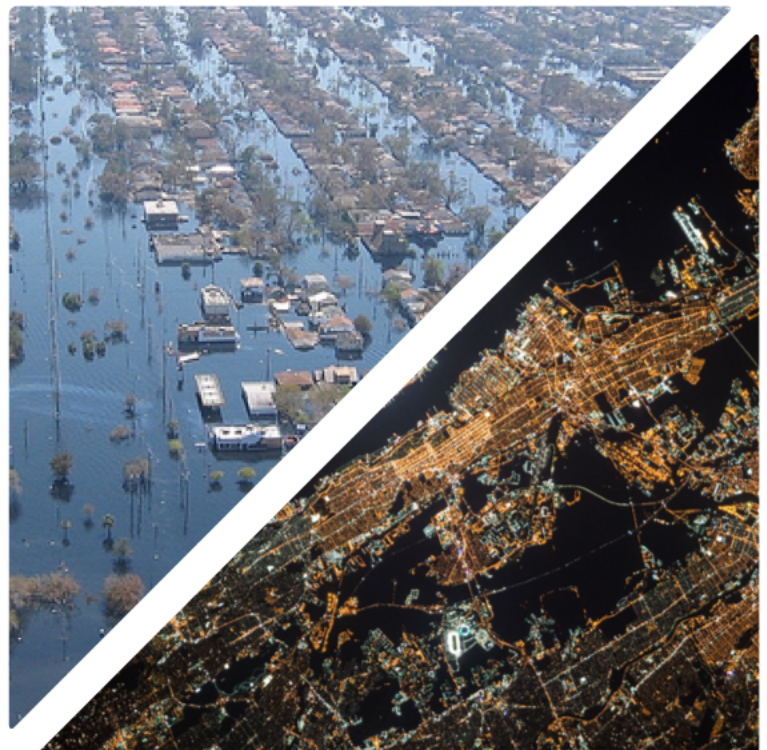




National Oceanic and  
Atmospheric Administration  
U.S. Department of Commerce

# NOAA Water Initiative

Vision and Five-Year Plan  
December 2016



# Introduction

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. These threats to water security arise from several factors, such as increased water demand from population growth, energy production, and economic development, deteriorating water infrastructure, and the weather- and water-related impacts of climate change. In particular, expected climate change impacts on water vary regionally and will include changing sea levels, increased frequency of heavy downpours, changes in water quality, and longer, more intense periods of drought.

NOAA has embarked on a comprehensive NOAA Water Initiative, designed to give people and governments better access to the water information they need for their unique circumstances, so that they may take appropriate actions to address water-related risks and manage their water resources more efficiently and effectively.

From May to July 2016, as part of the NOAA Water Initiative, NOAA convened a series of meetings with water resources stakeholders across the United States entitled, “The National Conversation on Integrated Water Information for the 21st Century.” These meetings were designed to benefit from and integrate the lessons and experience of existing science and services related to weather, climate, oceans, and water. Participants in these meetings highlighted the importance of consistent, integrated water predictions, data, and analyses at appropriate space and time scales to inform critical decisions. They also emphasized the importance of NOAA’s work to convert predictions, data, and analyses into actionable water intelligence by developing effective visualization and decision support tools informed by social science. Perhaps most importantly, they emphasized the need for regular communication, consultation and engagement with decision makers.

In response to these and previous stakeholder engagements, NOAA is actively working with its partners to develop and deliver services focused on next-generation water prediction,

sustained decision support, and delivery of timely, accurate, and actionable water information services, based on a deep understanding of user needs.

The NOAA Water Initiative builds on NOAA’s six mission areas relating to water resources and water information:

- ◆ NOAA’s National Environmental Satellite, Data, and Information Service (NESDIS) provides secure and timely access to global environmental data and information from satellites and other sources to promote and protect the Nation’s security, environment, economy, and quality of life.
- ◆ NOAA’s National Marine Fisheries Service (NMFS) provides stewardship of the nation’s ocean resources and their habitat.
- ◆ NOAA’s National Ocean Service (NOS) provides science-based solutions through collaborative partnerships to address evolving economic, environmental, and social pressures on our ocean and coasts.
- ◆ NOAA’s National Weather Service (NWS) provides weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.
- ◆ NOAA’s Office of Oceanic and Atmospheric Research (OAR) conducts research to understand and predict the Earth system, develop technology to improve NOAA science, service and stewardship; work within user communities to understand research needs and transition the results so they are useful to society.
- ◆ NOAA’s Office of Marine and Aviation Operations (OMAO) delivers effective Earth observation capabilities, integrate emerging technologies, and provide a specialized, flexible, and reliable team responsive to NOAA and the Nation.



Water is a common thread that runs through NOAA's mission areas and offices, each of which serve stakeholders through a variety of field offices, laboratories and national service outlets.<sup>1</sup>

NOAA is both a producer and customer of water information services; some of NOAA's more well-known water-related programs include the river forecasts provided by NWS River Forecast Centers, the Digital Coast service provided by NOS, the water temperature modeling produced and used by NMFS, the large-scale precipitation data collected and managed by NESDIS, and the water-related research activities of OAR's grant-making programs, labs and cooperative institutes. In addition, NOAA is home to the National Integrated Drought Information System (NIDIS), an interagency program based at NOAA that implements the NIDIS Act (Public Law 109-430) to, among other things, provide drought early warning information and coordinate federal research in support of drought information.

The NWI represents an unparalleled level of internal collaboration across NOAA offices and programs to enhance the agency's capability to develop and deliver better water information services. To that end, NOAA has established a new National Water Center in Tuscaloosa, Alabama to facilitate that collaboration across NOAA and with external partners. (see Section 5).

NOAA cannot accomplish this work alone. The NWI is designed to further coordinate NOAA's weather and water-related programs and services with NOAA's customers and partners in Federal, State, regional, local, and Tribal governments and agencies. In addition, NOAA's success will depend critically on partners in academic, non-governmental,

and private sector organizations, as well as international partners.

At the Federal level, NOAA will work closely with its partner agencies, such as the U.S. Geological Survey (USGS), the U.S. Army Corps of Engineers, the Bureau of Reclamation, the National Science Foundation, the Environmental Protection Agency, and the U.S. Department of Agriculture, in the development and delivery of these new information services. The NWI is designed to be a complementary activity to the activities of other Federal agencies with missions and operations related to surface and groundwater quantity, quality, and infrastructure.<sup>2</sup> Federal interagency collaboration will be accomplished through a variety of interagency forums, including the Integrated Water Resource, Science and Services (IWRSS) agreement, the National Drought Resilience Partnership (NDRP), and the Advisory Committee on Water Information (ACWI), among others.

Finally, the objectives and outcomes described in the NOAA Water Initiative will require the support of Congress.<sup>3</sup> As such, the NWI is a critical NOAA contribution to a broad national effort to meet stakeholders' most pressing requirements for water information.

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[1] See Appendix

[2] The water information provided by NOAA will supplement existing methods for providing public access to water data, including the National Water Census, which was called for by the SECURE Water Act (Subtitle F of P.L. 111-11), and the Access to Water Resource Data provision of the Water Resources Development Act of 2007 (P.L. 110-114).

[3] Funding for the activities described in the NOAA Water Initiative is provided in part by the President's Budget Request for Fiscal Year 2017.

# Vision and Mission

The NOAA Water Initiative envisions a Nation in which everyone from individual citizens to businesses and public officials has timely, actionable information about their vital water resources at their fingertips, and can factor this information wisely into their decisions about water risks, use, management, planning, and security.

The mission of the NOAA Water Initiative is to improve the Nation's water security by providing science-based information and services that address vulnerability to water risks and enabling greater efficiency and effectiveness in the management of water resources. NOAA will advance this mission primarily through transforming integrated water prediction services in collaboration with decision makers, partners, and users.

The NOAA Water Initiative will be developed in partnership with Federal, State, regional, local, and Tribal governments and agencies, as well as academic, non-governmental, private sector, and international partners, and will be characterized by the following attributes:

- 💧 **User-driven** – Bringing Earth system science to the service of society and supporting wise stewardship of our planet and its resources, by orienting products and services to end users to ensure the information produced by NOAA and its partners is easily accessible and meets user needs.
- 💧 **Science-based** – Delivering the best scientific information and services available to inform and support water decisions.
- 💧 **Seamless** – Facilitating linkages across disciplines, sectors, time and space, research and operations;
- 💧 **Interoperable** – Pursuing and supporting technical interoperability among internal and external systems across NOAA and Federal departments and agencies, as well as among the public, academic, and private sectors; and
- 💧 **Nimble** – Responding to user needs with speed and flexibility and adapting to new science and technology.

## Common Goal

The NOAA Water Initiative will be guided by one overarching common goal: *To transform water information service delivery to better meet and support evolving societal needs.* This goal directly supports NOAA's mission to protect life and property from extreme events and to create and strengthen resilience in ecosystems, communities, and economies.

To transform water information service delivery, NOAA and its partners will work to foster an integrated approach to water information systems and services, building on established and successful programs, that is:



- 💧 Accountable to the public;
- 💧 Driven by user-defined questions and needs, through robust engagement with stakeholders that considers routine feedback to respond to changing priorities;
- 💧 Characterized by effective risk communication, including clear communication of uncertainty;
- 💧 Delivered across time and spatial scales relevant to decision-making, including simulations and scenario planning relevant to a variety of time scales;
- 💧 Accompanied by education and outreach to enable their effective use by decision makers;
- 💧 Informed by science and technology, including social and behavioral considerations and methodologies;
- 💧 Embedded into community decision-making; and
- 💧 Complementary to existing Federal agency water data missions and operations.

This approach takes into consideration the water cycle as a whole while also focusing on the unique physical and socioeconomic attributes and challenges of specific regions. It supports the efforts of communities to engage in a holistic analysis of their water resource challenges and promote integrated water resources management across geographic and jurisdictional boundaries. This approach will be supported by a world-class technical enterprise of integrated decision tools, delivery methods, predictions, observations, and networks of experts and practitioners working to contextualize information for strategic planning.



## Objectives and Outcomes

To achieve the common goal of the NOAA Water Initiative, the agency will pursue five interdependent strategic objectives, which are equal in priority, will be pursued concurrently, and will result in a specific set of outcomes.

By working toward these objectives, this initiative will advance the nation's awareness and understanding of water-related risks, extreme events, and vulnerabilities across sectors and regions and will promote the development of sustainable tools to foster more informed decision-making.

- 01 **Build strategic partnerships for water information services.**
- 02 **Strengthen water decision support tools and networks.**
- 03 **Revolutionize water modeling, forecasting, and precipitation prediction.**
- 04 **Accelerate water information research and development (R&D).**
- 05 **Enhance and sustain water-related observations.**

## Objective 1: Build Strategic Partnerships for Water Information Services

Water information services today are delivered by a wide community of Federal, State, local, regional, and Tribal authorities, as well as from a variety of academic, non-profit, and commercial sector service providers. These partners are both end users and providers of weather and water information. Within this community, NOAA is a leader in predicting risks to life, property, and ecosystems from floods, droughts, water quality, and water availability in the context of a changing climate. NOAA also has played a central role in fostering interagency collaboration and engaging public and private sector partners in the design and implementation of drought and flood early warning information systems. NOAA water information services include impact-based decision support, science-based risk assessments, forecasting and warning, and capacity building for a host of near- and longer-term societal challenges. These challenges include the need for expanded integrated water decision-support for municipal water supply, power generation, agriculture and fisheries management, recreation, ecosystem management, navigation, drought, climate change, coastal zone management, and marine resource protection, among others.

To achieve the vision of this initiative, NOAA will enhance strategic partnerships that span jurisdictions, geographic boundaries, agency mission areas, and sectors to meet shared water decision-support goals. These partnerships require an emphasis on specific areas relating to water, as well as their associated research, measurement, modeling, educational and decision-support requirements. These areas include:

- ◆ Flooding and coastal inundation;
- ◆ Water resource and water supply management;
- ◆ Water quality risks to ecosystems and communities; and
- ◆ Transportation and navigation.

These partnerships, developed from existing arrangements and the creation of new arrangements as appropriate, will leverage and enhance stakeholder engagement and collaboration at both regional and local levels and will increase interaction and cooperation across Federal agencies at the national level.<sup>4</sup>

*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.

Engagement with the private sector will be particularly important to the success of the NOAA Water Initiative. Over many decades, the bureaus and offices of NOAA have developed robust and productive relationships with private sector providers and users of environmental information services. The NOAA Water Initiative will build on these relationships both to carry out its public mission and to cultivate and support a new greenfield of private enterprise around water information services.<sup>5</sup>

[4] Regional collaboration will take advantage of existing regional structures and extensions of NOAA as well as those of other Federal agencies.

[5] Private sector engagement and decision-support tool development activity under the NOAA Water Initiative will be carried out in keeping with NOAA Administrative Order 216-112: *Policy on Partnerships in the Provision of Environmental Information*, July 10, 2007.

## Objective 2: Strengthen Water Decision Support Tools and Networks

Across the nation, water managers, government leaders, corporate executives, and the general public are facing ever more urgent questions about water with increasing frequency. NOAA and many other information-service providers across the water enterprise work with decision makers to supply information at appropriate time and geographic scales through analytical and geospatial support tools that directly address stakeholder questions. Through sustained partner engagement, these user-defined, question-specific tools are designed to provide “actionable analytics”— data mined from diverse sources and placed in context so that it can be acted upon or factored into decisions.

In keeping with the design principles of the new model of service development and delivery, NOAA will collaborate with its partners to foster the development of new weather and water decision support tools and networks, leveraging existing networks and tools where possible, to create accessible solutions that work across multiple platforms. Wherever possible and appropriate, these tools focus on place-based, watershed system questions and will focus on consultation, interpretation, and impact-based decision support, rather than the advancement of specific technologies.

*Outcome 2.1:* Within five years, NOAA, together with its partners, will facilitate the creation of new decision support tools and applications in the following areas:<sup>6</sup>

- ◆ Flooding and coastal inundation tools for emergency managers;
- ◆ Water resource management tools, including seasonal forecasting tools, at multiple time scales for sectors such as agriculture, energy, planning, and municipal water supply;
- ◆ Water quality (e.g., temperature and salinity) and ecological modeling and forecasting tools for a variety of water resource, water quality, and ecological functions; and
- ◆ High-flow, ice, and low-flow risks for the navigation sector.

[6] Proposed Federal partners for each decision-support area will include: a) FEMA, USACE, USGS; b) USACE, USBR; USGS; c) EPA, USGS; d) USACE, FEMA



### DIGITAL COAST

Decision Support Tool Example 1

The NOAA-sponsored Digital Coast website is focused on helping communities address coastal issues and meeting the needs of the coastal management community. The website provides not only coastal data, but also the tools, training, and information needed to make these data truly useful. For example, a case study from Mississippi and Louisiana depicts how coastal communities are susceptible to a variety of natural and man-made hazards. Many of the residents who live in these areas are vulnerable because of age, income, disabilities, or other factors and require special assistance when events occur. Having tools to quickly communicate vulnerability data is critical in planning for and responding to hazard events. The Red Cross is using the Digital Coast’s Coastal County Flood Exposure Snapshot to communicate vulnerability information to its network members. This tool captures the numbers of elderly and impoverished residents living in the floodplain as well as the number of critical facilities located there, which is valuable information for pre-event and recovery planning. Organizations can find it difficult to locate and analyze vulnerability data and present that information to others in a meaningful way. Digital Coast resources allow organizations like the Red Cross to communicate vulnerabilities using easy-to-understand tables and graphs that will help inform hazard planning efforts.

Learn more at  
[www.coast.noaa.gov/digitalcoast](http://www.coast.noaa.gov/digitalcoast).



A critical feature of NOAA's approach to decision support will be to emphasize open data services, which refers to providing authoritative, standardized data that are easily discoverable, accessible, usable, and interoperable across different platforms.<sup>7</sup> NOAA will design its water data services to support downstream interoperability between information systems. NOAA will also focus on the needs of key target audiences when determining format, frequency of updates, and other aspects of the specific information products and services. NOAA water data services will rely on machine-readable and open formats, open data standards, and open licenses where appropriate, as well as common core and extensible metadata.

**Outcome 2.2:** Within three years, NOAA's initial water data services will demonstrate open data principles for at least two new services, including machine readability across multiple platforms and accessibility validated by key user communities.<sup>8</sup>

### Objective 3: Revolutionize Water Modeling, Forecasting, and Precipitation Prediction

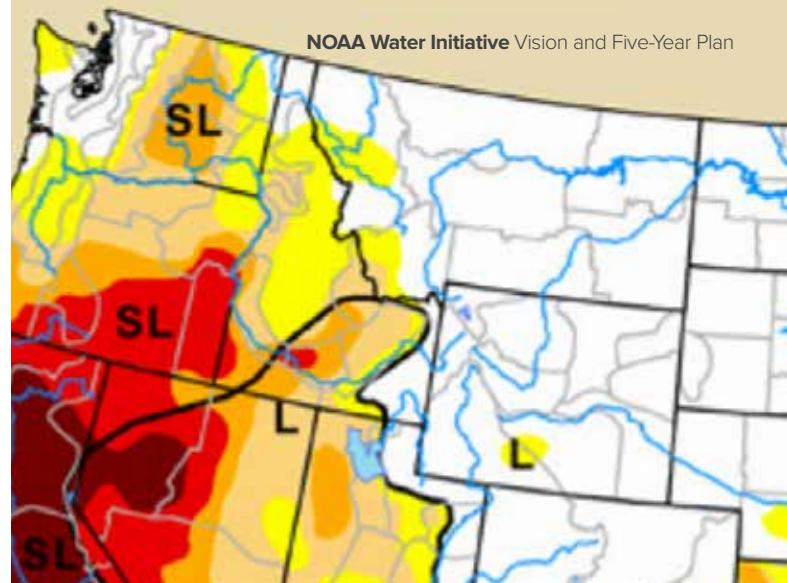
A key building block of the NOAA Water Initiative is the transformation of NOAA's current water prediction services, in close partnership with the USGS and other Federal agencies, to provide integrated water modeling and prediction across a range of timescales and watershed sizes, with the appropriate timeliness, resolution, reliability, and accuracy required to help inform decision making. Forecast products will incorporate ensemble-based prediction to quantify and convey forecast uncertainty, bias, and skill. NOAA will also expand its efforts to improve skill of sub-seasonal to seasonal precipitation outlooks to provide actionable intelligence for water supply management and drought preparedness. The pillars of this modeling work are:

- Transforming NOAA's inland and coastal hydrology prediction services through ongoing improvements to existing hydrologic services, including coastal mapping, the continued implementation and utilization of the Hydrologic Ensemble Forecast Service (HEFS), and the development of the new, prototype National Water Model (NWM), the nation's first-ever continental-scale hydrologic prediction system;<sup>9</sup> (see section 5)

[7] Executive Order — *Making Open and Machine Readable the New Default for Government Information*, May 9, 2013.

[8] Key Federal partners will be USGS and EPA, and others organized through the Open Water Data Initiative

[9] The National Water Model was developed by NOAA's National Weather Service in partnership with the U.S. Geological Survey (USGS), the National Science Foundation (NSF), the National Center for Atmospheric Research (NCAR), and the Consortium of Universities for the Advancement of Hydrologic Sciences Incorporated (CUAHSI). Future collaboration is envisioned with Department of Energy (DOE), the National Aeronautics and Space Administration (NASA), and other Federal agencies and external stakeholders in hydrologic modeling.



## U.S. DROUGHT MONITOR

Decision Support Tool Example 2

Recognizing drought before it intensifies can reduce impacts and save money. The U.S. Drought Monitor is a weekly map of drought conditions. The U.S. Drought Monitor is produced jointly by NOAA, the U.S. Department of Agriculture (USDA), and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln. The USDA uses the Drought Monitor to trigger disaster declarations and eligibility for low-interest loans. The Farm Service Agency uses it to help determine eligibility for their Livestock Forage Program (LFP), and the Internal Revenue Service uses it for tax deferral on forced livestock sales due to drought. State, local, tribal and basin-level decision makers use it to plan and initiate drought responses, ideally along with other more local indicators of drought. The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country. Experts synthesize the best available data from multiple sources and work with local observers to localize the information as much as possible. Eleven climatologists from partner organizations take turns serving as the lead author each week. The authors examine all the data and use their best judgment to reconcile any differences in what different sources are saying.

Learn more at [www.droughtmonitor.unl.edu](http://www.droughtmonitor.unl.edu).



- ◆ Transforming NOAA's quantitative precipitation forecasting capabilities at time scales necessary to support water supply and water resource management—from daily to weekly to seasonal—through research into key underlying physical processes, including sources of predictability, and the development of sub-seasonal to seasonal forecasting tools;
- ◆ Recognizing water as habitat by integrating physical and ecological modeling of water quantity and water quality (e.g., temperature, salinity, ocean color, etc.) to inform effective management of riverine, estuarine, and marine ecological functions and processes in support of a wide variety of human uses and community needs; and
- ◆ Evolving NOAA's water modeling efforts in support of the longer range goal of integrated Earth system modeling in the context of a unified modeling approach, where best practices in process understanding, model development, data assimilation, post-processing, and product dissemination will be leveraged across disciplinary boundaries.<sup>10</sup> This activity will be carried out in keeping with the updated interagency Charter for the Partnership on the National Earth System Prediction Capability (ESPC).

To achieve this, NOAA will tap into the Nation's best talents from the public, private, and academic sectors.

*Outcome 3.1:* Within five years, NOAA will work with our Federal partners to further develop, demonstrate and implement improved continental-scale hydrologic prediction across the Nation through the NWM, to support:

- ◆ Water resource management across short- to long-range time scales and across high- to low-flow conditions;
- ◆ Flash-flood and urban water prediction;
- ◆ Total water levels propagating up and downstream in coastal and estuarine environments, particularly during storm events; and ultimately
- ◆ Water quality forecasting, including demonstrations of water temperature forecasting.

*Outcome 3.2:* Within five years, NOAA will make investments in unified Earth system modeling to improve quantitative precipitation forecasts from the short-range time scale through seasonal prediction, to improve precipitation forecasting products developed by the National Weather Service.<sup>11</sup>

*Outcome 3.3:* Within five years, NOAA and its partners will develop and demonstrate biogeochemical modeling of water quality and ecosystem functions in five targeted basins or watersheds and their associated outlets distributed across the U.S.

[10] NOAA Strategic Research Guidance Memorandum, September 16, 2016

[11] Includes products developed and delivered by the Climate Prediction Center, the Weather Prediction Center, and local Weather Forecast Offices of the National Weather Service.

## Objective 4: Accelerate Water Information Research and Development and Research Transitions

A number of fundamental scientific barriers must be broken down to achieve the caliber of water information services necessary to meet user needs. NOAA will benefit from and advance focused research agendas that targets these barriers and engages the best extramural and intramural talents to tackle them, and transitions them from research to operations, application, commercialization, or other uses.<sup>12</sup>

*Outcome 4.1:* Within five years, NOAA, with the support of Congress and input from all partners, will enhance investments in a concurrent series of water R&D projects such as, but not limited to:

- ◆ Coupling land surface and coastal estuary models to improve the prediction of total water level in the coastal zone;
- ◆ Testing and implementing enhanced groundwater modeling capabilities within the NWM;
- ◆ Establishing a long-term model development environment to allow for the ongoing expansion and improvement of the NWM, and incorporating multiple physical, biological, and chemical Earth system processes, as well as the anthropogenic influences that affect water prediction;
- ◆ Developing additional sector-specific tools and methodologies to characterize and assess opportunities and communicate water-related vulnerabilities;
- ◆ Expanding and improving short-term and medium-range quantitative precipitation forecasts (QPF) and ensembles of QPF for enhanced water prediction;
- ◆ Advancing water quality forecasting, including temperature, in stream, riverine, estuarine and coastal ocean environments;
- ◆ Advancing hyper-resolution modeling to account for urban-scale hydrologic processes;

[12] Activities under this goal will be carried out in keeping with NOAA Administrative Order 216-105A: *Policy on Research and Development Transitions*, December 3, 2015, and NOAA Administrative Order 216-115A: *Research and Development in NOAA*, October 3, 2016.



### GREAT LAKES HARMFUL ALGAL BLOOM TRACKER

Decision Support Tool Example 3

Harmful Algal Blooms (HABs) in the Great Lakes have increased in recent decades. The NOAA Great Lakes HAB Tracker is an experimental tool that combines remote sensing, monitoring, and modeling to produce daily 5-day forecasts of bloom transport and concentration. For example, in a 2014 Toledo, Ohio water crisis, half a million people were warned to avoid drinking the water due to toxins overwhelming a water treatment plant in Lake Erie's western basin. The HAB Tracker experimental tool was subsequently developed to provide real-time updates of blooms in Lake Erie, providing situational awareness of blooms between regular bi-weekly bulletins. This increased awareness could potentially help water treatment plant managers to prepare if a bloom appears to be moving towards a water intake line. The NOAA Great Lakes HAB and Hypoxia program is a collaborative effort between scientists at NOAA Great Lakes Environmental Research Laboratory (GLERL) and the Cooperative Institute for Limnology and Ecosystems Research (CILER).

Learn more at [www.glerl.noaa.gov](http://www.glerl.noaa.gov).

- ◆ Generating flood forecast inundation maps;
- ◆ Generating basin and sub-basin scale assessments of the NWM's predictive value to inform decision making and guide model development; and
- ◆ Advancing basic earth system process studies.

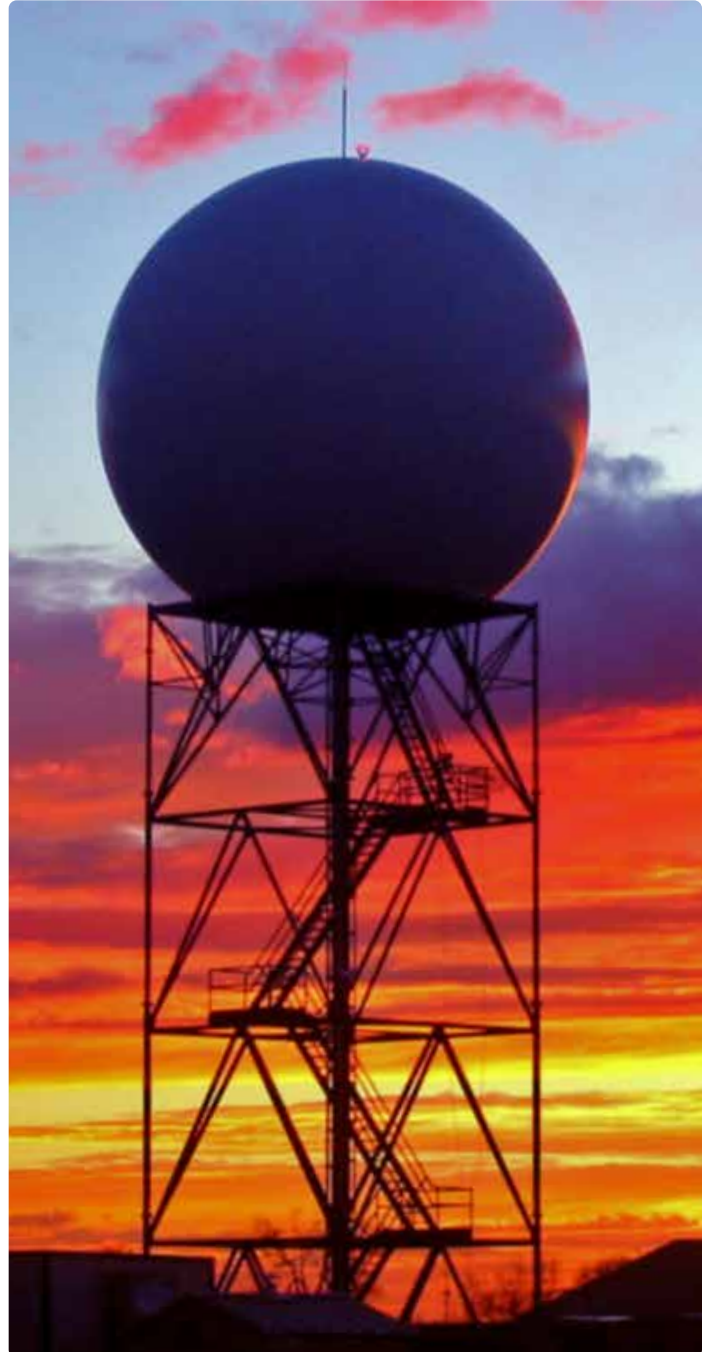
*Outcome 4.2:* Within five years, NOAA will transfer at least three new or improved scientific concepts, technologies, or applications produced by water R&D activities to operations, application, commercialization, or other uses. NOAA will also promote specific research transition pathways to rapidly improve water prediction.

## Objective 5: Enhance and Sustain Water-Related Observations

NOAA, in partnership with USGS, will take greater advantage of advanced observational datasets from new or future space-based, airborne, terrestrial, and marine Earth observing platforms, more fully exploiting them to determine the amount and quality of water from sub-surface to atmosphere and in rivers, lakes, and oceans.<sup>13</sup>

*Outcome 5.1:* Within two years, NOAA will work with its partners to identify requirements for an optimal suite of observations to enable strategic investments that will strengthen water observations and data collection nationwide to support water resource and risk management. To inform investment decisions, NOAA will develop plans for addressing observation gaps by expanding our current capabilities, fully exploiting and enhancing observation systems not fully utilized today (e.g., LIDAR, fused radar-gauge-satellite, etc.), and embracing non-traditional sources of observational data (e.g., citizen science).

[13] Activities under this goal will be carried out in keeping with the *National Plan for Civil Earth Observations*, July 18, 2014.



# The National Water Center



NOAA's new National Water Center (NWC), located in Tuscaloosa on the campus of the University of Alabama, is an anchor for the activities of the NOAA Water Initiative. The NWC is designed to facilitate partnerships and collaboration across organizations and sectors to deliver a new generation of water information and decision-support services that will:

- ◆ Strengthen the nation's water forecast capabilities by serving as an innovation incubator and research accelerator for water prediction;
- ◆ Improve national preparedness for water-related disasters;
- ◆ Provide enabling, predictive information to support existing (e.g., regional drought and flood early warning) and new networks that advance integrated water resource management at the local, state, regional, and national levels;
- ◆ Serve as a hub for collaborative meetings between water managers, forecasters, stakeholders and public officials;
- ◆ Inform event-driven, high impact, and routine, high-value water decisions at the local, state, regional, and national levels; and
- ◆ Provide water information that supports and promotes water stewardship.

The NWC will foster scientific excellence and innovation by promoting research and collaboration across Federal water science and management agencies, academia, and the private sector and by accelerating the transition of research to application and forecasting operations. It will serve as a venue for enhanced and sustained stakeholder engagement and will provide a central hub to efficiently manage the flow of water

information, operating state-of-the-art water prediction models in a high-performance computing environment.

The NWC is structured to support cross-NOAA, cross-Federal collaboration and will initially include staff from NOAA/NWS, NOAA/NOS, NOAA/NESDIS, the Federal Emergency Management Agency, USGS, and the University Corporation for Atmospheric Research.

A central activity of the NWC is the development and implementation of NOAA's new National Water Model (NWM). Version 1 of the NWM, launched as an operational prototype by the National Weather Service (NWS) in August 2016, combines data from USGS stream gauges with outputs from NOAA's atmospheric weather models to produce water forecasts for 2.7 million rivers and stream reaches nationwide. This new capability expands NOAA's forecasting capability 700-fold, such that the millions of people living near small streams can have forecasts similar to those that live next to major rivers.

NWM represents an initial step to transforming water prediction services by providing prototype forecasts that augment the official forecasts of NOAA's regional River Forecast Centers. This new information also supplements and leverages the broad suite of existing NOAA weather and water information services delivered through a range of NOAA field offices and mission areas. In the future, the prototype NWM will be calibrated and validated so that uncertainties in the new model can be explicitly described. Future versions of the NWM are planned to include integrated water-level information at the coast, more comprehensive information about conditions affecting drought, low-flow, and land-surface conditions, and, ultimately, predictive information about water quality risks. The prototype NWM is just the first of many exciting new projects to be developed through the NOAA Water Initiative.

## Summary

The NOAA Water Initiative calls for a boundary-spanning partnership across multiple sectors to create and deliver water information to meet the needs of the 21st century. NOAA will support this idea by working toward the objectives and outcomes of the initiative and leveraging the resources of the National Water Center to provide next-generation, science-based water information and decision support services. We look forward to collaborating with a full array of partners, decision makers, and users to achieve this vision for the benefit of our communities, our economy, and our planet.

## Appendix: NOAA Service Outlets

NOAA's Service Outlets	Line Office	Link for more information:
NOAA CoastWatch	National Environmental Satellite, Data, and Information Service (NESDIS)	<a href="http://coastwatch.noaa.gov">http://coastwatch.noaa.gov</a>
NOAA Comprehensive Large Array - data Stewardship System (CLASS)	National Environmental Satellite, Data, and Information Service (NESDIS)	<a href="http://www.class.noaa.gov">http://www.class.noaa.gov</a>
Regional Climate Service Directors (RCSDs)	National Environmental Satellite, Data, and Information Service (NESDIS)	<a href="https://www.ncdc.noaa.gov/rcsd">https://www.ncdc.noaa.gov/rcsd</a>
Fisheries Science Centers	National Marine Fisheries Service (NMFS)	Alaska: <a href="http://www.afsc.noaa.gov/">http://www.afsc.noaa.gov/</a> Northeast: <a href="http://www.nefsc.noaa.gov/">http://www.nefsc.noaa.gov/</a> Northwest: <a href="https://www.nwfsc.noaa.gov/">https://www.nwfsc.noaa.gov/</a> Pacific Islands: <a href="https://www.pifsc.noaa.gov/">https://www.pifsc.noaa.gov/</a> Southeast: <a href="http://www.sefsc.noaa.gov/">http://www.sefsc.noaa.gov/</a> Southwest: <a href="https://swfsc.noaa.gov/">https://swfsc.noaa.gov/</a>
Habitat Focus Areas	National Marine Fisheries Service (NMFS)	<a href="https://www.habitatblueprint.noaa.gov/habitat-focus-areas/">https://www.habitatblueprint.noaa.gov/habitat-focus-areas/</a>
National Estuarine Research Reserves (NERRS)	National Ocean Service (NOS)	<a href="https://coast.noaa.gov/nerrs">https://coast.noaa.gov/nerrs</a>
National Marine Sanctuaries	National Ocean Service (NOS)	<a href="http://sanctuaries.noaa.gov">http://sanctuaries.noaa.gov</a>
Office for Coastal Management (OCM)	National Ocean Service (NOS)	<a href="https://coast.noaa.gov/https://coast.noaa.gov/digitalcoast">https://coast.noaa.gov/https://coast.noaa.gov/digitalcoast</a>
National Centers for Environmental Prediction	National Weather Service (NWS)	<a href="http://www.weather.gov/organization_prv">http://www.weather.gov/organization_prv</a>
Office of Water Prediction/ National Water Center	National Weather Service (NWS)	<a href="http://water.noaa.gov/">http://water.noaa.gov/</a>
River Forecast Centers	National Weather Service (NWS)	<a href="http://water.weather.gov/ahps/rfc/rfc.php">http://water.weather.gov/ahps/rfc/rfc.php</a>
Weather Forecast Offices	National Weather Service (NWS)	<a href="http://www.weather.gov/organization_prv">http://www.weather.gov/organization_prv</a>
National Integrated Drought Information System (NIDIS)	Oceanic and Atmospheric Research (OAR)	<a href="https://www.drought.gov/drought/regions">https://www.drought.gov/drought/regions</a>
NOAA Research Laboratories and Cooperative Institutes	Oceanic and Atmospheric Research (OAR)	<a href="http://ci.noaa.gov/">http://ci.noaa.gov/</a>
Regional Integrated Sciences & Assessments (RISA)	Oceanic and Atmospheric Research (OAR)	<a href="http://cpo.noaa.gov/ClimatePrograms/ClimateandSocietalInteractions/RISAProgram.aspx">http://cpo.noaa.gov/ClimatePrograms/ClimateandSocietalInteractions/RISAProgram.aspx</a>
Sea Grant	Oceanic and Atmospheric Research (OAR)	<a href="http://seagrant.noaa.gov/">http://seagrant.noaa.gov/</a>