

A Model of Service Delivery for the NOAA Water Initiative

A proven framework for integrating service delivery and decision support



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Recommended Citation. National Oceanic and Atmospheric Administration (NOAA), Water Initiative. 2020. "A Model of Service Delivery for the NOAA Water Initiative: A Proven Method for Integrating Decision Support and Service Delivery." Authored by the NOAA Water Team.

INTRODUCTION

The NOAA Water Initiative (NWI) was launched in December 2016 with one overarching goal: To transform water information service delivery to better meet and support evolving societal needs.¹ As the nation experiences increasing variability and change in precipitation patterns, flooding, drought, and other complex water issues, NOAA's mission of science, service, and stewardship becomes of even greater importance. In 2019 alone there were three billion-dollar flooding events, and since 2015 there have been 15 drought and flood events that together caused more than \$60 billion dollars in damage.² In addition, many communities are facing increased disruptions to their daily lives as a result of recurring flooding along our coasts. NOAA must coordinate a unified service delivery approach that leverages partnerships and informs the development of use-inspired products and services. This service-oriented approach, working across the existing network of line offices and affiliated partners (see Appendix A for definitions), is focused on understanding the challenges users face and helping to address society's needs.

The purpose of this framework is to guide and improve decision support products and services and their delivery. This document captures the shared language (see Appendix A), components, and best practices that make NOAA service delivery and decision support successful.

“In the United States and around the world, water security is increasingly in jeopardy. **Too much water, too little water, or water of poor quality** can endanger life, property, economies, and ecosystems.”³

NOAA's Mission

Science: to understand and predict changes in climate, weather, oceans, and coasts

Service: To share that knowledge and information with others

Stewardship: To conserve and manage coastal and marine ecosystems and resources

THE DRIVERS FOR INTEGRATING SCIENCE AND SERVICES

Service delivery lies at the heart of NOAA's mission and is critical in all that it does. Users look to NOAA for a range of data, information, tools and services, but sometimes find them difficult to efficiently and effectively access and understand. Some users seek additional support to apply NOAA's data, information, and tools to their situation. They want answers, guidance, training, and a helping hand. Through continuous customer engagements, NOAA personnel glean important information about how data, products and tools are, or are not, serving specific localities or sectors. (Successful examples are provided in Appendix B).

NOAA Water Initiative Outcomes

SERVICE DELIVERY

Objective 1: Build Strategic Partnerships for Water Information Services

Outcome 1.1: Within three years, NOAA agencies will identify, establish, or strengthen three or more partnerships to engage stakeholders in an ongoing and sustained manner. These partnerships will build on and add value to existing stakeholder frameworks and activities.

Outcome 1.2: Within five years NOAA will establish a new model of service delivery for its water information services, building on the partnerships in Outcome 1.1, conducting targeted risk and vulnerability assessments, and building collaborative solutions for advancing water information service delivery.



¹ <https://www.noaa.gov/water/explainers/noaa-water-initiative-vision-and-five-year-plan>

² <https://www.ncdc.noaa.gov/billions/>

³ Ibid

NOAA has been transforming from a scientific and technologically constrained set of products and services, to valuing user needs as a critical input for developing useful, actionable information. Timely and specific user needs are essential inputs for advancing and deploying new technologies, models, tools, and resources. This framework will enable NOAA to consistently understand user needs and prioritize responses to the evolving decisions in society.

The nation benefits from enhanced service delivery through improved decision making; reduced risk to lives, property, and the economy; and increased resilience and strengthening of water-sensitive sectors such as agriculture, water management, transportation, natural resources, recreation, and energy. The benefit of enhanced service delivery for NOAA is a more efficient and effective agency that is better able to fulfill its mission by:

- Prioritizing investments in its product lines (e.g., science (observations and data), services (technical assistance, engagement, training), and stewardship (resource management, place-based));
- Leveraging the capabilities/roles of NOAA and our partners to help meet the needs of our users;
- Developing new, and refining existing, products and services that are informed by user needs; and
- Transmitting and translating information for decision-makers across multiple sectors.

This framework describes a consistent approach that will enhance NOAA's delivery of water-related services, and could also be applied to other NOAA initiatives that cite the need to understand and apply user needs to guide product and service development (e.g., subseasonal-to-seasonal predictions, climate services, Blue Economy, and Weather-Ready Nation). Institutionalizing and integrating these processes to align with other weather-, ocean-, coast-, climate-, and fisheries-related initiatives and activities will better equip NOAA to fulfill its vision of developing and sustaining resilient ecosystems, communities and economies.

MODEL FOR SERVICE DELIVERY

Effective implementation of service delivery requires relationships between information producers and consumers built on mutual trust and respect. Key to developing and maintaining these relationships is sustained engagement and collaboration that will facilitate the integration of services into actionable information. NOAA's existing network of line offices and affiliated partners is a critical asset to support improved service delivery. Many of these entities already have the desired level of trust and frequent engagement with their community members. This new model for service delivery offers a guiding concept to transform interaction among these groups. It documents best practices for service-oriented approaches, processes, and tools to improve how NOAA's products and services are developed and delivered to society.

Framework Vision

U.S. residents understand and use the breadth of NOAA's information for their decisions

Framework Mission

NOAA will continuously build a network of trusted experts who engage internally and externally with partners to inform NOAA's product and service development to be useful, usable, and used

The foundational element, central to the effectiveness of this model (Figure 1), is the principle of continuous user engagement. As evidenced from the literature (Appendix C), NOAA must embrace the coordinated production of information as a critical part of product and service development. This requires that NOAA services entities continuously engage with users in order to fully understand their evolving needs and the accuracy and timeliness of NOAA's response to their needs.



Figure 1. To achieve this vision, NOAA's service providers must (1) continue to build trusted relationships with NOAA's internal and external users and partners; (2) understand the decisions of those users, their use of NOAA information, and be able to gather the user's information needs; (3) evaluate user needs (that cannot be quickly satisfied) through a lens of both NOAA and its partners' capacity; (4) review and prioritize NOAA's products and services to meet the needs; (5) respond to user needs by developing new, or refining existing, products and services across NOAA; (6) deliver these products and services to users; and (7) evaluate user impact of NOAA's tools and services. These elements represent a process. It is imperative that as each element is conducted, interaction occurs between the trusted NOAA entity, end users, and various partners. It is also likely that elements will co-evolve and loop forward, across, and behind in the diagram to verify needs and capabilities, and ensure the provision of the best products and services.

Additionally, successful service delivery includes an awareness of relevant NOAA products and services that would be responsive to the user needs. Service entities need to be prepared to, and have the capacity to, transfer the products and services in such a way that the users have the knowledge and skills to apply them to their needs.

The detailed model documents a clearly-defined, high-impact approach for NOAA offices and their core partners to capture and be responsive to a suite of user needs. The model includes components of shared feedback received during constituent engagements, the identification and adjudication of user needs, the integration of needs into agency science, service, and stewardship requirements, and ultimately relies on Line Offices to respond with credible, use-inspired products that are then delivered and evaluated by the engagement entities. This framework will enable NOAA to continue serving as a trusted source for science and information. Through technical assistance, training, personal engagement, evaluation, and customer service, NOAA will guide its partners, users, and stakeholders across all sectors in applying and interpreting NOAA's vast collection of weather, climate, and water information and tools to build resiliency.

THE FRAMEWORK FOR INTEGRATING DECISION SUPPORT AND SERVICE DELIVERY WITH PRODUCT DEVELOPMENT

Foundation // Continuous Engagement

Continuous engagement is the central element for successful service delivery. Engagement is a process that is developed and nurtured through ongoing interactions and results in trusted relationships. Critical to the success of engagement is communication that fosters mutual learning and facilitates joint dedication to achieving agreed upon needs and goals. Like any relationship, engagement takes time. It does not occur as the result of one call or meeting. Trust is built with iterative, frequent, and consistent interactions in local settings, that embody dedication and commitment to the user and their priorities. Over time, trust and relationships are built between individuals and organizations. Personal involvement in all interactions with the users and partners is critical because they are the personification of the Agency's interest and commitment. Further, the first hand involvement of the trusted NOAA entity in all steps (with users, colleagues within NOAA, and with partners, throughout all stages of service delivery) builds trust and streamlines processes, as they have the best understanding of the complex needs of the users. The trusted NOAA entity has spent years understanding the scope and context of needs via continuous two-way communication, and can thus assist with the translation and development (and co-development, where appropriate) of products and services, and best facilitate delivery and use.

Build // Building Trusted Relationships

NOAA's relationships with new and existing partners (e.g., other governmental agencies, academia, the private sector, non-profits, and the public) must be built through frequent two-way communication and continuous respectful engagement. Central to this is fostering listening, dialogue, and understanding with users to help address our shared mission. As a result, NOAA and our partners will better understand and use the broad suite of water information and tools already available, as well as the continuously evolving needs of users. Under the best circumstances, practitioners and providers jointly assess the utility of services and identify useful next iterations.

As NOAA considers the next generation of data and information production, delivery, and research and development, it is incumbent upon the organization to understand, use, and expand upon the existing array of NOAA partners. These entities are its first and most valuable resource. Utilizing these partnerships and integrating the experiences they bring to water resources challenges, will allow a more informed process in evolving and developing products and services that better serve the American public.

Gather // Connecting Lessons about Use of Information with User Needs

Continuous investment in engagement, within NOAA and with external users and partners, allows us to fully understand the use of NOAA's information and the scope of information needs. Engagements, as outlined above, are conducted for the purposes of building trust and understanding the use of NOAA's information in the context of what needs still exist. In order to clearly capture and articulate user needs, NOAA relies on continuous engagement with the end user. It is crucial that the trusted NOAA representative also work directly with NOAA's subject matter experts and science teams to ensure the needs are correctly understood. Additionally, NOAA's subject matter experts and science teams must understand that user needs are not limited to specific information. Needs also include the ability to understand when and how users will best receive, and thus use, the information. Gathering needs and understanding how NOAA's products and services are used is a key step in using trusted relationships to build products and services that will be used. To do this, NOAA must (1) leverage the existing efforts, knowledge, and expertise from across the agency and from its partners; and (2) transfer user experience and needs in a systematic and useful way across NOAA. Users can grow weary of their needs being assessed without follow through on NOAA's part in developing solutions. When this occurs, NOAA risks losing the trust of its constituents.

Translate // Review and Consider NOAA's capacity to respond

As relationships are built and user needs are identified, NOAA subject matter experts will translate the needs identified above into technical aspects NOAA will use to make decisions for mission improvement or enhancement. In order for NOAA to produce products that will be used, analysis teams will study, prioritize, and translate the needs as articulated from the user into the development, or refinement, of products and services. NOAA examines not only the mission relevance, but the capacity to be responsive and adapt to the user needs expressed. In this step, NOAA and teams would review, iteratively with the customer, their capacity, and the capacity of NOAA's partners, to respond. This may be accomplished through a formal process, or through less formal structures directly accountable to the user. Regardless of the mechanism, processes must be focused on transparency, responsiveness, and accountability. Understanding the capacity ensures entities who may be tasked with service development receive actionable information to determine existing product value as well as future considerations for maintenance and sustainment.

Assess // Review and Prioritize Product and Service Development

Once user needs are translated and defined, they must be aligned with NOAA's mandates and mission. Once the needs are determined to be within NOAA's mission, they may be further assessed based upon criteria such as applicability and alignment with NOAA priorities. The criteria also must account for the urgency of user needs.

Within the framework of NOAA's strategic priorities and goals, subject matter experts, and/or project teams with knowledge of underlying or consensus user needs, will prioritize solutions. This involvement can better direct development to the entity best positioned to respond, while ensuring outcomes are addressed in an effective manner. Investing in resources (either monetarily or through staff time) must be justified in implementing the request. Proposed solutions will be balanced against potential risks along with opportunities to combine or coordinate efforts to optimize NOAA's outcomes. The results will be documented for reference, particularly, those needs that are not prioritized. Open, transparent communication with our constituents as to NOAA's ability to meet the need identified is critical in maintaining trust. This informs and fosters transparent engagement activities and capitalizes on relationships to keep NOAA cognizant of the context for user needs.

Address // Respond to User Needs

Being responsive to the user's requests and needs is one of the most critical elements in effective service delivery. After the need has been identified and NOAA has decided that it is well positioned (mission and resources) to meet the need, the work of developing the product or services can begin. In identifying and developing the most effective and efficient product or service to address the need, there is regular engagement with the users and partners. Sometimes the need calls for building a new product or service, sometimes it is adjusting or enhancing an existing one, sometimes it is initiating a process such as joint fact finding and, or sometimes it is building the capacity of the users to apply the product via technical assistance, training, or other learning mechanisms. There are times it will require multiple complementary products and services such as a new decision support tool paired with training to ensure end users can best apply. The important piece is that there is a commitment to both develop and deliver a product and or service that addresses the need.

During the process of developing the product or service, communication with the end users is critical. Once they have expressed their needs and NOAA has agreed to develop a product or service, the end users need routine engagement to understand the length of time it will take, how often they will be consulted with, and who is their contact. The more connected the intended users feel during the development time, the more likely they will be to use the end product or service. Interactions between experts and users can drive innovation. The development process should be iterative providing feedback to the developers along the way and understanding to the end users. The NOAA development process needs to ensure the products and services are responsive, relevant, and actionable to the evolving users needs and considers the potential impact of product/service changes on our partners.

Deliver // Deliver Products to Users

NOAA data, information, and tools are developed to enhance users' understanding and decision making. Unless that data, information, and tools are delivered in such a way that the potential end users are aware of, can access, understand how they can be best used to address their issues, and have the knowledge and skills to appropriately apply them, the data, information, and tools risk not being used. The on-going engagement element in the proposed model is key in the delivery element. Targeted outreach and communication can help users know that a specific product or service is available and user-friendly websites assist in an end users ability to access the data, information, and tools.

Increasingly high touch (in person or virtual) delivery mechanisms are sometimes needed for end users to be able to understand and have the skills to apply the data, information, and tools to their decisions. Long term or power users of NOAA water products and services are able to assimilate and apply new products and services more easily and can serve as peer mentors. High touch delivery mechanisms include technical assistance, learning tools (such as case studies, job aids, quick references, tutorials, and community of practices), as well as workshops and training. These mechanisms are most effective if development of them are grounded in the learning sciences. Continuous engagement with the end users will ensure the delivery mechanisms are strategic, relevant, responsive, and timely. The value of the data, information, and tools are not realized until they are being applied by the end users to decisions.

Evaluate // Evaluate User Impact

Evaluating NOAA's efforts on service delivery is a continuous process. Front-end evaluation, or needs assessments, are key in gathering needs and distinguishing between the needs and wants of the end users. Formative evaluation happens as the products and services are being developed and includes the back and forth between developers and the end users. It is through the formative evaluation that NOAA ensures that the end users needs are being met appropriately. Summative evaluations are completed after the products and services have been delivered to document the results. Evaluations can assess the results or examine the process. A return on investment study can be then done to monetize the results.

There are many methods to collect information about how users are applying the products and services delivered. The first questions are typically around if they are using, then how they are using and then importantly, if the use of the products and services are assisting them in reaching their goals more effectively and efficiently. The scope and scale of the products and services can help determine which products and services receive summative evaluations. The science of evaluation is best accomplished through proven social science methods (survey, focus group, interviews, observations) done by expert evaluators particularly for summative and ROI studies. NOAA social scientists, partners, and others specializing in evaluation must work together to leverage resources and capabilities that will ensure products and services accomplish the desired outcomes.

CONCLUSION

The purpose of this framework is to strengthen NOAA's service delivery enterprise so that users can clearly understand and use the breadth of NOAA's information for their decisions. This framework describes the service delivery concept and the activities required to inform use-inspired products and services. NOAA's strength is commitment to service. As an agency, NOAA must fully engage society, utilizing its extended network and partners to leverage knowledge, expertise and resources. The overall value of enhanced service delivery for NOAA is a more efficient and effective agency that is better able to fulfill its vision of healthy ecosystems, communities, and economies that are resilient in the face of change. The NWI Service Delivery and Decision Support Teams (see Appendix D) are committed to developing the implementation and next steps needed to realize the vision of a new service delivery model for NOAA.

APPENDIX A: DEFINITIONS

Definitions for commonly-used terms from the NWI Vision and Five-Year Plan were developed through research and synthesis of existing definitions derived from multiple Line Offices.

Audience. Targeted group for whom NOAA develops and serves information, products and services.

User(s). A person(s), group, or organization who accesses and applies information, products, or services.

User Group. A set of people who have common interests, goals, or concerns about NOAA products and services.

Partners. Organizations and individuals with whom NOAA shares a mission and/or has regular, substantive interaction in order to effectively achieve both of our missions. This definition includes the following terms which may refer to specific LO usage: Core, Close, Key, Primary, Federal, Traditional Line Office; Weather, Water, and Climate Enterprise, etc.

Product. A tangible piece of information (printable, visible) that enables a user to learn or take action.

Service Delivery. The continuous process of engaging with users in order to provide relevant and timely information via appropriate mechanisms.

Stakeholder. Anyone with an interest in the process or outcome, or who is affected by water resources.

Technical Assistance. Targeted coaching for users to help them access, understand, and use NOAA products and services for their own decisions.

Training. Instructionally designed activity aimed at imparting information and building participants skills to attain a specified level of knowledge or skill.

APPENDIX B: SERVICE DELIVERY FRAMEWORK IN ACTION

The following are three successful NOAA examples of implementing this framework.

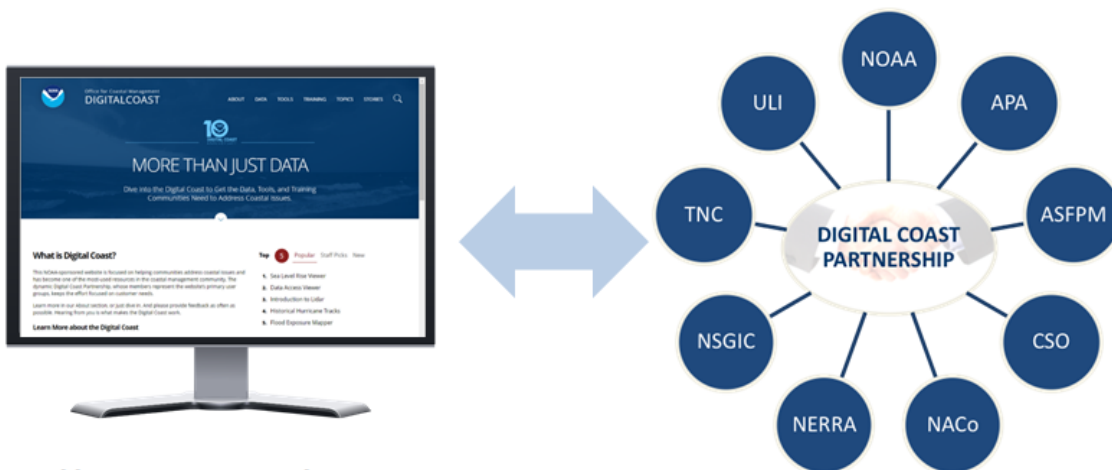
DIGITAL COAST // NOAA developed the Digital Coast to serve those who manage our nation's coastal resources. This digital resource provides not only data, but also the tools, training, and information coastal communities need if they are to use these data in the decision-making process. This centralized repository is cost effective and easy to use. While the Digital Coast was developed and is currently maintained by the NOAA Office for Coastal Management, hundreds of organizations and federal, state, and local agencies contribute content. This resource is a first stop for the nation's coastal management community.

The Digital Coast, however, is more than just a website. The Digital Coast provides the framework, through the Digital Coast Partnership, that allows groups that might not otherwise work together to join forces to address coastal issues. The Digital Coast Partnership, which is composed of membership organizations who represent Digital Coast users, is essential for the success of this effort, since partner input ensures the relevance of the Digital Coast in the face of the constantly changing needs of the coastal management community.

CONNECTION TO KEY ELEMENT(S):

- **Foundation // Continuous Engagement** - NOAA's Office for Coastal Management has dedicated points-of-contacts who routinely speak to and coordinate with the partnership organizations. In addition, quarterly calls are held along with annual face-to-face meetings. This highly successful partnership approach is based on clear expectations and roles for all partners and NOAA.
- **Build // Building Trusted Relationships** - The Digital Coast Partnership was formed in 2007 to help guide the scope and content of what Digital Coast has evolved to be. Dedicated, long-term, continuous engagement; shared expectations; clear roles; transparency; joint strategic planning; and shared credit and shared opportunity has built trust among all partner organizations. Even with staff turnover, the relationship has continued because of the relationships built.
- **Gather // Connecting Lessons about Use of Information with User Needs** - Partnership members routinely discuss information needs and priorities. This direct feedback leads to product and service delivery improvements for the Digital Coast.
- **Translate // Review and Consider NOAA's Capacity to Respond** - NOAA's Office for Coastal Management assesses the organization's capacity to address identified needs. Critical to success is sharing what can be done, but equally importantly, what cannot be done and why.
- **Review // Review and Prioritize Product and Service Development** - User needs and capacity to respond are reviewed to determine products and services to enhance, develop, or in some cases, abandon. Transparency back to the partnership organizations is a key component of this element.

- **Respond // Respond to User Needs** - Using routine meetings and other forms of engagement and outreach to demonstrate products and services and provide answers to expressed needs shows responsiveness and is critical.
- **Deliver // Deliver Products to Users** - The Digital Coast provides products and services in accessible, and many times multiple, formats for the target audiences. Each product also includes, as appropriate, training, tutorials, and metadata that enable the user to apply the product and services with confidence.
- **Evaluate // Evaluate Impact** - Continuous feedback and evaluation lead to improved products and services. The Digital Coast Partnership represents well over 100,000 potential users; one of their primary roles is to evaluate products during development and after release.



<https://coast.noaa.gov/digitalcoast>

The Digital Coast Enabling Platform is built on the interaction between the Digital Coast Partners and users and the website. This connection is critical to the platform’s success.

NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM (NIDIS) // The National Integrated Drought Information System (NIDIS) Act was authorized by Congress in 2006 (Public Law 109-430) and reauthorized in 2014 and 2019 with an interagency mandate to develop and provide a national drought early warning information system, by coordinating and integrating drought research, and building upon existing federal, tribal, state, and local partnerships. NIDIS is led by the National Oceanic and Atmospheric Administration (NOAA). NIDIS's mission is to improve the nation's capacity to proactively manage drought-related risks, by providing those affected with the best available information and resources to assess the potential for drought and to better prepare for, mitigate, and respond to the effects of drought. Service delivery and stakeholder engagement are key components of NIDIS implementation.

CONNECTION TO KEY ELEMENT(S):

- **Foundation // Continuous Engagement** - Partnerships are a foundational element of NIDIS, with numerous mechanisms for engagement. For example, NIDIS has regional Drought Early Warning System (DEWS) coordinators that are continuously speaking and coordinating with a wide range of regional partners.
- **Build // Building Trusted Relationships** - NIDIS builds and sustains relationships to implement an integrated drought monitoring and forecasting system at federal, tribal, state, and local levels. At the national level, NIDIS has an Executive Council with a broad representation of federal and non-federal partners. At the regional level, the DEWS serve as the primary platform for building and sustaining relationships.
- **Gather // Connecting Lessons about Use of Information with User Needs** - NIDIS has supported several assessments related to the use of drought information, which has informed future research investments.
- **Translate // Review and Consider NOAA's capacity to respond** - NIDIS fosters and supports a research environment focusing on risk assessment, forecasting, and management.
- **Review // Review and Prioritize Product and Service Development** - Regional needs for drought early warning information is routinely collected in each regional DEWS through workshops and sustained dialogue with partners. These needs, and actions required to meet those needs, are further reviewed and prioritized by the regional network and articulated in regional DEWS Strategic Action Plans.
- **Respond // Respond to User Needs - Deliver // Deliver Products to Users** - NIDIS provides a framework for public awareness and education about droughts, which includes the U.S. Drought Portal located at drought.gov.
- **Evaluate // Evaluate Impact** - The NIDIS implementation plan details the evolution and lessons learned in moving towards a national drought early warning information system, and highlights the thoughtful feedback and participation of NIDIS's partners.

Drought.gov
National Integrated Drought Information System

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Forecast-informed Reservoir Operations (FIRO) Interactive Workshop

An interactive workshop on September 12-13 in Arlington, Texas, to learn how NOAA forecasts have been applied in decision-support tools for water management in different states.

[Learn more](#)

NEWS
March 2019 California-Nevada Drought Outlook and Webinar Summary
Tribal Drought Pages on Drought.
How Drought Prone is Your State? A Look at the Top States and Counties in Drought Over the Last Two Decades

How is Drought Affecting your Neighborhood? [Get Conditions](#)

Advancing Drought Science and Preparedness across the Nation

NIDIS is a multi-agency partnership that coordinates drought monitoring, forecasting, planning, and information at national, tribal, state, and local levels.

Current Conditions | September 20, 2019 [Drought in your area?](#) [Report Issues](#)

U.S. Drought Monitor	Temperature	Precipitation
D0 - Abnormally Dry • 10-20% of normal precipitation, growth or crop loss • 10-20% of normal soil moisture • 10-20% of normal streamflow	35.6% of U.S.	
D1 - Moderate Drought • 20-30% of normal precipitation, crop loss • 20-30% of normal soil moisture • 20-30% of normal streamflow	22.3% of U.S.	
D2 - Severe Drought • 30-40% of normal precipitation, crop loss • 30-40% of normal soil moisture • 30-40% of normal streamflow	6.8% of U.S.	
D3 - Extreme Drought • 40-50% of normal precipitation, crop loss • 40-50% of normal soil moisture • 40-50% of normal streamflow	5.6% of U.S.	
D4 - Exceptional Drought • 50-60% of normal precipitation, crop loss • 50-60% of normal soil moisture • 50-60% of normal streamflow	1.6% of U.S.	

[View more national drought maps.](#)

32,870 acres burned since January 1, 2019.	\$1,267,850 spent on wildfire management last year.	15,395 people within 10 miles of an active wildfire.	5 national parks with active wildfires.
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[Learn more about these stats.](#)

Drought.gov is the U.S. Drought Portal and serves as the public face of NIDIS by providing timely information on drought to the country. An updated drought.gov portal will be launched in 2020 following extensive user feedback outreach.

WATER RESOURCES DASHBOARD // To ensure a safe and secure supply of clean water and to protect the health and safety of residents, water resource managers and urban planners need to monitor and respond to the potential for flooding and drought in their regions. Federal weather and climate data and tools keep decision-makers informed, but sometimes finding information poses a challenge to water managers. In response to requests from decision and policy makers from the water resource management and city planning communities, NOAA's Climate Program Office (CPO), National Centers for Environmental Information (NCEI), EPA, and several water and planning-oriented NGOs have been working together since 2014 to develop the Water Resources Dashboard (Dashboard). The Dashboard provides an integrated information resource for a wide variety of weather, climate and water information that NOAA and other federal agencies provide for the water sector (<https://toolkit.climate.gov/topics/water/water-resources-dashboard>).

CONNECTION TO KEY ELEMENT(S):

- **Foundation // Continuous Engagement** – All regions and economic sectors in the US depend on adequate and reliable water supplies. Too much or too little water can endanger the health and welfare of citizens and businesses. Driven by feedback from user communities and federal agencies, NOAA and partners have developed the Water Resources Dashboard: a one-stop location for water-relevant data sets. The effort began in 2014. The planning group for this effort met (and continues to meet) periodically, both in person and virtually, to continue to enhance NOAA's ability to provide climate/weather data to water resource managers who make decisions at various time scales from minutes to centuries, or basically, from today's intense storm impact on water quality to designing water infrastructure that should last into the next century. The original dashboard was completed two years later. Through continuous engagement, the dashboard has been enhanced (as described below) with educational and outreach activities, and currently through interactions with a subset of users.
- **Build // Building Trusted Relationships** – With the help of several non-governmental organizations—including the American Planning Association, American Water Works Association, Association of Metropolitan Water Agencies, Water Environment Federation, Water Environment Research Foundation and the Water Research Foundation – NOAA worked to combine resources on flooding, drought, and other extreme precipitation events into one location to better serve the needs of stakeholders. This process took two years in which these organizations queried their key constituents on how they used climate/weather information, how they would like to use these data, and other suggestions for improved use of these resources to help water resource managers and urban planners build resilience to extreme precipitation events. The group then met with NOAA scientists to discuss the available and newly released data. Based on these discussions, a team, consisting of water/planning NGOs, NOAA scientists and web developers developed the Water Resources Dashboard, which was released in 2016.
- **Gather // Connecting Lessons about Use of Information with User Needs** – Members of the planning team meet periodically to discuss updates to the Dashboard, communication strategies, and future steps to improve the reach and use of the tool.
- **Translate // Review and Consider NOAA's Capacity to Respond** – There have been continuous updates to the Dashboard. However, after the initial release of the Dashboard, the committee discussed how to increase the use of climate data by water utilities. Prominent in this discussion was a dearth of education and outreach materials. The team worked over the next few years on a series of webinars that are now used to “teach” about the individual data sources that appear on the Dashboard. Each webinar is ½ hour

in length with a scientist involved in developing the data source explaining in lay terms the data set including potential uses and limitations. This is followed by a 5-10 minute response by a water resource manager who describes how they use the data in their decision-making processes. The final part of the webinar contains questions and answers from the speakers and the audience. Each webinar was recorded and currently resides as a thumbnail on the Dashboard beneath the description of the data; these recordings are also available on Youtube and have been accessed numerous times after the initial airing of the videos.

- **Review // Review and Prioritize Product and Service Development** – Once the webinars were added to the Dashboard, the planning team met and discussed other improvements. NOAA staff interviewed these members separately and found that overwhelmingly, they felt that the Dashboard could be enhanced to better address the needs of small – medium size water utilities.
- **Respond // Respond to User Needs** – The NOAA Water Initiative was able to provide funding for a study to better understand the needs of smaller water utilities. Currently, CPO and NESDIS are leading a study with the water and planning foundations (and with additional financial and in-kind support from the Water Resources Foundation and US Water Alliance) to better understand gaps and opportunities with working with this population. As part of NWI’s decision-support services, supported by NOAA’s Office of Coastal Management and executed by CPO and NESDIS, regional meetings are being planned to access and understand the information needs of small- to medium-scale water utilities, to improve existing tools, and to build additional resources to meet water sector needs at different scales. Additional tools will be developed and a final report, complete with suggestions for next steps will be delivered in December 2020.
- **Deliver // Deliver Products to Users** – Currently, links to over twenty datasets relevant to water managers reside on the Dashboard accompanied in most cases with at least one webinar tutorial of the uses and applications of the discrete data. When available, case studies are also listed to increase utilities’ understanding of the use and application of the data sets.
- **Evaluate // Evaluate Impact** - Feedback and evaluation led by NGOs with direct ties to users continues to help improve the content and application of data that resides on the Dashboard. The current study of small-medium water utilities includes evaluation of users understandings, needs, and desires that will lead to continued enhancements to the Dashboard as well as other NOAA data and tools.



Water Resources Dashboard

SHARE

TWEET

PRINT

Water resource managers and urban planners can use this dashboard to access maps and data that help them monitor the potential for extreme precipitation and drought in their regions. A similar set of information is available via an Esri Story Map, [Climate Information for Water Utilities](#). The Climate Resilience Toolkit's [Acknowledgments](#) page lists the individuals who contributed to this collection.

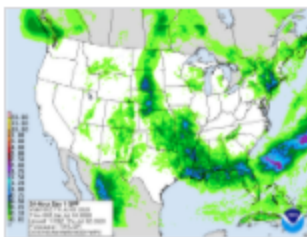
Note that this is a dynamic page: the scope and content of dashboard entries are driven by input from users. We welcome your suggestions and additions to improve its usefulness. Please [email us](#) with your suggestions.

Forecasts, Outlooks, and Future Projections



National Weather Service Forecasts

View current conditions and short- to medium-range (1-7 days) forecasts for precipitation, temperature, wind, and clouds. These forecasts often identify potential hazards such as heavy precipitation three or more days in advance.



Quantitative Precipitation Forecasts

View forecasts of cumulative precipitation for periods from 6 hours to 7 days into the future. Monitoring this site can alert decision makers of the potential for wet weather and/or flooding.

[View tool demo >](#)

[Visit data source >](#)



NWS Hydrologic Forecasts

View predicted flood status at more than 3,700 gauges in the United States. Click to zoom in on a region, and then roll your cursor over gauge locations to view hydrographs of recent and forecast discharge levels

[Visit data source >](#)

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APPENDIX C: ADDITIONAL RESOURCES

Theory Behind It, Guides, and resources on engagement and user-driven product and service development:

- The shape of engagement, by Scott Gould (HBS)
- What customers want (customer theory, outcome theory), by Anthony Ulwick
- Adler, Peter and Juliana Birkhoff. (2002) Building Trust: When knowledge from “here” meets knowledge from “away”. National Policy Consensus Center: Washington DC.
- Forester, John. (2006). Making Participation Work When Interests Conflict: Moving from facilitating dialogue and moderating debate to mediating negotiations. *Journal of the American Planning Association*. 72:4. 447-456.
- Gray, B. (1989). Collaborating: Finding common ground for multiparty problems. San Francisco: Jossey-Bass Publishers.
- Innes, J.E., Booher, D.E. (2010). Planning With Complexity: An introduction to collaborative rationality for public policy. New York: Routledge.
- Karl, H., Susskind, L., & Wallace, K. (2007). A Dialogue, Not a Diatribe: Effective integration of science and policy through joint fact finding. *Environment*, 49(1), 20-34.
- Creighton, James L. 2005. The Public Participation Handbook: Making Better Decisions through Citizen Involvement. Jossey-Bass. San Francisco, CA.
- 2020 Special Edition of the Journal for Current Opinion in Environmental Sustainability on Making Knowledge Actionable for Environmental Sustainability from the Aspen Global Change Institute
- Accelerate-- The science of lean software in DevOps (agile modifications, updates quickly, fixing pieces)
- Andrea J. Ray and Robert S. Webb (2016) Understanding the user context: decision calendars as frameworks for linking climate to policy, planning, and decision-making, NOAA Earth System Research Laboratory

APPENDIX D: NWI SERVICE DELIVERY/DECISION SUPPORT OBJECTIVE TEAM MEMBERS

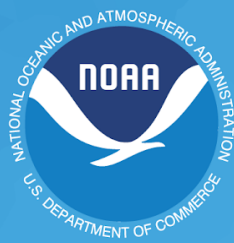
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Members of this team represent all of NOAA's line offices, and years of experience in the field of engagement and the development of user-driven science, products, and services.



NOAA Water Initiative