

Montana Bureau of Mines and Geology Ground-Water Assessment Program

December 2008

Program History

The Legislature established the Ground-Water Assessment Program (85-2-901 et seq.) in 1991 after considering the recommendations of a Ground-Water Task Force organized by the Environmental Quality Council in 1989. Statute specifically requires a **Ground-Water Monitoring** program to produce and maintain long-term water-level and water-quality records and a **Ground-Water Characterization** program to systematically assess and document the hydrogeology and quality of the state's major aquifers. As part of a mandate to make ground-water information widely available, the Assessment Program includes the **Ground-Water Information Center** (GWIC) database at the Montana Bureau of Mines and Geology (MBMG). The Legislature also created an interagency Steering Committee that selects study areas, addresses the need for better coordination among state, federal, and local government units, and oversees Assessment Program progress.

Ground-Water Information Center

Data collected by the Characterization and Monitoring Programs and other ground-water projects are only useful when they become available to data users. Consequently, all data gathered by the Monitoring or Characterization Programs, many other MBMG projects, and projects managed by other agencies are stored in GWIC. Some of the data available through the GWIC website are described in the table to the right.

Who are GWIC customers, what do they do with data, and how can they get data?

More than 14,200 registered GWIC customers include people from all parts of Montana and about 1,690 individuals from other states. Out-of-state users are either private citizens who are considering purchasing land in Montana or consultants who have jobs in Montana. When entering the GWIC website, users are asked about who they are and what they plan to do with GWIC data. The table on the next page shows who database users are and that they consistently return for more information as their needs and projects change.

The Legislature recognized that ground-water information is the key to dealing with the issues shown below and decided to “systematically assess and monitor the state’s ground water and to disseminate the information...” 85-2-902(2) MCA.

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- "Montana's citizens depend on ground water..."
 - "ground-water supplies are threatened..."
 - "there is **insufficient information** characterizing..."
 - "**ground-water information deficiencies** are hampering..."
 - "...focus on preventing ground-water contamination...but **better ground-water information** is required"
 - "there is a need for better coordination among those numerous units of state, federal, and local government..."

(85-2-902(1) MCA)

Some types of data available from the Ground-Water Information Center website are shown below. GWIC staff add new records and update many existing records daily. New well logs are available 2-3 weeks after receipt.

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- Construction information for almost 221,100 wells.
 - Results from 33,900 water-quality analyses from about 14,900 sites.
 - Water-level measurements from more than 12,500 wells for periods as long as 65 years.
 - Descriptions of materials encountered in more than 166,680 wells.
 - Scanned images of more than 100,200 well logs.
 - High-quality data for about 8,300 wells visited by Characterization Program staff.
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Between July 1, 2007 and November 30, 2008, GWIC customers logged in almost 65,000 times; averaging about 3,800 logins each month. The tabulation below does not include direct access to GWIC through the thematic mapper at the Natural Resources Information System (NRIS), “non-login” retrievals through the GWIC home page, or logins by GWIC staff to maintain the database.

Customer groups	Customers	Logins	Return frequency
General public (agriculture, homeowners, landowners, students)	2,252	7,330	3.3
Water well drillers	132	5,734	43.4
Industrial/commercial (real estate agents, businesses)	2,484	18,962	7.6
Consultant/scientists (engineering and technical firms)	1,120	13,477	12.0
Government/scientists (regulators and scientists)	905	19,534	15.9
MBMG research	68	6,267	92.2

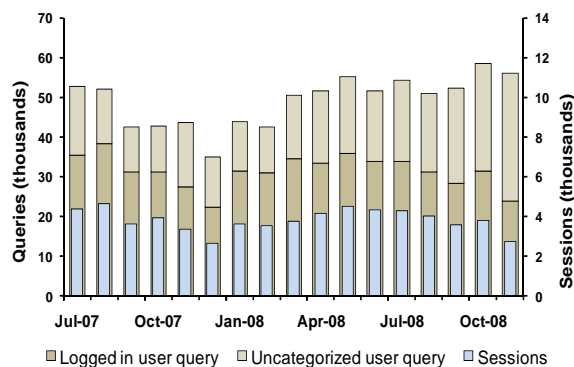
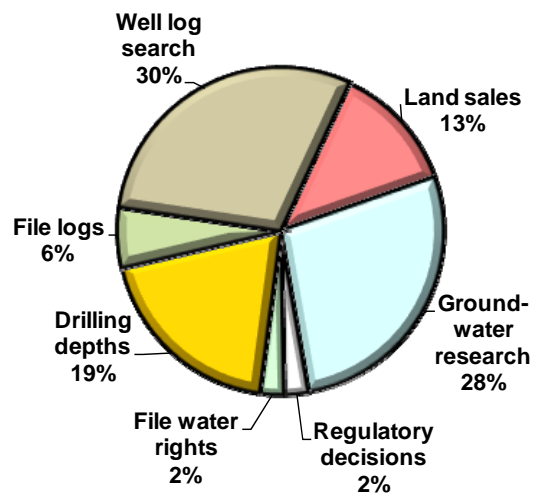
The pie-chart (right) shows how people use GWIC data. About 20 percent of requests are from those who need to determine drilling depths. The need for a new well could be related to drought, but is most often related to residential development. Another 20 percent of GWIC data is used to support land sales and filing logs. About 30 percent of data users simply say they are looking for a well log. The ground-water research category covers many other uses including research for environmental assessments.

Usage of the GWIC website continues to increase (graph–bottom right) and now averages about 47,000 queries each month. However, the way customers access GWIC is changing because of the increased ability of search engines to index websites and databases. More robust web-search offerings by Google, MSN, Yahoo, and others have, since about April 2008, markedly increased queries by “uncategorized” users. Increased “uncategorized” retrievals appear to correlate with a decrease in user sessions. An “uncategorized” query is one where an individual types search terms into an Internet search engine and then follows a link that directly returns data from GWIC. In this case GWIC tracks the delivery of the data but there is no user session linked to the query. Without a user session, GWIC has no information about who made the retrieval or how they intend to use the data.

In 2005 GWIC staff began scanning well-log documents so that the images could be delivered via the website. Currently there are more than 100,000 images available. The availability of the original document’s image fully captures the information on the document.

On July 1, 2003 drillers began filing water-well logs directly with the MBMG. Statute also allows the MBMG to accept electronically filed logs. Between July 1, 2007 and November 30, 2008 almost 3,100 water-well logs (37 percent of all logs) were filed electronically through GWIC’s “DrillerWeb” tool.

GWIC data are put to a variety of uses by a diverse customer group.



GWIC usage (<http://mbmggwic.mtech.edu>) now averages about 3,800 sessions and 46,500 queries each month.

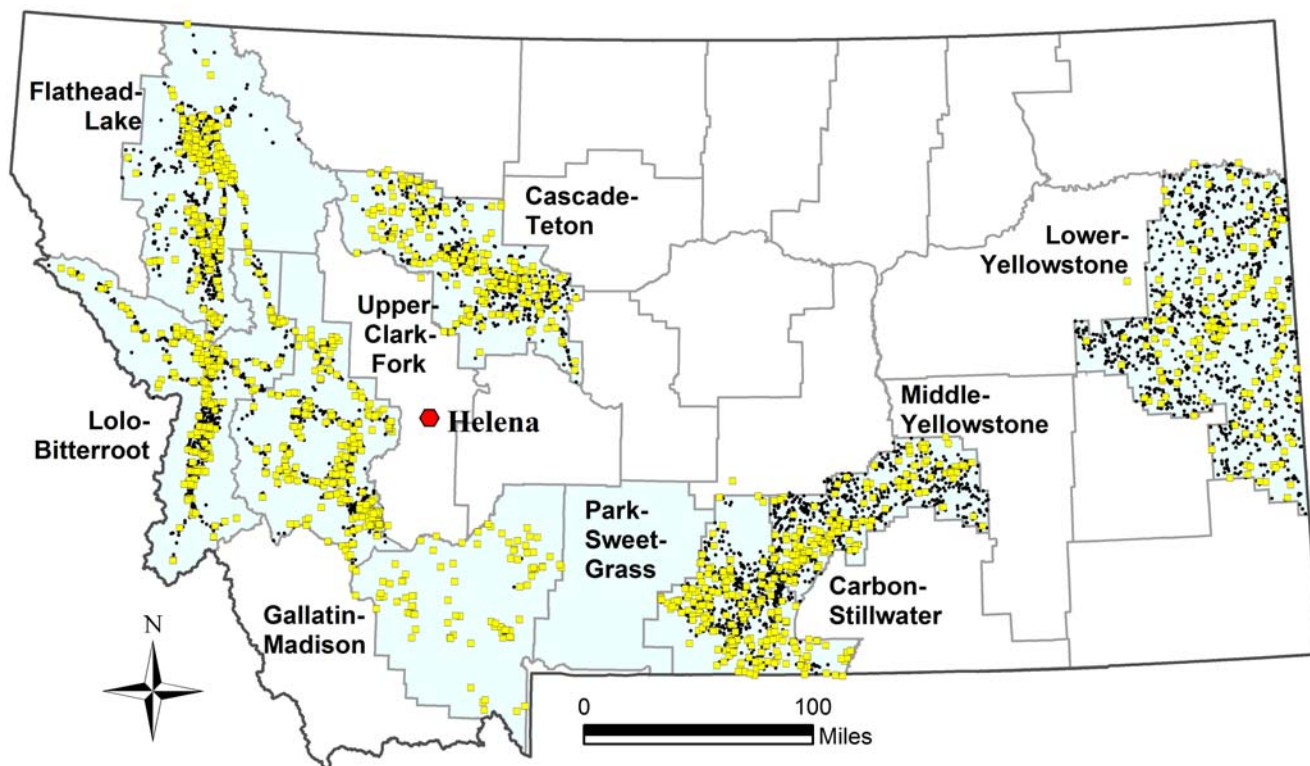
MBMG has released 41 maps describing the hydrogeology of active characterization areas. Characterization Program staff also have visited more than 8,300 wells and high-quality data from those wells are retrievable from the GWIC database at <http://mbmggwic.mtech.edu>.

- Montana Ground-Water Assessment Atlases 1, 2, and 4. Thirty-one maps detailing the hydrogeology of the Lower Yellowstone River Flathead Lake, and Lolo-Bitterroot areas.
- Montana Ground-Water Assessment Atlas 3. Seven maps detailing the hydrogeology of the Middle Yellowstone River Area.
- Well-visit data for 2,177 sites and results from 690 new water-quality analyses for the Upper Clark Fork River, Carbon-Stillwater, and Cascade-Teton study areas. Three maps released.
- Well-visit data for 200 sites and results from 91 new water-quality analyses for the Gallatin-Madison study area. Field work will continue until 2010.

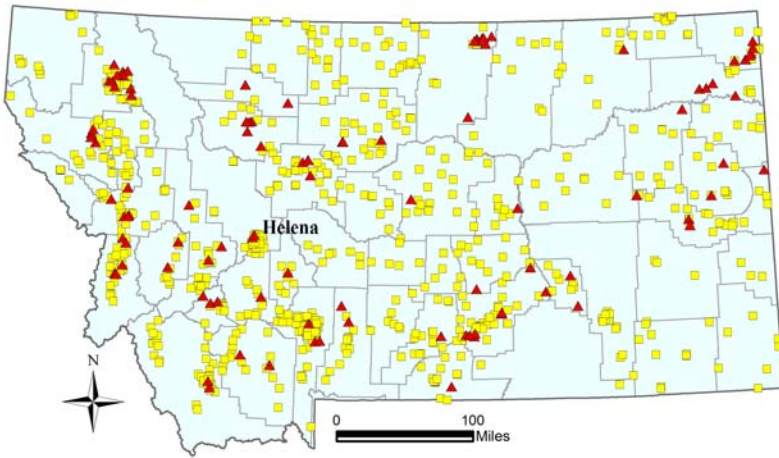
Ground-Water Characterization

In 2006 the Ground-Water Assessment Steering Committee, decided to change the naming convention for characterization study areas so that any study area consisting of two or fewer counties would be named after the counties involved. For example, the Missouri Headwaters study area is now called the Gallatin-Madison study area.

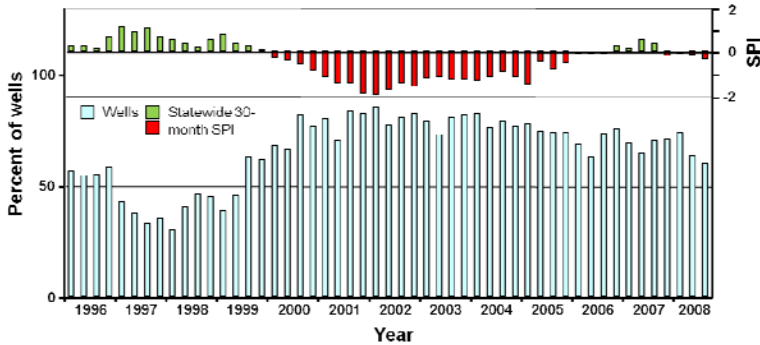
Data collection is complete in the Upper Clark Fork River, Carbon-Stillwater, and Cascade-Teton study areas. All 7 maps for the Middle Yellowstone River Area atlas are released and the Lolo-Bitterroot atlas manuscript is ready for review. The program released an Open-file report about nitrate concentrations in the Clark Fork River Basin with a focus on the Summit Valley near Butte, Montana. Characterization Program maps are available through MBMG and GWIC websites. Since July 2007, the websites have delivered more than 19,000 map retrievals. In early 2010 program staff will start visiting wells in the Park-Sweet Grass Area after work in the Gallatin-Madison area is completed. In 2009 the committee will select the next characterization areas.



The locations for more than 8,300 visited wells (dots) and 1,900 samples (yellow squares) collected by Characterization Program staff are shown above. Field work is in progress in the Gallatin-Madison characterization area where, at the time this map was made, only the sampled sites are shown. The Park-Sweet Grass area has been selected by the Ground-Water Assessment Steering Committee for future work.



Quarterly water-level data from about 930 wells help people understand how the ground-water resource responds to climatic and other factors. Additionally, 100 water-level recorders (triangles) provide continuous or hourly data. Water-level data are available from the Ground-Water Information Center database.



Water-level measurements show that about 75 percent of about 350 climate-sensitive network wells were below their seasonal averages in response to the 2000-2005 drought. The 30-month Standardized Precipitation Index (SPI) (a drought index) was negative (dry) between 2000 and 2005. Since 2005 the index has been neutral (normal) to slightly dry.

at right shows that water levels in a shallow well 0.5 mile east of the Bitterroot River are strongly influenced by irrigation.

The Monitoring Program also creates long-term records of water quality and collects about 70 samples annually. The water samples provide new water-quality information extending periods of record in wells that have not been sampled for more than 10 years. One parameter of recent interest is tritium. Water with elevated tritium concentrations may be less than 50 years old, possibly identifying aquifers susceptible to contamination.

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Ground-Water Monitoring

The Ground-Water Monitoring Program measures water levels in 929 wells each quarter. Long-term records of water-levels in wells are like long-term records of stream flow and provide information about how ground water responds to seasonal and climatic changes. Water levels in wells also can respond to other factors such as increased withdrawals due to population growth, or from land use change.

Information from the Ground-Water Monitoring Program improves our understanding of how drought impacts water levels in wells. The chart below left shows that between 2000 and 2003 water levels in about 75 percent of 300 wells were below their seasonal averages. In late 2003 the percent of wells with below average water levels began to decrease as the climate became wetter. The climate in 2006-2008 has been near normal and the percent of wells below their averages has continued to slowly fall. Detailed analysis of the data often provides clues to why water levels have changed. A report describing where and how much water-levels have changed is available from the GWIC website. Since July 2007, more than 7,900 copies have been downloaded.

Water levels can also show the connection between surface and ground water. The hydrograph

