National Oceanic and Atmospheric Administration
U.S. Department of Commerce

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U.S. Precipitation Time Series Explorer (PTE)

Location-Specific Rainfall Data for Risk Analysis

Product Overview

The PTE product shows the total precipitation accumulation for any given location in the U.S. historically and in near real-time to better understand exceedance potential, frequency, and risk of extreme rainfall events.

Courtesy of: *NOAA Photo Library*

Access PTE and more NOAA Products and Resources

Access the PTE Landing Page

Access the NODD Cloud Storage Bucket

Visit the Our Impact - Industry Partnerships Page

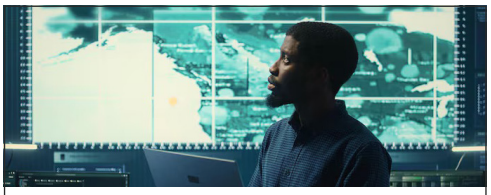
What Industry Leaders are Saying

"[At our company], we mostly help cities with their sewer systems. One of the issues with that is with filtration. For sanitary, [stormwater] often ends up leaking into the pipes although it shouldn't be. ***[We can use PTE in our] design to predict what will happen in the future.****"*

- Civil Engineer

"[PTE will] help with assessing property issues for future customers based on rainfall history and resilience moving forward. *Rainfall is particularly important for roof assessment as an example."*

- Machine Learning Engineer, Insurance Analytics



"This is a really nice tool for easy data exploration. The ability to query, and point-and-click anywhere, and get a time series anywhere, it makes it really easy. ***A tool like this helps tell a story... it's really easy to get in to see what [precipitation] looked like over hours or days****, as opposed to doing that in Excel, which is really challenging."*

- Hydrologic Modeler

Potential Product Applications

Architects and Engineers can apply this data to:

- **Transportation and infrastructure design** including roads, bridges, and drainage systems by assessing rainfall exceedance for code compliance and resilient design.
- **Site selection and land-use planning** by evaluating watershed behavior, topography, and spatial rainfall variability that may impact proposed developments.
- **Emergency planning, preparedness, and response** through identification of flood-prone corridors, planning of emergency access routes, resource staging, and support for decision-making during extreme rainfall events.
- **Flood risk assessment and mitigation** by analyzing historical and near-real-time precipitation patterns to inform detention, retention, and flood-control strategies.
- **Post-event damage assessment and recovery planning** by quantifying precipitation intensity and duration to help prioritize inspections, repairs, and infrastructure rehabilitation.

Insurers and Reinsurers can use this tool to:

- **Validate claims** by verifying the timing, location, and magnitude of reported precipitation events.
- **Conduct risk assessments** by analyzing historical frequency, intensity, and spatial extent of extreme rainfall events.
- **Inform catastrophe modeling** through refinement of rainfall-driven loss assumptions and event validation of modeled losses against observable impacts.
- **Post-event analysis and reporting** by quantifying event severity for regulatory, internal, and client reporting purposes.

Retailers can inform decisions related to:

- **Emergency planning, preparedness, and response** by supporting timely communications and actions to protect employees, customers, and assets such as warehouses, storefronts, and inventory.
- **Supply chain continuity** by identifying weather-related disruption risks along transportation routes, distribution centers, and supplier locations.
- **Operational resilience** by anticipating extreme rainfall impacts to minimize downtime and enable proactive store closures, staffing adjustments, and recovery planning.
- **Site selection and facility design** by evaluating historical and projected precipitation patterns to reduce exposure to flooding and water-related damage.

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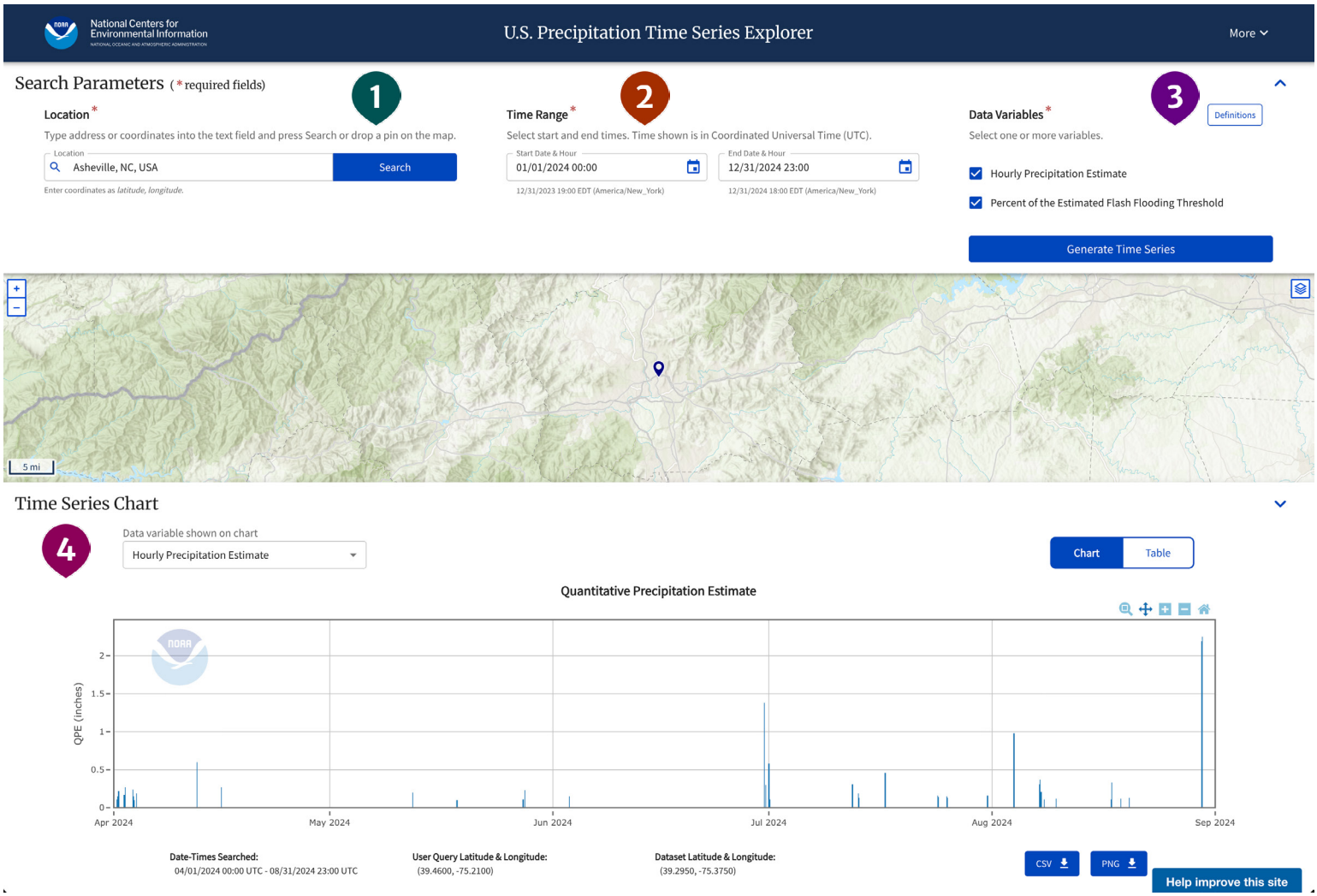
Data Discovery Tool - *In Development*

1. Search by address, coordinates, or pin on the interactive map.
2. Select a custom time range to generate time series chart of precipitation estimates for temporal variability analysis.
3. Choose data variables to show on the time series graph, including the Quantitative Precipitation Estimation (QPE) and/or the Quantitative Precipitation Estimation / Flash Flood Guidance (QPE/FFG).
4. Download a PNG of the Time Series Chart and a CSV of the data.



Complementary NOAA Tools and Products

Multi-Radar Multi-Sensor System (MRMS) — The Foundation for PTE

The MRMS dataset from the National Severe Storms Laboratory integrates data from multiple radars, surface and upper-air observations, lightning detection systems, satellite data, and forecast models to produce a wide range of two-dimensional products for monitoring severe weather and precipitation. The MRMS Quantitative Precipitation Estimation dataset provides the foundational data for PTE and supports applications across severe weather analysis, transportation, hydrology, aviation, and numerical weather prediction.

Atlas 14 — Contextualize PTE with Frequency Data

Atlas-14 provides precipitation frequency estimates for a location by selecting its state, then selecting the location from the point-and-click interactive map. When used alongside PTE, Atlas 14 allows users to place observed precipitation events in context, supporting risk assessment and planning for extreme rainfall scenarios. The next generation precipitation frequency dataset, Atlas 15, is currently in development.

COOP Hourly Precipitation Data — Extend PTE into Historical Observations

This Cooperative Observer Program (COOP) product provides hourly and daily precipitation measurements from approximately 5,500 National Weather Service, Federal Aviation Administration, and cooperative observer stations across the U.S., including Puerto Rico, the U.S. Virgin Islands, and various Pacific Islands. These records begin earlier than the MRMS data that power PTE, with start dates varying by region from 1900 to 1978 and continuing to the present. When used alongside PTE, COOP data enable comparison of modern precipitation events with long-term historical records, supporting trend analysis, risk evaluation, and the design of culverts, stormwater systems, and other water runoff infrastructure.

National Water Model (NWM) — Connect PTE to Streamflow Impacts

The NWM is NOAA's hydrologic modeling framework that simulates observed and forecast streamflow over the entire continental U.S. (CONUS), southern Alaska, Hawai'i, Puerto Rico and the U.S. Virgin Islands. It also provides total water level guidance for the coastlines of these regions, except Alaska. The NWM represents the water cycle using mathematical models of interconnected physical processes, producing hydrologic guidance at fine spatial and temporal scales. Because precipitation can vary dramatically over short distances and times, river and stream responses can change quickly, allowing users to better understand the ground-level impacts of the precipitation data they reference from PTE.

Past Weather Product — Understand Broader Weather Context

This tool provides options to view and download time series data at different stations in the U.S. that show average temperature, max temperature, minimum temperature, precipitation, snowfall, and snow depth. With a greater variety of variables than PTE, users can analyze past weather conditions that may influence or correlate with precipitation events, supporting more comprehensive event assessments.

**Disclaimer:* *The NWM requires high-performance computing to run fast enough to support near real-time decision-making during flood events.*

Complementary NOAA Tools and Products (continued)

Probable Maximum Precipitation (PMP) — Frame Extreme Events

PMP provides precipitation depth estimates for a specific location, duration, and area (such as a drainage basin) with an extremely low probability of being exceeded for a given climate period. These estimates are currently being modernized to reflect state of the science advances in statistics, modeling, and hydrometeorology. When used alongside PTE, PMP estimates support analyses of extreme rainfall, helping users assess risk and plan for high-consequence or critical infrastructure scenarios.

Sea Level Rise Viewer — Visualize Coastal Impacts

This product displays potential coastal flooding impacts, including sea level rise, flood depth, and high tide flooding exposure. Users can explore historical events as well as future scenarios at the local level. When used alongside PTE, this immersive tool helps users better understand how precipitation patterns can contribute to coastal flooding impacts.

Additional Tools and Resources

Annual National Land Cover Database (NLCD)** — Integrate PTE with Land Cover

This suite of products from the USGS offers data that describe nationwide land cover and land change over nearly four decades. The annual NLCD has harnessed the full Landsat data record and uses an ensemble of classification and change algorithms to map, monitor, and synthesize the complexities of land use, cover, and condition change through time. Land cover and precipitation information go hand-in-hand to track water quality and quantity. NLCD information, in tandem with PTE data, can enable users to better understand issues an area may be facing, including runoff and flood risk. Next-generation USGS land cover mapping uses AI in high-performance cloud environments.

FEMA Flood Maps — Relate PTE to Flood Risk

This resource from the Federal Emergency Management Agency (FEMA) provides official flood hazard information, including maps, products, and tools to support the National Flood Insurance Program. When used alongside PTE, these resources allow users to compare precipitation data with flood hazard information, improving understanding of a location's flood risk.

USGS Hydrologic Unit Code (HUC) Maps — Locate PTE Within Watersheds

The United States Geological Survey (USGS) delineates watersheds using a nationwide system based on surface hydrologic features. A hierarchical HUC is used to identify any hydrologic area (see Federal Standards and Procedures for the National Watershed Boundary Dataset). This system divides the country into 22 regions (2-digit), 245 subregions (4-digit), 405 basins (6-digit), ~2,400 subbasins (8-digit), ~19,000 watersheds (10-digit), and ~105,000 subwatersheds (12-digit). A complete list of Hydrologic Unit codes, descriptions, names, and drainage areas can be found in the United States Geological Survey Water-Supply Paper 2294, entitled "Hydrologic Unit Maps." PTE users may reference the HUCs for the location they are analyzing in order to understand its watershed boundaries and relationship to nearby areas. The HUC 4 and HUC 8 level watersheds are embedded in the PTE product as available map layers for reference.

*** Next-generation USGS land cover mapping uses AI and machine learning in high-performance cloud environments.*

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Working Together to Improve Resilience

NOAA collaborates with industry leaders to update and develop new data and observation products, including maps, interactive tools, and other datasets. By improving access to environmental data, NOAA connects decision makers with accurate, timely, and future-facing data products and services to support improved risk assessments and economic, community, and environmental resilience.

Together, we can empower safe, resilient, and cost-efficient decisions for short and long-term planning, which safeguards communities and the U.S. economy.

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