

**Statement of Matthew C. Larsen,
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U.S. Department of the Interior
Before the
Committee on Natural Resources
Subcommittee on Water and Power
U.S. House of Representatives
On
Collecting and Managing Water Data**

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Madam Chairwoman and members of the Subcommittee, I am Matthew C. Larsen, Associate Director for Water at the U.S. Geological Survey (USGS). I appreciate the opportunity to provide the views of the Department of the Interior (Department) on the challenges and opportunities of collecting and managing water data.

Introduction

The Subcommittee's invitation asked the Department to answer a set of seven specific questions relative to funding levels, data integration, data type, data storage, and the Survey's response to 2009 recommendations by the National Research Council. We will endeavor to address those concerns in this statement.

Surface-water data

The USGS has played an essential role in monitoring the Nation's rivers for well over a century, providing streamflow information that is critical for protecting life and property from floods, assessing and allocating water resources, managing water quality, supporting engineering design of water projects, and ensuring the safety and enjoyment of the many people who fish and boat in the Nation's rivers and streams. The USGS currently operates approximately 7,500 streamgages nationwide that provide daily streamflow records accessible to the public through the Internet, such as our WaterWatch website at <http://waterwatch.usgs.gov/>. This national system of streamgages provides information that is essential to water resources management throughout the country. In recent years, the value of streamgage information for identifying the effects of climate change on the timing and availability of surface water resources has become increasingly clear.

USGS streamgages are funded by direct appropriations to two programs, the National Streamflow Information Program (NSIP) and the Cooperative Water Program (CWP), and through partnership agreements with over 850 Federal, State, and local agencies and Tribal governments and other partners. Federal appropriations to NSIP and CWP currently provide about one-third of the funding for the USGS national streamgage network, and partnership agencies provide about two-thirds of the funding. Through this arrangement of shared cost and shared benefit, the USGS is able to operate an integrated national streamgage network that meets

the specific hydrologic information needs of local water resources managers, while providing readily accessible, high-quality hydrologic information at local, regional, and national scales that, according to the Association of California Water Agencies, plays “a vital role in the management of our water resources.” The Bureau of Reclamation (Reclamation) has long been an active participant in the USGS streamgaging program to collect and utilize information about the Nation’s water resources. As part of this program, water data needed for planning and operating water resources projects and regulatory programs are collected and disseminated.

In P.L. 111-11, Congress authorized the operation and maintenance of a stable “backbone” network of 4,774 federally funded streamgages through NSIP to meet five well-defined federal needs for streamflow information: at (1) interstate and international boundaries, (2) National Weather Service flood forecast sites, (3) outflows of major river basins, (4) sentinel watersheds to track the influence of changes in land use, water use, and climate change, and (5) USGS national water-quality monitoring sites. Currently, in FY 2009, NSIP is funded at about 25 percent of its full implementation of 4,774 federally funded streamgages. In its FY2010 budget request, the Administration proposed an increase of \$5 million for NSIP to support the re-establishment of discontinued streamgages and the operation and maintenance of existing streamgages, and we are pleased that both the House and the Senate have supported this increase through their appropriations bills.

Groundwater Data

The USGS operates several long-term systematic groundwater monitoring networks through the USGS Groundwater Resources Program and in partnership with State, local, and Tribal water resources agencies through the CWP. Information from these networks is accessible through the Internet at <http://groundwaterwatch.usgs.gov> and from the USGS National Water Information System (NWIS) at <http://waterdata.usgs.gov/nwis/gw>. The NWIS database includes readily accessible data from 1,264 real-time ground-water monitoring sites and 5,459 daily value ground-water monitoring sites. Most of these data are collected by USGS; some data are collected by partner agencies and quality-assured by USGS and then incorporated into NWIS.

Reclamation works cooperatively with the USGS on a case-by-case basis to systematically collect groundwater information to meet project-specific and issue-specific needs. For example, Reclamation’s Lower Colorado Region maintains a groundwater data collection system called the Yuma Area Water Management System. Groundwater wells are controlled by a Supervisory Control and Data Acquisition (SCADA) system, and groundwater data, including salinity levels, well pumping, groundwater levels, and canal flows, are collected and stored. In planning investigations and environmental assessment activities, Reclamation cooperates with stakeholders and others when it is determined that the collection of groundwater data is required. Additionally, groundwater data, more specifically groundwater levels, at Reclamation dams and facilities are typically monitored either by in-place piezometers or by direct observation. The data are collected and analyzed to monitor the structural integrity of Reclamation facilities. The groundwater observation wells provide a measure of water pressure within or beneath dams and are installed either during construction or through a drillhole after construction is completed.

The Advisory Committee on Water Information (ACWI) Subcommittee on Groundwater recently completed a review of the groundwater monitoring throughout the country and

developed a “National Framework for Groundwater Monitoring in the United States.” P.L. 111-11 directs the USGS to implement many of the recommendations in the Framework. The Framework includes recommendations for the design of a national groundwater monitoring network that would establish criteria for monitoring wells, incorporate existing Federal and State groundwater networks to monitor each major aquifer system, fill in existing data gaps, and improve data delivery methods by developing a data portal for unified Internet based data retrieval. Both USGS and Reclamation groundwater ambient monitoring data would be included in this network.

Data Management, Dissemination, Integration, and Integrity

USGS hydrologic information is stored and made available to the public through the USGS National Water Information System (NWIS), available online at <http://waterdata.usgs.gov/nwis>. NWIS is both a work-flow application, used by USGS personnel for the collection/acquisition, processing, review, and storage of data, and a long-term data base for archiving and delivery of national records of groundwater quality and levels, surface-water quality, flow, stage and discharge. NWIS currently stores over 300 million daily values of hydrologic information that have been collected by USGS over more than 100 years, and these data are accessed by users at a rate of up to 50 million successful page requests per month. Through NWIS, USGS hydrologic information is stored and managed for consistency, accessibility, and coordination and is readily available to a wide range of users.

Both the software and the data collection and workflow through which the raw data are entered and processed are well documented. Critical metadata are attached to the records at each step so that the USGS knows who performed the work, and written text thoroughly documents field conditions, instrument performance, the basis for required modifications, and the review and quality assurance of the records. In recent years, the USGS has invested in the development of electronic field forms to expedite fieldwork and better control access to data files and has improved software for office computations and review.

In addition to USGS collections, about 10 percent of the records published by the USGS are furnished by other agencies, including Reclamation, other Department agencies, other Federal agencies, State and local agencies, and some FERC licensees and are added to the NWIS database. The processes used to prepare these data are reviewed for consistency and conformance to applicable USGS practices and policies, and the data are spot-checked for reasonableness and consistency.

Reclamation actively participates in the Department of the Interior’s Geospatial CORE Team established under Interior’s Assistant Secretary for Policy, Management, and Budget. Reclamation has an established enterprise-level geospatial information technology system, called BORGIS (Bureau of Reclamation GIS), that provides geospatial information management services in support of Reclamation’s mission. The system provides an array of geospatial data and imagery services that support Reclamation programs and operations on a project-by-project and issue-by-issue basis. Reclamation activities supported by BORGIS include water operations, land and resource management, recreation management, geological investigations, hydraulic and hydrologic simulation modeling, ESA activities, environmental site analysis, and cultural resource assessments.

Reclamation and the California Department of Water Resources (DWR) are the major water management agencies in California. As part of its water management responsibilities, Reclamation maintains water related data in a Reclamation system and also provides the data to the California Data Exchange Center (CDEC) of DWR, online at <http://cdec.water.ca.gov/>. CDEC provides a centralized location to store and process real-time hydrologic information gathered by various cooperators throughout California. Currently, numerous Federal, State, and local agencies collect data from hundreds of rain, snow, temperature, wind, atmospheric pressure, humidity, and stream stage sensors. This data are used both for operational decision making and for reporting purposes.

Reclamation's Pacific Northwest Hydromet network consists of approximately 300 data collection platforms located at dams, streams and mountain areas in the Pacific Northwest, plus computer systems in Boise, Idaho, and Yakima, Washington. The system collects data from approximately 1,100 similar stations maintained by other organizations. A similar network is active in Reclamation's Great Plains Region and Upper Colorado Region. These stations collect data in typically 15- or 60-minute increments, then transmit collected data every 4 hours via the Geostationary Operational Environmental Satellite (GOES) network.

Water data related to Reclamation's Title XVI Program are collected on a fiscal-year basis at Reclamation's Southern California Area Office. Water data are collected through direct communication with local water districts and agencies participating in the Title XVI Program. Depending on the agency, the water data record consists of water produced, water distributed, or both. The water data record is maintained in response to PART requirements.

One example of a geospatial data management system is Reclamation's Lower Colorado River Accounting System, which collects, analyzes, and disseminates geospatial data related to agricultural crops and riparian vegetation, as well as daily weather station data. Data collection is accomplished through Landsat satellite imagery (provided by the USGS), crop and riparian vegetation data collected four times a year (provided by Reclamation and DWR), and weather station data (provided by California Irrigation Management Information System and Arizona Meteorological Network). Data are disseminated via official reports published each year; detailed data are provided upon request by various agencies for studies including land use conversion, economic analyses, restoration of riparian habitat, and ground water modeling.

The USGS, Reclamation, and other agencies participate on the Advisory Committee for Water Information and its subcommittees and workgroups, which are charged with coordinating the collection and sharing of water data in order to ensure compatible data and networks and facilitate dissemination of the data. In addition, the USGS and Reclamation participate in the NOAA Data Collection Services Technical Working Group, which coordinates satellite radio assignments for environmental data. In response to the recommendations of the President's Commission on Ocean Policy, the USGS, NOAA, and EPA agreed to better coordinate water-data networks and are developing data-sharing and integrating mechanisms. Some of these efforts link geospatial data products such as the National Hydrologic Data set to features such as dams, water-supply intakes, efficient discharge outlets, and water-monitoring infrastructure such as streamgages.

Coordination for the maintenance and stewardship of geospatial water data for Reclamation and the USGS is through the Federal Geographic Data Committee and its subcommittees. Specific areas of collaboration for geospatial water data are the National Hydrography Dataset and the Watershed Boundary Dataset. Recently, several Federal agencies, working together with States, have completed initial coverage of both datasets. Future plans are to integrate the management of the datasets within a single geodatabase, which will be managed by the USGS. The two datasets provide the geospatial framework for the USGS streamgages. Together the National Hydrography Dataset, the Watershed Boundary Dataset, and the streamgaging network provide the spatial context for a watershed approach to land and water management. Reclamation and other Federal agencies participate in the planning and prioritizing of the geospatial data collection and stewardship through the FGDC Sub-Committee on Spatial Water Data and through the NHD and WBD Program Planning process. The USGS has stewardship responsibilities for each of these datasets in coordination with other Federal agencies, in particular Reclamation, the Bureau of Land Management, USDA National Resources Conservation Service, and EPA.

Water and Climate Change

The USGS has an essential role in long-term water resource monitoring. Such monitoring and observational records, coupled with scientific analysis and reporting, are critical to informing regional and national policy makers and resource managers about the consequences of climate change on our Nation's water resources. Detecting early change in water quality, quantity, and stream ecosystems as a result of changes in climate requires long-term surveillance and data at a range of spatial scales. In order to manage the Nation's water resources as climate changes, robust, gap-free data are needed, including expanded data at existing monitoring sites, plus addition of new sites that are carefully chosen to address National, regional and local concerns.

A major goal of the hydrologic and water-quality component of the Department's Regional Climate Centers will be a research and observational network in surface water and groundwater that can be sustained over the time scales needed to clearly define climate-related responses at watershed, regional, and national scales.

The water data being collected will support watershed and water-quality models and other model applications for predicting and forecasting climate changes under varying climate scenarios driven by climate policy. Downscaled climate models can be used to couple predicted changes in air temperature and precipitation to water resources outcomes. At the same time, climate model outputs will be used to inform ecological models and forecasts so that managers have the best available information to support their decisions.

The USGS Global Change Program and the USGS National Water Quality Assessment Program are currently inventorying USGS data across the Nation to identify long-term hydrologic and water-quality data sets that could be used to evaluate short-term (years to decades) climate-related effects on streamflow, temperature, and water quality. Data sets and periods of record are being analyzed to evaluate options for building a water-quality network that could be used to monitor the effects of climate change on key water-quality parameters such as temperature and carbon. Such a network would integrate across and build upon existing USGS networks and be

operated jointly by NAWQA and the USGS Global Change program at local, regional, and national scales.

The initial focus of the inventory has been on locating long-term sites (with more than 10 years of data) that have continuous streamflow and temperature data. These measurements have been identified as two critical components for the climate network. Carbon and nitrogen data would also be important parameters to monitor, and other water-quality factors would be added to the network as needed to address regional/local concerns. As time goes by, the data collected and integrated through this effort will provide a strong basis for understanding and anticipating the effects of climate change on water resources, thus giving managers and policymakers tools that will support decisionmaking and improve both the timeliness and quality of our responses to potential climate change.

Future Challenges

The National Research Council recently provided a number of recommendations for the USGS Water Resources Discipline (WRD) in their report “Toward a Sustainable and Secure Water Future: A Leadership Role for the U.S. Geological Survey.” The NRC review was complimentary of USGS past performance in meeting the hydrologic science and information needs of the Nation, noting that the discipline “is recognized as a source of unbiased hydrologic data and information....has shown effective leadership in water sciencehas done a good job of fostering internal cooperation, external collaboration, and coordination...is well-positioned to add value to water resources challenges both in the present and future.” The report offered several challenging recommendations to the USGS, noting, “The USGS and WRD leadership should re-focus their vision to define the national water priorities that they will address and develop a management approach to integrate WRD programs to meet these needs and lead the nation in water science.” The NRC specifically recommended that the USGS address the important priority of assessing the availability and use of the Nation’s water resources through a national water census.

The USGS is responding to this recommendation, which reflects one of the six science directions outlined in our 2007 Science Strategy, by developing an implementation plan for a national census of water availability and use. A draft implementation plan is being developed internally by USGS scientists and managers in the fall of 2009 and provided for review and input to external stakeholders through the winter and spring of 2010, with the goal of having a detailed implementation plan that meets both regional and national water information needs by October 2010. This plan will take advantage of existing USGS programs and information and partnership opportunities with State, local, and Federal water resources agencies. The USGS will build further on the NRC review to include the views of USGS scientists and managers, external stakeholders, and the Congress in developing a new strategic plan that will identify and prioritize issues of national importance upon which the USGS should focus its future water program. Thank you for the opportunity to testify, and I will be pleased to answer any questions the Subcommittee may have.