



United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Alabama Water Science Center
75 TechnaCenter Drive
Montgomery, AL 36117

United States Geological Survey Availability of Water Resources Information for the Nation

The U.S. Geological Survey (USGS) collects information needed to understand the Nation's water resources, and provides access to water data, publications, and maps, as well as to recent water projects and events.

To understand the Nation's water resources, the USGS collects hydrologic and water-quality information and provides access to water data, publications, and maps, as well as to recent water projects and events. Water data collected by USGS is discovered through that National Water Information System (NWIS). NWIS is the Nation's principal repository of water resources data. It includes data from more than 1.5 million sites, some in operation for more than 100 years. Most NWIS data can be accessed directly at: <http://waterdata.usgs.gov/nwis>

The USGS investigates the occurrence, quantity, quality, distribution, and movement of surface and ground-waters and disseminates the data to the public, State and local governments, public and private utilities, and other federal agencies involved with managing our resources. NWIS contains site information for over 14,000 sites in Alabama. The inventory contains and provides access to information about sites at stream reaches, groundwater wells, test holes, springs, tunnels, drains, lakes, reservoirs, ponds, excavations, and water use-facilities. Information for each site in the USGS data base can be retrieved for viewing and downloaded/imported into other software, including GIS software.

Additional tools are provided to help find current and historical data in NWIS include:

Water Watch: <http://waterwatch.usgs.gov/>

The USGS operates more than 7,400 streamgages nationwide to provide streamflow information for a wide variety of uses. These uses include prediction of floods, management and allocation of water resources, design and operation of engineering structures, scientific research, operation of locks and dams, and for recreational safety and enjoyment. These streamgages are operated by the USGS in partnerships with more than 800 other Federal, State, Tribal, and local cooperating agencies. The streamgages record and transmit streamflow information electronically so that streamflow information is available on the World Wide Web in real time. Most streamgages transmit information via satellite, but a few use telephone and radio telemetry. Collecting and delivering streamflow information from the streamgage to the World Wide Web in real time by satellite involves numerous steps and the simultaneous activities of a large array of computer hardware and software. These processes work together to ensure the prompt delivery of streamflow information to many diverse users.

- **Current Streamflow:** http://waterwatch.usgs.gov/index.php?id=ww_current
Map of real-time streamflow compared to historical streamflow for the day of the year

- **FloodWatch:** http://waterwatch.usgs.gov/?id=ww_flood
Map of flood and high flow condition
- **DroughtWatch:** http://waterwatch.usgs.gov/?id=ww_drought
Map of below normal 7-day, 14-day, and 28-day average streamflow compared to historical streamflow for the day of year
- **Past Flow/Runoff:** http://waterwatch.usgs.gov/?id=ww_past
Archive of streamflow maps to include map of monthly-average streamflow for the month of year, computed runoff in hydrologic units, annual summary of computed runoff

Groundwater Watch: <http://groundwaterwatch.usgs.gov/>

The USGS has a database of about 850,000 wells across the Nation. Through various groundwater programs over the past 100 years, the USGS actively measures water levels in, or collects data from more than 20,000 of these wells each year. These wells are measured for a variety of disparate purposes, such as statewide monitoring programs, or more local effects like monitoring well drawdown, hydrologic research, aquifer tests, or even earthquake effects on water levels. NWIS provides all USGS groundwater data that area approved for public release. These 'groundwater watch' web pages group related wells and data from these active well networks, and provide basic statistics about the water-level data collected by USGS water science centers for Cooperative Programs, for Federal Programs, and from data supplied to USGS by our customers through cooperative agreements.

- **Real-time ground-water levels:**
<http://groundwaterwatch.usgs.gov/Net/OGWNetwork.asp?ncd=rtn>
The Real Time Groundwater Level Network contains water levels and well information from wells with "real time" data transmission instrumentation. This network includes all of these wells, regardless of the aquifer monitored or the monitoring objective.
- **Ground Water Climate response Network:**
<http://groundwaterwatch.usgs.gov/Net/OGWNetwork.asp?ncd=crn>
The USGS maintains a network of wells to monitor the effects of droughts and other climate variability on groundwater levels. The water level changes in the Climate Response Network should primarily reflect climatic variability and not human influences.
- **Active Groundwater Level Network:** <http://groundwaterwatch.usgs.gov/default.asp>
The Active Groundwater Level Network contains water levels and well information from more than 20,000 wells that have been measured by the USGS or USGS cooperators at least once within the past 13 months. This network includes all of these wells, regardless of measurement frequency, aquifer monitored, or the monitoring objective.
- **Below Normal Groundwater Levels:**
<http://groundwaterwatch.usgs.gov/Net/OGWNetwork.asp?ncd=lwl>
The well with below normal groundwater levels is identified on these pages when the most recent water-level measurement is in the 24th percentile or lower in the month of measurement over the period of record for the well. To be included on this map, the well must be in an active measurement program and the well must have 10 or more years of record in the month of the most recent measurement. These web pages present all active wells, regardless of measurement frequency, aquifer monitored, or the monitoring objective.
- **Long-Term Groundwater Data Network:**
<http://groundwaterwatch.usgs.gov/Net/OGWNetworkLTN.asp?ncd=ltn&a=1&d=1>
The Long-Term Groundwater Data network consists of actively-measured periodic, continuous, and/or real-time wells with at least 20 years of measurements.

USGS Online Water-Quality Data: <http://waterdata.usgs.gov/nwis/qw>

The USGS collects and analyzes chemical, physical, and biological properties of water, sediment and tissue samples from across the Nation. The National Water Information System (NWIS) includes current and historical water-quality data and related summary statistics.

Water Quality Watch: <http://waterwatch.usgs.gov/wqwatch/>

Water-Quality Watch provides continuous real-time water-quality measurements from USGS surface-water monitoring locations. Sensors that measure water quality properties or constituent concentrations are available for specific conductance, pH, water temperature, turbidity, and dissolved oxygen, and ion-specific electrodes (chloride or nitrate). Sensors also are available that measure portions of the electromagnetic spectrum (light) that indicate adsorption or scatter (turbidity, chlorophyll, and fluorescence) or sound (acoustic Doppler technology). In-stream chemical analyzers and portable field laboratories for nitrate and phosphorus also are available.

WaterAlert: <http://water.usgs.gov/wateralert/>

The U.S. Geological Survey WaterAlert service sends e-mail or text (SMS) messages when certain parameters, as measured by a USGS real-time data-collection station, exceed user-definable thresholds. The development and maintenance of the WaterAlert system is supported by the USGS and its partners, including numerous federal, state, and local agencies.

Annual Water Data Reports: <http://wdr.water.usgs.gov/adrgmap/>

Water resources data can be accessed through annual summary reports or an interactive map. These archival products supplement direct access to current and historical water data. Compilation of published water resources data collected during a "Water Year", which is the 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and includes 9 of the 12 months. The year ending September 30, 2012, is called the "2012 Water Year".

Instantaneous Data Archive (IDA): <http://ida.water.usgs.gov/ida/>

Since 1889 the United States Geological Survey has collected continuous stage, discharge, and other instantaneous time-series data on the nations rivers and streams. These time-series data have been and are typically recorded at intervals ranging from 5 to 60 minutes. These instantaneous data have been processed into and published as various daily values, such as the daily maximum, minimum, and/or mean. Because the published records are daily values, the original instantaneous data have not historically been officially approved, published, or made widely available. This web site has been established to make available as much historical instantaneous data from USGS data collection stations as possible.

Other USGS products/services include:

National Water Quality Assessment (NAWQA) Program:

<http://infotrek.er.usgs.gov/apex/f?p=NAWQA:HOME:0:>

The NAWQA Program investigates the status of water-quality conditions and studies how and why these conditions change over time. Most NAWQA data are included in NWIS, but additional data products and databases are available:

- **NAWQA Data Warehouse:** <http://infotrek.er.usgs.gov/apex/f?p=NAWQA:HOME:0:> includes chemical, biological, and physical water-quality data from across the Nation
- **National maps:** <http://water.usgs.gov/nawqa/digmap.html> summarizes particular data sets or investigations from featured NAWQA activities

Water Use in the United States: <http://water.usgs.gov/watuse/>

Use of water in the United States is tracked by USGS in cooperation with state, tribal, and local governments.

Sediment data: <http://water.usgs.gov/osw/sediment/>

Sediment data collected by USGS is stored in NWIS and is also described in a dedicated web page.

Reservoir Sedimentation Database: <http://ida.water.usgs.gov/ressed/>

Reservoir Sedimentation Database from federal agencies is also maintained by USGS.

Hydro-Climate Data Network: http://pubs.usgs.gov/wri/wri934076/1st_page.html

The Hydro-Climate Data Network provides streamflow data between 1874 and 1988 and is useful for studying climate change.

National Stream Quality Accounting Network (NASQAN): <http://water.usgs.gov/nasqan/>

The National Stream Quality Accounting Network provides ongoing characterization of the concentrations and transport of sediment and chemicals in the Nation's largest rivers.

Acid Rain, Atmospheric Deposition, and Precipitation Chemistry: <http://bqs.usgs.gov/acidrain/>

USGS is the lead federal agency for monitoring acid rain and related issues as part of the National Atmospheric Deposition Program: <http://nadp.sws.uiuc.edu/>

Hydrologic Benchmark Network (HBN): <http://ny.cf.er.usgs.gov/hbn/flowchem.cfm>

collects data from a long-term network of sites located in areas that are minimally affected by human activities

The Ground-Water Atlas and the National Atlas provide many maps that summarize water resources data and related information:

<http://pubs.usgs.gov/ha/ha730/>

<http://www.nationalatlas.gov/maplayers.html?openChapters=chpwater#chpwater>

Forecasts: <http://water.weather.gov/ahps/rfc/rfc.php>

USGS collects most of the water data in the Nation, but official forecasts are made by other agencies. Water resources planning and forecasts are done by other federal, regional, state, local, and tribal agencies. In most cases, USGS partners with these agencies to provide reliable current and historical water data that are essential for making accurate forecasts. The National Weather Service is the primary federal agency for water resources forecasting

Statistics:

USGS water data and statistics are used by other agencies to estimate future conditions and to assess risks as flooding and drought. Planners and engineers use USGS water data, statistics, and other data for design of systems for water supply, flood control, environmental protection, and recreation.

- **Water Watch:** <http://waterwatch.usgs.gov/?m=sitempnn&r=us&w=real%2Cmap> provides basic flow statistics computed from daily streamflow values, including the daily average, minimum, and maximum streamflow; and flow duration curve for the period of observed data. Additional statistics are computed from daily streamflow values, flood peak flows, and measured low flows, and include, for example, 100-year flood; 7-day, 10-year low flow; and mean annual flow. Statistics such as these are commonly used to help estimate reliability of water supplies and risks of floods or droughts.
- **National Streamflow Statistics (NSS) Program:** <http://water.usgs.gov/osw/programs/nss/> is a computer program that provides a simple method for applying regional flood-peak streamflow estimates and low flow frequency/duration streamflow estimates.
- **StreamStats:** <http://water.usgs.gov/osw/streamstats/> provides tools to estimate required inputs for the National Streamflow Statistics computer program, and is currently available for about half of states, with additional states being added regularly.

Flood Inundation Mapping Science: http://water.usgs.gov/osw/flood_inundation/

The USGS Flood Inundation Mapping Program focuses its efforts at state and local levels to help communities understand flood risks and make cost-effective mitigation decisions. We partner with local communities to assist in the development and validation of flood inundation map libraries. Communities use these maps to help protect lives and property. The USGS works with the National Weather Service, the U.S. Army Corps of Engineers, and the Federal Emergency Management Agency to connect communities with available federal resources thereby ensuring the quality and consistency of flood inundation maps across the country.

Water-Quality Portal: <http://www.waterqualitydata.us/>

provides access to over 150 million water-quality records in the USGS NWIS and the U.S. Environmental Protection Agency (EPA) STORage and RETrieval (STORET) data bases. The portal is sponsored by the USGS, the EPA, and the National Water Quality Monitoring Council (NWQMC).

Water Resources Maps and GIS Information: <http://water.usgs.gov/maps.html>

provides a list and links to water-resources GIS resources.

Integrated Water Resources Science and Services (IWRSS):

http://www.nws.noaa.gov/oh/docs/IWRSS_1p_summary.pdf

The State of Alabama will benefit from the IWRSS which will be housed on The University of Alabama campus in Tuscaloosa, AL. IWRSS is an innovative partnership of federal agencies with complementary operational missions in water science, observation, prediction and management. Consisting initially of NOAA, the U.S. Army Corps of Engineers, and the USGS, the IWRSS consortium envisions a highly collaborative and integrative framework for providing a seamless suite of water resources information across scales ranging from small to large watersheds, from droughts to floods and from historical analyses to long-range predictions.



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Alabama Water Science Center
75 TechnaCenter Drive
Montgomery, AL 36117

Governor Robert Bentley
Office of the Governor
State Capitol
Montgomery, AL 36130

November 1, 2012

RE: Water Management Issues in Alabama
Statewide Water Management Plan

Dear Governor Bentley,

The U.S. Geological Survey (USGS) Alabama Water Science Center (AL-WSC) has reviewed the report entitled "Water Management Issues in Alabama" and would like to commend the members of the Alabama Water Agencies Working Group (AWAG) for what appears to be a comprehensive effort.

While as a federal agency it is outside our purview to provide direct comments on what we would like a statewide water management plan to address, we did want to provide some additional information that might be useful regarding the resources we currently provide to the state of Alabama, in cooperation with the public and private sectors; academia; and state, local and federal agencies.

The AL-WSC (<http://al.water.usgs.gov/>) is devoted to data collection, applied science, and dissemination of information, and has been collecting hydrologic information in Alabama since our earliest streamgaging efforts on the Tennessee River at Florence in 1894. The AL-WSC collects high-quality hydrologic data and conducts objective investigations on the quantity, quality, and use of surface and ground-water resources in the state of Alabama to help achieve the best use and management of water resources in the state. These efforts provide Alabama's decision-makers, managers, scientists, and the general public with information needed to make informed decisions about the state's natural resources. To ensure that our work is relevant and useful, we form partnerships with federal, state, and local agencies, and other private organizations throughout the state.

USGS applies over \$1.4 million of federal funds directly to Alabama through various federal appropriations. Through the Cooperative Water Program, matching funds are made available on an annual basis, starting October 1st through September 30th the following year. Cooperative Water Program funding for Alabama has been steady for several years. The allocation for Alabama in FY11 and FY12 was \$803,217 and \$821,764, respectively.

The Cooperative Water Program allows the AL-WSC to match funding, up to 50%, with state and local agencies. The program brings local, state, and tribal water science needs and decisions-making together with USGS national capabilities, providing consistent methods and quality assurance. Because data collection and analyses adhere to strict national protocols, findings are directly comparable across local, state, regional and national levels; water issues in a specific watershed, municipality, or state can be compared to those in other geographic regions and across the nation.

In addition to providing real-time streamflow, lake and reservoir levels, precipitation, water quality, and groundwater data (<http://waterdata.usgs.gov/al/nwis/rt/>), the AL-WSC has worked collaboratively with all of the five state agencies that form the AWAG on projects such as:

- **Water Use:**

Estimated Use of Water in Alabama in 2005: <http://pubs.usgs.gov/sir/2009/5163/>

- Alabama Water Use, 2005 (Fact Sheet): <http://pubs.usgs.gov/fs/2009/3081/>
- Water Use in the United States: <http://water.usgs.gov/watuse/>

- **Water Availability:** http://wwwbrr.cr.usgs.gov/projects/SW_MoWS/PRMS.html

Alabama is the only state in the nation with a statewide water availability model. The water availability model, Precipitation-Runoff Modeling System (PRMS), is a modular, physically based, distributed-parameter modeling system developed to evaluate the impacts of various combinations of precipitation, climate, and land use on surface-water runoff and general basin hydrology. PRMS simulates precipitation-driven movement of water through the basin via overland flow, interflow, and baseflow. Watershed response can be simulated at a daily time step.

- **Flood Frequency:**

- Magnitude and Frequency of Flood in Alabama, 2003: <http://pubs.usgs.gov/sir/2007/5204/>
- Magnitude and Frequency of Flood on Small Rural Streams in Alabama: <http://pubs.usgs.gov/sir/2004/5135/>
- Magnitude and Frequency of Flood for Urban Streams in Alabama, 2007: <http://pubs.usgs.gov/sir/2010/5012/>

- **Low Flow:**

- Low-Flow and Flow-Duration Characteristics of Alabama Streams: <http://pubs.usgs.gov/wri/1993/4186/report.pdf>

- **StreamStats:** <http://water.usgs.gov/osw/streamstats/alabama.html>

StreamStats is a Web-based Geographic Information System (GIS) that provides users with access to an assortment of analytical tools that are useful for water-resources planning and management. StreamStats allows users to easily obtain streamflow statistics, drainage-basin characteristics, and other information for user-selected sites on streams. StreamStats users can choose locations of interest from an interactive map and obtain information for these locations. If a user selects the location of a U.S. Geological Survey (USGS) data-collection station, the user will be provided with a list of previously published information for the station. If a user selects a location where no data are available (an ungaged site), StreamStats will delineate the drainage-basin boundary, measure basin characteristics and estimate streamflow statistics for the site. These estimates assume natural flow conditions at the site.

The AL-WSC would like to partner with the AWAG to optimize and/or expand the real-time data networks for streamflow, lakes and reservoirs, precipitation, water quality, and groundwater. USGS can assist scientifically, technically, and financially in the expansion of these networks.

The AL-WSC welcomes the opportunity to work with the AWAG on updating previous reports such as:

- Estimated Use of Water 2010 (last updated 2005)
- Low-Flow and Flow-Duration Characteristics of Alabama Streams (last updated 1994)

Additionally, we welcome the opportunity to assist the AWAG with defining an acceptable framework for implementing instream flows into a statewide water management plan. One possible option is to consider using the Instream Flow Incremental Methodology (IFIM). The IFIM is a decision-support system designed to help natural resource managers and their constituencies determine the benefits or consequences of different water management alternatives. IFIM provides a comprehensive technical framework for addressing the streamflow needs of fish and other living organisms within a river system. Other appropriate uses and applications for IFIM include the evaluation of future water use patterns included in area-wide planning studies, impact analysis of diversions of water or of channel alterations, and negotiations of flow regimes for managed rivers and streams. To learn more about IFIM and the 5 Phases of IFIM, please visit the following link: <http://www.fort.usgs.gov/Products/Software/IFIM/>
The AL-WSC would be glad to host a workshop on IFIM.

In closing, I welcome the opportunity to meet with you, your staff, and any member of the AWAG to further discuss water resources and water management needs in Alabama, and how the USGS can assist in providing the data and investigations to address those needs. Attached you will find some additional information on our programs and capabilities. Please consider the USGS Alabama Water Science Center your science and funding partner for water resources in Alabama.

Sincerely,



Athena P. Clark, Director, PE
USGS Alabama Water Science Center

CC: AWAG members