



RECOMMENDATIONS OF THE AD HOC WORKGROUP TO ASSURE STRONG WATER DATA AND SCIENCE IN A CONSTRAINED/SHRINKING BUDGET

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Long-term water quantity and quality data collection, especially in critical watersheds, aquifers, and water-short areas, is crucial for the economic strength of the Nation. The U.S. Geological Survey (USGS) plays an indispensable role in helping the nation maintain a reliable, high quality foundation of water information and science. This foundation supports water planning, management, research, and investment by federal, regional, state, tribal and local agencies, as well as by universities and businesses. The USGS role and the foundation it supports have been put at risk by today's shrinking budget environment. USGS has dealt with budget limitations for some time. In an age where more science is needed for better decision-making, it has been a challenge to find funds to develop and apply our water science to serve a wide variety of purposes more efficiently.

Management and protection of water resources in the United States require coordination on many levels. The USGS capability to collect data and provide analyses enables the Nation to make challenging decisions for the allocation, protection, and treatment of water and to maximize economic opportunities, environmental quality and public safety in a changing world. Water availability is critical to the long-term sustainability of ecosystems, communities, and economies. As such, the USGS has the key responsibility to lead the Nation in collecting long-term data, synthesizing the data, and providing projections of future conditions and needs; this is accomplished in conjunction with many federal and non-federal partners.

Budget decisions should support the USGS water resources mission to provide the reliable, impartial, and timely information needed to understand and manage water resources in the Nation, and to actively promote the use of this information by decision-makers to:

- Minimize the loss of life and property as a result of water-related natural hazards such as floods, droughts, and land movement;
- Effectively manage groundwater and surface-water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses;
- Protect and enhance water resources for human health, aquatic health, and environmental quality; and
- Contribute to wise physical and economic development of water resources for the benefit of present and future generations.

The Workgroup Task. In July 2012, the Advisory Committee on Water Information (ACWI) formed an *ad hoc* Workgroup to ensure the efficient collection of strong water data and support of science in an environment of constrained or shrinking budgets; this report and the recommendations described below are the result of the Workgroup deliberations. The Assistant Secretary of the Interior for Water and Science asked the ACWI to provide advice and recommendations to the Department of the Interior (DOI) and the USGS on approaches and options that might help sustain and enhance water monitoring and related science in the face of federal funding constraints in the coming years¹. Her request reflected the increasing need for water data and science and the likely constraints on federal resources in coming years, and expressed an intention that USGS continue and strengthen its leadership of the nation's water monitoring, assessment and research despite those constraints.

Beginning in August 2012, all members and interested followers of the ACWI were invited to participate in a series of telephone conferences to prepare recommendations for the ACWI to consider, and the Workgroup continued meeting twice each month with WebEx-supported conference calls between December 2012 and December 2013. USGS staff provided valuable briefings concerning the three monitoring networks and related science programs between November 2012 and March 2013, and the meeting notes and PowerPoint files from those briefings are available on the ACWI website. In June 2013, the first draft recommendations were provided for preliminary review by USGS senior staff and Interior Department. Workgroup participation² was strong and consistent, and represented a broad range of the diverse stakeholder community, although several elements of the community were not able to make this commitment of time and consideration.

There is one significant element of the Assistant Secretary's request for which the Workgroup has been unable to provide helpful recommendations, namely the request to identify new or alternative funding sources. While several options were considered, they are unlikely to produce significant or reliable revenue, and the options for generating significant revenue seem inconsistent with the national character of these functions, their relation to federal responsibilities, the lean budget currently available and the congressional efforts to reduce the cost of government programs. However, it may be that the ACWI will want to dedicate further effort in the future to this quest.

Federal Funding is Warranted by Federal Responsibilities and National Benefits. Congress has made clear that federal responsibilities and national benefits require the enhancement or development of a national water science program to inform water resource management in the United States³. The Workgroup is cognizant of the specific federal responsibilities and national benefits that warrant federal funding.

¹ The November 6, 2012 [letter from the Assistant Secretary](#) is posted on the [ACWI website](#).

² A list of the individuals who dedicated a generous portion of their time and the organizations they represent will be posted on the ACWI website.

³ Public Law 111-11, Sections 9507(a) and (b) are among the most recent indications of this Congressional mandate.

Federal responsibility is based on many factors, including negotiation and compliance with international water treaties, interstate water compacts and tribal water agreements, the implementation, evaluation and improvement of federally funded programs.

National benefits result from USGS leadership as a federal science agency in initiatives that transcend specific state, regional or local boundaries. These include, for example, monitoring, modeling, and assessment required to forecast flooding; providing safe and sustainable water supply; protecting and restoring ecosystems; understanding the sustainability of intergovernmental water allocation agreements; investing in water infrastructure; enhancing the value of data collected by others; and generally helping officials, leaders, and the public understand and utilize the science associated with climate, flooding, droughts, sea level rise, water pollution, endangered species, and ecosystems. National benefits are also derived from open public deliberation and from the opportunities for education and innovation created by USGS scientists working directly with water managers to meet local, state, regional, and national needs.

Finally, America's water resources support hundreds of billions of dollars in commerce, provide safe drinking water for millions of Americans, supply essential habitat for fish and wildlife, affect public safety, and provide a variety of other important benefits, including recreation, irrigation, power generation, and manufacturing⁴. Each of these benefits has national economic implications, and USGS leadership in water science is essential in the national effort to maximize sustainable economic development.

GUIDING PRINCIPLES

To fulfill its mission, the Workgroup identified the following set of six principles to guide decisions affecting the USGS water program budget. The goal is to ensure that such decisions safeguard the ability of the USGS to provide the reliable, impartial, and timely information needed by other federal agencies, non-federal agencies, businesses, universities, and the general public to understand and manage water resources. The Workgroup believes that these six principles, when applied as a package, will help USGS and DOI leaders make budget decisions that will not impair this overarching goal:

- Water Data and Science Should Inform Decisions,
- Water Science Should Address the Whole Water Cycle,
- Water Science Requires Continuity of Water Data,
- Reducing Uncertainty and Risk Should be Weighed Against Costs and Benefits,
- Research Should Strengthen Water Science, and
- Collaboration Should Leverage Ideas and Resources.

⁴The evidence of these benefits to the Nation is described in many places, and most recently in the [*Principles and Requirements for Federal Investments in Water Resources*](#) adopted by the President's Council on Environmental Quality in March 2013.

WATER DATA AND SCIENCE SHOULD INFORM DECISIONS: Water data is the foundation of water science, and water science⁵ is the basis for sustainable water management⁶. The USGS must continue to provide the timely, high quality, and unbiased water data and science necessary for informed decision making.

America needs the USGS to lead its water science efforts. The USGS must continue providing essential “backbone” elements of a national water data collection and delivery system and serve as an objective science expert for other federal agencies and for interstate, state, tribal, and local agencies with responsibility for public health and for managing water and related resources throughout the United States.

WATER SCIENCE SHOULD ADDRESS THE WHOLE WATER CYCLE: The elements of the water cycle⁷ are inextricably linked. The Nation must understand the entirety of the water cycle, including both quantity and quality, if it is to manage, use, and protect its water resources intelligently. The USGS must continue serving a leadership role in developing and supporting the necessary science.

The national water data network must be able to clearly characterize each element of the water cycle if the appropriate agencies are to understand the hydrologic system and manage water sustainably. Research has repeatedly shown that these components must be considered together for effective water resources management. The Nation depends on the USGS to anchor the collection and assessment of water cycle information and support the development of interpretive and forecasting tools that depend on accurate measurements.

WATER SCIENCE REQUIRES CONTINUITY OF WATER DATA: Understanding water resources and the threats to them requires a sustained commitment to research, data collection, and assessment across short and long spatial and temporal scales. The USGS provides a national perspective and expertise, without regulatory or resource management responsibilities, and applies the consistent methods necessary to meet these demands and to lead America’s water science community.

Understanding relationships, trends, and variations over the long term is a prerequisite for predicting effects on water resources and providing the information that is crucial to land and water managers. Long-term monitoring is needed to distinguish short-term variation from long-term drivers, such as land use and climate variability. Existing long-term records provide

⁵ The term “water science” is used in this report to refer to analysis, interpretation, research, and application of water monitoring needed to support water management; this support is provided in the form of maps, models and other decision support products. The term “water data” is used in this report to refer to water data collection, management, and delivery.

⁶ The term “water management” is used in this report to include the full spectrum of protection and utilization activities to support all existing and future needs.

⁷ The USGS has included useful graphics that illustrate the water cycle in its recent progress report to Congress concerning its National Assessment of Water Availability and Use ([Circular 1384](#), see page 5) and in its Water Science Strategy report ([Circular 1383-G](#), see pages 20-21).

important information on trends of water quality and water availability that are used for future projections. Continuing the development of these irreplaceable records will provide invaluable information about the impacts of current and future water withdrawals and use, climate impacts, and land use changes.

The USGS application of consistent monitoring methods across hydrogeologic and ecological regions at various appropriate scales provides important and comparable information on quality trends, impaired waters, water use, ecosystem impacts and management alternatives.

REDUCING UNCERTAINTY AND RISK SHOULD BE WEIGHED AGAINST COSTS AND BENEFITS:

Understanding water resources requires an understanding of the uncertainty that is inherent in measurement, analysis, and assessment. The USGS should invest resources to reduce uncertainty where risks are high and the cost of reducing that uncertainty is reasonable. The goal is to balance the desired level of confidence in understanding water resource management and protection options with the cost to attain it. For example, with the added uncertainty created by cutting back on the frequency of monitoring flow in a stream, comes added risk from estimating flood or low flows incorrectly. This principle applies generally, in that any cutback on monitoring frequency can result in added risk. A constrained budget environment might lead to reducing the effort invested in updating the rating curves for certain streamgages, but the resulting uncertainty in the estimation of flows at ungaged sites, the validation of remote sensing data and other applications should be clearly understood first.

At this point, the current network of monitoring sites is insufficient relative to the national and regional needs; quality assurance should not be compromised due to our heavy reliance upon estimating conditions where we are not able to measure them. The challenge is to avoid cost-cutting where the increased uncertainty in understanding the whole water cycle is likely to have large consequences in designing and operating measures to reduce flooding, provide water supply, or protect water quality. In sum, extra spending to keep uncertainty low where the risk to investments in people and ecosystems would also be low makes little sense in a shrinking budget.

RESEARCH SHOULD STRENGTHEN WATER SCIENCE: Research defines, develops, and refreshes the understanding of water resources and the programs designed to manage these resources. Research conducted by the USGS provides an essential feedback mechanism to help optimize data collection and science.

Research that supports the national scientific mission, including applied research that directly supports the operational parts of USGS water science, has the greatest long term benefit. In the short term, the greatest emphasis should be placed on research with the strongest relation to the most immediate water management challenges, provided the interruption of promising in-progress basic research can be minimized.

COLLABORATION SHOULD LEVERAGE IDEAS AND RESOURCES: Collaboration builds partnerships and enhances opportunities for collecting data and understanding water science, draws attention and resources to immediate management challenges, builds support for water management activities, and leverages private, local, state and federal dollars, ideas, experience, and capabilities.

Collaboration is needed to support integrated science in concert with partners in other disciplines, mission areas, and agencies. Collaboration is a natural outcome of the goal of being responsive to a wide range of decision-makers. Important science activities in which integration occurs are ecology, energy, public health, and natural hazards.

RECOMMENDATIONS

The USGS reputation for delivering solid, unbiased information and science is its greatest asset. This reputation for reliability is grounded in decades of high quality performance. In considering ways to address the challenges of monitoring in a shrinking budget environment, every caution should be taken to avoid actions that put this reputation, or the record of performance that underlies it, at risk. Within these constraints, the Workgroup has identified recommendations that may be useful, if the current shrinking budget concerns make this necessary, while preserving the USGS capability to carry out its vital mission. These recommendations, like the guiding principles identified above, are not necessarily listed in order of priority.

- 1) **Sustain the national monitoring network** for surface water, groundwater and water quality and extend coverage to address any significant gaps in the network which interfere with the fulfillment of federal responsibilities or the maintenance of national benefits. This includes capturing efficiencies already planned in national monitoring network operations, which can be achieved in line with the guiding principles identified above.

To the extent that USGS operation of high priority monitoring sites becomes threatened as the result of funding decisions by other federal agencies, USGS should sustain those operations through collaboration with other reliable partnerships or at its expense. USGS should continue identifying those high priority monitoring sites in collaboration with other agencies and stakeholders.

- 2) **Sustain funding to continue cost-shared investigations, studies and research**, to the extent that identified, national or regional needs will be served. **Defer less critical grants, interpretive investigations, analytical studies and research** (new projects first, but ongoing efforts if necessary; including any monitoring that is needed primarily for these projects), to the extent necessary to sustain the USGS monitoring network and in a manner that will minimize both immediate and long-term adverse consequences for water resource management decisions. The USGS Senior Staff are best positioned to evaluate which grants, studies, analyses and research can be deferred with the least adverse impact to water management decisions.
- 3) **Continue providing incentives for projects and programs that build partnerships and leverage additional resources for water data and science.** A flexible approach should be designed to support these partnerships and, where possible, to increase the funding support from partners that directly benefit from USGS activities.

- 4) USGS should characterize “**uncertainty**” in scientific terms that data users and decision makers understand⁸, including uncertainty associated with water monitoring; modeled estimates for watershed and aquifer conditions at monitored and unmonitored sites; and other interpretative and forecasting applications. USGS should continue to explore cost savings in sustaining national and long-term monitoring networks, while maintaining its rigor and consistent methodology because such standards are required to address multiple needs of a myriad of stakeholders and users. USGS should better educate its stakeholders about the value of high quality data and trade-offs in reducing current standards for monitoring and analysis.
- 5) The USGS Water Science Centers (WSCs) should convene regular meetings with the other federal and state agencies responsible for water monitoring and prepare reports to the Associate Director for Water regarding the distribution of monitoring responsibilities, what the shared priorities are, and where there are significant **opportunities to increase efficiency and reliability** in case of further budget cuts.
- 6) Anticipate and **support an increased role for other agencies**, universities, businesses, monitoring councils, *etc.*, who demonstrate the opportunity and capability to collect, manage and contribute useful data to the National Water Information System (NWIS). As an initial step, USGS should evaluate the situations in which other agencies have taken responsibility for significant elements of nationally-relevant monitoring and summarize the experience; the analysis should identify the circumstances that lead to successful collaboration. USGS is a leader in setting standards and providing training for data collection and management. The water data available nationwide will be greatly enhanced if their standards are more frequently discussed and compared with the practices of other experts.
- 7) Evaluate the current **distribution of funding to the National Streamflow Information Program** (NSIP) over the entire streamgauge network, in lieu of a fully funded NSIP, and redistribute funds to maximize stability of the streamgauge network and ultimately provide the “backbone” network central to the NSIP objective. To the greatest extent possible, partially funded gages should be minimized in favor of fully funded NSIP gages. Prioritization of those gages to be fully NSIP funded should be completed by USGS and consistent with the 5 criteria set forth to establish an NSIP gage. In prioritizing an eligible gage, consideration should be given to the number of criteria the gage meets as well as the population the gage serves.
- 8) Distribute **funding of the National Ground Water Monitoring Network** (NGWMN) to maximize its stability toward providing the quantity and quality monitoring capability that is central to the framework design⁹. Until full funding can be achieved, partial funding should be allocated by the management organization described in that framework design, which is

⁸ This correlates with the 2012-2022 Strategic Directions for USGS Water Science [OFR-1066](#) (see Strategic Action 8 on page 21 and Strategic Action 16 on page 29, for example)

⁹ The framework design was developed by the ACWI Subcommittee on Ground Water and is available at [A National Framework for Ground-Water Monitoring in the United States](#), and the management function is described in pages 49-53

founded on key network design principles of stakeholder involvement and partnering of the USGS with data-owners/providers.

- 9) Encourage the USGS Water Science Centers (“WSCs”) to **collaborate on monitoring site maintenance** responsibilities (among the WSCs and with other agencies) to reduce travel and maintenance expenses.
- 10) Extend the **water data portal** capabilities that have been developed for groundwater and water quality data to include surface water data (stage and flow), although it requires new or reallocated funding. USGS should foster and facilitate a flexible approach that stems from proven application by all data providers of industry-accepted standards for data collection and data management. The design of the National Groundwater Monitoring Network serves as a useful example.
- 11) Maintain a clear **design strategy for each of the three monitoring networks**, along with a statement explaining how they support each other. Include network maps and implementation progress assessment in an annual update. Without a clear, strategic design, it appears that USGS operates disparate networks based on various plans and authorities, and it is more difficult to assure that USGS is making the most strategic investment of the available resources.
- 12) Since recommendations 1-11 suggest a reduction in **support for research and development**, it will be especially important for ACWI and USGS, in consultation with stakeholders, to recognize that reducing these functions too much or for too long will be detrimental to the future of water science, water management and to the USGS mission. One way to accomplish this would be to establish a new ACWI **Subcommittee for Research, Development and Innovation (SRDI)** to identify and propose innovations that can reduce costs and improve data quality for water and watershed monitoring by Federal and non-Federal agencies through the following: (1) use of new technologies, (2) enhancement in monitoring processes, and (3) increasing efficiencies. Although the SDRI organization and function may require new or reallocated funding in the near-term, it should evaluate innovation opportunities in the context of technical, economic, and environmental benefits.