



OWP | OFFICE OF
WATER
PREDICTION

WaterPrediction Node Update

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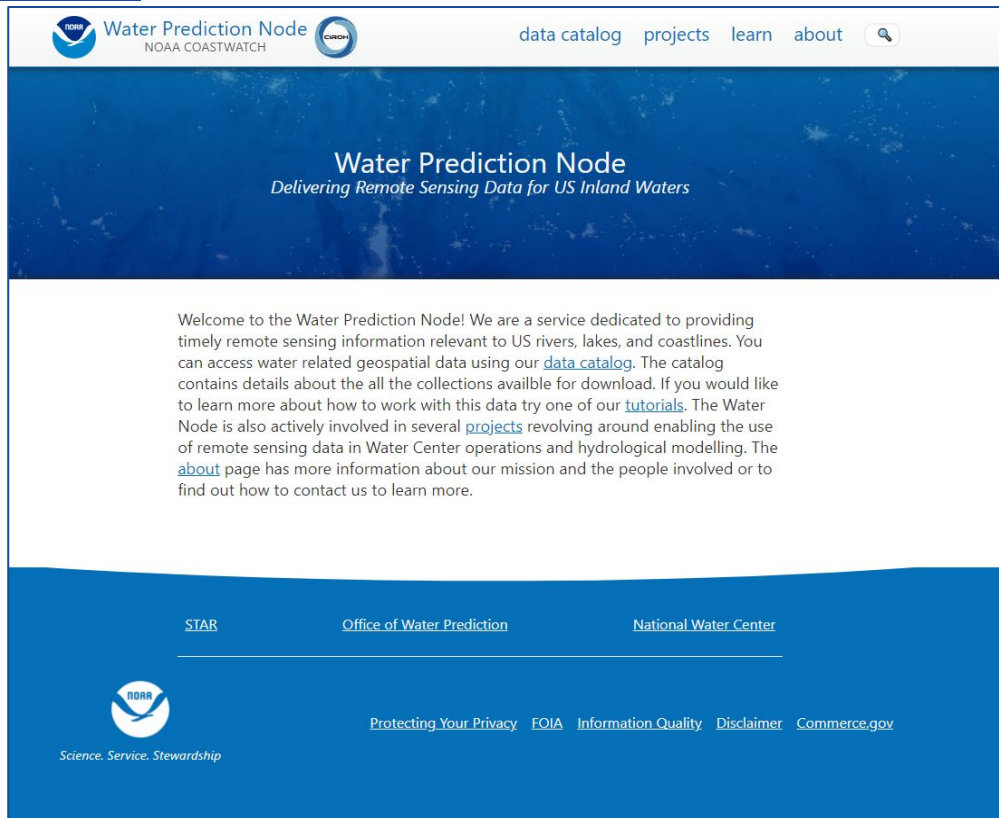
Overview

- National Water Model Development as a linchpin
- FIM Services - operational to 10% of the nation
- Application of Satellite derived FIM analyses to our real-time and post event evaluations
- Recommendations & Opportunities resulting from our face-to-face meeting in the spring of 2023



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WaterPrediction Node Website



The screenshot shows the homepage of the Water Prediction Node website. At the top, there is a navigation bar with the NOAA logo, the text "Water Prediction Node NOAA COASTWATCH", the CIRCUI logo, and menu items for "data catalog", "projects", "learn", "about", and a search icon. Below the navigation bar is a dark blue header section with the text "Water Prediction Node" and the tagline "Delivering Remote Sensing Data for US Inland Waters". The main content area is white and contains a welcome message. At the bottom, there is a dark blue footer section with logos for STAR, Office of Water Prediction, and National Water Center, along with a NOAA logo and the text "Science. Service. Stewardship".

Water Prediction Node
Delivering Remote Sensing Data for US Inland Waters

Welcome to the Water Prediction Node! We are a service dedicated to providing timely remote sensing information relevant to US rivers, lakes, and coastlines. You can access water related geospatial data using our [data catalog](#). The catalog contains details about the all the collections available for download. If you would like to learn more about how to work with this data try one of our [tutorials](#). The Water Node is also actively involved in several [projects](#) revolving around enabling the use of remote sensing data in Water Center operations and hydrological modelling. The [about](#) page has more information about our mission and the people involved or to find out how to contact us to learn more.

STAR Office of Water Prediction National Water Center

NOAA
Science. Service. Stewardship

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Vision

A “water-ready” nation, capable of addressing the nation’s challenges relating to water extremes, water scarcity, and water quality through improved water prediction and related decision support services.

Mission

Collaboratively research, develop and deliver timely and consistent, state-of-the-science national hydrologic analyses, forecast information, data, guidance, and decision-support services to inform essential emergency management and water resources decisions across all time scales.

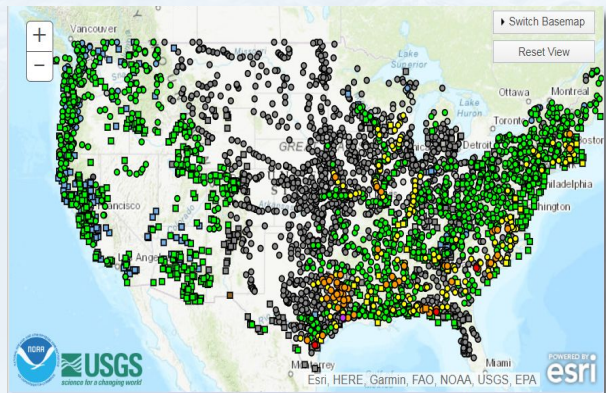


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National Water Model Overview

The National Water Model (NWM) revolutionizes how hydrologic guidance is developed and delivered, providing both complementary and first-time spatial coverage and product types.

RFC AHPS

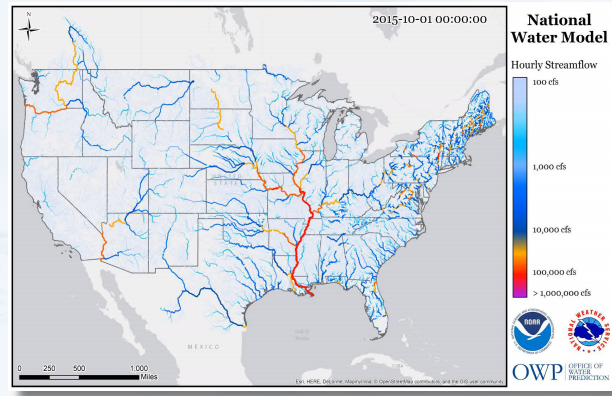


River Forecast Centers:

Authoritative forecasts at ~3,600
RFC Points
(110,000 River miles)



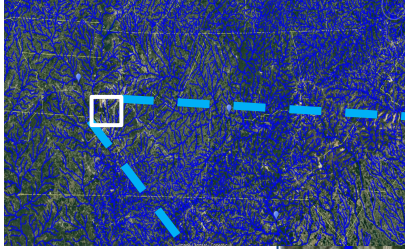
NWM



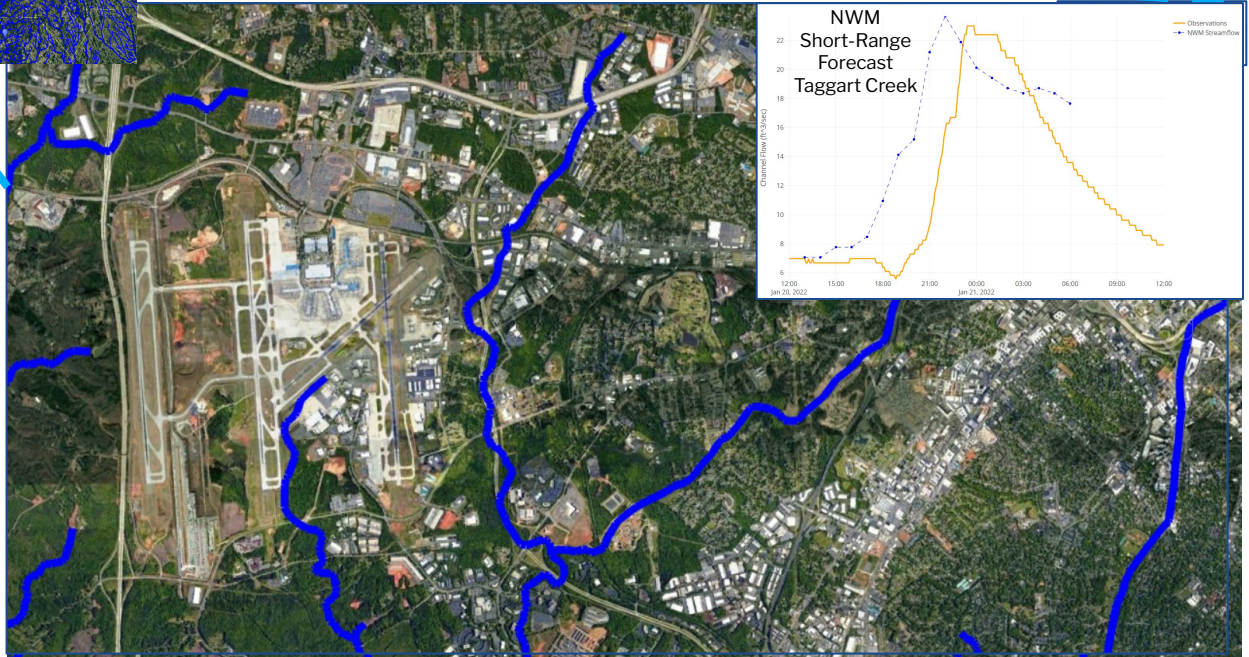
National Water Model:

Guidance at 2.7 million NHDPlus river
segments, filling in coverage
(3.4 million River miles)

NWM: Filling the Forecast Coverage Gap



- NWM provides the spatial resolution needed to resolve features down to the street-scale, in areas where traditional forecast guidance is not available



National Water Model Overview

- The NWM revolutionizes how hydrologic guidance is developed and delivered, providing both complementary and first-time coverage and outputs
- Full spectrum hydrologic model, from droughts to floods
- Most recent NWM upgrades; v2.1 in April 2021, v3.0 August 2023
- Planned: v3.1 planned for Summer 2025, NextGen v4.0 ~ 2026

**v.1.0/
1.1/1.2**

**v.2.0/
2.1**

v.3.0

v.4.0

**Foundation:
2016-2018**

**Upgrades:
2019-2021**

**NWM 3.0
August 2023**

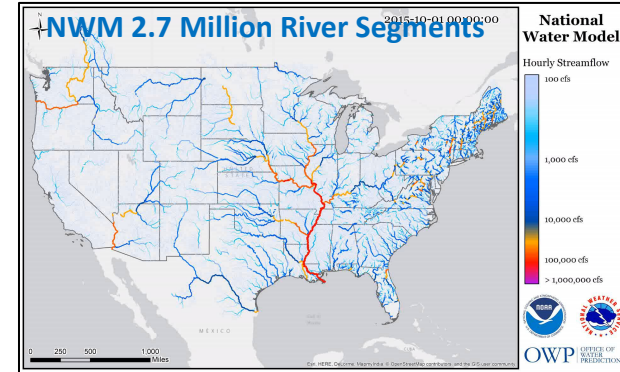
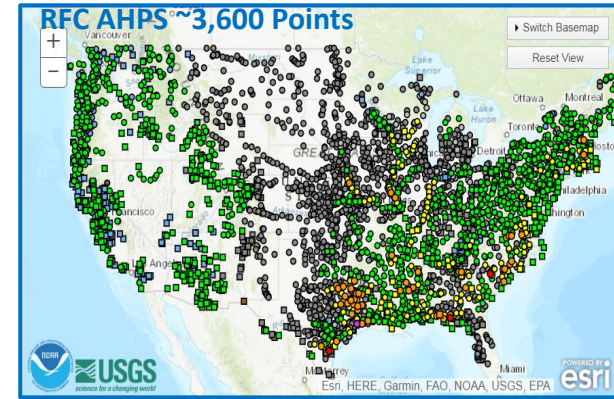
**Future Upgrade:
2026+**

- Baseline NOAA water forecast model running on operational supercomputer

- Expansion to Hawaii and Puerto Rico, forcing and reservoir improvements

- Total water level, expansion to Alaska, NBM forcing, physics and calibration

- Use of NextGen - heterogeneous modeling, coastal coupling / river routing upgrades





NWS Flood Inundation Mapping Services Implementation

Map Legend



Population served by **October 2023.**



Population served by **October 2024.**

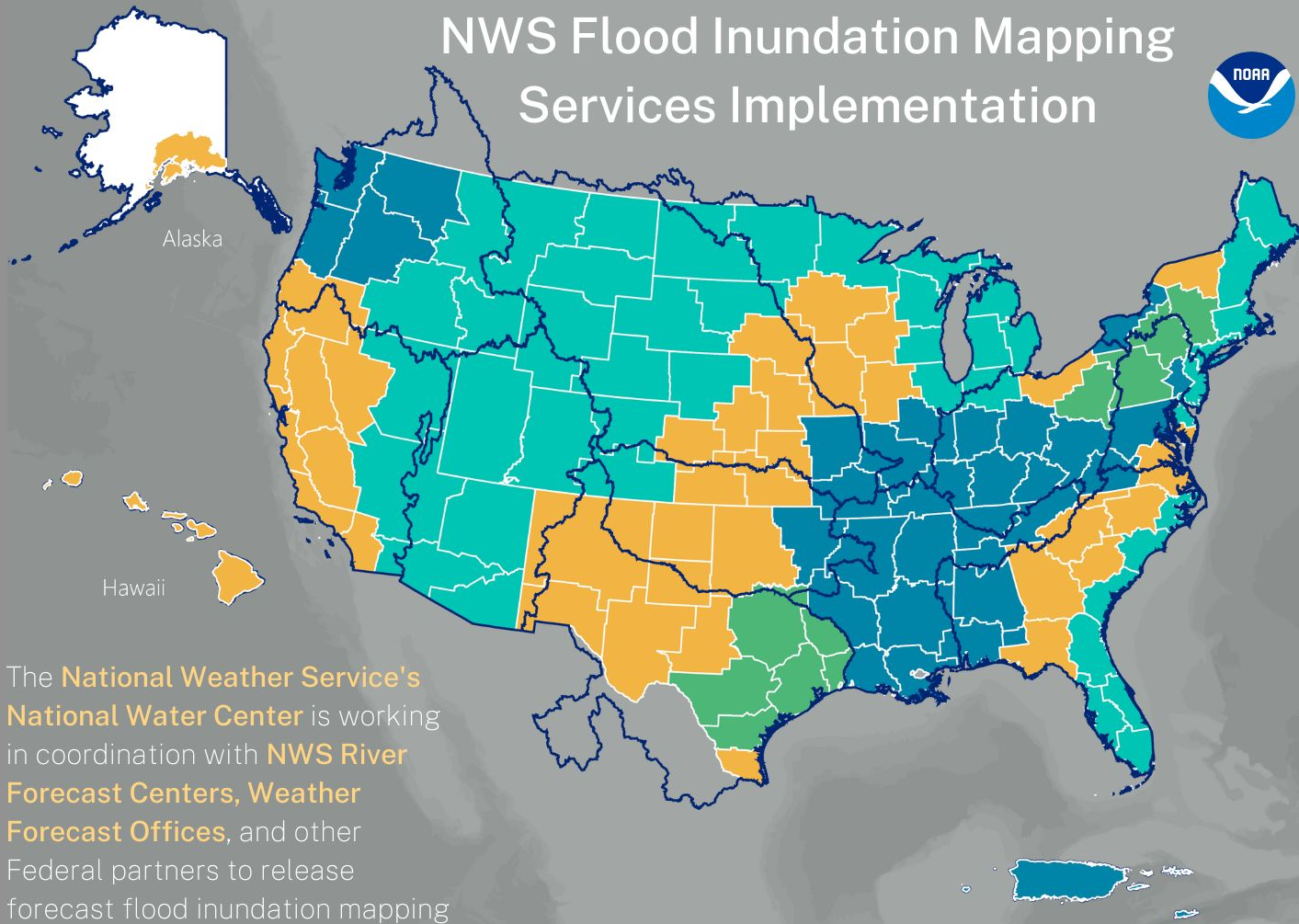


Population served by **October 2025.**



Population served by **October 2026.**

-  NWS County Warning Areas
-  NWS River Forecast Center Boundaries

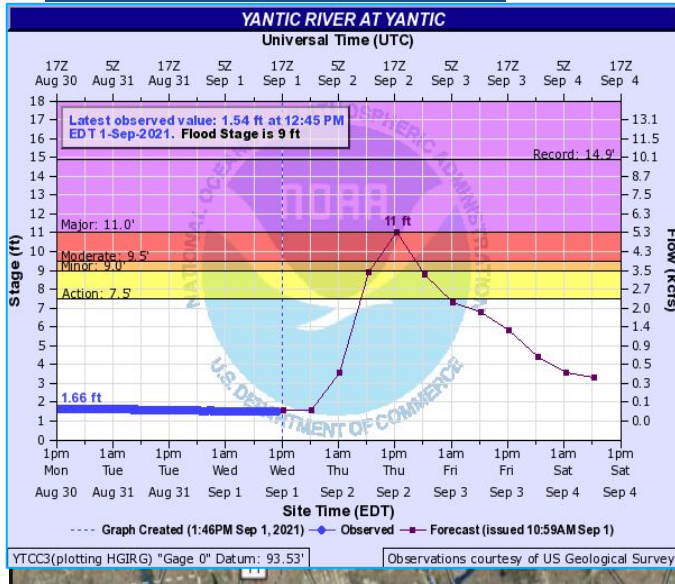


The **National Weather Service's National Water Center** is working in coordination with **NWS River Forecast Centers, Weather Forecast Offices**, and other Federal partners to release forecast flood inundation mapping services to the Nation.

*100% is approximate. Does not include all parts of Alaska, American Samoa, and Guam. Implementation areas are subject to change.

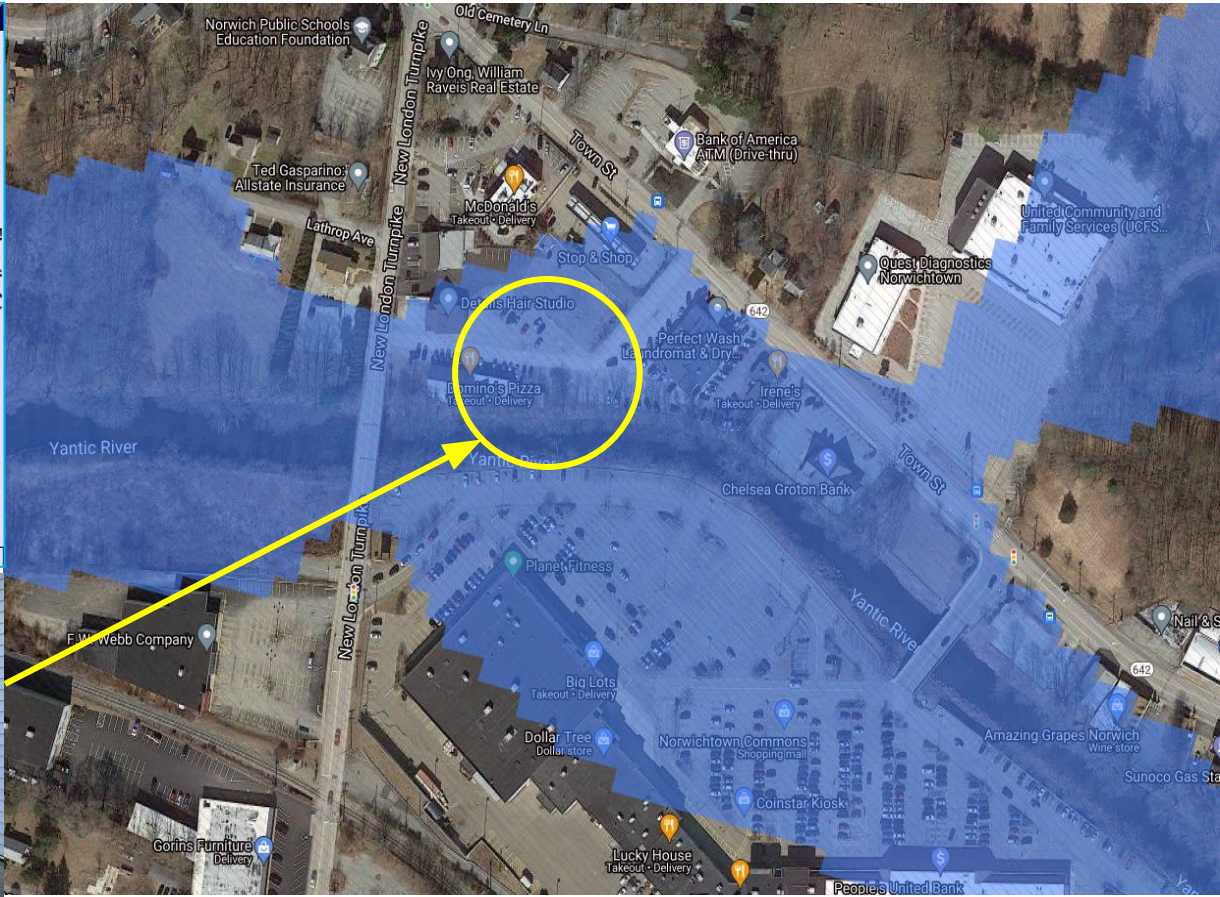
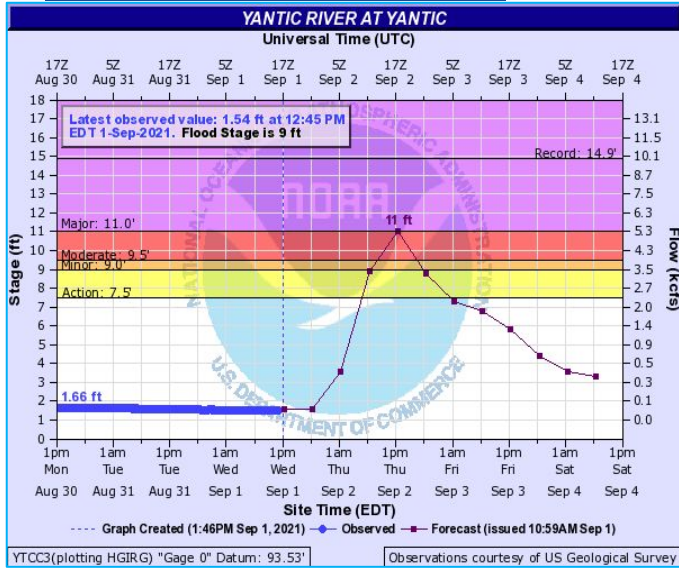
Puerto Rico & U.S. Virgin Islands

Value of FIM Services - Visualizations to depict impacts!



- Flood Impacts & Photos Collapse
- If you notice any errors in the below information, please contact our Webmaster
- 10 Flooding along Otobando Avenue at the Fitness World, Pleasant Street bridge and along Town Street at the Norwichtown Mall.
 - 9.5 Flooding begins at several commercial structures along west Town Street in Yantic Flats.
 - 9 Flooding begins along Sturtevant Street.
 - 7.5 Flooding begins in the Meadow in Yantic Flats.

Value of FIM Services - Visualizations to depict impacts!





Integrating FIM Services into our IDSS

Disclaimer: This experimental map represents the NWS's best approximation of inundation based upon modeled river discharge

Yantic River at Yantic, CT

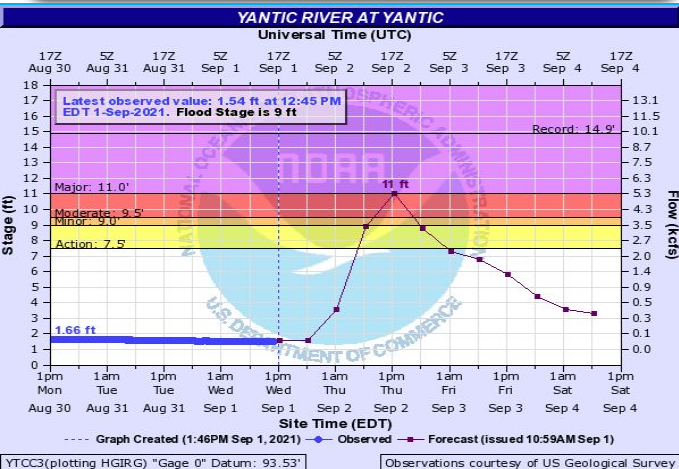
Forecast Crest Height: 11 Feet

Map Height Shown: 11 Feet

FIM Source: RFC FIM 5 Day Max Extent

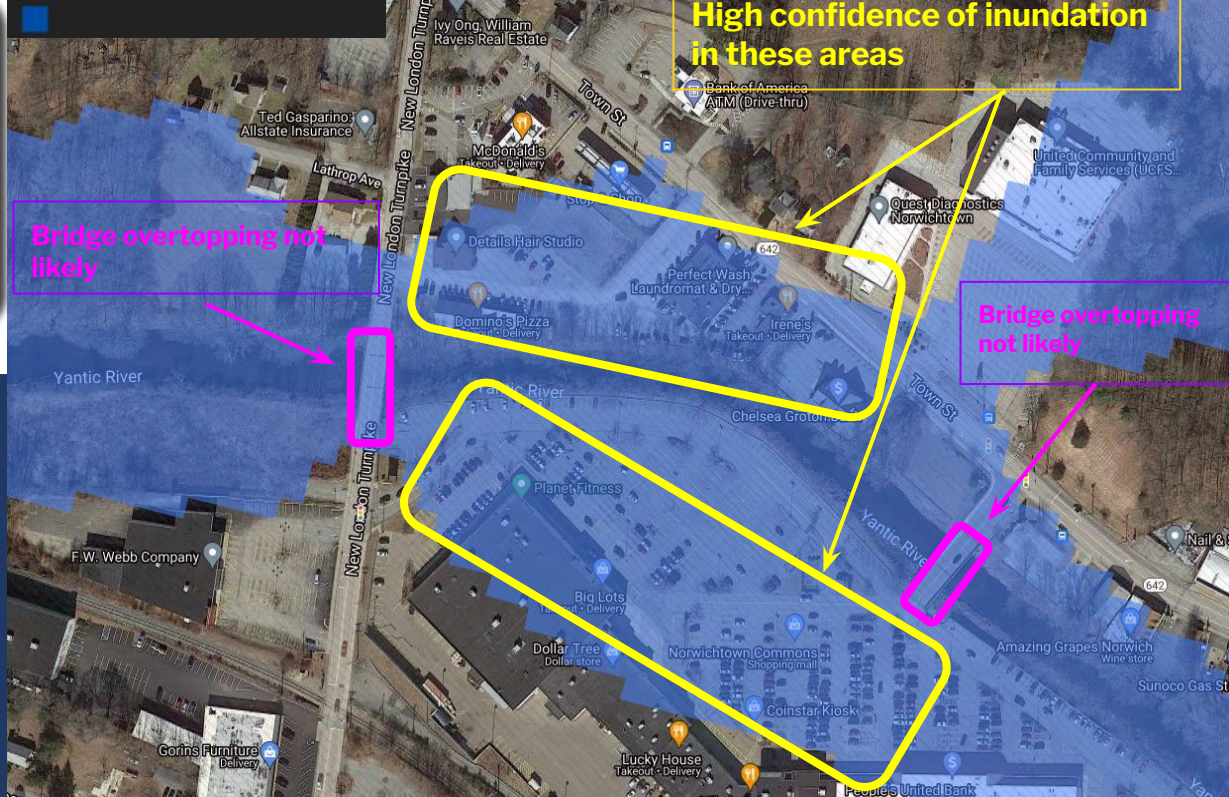
FIM Type: Dynamic (Depth NOT Included)

FIM Creation Time: Sept 1st, 1 pm



RFC 5-Day Max Inundation Extent Forecast

Maximum Inundation Extent



9/1/2021 @ 1 pm

Initial FIM Rollout - National Viewer

Experimental Services - FIM for 10% of the U.S. population

- Services available on our 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
- Actual services available for ingest into your local GIS systems



Dynamic FIM Services Comparison Table

FIM Service	NWM Latest Analysis 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]
Total Latency	55 minutes	45 minutes	6 hours 30 minutes
Updates	Hourly	Hourly [if new forecasts available]	Every 6 hours
HAND Inputs	Flow	Flow	Flow
Threshold Source [NWM/RFC]	NWM High Water	RFC	NWM High Water
Error Sources	<ul style="list-style-type: none"> • RADAR or gage malfunctions • For unengaged 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]
FIM Domain	Entire NWM domain [CONUS, HI, PR, US Virgin islands]	Downstream of AHPs forecast points	CONUS
Mapping Threshold	Only available for reaches that meet and/or exceed the "High Water" threshold	Only available based on active RFC forecasts at or above "Action Stage"	Only available for reaches that meet and/or exceed the "High Water" threshold
When to Use	Use as a snapshot of the most recent modeled inundation	Use when RFC forecast is available	Use for rivers and streams not covered by RFC forecast

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National Water Model & Flood Inundation Services



NWS GIS Viewer | Water



LAYERS

Clear Layers Collapse Folders

LEGEND

ADD DATA

QUERY

OTHER

CHANGE SITE

LOGIN

Flood Inundation Maps (FIM) (EXPERIMENTAL)

- NWM Latest Analysis (Zoom level 18+) ^{GO}
- RFC 5-Day Max Forecast (Zoom level 18+) ^{GO}
- NWM 5-Day Max Forecast (GFS) (Zoom level 18+) ^{GO}
- FIM Coverage Domain ^{GO}
● Opacity :100%
- FIM Coastal Exclusion Zone ^{GO}

Flood Products

River Observations and Forecasts

Advanced Hydrologic Prediction Service (AHPs) River Gauges

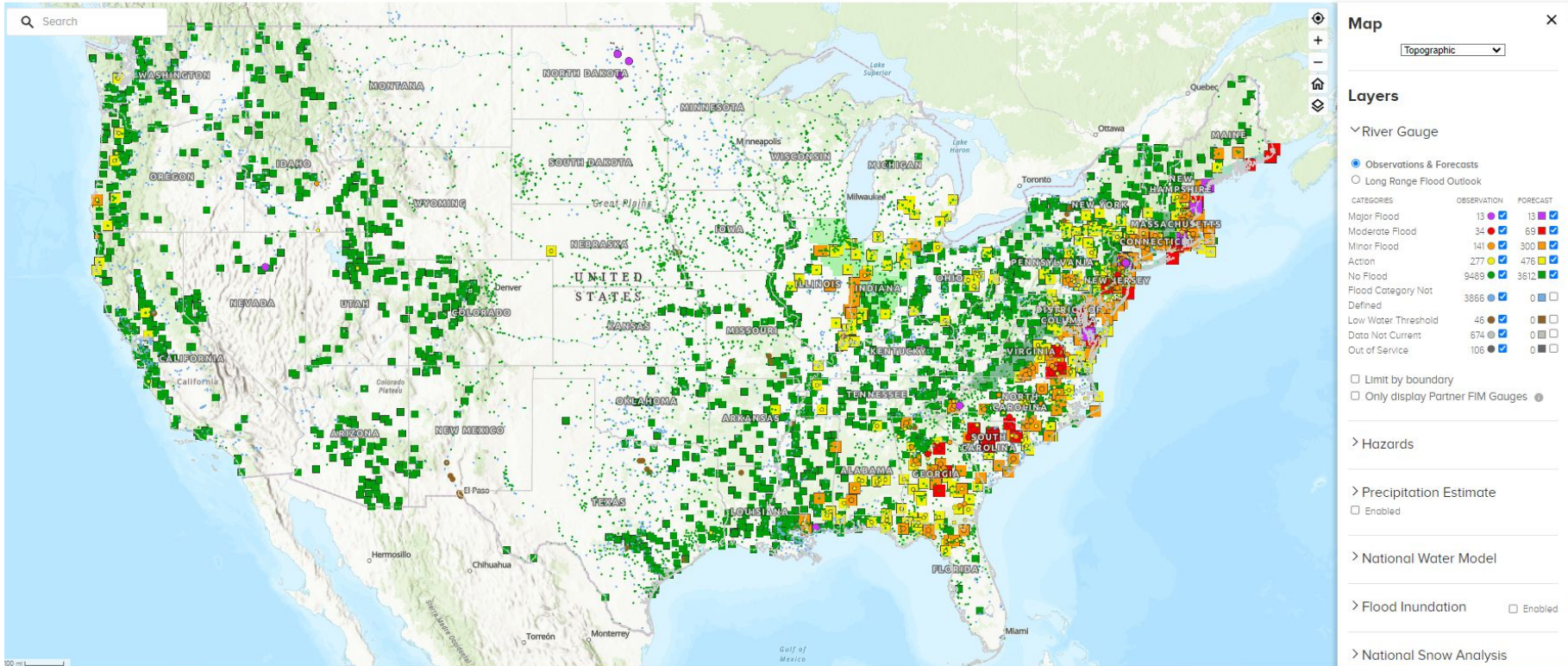
Land Analysis

National Water Model (NWM) Output

- CONUS Precipitation (inches) ^{GO}
- Hawaii Precipitation (inches) ^{GO}
- Puerto Rico Precipitation (inches) ^{GO}
- Streamflow Anomaly Analysis
 - High Flow Magnitude Analysis
 - Medium-Range High Water Arrival Time Forecast
 - Medium-Range High Water Probability Forecast
 - Medium-Range Max High Flow Magnitude Forecast
 - 3 Days - Est. Annual Exceedance Probability ^{GO}
 - 5 Days - Est. Annual Exceedance Probability ^{GO}
● Opacity :100%
 - 10 Days - Est. Annual Exceedance Probability ^{GO}
 - Medium-Range Rapid Onset Flooding Forecast
 - Medium-Range Rapid Onset Flooding Probability
 - Medium-Range Peak Flow Arrival Time Forecast
 - Flowlines
 - Short-Range High Water Arrival Time Forecast
 - Short-Range High Water Probability Forecast
 - Short-Range Max High Flow Magnitude Forecast
 - Short-Range Rapid Onset Flooding
 - Short-Range Rapid Onset Flooding Probability

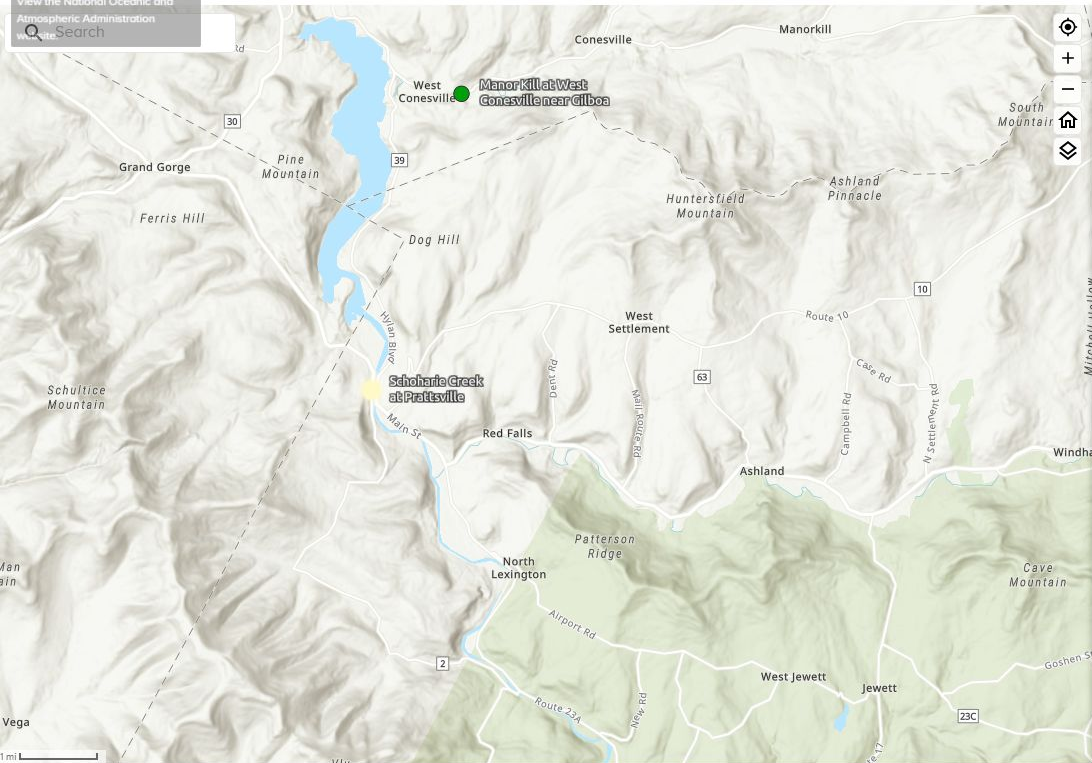
Bookmark Views:

National Hydrologic Prediction System



National Hydrologic Prediction System

View the National Oceanic and Atmospheric Administration Search

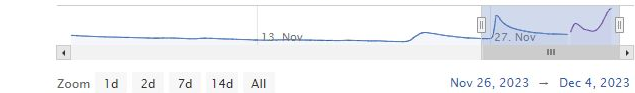
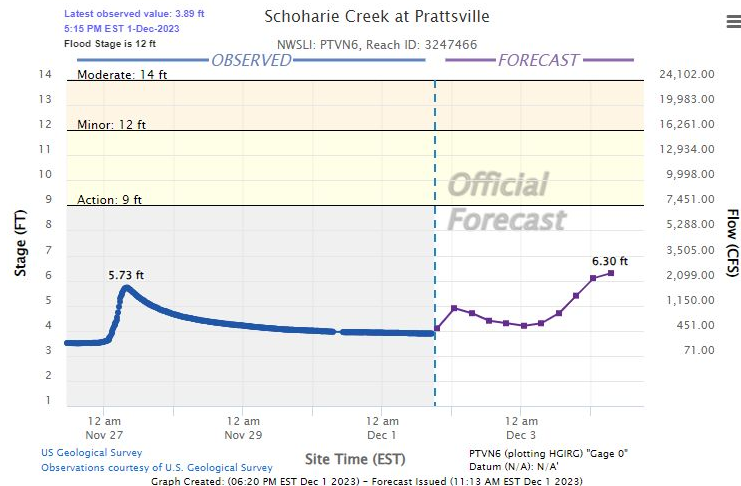


PTVN6

Upstream gauge unavailable

Full Information >

Downstream gauge (GILN6) →



Scale to Flood Categories

CATEGORY	STAGE
Official	16 ft
Major Flooding	

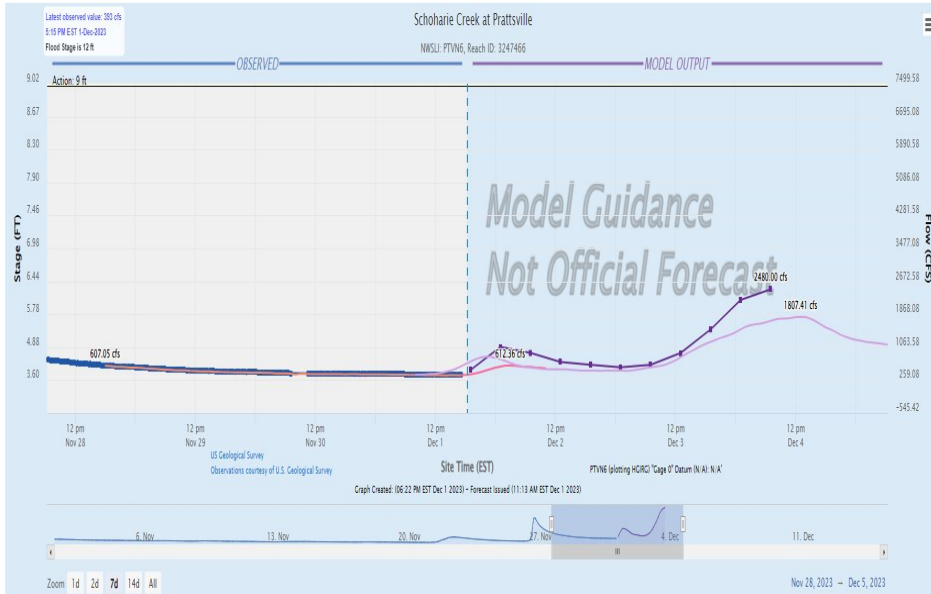
National Hydrologic Prediction System

Schoharie Creek at Prattsville

Last updated: Dec 1, 2023, 6:22 PM EST

No watches, warnings or advisories are in effect for this area.

Official National Water Model Guidance



Official

Observed (OBS)

Forecast (FCST)

CATEGORY STAGE

Major Flooding 16 ft

Moderate Flooding 14 ft

Minor Flooding 12 ft

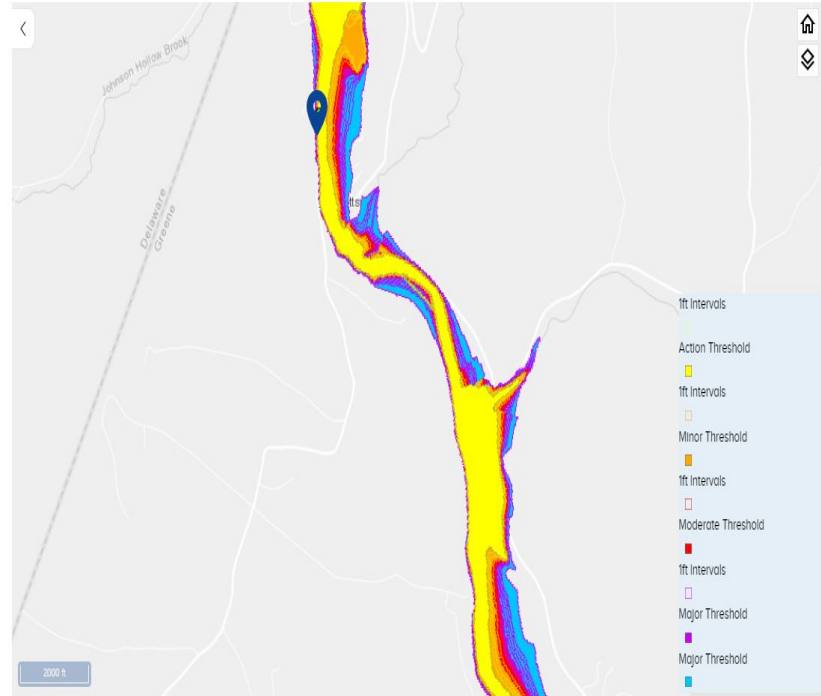
National Water Model

Analysis (ANA)

Medium Range Blend (MRB)

Gauge Location

- Action ft Intervals
- Action Threshold
- Minor ft Intervals
- Minor Threshold
- Moderate ft Intervals
- Moderate Threshold
- Major ft Intervals
- Major Threshold
- Major Threshold
- Major Threshold



- Display PTVN6 marker
- Activate PTVN6 FIM Gauge
- Deactivate PTVN6 CATFIM
- Display FEMA's National Flood Hazard Layers

Current Stage:

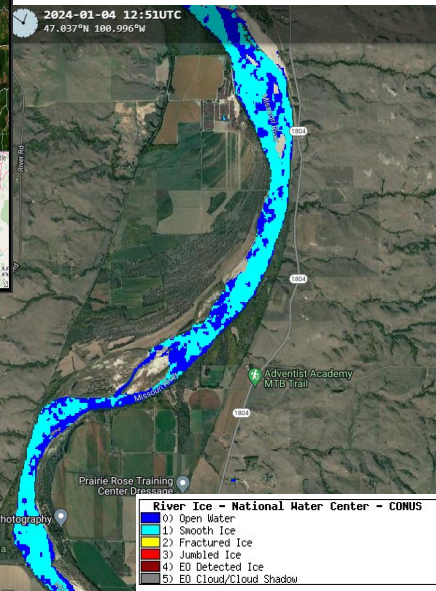
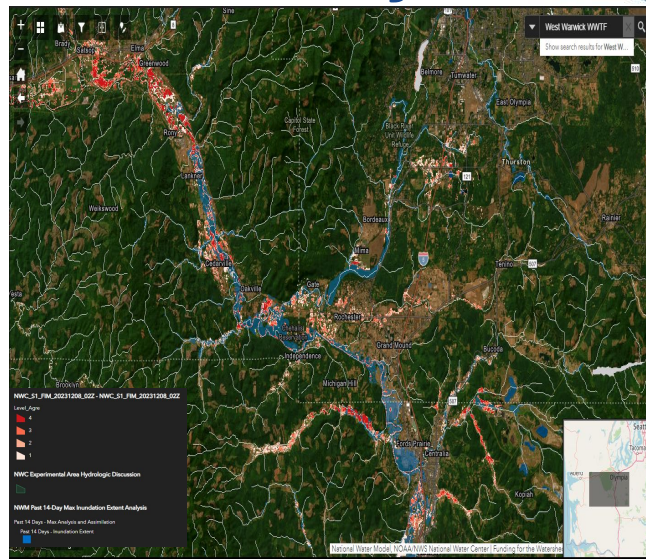
3.89 ft at 2023-12-01 23:22:05 UTC

Highest Forecast: 6.3 ft

Current Mouse Location

Satellite Derived FIM & River Ice Analyses

- These are of greatest priority
 - Working within the NWC Water Prediction Operations Division (WPOD)
- Supports near-real time situation awareness & FIM services assessments
- Supports Post-event Evaluation leading to service improvements



WaterPrediction Node Goals

2024 Goals

- Finish standing up website
 - Experimental catalog
 - Dynamic, searchable STAC catalog
 - Web map tile server
- Transfer website to NWPS
- Water Node/NWC Ops comparison tools for FIM
- Satellite-based downscaled Flood Depths
- Moving OWP SAR based flood mapping (extent) into WP Node/NWC
- Host and catalog OWP river ice products
- Incorporation of remotely sensed terrestrial information into the Node
 - Soil moisture, ET, products, Vegetation indices

2025 Goals

- Development of improved remotely sensed observations of stream conditions via near and in channel morphology - extent coupled with height
- Modify elevation models based on satellite derived elevation information
- Catalog products/imagery (latency, resolution, etc)
- Exploration of Satellite-based groundwater product utility (GRACE FO etc)
- Deliver water clarity/turbidity products to WP Node for evaluation along with new/improved water quality products
- Incorporate OWP river ice remotely sensed products into SAR enterprise flood product suite from STAR



WaterPrediction Node Goals

Longer Range Goals Year 3+

- Data assimilation efforts for soil moisture, ground water, satellite based stream conditions, et al.
- Assimilating changes in the landscape into modeling frameworks
- New mission products: SWOT/FF-SAR; root zone satellite soil moisture from Snoop; PACE, et al.
- Testing new land surface vegetation structure parameters for NWM next gen framework (e.g., canopy height, canopy areal index, canopy height diversity, veg fraction)
- Ways to assimilate landscape changes into the modeling frameworks, e.g., modifying DEMS
- Testing assimilation of remotely sensed stream conditions

Longer Range Goals Year 3+

- Planning/prep for CoastWatch Science Meeting in (May) 2025 - hosted by the NWC & CIROH
- Lake Surface Temperature products delivered to Water Prediction Node/NWC; linkages to Next Gen model framework and data assimilation
- Develop threshold water clarity/turbidity/quantity states with WP Node - how precipitation/flooding could trigger HABs “downstream” - need indicators
- Co-design/develop with WP Node (NWC/CIROH) other new and improved WQ products





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