# National Water Prediction Service Product and Users Guide
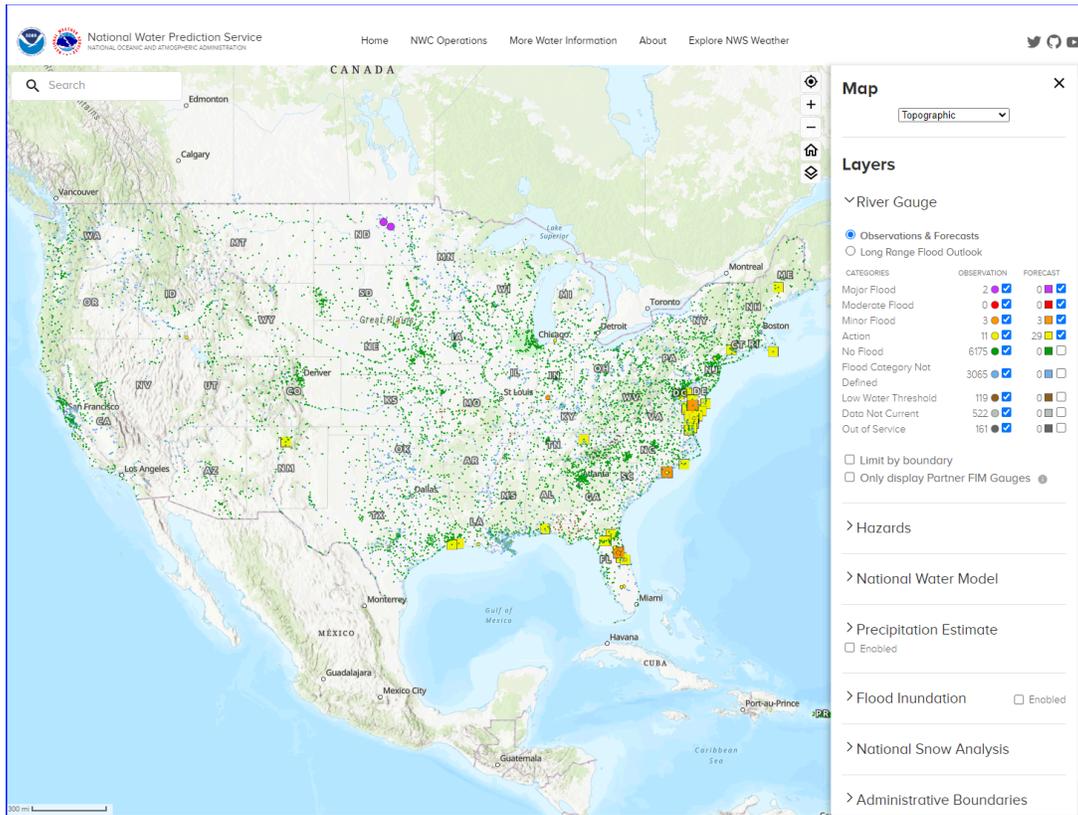
Version 2.0
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National Oceanic and Atmospheric Administration
National Weather Service
Analyze, Forecast, and Support Office
Water Resources Services Branch

Table of Contents

Background

This Product and Services Guide serves as a reference to the [National Weather Service](#) National Water Prediction Service (NWPS) [webpage](#). It aims to be a comprehensive guide to the vast services contained within the [water.noaa.gov](#) website.

This guide is written and maintained by the Water Resources Services Program within the Analyze Forecast and Support Office (AFSO) of the National Weather Service.

Note: NWPS is currently considered an experimental product being evaluated for

Any questions, comments or suggestions can be directed to [nwps.webmaster@noaa.gov](#)

Change Log

Version	Date	Description of Change/Revision	Section/Pages Affected	Changes Made by Name
1.0	11/11/2023	Initial Version	-	-
2.0	3/27/2024	Many updates to coincide with operational deployment of NWPS		

1. **Introduction**

The National Weather Service (NWS) has delivered water resource forecast products and services via the Advanced Hydrologic Prediction Service (AHPS) for over two decades. This legacy system has been modernized to support new data sets and capabilities, supported by a scalable infrastructure using services-driven architecture.

The National Water Prediction Service (NWPS), https://water.weather.gov, is a new Next Generation gateway to water resources forecasts and information on the web. The NWPS completely rewrites the Advanced Hydrologic Prediction Service (AHPS) web functionality into modern, efficient, and mobile-friendly web code (Figure 1). This web delivery platform will be the primary source of NWS water data and forecast information, combining the information currently available at the Advanced Hydrologic Prediction Service (AHPS) website (water.weather.gov) and the Office of Water Prediction (OWP) / National Water Center (NWC) website (water.noaa.gov).

This document describes the interactive maps, graphs, tables, and key products and services available on the NWPS webpage.
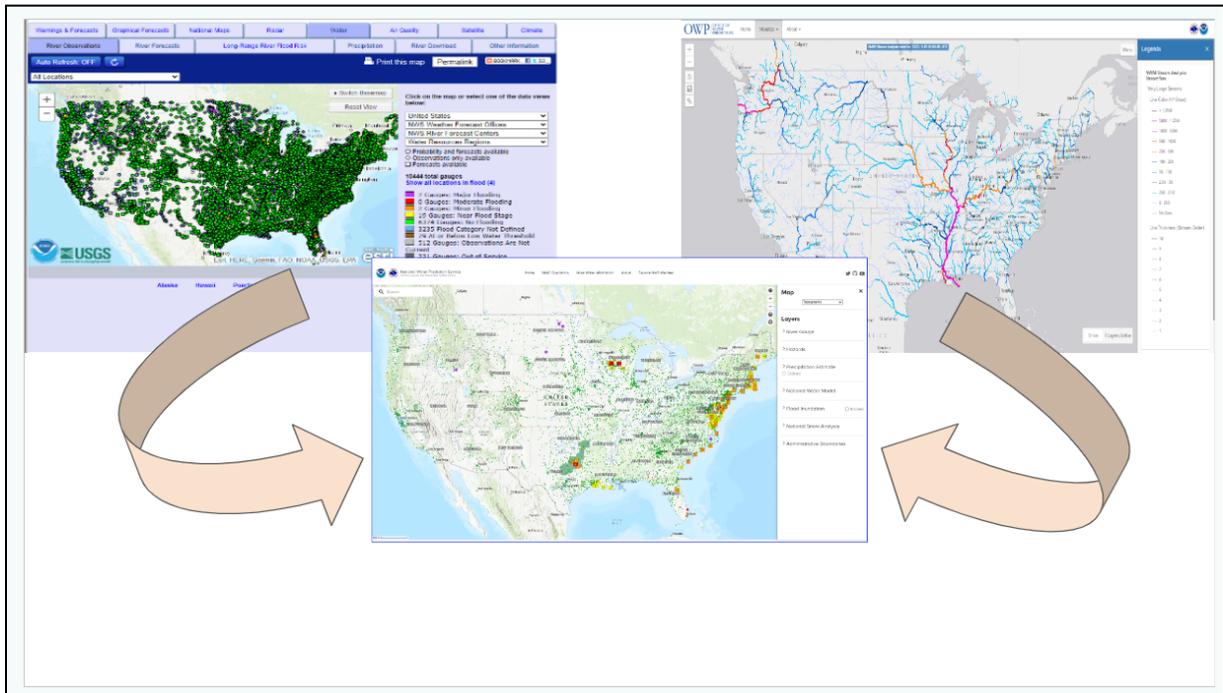

Figure 1 - Modernized NWPS (National Water Prediction Service)

2. **The Main Page**

When loading the NWPS web page, the user is presented with a page similar to Figure 2. This is the Main Page of the NWPS service. The Main Page has three sections.

Section 1 on Figure 2 is the Map. The map is fully interactive with mouse-controlled panning and zooming with point and clip options, depending on the Layers chosen. Refer to Section 2.1 for details on using the map.

Area A on Figure 2 contains map display options including a geo-locator to bring the user to their current location, zoom in/out button, a home button to reset the map display and a toggle button to turn the layers Map Choice and Layers on/off. Area B on Figure 2 is the search bar, covered below.

Section 2 on Figure 2 is the Map Choice and Layers. Here, the user can choose the map background of their choice and the data layers they wish to display. Refer to Section 2.2 for a description of the many options available.

Section 3 on Figure 2 is the Columns or pull-downs. Each column contains links and references to hydrologic information independent of the map. Refer to Section 2.3 for more details on the data collected in the different columns.

Section 1 and Section 2 display user-selectable data on the map.
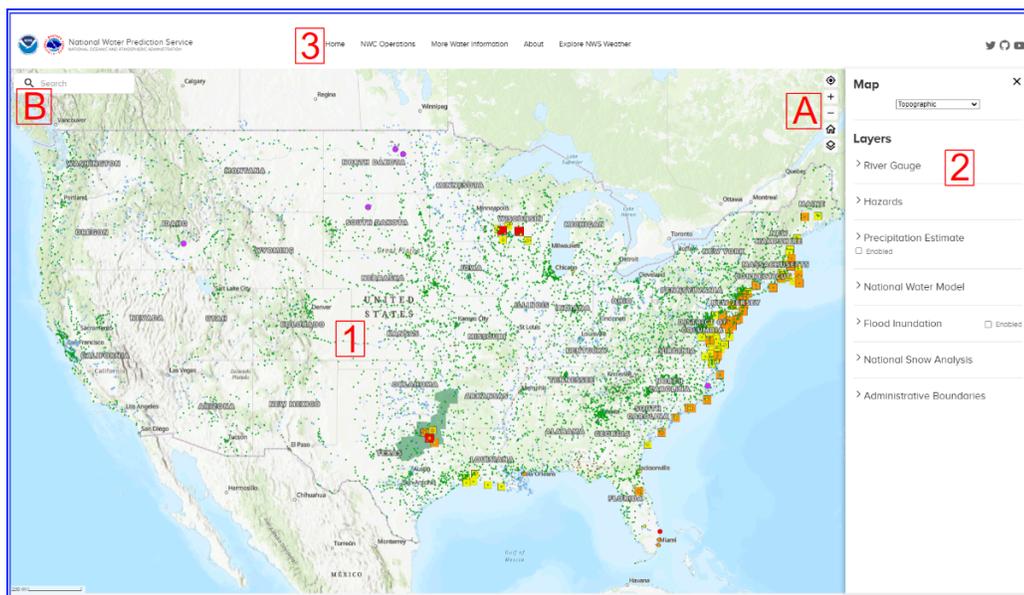
Figure 2 - Main NWPS website. There are three sections to this page. Section 1 is the Map, Section 2 is the Map Choice and Layers and Section 3 is the Columns or Pull-downs.

2.1. The NWPS Map

By default, the map depicts current NWS river gauge location observations as circles, color-coded by their current flood category. The map also depicts any river gauge locations forecast to exceed the action stage as squares, color-coded by the highest flood category forecast (see Figure 2).

When moving the cursor over the map display, the hand icon represents the cursor location on the map. The mouse wheel allows a user to zoom in and out. On a mobile device, the user can move around with their fingers—pinch in and out to zoom and tap to select a river gauge. Each layer choice is described below, covering more details on data points.

Search Function

See Area B on Figure 2. There are several search strings that are recognized:

- *State - Enter "state: xx" or spell out.*
- *Weather Forecast Office - Enter "wfo: xxx" or three letter NWS Weather Forecast Office abbreviations.*
- *River Forecast Center - Enter "rfc: xxxxx" or type the full River Forecast Center (RFC) name; see NWS RFC map.*
- *River Gauges - Enter "gauge: xxxxx" or spell out gauge / location name or its SHEF id.*
- *Rivers - Enter river or steam name.*

Displaying a Hydrograph for a Given Gauge Location

The river gauge locations on the map, enabled by user choices in the "River Gauge" Layer, display the gauge hydrograph information to the right of the map once a gauge is clicked (Figure 3).
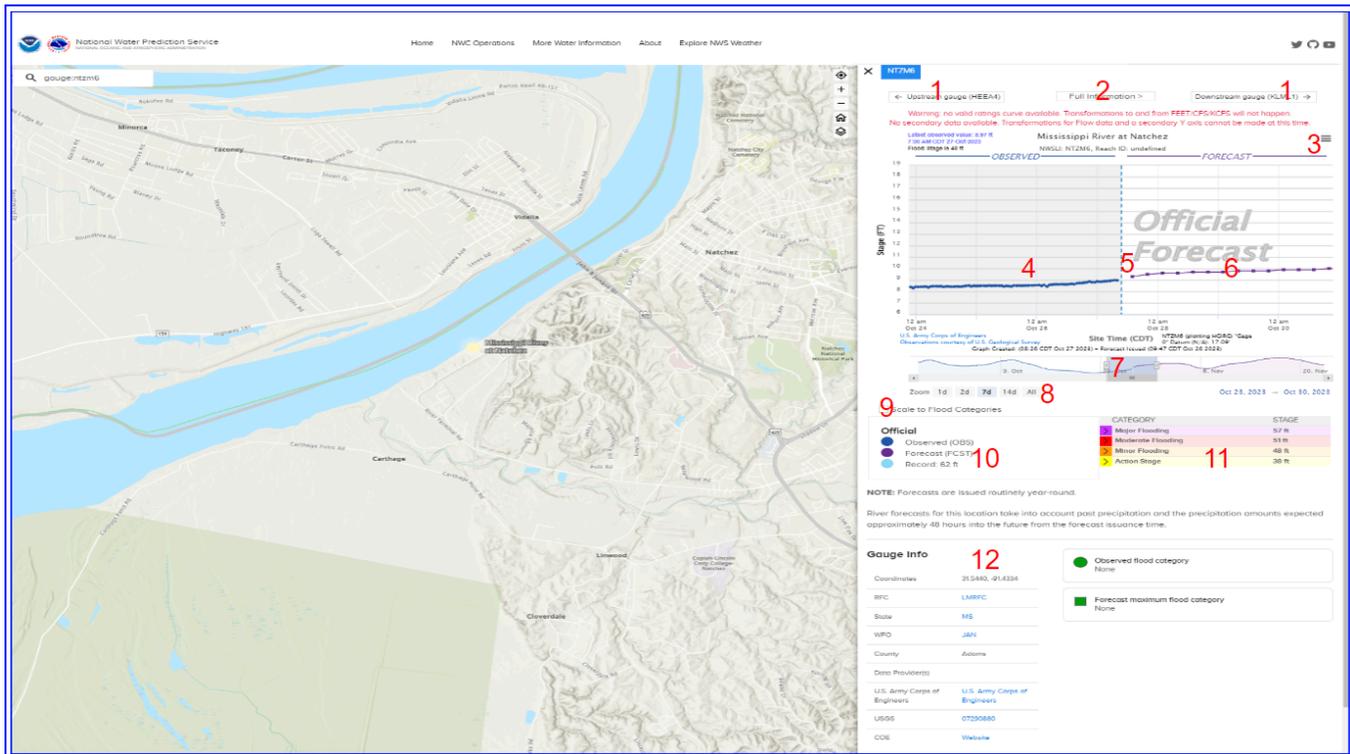
Figure 3. Hydrograph display when a gauge location is selected on the map.

On the top right of the hydrograph, to the right of the river gauge name, the user is shown three horizontal lines (Figure 3 number 3). Clicking on these lines allows viewing the hydrograph in full-screen mode (hit the escape key to return), printing the chart, or downloading the hydrograph as a PNG, JPG, PDF, or SVG image.

The observed trace (4) is within the hydrograph section to the left of the vertical current time bar (5). If a River Forecast Center forecast is available, it displays on the right side of the hydrograph (6).

The hydrograph is feature-rich, with a current and forecast values data readout. There are several user-controllable options, including a user-expandable time bar to change the date range displayed on the hydrograph (7) or to choose preset periods of 1, 2, 7, 14, and all days (8).

Below the hydrograph, there are more options and information. The user can scale the hydrograph's vertical axis to show all flood categories (9). The user can turn off the observed, the forecast, and the record stage listing (10). If the gauge is a forecast point, the values of action, minor, moderate, and major flood stages displays in a table (11). Below this are river gauge data with information and links such as the latitude-longitude coordinates of the gauge, the RFC and WFO within which the gauge is located, the County or Parish the gauge is in, and information and links to the data providers (12).

Finally, above the hydrograph, the user can choose to move to display either upstream or downstream gauges if they exist (1 in Figure 3). Click the "Full Information" button (2) to open the hydrograph in its browser window for a more detailed gauge analysis.

See Appendix F for details on obtaining a static link to each hydrograph.

Figure 4 shows more features of the NWPS hydrograph page.
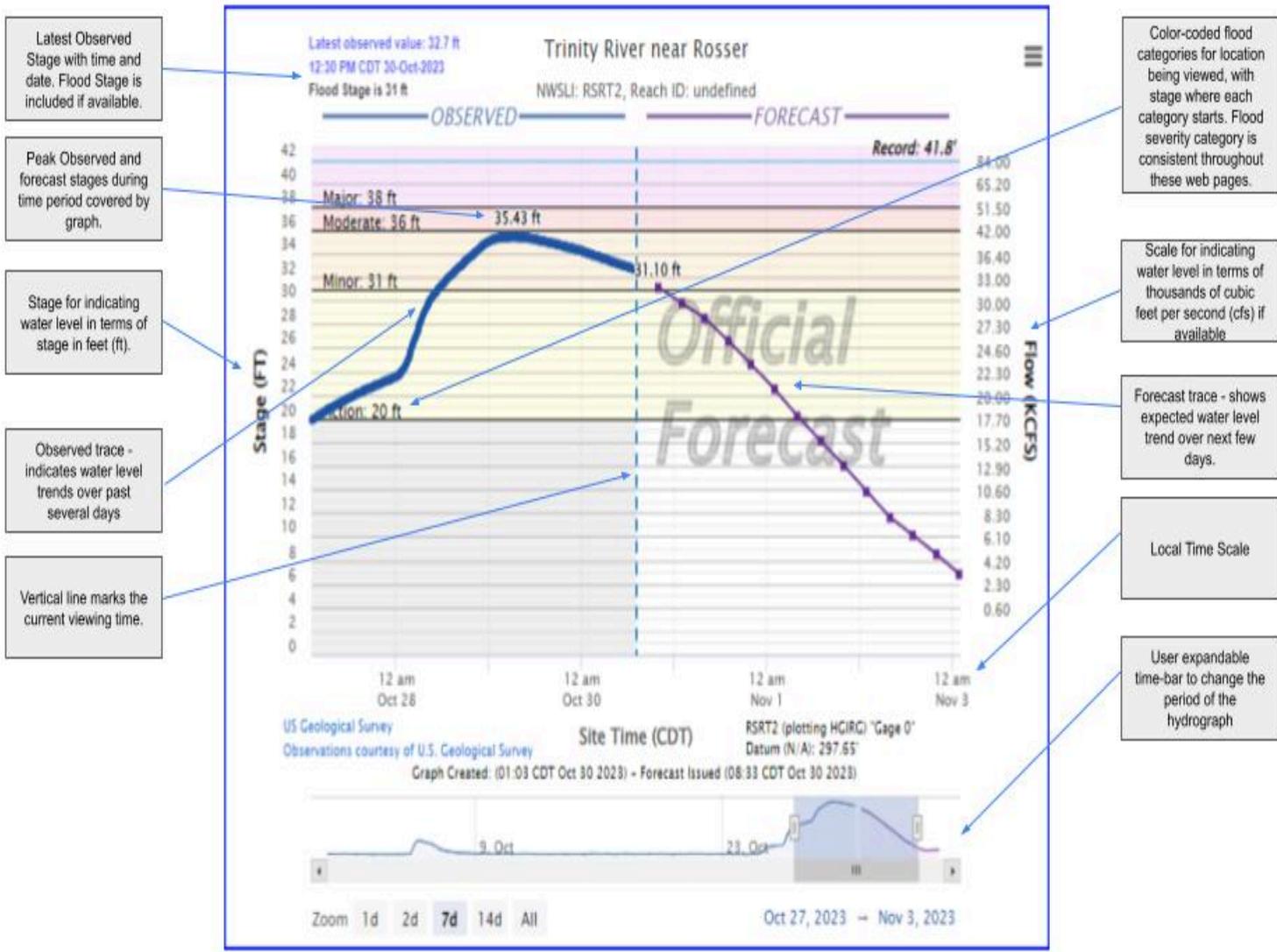
Figure 4. NWPS Hydrograph features

Full Information River Gauge Page

When the user clicks on the "Full Information" button from the hydrograph on the map display (Figure 3, 2), a separate window opens (Figure 5). This gauge-specific page contains more details on the river gauge for the user.
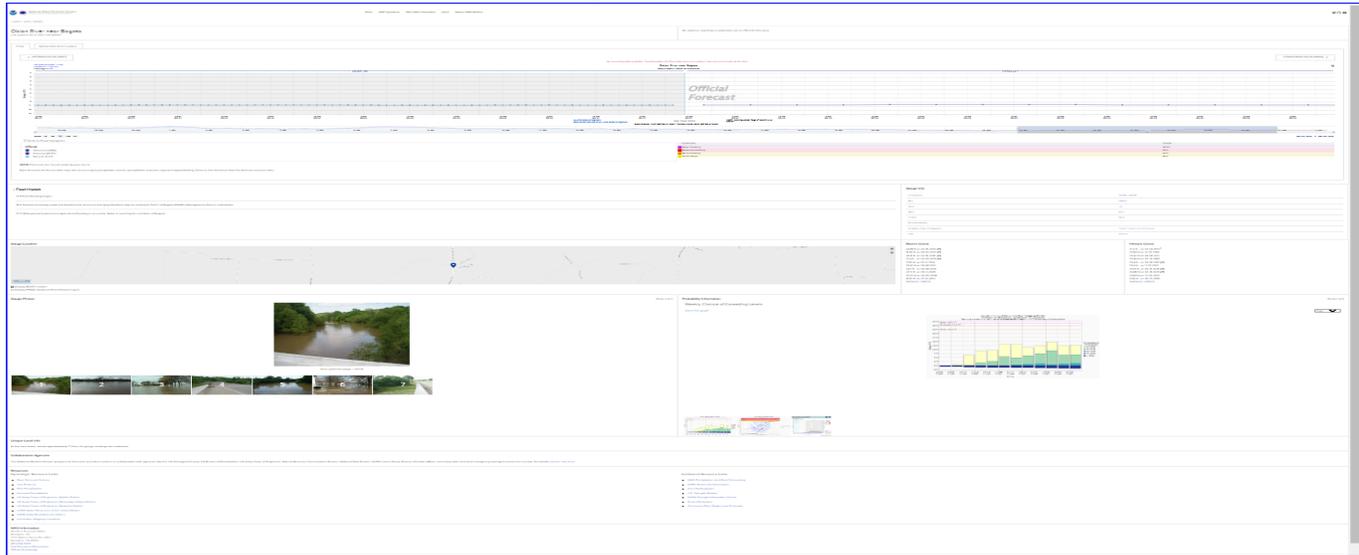
Figure 5 - Full Information Hydrograph page.

This full information page is broken into 4 sections. Section 1 (Figure 6 and 7) contains the hydrograph section. This is similar to the hydrograph displayed on the map (covered in the section above), with one key difference. Notice the two tabs: the "Official" tab (Figure 5) and the "National Water Model" tab (Figure 7). Refer to the section above for details on the "Official" hydrograph tab. For information on the National Water Model hydrograph see the National Water Model section below.
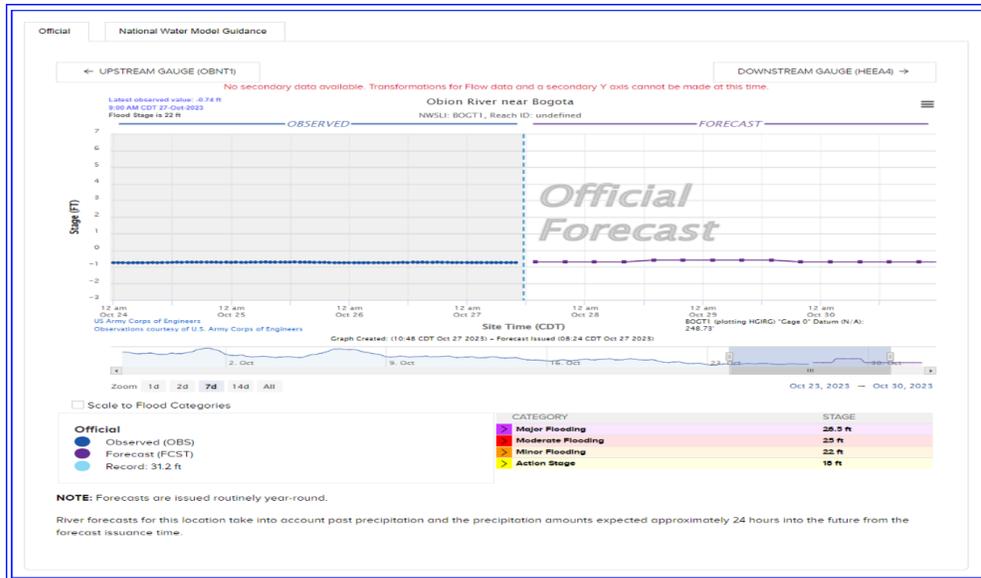
Figure 6 - Official hydrograph and forecast.
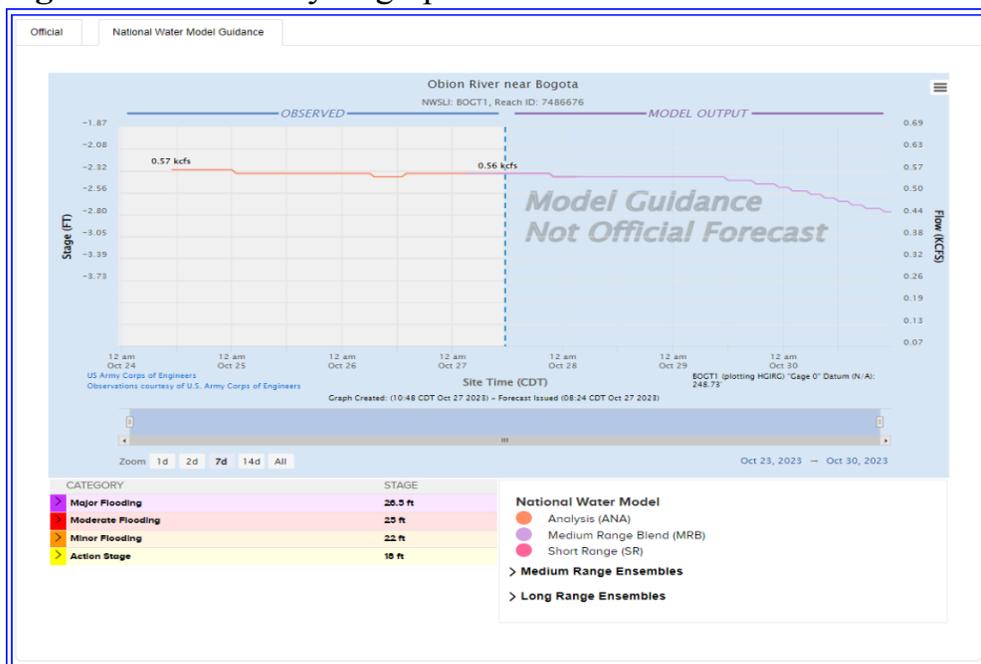
Figure 7 - National Water Model Forecast.

Figure 8 (below) shows the features available on both tabs. Below the hydrograph is a listing of known *Flood Impacts* by river stage (or flow) (Figure 8, 1), a listing of *Gauge Info*, including the geographical coordinates of the gauge and the data provider (2), the *Gauge Location*, a map of the gauge location (3), with the option of displaying the FEMA National Flood Hazard Layer, Flood Inundation Maps if available, and a listing of recent and historic crests at the gauge (4).
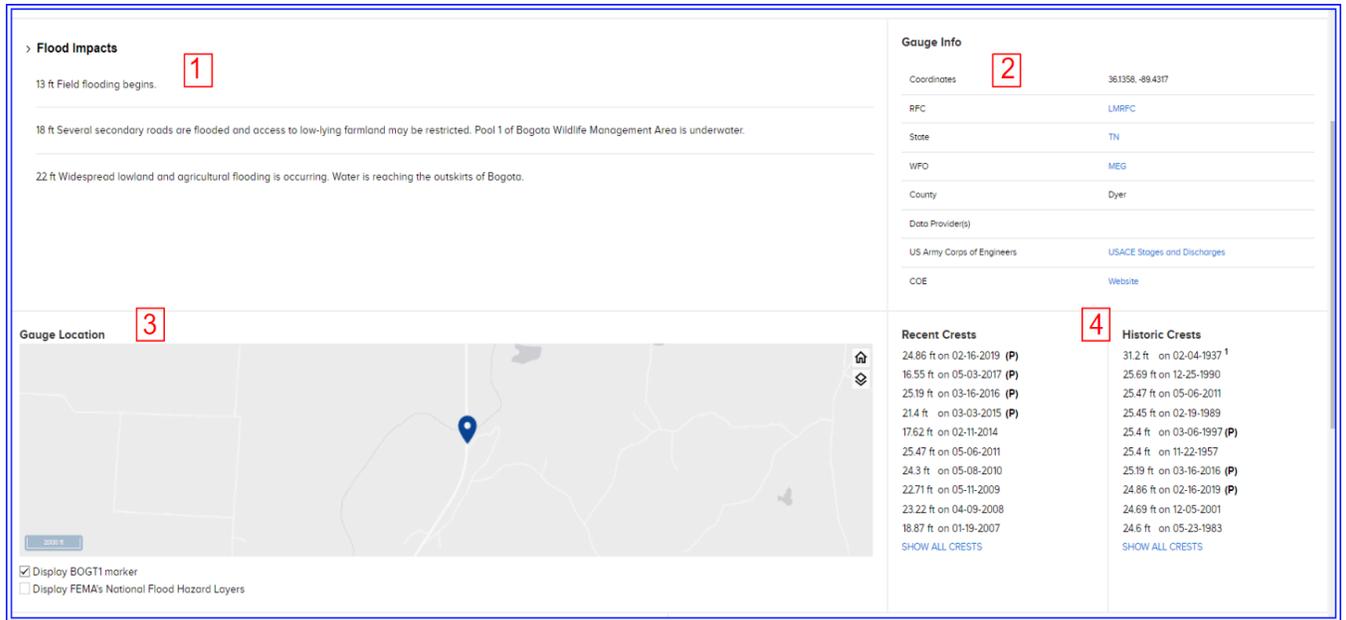
Figure 8 - Sub section of the Full Information Hydrograph Page.

The next section on the full hydrograph page contains Gauge Photos (Figure 9, 1) and Probability Information (2).
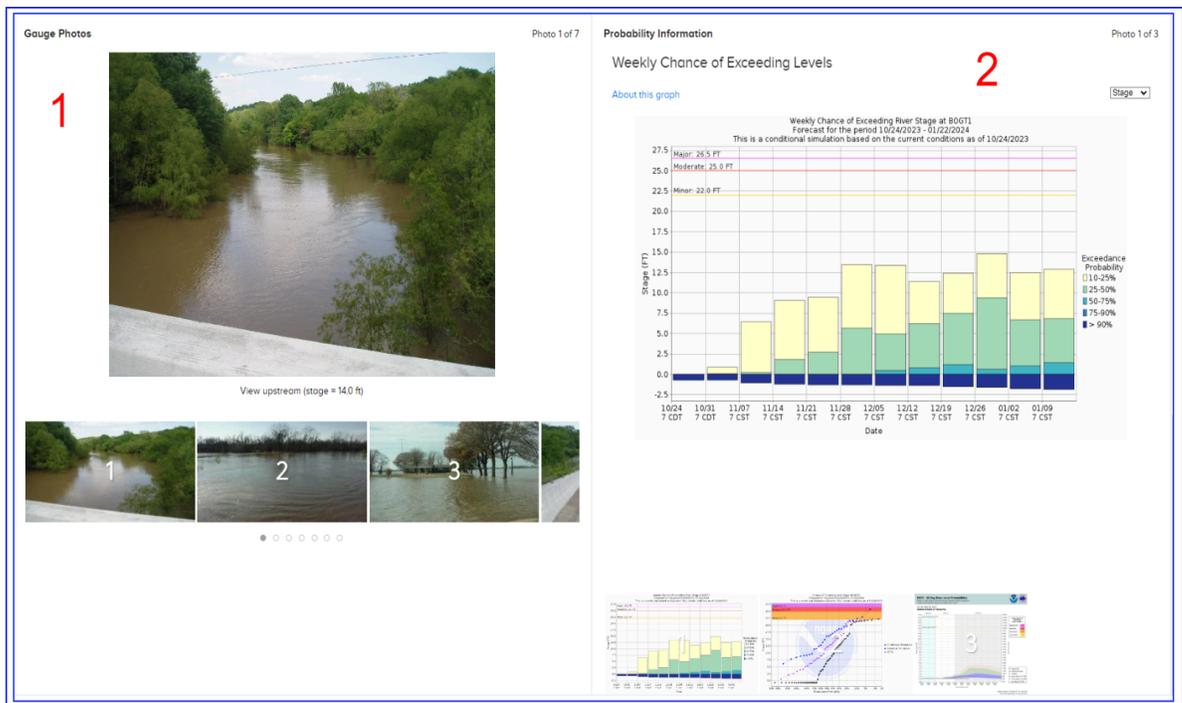
Figure 9 - Gauge Photos and Probability Information

At many river forecast points, there are three Probability Information plots available:

- Weekly Chance of Exceeding Levels

    This graphic (Figure 10) shows the probability or chance of the maximum stage, flow, or volume at a point on a river exceeding a particular value for consecutive 7-day periods in a 90-day interval. The vertical axis shows river stage or level measured in feet (ft) and the horizontal axis shows time. An individual multi-color vertical bar represents the exceedance probabilities for a 7-day period, each color representing a range of probability as defined in the key to the right of the graph. A sample graphic is provided below.
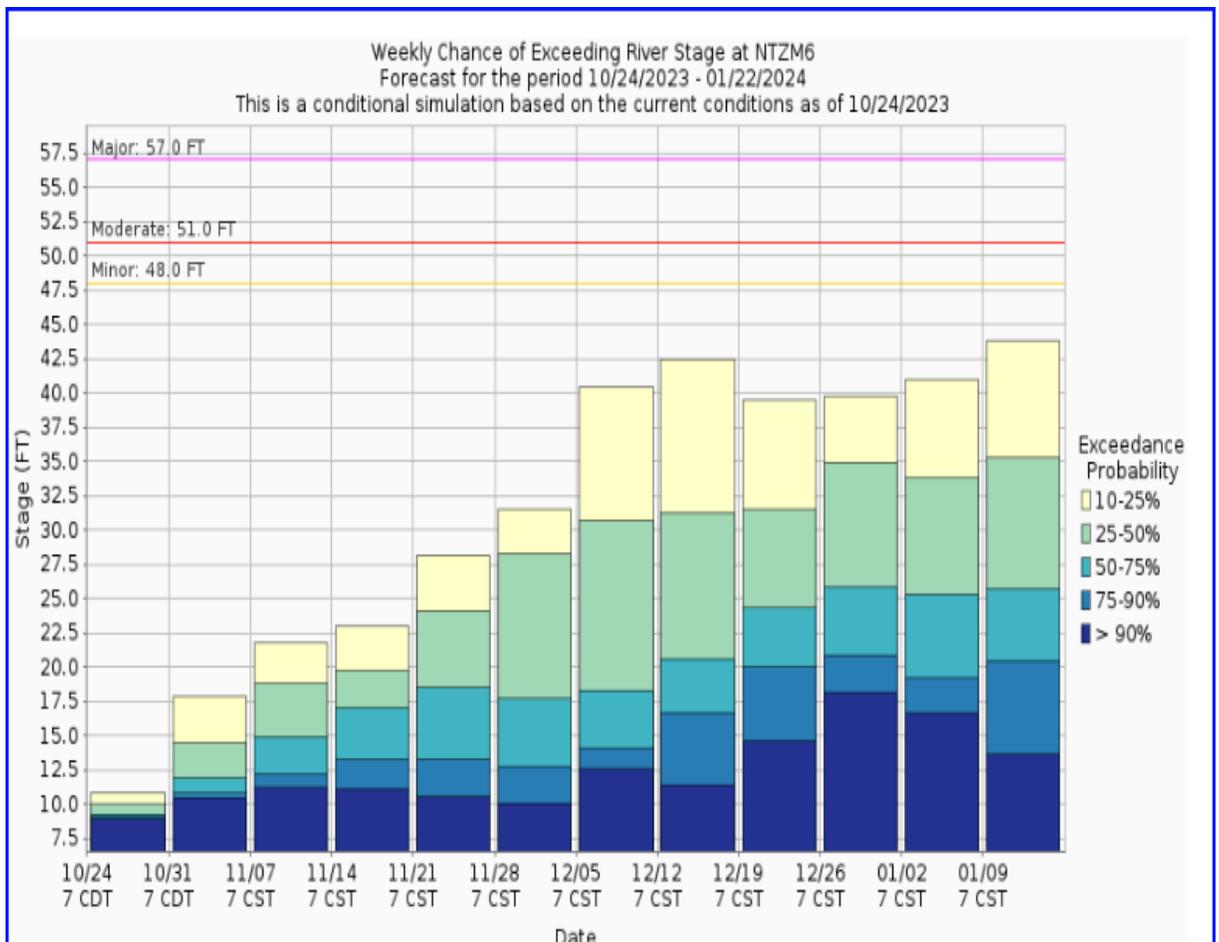
Figure 10 - Weekly Chance of Exceeding Levels

- Chance of Exceeding Levels During Entire Period

This graphic (Figure 11) shows chances of the river stage, flow, or volume rising above various levels during the forecast period. The simulation definitions are given below:

> Conditional Simulation (CS) - Represents the chances of the river exceeding the given levels based on the current conditions and latest probabilistic river forecast.

> Historical Simulation (HS) - Represents the chances of the river exceeding the given levels based on historical information (or based on the average).

The probabilities in these graphics are based on river model simulations that produce many forecast scenarios. The forecast river level probabilities in the conditional simulation can be compared to the historical simulation probabilities (what might be considered normal based on historical data). It should be expected that conditions can change over a long forecast period. These outlooks are updated periodically and should be consulted on a regular basis. See this link for more details on this graphic.
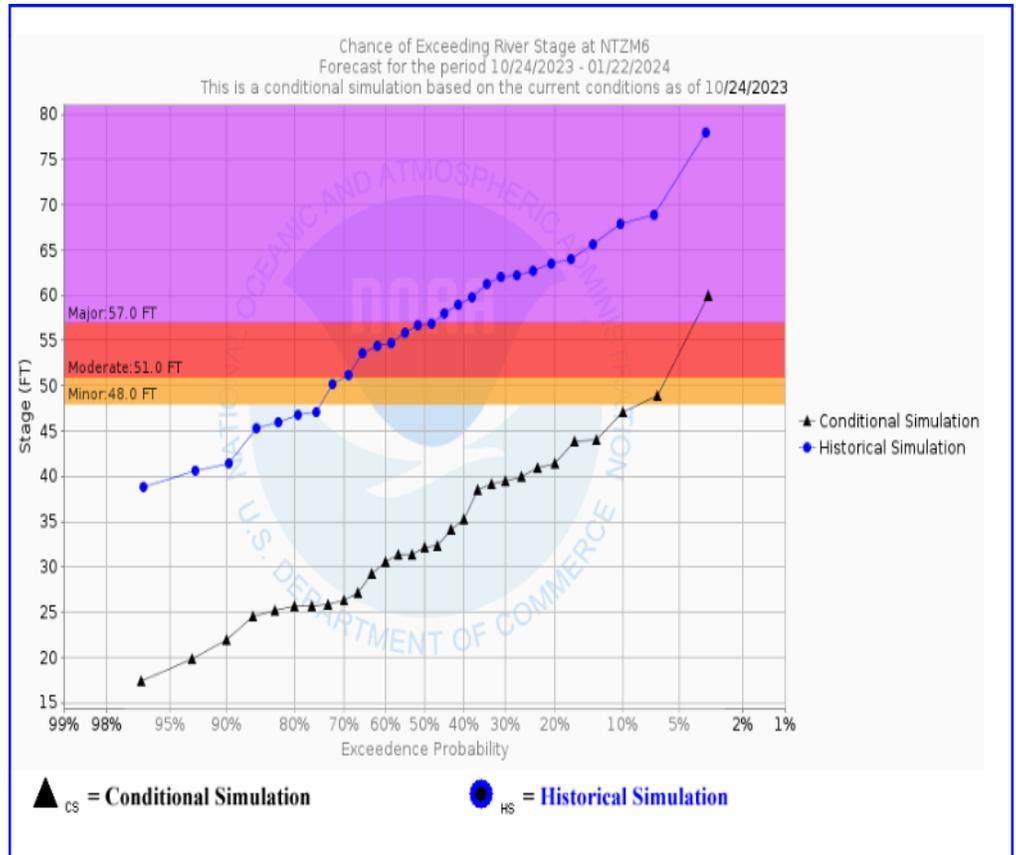
Figure 11 - Chance of Exceeding Levels During Entire Period

- Short Range Forecast Uncertainty

The Short-Term Probabilistic Guidance Graphic (Figure 12) contains a graphical depiction of the short-range (0-10 days) river forecast uncertainty predicted by the Hydrologic Ensemble Forecast System (HEFS). At each forecast time-step (typically every 6 hours), the graphic conveys a range of possible river stages, and corresponding flows, at a particular forecast location. These possibilities are shaded using different categories of forecast probability, ranging from most likely to less likely. These probability ranges (uncertainty bounds) are derived from the ensemble forecasts produced by HEFS at each forecast time-step. See this link for more details on this graphic.
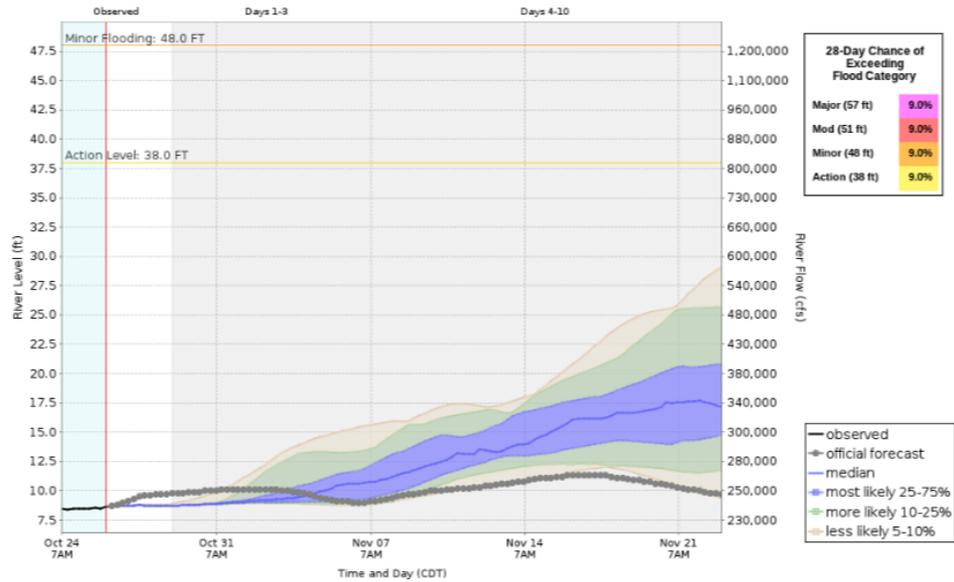
Figure 12 - Experimental Short Range Forecast Uncertainty Plot

The final section on the full hydrograph page contains "Unique Local Info" about the river gauge, a list of "Collaborative Agencies" that work with the National Weather Service on this gauge, a "Resources" list with pertinent links and finally "WFO Information" with contact information for the local National Weather Service Weather Forecast Office. (Figure 13).

Figure 13 - Bottom portion of the Full Information Hydrograph Page.

2.2. Map Choice and Layers

The Layer section to the right of the map is where the power of NWPS can be seen (Figure 2, 2). Here the user can select different hydrologic layers to provide a custom viewing experience.

Choices available include:

- [Map Choice](#)
- [River Gauge](#)
- [Hazards](#)
- [Precipitation Estimation](#)
- [National Water Model](#)
- [Flood Inundation](#)
- [National Snow Analysis](#)
- [Administrative Boundaries](#)

Map Choice

By default a topographic basemap is displayed. The user can change the basemap displays by clicking on the Map choice to the top right of the map. Current basemap choices are Topographic, Satellite, Dark, Light.

River Gauge

By default this section appears on the map when NWPS is loaded.

There are two button options available (Figure 14,15):

o *Observations & Forecasts*

Default selection (Figure 14). This shows river/stream locations which are color-coded according to the flood status of their most recent observation, the maximum stage/flow forecast through the entire period, or according to the maximum of both values. Though off by default, users can also view river/stream locations:

- where the NWS flood category is not defined,
- at or below the low water threshold,
- where data is not current, and
- where the river gauge is out of service.

Note: To turn all gauges on or off at once, click on "Observation" or "Forecast"
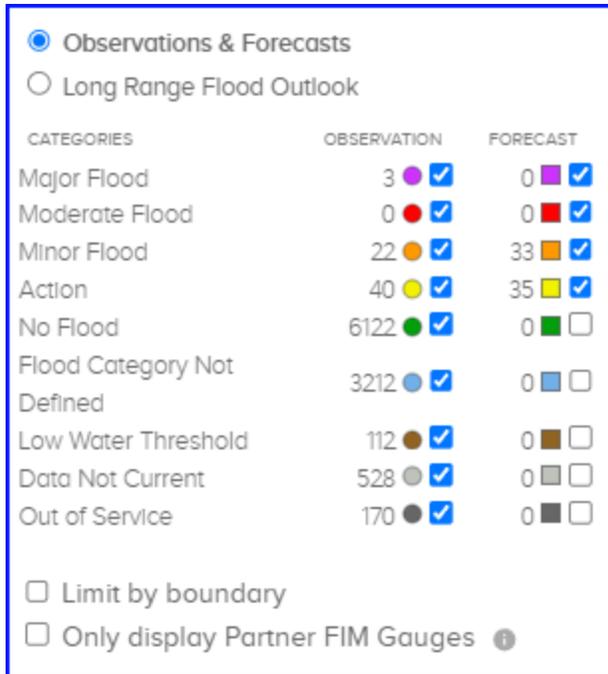
Figure 14 - River gauge Observations & Forecasts.

   o *Long Range Flood Outlook*

This selection (Figure 15) shows river/stream locations which are color-coded according to the long-range (3-month) risk of minor, moderate, and major river flooding as follows:

- Less than X% chance of flooding (green)
- Greater than X% chance of minor flooding (orange)
- Greater than X% chance of moderate flooding (red), and
- Greater than X% chance of major flooding (violet).

When first viewing the long-range river flood risk map, the percent (X) chance defaults to 50. Use the dropdown box to select different percentages, including 5, 10, 25, 50, 75, 90, and 95%. Locations where long-range flood risk is not calculated are shown in gray. Long-range (3-month) risk information is based on NWS Ensemble Streamflow Prediction (ESP) forecasts.
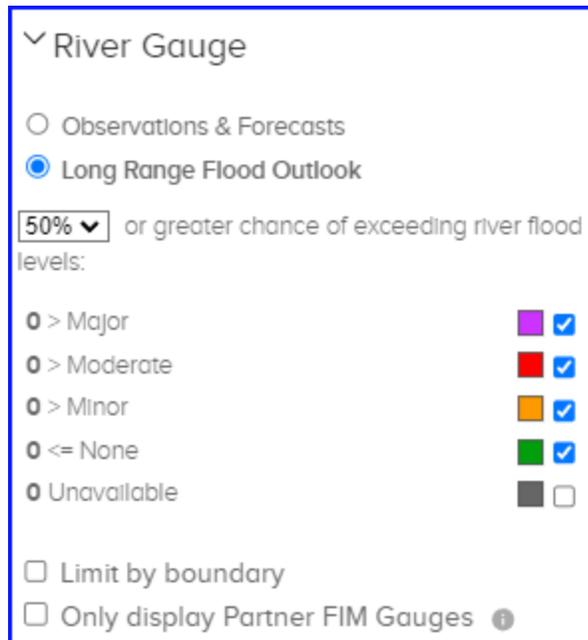
Figure 15 - River gauge Layer Menus showing both options.

There are two buttons available to aid in filtering the data shown on the map bottom of Figure 14 and 15).

☐ "*Limit by boundary*" limits the gauges displayed on the map to those within the currently selected boundary. For example, if the user zooms in on a particular state, gauge data from outside the state boundary may be shown. By enabling this button, those gauges outside the boundary are not shown.

☐ "*Only display Partner FIM*" limits the gauges displayed on the map to those which have Flood Inundation Mapping (FIM) enabled.

Hazards

Under Hazards, users can choose to display all NWS products currently in effect (much like the weather.gov homepage) by selecting All, or can limit the view to only water-related threats by selecting Hydrologic (Figure 16). Users can also clear the display of NWS products from the map by selecting "Do Not Display". A slider bar allows the user to adjust the opacity.
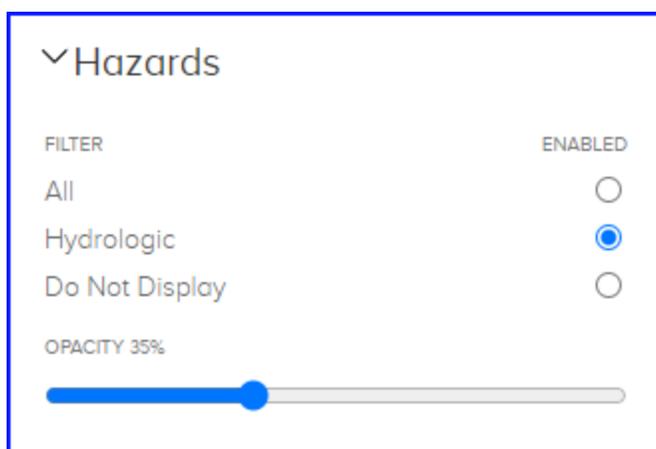
Figure 16 - Hazards layer menu

Precipitation Estimate

Under "Precipitation Estimate", users can choose to view estimates of past precipitation across the continental United States, Puerto Rico, and Alaska. Refer to Appendix A for more information on the Precipitation Analysis.

Note: Click on/off the "Enabled" button to turn the display of this service on and off (Figure 17, 1).

Select the "Display estimated precipitation on hover" to enable the ability to see pop-up precipitation estimates for each grid cell (Figure 17, 2).

Temporal choices include:

- Year
  - Full (Calendar) or Water Year (October 1 - September 30) back to 2005
- Month

- ○ Any month back to 2005
- Day
  - ○ Any day back to 2005
  - ○ Within the last 15 days, users can also select different time lengths ranging from 1-hour to the last 365 days.

For each temporal choice above, the following products are available to be displayed on the map:

- Observed - This map integrates multi-sensor quantitative precipitation estimates (QPE) from the NWS River Forecast Centers. Multi-sensor QPEs are produced by integrating radar-based precipitation estimates, satellite-based precipitation estimates, and ground-based precipitation gauge data.
- Normal - This map shows Normal precipitation as derived from 1981-2010 Parameter-elevation Relationships on Independent Slopes Model (PRISM) climate data created by Oregon State University.
- Departure from Normal - This map is generated by subtracting the Normal precipitation value from the Observed precipitation value for each grid cell.
- Percent of Normal - This map is generated by dividing the Observed Precipitation by the Normal precipitation for each grid cell.

Users can choose to view and adjust the opacity of Observed, Normal, Departure from Normal, or Percent of Normal products by using the slider bar above the Rainfall Legend.
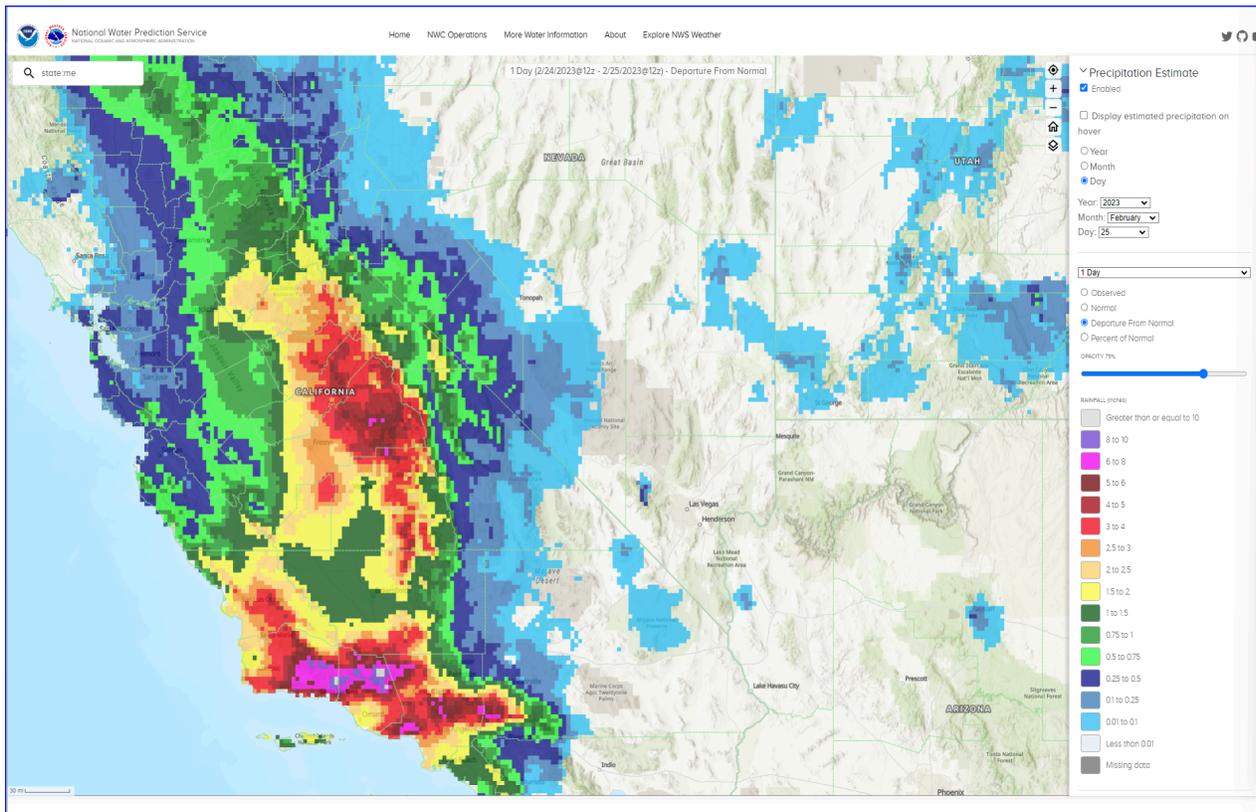
Figure 17 - Precipitation Estimation

National Water Model

[The National Water Model (NWM)](#) is a hydrologic modeling framework that simulates observed and forecast streamflow over the entire continental United States (CONUS), southern Alaska (Cook Inlet, Copper River Basin, and Prince William Sound regions), Hawaii, Puerto Rico and the US Virgin Islands. The NWM produces hydrologic guidance at a very fine spatial and temporal scale. The NWM forecasts complement the official NWS river forecasts available at approximately 4000 locations by providing guidance at approximately 3.4 million river reaches that do not have an RFC generated river forecast. The NWM output provides supplemental guidance to NWS forecasters and should not be considered an official NWS river forecast.

There are three display options available the user can "enable" in this tab (Figure 18). Review the pop-up disclaimer when viewing these products.
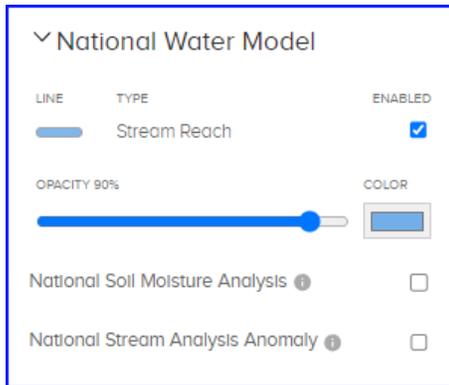
Figure 18 - National Water Model Layer with "Stream Reach" Enabled

Stream Reach

When "Stream Reach" is enabled, users can choose to display and adjust the opacity of the stream reaches where NWM guidance is available.

The streamflow network on the NWM layer is shown in a user-selectable color when the layer is enabled. As one zooms in, more of the network is disclosed. At river gauge locations where there is an official NWS gauge (denoted by a square and/or circle marker), selecting the marker provides access to the official hydrograph ("Official" tab) for that gauge and a supplemental hydrograph ("National Water Model Guidance" tab) for the river reach that contains the gauge. This supplemental "National Water Model Guidance" hydrograph displays the NWM model output in addition to the official hydrograph. Selecting a section of river with no gauge marker (no official forecast) shows only the NWM guidance hydrograph for that river section.

Users can toggle on and off the following types of NWM water guidance: *Analysis and Assimilation (default choice), Short-Range (default choice, Medium Range Blend (MRB, default choice), Medium-Range Ensembles, and Long-Range Ensembles* (Figure 19).

- *Analysis (AnA):* This trace uses forcing data from the HRRR, RAP, and observed precipitation to show modeled streamflow for the past three days.

- *Short Range (SR):* This 18-hour streamflow forecast uses the HRRR and RAP weather models.
- *Medium Range Blend (MRB):* This 10-day streamflow forecast uses the [National Blend of Models](#).
- *Medium Range Ensembles:* Click on the text to open. Presents a streamflow forecast using the [GFS](#) model including the most recent 10-day medium-range, the 8.5 day 6-member ensemble mean, and the 6 individual medium-range ensemble members each extending out to 8.5 days. Users can toggle each trace on/off.
- *Long Range Ensembles:* Click on the text to open. A suite of streamflow forecasts which include the 30-day long-range ensemble mean and the 4 individual long-range ensemble members each extending out to 30 days.
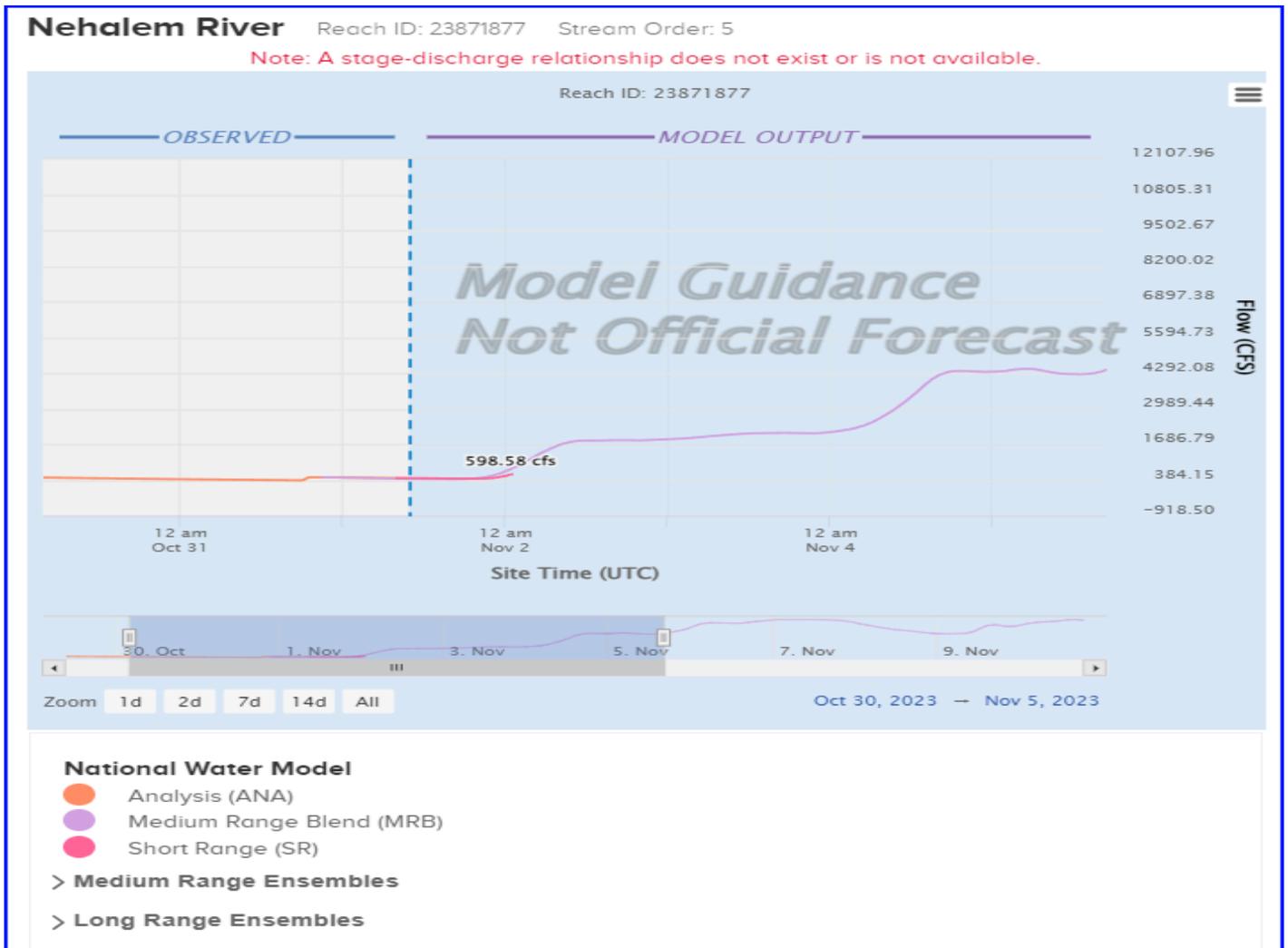
Figure 19 - Example of NWM forecast output for a small, ungauged stream

National Soil Moisture Analysis

Enabling this button displays the NWM National Soil Moisture Analysis product on the map. This map uses NWM near-surface soil saturation data from the most recent Analysis and Assimilation (AnA) cycle, which updates hourly; it depicts the soil saturation percentage in the top 40 cm of the soil layer. (Figure 20)
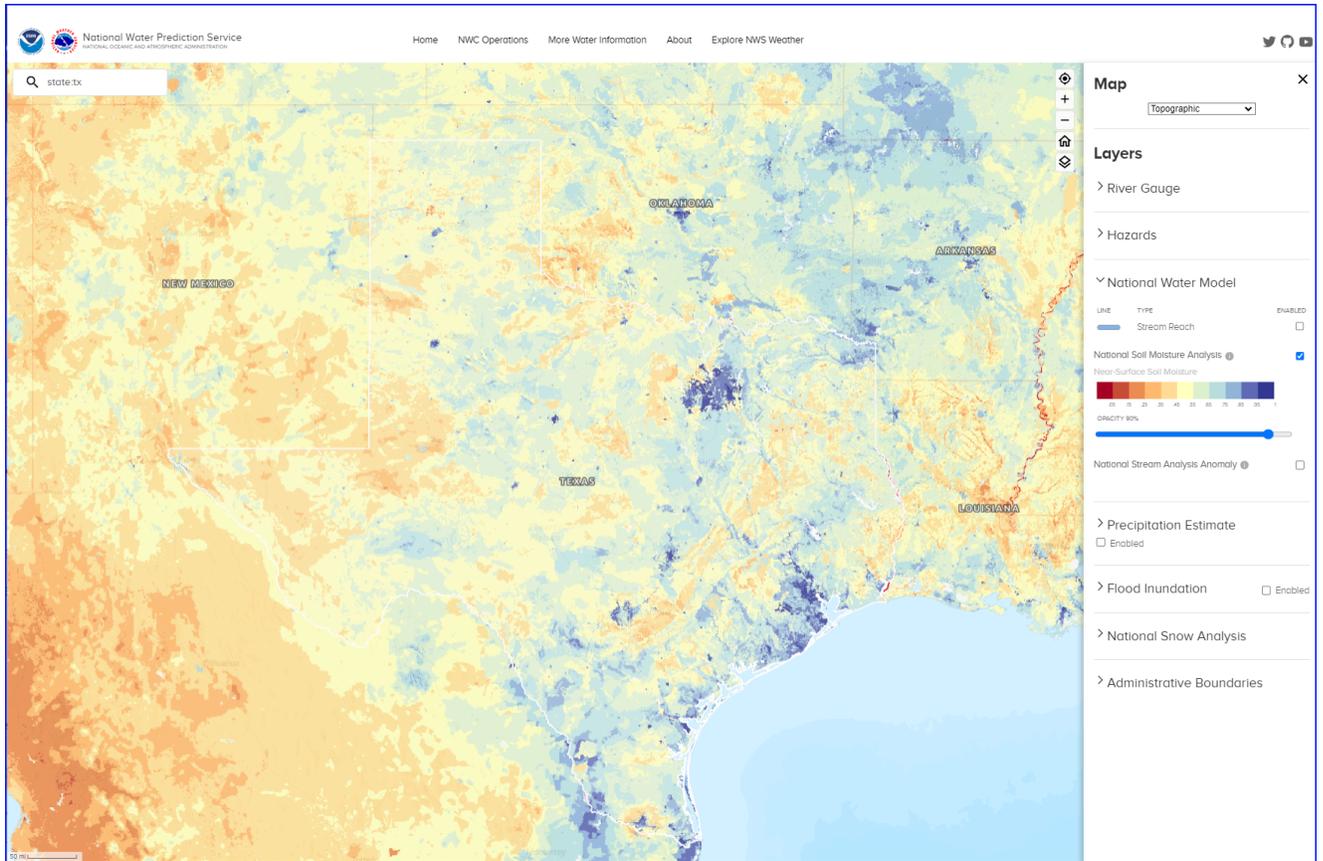
Figure 20 - Example of the NWM National Soil Moisture Analysis product

National Stream Analysis Anomaly

Enabling this button displays the NWM National Stream Analysis Anomaly. This layer depicts seasonal streamflow anomalies derived from the Analysis and Assimilation configuration of the National Water Model (NWM) over the contiguous U.S. The anomalies are calculated for each reach based on 7-day moving average streamflow percentiles for each reach, for the current calendar day. (Figure 21).
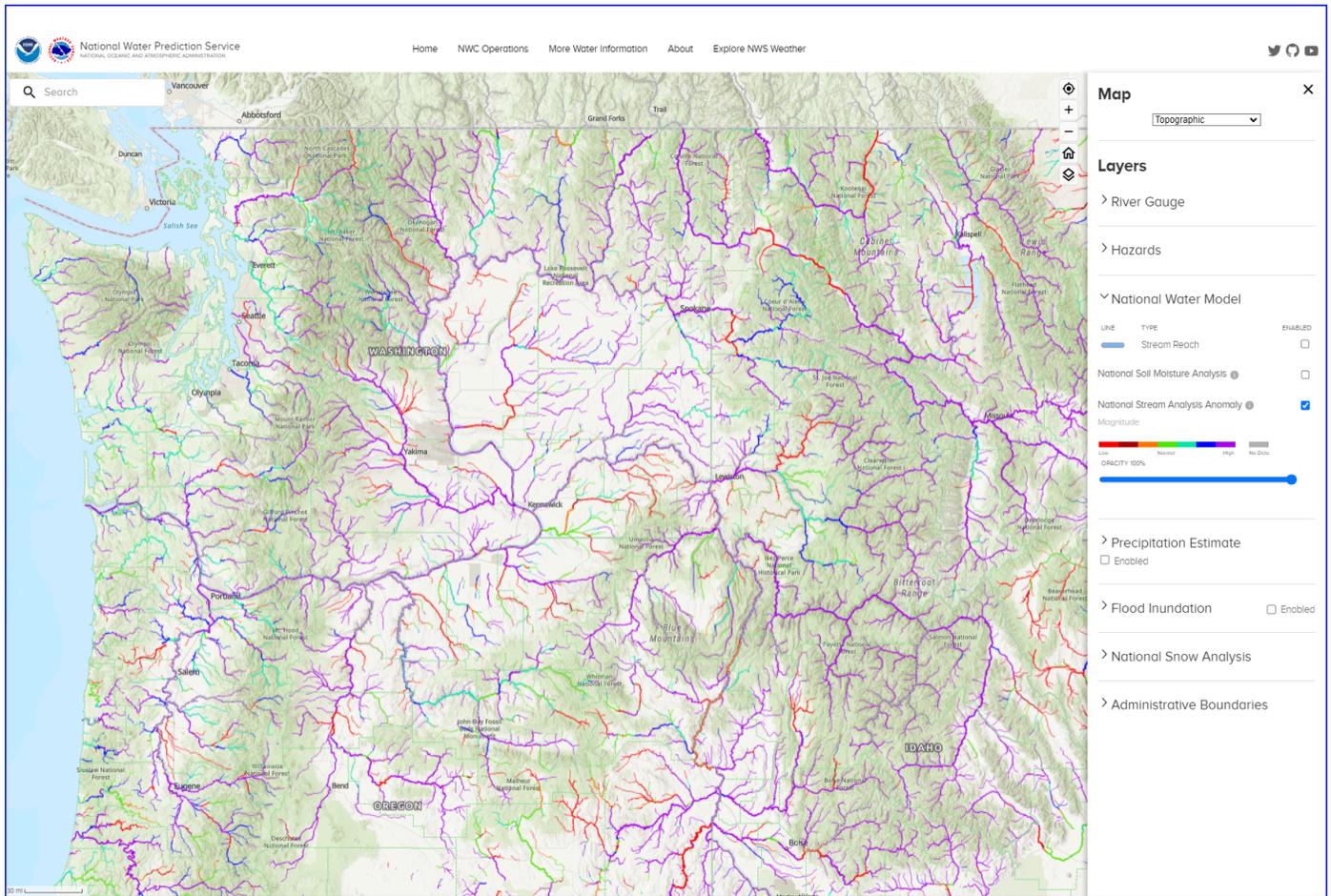
Figure 21 - Example of the NWM National Stream Analysis Anomaly

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Flood Inundation

Note: Flood Inundation Layers are currently experimental products and are not available for all areas. Learn more here.

When "Flood Inundation" is enabled, users are presented with additional display options. Under "Guidance Options" there are three products currently available. "RFC Max Forecast", "NWM Latest Analysis", and "NWM Max Forecast". Information on these products can be found here.

Zoom in to a local level to engage the flood inundation mapping. Once the guidance option is chosen (RFC Max Forecast is the default FIM guidance option), the user can choose from among a number of FIM display options, all are toggled on by default (Figure 22):

- *River Flow NWM Estimated Annual Exceedance Probability*. This layer depicts the magnitude of the NWM streamflow forecast where the NWM is signaling high water. This service is derived from the Analysis and Assimilation configuration of the NWM over the contiguous U.S. Shown are those reaches with flow at or above high water thresholds. The threshold flow is the flow associated with a regionally varied annual exceedance probability (AEP) (e.g. 65%, 70%, 80%, etc.) that is derived from the 40-year retrospective simulation of the NWM.
    - Reaches are colored by the annual exceedance probability (AEP) of their current flow. High water thresholds (regionally varied) and AEPs were derived using the 40-year NWM v2.1 reanalysis simulation.
- *Levee Info*. This toggle button displays levee walls, embankments and protected areas that have elevations defined in the United States Army Corps of Engineers (USACE) National Levee Database. Local levees are not depicted.
- *Coastal Modeling Zone*. This toggle button displays the 10-meter elevation contour above the zero reference point defined by the NAVD88 datum. In these areas, caution should be used when interpreting the inundation extent predicted by the FIM services as it may not reflect the comprehensive impact of the flood threat given the influence of coastal processes (e.g. tides, waves, and storm surge).
- *Inundation Coverage*. This toggle button displays the portions of the United States which currently have experimental NWC FIM products available for use. Currently this includes portions of Texas, Pennsylvania, and New York.
- *Inundation*. This button turns the user-chosen guidance inundation layer on/off (Figure 23).

Figure 22 - Flood Inundation Layer

Figure 23 - Example of the Flood Inundation layer with the "Satellite" basemap.

National Snow Analysis

The Office of Water Prediction's National Operational Hydrologic Remote Sensing Center (NOHRSC) ingests daily ground-based, airborne, and satellite snow observations from all available electronic sources. These data are used along with estimates of snowpack characteristics generated by a physically-based snow model to generate the operational, daily NOAA National Snow Analyses (NSA) for the coterminous U.S. The snow model is an energy-and-mass-balance, spatially-uncoupled, vertically-distributed, multi-layer snow model run operationally at 1-km² spatial resolution and hourly temporal resolution. Ground-based and remotely-sensed snow observations are assimilated daily into the simulated snow-model state variables.

Under "National Snow Analysis", users can choose to display and adjust the opacity of two products produced by the National Snow Analysis. The "Snow Depth" depicts the depth of snow in inches (Figure 24). The "Snow Water Equivalent" product depicts the liquid water content of the snowpack in inches (Figure 25).
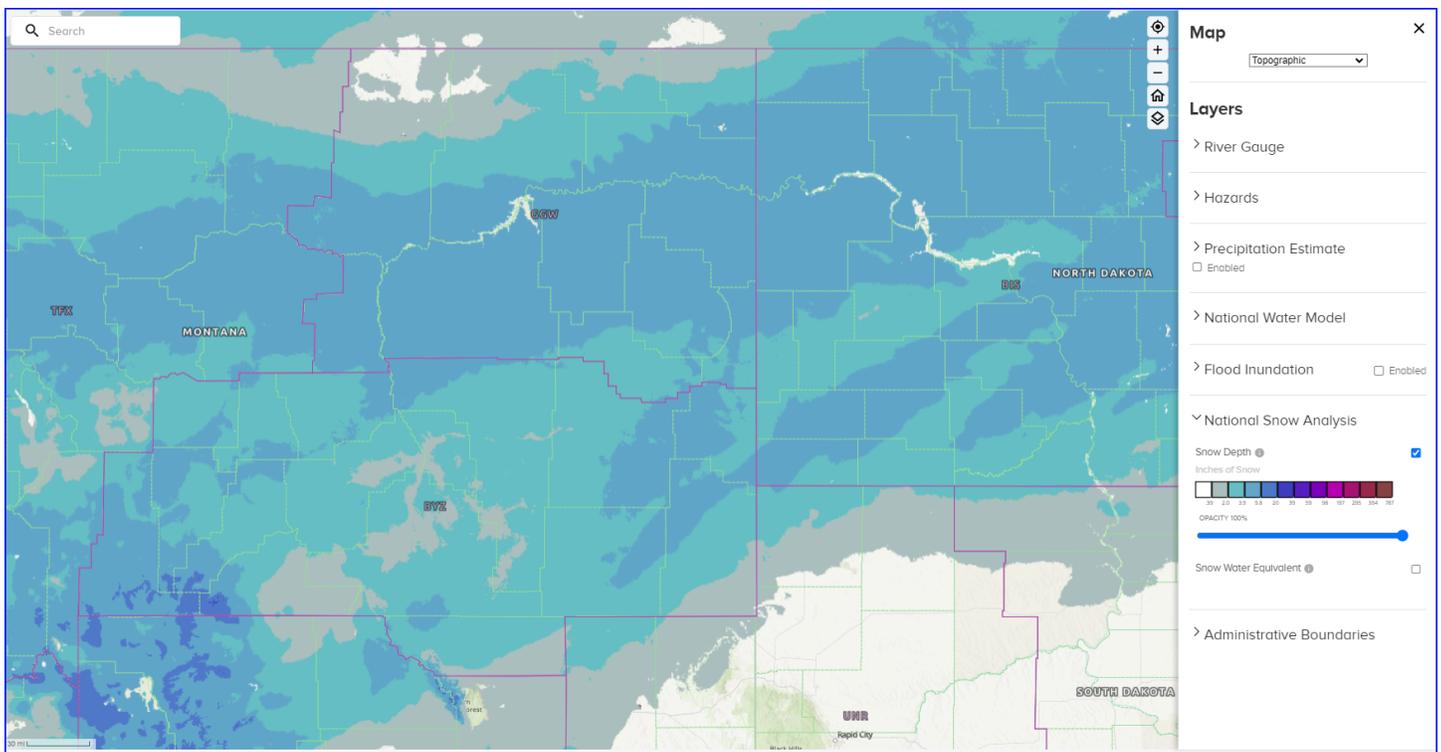
Figure 24 - Example of a National Snow Analysis Snow Depth Product
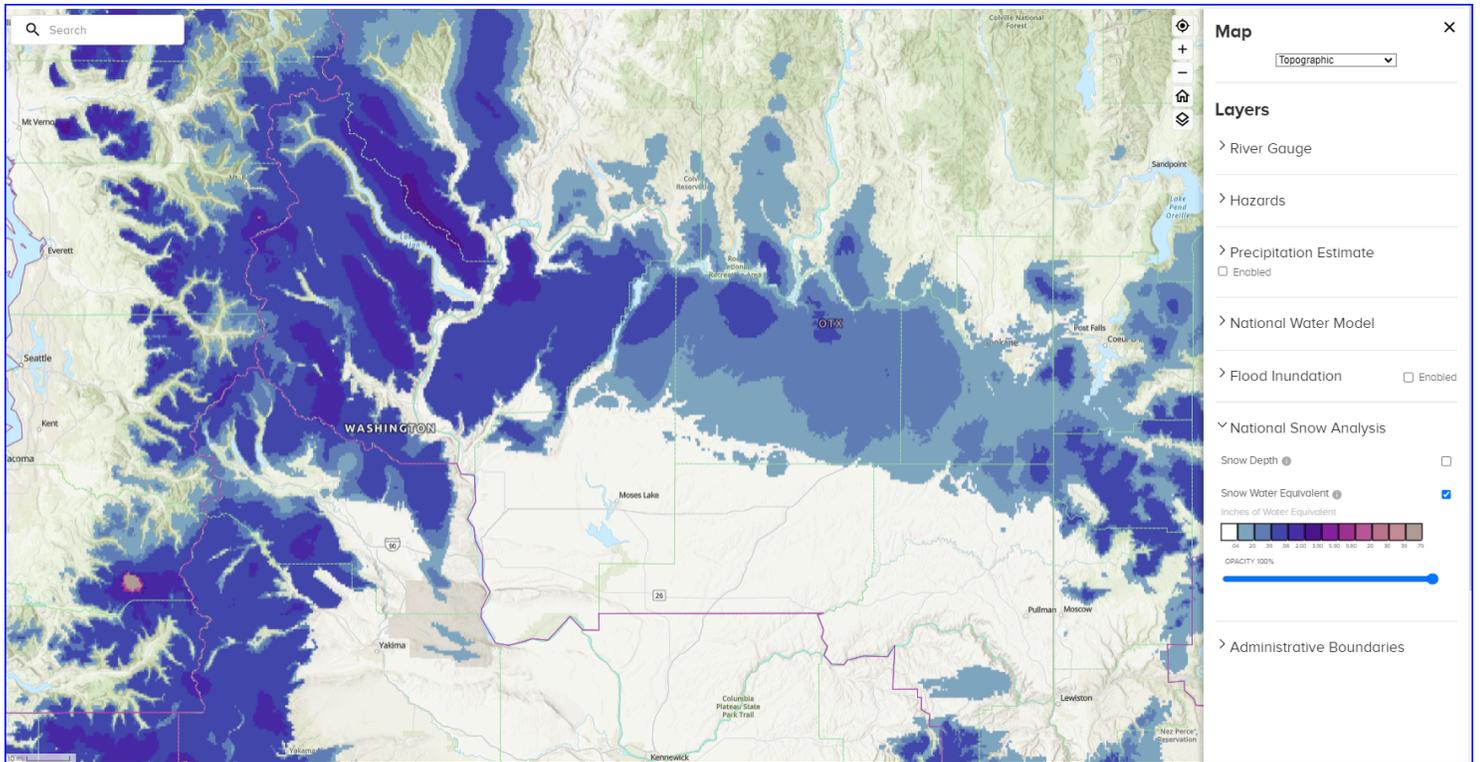
Figure 25 - Example of a National Snow Analysis Snow Water Equivalent Product

Administrative Boundaries

Under "Administrative Boundaries", users can choose to view and adjust the opacity and color of River Forecast Centers' (RFC) areas of responsibility, Weather Forecast Office (WFO) Hydrologic Service Areas, as well as state and county political boundaries (Figure 26).
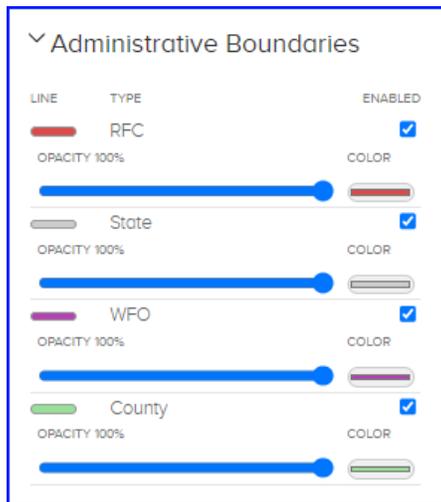
Figure 26 - Available Administrative Boundaries for display on the map

2.3. NWPS Menu Pulldowns

NWPS menu pulldowns ("columns") contain hydrologic information that is not displayed on the NWPS map (Figure 27).

Figure 27 - Column choices on NWPS

The menus are arranged as follows:

- Home - Resets the map view to the full continental United States (CONUS).
- NWC Operations
  - Products
    - Significant River Flood Outlook
      - This Flood Outlook is intended to provide a spatially general outlook for significant 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.

- ■ Area Hydrologic Discussion
  - ● Experimental short range, episodic discussion and graphic which highlights locations across the nation that may be impacted by rapid-onset flooding, using National Water Model and other guidance. More information can be found here, with a one-page summary here.
- ■ National Hydrologic Discussion
  - ● Experimental discussion of the current and forecast hydrologic conditions across the nation, including short and medium range (Days 1-10) observed and modeled hydrologic guidance. More information can be found here, with a one-page summary here.
- ■ Flood Hazard Outlook
  - ● Experimental, high-level graphical depiction and text of key messages highlighting the potential threat of inland flood hazards (flash, urban, small stream and riverine) and their associated impact severity (catastrophic, considerable, and limited) for the next seven days. More information can be found here, with a one-page summary here.
- ○ Archive
  - ■ Archives of the above products
- ● More Water Information
  - ○ Image Viewer
    - ■ Product Description Document
- ● About
  - ○ NWPS Downloads
  - ○ National Water Center
  - ○ National Water Model
  - ○ Hydrographs
  - ○ River Forecast Centers
  - ○ Hydrologic Text Product Information
  - ○ FAQ
  - ○ What's new
  - ○ Data and Web Services Catalog
    - ■ See Appendix D for details
- ● Explore NWS Weather
  - ○ Active Alerts
    - ■ Numerous links to alerts

- ○ Past Weather
  - ■ Numerous links
- ○ Current Conditions
- ○ Forecast
- ○ Information Center
- ○ Weather Safety
- ○ News
- ○ Education
- ○ About

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3. The NWPS API

All NWPS data is available via the new NWPS Application Programming Interface (API), which allows users to include NWPS information directly into their own applications and services (Figure 28).

To access the APIS, go to: https://api.water.noaa.gov/nwps/v1/docs/.

View the NWPS API training webinar.

Example: Latest data values with a bound box for Pennsylvania:

https://api.water.noaa.gov/nwps/v1/gauges?bbox.xmin=-80.52&bbox.ymin=39.72&bbox.xmax=-74.68&bbox.ymax=42.26&srid=EPSG_4326
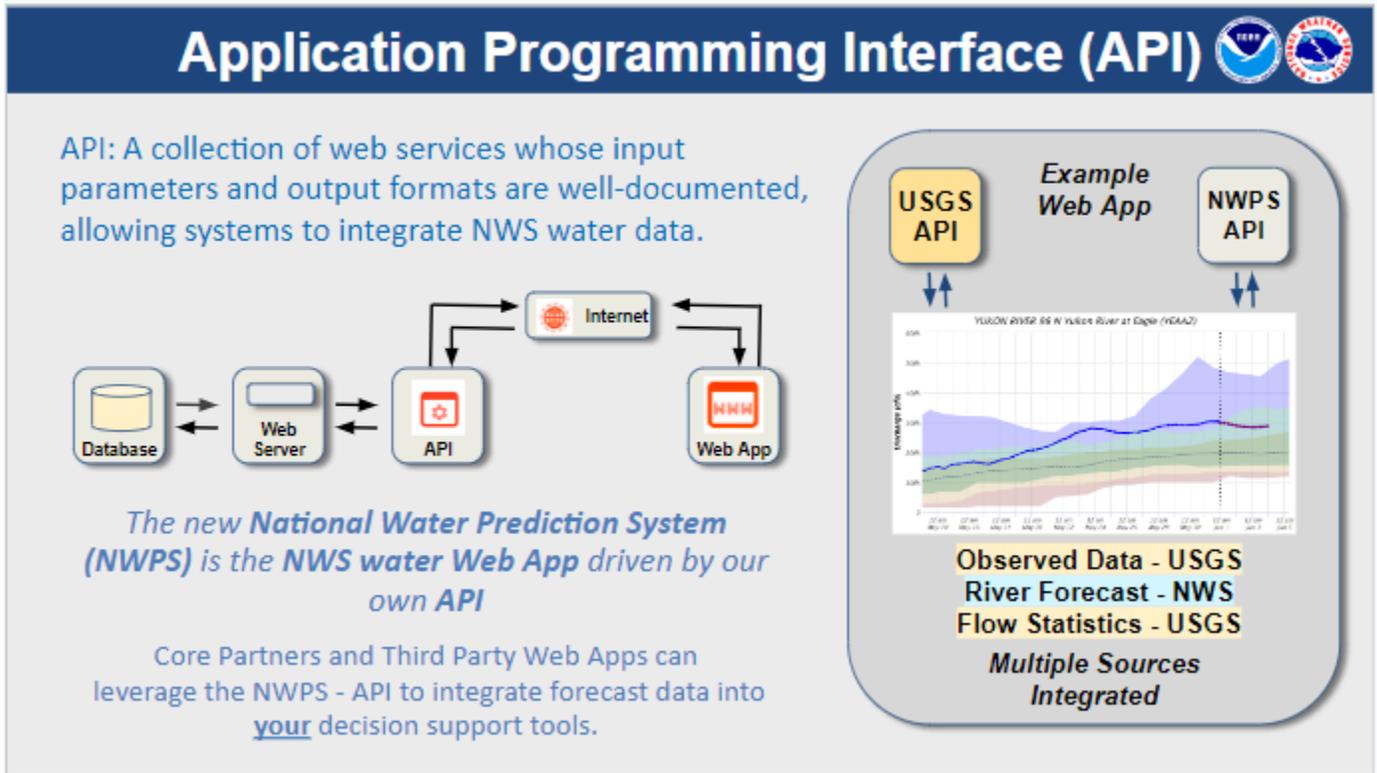
Figure 28 - The NWPS API Interface

4. Precipitation Data

The precipitation data are quality-controlled, multi-sensor (radar and rain gauge) precipitation estimates obtained from National Weather Service (NWS) River Forecast Centers (RFCs) and mosaicked by National Centers for Environmental Prediction (NCEP). The original data from NCEP is in GRIB (GRIdded Binary or General Regularly-distributed Information in Binary form) format (files pre-March 22nd, 2017 are in XMRG format) and projected in the Hydrologic Rainfall Analysis Project (HRAP) grid coordinate system, a polar stereographic projection true at 60°N / 105°W.

To automate or download multiple datasets, the user can download a program called wget. (Due to increased web security, the anonymous FTP server is no longer available.)

The NWPS Quantitative Precipitation Estimate (QPE) Data page is available here:
https://water.noaa.gov/about/precipitation-data-access

4.1. Stage IV Hourly QPE Precipitation Data for CONUS and Puerto Rico

https://water.noaa.gov/resources/downloads/precip/stageIV/current/

	Since 12Z	Latest 1-hour	Latest 2-hour	Latest 3-hour	Latest 6-hour	Latest 12-hour	Latest 24-hour
CONUS	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF
Puerto Rico	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF	NetCDF GeoTIFF

4.2. Stage IV Daily QPE Source Data (2016-present)

Daily grib2 files for CONUS, Alaska or Puerto Rico. See Appendix B, QPE Data formats for more detail on these files.

These files are available daily as a tar file in the following directory:

https://water.noaa.gov/resources/downloads/precip/stageIV/YYYY/MM/DD/ncep_stage_iv_source_files_YYYYMMDD.tar

YYYY: Year (2016-present Conus, 3/2017-present Alaska, 4/27-present Puerto Rico)
MM:Month (01-12)
DD: Day (01-31)

Example:
https://water.noaa.gov/resources/downloads/precip/stageIV/2024/02/02/ncep_stage_iv_source_files_20240202.tar

The tar file contains these three files:
ak_20231016_24.grb2
conun_20231016_24.grb2
pr_20231016_24.grb2

4.3. NCEP Stage III Daily Accumulations (1/1/2005 - 6/27/2017)

These files are available in the following directory:

https://water.noaa.gov/resources/downloads/precip/stageIII/**YYYY**/**MM**/**DD**/

YYYY: Year (2005-6/27/2017)
MM: Month (01-12)
DD: Day (01-31)

The directories contain the following files:

-conus_precip-composite_hi_res_YYYYMMDD.tar.gz   [gzip compressed file containing a high resolution png image]

-nws_precip_1day_observed_shape_YYYYMMDD.tar.gz [shapefile for the day]

-nws_precip_YYYYMMDD_nc.tar.gz [NetCDF files]

-nws_precip_conus_YYYYMMDD.nc [netCDF file for CONUS]

-nws_precip_pr_YYYYMMDD.nc [netCDF file for Puerto Rico]

4.4. NCEP Stage IV Daily Accumulations (06/28/2017 - Current)

These files are available daily as a tar file, with a valid period ending at 12Z on the day of the file in the following directory:

https://water.noaa.gov/resources/downloads/precip/StageIV/**YYYY**/**MM**/**DD**/

If the date is requested within the last three weeks (21 days) the following files are available:

1-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_1day_YYYYMMDD_[conus,alaska,pr].[nc,tif]**

2-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last2days_YYYYMMDD_[conus,alaska,pr].[nc,tif]**

3-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last3days_YYYYMMDD_[conus,alaska,pr].[nc,tif]**

4-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last4days_YYYYMMDD_[conus,alaska,pr].[nc,tif]**

5-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last5days_YYYYMMDD_[conus,alaska,pr].[nc,tif]**

6-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last6days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

7-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last7days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

10-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last10days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

14-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last14days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

30-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last30days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

60-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last60days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

90-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last90days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

120-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last120days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

180-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last180days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

365-day precipitation:
YYYY/**MM**/**DD**/**nws_precip_last335days_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

Water year to date precipitation (Oct 1 - date):
YYYY/**MM**/**DD**/**nws_precip_wytd_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

Year to date precipitation (Jan 1 - date):
YYYY/**MM**/**DD**/**nws_precip_ytd_YYYYMMDD_**[**conus**,**alaska**,**pr**].[**nc**,**tif**]

If the date is requested within the last month (31 days), one-day and 10-day precipitation is available (see format above).

If the date is on the first of the year, the year-to-date is available (for the previous year).

If the date is on the first of the month, the month-to-date is available (for the previous month).

If the date is on October 1st, the water year to date is available (for the previous water year). A water year runs from 10/1-9/30.

File Conventions:

YYYY: Year (6/28/2017-present)
MM:Month (01-12)
DD: Day (01-31)

conus: Continental United States
alaska: Alaska
pr: Puerto Rico

nc: NetCDF File format
tif: GeoTIFF File format

5. Appendix A: About the Precipitation Analysis

These pages graphically show the short-term observed and climatic trends of precipitation across the lower 48 United States (CONUS), Puerto Rico and Alaska.

"Observed" data is a byproduct of National Weather Service (NWS) operations at the 12 CONUS River Forecast Centers (RFCs), and is displayed as a gridded field with a spatial resolution of roughly 4x4 km. "Observed" data is expressed as a 24-hour total ending at 1200 Z (same as Greenwich Mean Time, or GMT), with longer periods simply being a summation of multiple 24-hour periods. 1200 GMT is used as the ending time for a 24-hour total, because it is the end of the "hydrologic day", a standard used in river modeling. Additionally, 1200 GMT closely coincides with the reporting time for most of the National Weather Service's cooperative observers, whose data are used as a quality control on the dataset. 1200 GMT coincides with 8 AM EDT, 7 AM EST, 7 AM CDT, 6 AM CST, etc.

When viewing "ALL RFC DATA" the user may notice that "Observed" data extends well beyond the U.S. border, most notably north of Washington and Idaho and west of Texas. Several RFCs located in the CONUS have service areas that extend beyond the U.S. border, in order to model rivers that flow into the United States. Examples include the Columbia River in the Pacific Northwest and tributaries of the Rio Grande along the Texas-Mexico border. Although no forecasts are provided outside of U.S. boundaries, precipitation estimates are created over these areas in order to simulate streamflow along these rivers as they cross into the United States. When viewing "ALL RFC DATA" it may be helpful to turn on the "RFC Boundary" overlay as a geographic reference.

Normal Precipitation

"Normal" precipitation is derived from PRISM climate data, created at Oregon State University. The PRISM gridded climate maps are considered the most detailed, highest-quality spatial climate datasets currently available. The 30 year PRISM normal from 1981-2010 is used for precipitation analysis since 2004. Prior to 2004 the 30 year PRISM normal from 1961-1990 is used.

Puerto Rico PRISM data comes from a separate project by the International Institute of Tropical Forestry (Reference: Daly, C, E.H. Helmer and M. Quiñones. 2003. Mapping the climate of Puerto Rico, Vieques and Culebra. International Journal of Climatology 23:1353-1381.) PRISM data for Puerto Rico covers the time period 1963-1995.

The PRISM data is expressed as a monthly normal rainfall. For durations less than one month, the value for that month is divided by the total days in that month and multiplied by the number

of days in the selected field. For example, a 7-day normal for January 10th (ending at 1200 GMT) would be 7/31 of the total normal rainfall for January, while a 14-day normal would be 9/31 of January's normal plus 5/31 of December's normal.

Derived Precipitation Products

"Departure from Normal" and "Percentage of Normal" graphics are generated by simple grid mathematics, where the "Normal" dataset is respectively subtracted from or divided into the "Observed" dataset.

Observation Methods

Most RFCs derive the "Observed" precipitation field using a multi-sensor approach. Hourly precipitation estimates from WSR-88D NEXRAD are compared to ground rainfall gauge reports, and a bias (correction factor) is calculated and applied to the radar field. The radar and gauge fields are combined into a "multisensor field", which is quality controlled on an hourly basis. In areas where there is limited or no radar coverage, satellite precipitation estimates (SPE) can be incorporated into this multisensor field. The SPE can also be biased against rain gauge reports.

The Stage IV precipitation data is mosaicked into a national product at NCEP from the regional hourly and 6-hourly multi-sensor (radar+gauges) precipitation analyses produced by the 12 River Forecast Centers (RFCs) over the Continental United States. Significant manual quality control is done at the RFCs. Mosaicing is done at NCEP within an hour of receiving any new hourly/6-hourly data from one or more RFC.

The following links provide additional information about the programs used to derive these multisensor fields:

- [Assessment and Implications of NCEP Stage IV Quantitative Precipitation Estimates for Product Intercomparisons](#)
- National Stage IV QPE Product - Mosaicked from Individual RFC's Quantitative Precipitation Estimates (QPEs) (link needed)
- [Enhancing Precipitation Estimation Capabilities at National Weather Service Field Offices Using Multi-Sensor Precipitation Data Mosaics](#)

In mountainous areas west of the Continental Divide, additional methods are used to derive the "Observed" data. Gauge reports are plotted against long term climatological precipitation (PRISM data), and derived amounts are interpolated between gauge locations.

Quality of Data

Studies have shown that algorithms which combine sensor inputs -- radar, gauge, satellite -- yield more accurate precipitation estimates than those which rely on a single sensor (i.e. radar-only, gauge-only, satellite-only) (References). This dataset is one of the best sources of timely, high resolution precipitation information available. Users should understand the inherent weaknesses of this dataset before using it in certain decision - making applications, especially those which require a high degree of accuracy.

Radar Data Errors: These precipitation estimates are based substantially on radar which samples over a large area. Each grid value on the maps represents average precipitation over roughly 16 km2 (6¼ mi2). Radar values may not be comparable with one or more rain gauges within that area. Radar sampling errors that can create inaccuracies in the data include freezing or frozen precipitation, low topped convection, bright banding, accuracy of the reflectivity - rainfall relationship in use, calibration of the radar, radar location and elevation, range degradation (i.e., larger sampling area and effect of intervening precipitation), and the radar's effective coverage (e.g., physical obstructions such as mountains).

Precipitation Gauge Errors: A rain gauge measures approximately 12 in2. There are over 10,000 precipitation gauges scattered through the country. Gauge sampling problems could include freezing precipitation, windy conditions, gauge siting (e.g., obstructions around the gauge), under-measurement by tipping bucket gauges in high intensity rainfall, and gauge maintenance. In places where NWS quality control efforts fail to resolve persistent problems, significant sampling errors are noticeable in longer-duration products (e.g. 30 days or more).

Horizontal Accuracy: Horizontal accuracy errors may reach up to 5 km (3 mi). In other words, "peaks" in the precipitation data may actually have occurred miles away.

This information is not certified as official precipitation estimates. Official, certified data is available exclusively through the National Centers for Environmental Prediction .

Production / Update Times

The Stage IV precipitation data is updated and re-mosaicked per NCEP guidelines. (correct link needed)

The QPE precipitation analysis pages and downloadable data are updated any time updated mosaicked data is detected from NCEP. Data for the western U.S. are usually available by mid morning each day. The data are preliminary and subject to change throughout the day and even on subsequent days. While the data in the final update are much less likely to change, they are neither official nor certified. Please contact the National Climatic Data Center for certified past weather information.

Data Formats

The QPE data are provided in GeoTIFF and CF-1.6 compliant NetCDF formats, however, the legacy, pre-March 22nd, 2017 QPE data is only available in Shapefile and non-CF compliant NetCDF formats. This data is available for download and use in other projects and research. More information about using NetCDF files is available from the University Corporation for Atmospheric Research (UCAR).

Metadata

The following links provide more information about the observed precipitation, normal precipitation, and derived precipitation products:

- Observed precipitation
- Normal precipitation
- Departure from normal precipitation
- Percent of normal precipitation

6. Appendix B: QPE Data Formats

6.1. Data Formats Post-March 22nd, 2017 - Derived from Stage IV QPE

Tips for using these precipitation data formats on common GIS platforms are available in [Appendix C - Use of New Precipitation File Formats in Common GIS Software](#)

6.1.1. NetCDF

The new QPE NetCDFs generated from the NCEP Stage IV data are CF-compliant multi-variable NetCDFs. The variables they contain are:

- *observation* - Last 24 hours of QPE spanning 12Z to 12Z in inches
- *normal* - PRISM normals in inches (see [Appendix A- Normal Precipitation](#))
- *departure_from_normal* - The departure from normal in inches
- *percent_of_normal* - The percent of normal

6.1.2. GeoTIFF

The new QPE GeoTIFFs generated from the NCEP Stage IV data are multi-band GeoTIFF. The bands they contain are:

- Band 1 - Observation - Last 24 hours of QPE spanning 12Z to 12Z in inches
- Band 2 - PRISM normals - PRISM normals in inches (see [Appendix A- Normal Precipitation](#))
- Band 3 - Departure from normal - The departure from normal in inches
- Band 4 - Percent of normal - The percent of normal

6.1.3. Missing Data

In the output files, the special value of -10,000 indicates the cell is expected to have valid data, however, no data has been received. Since data is submitted by individual RFCs, if an RFC does not submit data for their area of responsibility, all the cells within the RFC are filled with a missing value indicator of -10,000 and displayed as dark gray on the mapping interface.

6.1.4. Layer Masks

The output masks are used to determine which cells within the coverage domain are expected to contain precipitation data and may be downloaded here.

In all three masks, a value of 0 marks a cell that does not fall within the bounds of valid input data. A three digit value indicates which RFC is responsible for providing data for a given grid cell. In many cases, any value greater than 1 can simply be considered a cell which should contain valid data. Lastly, the CONUS mask contains cells with a value of 1. These cells indicate they contain offshore readings from coastal RFCs. A value of 1 fills the cells in the Gulf of Mexico and of the eastern coastline of the United States.

6.1.5. Symbolizing in ArcMap or QGIS

To symbolize the downloadable accumulations to match the look of the mapping interface, use the prebuilt ArcMap layer files or the QGIS color map text files:

- [ArcMap v10.5 QPE Symbology (NetCDF only)](ArcMap v10.5 QPE Symbology)
- [ArcMap v10.3 - v10.4 QPE Symbology (NetCDF only)](ArcMap v10.3 - v10.4 QPE Symbology)
- QGIS QPE Symbology
  - *Note: The pre-built layer files, tested with ArcMap 10.5, does not support the "Classified" symbology type for the multiband GeoTiff files. When using QGIS (tested with QGIS 2.8.6-Wein), either file format can be used.*

Applying symbology in ArcMap

1. Drag the NetCDF file into ArcMap
2. (optional) Select the appropriate variable in the NetCDF tab if it's not already asked for a selection
3. Open the Symbology tab of the layer's properties
4. Select the "Classified" symbology type in the left pane
5. Click the folder icon to import the symbology from a file or other layer
6. Click the folder icon in the "Import Symbology" window
7. Select the appropriate .lyr file for the dataset being viewed
8. Click "Ok"

Applying symbology in QGIS

1. Drag a NetCDF file or GeoTiff into QGIS
2. (optional) Select the appropriate band. *If using GeoTiff, see band definitions above*
3. Open the Style pane of the layer's properties
4. Select "Single band pseudocolor" as the Render Type
5. Click the folder icon for "Load color map from file"
6. Select the appropriate color map file for the dataset being viewed
7. Click "Ok

6.2. Data Formats Pre-March 22nd, 2017 - Derived from Stage III QPE

6.2.1. Shapefile Information
The shapefile contains the following fields:

1. *ID* - a unique value for each grid bin

2. *HRAPX* - column number of the HRAP grid cell (higher numbers are further east)

3. *HRAPY* - row number of the HRAP grid cell (higher numbers are further north)

4. *LATITUDE* of the HRAP grid point

5. *LONGITUDE* of the HRAP grid point

6. *GLOBVALUE* - 24-hour precipitation value in inches. "-2" values correspond to "Missing Data", i.e. an incomplete dataset.

The second download option "Legend File" to reproduce the color scheme we are using. If using ArcView, the user needs to copy it into their c:\esri\av_gis30\arcview\legend_avl\ directory and load it manually through the legend editor. This file does not change from day to day.

Projection files (.PRJ extension) is available at
https://water.weather.gov/precip/archive/nws_precip_projection.prj

Please note, grids with no precipitation (i.e. 0.00") are not in the observed data shapefiles. A shapefile with all points is available at
https://water.weather.gov/precip/archive/nws_precip_allpoint.tar.gz

A precipitation data legend file can be downloaded at
https://water.weather.gov/precip/archive/nws_precip_legend.avl

A problem was discovered on August 9, 2007. The shapefile coordinates for each HRAP grid were indicative of the lower left corner of the grid rather than the center of the grid. The entire shapefile archive has been updated to correct the lat-lon issue. The shapefile https://water.weather.gov/precip/archive/nws_precip_allpoint_conversion.tar.gz shows both the old and new coordinates for each point.

6.2.2. NetCDF Information (Stage III archive version)

The three netCDF files (one for CONUS, one for Puerto Rico, and one for Alaska), may be used independently of one another. Each file contains the following fields:

1. *hrap_xor and hrap_yor* - the lower left corner of the grid

2. hrapx and hrapy - grid dimensions

3. amountofprecip - an array with the 24-hour precipitation values in hundredths of a millimeter (a value of 2540 corresponds to 1 inch). "-1" values correspond to "No Data", e.g. data over the ocean. "-2" values correspond to "Missing Data", e.g. an incomplete dataset.

4. other metadata - date and time of creation, lat-lon of the bottom-left, bottom-right, top-right and top-left corners of the grids, et al.

NOTE -- Latitude and Longitude are not explicitly stated in the netCDF file. The second download option "HRAP-to-LatLon" contains source code for a C-program. The program contains a function that reprojects HRAP coordinates to Lat-Lon coordinates. The fully compiled program reads the netCDF files and writes ascii files with the following fields:

1. *id* - a unique value for each grid bin

2. *hrapx* - column number of the HRAP grid cell (higher numbers are further north)

3. *hrapy* - row number of the HRAP grid cell (higher numbers are further east)

4. *latitude* of the HRAP grid point

5. *longitude* of the HRAP grid point

6. *value* - 24-hour precipitation value in inches

To compile the C-program the user needs to install the netCDF library on their computer. More information about using netCDF files (including the netCDF C-library) is available from the University Corporation for Atmospheric Research (UCAR).

7. **Appendix C: Use of New Precipitation File Formats in Common GIS Software**

- **ArcMap**

  - NetCDF: Can drag/drop NetCDF files directly from a Windows folder into ArcMap Table of Contents.

  - GeoTIFF: Surf to the file in the Catalog. Expand the the dataset to see Bands 1-4. 1=obs, 2=PRISM Normal, 3=Departure from Normal, 4=Percent of Normal.

- **QGIS**

  - Setting the AHPS Projection: The AHPS file does not contain an EPSG compliant coordinate reference system, so the user must add the definition of the coordinate system into the QGIS system. Select the "Custom CRS" tool from the "Settings" pull-down menu. Click the "+" button to define a new CRS. Input a descriptive name in the 'Name' field and enter the following into the 'Parameters' field:

    +proj=stere +lat_0=90 +lat_ts=60 +lon_0=-105 +x_0=0 +y_0=0 +a=6371200 +b=6371200 +units=m +no_defs

    Click OK and the CRS is added to the users list of definitions and imported AHPS rasters should use this CRS

  - NetCDF: Can drag/drop NetCDF files directly from a Windows folder into the QGIS map document workspace. Select the desired layer name to complete the import process.

  - GeoTIFF: Most QGIS configurations default to assuming multi-band geoTIFF images are RGB and displays bands 1/2/3 as an RGB image. Once loaded into the Table of Contents, double-click the raster name to open the raster properties dialog. Change the render type from "Multiband color" to "Singleband gray". Choose which band is needed (1=obs, 2=PRISM Normal, 3=Departure from Normal, 4=Percent of Normal). Expand the "Load min/max values" dialog and select either "Cumulative count cut" or "Min/Max". Change the "Contrast enhancement" value to "Stretch to MinMax".

- **GRASS**

  - NetCDF: Import netCDF into the users mapset using the r.in.gdal command. The user needs to specify the layer needed. First, point the "Source input" option to

their netCDF. Then insert "NETCDF:" immediately before the file location and ":Layer_Name" after the file location where layer name is one of the following: observation, normal, departure_from_normal, percent_of_normal. The "Source input" option should look like:

> NETCDF:C:\Users\user.name\AHPS\nws_precip_last7days_201706 14_conus.nc:observation

- ○ GeoTIFF: Import raster into the users mapset using the r.import command.

- **SAGA**

  - ○ NetCDF: Select the Geoprocessing pulldown menu, select File, then Grid, then import NetCDF. NetCDF layers are available in the Data Management tab identified by their layer number and layer name

  - ○ GeoTIFF: Same process as NetCDF except the last selection is "import raster". Raster layers are imported individually with the Band Number appended to the name in the Data Management tab.

- **NOAA's Weather and Climate Toolkit (https://www.ncdc.noaa.gov/wct/)**

  - ○ NetCDF: Fully supported.

  - ○ GeoTIFF: Fully supported. Expand the the dataset to see Bands 1-4. 1=obs, 2=PRISM Normal, 3=Departure from Normal, 4=Percent of Normal

8. **Appendix D:** National Forecast and Observed Shapefile Downloads

These shapefiles are updated every 15 minutes. These files are available in the NWPS Data and Web Services *Catalog*. Note: The Maximum Forecast for the Entire Period shapefile, and the Long Range Shapefiles will be available later.

Most Recent Observations:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_obs.zip
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_obs.dbf
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_obs.shp
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_obs.shx

Maximum Forecast 1-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f024.zip
Maximum Forecast 2-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f048.zip
Maximum Forecast 3-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f072.zip
Maximum Forecast 4-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f096.zip
Maximum Forecast 5-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f120.zip
Maximum Forecast 6-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f144.zip
Maximum Forecast 7-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f168.zip
Maximum Forecast 8-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f192.zip
Maximum Forecast 9-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f216.zip
Maximum Forecast 10-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f240.zip
Maximum Forecast 11-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f264.zip
Maximum Forecast 12-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f288.zip
Maximum Forecast 13-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f312.zip
Maximum Forecast 14-Day:
https://water.noaa.gov/resources/downloads/shapefiles/national_shapefile_fcst_f336.zip

9. **Appendix E: Data and Web Services Catalog**

The NWPS Data and Web Services Catalog is available here:

https://water.noaa.gov/about/data-and-web-services-catalog

Content:

- **Data Downloads**
  - All Data Downloads
    - https://water.noaa.gov/resources/downloads/
  - Find the data powering NWPS available for download here.
    - Partner FIM services data download: Partner FIM Services Downloads
    - Long Range River Flood Risk Data: CSV file
    - NWM Hydrofabric and Parameter Shapefiles: NWM Shapefile Downloads
    - Precipitation data downloads: Quantitative Precipitation Estimation (QPE) Downloads
      - See Section 4. Precipitation Data for more information.
    - National Forecast and Observed shapefile downloads: Obs and FCST Shapefile Downloads
      - See Appendix D: National Forecast and Observed shapefile downloads for more information
    - NWS Watch Warning and Advisory (WWA) Data: WWA Shape Files
- **Observed and Forecast River gauge values (River Status Web Service)**
  - River gauges GIS Web Services
- **Partner Flood Inundation (FIM) Map**
  - Partner Flood Inundation (FIM) GIS Web Services
- **River Forecast Centers (RFC) Quantitative Precipitation Estimates (QPE)**
  - River Forecast Centers Quantitative Precipitation Estimates (QPE) GIS Web Services
    - The 13 National Weather Service (NWS) River Forecast Centers (RFC) produce Quantitative Precipitation Estimates (QPE) for their individual RFC areas. The RFCs produce the data using a multi-sensor approach utilizing NWS 88D radar estimates of precipitation, automated and manual precipitation gauges and satellite estimates of precipitation. These QPEs are used as input into their hydrologic models to produce NWS river forecasts and guidance products. The QPEs from each RFC are combined into a single mosaic to create a QPE product that covers the lower 48 states, Alaska and Puerto Rico. The data are on an approximate 4km x 4 km grid cell scale.

- The individual hourly data products (labeled Since 12Z Observed and those labeled Last X hours) contain data for the labeled time frame. These products are updated every hour to incorporate the most recent data.
- The individual daily data products (Today's Analysis Observed, those labeled Last X Days Observed, and those labeled X To Date Observed.) represent a 24 hour total ending at 12 UTC on the indicated date. These 24-hour data are then summed together to produce multi-day precipitation totals. Normal precipitation data are also produced for the Today's Analysis Observed and multi-day summations of 7 days or greater using data from the PRISM Climate Group. Percent of normal and departure from normal comparisons are also available by comparing the QPE data with the PRISM normal data. The daily data may be updated several times between 12UTC and 21UTC each day as updated data becomes available.

- **Watch Warning and Advisory (WWA) Data**
  - [Watch Warning and Advisory GIS Web Services](#)
    - Watch - A watch is used when the risk of a hazardous weather or hydrologic event has increased significantly, but its occurrence, location, and/or timing is still uncertain. It is intended to provide enough lead time so that those who need to set their plans in motion can do so.
    - Warning - A warning is issued when a hazardous weather or hydrologic event is occurring, is imminent, or has a very high probability of occurring. A warning is used for conditions posing a threat to life or property.
    - Advisory - The expected weather condition has a pretty good chance of occurring, even a likely chance of occurring, but typically an advisory is used for less severe types of weather conditions. A Wind Advisory might be issued or a Freezing Rain Advisory issued instead of a High Wind Warning or an Ice Storm Warning.
      - Link to graphical web page https://www.weather.gov/
      - Link to [metadata](#)
    - Questions/Concerns about the service, please contact the CloudGIS team (nws.mapservices@noaa.gov)
    - **Note:** This service is not time enabled
- **Flood Hazard Outlook (FHO)**
  - Flood Hazard Outlook GIS Web [Service](#) and Web [Application](#)
    - The Experimental Flood Hazard Outlook (FHO) is intended to provide a coordinated inland hydrologic flood graphic for use in regional and national Impact-based Decision Support Services (IDSS) briefings and support broad messaging of flood threat to NWS stakeholders and Federal water partners. This experimental product combines a depiction of current flood conditions based on the latest river observations with an assessment of flood risk for the next seven days, leveraging various sources of NWS water resources forecast information. This experimental product will be issued daily (21Z), but will increase to twice daily (1130Z & 21Z) during tropical cyclone events.

- The NWS is accepting comments through July 1, 2023 on the Experimental FHO as a replacement for the current Significant River Flood Outlook product. Please provide feedback on the Experimental FHO at:
    - Link to metadata: Product Description Document Experimental Flood Hazard Outlook

- **Area Hydrologic Discussion (AHD)**
    - The AHD is a short-term discussion focusing on areas of potential rapid-onset flooding with aerial coverage dependent on the hydrologic condition to support the NWS Flash Flood watch and warning process. (Current Product) (Archives)
        - The AHD speaks to the hydrology by providing analysis of NWM short-range forecasts and other prediction tools output, and focusing on how antecedent conditions will influence the potential rapid onset flooding impacts based on forecast rainfall and rainfall rates. To ensure a high level of internal situational awareness, the Weather Prediction Center (WPC) and NWC will each coordinate and alert the other upon the issuance of their respective products (Mesoscale Precipitation Discussion (MPD) for WPC and AHD for NWC).
            - Link to metadata: Product Description Document Experimental Area Hydrologic Discussion Product

- **National Hydrologic Discussion (NHD)**
    - The experimental National Hydrologic Discussion (NHD) informs users of the current hydrologic conditions at the continental scale, integrates and discusses hydrologic guidance from various sources, and provides additional information on impacts to communities along streams and rivers. (Current Product) (Archives)
        - The NWS is accepting comments through July 1, 2023 on the Experimental FHO as a replacement for the current Significant River Flood Outlook product. Please provide feedback on the Experimental FHO at:
            - Link to metadata: Product Description Document Experimental National Hydrologic Discussion Product

- **National Water Model (NWM) Streamflow Anomaly Analysis**
    - NWM Streamflow Anomaly Analysis GIS Web Services
        - Depicts seasonal streamflow anomalies derived from the analysis and assimilation configuration of the National Water Model (NWM) over the contiguous U.S. Anomalies are based on 7-day and 14-day moving average streamflow percentiles for each reach and the current calendar day.

- **National Water Model (NWM) High Flow Magnitude Analysis**
    - NWM High Flow Magnitude Analysis GIS Web Services (CONUS) (Hawaii) (Puerto Rico/USVI)

- Depicts the magnitude of the National Water Model (NWM) streamflow forecast where the NWM is signaling high water. This service is derived from the analysis and assimilation configuration of the NWM over one of three spatial domains (see below). Shown are reaches with flow at or above high water thresholds. Reaches are colored by the annual exceedance probability (AEP) of their current flow
    - CONUS: High water thresholds (regionally varied) and AEPs were derived using the 44-year NWM v3.0 reanalysis simulation.
    - Hawaii: High water thresholds and AEPs were derived from USGS regression equations found at https://pubs.usgs.gov/sir/2010/5035/sir2010-5035_text.pdf.
    - Puerto Rico / U.S. Virgin Islands: High water thresholds and AEPs were derived from USGS regression equations found at https://pubs.usgs.gov/wri/wri994142/pdf/wri99-4142.pdf.
- **National Water Model (NWM) Past 14-Day Max High Flow Magnitude Analysis**
    - [(NWM) Past 14-Day Max High Flow Magnitude Analysis GIS Web Services](#)
        - Depicts the magnitude of the peak NWM streamflow forecast over the past 14 days where the National Water Model (NWM) is signaling high water. This service is derived from the analysis and assimilation configuration of the NWM over the contiguous U.S. Shown are reaches with flow at or above high water thresholds. Reaches are colored by the annual exceedance probability (AEP) of their current flow. High water thresholds (regionally varied) and AEPs were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) 18 / 48-Hour High Water Arrival Time Forecast**
    - NWM 18 / 48-Hour High Water Arrival Time Forecast GIS Web Services ([CONUS](#)) ([Hawaii](#)) ([Puerto Rico / USVI](#))
        - Depicts the forecast arrival time of high water over the next 18 hours (CONUS) or 48 hours (Hawaii / PRVI). This service is derived from the short-range configuration of the National Water Model (NWM) over one of three spatial domains (see below). Shown are reaches that are expected to have flow at or above the high water threshold over the next 18 or 48 hours. Reaches are colored by the time at which they are forecast to reach high water.
        - CONUS: High water thresholds (regionally varied) and AEPs were derived using the 44-year NWM v3.0 reanalysis simulation.
        - **Hawaii:** High water thresholds and AEPs were derived from USGS regression equations found at https://pubs.usgs.gov/sir/2010/5035/sir2010-5035_text.pdf.
        - Puerto Rico / U.S. Virgin Islands: High water thresholds and AEPs were derived from USGS regression equations found at https://pubs.usgs.gov/wri/wri994142/pdf/wri99-4142.pdf.
- **National Water Model (NWM) 18-Hour Rapid Onset Flooding Forecast**
    - [NWM 18-Hour Rapid Onset Flooding Forecast GIS Web Services](#)

- Depicts forecast rapid onset flooding using the short-range configuration of the National Water Model (NWM) over the contiguous U.S. Shown are reaches (stream order 4 and below) with a forecast flow increase of 100% or greater within an hour, and which are expected to be at or above the high water threshold within 6 hours of that increase. Also shown are USGS HUC10 polygons symbolized by the percentage of NWM waterway length (within each HUC10) that is expected to meet the previously mentioned criteria. High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) 12-Hour Rapid Onset Flooding Probability Forecast**
  - [NWM 12-Hour Rapid Onset Flooding Probability Forecast GIS Web Services](#)
    - Depicts the probability of forecast rapid onset flooding over the next 12 hours using a time-lagged ensemble from the short-range configuration of the National Water Model (NWM) over the contiguous U.S. Shown are reaches (stream order 4 and below) that are expected to meet rapid onset flooding criteria (flow increase of 100% or greater within one hour and high water threshold conditions within 6 hours) using the most recent 7 forecasts. Reaches are colored by the probability that they will meet or exceed rapid onset conditions within hours 1-6, 7-12, and 1-12. Probabilities are computed as the % agreement across the 7 ensemble members that a given reach will meet rapid onset criteria at some point during the time period of interest. Hotspots show the average 1-12 hour rapid onset flooding probability, weighted by reach length, for USGS HUC10 basins with greater than 10% of NWM feature length meeting rapid onset criteria in the next 12 hours. High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) 12-Hour Max High Water Probability Forecast**
  - [NWM 12-Hour Max High Water Probability Forecast GIS Web Services](#)
    - Depicts the probability of forecast high water over the next 12 hours using a time-lagged ensemble from the short-range forecast of the National Water Model (NWM) over the contiguous U.S. Shown are reaches that are forecast to have flow at or above high water within the next 12 hours of at least one of the last 7 forecasts. Reaches are colored by the probability that they will meet or exceed the high water threshold across the last 7 forecasts. Probabilities are derived by counting the number of forecasts that meet the high water condition within the next 12 hours, equally weighted. Also shown are USGS HUC10 polygons for basins with greater than 50% of NWM features with flow expected to be at or above high water over the next 12 hours, symbolized by the average probability. High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) 18 / 48-Hour Max High Flow Magnitude Forecast**

- ○ NWM 18 / 48-Hour Max High Flow Magnitude Forecast GIS Web Services ([CONUS](#)) ([Hawaii](#)) ([Puerto Rico/USVI](#))
    - Depicts the magnitude of the peak National Water Model (NWM) streamflow forecast over the next 18 hours (CONUS) or 48 hours (Hawaii / PRVI) where the NWM is signaling high water. This service is derived from the short-range configuration of the NWM over one of three spatial domains (see below). Shown are reaches with peak flow at or above high water thresholds. Reaches are colored by the annual exceedance probability (AEP) of their forecast peak flow.
    - CONUS: High water thresholds (regionally varied) and AEPs were derived using the 44-year NWM v3.0 reanalysis simulation.
    - Hawaii: High water thresholds and AEPs were derived from USGS regression equations found at https://pubs.usgs.gov/sir/2010/5035/sir2010-5035_text.pdf.
    - Puerto Rico / U.S. Virgin Islands: High water thresholds and AEPs were derived from USGS regression equations found at https://pubs.usgs.gov/wri/wri994142/pdf/wri99-4142.pdf.
- **National Water Model(NWM) GFS 10-Day High Water Arrival Time Forecast**
    - ○ [NWM GFS 10-Day High Water Arrival Time Forecast GIS Web Services](#)
        - Depicts the forecast arrival time of high water over the next 10 days. This service is derived from the GFS medium-range configuration of the National Water Model (NWM) over the contiguous U.S. Shown are reaches that are expected to have flow at or above the high water threshold over the next 10 days. Reaches are colored by the time at which they are forecast to reach high water (calculated in 3 hour increments). High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) GFS 5-Day High Water Probability Forecast**
    - ○ [NWM GFS 5-Day High Water Probability Forecast GIS Web Services](#)
        - Depicts the probability of forecast high water over the next 5 days using ensembles from the medium-range GFS configuration of the National Water Model (NWM) over the contiguous U.S. Shown are reaches that are expected to have flow at or above high water on Day 1, Day 2, Day 3, and Days 4-5, using the 6 time-lagged ensemble members of the medium-range forecast. Reaches are colored by the probability that they will meet or exceed the high water threshold on Day 1, Day 2, Day 3, and Days 4-5. Probabilities are computed as the % agreement across the 6 time-lagged ensemble members, equally weighted. Also shown are USGS HUC8 polygons for basins with greater than 50% of NWM features with flow expected to be at or above high water over the next 5 days, symbolized by the average probability. High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) GFS 10-Day Max High Flow Magnitude Forecast**
    - ○ [NWM GFS 10-Day Max High Flow Magnitude Forecast](#)
        - Depicts the magnitude of the peak National Water Model (NWM) streamflow forecast over the next 3, 5 and 10 days where the NWM is signaling high water. This service is derived from the medium-range GFS configuration of the NWM

over the contiguous U.S. Shown are reaches with peak flow at or above high water thresholds. Reaches are colored by the annual exceedance probability (AEP) of their forecast peak flow. High water thresholds (regionally varied) and AEPs were derived using the 44-year NWM v3.0 reanalysis simulation.

- **National Water Model (NWM) GFS 10-Day Rapid Onset Flooding Forecast**
  - [NWM GFS 10-Day Rapid Onset Flooding Forecast GIS Web Services](#)
    - Depicts forecast rapid onset flooding using the medium-range configuration of the National Water Model (NWM) over the contiguous U.S. Shown are reaches (stream order 4 and below) with a forecast flow increase of 100% or greater within 3 hours, and which are expected to be at or above the high water threshold within 6 hours of that increase (all calculated in 3 hour increments). Also shown are USGS HUC08 polygons symbolized by the percentage of NWM waterway length (within each HUC08) that is expected to meet the previously mentioned criteria. High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) GFS 5-Day Rapid Onset Flooding Probability Forecast**
  - [NWM GFS 5-Day Rapid Onset Flooding Probability Forecast GIS Web Services](#)
    - Depicts the probability of forecast rapid onset flooding over the next 5 days using ensembles from the medium-range GFS configuration of the National Water Model (NWM) over the contiguous U.S. Shown are reaches that are expected to have flow at or above high water thresholds on Day 1, Day 2, Day 3, Days 4-5, and Days 1-5 using the 6 time-lagged ensemble members of the medium-range forecast. Reaches are colored by the probability that they will meet or exceed rapid onset conditions on Day 1, Day 2, Day 3, Days 4-5, and Days 1-5. Probabilities are computed as the % agreement across the 6 time-lagged ensemble members, equally weighted. Hotspots show average 1-5 day rapid onset flooding probability, weighted by reach length, for USGS HUC8 basins with greater than 10% of NWM feature length meeting rapid onset criteria in the next 5 days. High water thresholds (regionally varied) were derived using the 44-year NWM v3.0 reanalysis simulation.
- **National Water Model (NWM) Soil Moisture GIS Web Services**
  - [NWM Soil Moisture GIS Web Services](#)
    - Depicts estimated near surface soil moisture. This service is built by processing the analysis assimilation output of the National Water Model land based data. All outputs of the land dataset have the same geospatial extent covering all of CONUS with partial coverage into Canada and Mexico. Currently, the only layer within the service is near-surface soil moisture saturation. The near-surface soil moisture saturation layer shows moisture saturation of the top 40cm of the soil. Model Output Version: v3.0

10. **Appendix F:AHPS Style Hydrographs**

The Advanced Hydrologic Prediction Service static hydrographs are still available. They are updated every fifteen minutes.

The gauges are sorted by the National Weather Service Location Identifiers (NWSLI) 5-letter gauge id.

Two hydrographs are available for each gauge:

- Hydrograph scaled to the data
  - **https://water.noaa.gov/resources/hydrographs/xxxxx_hg.png**
    - Where xxxxx is the gauge SHEF ID (lowercase letters)
- Hydrograph scaled to the gauge flood categories
  - **https://water.noaa.gov/resources/hydrographs/xxxxx_record.png**
    - Where xxxxx is the gauge SHEF ID (lowercase letters)

Note: Each Gauge NWSLI is available on the Full Information Hydrograph page within NWPS.

Example:
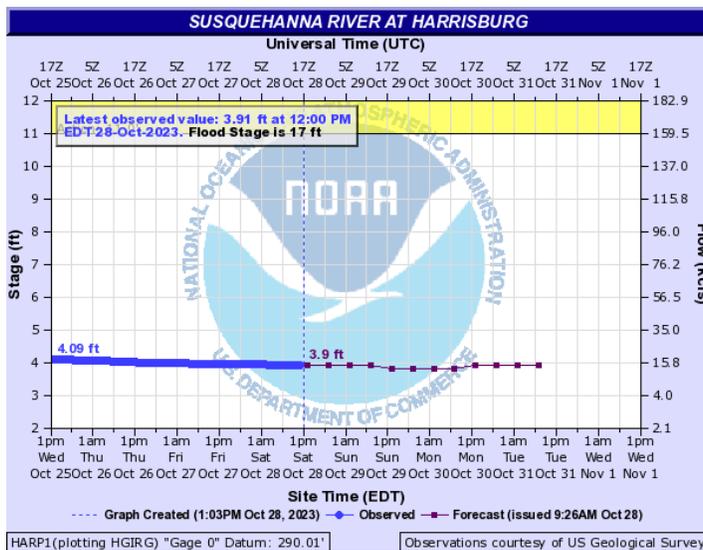
https://water.noaa.gov/resources/hydrographs/harp1_hg.png

11. Appendix G: NWPS River Observations and Forecasts Icons

On NWPS users can quickly determine current water levels and forecast river conditions by inspecting the shape and color of the icons on the pan-enabled map. Colored squares represent the river forecast, while the color of the inner circle represents the current river stage. See the charts below:

River Observations Icons	
Below Flood Stage	🟢
In Action Stage	🟡
In Minor Flood Stage	🟠
In Moderate Flood Stage	🔴
In Major Flood Stage	🟣

River Forecasts Icons	
No Flooding Forecast	🟩
Action Stage Forecast	🟨
Minor Flood Stage Forecast	🟧
Moderate Flood Stage Forecast	🟥
Major Flood Stage Forecast	🟪

In this example, The river gauge is currently below flood stage, but the forecast has the river rise to Moderate Flood Stage. Note, the user will need to click on the gauge location to view the hydrograph for timing and crest information.

River Observations Icons	
Below Flood Stage	🟢
In Action Stage	🟡
In Minor Flood Stage	🟠
In Moderate Flood Stage	🔴
In Major Flood Stage	🟣

River Forecasts Icons	
No Flooding Forecast	🟩
Action Stage Forecast	🟨
Minor Flood Stage Forecast	🟧
Moderate Flood Stage Forecast	🟥
Major Flood Stage Forecast	🟪

In this example, The river gauge is currently below flood stage, but the forecast has the river rise to Moderate Flood Stage. Note, the user will need to click on the gauge location to view the hydrograph for timing and crest information.

[END OF DOCUMENT]