Agency Priority Goal Action Plan

Mitigate Flood Impacts by Demonstrating Improved Decision Support Services to Emergency Managers

Goal Leader:
Dr. Neil Jacobs, Assistant Secretary of Commerce for Environmental Observation and Prediction, performing the duties of Under Secretary of Commerce for Oceans and Atmosphere

Deputy Goal Leader:
Dr. Louis Uccellini, NOAA Assistant Administrator for Weather Services & Director of the National Weather Service

Performance.gov

FY 2020, Quarter 1 & 2

Overview

Goal Statement

By September 30, 2021, NOAA National Weather Service will improve its flood related decision support services by expanding the demonstration of a new flood inundation mapping capability to at least an additional 10%* of the U.S. continental population residing in flood-vulnerable freshwater basins.

Challenge

- Flood and other water emergencies increasingly are associated with property damage and threats to safety. For example, in 2016, just four flooding events led to $16.6 billion in damages and 49 deaths. In 2017, Hurricane Harvey alone resulted in more than 17,000 water rescues and caused approximately 65 drowning deaths from freshwater flooding.**
- Emergency Managers lack sufficiently detailed information during flood emergencies to effectively allocate resources to save lives and property.

Opportunity

- NOAA can use advances from the state-of-the-art National Water Model to demonstrate improved decision-support products to Emergency Managers.
- Emergency Managers will use this information to more effectively mitigate flood impacts by prepositioning resources, ensuring critical infrastructure (e.g., hospitals, evacuation routes, shelters, etc.) are viable, and ordering evacuations.

* Additional coverage includes population served with National Water Model hydrography downstream from a subset of NWS official forecast locations throughout the continental U.S., plus populations in the NWS Northeast River Forecast Center National Water Model locations. This builds upon a FY18-19 DOC APG focused on the demonstration of this new mapping capability in Texas for 8% of the U.S. population for a total of at least 18%. Future out-year goal is to incrementally expand flood inundation mapping to near 100% of the continental U.S. population residing in flood-vulnerable freshwater basins.

** https://www.ncdc.noaa.gov/billions/events/US/1980-2017, https://weather.gov/media/publications/assessments/harvey6-18.pdf

Leadership & Implementation Team

Oversight and Project Management
NOAA, National Weather Service

Office of Water Prediction

Senior Lead:
- Dr. Thomas Graziano, Director, Office of Water Prediction
- Edward Clark, Deputy Director, Office of Water Prediction

Team Leads:
- Darone Jones, Director, Water Prediction Operations Division
- Mark Glaudemans, Director; Fernando Salas, Technical Lead; Geo-Intelligence Division
- Jocelyn Burston, Director, Service Innovation and Partnership Division
- Donna Page, Chief of Programs

Analyze, Forecast, & Support Office

Senior Lead:
- Andrew Stern, Director, Analyze, Forecast & Support Office

Team Leads:
- Elliott Jacks, Director, Forecast Services Division
- Mary Mullusky, Chief Water Resources Services Branch

Eastern Region

Senior Lead:
- Dr. Jason P. Tuell, Director, NWS Eastern Region

Team Leads:
- George McKillop, Chief, Hydrologic Services Division
- David Vallee, Northeast River Forecast Center Hydrologist-in-Charge

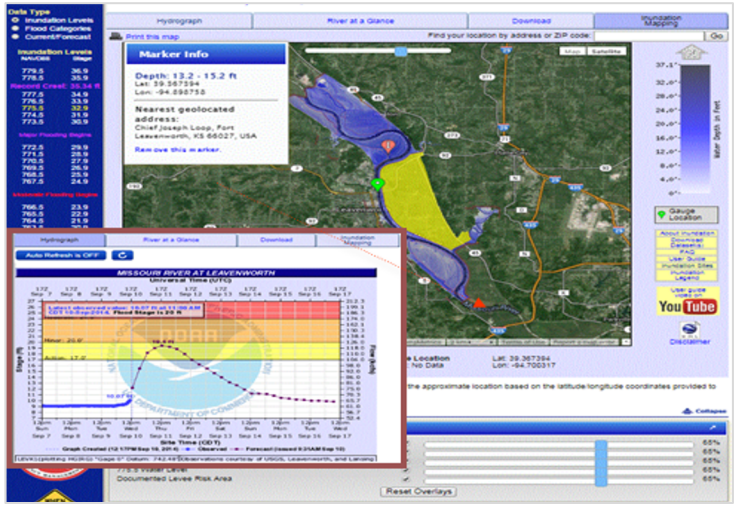
Agency Partners:
- Local, county, state Emergency Managers and Water Managers

Long-Range Vision for Flood Inundation Mapping

Flood Inundation Maps: Maps depicting the spatial extent and depth of flood waters, fully resourced for operational production and dissemination, will enable Emergency Managers to better mitigate impacts of flooding and build more resilient communities.

Current Capability:

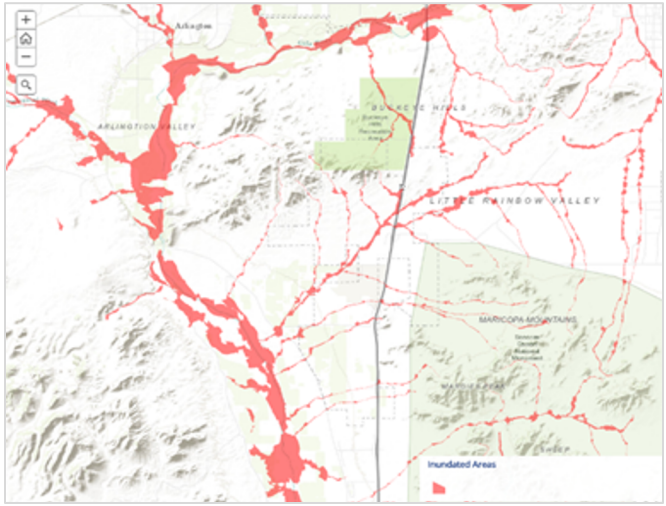
Static Inundation Map libraries at ~180 river locations across the United States.



- Provides the spatial extent and depth of flood waters
- Displays inundation maps for levels from minor flooding through flood of record
- Limited spatial coverage, resource intensive, only at small number of USGS stream gauge locations

Next Steps - NWM enabled capability:

The high spatial and temporal resolution capabilities of the National Water Model (NWM) coupled with high resolution hydrography datasets will allow us to provide real-time flood inundation mapping capabilities at neighborhood-level in a more consistent and timely way.



- Provides spatial extent of flood waters
- Technique can be driven by official streamflow forecasts (to be demonstrated in this APG for all CONUS River Forecast Centers)
- Technique can be driven by NWM guidance (to be demonstrated in this APG for the Northeast River Forecast Center domain)
- Incrementally expand flood inundation mapping demonstration to 2.7 million stream reaches nationwide
- Seek resources to operationally implement Flood Inundation Maps

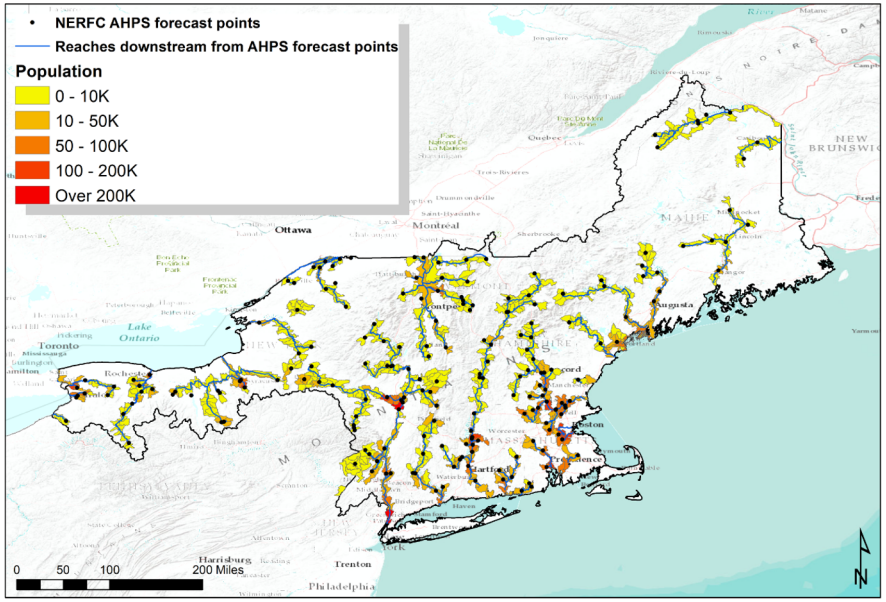
Future Planned Enhancements (resource dependent): Build on and enhance the NWM enabled capability to include:

- Flood Inundation Maps informed by the (to be developed) NWM coupled with estuarine and coastal processes, and groundwater models

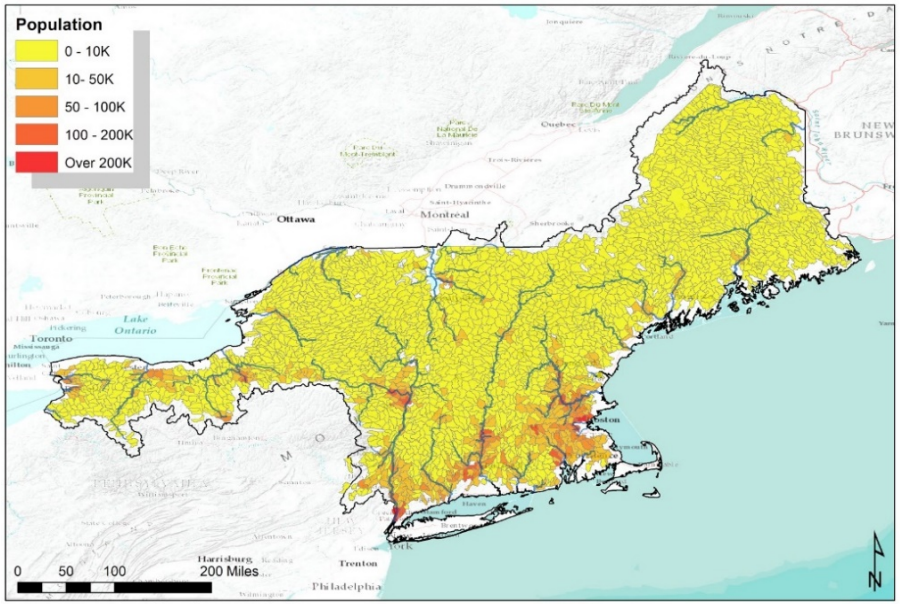
Goal Structure & Strategies – Northeast Region

Population served by inundation information for areas within NWS Northeast River Forecast Center (NERFC) service area.*

- **Baseline**: Currently ~0% of NERFC area served by an Advanced Hydrologic Prediction Service (AHPS) static inundation map library near a single river location.
- **FY20 Q3**: Initiate demonstration for 4% (12.5 million) of US population served with NWM hydrography near all NERFC NWS official non-tidal forecast locations.
- **FY20 Q3**: Initiate demonstration for additional 1% (2.8 million) of US population served with NWM guidance along full NERFC river/stream network.
- **FY21 Q4**: Complete demonstration and incorporate emergency manager feedback.



FY20 Q3: NERFC Official RFC Locations



FY20 Q3: NERFC NWM Locations

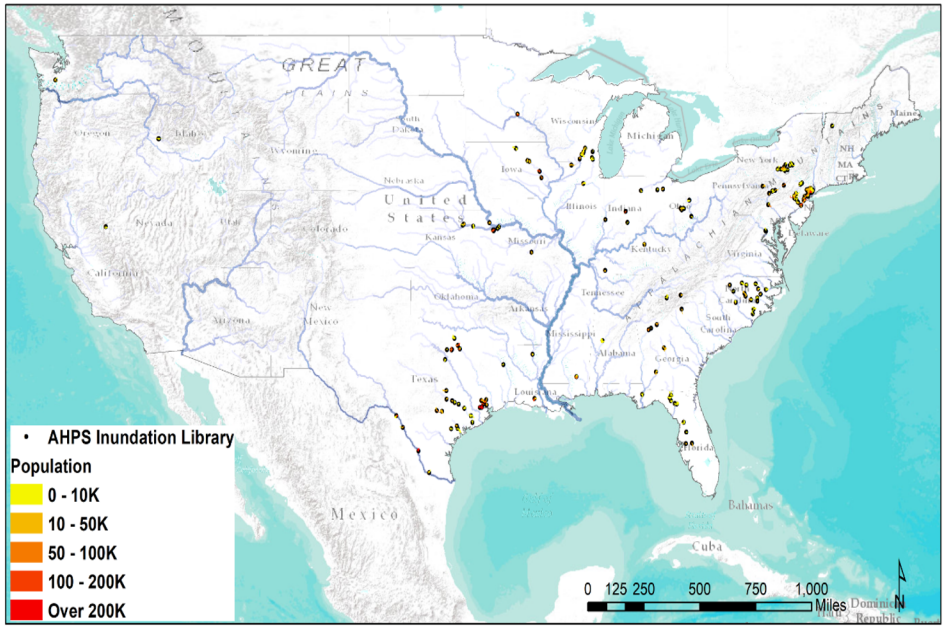
The latest information on the water model: water.noaa.gov Experimental interactive water model maps: water.noaa.gov/map

*Population totals based on 2017 population (327 million) in adjacent hydrologic areas, defined by Hydrologic Unit Code (HUC) 12 delineations.

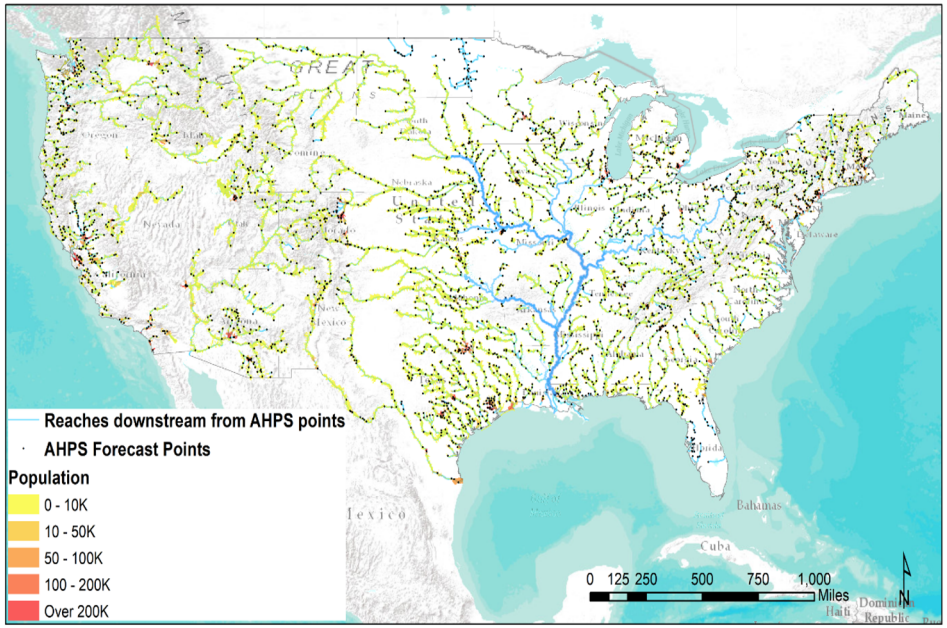
Goal Structure & Strategies – CONUS

Population served by inundation information, considering areas within Continental United States (CONUS).*

- <u>Baseline</u>: 2% of CONUS population served by current Advanced Hydrologic Prediction Service (AHPS) static inundation maps near select river locations.
- <u>FY21 Q1</u>: Initiate demonstration for 32% (100 million) of population served with NWM hydrography near NWS official non-tidal forecast locations in CONUS.**
- <u>FY21 Q4</u>: Complete demonstration and incorporate emergency manager feedback.



Baseline: CONUS NWS Inundation Libraries



FY21 Q1: CONUS Official RFC locations (excluding USACE inundation libraries)

*Population totals based on 2017 population (327 million) in adjacent hydrologic areas, defined by Hydrologic Unit Code (HUC) 12 delineations.

**Excludes US Army Corps of Engineers inundation mapping and North Dakota and Florida areas. Includes 12.9 million already demonstrated for Texas and 12.5 million being demonstrated for Northeast.

Summary of Progress – FY 20 Q1 & Q2

Milestones Completed:

Q3FY20 (Completed Q2FY20): Initiate Flood Inundation Mapping (FIM) techniques using the National Water Model (NWM) guidance and the River Forecast Center (RFC) official forecast for Northeast River Forecast Center (NERFC) domain.

Why these milestones are important:

This important milestone demonstrates FIMs using streamflow forecasts from both the NWM and the NERFC official forecast (using RFC Replace & Route technique). Maps will be evaluated to gauge the ability to support Emergency Managers' decision making, such as using these maps to reduce flood impacts by prepositioning resources, ensuring critical infrastructure (e.g., hospitals, evacuation routes) are viable, and ordering evacuations.

APG is **On Track** for completion Q4 FY21

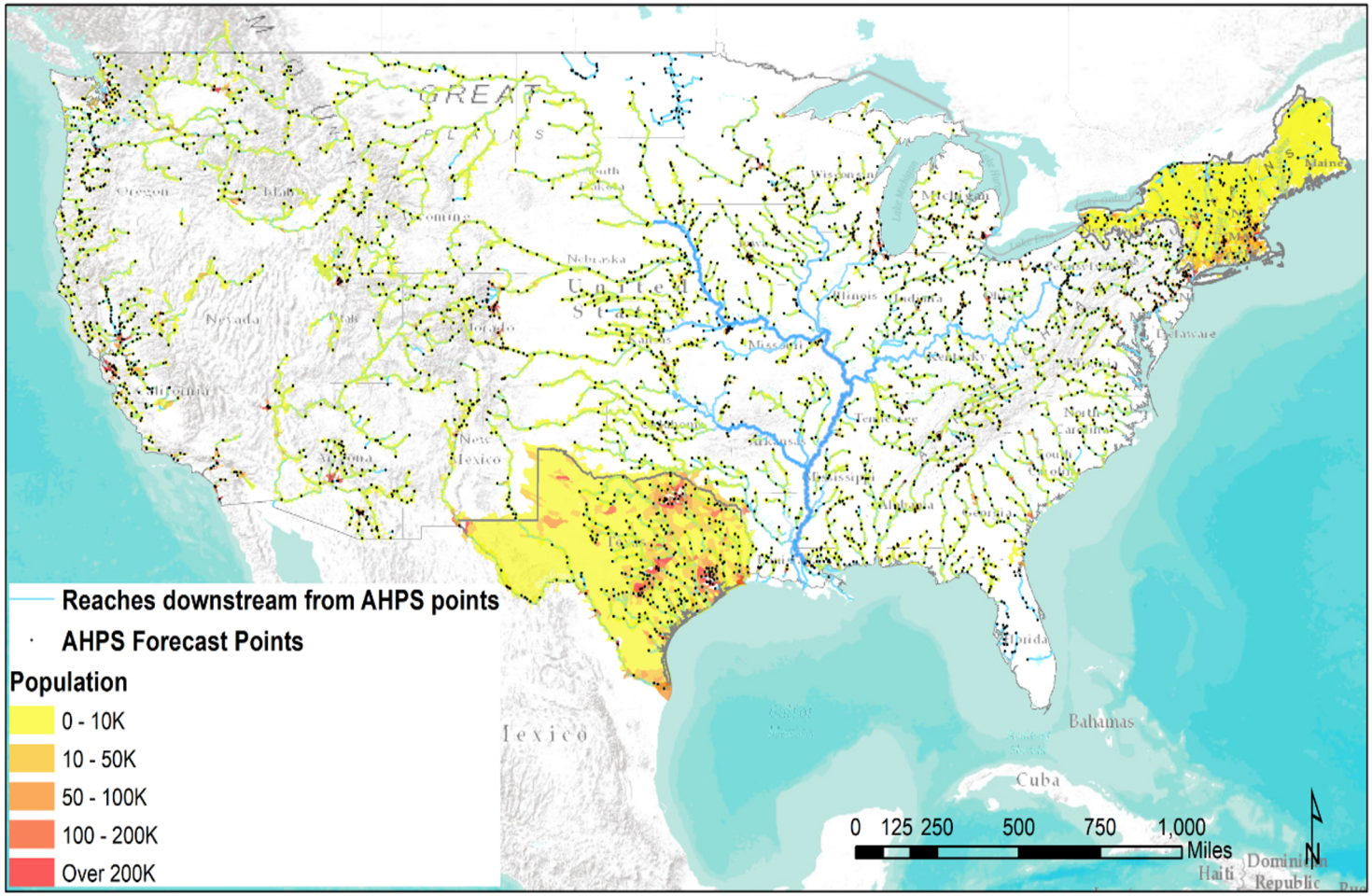
Key Milestones

Milestone Summary				
Key Milestone	Milestone Due Date	Milestone Status	Change From Last Quarter	Comments
Initiate Flood Inundation Mapping (FIM) techniques using the National Water Model (NWM) guidance and the River Forecast Center (RFC) official forecast for Northeast River Forecast Center (NERFC) domain	FY20 Q3	Complete (FY20 Q2)	Completed	
FIM demonstration downstream from a subset of NWS official AHPS river forecast locations throughout the CONUS initiated	FY21 Q1			
Internal validation of FIM (using official forecast) with OWP and CONUS RFCs	FY21 Q2			
Internal validation of FIM (using NWM guidance) with OWP and NERFC	FY21 Q2			
Execute tabletop exercises with NERFC demonstration area Emergency Managers	FY21 Q3			
Incorporate feedback from tabletop exercises Complete FY20/21 FIM demonstration	FY21 Q4			

Key Indicators – APG Summary

U.S. Population served by new Flood Inundation Mapping Demonstration

By completion, inundation information will be demonstrated for 115 million of the CONUS population. Results are cumulative from the current and previous APG demonstrations.



Additional Information

Contributing Programs

Organizations:

- OMB, DOC, NOAA – Oversight
- NWS -- Implementing Organization for APG

Program Activities:

- Office of Water Prediction -- Demonstrate Flood Inundation Map

Other Federal Activities:

- NOAA will coordinate the demonstration of FIM services with USGS, USACE, and FEMA leveraging the National Water Center Operations Center