

Water Priorities for the Nation—The U.S. Geological Survey

Integrated Water Availability Assessments

The United States faces growing challenges to its water supply, infrastructure, and aquatic ecosystems due to population growth, climate change, floods and droughts, and aging water delivery systems. To help address these challenges, the United States Geological Survey (USGS) Water Resources Mission Area (WMA) has established the Integrated Water Availability Assessments (IWAAs) to capitalize on the operational and scientific strengths of the USGS and engage in these complex societal issues. Substantial advances in water science, together with innovations in technological and computational capabilities, have resulted in sophisticated new monitoring and modeling capabilities that can provide managers with the data, decision support systems, information, and insights needed to address today's water availability challenges.



Figure 1. Numerous factors influence water availability. Water availability reflects the quality, timing, quantity, and use of water resources. More specifically, water availability has four components: (1) the need for a certain volume of water to meet the intended purpose, (2) the timing characteristics with which water is delivered, (3) the adequate quality of the water for the intended purpose, and (4) the need for water to meet both human and environmental/ecological uses.

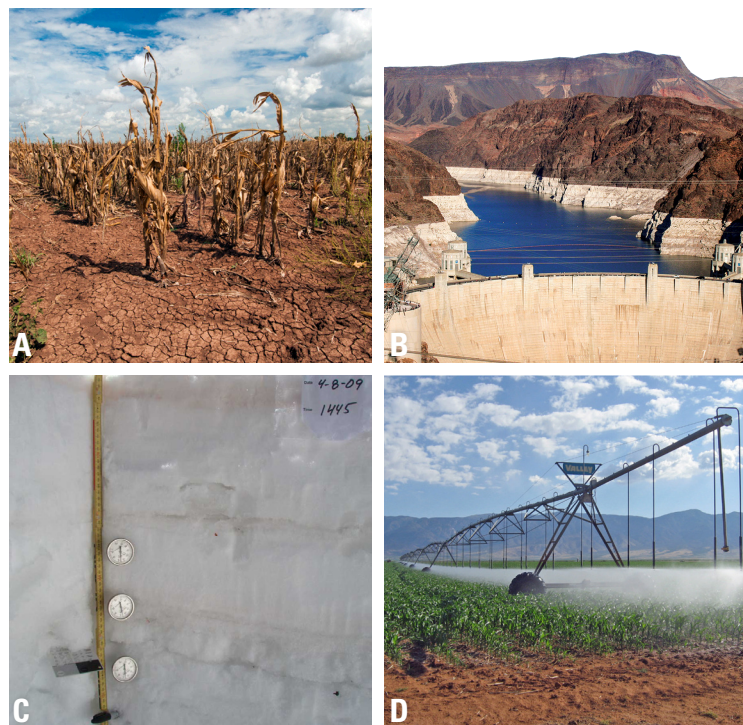


Figure 2. **A** - The effects of a water shortage on a corn crop in Texas. **B** - “Bathtub rings” at Lake Mead show the drop in water level due to drought. **C** - Measurements of snowpack in Colorado mountains help predict water supplies during Spring thaws. **D** - Water for agriculture primarily relies on underground aquifers.

Integrated Water Availability Assessments (IWAAs)

The USGS IWAAs will provide nationally and regionally consistent assessments of water for human and ecological needs and identify factors that limit water availability at a range of spatial and temporal scales. When fully implemented, the IWAAs will:

- (1) evaluate current water supplies and demands along with the factors that affect them (Fig. 1, 2),
- (2) quantify long-term trends in water availability metrics and their drivers,
- (3) provide seasonal to decadal forecasts of water availability, and
- (4) support water resource management through design of management-relevant integrated data and water-availability assessment products. (Fig. 3)

The goals and implementation of IWAAs, and particularly the relevance and utility of IWAA products, will rely on effective communication, coordination, and collaboration with the Federal agencies and Tribal, State, regional, and local partners that need or are supporting an enhanced understanding of water availability.

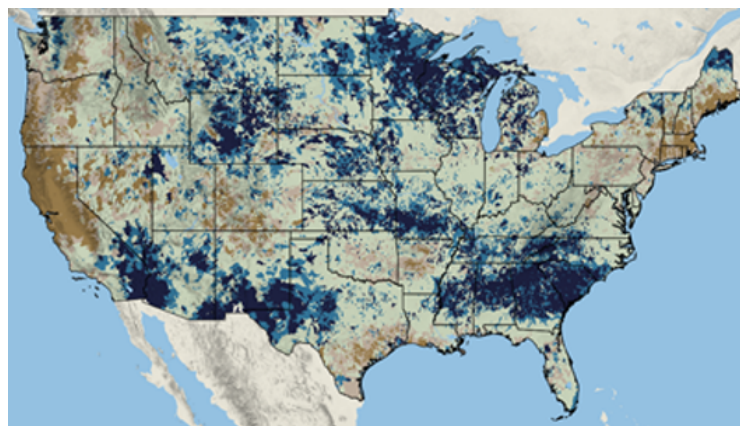


Figure 3. The USGS National Integrated Water Availability Assessments (IWAAs) concept map shows daily estimates of natural water storage (water present on the landscape such as standing water, snowpack, soil water, and shallow groundwater) for the conterminous United States. The USGS map is the first product to visualize a current, quantitative view of water availability at the national scale.

National and Regional IWAAAs

National Assessments

The National IWAA will provide a near-real-time census of water resources at the sub-watershed scale (tracts of 10,000 – 40,000 acres). When fully realized, the census will provide assessments and forecasts of the amount of surface water and groundwater available to support various uses over spatial extents including individual watersheds, major hydrologic regions, and the nation. Assessments will also provide information on the quality of available source water and the socioeconomic factors that affect demands on water supplies. This national census--and the data, research, and network of models it comprises-- will be supported by next-generation observation systems and an evolving hydrologic cycle and water-quality modeling capacity being developed by the USGS (Fig. 4).

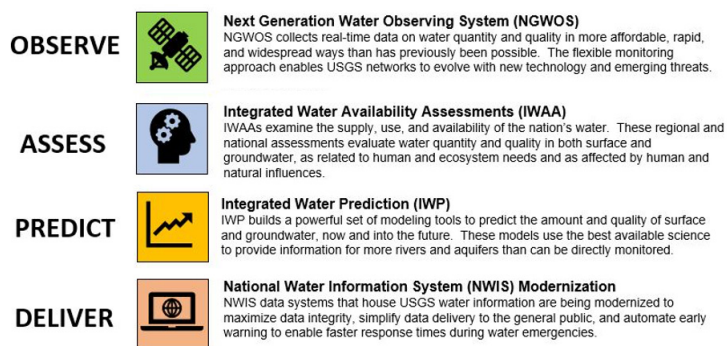


Figure 4. IWAAAs is one of four priority programs in the USGS Water Mission Area designed to help address current and future societal issues associated with water availability.

Regional Assessments

Models, tools, and supporting data developed for the National IWAAAs will be augmented by more refined information from select regional studies and assessments to improve National IWAAAs water-availability models. The specific information needs of each Regional IWAA will be informed by local hydrologic conditions, and partner and stakeholder input regarding information gaps and resource management needs. Improved estimates and understanding of the regional water budget, priority components of water availability, and controls on water quantity, quality, and use will be used to meet regional and local information and tool needs, and to inform and improve the water-availability assessments and forecasts made by the National IWAAAs.

In 2019, the USGS began a pilot Regional IWAA in the Delaware River basin. This pilot is providing an opportunity to explore new approaches to assess factors that influence both water supply and demand. Pilot Regional IWAAAs activities in the Delaware River Basin focus on:

- Understanding historic drought events and future water supply under drought conditions
- Assessing the impact of water quality on water availability for human and ecological purposes
- Developing new data processing techniques and models to predict water use, and

- Evaluating streamflow trends as model input toward use in forecasting reservoir storage.

In 2020, the USGS selected the Upper Colorado River Basin (Fig. 5) to conduct a fully implemented Regional IWAA. This basin will provide an opportunity to improve regional water availability prediction in snowmelt dominated systems. Ultimately, a new regional IWAA will be added each year, as funding is available, until 10 basins identified by a Basin Selection Team have implemented IWAAAs projects. The Basin Selection Team developed criteria that accounted for environmental, engineered, and social settings; ecological resources; water demand; water quality and water quantity; and changes to water resources in different regions.



Figure 5. The Upper and Lower Delaware River Basins (left) and Upper Colorado River Basin (right) were selected in 2019 and 2020 to implement regional Integrated Water Availability Assessments. Additional basins will be added each year through 2029.

The USGS WMA plays an essential role in meeting the current and future challenges associated with managing the Nation's water resources (National Academies of Science, Engineering, and Medicine, 2018). IWAAAs is one of four priority programs established by WMA (Fig. 4) to help ensure that its observational networks and renowned water science and research continue to provide timely and actionable information to stakeholders, managers, and decisionmakers.

Reference Cited

National Academies of Sciences, Engineering, and Medicine, 2018, Future water priorities for the Nation—Directions for the U.S. Geological Survey Water Mission Area: Washington, D.C., The National Academies Press, 96 p.
[Also available at <https://doi.org/10.17226/25134>.]

For More Information

<https://www.usgs.gov/iwaa>

<https://labs.waterdata.usgs.gov/estimated-availability/>

<http://water.usgs.gov/wausp>