



FACING TOMORROW'S CHALLENGES: USGS SCIENCE IN THE DECADE 2007–2017

# A Water Census of the United States

*In 2007, the U.S. Geological Survey (USGS) developed a science strategy outlining the major natural science issues facing the Nation in the next decade. The science strategy consists of six science directions of critical importance, focusing on areas where natural science can make a substantial contribution to the well-being of the Nation and the world. This fact sheet focuses on the development of a water census of the United States, and how USGS research can strengthen the Nation with information needed to meet the challenges of the 21st century.*

## Importance of a Water Census

A fresh and dependable supply of water is critical to sustaining life and supports healthy communities, economies, and natural environments. Changing climate patterns will affect the availability of freshwater both locally and regionally. Many States expect future water shortages and are concerned about how the Federal Government could help them meet that challenge, yet no comprehensive census of water information for the Nation exists.

In the past, water needs were viewed primarily in relation to human activity. Now, however, the demand for water for environmental purposes is an important factor as well. Decisions about water that involve competing demands can lead to controversy and conflict, in part because available information is insufficient to

resolve those disagreements. Therefore, it is essential to make scientifically rigorous determinations of environmental water needs and to provide reliable prediction capabilities relating ecosystem response to hydrologic conditions.

Because the availability of adequate quantities of suitable water is crucial to the Nation's human population, economy, and environment, the USGS will conduct a Water Census of the United States to provide citizens, communities, natural-resource managers, and policymakers with a clear knowledge of the status of their water resources, data on trends in water availability and use over recent decades, and an improved ability to forecast the availability of freshwater for future human, economic, and environmental uses.

## Why Action is Needed Now

As American population centers migrate to coastal areas and the arid west, water shortages will undoubtedly occur. In fact, ground-water levels in parts of the southwestern United States already have fallen so far as a result of pumping that many perennial streams, such as the Rio Grande, have at times ceased to flow. Cities that rely on ground water—for example, Tucson, Arizona—need to know how long pumping can be sustained. Conflicts over water are occurring within and among states, between states and the Federal government, and between environmentalists and government agencies. Tribal water rights are an additional concern, particularly in the western United States. Water availability conflicts also are likely to arise from future needs to develop energy or mineral resources and to meet the water-quality requirements of aquatic ecosystems. Fundamental data on the quantity and quality of the Nation's freshwater resources, as well as spatial and temporal variations and trends, are needed to ensure that decisionmakers have access to complete, up-to-date, and reliable scientific information.

## The Water Census of the United States.

The Water Census will focus on the 21 water-resources regions of the Nation, including their watersheds and associated aquifers. Water-resources regions along the coasts also include offshore freshwater aquifers.

Two current USGS projects, one in the Great Lakes Region and another on the Lower Colorado River in California, Nevada, and Arizona, could be used as pilot studies for the development of the Water Census. These pilot studies will demonstrate the best ways to evaluate freshwater resources and to deliver the information in a manner that is most helpful to planners and policymakers working at local, regional, and national levels.



## How the USGS Can Help

The USGS is the primary Federal agency responsible for scientific evaluation of the natural resources of the United States, including its water and biological resources. Many of its current programs provide the foundation upon which the Water Census of the United States can be built. The agency has a diverse cadre of scientists and technicians who work on aspects of the status and trends of freshwater quality and quantity for the Nation's human and environmental needs at the local, State, regional, and national levels. The USGS also has an existing infrastructure from which it can conduct a regular inventory of natural resources and water use, including water quantity, quality, and environmental water needs, in partnership with local, State, and regional water and environmental agencies. The USGS has the skills needed to better define the geologic framework of aquifers, physical characteristics of watersheds, geochemical aspects of soil, land-cover change, land-use practices, and related environmental factors, all



**Discharge measurement during drought conditions.** A USGS streamgager measures discharge at North Fork Little Wind River near Fort Washakie, Wyoming, August 28, 2002. Photo by Jerrod Wheeler, U.S. Geological Survey.

of which affect the movement of water and its quality. The USGS also has the biological capabilities needed to relate the presence of individual species, groups of species, and ecosystem function to the quantity, quality, and timing of water movement as well as environmental habitat requirements of those organisms. Its research on past climate variability enables the USGS to provide scientific

understanding and modeling perspectives for expected changes in water availability due to ongoing climate fluctuations. USGS ground-water flow models are the international standard and, when coupled with watershed, water-quality, and ecosystem models, will enable decisionmakers to better predict the consequences of water- and land-use decisions.

## USGS Science Can Meet the Challenge

### The USGS is ready to take action by:

- Defining the water needs of the Nation's natural landscapes and changing environments, and relating the quantity, quality, and temporal variability of water to ecosystem structure and function.
- Expanding its capabilities for collection of data on the status of and trends in water quantity, quality, and use by humans and biota, and making the information available to decisionmakers and the public in increasingly useful, nationally consistent formats.
- Promulgating the systematic identification and mapping of changes in land cover and land use in the United States on a continuous basis and relating these changes to the availability of water resources for human and environmental needs.
- Documenting changes in the water-storage and -retention capabilities of aquifers and watersheds through the development and use of advanced technologies such as geophysics and remote sensing.
- Refining existing ground-water and watershed models and developing new modeling techniques that accurately characterize system interactions, identify uncertainties, and forecast changes in the hydrologic cycle to provide resource managers with improved tools for predicting the consequences of their management decisions.
- Designing and developing a Water Census of the United States in cooperation with local, State, regional, and other Federal agencies that provides these partners, policymakers, communities, and citizens with a regularly updated, nationally consistent inventory of the Nation's freshwater resources.

## A Vision For the Future

An enhanced, fully integrated, real-time data-collection network is supplemented by remote sensing, analyses and models based on long-term records, and improved water-use and -demand information. The USGS provides the Nation with a comprehensive view of the status of and trends in the quantity and quality of its freshwater supply to facilitate a flexible and informed response by water decisionmakers to a wide range of challenges and ensure that local, State, and regional water needs are met.

### For Additional Information

U.S. Geological Survey, 2007, *Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007–2017*: Available online at <http://pubs.er.usgs.gov/usgspubs/cir/cir1309>

Also, visit the USGS home page at <http://www.usgs.gov/>