National Weather Service (NWS) Service Description Document (SDD)
National Water Prediction Service (NWPS) Website
December 2023

Part I - Mission Connection

a. Product/Service Description

The National Weather Service (NWS) has delivered water resources forecast products and services via the Advanced Hydrologic Prediction Service (AHPS) for more than two decades. With AHPS developed on now outdated technology and infrastructure, this service will no longer support newer innovation, technology, and services-driven architecture. This Next Generation of Water Services, known as the National Water Prediction Service (NWPS), will be a new gateway to water resource forecasts, information, and services on the web. The proposed date for this NWPS website is March 27, 2024.

This data-service-driven web delivery platform combines the legacy AHPS web services and functionality (available at https://water.weather.gov) with the newer National Water Center (NWC) developed models and services (available at https://water.noaa.gov/map) to become the modernized, next generation of water forecast services. The proposed implementation of the NWPS website would replace the current AHPS website at https://water.weather.gov.

The new NWPS website will be mobile-compatible and driven entirely by newly developed data services with an Application Programming Interface (API) that partners can leverage directly. In addition to adding modern dynamic plots that users have requested, the website takes full advantage of screen space. It provides seamless spatial navigation while allowing localized bookmarks to get users the view they need with the base maps and spatial layers tailored for decision-makers.

Improvements with the new website include, but are not limited to:

- Standard web map functionality - One geospatial mapping interface allows users to navigate via easy, intuitive controls to access data and information quickly. As the user explores an area of interest, associated news feeds appear relevant to the displayed location.
- Improved base maps and hydro-specific spatial layers - Users can change base maps to highlight and explore desired features and display other essential data layers for examining hydrologic hazards.
- Dynamically-plotting hydrographs - The gage hydrograph views utilize dynamic plots generated in the client's web browser to enable more speed and timely data for users.
- National Water Model (NWM) guidance - NWM guidance incorporated into the spatial map display and the site-specific gauge stage hydrograph pages.
- API-services based - All display, mapping, and hydrograph functionality runs by new Water API services, also available for public/partner access to drive decision support tools. The API services will be available here: https://api.water.noaa.gov/v1/docs/ upon implementation. A preview of the API services is available here: https://preview-api.water.noaa.gov/v1/docs/ .

- Flood Inundation Mapping (FIM) - As the NWS expands its flood inundation mapping services across the country, NWPS will be a primary access point for this information. See https://www.weather.gov/media/notification/pdf_2023_24/pns23-55_exp_flood_inundation_mapping_services_aaa.pdf for information on current FIM products and services.
- Mobile-compatible - The website will optimize mobile devices. Though the visual display may vary, the functionality will remain the same, ensuring a consistent, reliable user experience.

The following displays and tools from the AHPS website have been moved or are not incorporated in the upgrade. Refer to the chart below to determine how content and functionality can be accessed on the NWPS website. Please note that some capabilities were not included in the initial NWPS release but may be added later.

Display/Tool	**Where the content/functionality can be found**
Drop-down menus on the national map web page to select state, Weather Forecast Office, River Forecast Center, and Water Resources Regions data views	State, Weather Forecast Office, River Forecast Center, and Water Resources Regions data views can be accessed by entering the following in the search box: <state:>, <rfc:>, <wfo:>, or <wrr:> to activate options that are available to be selected.
River Observations and River Forecasts tabs on the national map web page	Choosing "Observations & Forecasts", which is the default selection on the right side legend under River Gauge, shows river/stream locations which are color-coded according to the flood status of their most recent observation or the maximum stage/flow forecast through the entire period or both. 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.
Long-Range River Flood Risk tab on the national map web page	Selecting "Long-Range Flood Outlook", which is a selection on the right side legend under River Gauge, shows a national map with river/stream locations which are color-coded according to the long-range (3-month) risk of minor, moderate, and major river flooding.
Precipitation tab on the national map web page	Under "Precipitation Estimate", which is a selection on the right side legend, users can choose to enable (i.e., view or download) short-term observed and climatic trends of precipitation across the conterminous United States, Puerto Rico, and Alaska.

River Download tab on the national map web page	The data in this tab will be included in the "Data and Web Services Catalog" in NWPS, under the "About" pull down tab. KMZ data will be discontinued. The RSS feed will be replaced by the NWPS API.
Waterway menus on the Weather Forecast Office data view web pages	This capability was not included in the initial NWPS release and may be added in a future release. In the meantime, users can turn on the National Water Model layer from the right side legend to be able to follow a particular river.
River at a Glance tab on the hydrograph web pages	This capability was not included in the initial NWPS release and may be added in a future release. In the meantime, users can select "Area Hydrographs" on the hydrograph web pages to view all hydrographs in a Weather Forecast Office's Hydrologic Service Area.
Tabular data on the hydrograph web pages	A tabular display of data is not provided. Users can create a display using the new NWPS API for tabular data.
XML and RSS on the hydrograph web pages	The new NWPS API replaces the legacy XML and RSS.

b. Purpose/Intended Use

The NWS Water Resources Services Program web presence helps the NWS meet its mission by providing water resources warning and forecast information in a variety of formats and time scales, which meets the needs of various partners and other users from the layman to the technically advanced water manager. With access to graphical, text, and numerical products through the web, anyone concerned with current and future water resources conditions can make informed decisions on a timely basis to protect life and property and enhance the United States' (the Nation's) economy.

c. Audience

This service intends to meet a wide range of needs from the general public to the technically advanced water manager. Any person with Internet access and a desire to view water resources services information can utilize this service.

Questions regarding this web service may be addressed to: nwps.webmaster@noaa.gov

Part II - Technical Details of Standards

a. Format and Science Basis

NOAA's NWS provides a wide variety of water resources forecasts and information through the web. These web-based resources originate at NWS field, national center, and headquarters offices. They are designed to meet the needs of a wide range of users, from someone who needs the five-day forecast for a river near their home to the technically advanced water manager who needs probabilistic information to make long-term decisions on the allocation of flood mitigation resources or water supply. The NWS will continue to expand and refine all types of web products to keep pace with the demands of all kinds of users. The gateway to water resources forecasts and information will be the NWPS website.

b. Availability

- The "preview" NWPS website will continue to be available at https://preview.water.noaa.gov/ until the implementation date for the operational NWPS, at which time the preview NWPS will no longer be available.
- After the implementation of NWPS, the current AHPS website at https://water.weather.gov will continue to operate in parallel to the new NWPS for approximately two months.
- The operational NWPS service will be available at https://water.noaa.gov, an existing service for National Water Center information which is being integrated into NWPS and which will be repurposed for the NWPS.

The NWPS website will enable users to:

- Access NWC Operations, More Water Information, Modeling, About, and Explore NWS Weather information via dropdown menus at the top of the website
- View top stories that are relevant to the area being displayed
- View News of the Day, which includes links to water resources-related watches, warnings, and advisories currently in effect
- View a basemap of their choosing. Options include topographic, satellite, dark, and light.
- View the water resources data of their choosing. Options include River Gauge, Hazards, Precipitation Estimates, National Water Model, flood inundation, National Snow Analysis and Administrative Boundaries.
    - Under "River Gauge", data includes observations & forecasts and long-range flood outlook data. Choosing "Limit by boundary" limits the gauges displayed on the map to those within the currently selected boundary and choosing "Only display FIM Gauges" limits the gauges displayed on the map to only those which have Flood Inundation Mapping (FIM) enabled.
        - Choosing "Observations & Forecasts", which is the default selection, shows river/stream locations which are color-coded according to the flood status of their most recent observation or the maximum stage/flow forecast through the entire period or both. 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.
        - Selecting “Long-Range Flood Outlook” shows a national map with 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.
    - Under “Hazards”, users can choose to display all or only hydrologic NWS watches, warnings, and advisories. They can also remove all hazards from the map and adjust the opacity of the hazards.
    - Under “National Water Model”, users can choose to display and adjust the opacity of the stream reaches where NWM guidance is available. Selecting a location along a stream reach will display a hydrograph showing NWM water guidance for that stream reach. Users can choose to toggle on and off the following types of NWM water guidance: Analysis, Short-Range, Medium-Range Ensembles, and Long-Range Ensembles.
    - Under “Precipitation Estimate”, users can choose to view short-term observed and climatic trends of precipitation across the conterminous United States, Puerto Rico, and Alaska.
        - 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 - Normal precipitation is 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 simple grid mathematics where the Normal precipitation is subtracted from the Observed precipitation.
        - Percent of Normal - This map is generated by simple grid mathematics where the Normal precipitation is divided into the Observed precipitation
        - Users can choose to view and adjust the opacity of observed QPE, normal precipitation, departure from normal, or percent of normal for various time periods relative to today at 12Z.
    - Under “Flood Inundation Mapping”, users can choose to display and adjust the opacity from three Experimental Products from the National Water Center: the NWM Analysis, the 5-day RFC Max Forecast and the 5-day NWM Forecast from the latest GFS model. Levee information and areas within the Coastal Modeling Zone can also be displayed.

    - Under “National Snow Analysis”, users can choose to display and adjust the opacity of the Snow Depth and/or Snow Water Equivalent from the National Operational Hydrologic Remote Sensing Centers National Snow Analysis.
    - Under “Administrative Boundaries”, users can choose to view and adjust the opacity and color of River Forecast Center area of responsibility, Weather Forecast Office county warning area, state, and county boundaries.
- Select a color-coded location on the national map to view two hydrographs for that location - one showing observed and official NWS forecasted river stages/flows with a tab labeled with a five-character, NWS Location ID (NWSLI), and another showing observed and NWM guidance river stages/flows with a tab labeled with a reach ID.
    - Below the hydrograph will be:
        - An attribution to the organization or organizations which support the stream gaging station at that location (e.g., U.S. Geological Survey, U.S. Army Corps of Engineers, etc.)
        - A slider which can be used to adjust the amount of observed and forecasted river stages/flows being being displayed on the hydrograph
        - A “Scale-to-Flood” Categories button which can be used to display the hydrograph with a vertical scale that is close to the range of past, current, and future (if available) stages/flows or is stretched out to include minor, moderate, and major flood categories; action stage; and record flood level. The former is the default display, but if a river/stream is already in flood or is forecast to be in flood, the hydrograph display will automatically include flood categories.
        - A legend depicting official observed, forecast, record, and low river stages/flows, which can be toggled on and off by clicking on them. To the right of that information are the NWS flood categories for that location. Select the ” >” button to toggle the definition of each category on and off.
        - Notes applicable to the location
        - “Upstream” and “downstream” buttons which can be used to review the hydrographs for river/stream locations in sequential order, which can be useful during a flood episode
        - Gauge Info
    - Above the hydrograph will be the name, NWS Location Identifier (NWSLI), and Reach ID of the stream gauge; options for viewing, printing, and downloading (in various formats) the hydrograph, and a “View gauge details” button.
    - Select the “Full Information” button to display a full-page view of the Official and National Water Model Guidance hydrographs. This page includes all of the information which was available when first selecting the location off the national map and may include some or all of this information:
        - Flood Impacts
        - Gauge Location map with a marker which can be toggled off and on. Options to toggle Flood Inundation Maps (FIM) and FEMA’s National Flood Hazard Layers off and on will appear below the map, if available.

        - Selecting “Activate FIM Gauge” will activate the inundation mapping interface. This feature is available for NWS forecast points where data sets known as flood inundation libraries have been developed through partnerships with federal, state, or local agencies. The inundation mapping interface provides information on the spatial extent and, for some locations, depth of floodwaters in the vicinity of the forecast point. It provides the ability to view inundation levels at stage (to the nearest foot) in the minor, moderate, and major flood categories. From this interface, the user can also view maps of observed or forecast inundation levels based on current NWS river forecasts. The user has the option to use four different types of basemaps, including World Street Map, World Light Grey, USA Topographic, and Satellite with Labels.
        - Display FEMA’s National Flood Hazard Layers
    - Recent Crests
    - Historic Crests
    - Gauge Photos
    - Probability Information
        - Weekly Chance of Exceeding Levels - This graphical product shows the probability or chance of the maximum stage, flow, or volume (the user selects one of these) at a point on a river exceeding a particular value for consecutive 7-day periods in a 90-day interval.
        - Chance of Exceeding Levels During Entire Period - This graphical product shows the probability of the river stage, flow, or volume (the user selects one of these) going above various levels during the forecast period labeled above the graph (usually 30 or 90 days).
        - Experimental Short-Range Forecast Uncertainty - This graphical product depicts short- to medium-range river forecast uncertainty and is generated from the NWS Hydrologic Ensemble Forecast Service (HEFS), which extends the existing hydrologic ensemble services to include short- to medium-range forecasts, incorporates additional weather and climate information, and better quantifies uncertainty in water resources forecasting. The product displays uncertainty bounds for the river forecast in the context of high and low water thresholds.
    - Unique Local Info
    - Collaborative Agencies
    - Resources

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