

Re-Prioritization of the U.S. Geological Survey Federal Priority Streamgange Network, 2022

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Abbreviations

FPS	Federal Priority Streamgagage
GWSIP	Groundwater and Streamflow Information Program
NSIP	National Streamflow Information Program
USGS	U.S. Geological Survey
WMA	Water Mission Area

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Abstract

The Federal Priority Streamgauge (FPS) network of the U.S. Geological Survey (USGS), created in 1999 as the National Streamflow Information Program, receives Congressional appropriations to support the operation of a federally-funded “backbone” network of streamflow gages across the United States that are designated to meet the “Federal needs” or priorities of the country. Anticipating the evolution of Federal stakeholder water-data needs, the USGS launched a re-evaluation of the fundamental priorities for the FPS network in October 2020. In March 2022, the FPS Re-Prioritization Project used an online survey to solicit feedback from 767 stakeholders representing 22 Federal agencies who benefit from the FPS network. Additional feedback from survey respondents was obtained during online listening sessions to validate the USGS’s understanding of current Federal water-data needs. Results of the feedback show that the original five network priorities identified by the U.S. Geological Survey in 1999 are still valid but require modification to better incorporate additional needs, including Federal water operations, streamflow trends and extremes, water rights involving Federal lands, and streamflow data supporting ecosystem health. Federal stakeholder feedback also indicated that the inclusion of precipitation and water-temperature data collection, along with stream imagery, would enhance the value of the FPS network.

Introduction

The Federal Priority Streamgauge (FPS) network—originally called the National Streamflow Information Program (NSIP)—was conceived in 1999 to allow U.S. Geological Survey (USGS) to operate a stable, fully federally-funded “backbone” network of streamflow gages to provide reliable, accurate, and timely streamflow data to serve Federal needs across the country. The streamflow data serves multiple Federal needs such as public safety, infrastructure design, and water-resource management. It is also recognized that the FPS network concurrently serves multiple needs of many other stakeholders beyond the Federal community.

Partial funding for NSIP was first allocated in 2000 and continues at a level that is currently (October 2022) sufficient to fully fund the operation of approximately 1,430 streamflow gages (out of a total of 4,758 eligible streamflow-gage locations), or roughly one-third of all eligible locations. The locations and funding status of current streamflow gages in the FPS network can be found online (<https://water.usgs.gov/networks/fps/>).

Recognizing that new technologies have developed in the 20 years since the FPS (formerly NSIP) was initiated, an FPS Advisory Group consisting of USGS Water Science Center Directors, Data Chiefs, and the National Streamflow Network Coordinator was tasked to review the original FPS network design criteria. This team performed a detailed internal review of the network and identified several potential design improvements. The USGS Water Mission Area (WMA) Executive Council realized that revisions of network priorities should also be driven by input from Federal agency stakeholders that rely on USGS water data. Considering Federal stakeholder input also provided the USGS an opportunity to determine interest in data types that may not have been feasible or practical to include within the FPS network as originally designed.

In the fall of 2021, the USGS initiated the FPS Re-Prioritization Project to develop a strategy to solicit feedback from Federal agency stakeholders on best approaches to modernize the FPS network. This engagement with Federal agency stakeholders will evolve the FPS network to better fulfill its goal as the federal-supported backbone of streamflow gages that benefits all public and private stakeholders into the next decade and beyond.

Background

The FPS network was initiated in 1999 (as the NSIP) in response to a 1998 request from Congress, motivated by a noted steady decline in the number of active and long-term streamflow gages across the nation. A subsequent Bales and others (2004) analysis of the network recommended the periodic re-evaluation of the network to ensure that it meets future needs for streamflow information. A U.S. Government Accountability Office (2005) report recommended that a

cost-benefit analysis could point to changes in the design or operation of the network that could enhance the level of benefits the network provides. Two independent reports (Hester and others, 2006a; Hester and others, 2006b), published by the National Hydrologic Warning Council, helped articulate the value that USGS streamflow gages provide to the country.

The FPS network is intended to be a federally-funded backbone or subset of the overall USGS National Streamflow Network, which provided streamflow and water-level information from about 8,500 locations across the country in 2020. As a federally-funded network within the National Streamflow Network, the FPS is intended to aid in decision-making regarding long-term national priorities that may not be supported if the network was funded by non-federal sources concerned primarily with local, short-term, or changing goals. Examples of these Federal interests include monitoring international boundary or interstate compact-governed streamflows. The original FPS network design, as seen in U.S. Geological Survey (1999) was intended to support five Federal priorities (table 1).

FPS Re-Prioritization Project

The FPS Re-Prioritization Project, initiated in the fall of 2021, was done to gather input from Federal stakeholders on streamflow-gaging priorities. The scope of the project included three tasks:

1. distributing an online survey to Federal stakeholders to identify their streamflow-gaging priorities and data needs,
2. hosting a set of virtual listening sessions to validate the online survey results, and
3. compiling survey and listening session results into a final publication.

Federal Stakeholder Online Survey

The first task in the project scope required the compilation of Federal stakeholders while a proposed online survey was developed. Compilation of the contact list of Federal agency stakeholders to be surveyed was accomplished in collaboration with managers from USGS Water Science Centers, Regions, and Water Mission Area offices. Development of the online stakeholder survey was aided by input from national network managers and the FPS Advisory Group. Final adjustments to the survey structure and format were provided by a team of USGS social scientists and outreach specialists.

The online survey was distributed to 767 Federal agency stakeholders, with results collected from 325 respondents (42 percent) representing 22 Federal agencies and 7 Executive Branch departments from March 14 through April 14, 2022. Respondents were asked to select from pre-determined lists of Federal priorities and data needs (Appendix 1) then rank their selections in order of importance to their agency mission. Each list also contained an “Other” option to allow respondents to add at their discretion any important priorities or data needs not included in the lists provided.

Respondents were asked to rank their selections from each list by distributing 100 points among each set of selections, with higher-ranking selections receiving more points. The result was a set of ranked priorities and data types from each respondent. The survey also solicited additional comments to allow respondents to share any further information pertinent to the purpose of the survey. Results are compiled in a separate data release. (Dillow and others, 2023)

Federal Stakeholder Listening Sessions

After the preliminary results were compiled and analyzed, a series of voluntary listening sessions were scheduled to share those results with Federal agency stakeholders and allow them the opportunity to provide further feedback to the USGS

Table 1. Original Federal Priority Streamgaging (FPS; formerly National Streamflow Information Program [NSIP]) Federal priorities with descriptions.

Original Federal priority	Description
National Weather Service flood-forecast sites	Supply essential data used for flood alerts, flood and drought forecasts, and assessment and modeling of streamflow conditions (primarily by the National Weather Service) to mitigate water hazards and supply shortages and allow science-based decision making by Federal water managers.
Compacts and decrees	Support interstate, international, and tribal border water agreements, compacts, court decrees, and treaties.
Water budgets	Monitor streamflow in large rivers, and water volume in key receiving waters such as the Great Lakes.
Long-term changes	Track sentinel trends at long-term streamflow gages associated with major land uses and ecoregions to support water modeling and management.
Water quality	Support Federal water-quality assessments of major rivers and estuaries.

indicating whether the survey results validated their priorities and data needs. A total of eight listening sessions were held between May 13 and June 28, 2022. Feedback received during each listening session was documented and incorporated into the overall analysis.

Compilation of Online Survey and Listening Session Feedback

Following the survey and listening sessions, all results and comments were analyzed to derive a summary of stakeholder preferences regarding revisions to FPS network priorities and potential new data types a modern FPS network could serve. These analyses and considerations include the distinction between specific Federal agency needs and broader Federal needs. This distinction is important because specific Federal agency needs, while rational and valid, can be unique to individual stakeholders while not serving the interests of multiple stakeholders and the public consistent with the principles supporting the original FPS network.

Within the survey responses, long-term streamflow trends, water forecasting, and floodplain management were the three most popular priorities, accounting for over 36 percent of all ranking points assigned amongst the priorities listed in the survey (fig. 1).

Survey responses pertaining to data needs identified that precipitation, stream imagery, and water temperature were the three most popular data types, accounting for over 46 percent of all ranking points assigned amongst the data types listed in the survey (fig. 2).

Other important considerations noted in the survey responses come from the emphasis seen in both the “Other” responses, and the content of the “Additional Comments” received. Among individual responses touching on various topics, the “Other” responses included multiple instances of issues relating to both “Water rights” and “Ecosystem health” (aquatic habitat, habitat restoration, and stream restoration). Among the 45 substantive responses submitted in the “Additional Comments” section of the survey there were several themes not otherwise included in the survey results that were mentioned multiple times, including support for:

- operation of sentinel or reference streamflow gages,
- monitoring in small watersheds,
- monitoring to facilitate adjudication of water-rights disputes at boundaries separating Federal lands from those of other jurisdictions, and
- monitoring to characterize sediment transport.

Further feedback received during the listening sessions was both positive and constructive, and contained some recurring themes. Specifically, there was general and consistent agreement that the original five Federal priorities governing the FPS network are still relevant to today’s water-data needs, and that the results of the survey

(as presented) emphasized additional priorities and data needs considered appropriate by participating stakeholders. Additional priorities and data needs mentioned multiple times during the listening sessions included:

- water rights or water supply at federal land boundaries (sometimes associated with Endangered Species Act issues),
- groundwater or spring effects on base flow in streams in arid regions,
- soil moisture (particularly in relation to snowpack),
- dissolved-oxygen concentration (in relation to fish migration), and
- stage (or some surrogate) data to better describe ice presence and thickness in stream channels.

Results

The feedback received from both the Federal stakeholder survey and the follow-on voluntary listening sessions provides sufficient evidence to support updating both the Federal priorities and the water-data parameters collected to serve Federal data needs. Stakeholder feedback verified that the original Federal priorities and data parameters served by the network are still valuable and necessary. Revisions will be accomplished by modifying the original five priorities to encompass the additional needs.

Consistent with the feedback received from the stakeholders, the impact of the priority revisions will be to expand the needs that the re-prioritized FPS network can serve, while preserving the original functionality relating to streamflow and water-level information. Subsequent to the publication of this report, a design framework consisting of monitoring-network characteristics, geographic-information resources and quantitative decision metrics will be created by the FPS Advisory Group to facilitate network reconfiguration consistent with the revised network priorities. The framework will be used by USGS Water Science Center staff and their Federal partners to make decisions about FPS site eligibility and operational priorities.

Updated FPS Federal Priorities

Based on the survey results and comments received during the follow-on listening sessions, the original five priorities governing the current FPS network are still valid with some slight updates. As seen in table 2, the resulting updates support inclusion of the following revised FPS priorities:

- water-rights issues relating to Federal land management,

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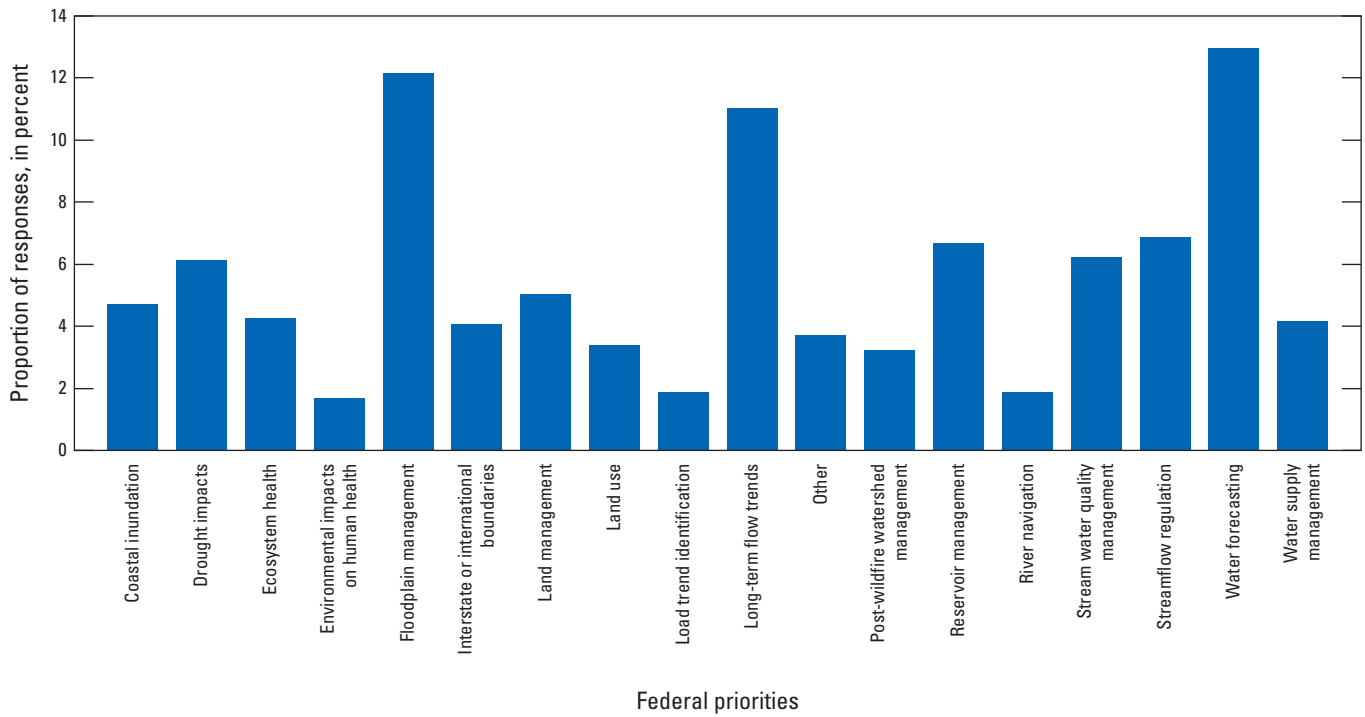


Figure 1. Bar chart showing Federal priorities with survey preference proportions.

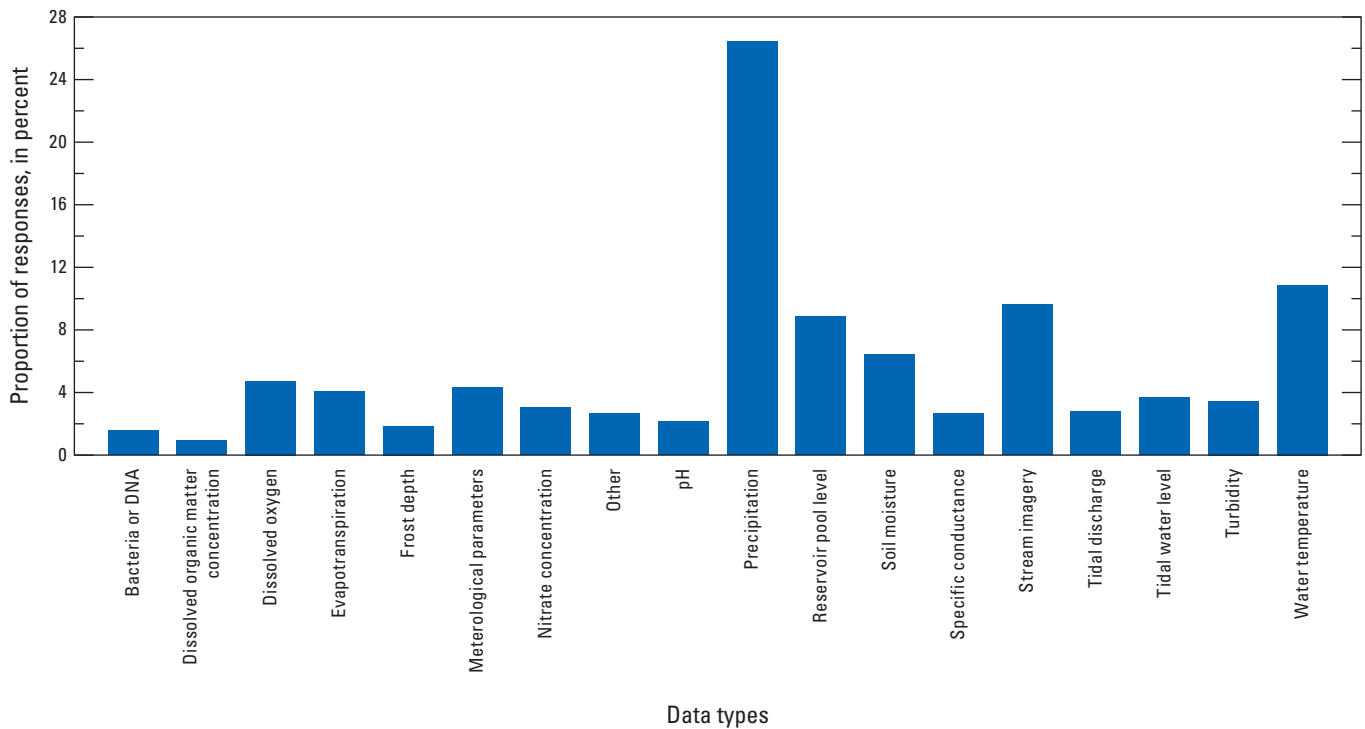


Figure 2. Bar chart showing Federal data needs with survey preference proportions.

Table 2. Updated Federal Priority Streamgauge (FPS) Federal priorities with descriptions.

Updated Federal priority	Description
Water forecasting and operations	Supply essential data used for flood alerts, flood and drought forecasts, river navigation, Federal reservoir operation, and assessment and modeling of streamflow conditions to mitigate water hazards and supply shortages and allow science-based decision making by Federal water managers.
Boundaries, compacts, treaties and Federal lands	Support interstate, international, and tribal border water agreements, compacts, court decrees, treaties and water-use/water-rights management involving Federal lands.
Water budget	Monitor streamflow in major rivers, and water volume in key receiving waters such as the Great Lakes.
Long-term hydrologic trends and extremes	Monitor long-term streamflow conditions associated with major land uses and ecoregions, including at springs making significant contributions to base flow in streams and in coastal-zone environments impacted by sea-level rise, to identify and track long-term hydrologic trends and support Federal water modeling and management.
Water quality	Support Federal water-quality assessments of major rivers and estuaries, public-health risk assessment and warning relating to impaired streams and ecosystem health management on Federal lands.

- stream-ecosystem health impacted (or affected) by stream restoration or management on Federal lands, and
- Federal reservoir operational impacts on water supply.

Additional Federal Data Needs

The results of the survey and feedback received during the voluntary listening sessions indicate that the preferences for additions to the data types eligible to be served by the re-prioritized FPS network are clear and strong. They indicate that precipitation, water temperature, and stream imagery (still imagery or video) are considered valuable enough that they should be included in the FPS network. All three data types, in addition to water-level and streamflow data collection, are considered valid within the definition of Federal needs and are within the technical capacity of the USGS to serve using existing monitoring technology and telemetry systems. As previously stated, implementation of these parameters would be site specific and only as available funding allows.

Summary

The Federal Priority Streamgauge (FPS) network receives congressionally-appropriated funding to support the operation of a federally-funded “backbone” network of streamflow gages across the United States. Anticipating the evolution of stakeholder water-data needs since its inception in 1999, and advances in monitoring and communication technologies, the USGS launched discussions to re-evaluate the fundamental priorities for the FPS network in 2020. The FPS Re-Prioritization Project, initiated in 2021, used an online survey to solicit feedback from 767 Federal agency stakeholders representing 22 Federal agencies who benefit from the FPS network so it can better serve their needs in the next decade. Additional feedback from survey respondents was obtained during online listening sessions to validate the USGS’s understanding of current Federal water-data needs. A

USGS team used the feedback to determine that the original five network priorities are still valid but require modifications to better incorporate additional needs, including Federal water operations, streamflow trends and extremes, water rights involving Federal lands, and streamflow data supporting ecosystem health. Federal stakeholder feedback also indicated that the inclusion of precipitation and water-temperature data collection, along with stream imagery, would greatly enhance the value of the FPS network.

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Appendix 1. Federal Stakeholder Online Survey Questions

Federal Priority Streamgange Priority Options Posed to federal Stakeholders

- Interstate or international waters legal/treaty obligation compliance
- Water forecasting
- Water-supply management
- Long-term flow-trend identification
- Load-trend identification
- Coastal inundation effects
- Drought impacts
- Ecosystem health or services maintenance
- Environmental impacts on human health
- Floodplain management or inundation mapping
- Land management
- Land-use change impacts
- Reservoir management
- River navigation
- Streamflow regulation
- Stream-water quality management
- Post-wildfire watershed monitoring
- Other

Federal Priority Streamgange New Data Collection Possibilities Posed to Federal Stakeholders

- Dissolved-organic-matter concentration
- Dissolved-oxygen concentration
- Evapotranspiration
- Frost depth
- Meteorological parameters (non-precipitation)
- Nitrate concentration
- pH
- Precipitation
- Reservoir pool level or tailrace flows
- Soil moisture
- Specific conductance
- Stream-condition imagery (still photos, streaming video)
- Tidal discharge
- Tidal water level
- Turbidity
- Water temperature
- Bacteria or DNA
- Other

For additional information, contact:

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