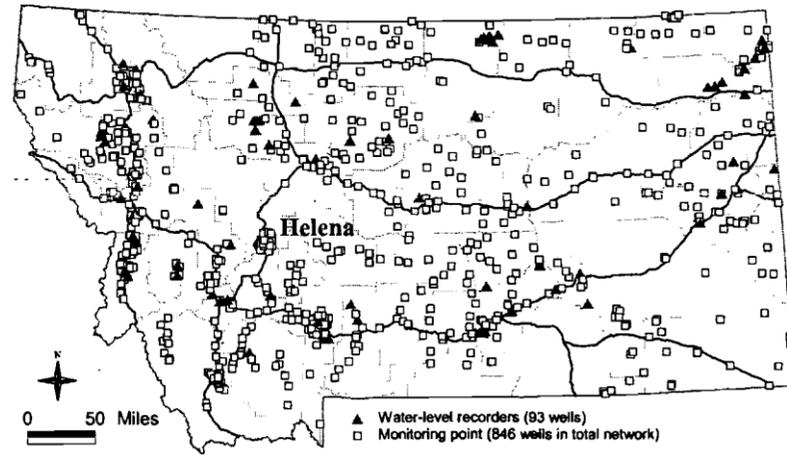


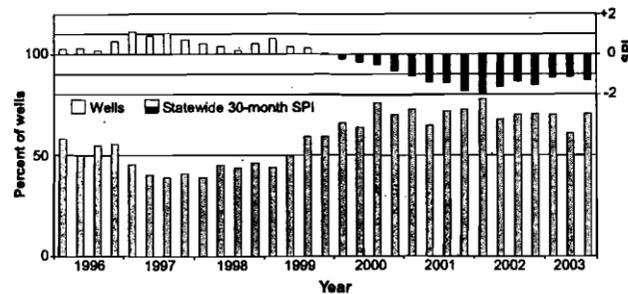
Water-level Monitoring

The Ground-Water Monitoring Program measures water levels in about 860 wells quarterly. 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 helps people understand the impact of drought on water levels in wells. The chart below shows that since 2000, about 70 percent of 600 wells, that have a period of record long enough to calculate an average, are



Quarterly water-level data from about 860 wells help people understand how the ground-water resource responds to climatic and other factors. Additionally, there are about 93 water-level recorders (triangles) in the network that provide continuous or hourly data from selected wells. Water-level data collected from the network are available from the Ground-Water Information Center database.

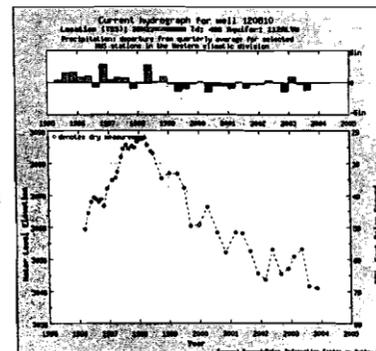


Water-level measurements show that about 70 percent of network wells that have long periods of record are below their seasonal averages in response to the recent dry period. The 30-month Standardized Precipitation Index (a drought index) has been negative (dry) since early 2000. A hydrograph from a climate sensitive well is at right.

have not been sampled for more than 10 years. One parameter of recent interest is tritium. Elevated tritium values show that the sampled water may be less than 50 years old, helping to identify aquifers and wells that may be susceptible to contamination.

below their seasonal average. Detailed analysis of the data can show where water levels have fallen and examination of individual hydrographs often provides clues to why water levels have changed. A report containing evaluations of where and how much water levels have changed is available from the GWIC website. Since July 2002, more than 1,200 copies of the report have been downloaded.

The Monitoring Program also creates long-term records of base-line water quality by collecting about 100 samples annually. The water samples provide new water-quality information and also extends periods of record in wells that



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Montana Bureau of Mines and Geology Ground-Water Assessment Program December 2003

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 systematic **Ground-Water Monitoring and Ground-Water Characterization** efforts to improve understanding of Montana's ground-water resources. 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 to select study areas, to address the need for better coordination among state, federal and local government units, and to oversee 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 7,100 registered GWIC customers include people from all parts of Montana, and about 700 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 data that they retrieve. The table below shows who database users are and that they consistently return for more information as their data 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.

- "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 adds new records and updates many existing records daily. New well logs are available 2-3 weeks after receipt.

- Construction information for almost 185,600 wells.
- Results from 26,300 water-quality analyses from about 14,800 sites.
- Water-level measurements from more than 9,300 wells for periods as long as 61 years.
- Descriptions of materials encountered in more than 130,300 wells.
- High-quality data for about 5,500 wells visited by Characterization Program staff.

GWIC customers contact the website repeatedly for additional or updated information. Between July 1, 2002 and December 31, 2003, customers logged in almost 58,000 times. The average number of logins each month was 3,220. The data below do not include direct access to GWIC through the thematic mapper at the Natural Resources Information System (NRIS).

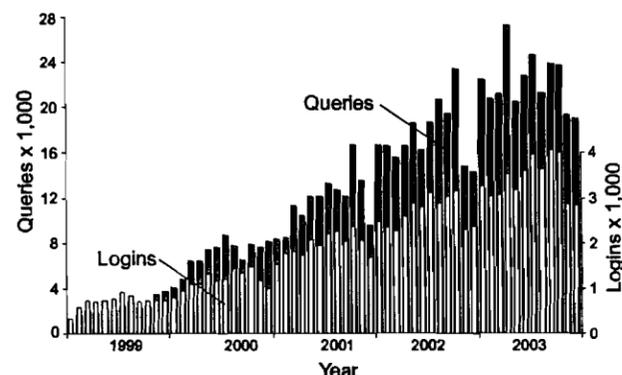
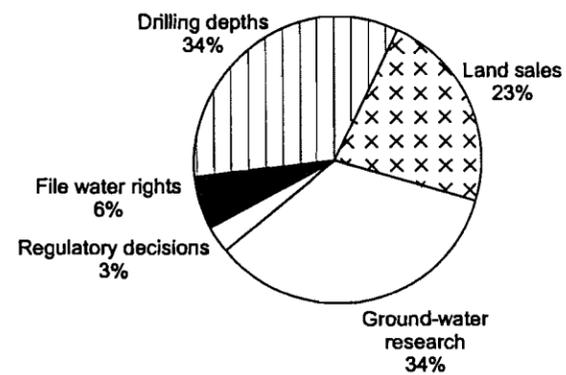
Customer group	Customers in group	Number of logins	Return frequency
General public (homeowners, landowners, students)	2,144	4,453	2.1
Water well drillers	164	3,835	23.4
Industrial/commercial (real estate agents, businesses)	2,251	15,782	7.0
Consultant/scientists (engineering and technical firms)	1,386	10,456	7.5
Government/scientists (regulators and scientists)	1,173	23,438	17.9

The pie-chart (at right) shows how GWIC data are used. About one third of requests are from those who need to determine drilling depths. The need for a new well could be related to drought but is often based on residential development. About one quarter of the data are used to support subdivision of land or are needed for property sales. The ground-water research category covers many other uses including research for environmental assessments.

Usage of the GWIC website has rapidly increased (graph— bottom right). The ability to serve data electronically has resulted in more efficient data processing at GWIC because staff spends less time answering requests. In the 1997-98 biennium GWIC staff serviced about 200 calls each month involving copying and mailing well logs. Because most users now get data directly from the website, staff serviced only about 20 direct calls each month between July 1, 2002 and December 31, 2003.

The success of the GWIC website has resulted in the legislature requiring drillers to file well logs directly with MBMG and not with the Department of Natural Resources and Conservation (DNRC). The legislature also allowed the documents to be filed electronically. DNRC will obtain well-log data necessary for water rights processing directly from the GWIC website and MBMG has created a "private" website through which DNRC can submit ownership and location corrections that arise during the water rights process.

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



Usage of GWIC (<http://nmbmgwic.mtech.edu>) now averages about 3,200 visits and 22,000 queries each month.

MBMG has released 24 maps describing the hydrogeology of active characterization areas. Characterization Program staff also have visited more than 5,500 wells and high-quality data from those wells are stored in the GWIC database.

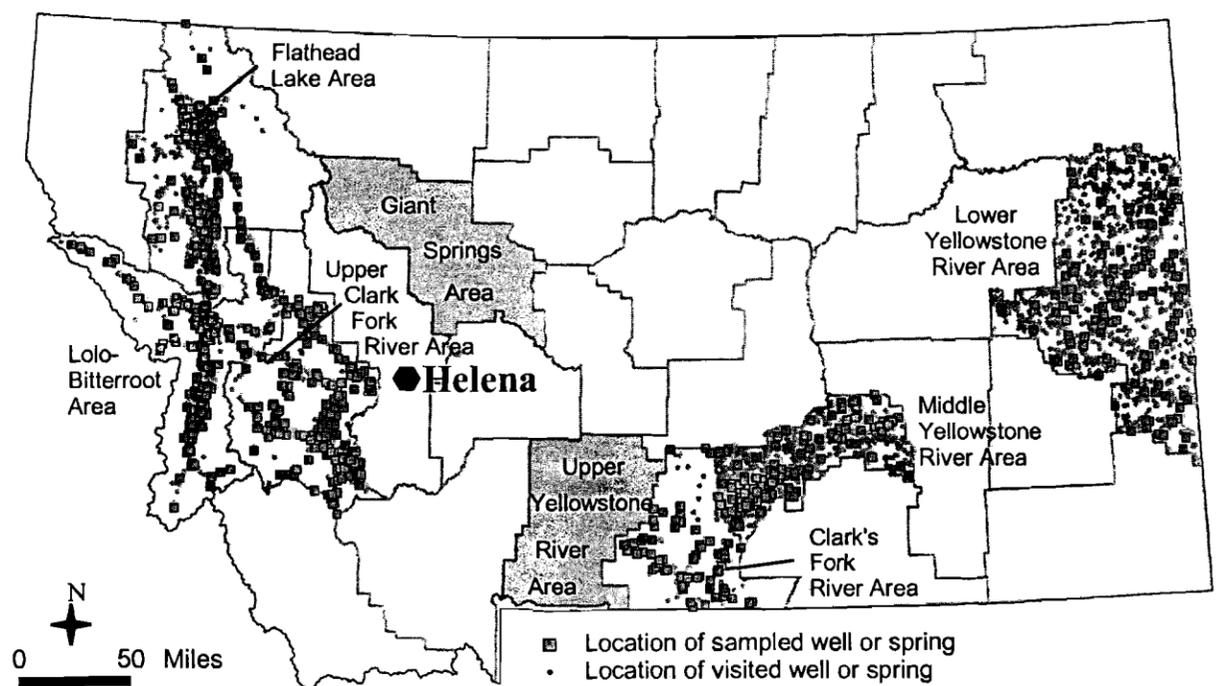
- Montana Ground-Water Assessment Atlases 1 and 2. Twenty-one Part B maps detailing the hydrogeology of the Lower Yellowstone River and Flathead Lake areas.
- Montana Ground-Water Assessment Atlas 3 (2 of 7 maps detailing the hydrogeology of the Middle Yellowstone River Area.
- Well-visit data for 884 wells and results from 286 new water-quality analyses for the Lolo-Bitterroot Area. One Part B map released.
- Well-visit data for 915 wells and results from 292 new water-quality analyses for the Upper Clark Fork River Area.
- Well-visit data for 219 wells and results from 87 new water-quality analyses for the Clark's Fork of the Yellowstone area (ongoing).

Ground-Water Characterization

Atlas No. 2 for the Flathead Lake Area is completed with all 11 Part B maps released and the manuscript for Part A in production. MBMG expects to release Part A in May 2004. The first 4 of 7 maps for the Middle Yellowstone River Area atlas are in review or released. The remaining maps are in preparation. Data collection is complete in the Lolo-Bitterroot and the Upper Clark Fork River areas. Data collection is ongoing in the Clark's Fork of the Yellowstone River area (Carbon and Stillwater counties).

Characterization Program maps are available through MBMG publications and the GWIC website. About 30 maps have been purchased from MBMG publication sales but about 750 have been delivered by the website.

Two additional study areas have been selected by the Ground-Water Assessment Steering Committee. They are the Upper Yellowstone River (Park and Sweetgrass Counties), and Giant Springs (Cascade and Teton Counties). Field work will begin in the Upper Yellowstone River Area in spring 2005.



The locations for more than 5,500 visited wells (dots) and 1,228 samples (squares) collected by Characterization Program staff are shown above. The Upper Yellowstone River area and Giant Springs characterization areas selected by the Ground-Water Assessment Steering Committee in June 2000 are shaded. Field work will continue for one more year in the Clark's Fork of the Yellowstone River Area. Database preparation is complete in the other two areas.