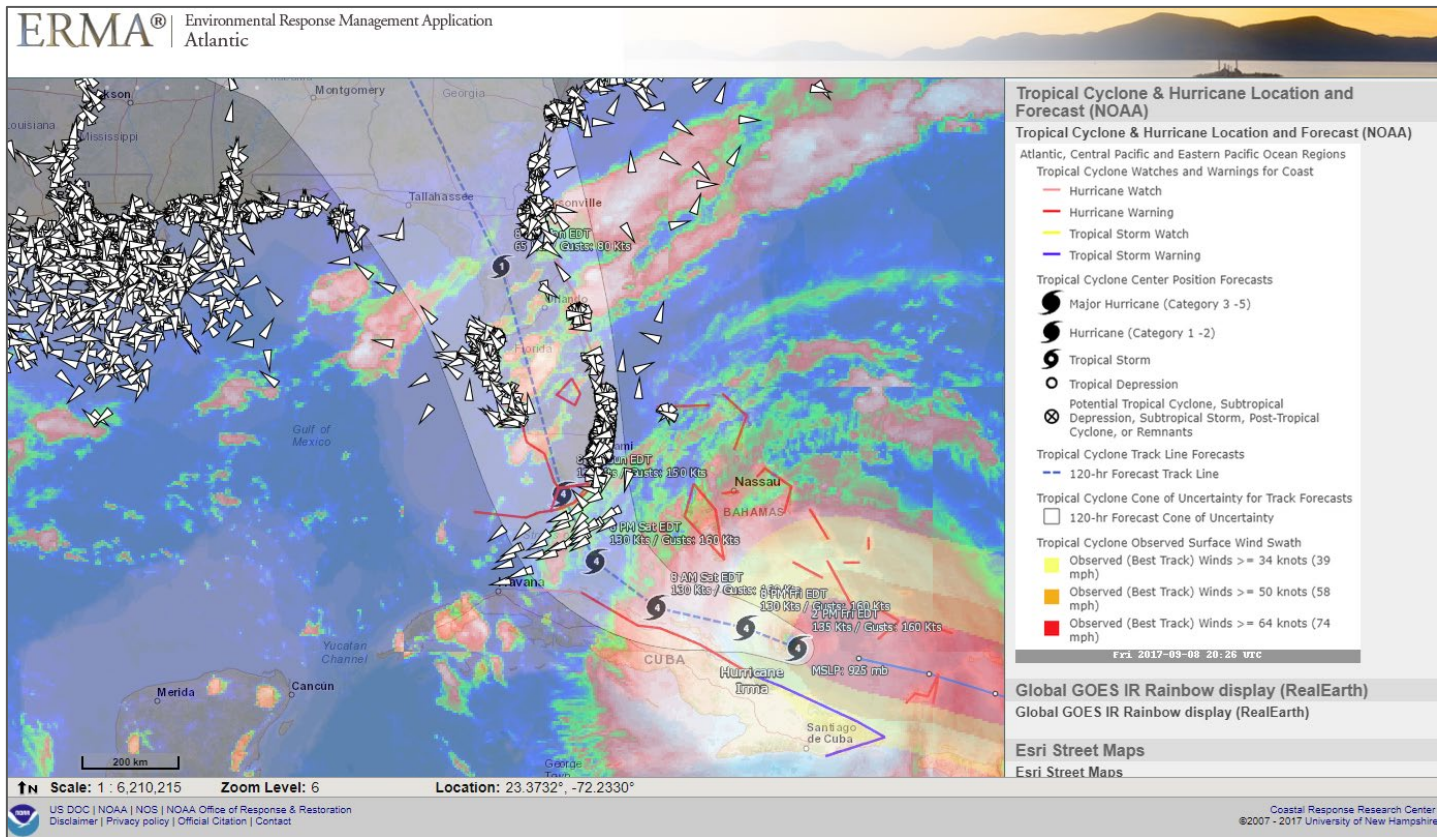
Storm Surge Modeling



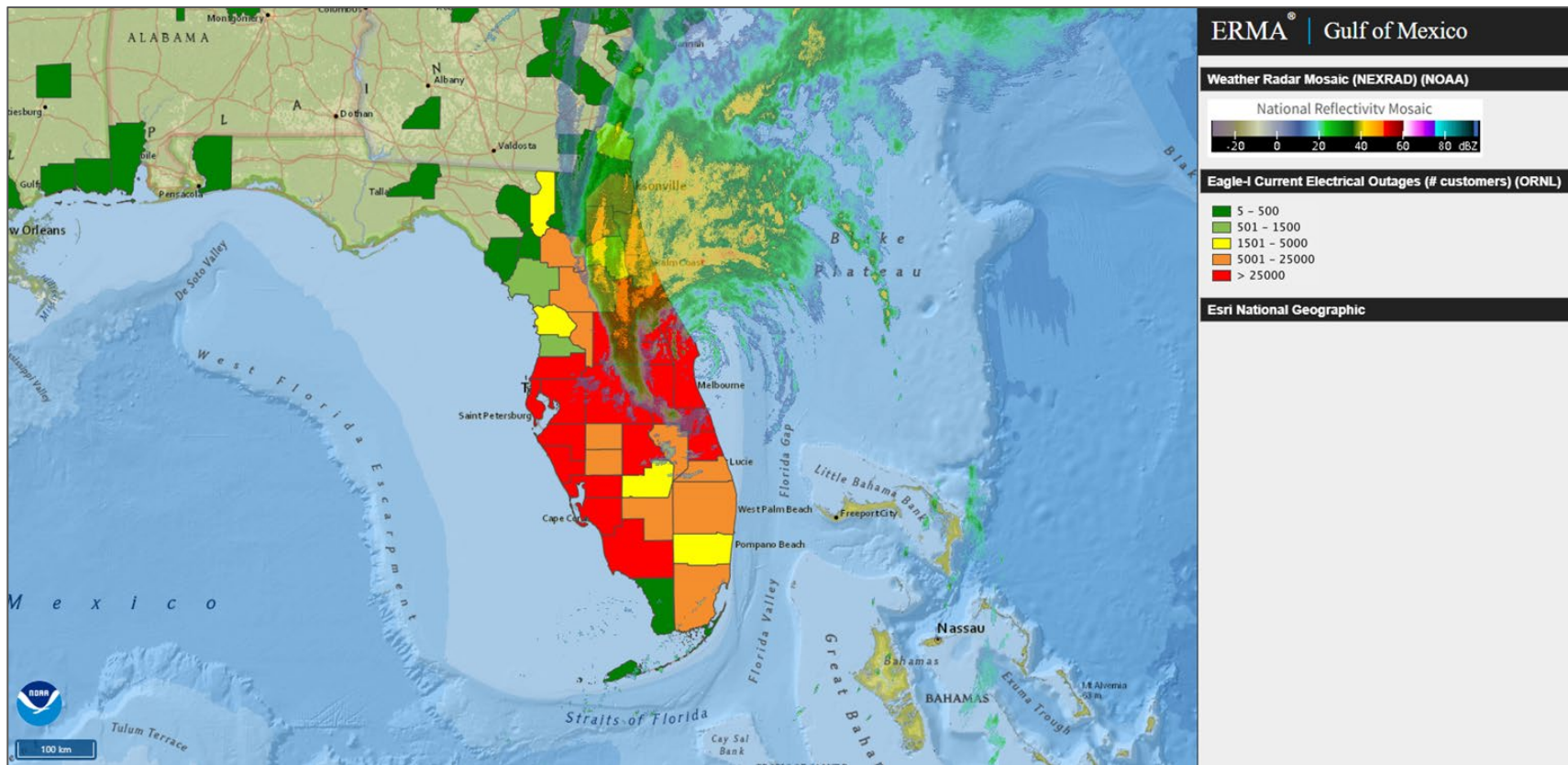
Water Levels



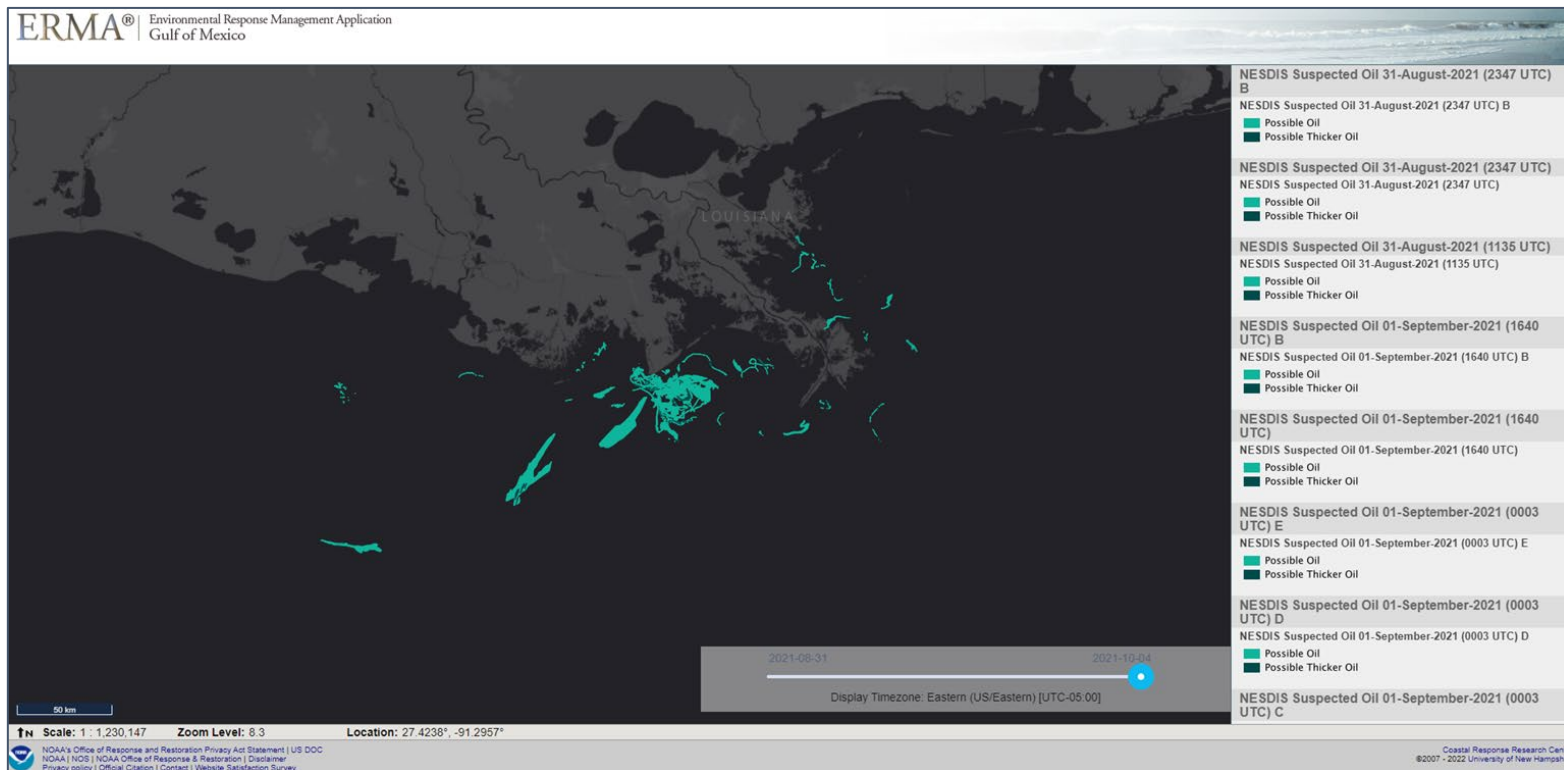
Vessel Tracking



Power Outages




Marine Pollution Surveillance Reports (MPSR)



<https://www.ospo.noaa.gov/Products/ocean/marinepollution/>

NGS Response Aerial Photography

ERMA® Environmental Response Management Application
Gulf of Mexico



Esri Street Maps
Esri Street Maps
Aerial Imagery 2017-08-31b (NOAA NGS)
Aerial Imagery 2017-08-31b (NOAA NGS)

Aerial Imagery 2017-08-31a (NOAA NGS)
Aerial Imagery 2017-08-31a (NOAA NGS)

↑N Scale: 1 : 753,135 Zoom Level: 9 Location: 29.4774°, -94.5800°

US DOC | NOAA | NOS | NOAA Office of Response & Restoration
Disclaimer | Privacy policy | Official Citation | Contact

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NGS Response Aerial Photography



Search layers, folders and bookmarks

Select the dynamic layers to swipe

- Right ▾ Hx Ian Aerial Photography 20220930d (NOAA NGS)
- Left ▾ Gulf of Mexico Pre-Storm Aerial Imagery 2022 (NOAA NGS)

ERMA® | Gulf of Mexico

LEGEND

- Gulf of Mexico Pre-Storm Aerial Imagery 2022 (NOAA NGS)
- Hx Ian Aerial Photography 20220930d (NOAA NGS)
- MapBox Hybrid Imagery

20 m

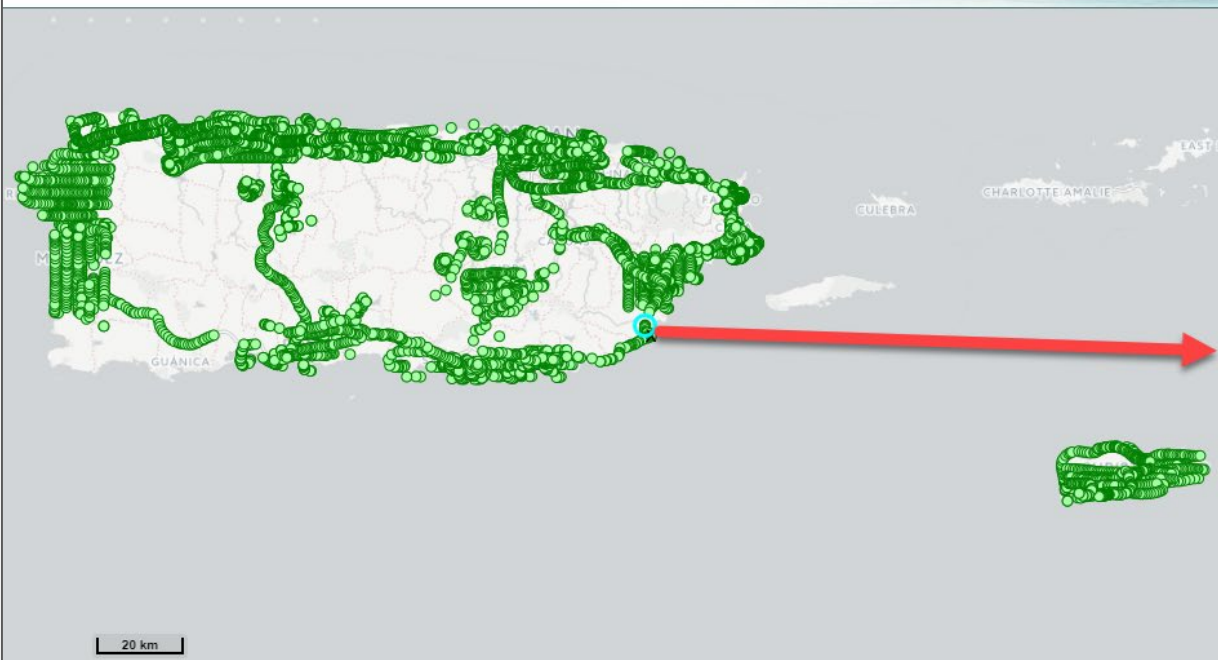
Scale: 1 : 758 Zoom: 19 Location: Projection: 3857: WGS84 Web Mercator

Other Imagery - Geospatial Insurance Consortium (GIC)



Civil Air Patrol

ERMA® Environmental Response Management Application
Caribbean



Civil Air Patrol Photos for Hurricane Maria (CAP)
Civil Air Patrol Photos for Hurricane Maria (CAP)
● Civil Air Patrol Photos for Hurricane Maria (CAP)

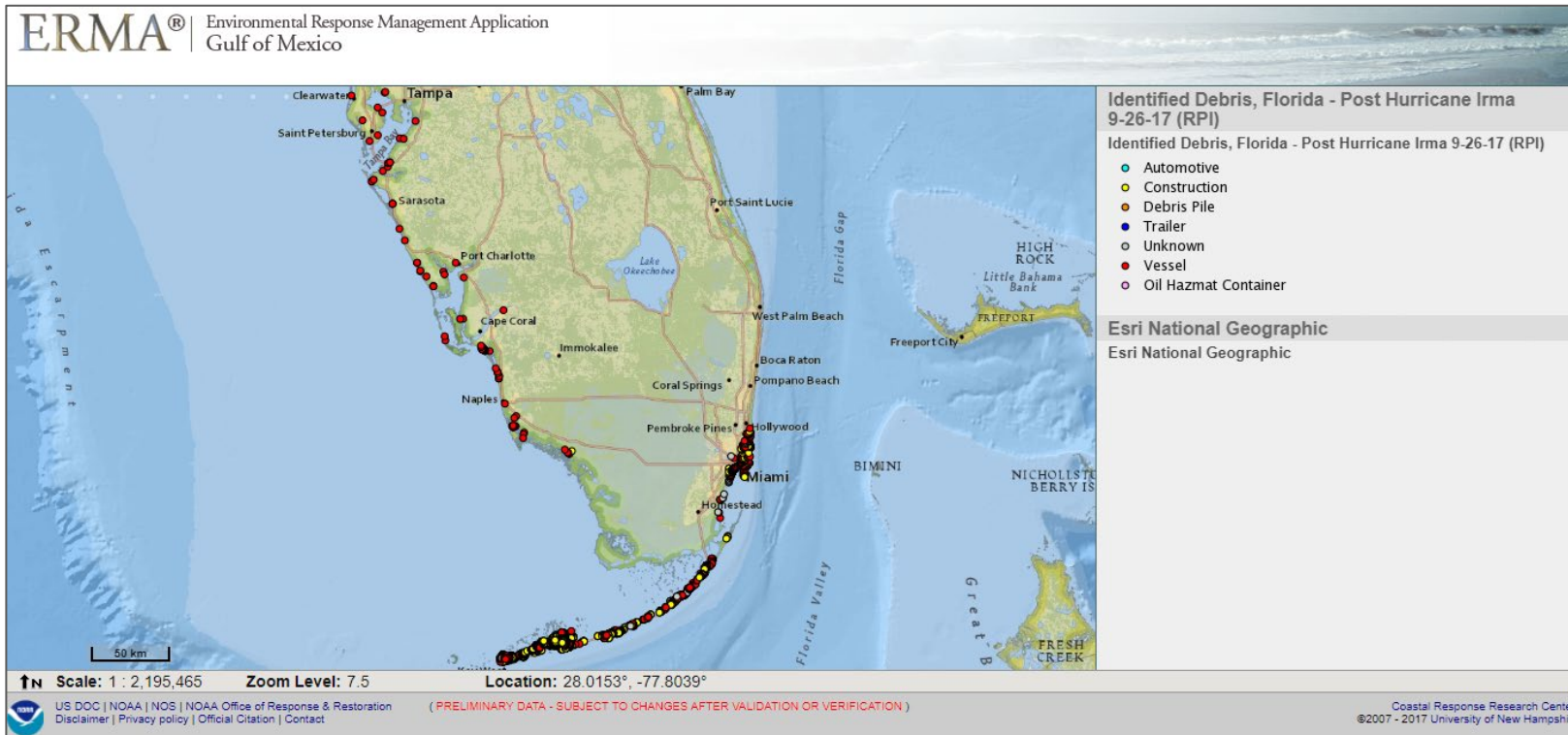
OpenStreetMap Light Gray (CARTO)
OpenStreetMap Light Gray (CARTO)

Scale: 1 : 882,296 Zoom Level: 8.9000000000000000 Location: 18.2965°, -64.5829°

US DOC | NOAA | NOS | NOAA Office of Response & Restoration
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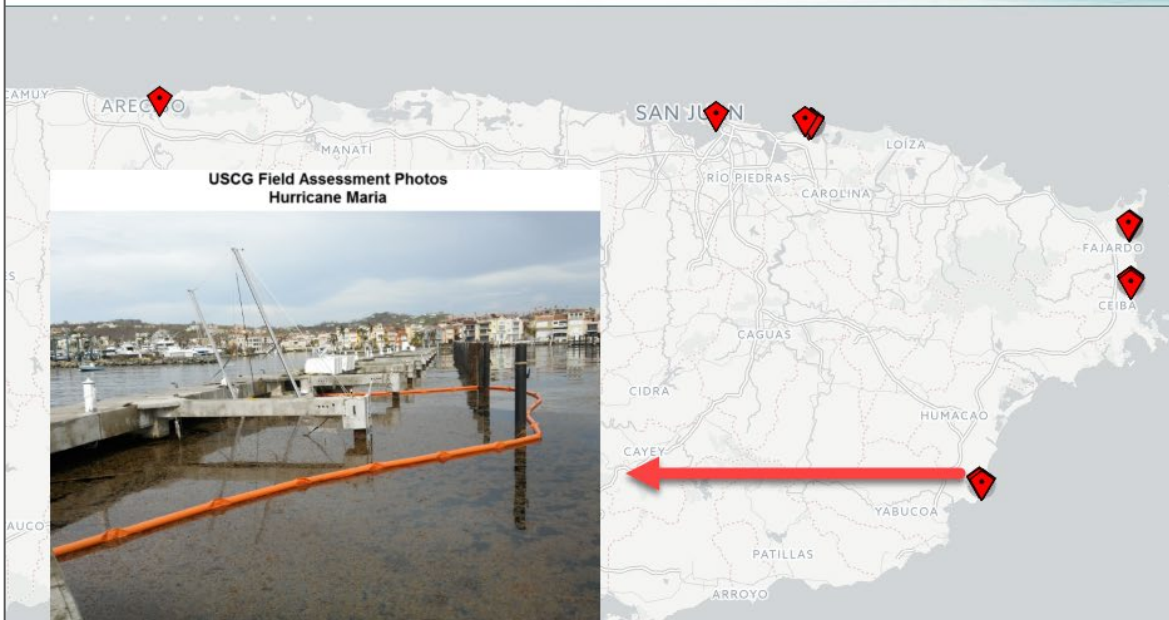
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Identified Debris from Imagery 09-28-17



Field Photos

ERMA® | Environmental Response Management Application
Caribbean



USCG Field Assessment Photos
Hurricane Maria

W 65° 47.796'
N 18° 04.641'

10/6/2017
7:57:57 AM, 18.4531°, -65.8444°

USCG Field Photos 10-03-2017

USCG Field Photos 10-03-2017

USCG Field Photos 10-01-2017

USCG Field Photos 10-01-2017

USCG Field Photos 10-05-2017

USCG Field Photos 10-05-2017

USCG Field Photos 10-04-2017

USCG Field Photos 10-04-2017

USCG Field Photos 10-06-2017

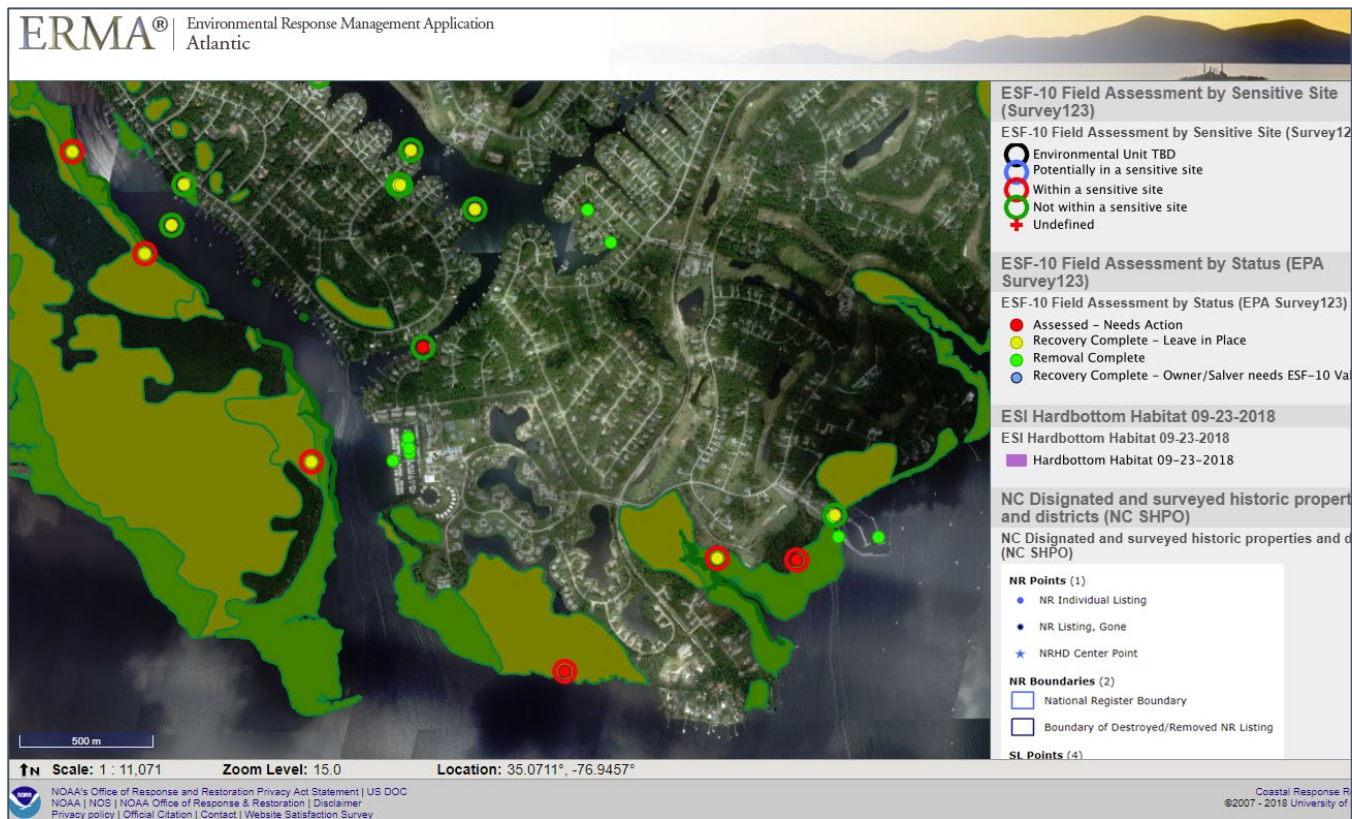
USCG Field Photos 10-06-2017

USCG Field Photos 10-07-2017

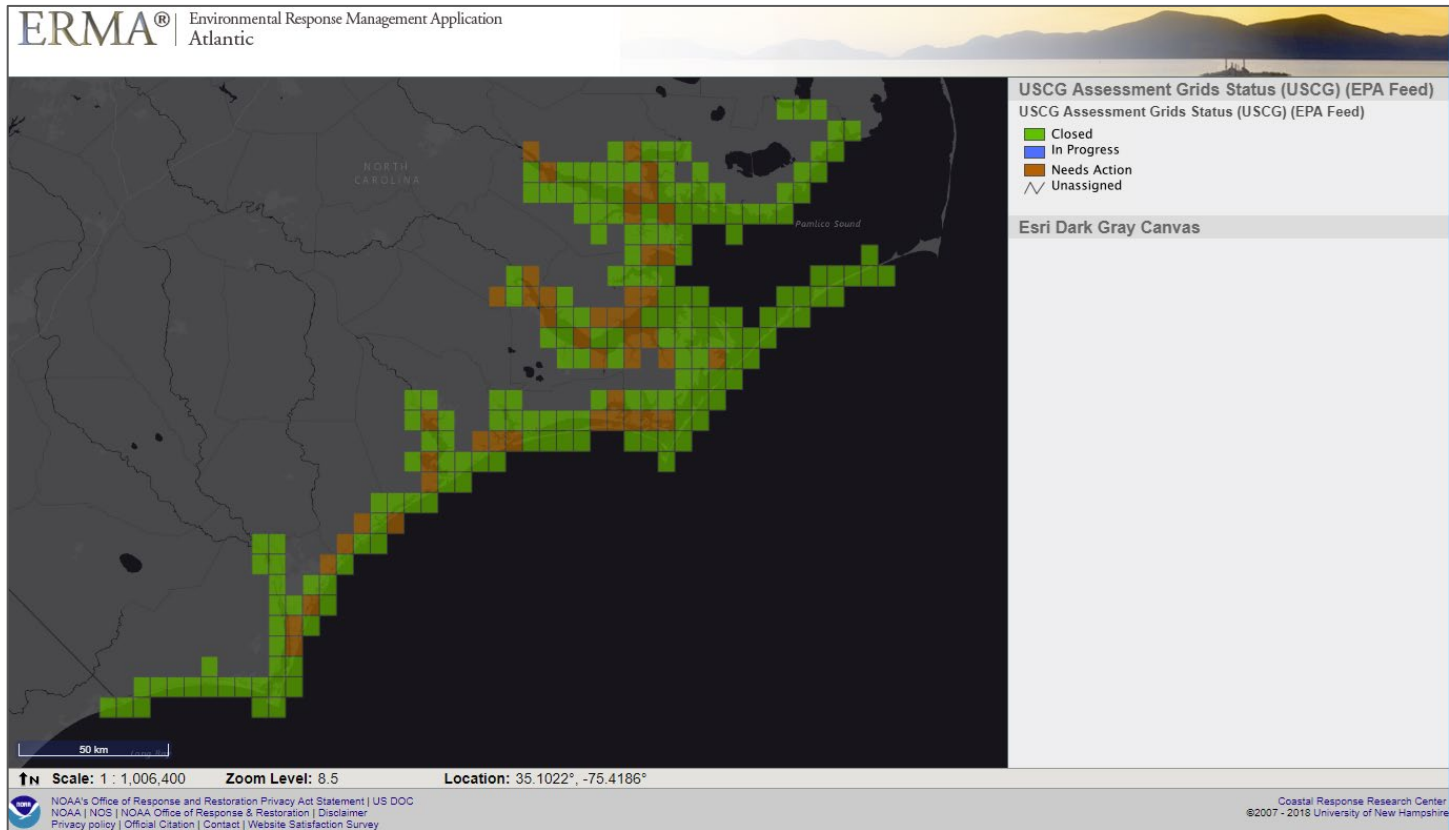
USCG Field Photos 10-07-2017



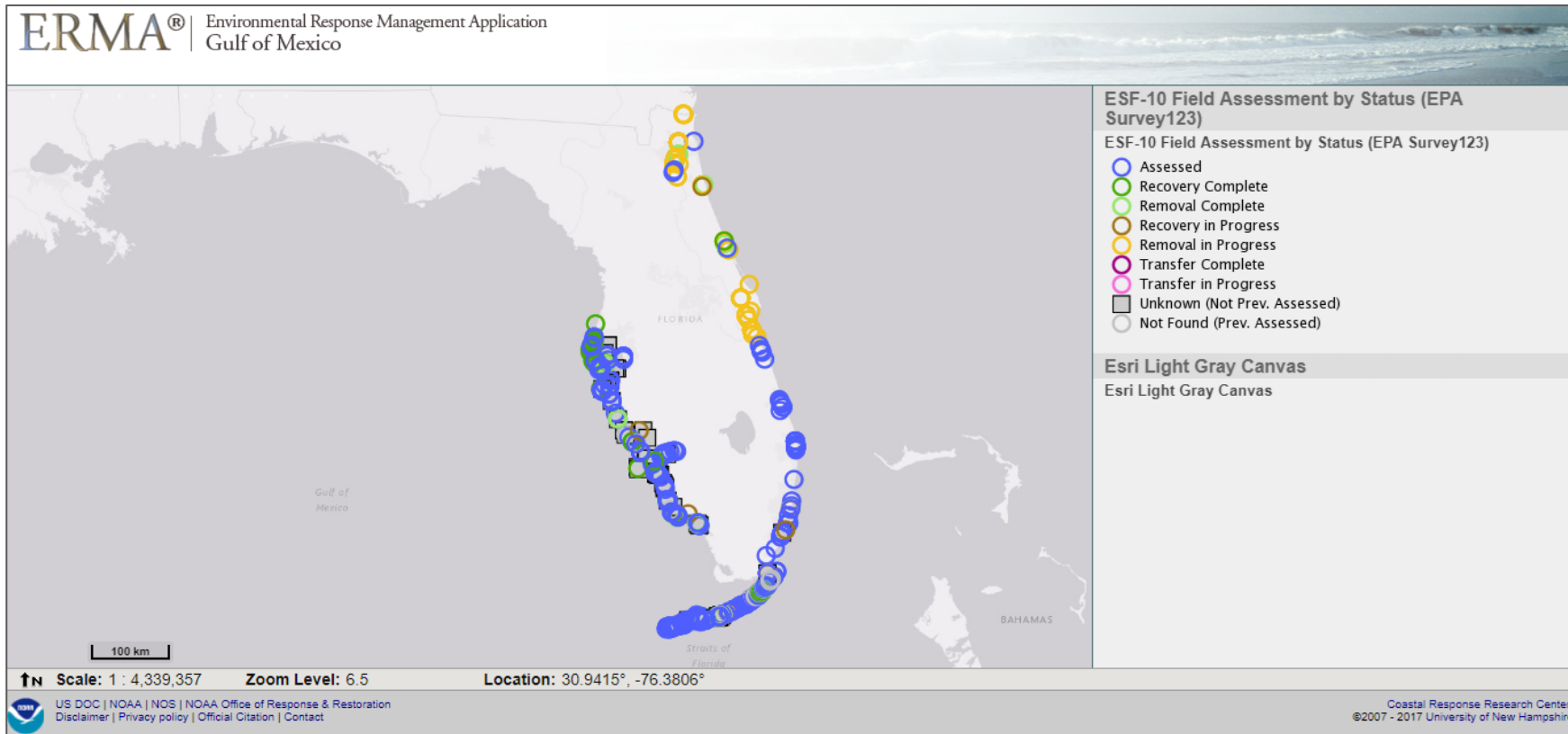
ESF-10 with Sensitive Sites



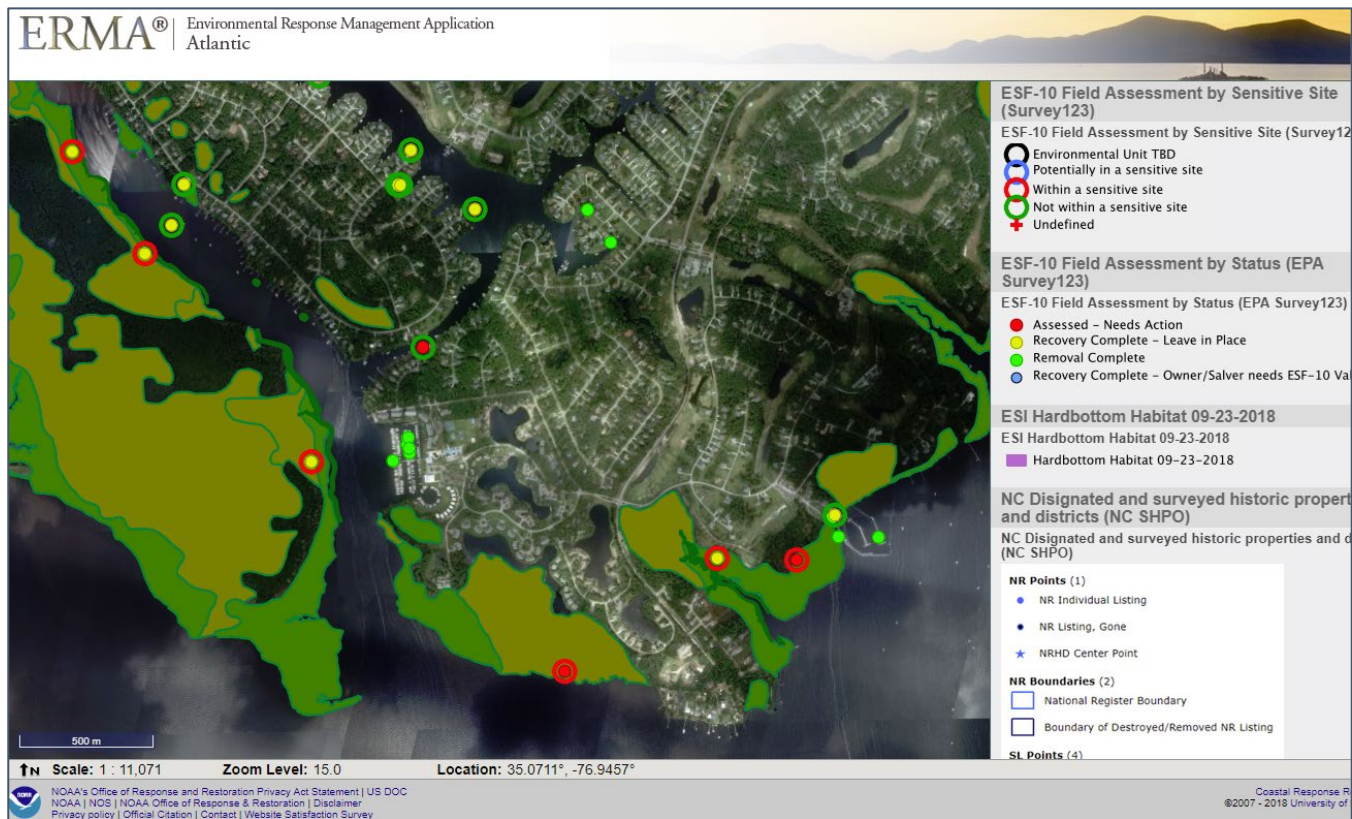
Operational Grids



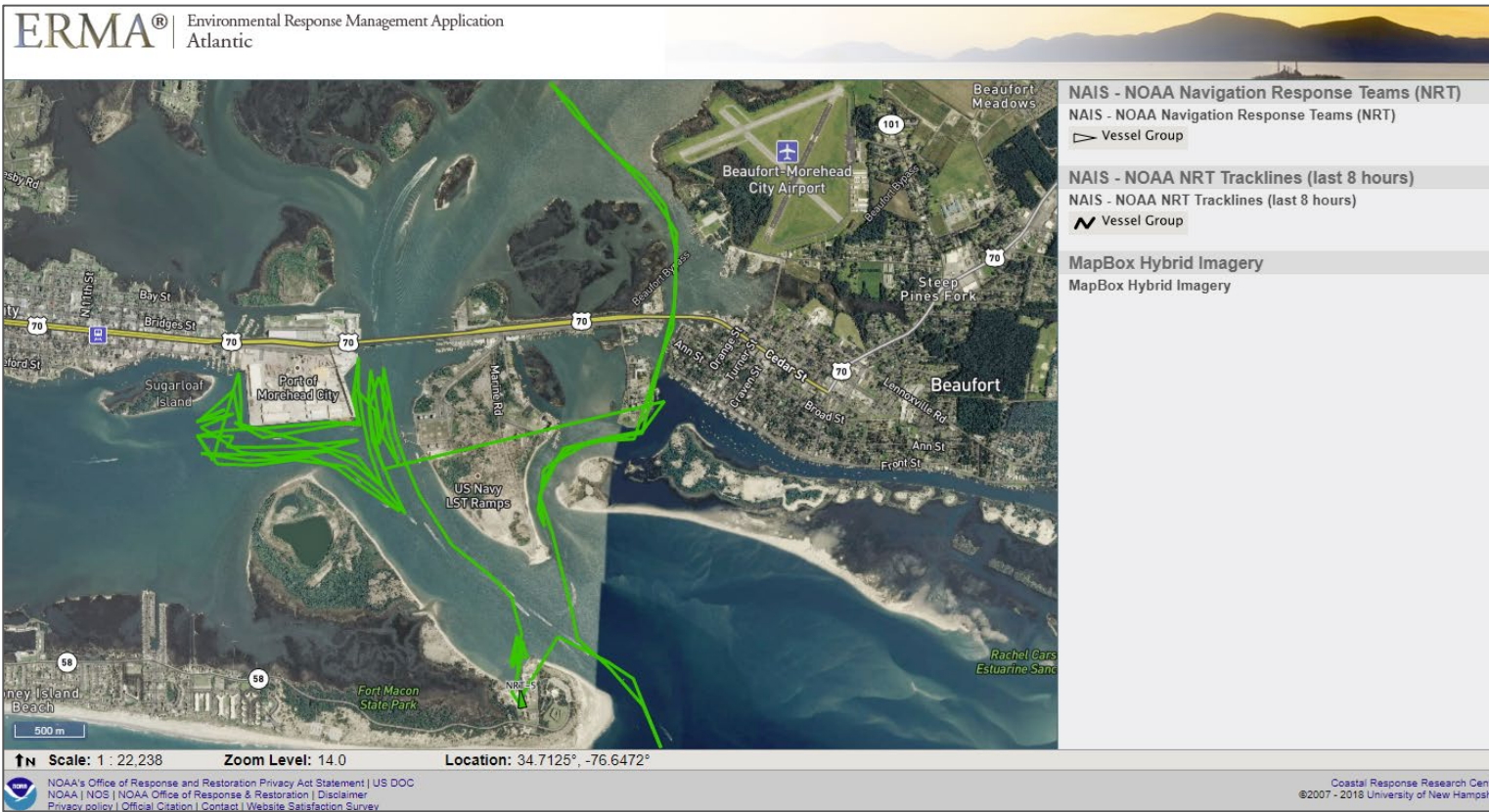
ESF 10 Targets



ESF-10 with Sensitive Sites



Navigational Response Teams (NRT)



Pollution Target Dashboard



Hurricane Ida Pollution Targets

Total Targets	Threat - USCG Ops	Commercial vs. Non-Commercial Vessels	
2,484	79	commercial	21
		commercial_fishing	224
		recreational	329
		unknown	204
Threat - Monitor	Not Assessed		
644	273		
Target Not Found	No Action - LIP	Target Removal Complete	USCG Action Complete LIP
319	832	80	257

Hurricane Ida Targets

Layers Legend Draw Query Tools Zoom Download

Hx Ida All Targets by Status

Hx Ida All Targets by Status

- ◆ 1. Not Assessed
- ◆ 2. Assessed - Threat USCG Ops
- ◆ 3. Assessed - Threat (Monitor)
- ◆ 4. Target Not Found
- ◆ 5. No Action LIP (final action)
- ◆ 6. USCG Action Complete LIP (final action)
- ◆ 7. Target Removal Complete (final action)

Hx Ida All Targets by Vessel Type

Hx Ida All Targets by Vessel Type

- Commercial
- Recreational
- Unknown

Esrri Dark Gray Canvas

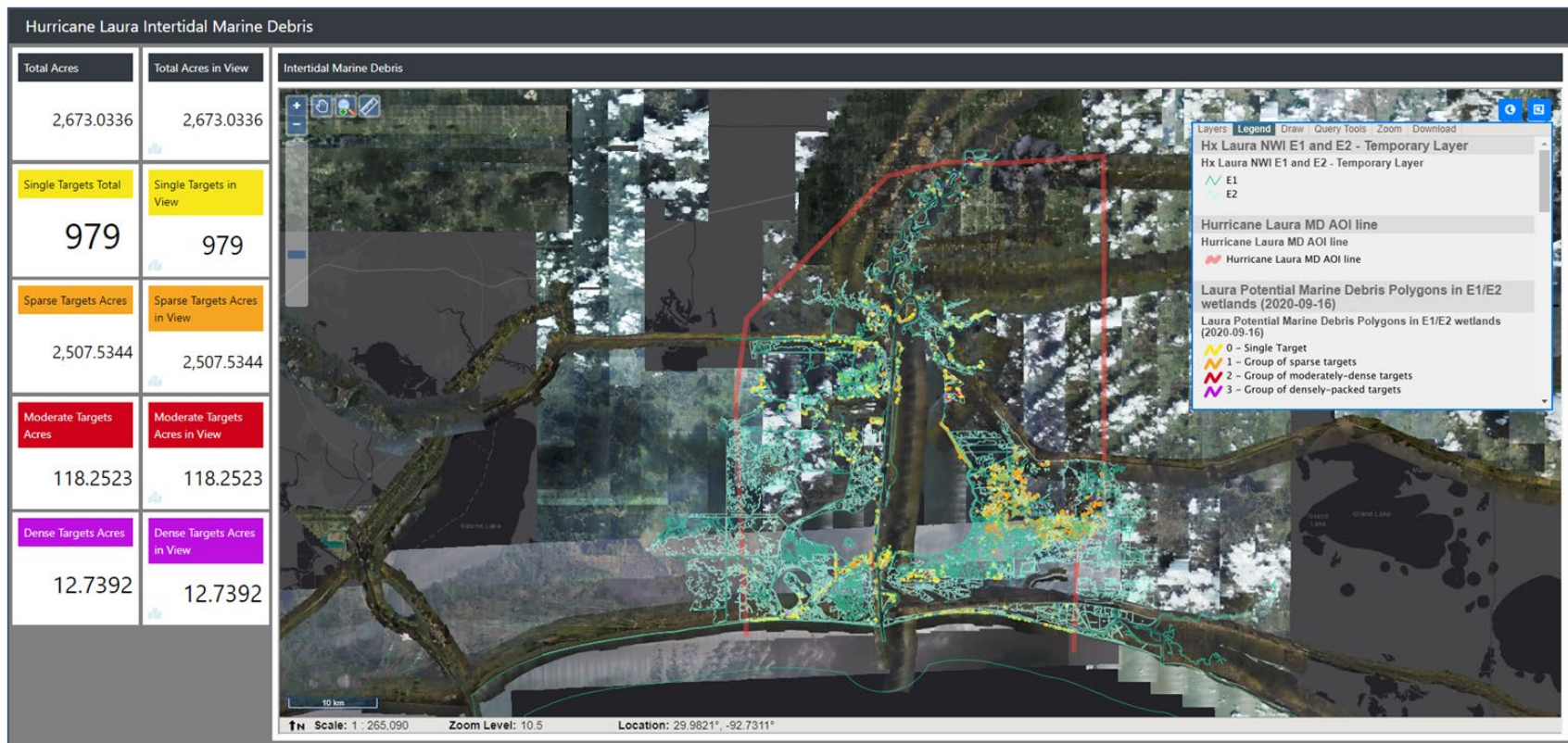
Scale: 1 : 865,129 Zoom Level: 8.8 Location: 29.4750°, -88.2960°

Debris Targets in View

2 of 2,478

- Photo Link
- Unique ID
- Navigation Hazard
- Assessment Type
- USCG Unit
- NRC Number if Applicable
- Date of Updated Assessment
- Updated Assessment Type
- Updated Assessment Team Lead
- Target Type
- ESF10

ESF-3 Tracking



Query and Save Data



The screenshot displays the ERMA (Emergency Response and Assessment) web application for the Gulf of Mexico. The main map area shows a large blue polygon drawn over the Gulf of Mexico, containing numerous small, multi-colored data points. The map includes labels for various locations such as Sarasota, Port Charlotte, Punta Gorda, Lehigh Acres, Immokalee, Bonita Springs, and Naples. A search bar at the top left contains the text "Search layers, folders and bookmarks". A toolbar with various icons is located below the search bar. The bottom of the map shows a scale bar (20 km), a NOAA logo, and technical information: "Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community", "Scale: 1 : 637,736", "Zoom: 9.3", "Location:", and "Projection: 3857; WGS84 Web Mercator".

The right sidebar is titled "ERMA | Gulf of Mexico" and contains a "QUERY TOOLS" section. It includes the following text and buttons:

Step 1: Create New or Use Existing Shapes
 Create new shapes by selecting the Create Polygon button. Draw the polygon on the map by clicking vertices with the mouse. **Double click to stop drawing.** You may also import an existing shape from the Draw panel.

All shapes drawn on the map will be used. If you want run the query with one shape, delete the remaining shapes. You do not need to select a shape for it to be run in the query.

Buttons: CREATE POLYGON, DELETE SELECTED, DELETE ALL, DISPLAY WKT

Step 2: Select a Query Tool

Dropdown menu options:
 ----- Select A Query Tool -----
 ----- Select A Query Tool -----
 Query ERMA Data
 NOAA ESI Query Tool
 U.S. Fish and Wildlife Service IPaC Query Tool

Button: RUN QUERY

Query and Save Data

Summary Layer 47843

Layer Name	Layer ID	Result Count	Comments	Information	Export
Hx Ida All Targets by Status	47843	110		Information	<input checked="" type="checkbox"/>

Some or all of the layers you have selected may be **restricted** and **not publicly accessible**.
By exporting data from ERMA, you are agreeing to take all reasonable precautions to prevent unauthorized third parties or persons from accessing, using, or redisplaying the data in a public setting or view.

Export

Filters

- Export with spatial and field filters applied.
- Export with only spatial filters applied.

File Format

Shapefile (column names truncated to 10 characters)

Shapefile (column names truncated to 10 characters)

GeoJSON

Comma Separated Values (no geometries)

MS Excel Format (no geometries)

Terms of Use

ACKNOWLEDGMENTS

NOAA:

- Michele Jacobi
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- Zach Winters-Staszak
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- Chander Ganesan, OTG
- Robert St. Lawrence, UNH
- Jerry Bower, Bowerson Services
- Mark Bonner, Cheetah Consulting, Inc.



Questions?



NOAA

The NOAA logo graphic is a stylized wave or bird-like shape, composed of two overlapping curved segments. The upper segment is a light blue color, and the lower segment is a darker blue color. The shape is positioned on the left side of the slide, partially overlapping the 'NOAA' text.

**NOAA Emergency
Notification System**



What is the NOAA ENS?

NOAA's Emergency Notification System (ENS) is a cloud-based system utilizing a software called *Everbridge Mass Notification* that quickly delivers emergency alerts to NOAA staff. ENS uses multiple communication pathways including phone, text, and email thereby increasing the ability to provide employees with timely, consistent information during a crisis.

- **Notifications** are sent by designated NOAA staff (Message Senders) and are sent to either all NOAA staff (Federal employees, contractors, and affiliates) or a subset (cluster) of personnel
- Individual NOAA facilities can be contacted with a single message
- The NOAA ENS is entirely driven by the information in the NOAA Staff Directory (NSD) and is augmented by valid NOAA ICAM (email) addresses



NOAA ENS Capabilities and Limitations

Capabilities

- Efficiently contact all or a subset of NOAA staff very quickly
- Used before, during, or after an emergency event
- Delivers consistent information during a crisis
- Contacts using SMS/text, cell phone, email, and desk phones
- Records who did and did not confirm receipt of an emergency alert
- Used in accordance with the NOAA ENS Standard Operating Procedure

Limitations

- Some NOAA desk phone systems may have timing issues that create problems
- Contacting someone without adequate or accurate contact information – not all staff keep their record up to date
- Knowing exactly where the person is when they are contacted
- Knowing exactly who is answering the phones



How Should the ENS be Used?

Should be used for...

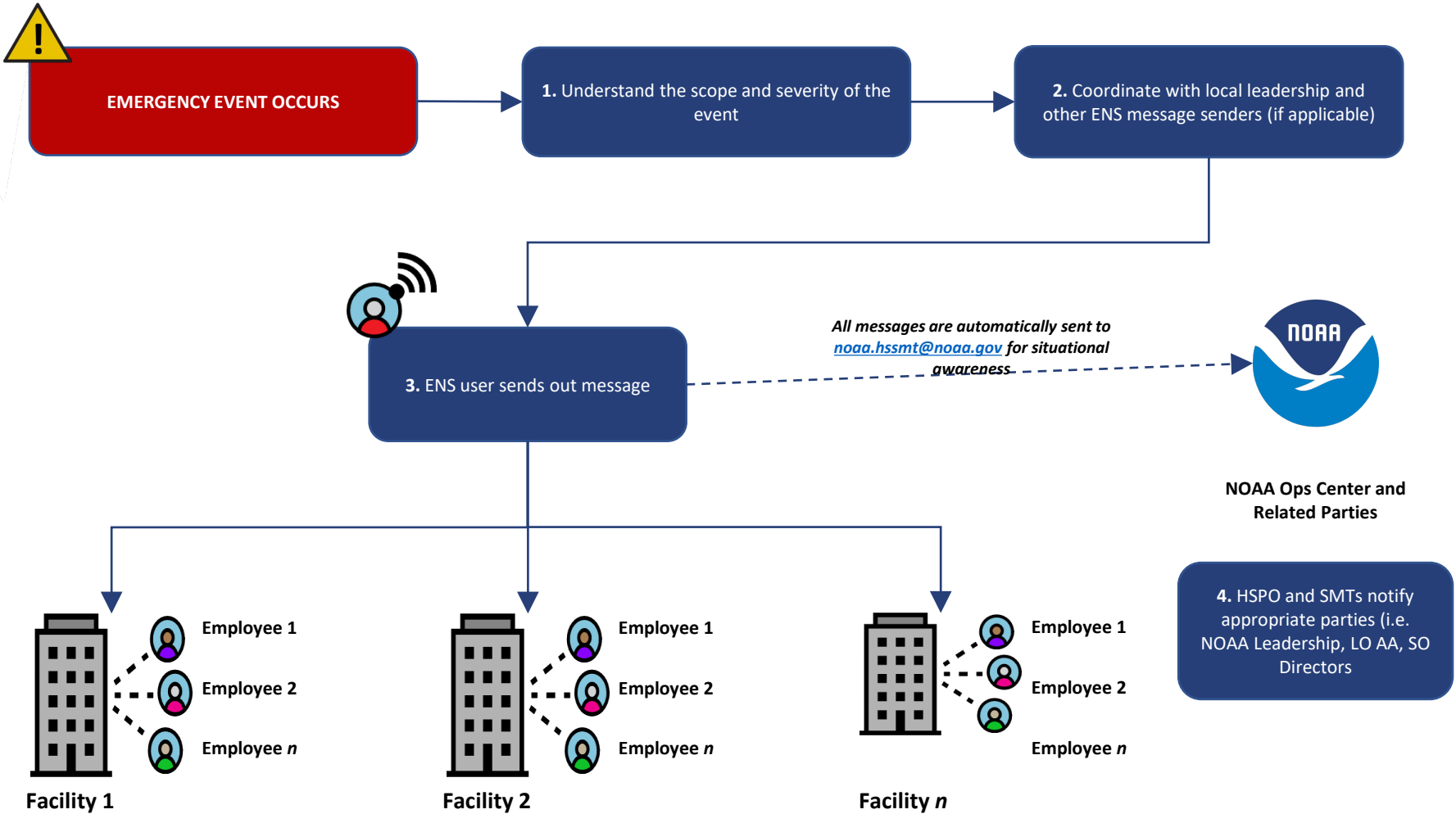
- **Rapid Emergency Notification**
 - Example: Imminent wildfire approaching
- **Post-Emergency Notification**
 - Reaching out to NOAA staff for health and safety, mission critical functions, or NOAA facilities status
- **Initiating a Reverse NOAA Phone Tree**
 - Instruct NOAA employees to contact their supervisor (or other appropriate NOAA Phone Tree contact) to account for their safety
- **ENS Drills, Phone Tree Drills, COOP Exercises**

Should not be used for...

- **General Emergency Announcements**
 - Continue to use well-established existing emergency notification mechanisms already in place (i.e. PA system, fire alarm, etc.)
- **Evacuation for a Fire in the Building**
 - When a fire alarm will offer a well-known response from employees needing to quickly evacuate a burning building
- **Building Evacuation Drills**
- **Administrative Announcements or Other Routine Matters**



Operational Workflow of an Emergency Message

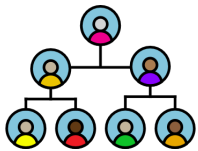


Messaging Types



1. Broadcast Message

- Simply inform staff about a situation



2. Reverse Phone Tree

- Requests staff to contact their supervisor
- Supervisors quickly know who to follow-up with

3. Polling Message

- Requests staff to respond with a certain answer





Broadcast Messages

Broadcast messages are quick messages to impacted staff informing them about an event

- Simply a “blast” notification
- An instruction can be given (e.g. “shelter in place”)
- In *Message Settings*, requesting confirmation that a recipient has received the message is defaulted to **Yes**
- Message senders can view additional information on who has confirmed receipt of the message in the Everbridge Dashboard or Reports



Example Message

Subject: Oregon Tsunami Warning – Evacuate to High Ground

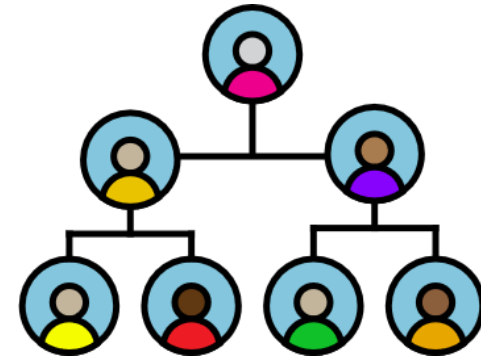
Message Body: A tsunami warning has been issued for the greater Pacific region. Evacuate to high ground.



Reverse Phone Tree Messages

Reverse phone tree messages provide additional support to the NOAA phone tree:

- All staff receive the same message immediately
- This instructs staff to begin executing the NOAA phone tree in reverse with each employees contacting their supervisor or named phone tree person
- The ENS is used only for distribution of the initial message
- Supervisors report up the chain the status of their staff:
 - # contacted, # not contacted, full names, and special circumstances



Example Message

Subject: SSMC ACTION: Contact your NOAA Supervisor

Message Body: Phone Tree has been activated for the area affected by Big Canyon fire. Confirm receipt of this message and contact your Supervisor to verify your safety.



Polling Messages

Polling Messages provide a way for ENS Users to ask a simple question of NOAA Staff.

- Questions must be brief – comprehending long/multiple choices over the phone may be difficult during an incident



- This is an alternative to the phone tree
 - Supervisors only deal with staff who don't respond or respond that they need assistance
- Responses to a *Poll* can be viewed in the Everbridge Dashboard or as a Report

Example Message

Subject: Post Tornado: requesting assistance

Message Body: NOAA is requesting information about your well-being after the tornado event. Please answer:

- 1) If you are OK
- 2) If you would like somebody from NOAA to contact you



Live Demo

- ENS Live Demo
- ERMA Live Demo

D. Disaster Related Tools from NOS and Partners



DISASTER RELATED TOOLS FROM NOS AND PARTNERS

NOAA and its partner agencies have tools that are useful during response to disaster events. Tools range from those that help with internal NOAA coordination to large mapping tools such as ERMA and nowCOAST for viewing large areas. In this document, a number of tools have been selected that are helpful during disaster response. Please note some tools are for internal NOAA use only and require a NOAA login for access.

Note:

= Requires a NOAA login

* = tools that have authoritative sources of information.

Authoritative Source: A source of data or information that is recognized by members of a Community of Interest (COI) to be valid or trusted because it is considered to be highly reliable or accurate or is from an official publication or reference.

OR&R

- [ADIOS](#) The Automated Data Inquiry for Oil Spills is NOAA's oil weathering model. It's an oil spill response tool that models how different types of oil weather undergo physical and chemical changes in the marine environment.
- [ADV InfoHub](#) The Abandoned and Derelict Vessel Information Hub is a central source of information regarding ADVs and the policies surrounding them organized at the state level. It explains how ADVs are handled by each coastal state creating a comprehensive look at the subject.
- [CAFE](#) The Chemical Aquatic Fate and Effects database is a program used to estimate the fate and effects of thousands of chemicals, oils, and dispersants. CAFE helps responders in their assessment of environmental impacts from chemical or oil spills into an aquatic environment.
- [CAMEO](#) Computer-Aided Management of Emergency Operations software suite is a set of tools designed to assist emergency planning and response—especially for events related to hazardous chemicals. There are four core programs in the suite: **ALOHA** (Areal Locations of Hazardous Atmospheres) estimates threat zones for chemical spills, including toxic gas clouds, fires, and explosions. **CAMEO Chemicals** provides critical response information and physical properties about hazardous chemicals. **CAMEOfm** manages emergency planning and response data, including facilities, chemical inventories, contact information, transportation routes, past incidents, special locations of interest, and response resources. **MARPLOT** (Mapping Application for Response, Planning, and Local Operational Tasks) is a mapping tool used for assessing geospatial information for emergency incidents and creating custom maps displaying data created in CAMEO.



OR&R DISASTER PREPAREDNESS PROGRAM

- [DIVER](#) Data Integration Visualization Exploration and Reporting (DIVER) allows users to search and download a broad array of environmental characterization and project planning data specific to geographic regions or activities.
- [ERMA](#) The Environmental Response Management Application is an online mapping tool that integrates both static and real-time data, such as Environmental Sensitivity Index (ESI) maps, ship locations, weather, and ocean currents, in a centralized, easy-to-use format for environmental responders and decision makers. ERMA houses digital Area Contingency Plans and oil infrastructure data for the region along with environmental data enabling responders to quickly access relevant information during an incident. ERMA serves as OR&R's and NOAA's Homeland Security Program Office (HSPO) Common Operational Picture during events.
- [ESI Maps*](#) Environmental Sensitivity Index maps provide a concise summary of coastal resources that are at risk if an oil spill occurs nearby. Examples of at-risk resources include biological resources (such as birds and shellfish beds), sensitive shorelines (such as marshes and tidal flats), and human-use resources (such as public beaches and parks).
- [GNOME](#) General NOAA Operational Modeling Environment is the modeling tool the Office of Response and Restoration (OR&R) Emergency Response Division uses to predict the possible trajectory a pollutant might follow in or on a body of water, such as in an oil spill.
- [Marine Debris Emergency Response Guides](#) are response guidance documents aimed at improving preparedness and facilitating a coordinated, well-managed, and immediate response to acute waterway debris incidents.
- [Marine Debris Tracker App](#) is a smart phone application that allows for easy data recording of marine debris found across the country.
- [MDMAP](#) Marine Debris Monitoring and Assessment Project is a citizen science initiative that engages NOAA partners and volunteers across the nation to survey and record the amount and types of marine debris on shorelines.
- [NRAD#](#) The NOAA Response Asset Directory (NRAD) is an internal all-hazards NOAA directory that includes searchable information on physical assets and services which could be used or in need of protection during response and recovery from disasters.
- [ResponseLink#](#) is an internal NOAA website which the Office of Response and Restoration uses to share information during oil spills or other pollution response operations with NOAA and our federal, state, and local government partners.



CO-OPS

- [Tides and Currents Map](#)* displays locations of CO-OPS water level and meteorological stations. From this map you can access real-time and historical data, station information, tidal datums, tide predictions and other products for all available stations.
- [Storm Quicklook](#) provides a synopsis of near real-time oceanographic and meteorological observations at locations affected by a tropical cyclone. It is initiated when a National Weather Service (NWS) storm center issues a tropical storm or hurricane warning for the U.S. or its island possessions and updated 4 times a day.
- [Coastal Inundation Dashboard](#) displays real-time and historical coastal flooding information at CO-OPS tide gauges. Map layers include active tropical cyclone information, NWS coastal flood forecast products and NOAA Sea Level Rise Viewer. Station markers "ping" when water levels exceed NWS minor flood impact threshold.
- [1-Minute Tsunami Water Level Data](#) map provides locations of all coastal tide gauges (CO OPS, NTWC) configured to collect 1-minute water level data to support tsunami monitoring. Recent earthquake information from USGS is displayed in red.

OCM

- [Coastal Flood Exposure Mapper](#) is an online visualization tool that supports communities that are assessing their coastal hazard risks and vulnerabilities. It creates user-defined maps showing the people, places, and natural resources exposed to coastal flooding.
- [Marine Cadastre](#) A joint BOEM and NOAA initiative providing authoritative data to meet the needs of the offshore energy and marine planning communities.
- [Digital Coast](#) is an online tool that provides coastal data, tools, training, and related information that will be useful for coastal managers.

NGS

- [Emergency Response Imagery](#)* The imagery is acquired by the NOAA Remote Sensing Division to support NOAA homeland security and emergency response requirements.
- [NCAT](#) The NGS Coordinate Conversion and Transformation Tool easily converts Latitude and Longitudes into different formats.



OCS

- [AWOIS](#) The Automated Wreck and Obstruction Information System contains information on over 10,000 submerged wrecks and obstructions in the coastal waters of the United States. Information includes latitude and longitude of each feature along with brief historic and descriptive details.
- [Electronic Navigational Charts](#) from NOAA provide the latest navigational aids for navigable waters. Electronic Navigational Charts, which are vector versions of the charts, are available in several formats, plus a map viewer.
- [nowCOAST](#) is a web mapping portal that provides spatially referenced links to thousands of real-time coastal observations and NOAA forecasts. It is a planning aid for mariners, coastal managers, HAZMAT responders, marine educators, and researchers, allowing for display of real-time information for an area of interest.
- [Navigation Response Teams \(NRT\)](#) conduct hydrographic surveys to update NOAA's suite of nautical charts. The teams are strategically located around the country and remain on call to respond to emergencies, speeding the resumption of shipping after storms, and protecting life and property from underwater dangers to navigation.
- [Raster Navigational Chart \(RNC\) Viewer](#) allows digital viewing of paper charts. These are also available for [download](#).
- [Regional Navigation Managers](#) is a clickable map that provides contact information for Regional Navigational Managers that coordinate the Office of Coast Survey's Navigation Response Teams.
- [United States Coast Pilot](#) consists of a series of nautical books that cover a variety of information important to navigators of coastal and intracoastal waters and the Great Lakes. Issued in nine volumes, they contain supplemental information that is difficult to portray on a nautical chart.

NATIONAL WEATHER SERVICE

- [2-Day Graphical Tropical Weather Outlook*](#) This online satellite viewer by the National Hurricane Center shows predictions for tropical cyclone activity for the next 48 hours for both the Eastern North Pacific and the Atlantic.



- [NHC Active Storms*](#) This online satellite viewer by the National Hurricane Center shows positioning and intensity of current active tropical cyclones for both the Eastern North Pacific and the Atlantic.
- [NWS Enhanced Data Display \(EDD\)](#) is a web mapping site with many weather and incident related layers. Many of the layers are interactive for forecasts.
- [Weather & Hazards Data Viewer](#) This online mapping tool brings weather forecast information and hazards planning data into the same location—helping managers monitor storms and fire weather and visualize potential impacts. The weather forecast information is provided by NOAA nowCOAST and the NOAA National Weather Service’s National Digital Forecast Database.

NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION

- [Severe Weather Access Tools](#) This online severe weather products site provide access to data on destructive storms and other severe weather. The interactive radar map, storm event database, and severe weather data inventory can be used to find detailed information about local, intense, often damaging storms such as thunderstorms, hail storms, and tornadoes, but can also describe more widespread events such as tropical systems, blizzards, nor'easters, and derechos.
- [Weather and Climate Toolkit](#) This online platform allows for users to visualize and export weather and climate data, including Radar, Satellite and Model data. The toolkit also provides access to weather/climate web services provided from NCEI and other organizations.

FEDERAL PARTNER TOOLS

- [Coastal Change Hazards Portal](#) This U.S. Geological Survey (USGS) online portal allows users to have interactive access to coastal change science and data for our Nation’s coasts. Explore data and products on extreme storms, shoreline change, and sea-level rise.
- [Flood Event Viewer](#) This interactive map provides viewable and downloadable flood event data from the U.S. Geological Survey's Short-Term Network (STN) database.
- [HAZUS-MH](#) FEMA’s Hazards U.S. Multi-Hazards is a nationally applicable, standardized method that estimates potential losses from earthquakes, hurricane winds, and floods. State-of-the-art GIS software maps and displays hazard data and estimates of damage and economic losses to buildings and infrastructure. **Requires ArcGIS 10.x*



- [Hazards Data Distribution System \(HDDS\) Explorer](#) This U.S. Geological Survey's tool is an event-based interface that provides a single point-of-entry for access to remotely sensed imagery and other geospatial datasets as they become available during a response.
- [Hurricane eMatrix](#) This OSHA tool uses hazard exposure and risk assessment matrices for individuals participating in hurricane response and recovery work based on the response activity using activity sheets.

NGO PARTNER TOOLS

- [Coastal Resilience Mapping Portal](#) The Nature Conservancy's online mapping tool helps users visualize future flood risks from sea level rise and storm surge.
- [Surging Seas](#) Climate Central's web-based tool allows users to visualize areas potentially affected by sea level rise and storm surge, down to the neighborhood scale.