Montana Ground-Water Assessment Water-Quality Data Collection Environmental Quality Council

Land Use and Water Policy Subcommittees
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The Ground-Water Assessment program collects between 200 and 300 water-quality samples each year. The areas that are sampled vary and are dependent on the current Characterization Program study area, the existence of previous data, and the availability of wells and springs. For example, during the 1998 and 1999 field seasons about 260 samples were collected in the Lolo-Bitterroot study area. Two hundred of these samples were for common inorganic anions and cations, nitrate (as nitrogen, nitrate-nitrogen), and trace metals. An additional 60 samples were collected only for nitrate-nitrogen to improve the geographic distribution of nitrate data in the study area. The Monitoring Program is currently collecting about 100 samples from wells within the monitoring network. About 25 of the samples will be collected from wells that were sampled more than 15 years ago, and about 75 samples will be collected from wells that have never been sampled. Water-quality data from the Assessment Program are available directly from the GWIC data base (http://mbmggwic.mtech.edu).

Which water-quality parameters does Ground-Water Assessment routinely sample?

The Ground-Water Assessment steering committee extensively discussed the types of water-quality information that would be collected by the Assessment Program. Most of the parameters for which samples are routinely collected are shown in the table to the right, although some trace metals of lesser importance are not listed. The steering committee decided that water quality data collected by the **Characterization Program** would be used to 'fill in' locations where no data existed, be used to create a snapshot evaluation of background water quality in each study area, and be used to better understand the hydrogeology of aquifers by helping to interpret how water chemistry evolves down flow paths. Water-quality data collected by the **Monitoring Program** would be used to 'fill in' locations where the no background water-quality information existed and to begin creating a statewide set of points from which some water-quality trends could be evaluated.

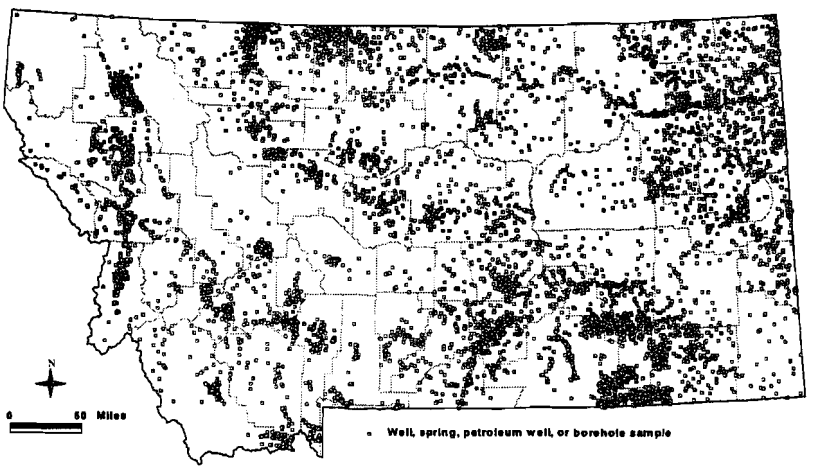
Basic chemistry	Trace metals	Nutrients	Others
calcium	aluminum	nitrate	tritium
magnesium	arsenic	phosphate	radon
sodium	barium		
potassium	boron		
iron	cadmium		
manganese	chromium		
silica	copper		
bicarbonate	lead		
carbonate	nickel		
chloride	selenium		
sulfate	silver		
fluoride	zinc		

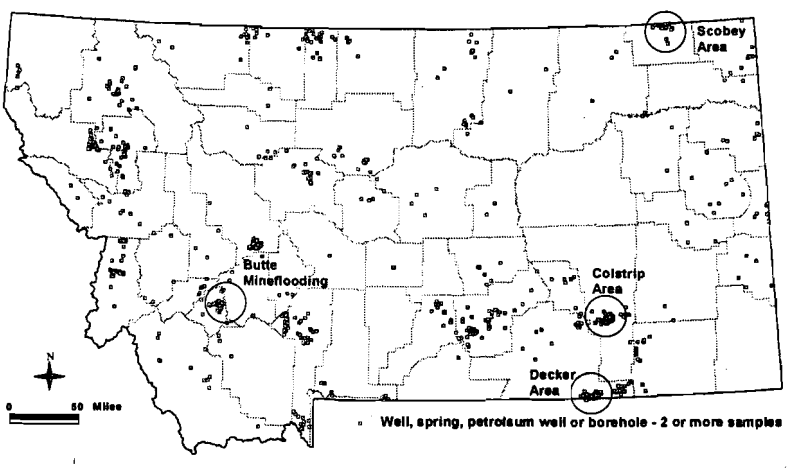
Are the data collected by Ground-Water Assessment useful in evaluating trends?

If sites sampled by the Assessment program are re-sampled for the same parameters repeatedly, the data generated could be used to evaluate water-quality trends. However, some of the parameters are more interesting than others for determining trends. Currently, interest is high in **nitrate-nitrogen** and repeated sampling of Characterization or Monitoring Program sites for nitrate-nitrogen could be useful in trend analysis. **Chloride** would be another parameter for which trends could be evaluated in conjunction with the nitrate data. **Total dissolved solids** (TDS) concentrations (derived from summing the concentrations of the basic chemical parameters) could change depending on land use changes, and evaluating TDS trends in some areas could be important. **Radon** and **tritium** are 2 other parameters in which public and regulatory interest is high. However, these parameters would not be suitable for trend analyses. For data collected by any program to be useful for trend analysis, the following factors must exist.

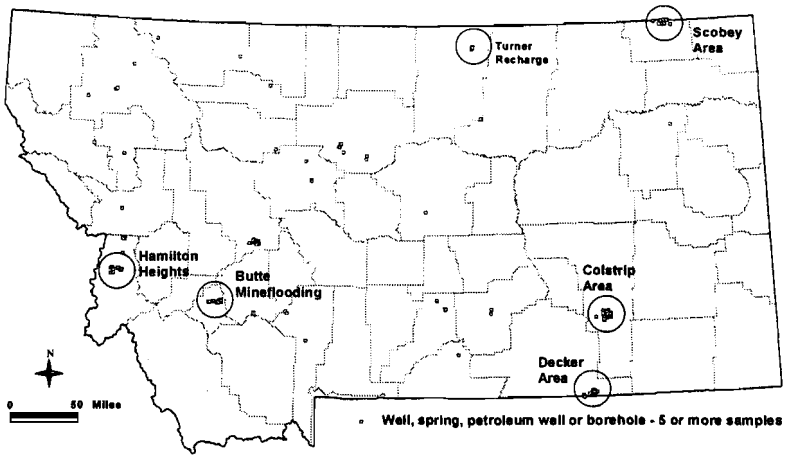
- The same sites must be sampled repeatedly,
- The same sample handling and sampling methods must be used,
- The same analytical methods and quality-assurance procedures must be used, and
- Sampling must continue indefinitely for the same parameters.

Historic data from the Ground-Water Information Center databases can be used to illustrate that a statewide data set designed to evaluate trends in parameters collected by the Assessment Program is currently very limited. The top map to the right contains points for about 10,000 wells, springs, petroleum wells, or boreholes for which GWIC has water-quality data. The contents of the data base provide basic information about water-quality in Montana, but when compared to the map immediately below that shows which of these sites have more than 2 samples, the results of not systematically re-sampling selected wells for various water-quality parameters become clear. Groups of wells in the Colstrip and Decker areas, near Butte, and near Scobey are apparent where long-term





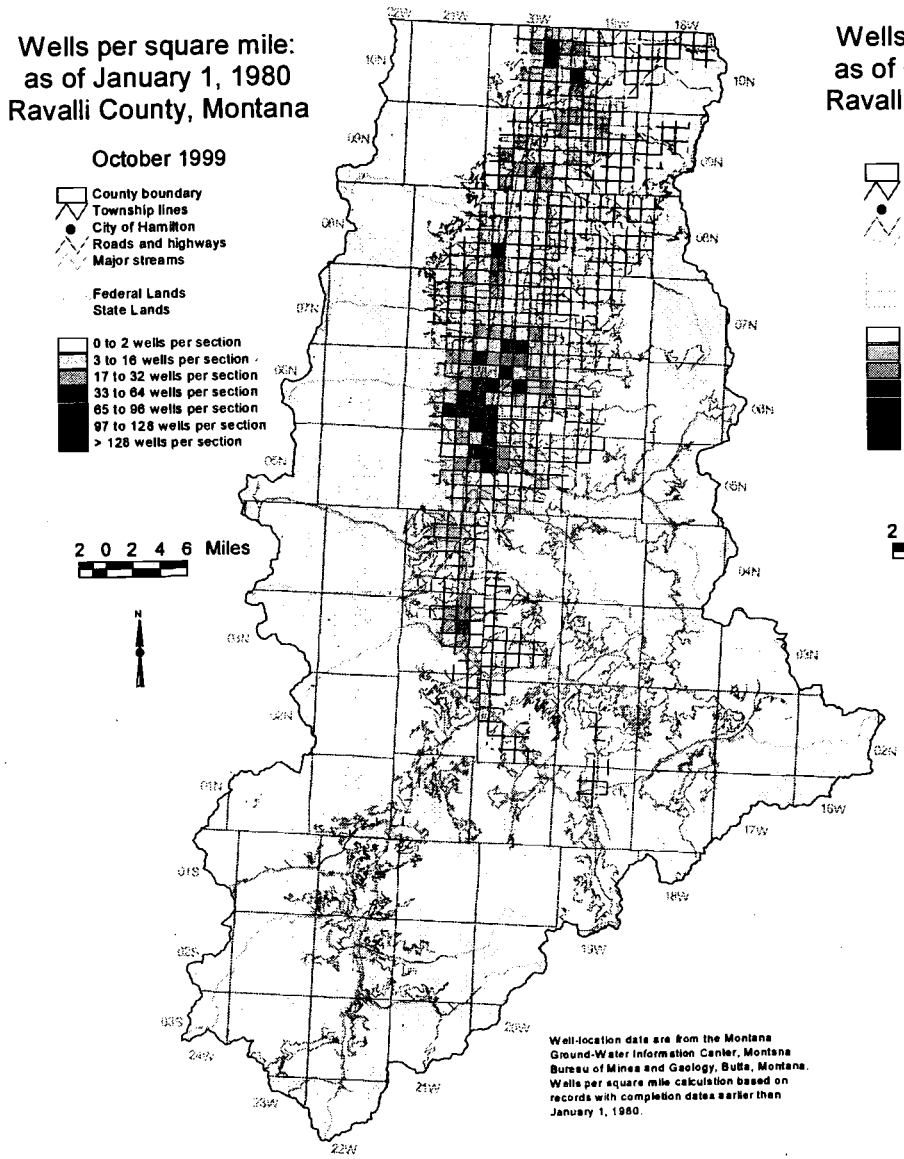
monitoring near coal mining or hardrock mine cleanup is ongoing. The map on the next page shows an even smaller number of sites that have 5 or more samples. The sites near Scobey, Colstrip, and Decker have been monitored for between 20 and 30 years primarily in response to coal mining. The sites near Turner, Montana are all related to a research project that started in 1990 and ended in1996. A number of sites in the Butte Mine-flooding area have been monitored for between 15 and 20 years to watch for contamination from the Berkeley Pit and other mining activities. Water-quality sites in the Hamilton Heights area were established in 1994 and 1995 by the U.S. Geological Survey to investigate potential nitrate-nitrogen concentration trends near Hamilton, Montana. The U.S. Geological Survey project ended in about 1998 but sampling at several sites has been continued by the Ground-Water Characterization program's Lolo-Bitterroot Area study.

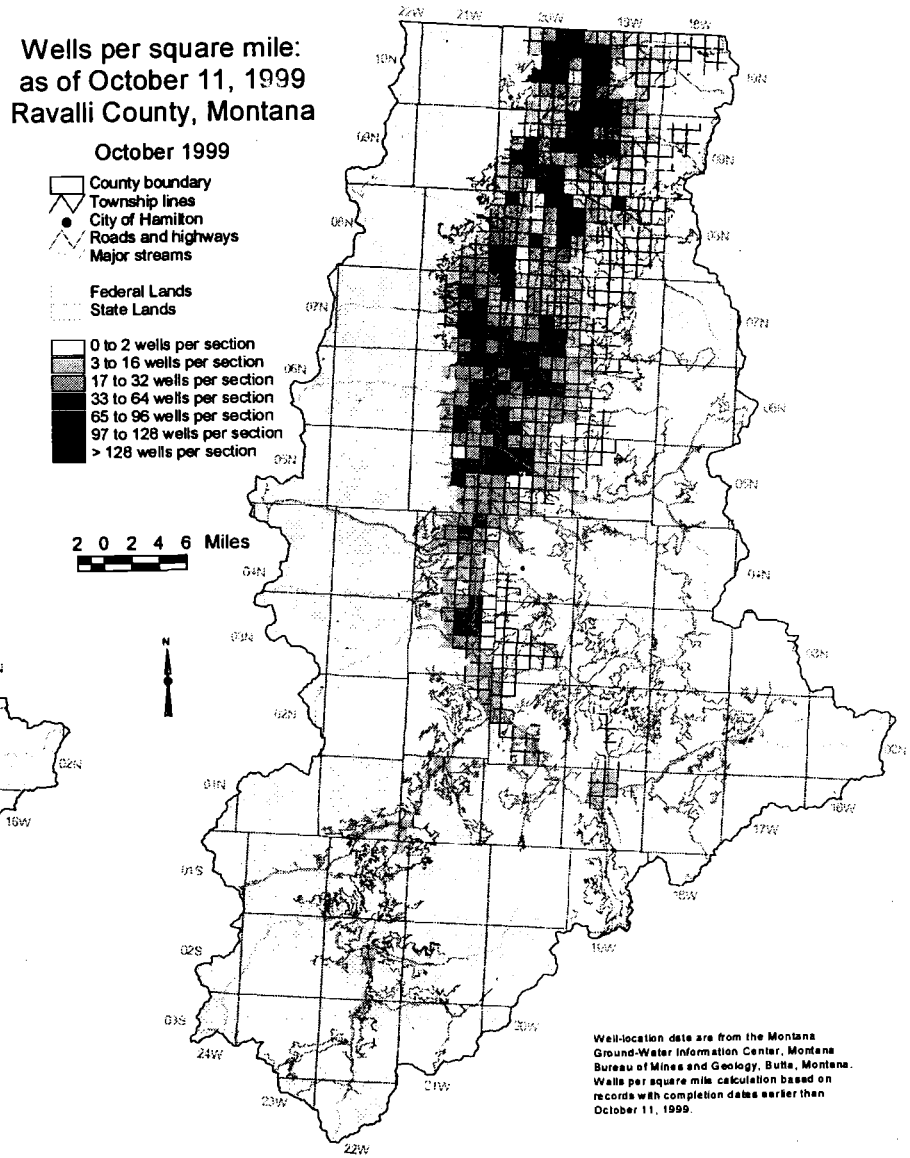


Can the Characterization Program help EQC with environmental indicators?

The Characterization Program can provide EQC with ground-water quality data and help interpret those data relative to environmental concerns. Despite the view shown above there are some sites at which trends could be examined and the Ground-Water Characterization and Monitoring programs are currently adding locations at which time-dependent water-quality monitoring can proceed. Each set of visited Characterization program wells are potential sites for which additional samples can be collected at any time. Wells included in the temporary water-level monitoring efforts for each Characterization study area are evaluated at the end of each of those studies and some are selected for inclusion in the statewide monitoring network. If included in the network, those wells automatically will be re-sampled in a few years. Additionally, data summaries such as those prepared for DEQ for the 305b report (see attached) could be used to discuss general water- quality conditions and the numbers of samples in various areas that exceed (or don't exceed) water-quality limits.

Water well drilling statistics can help people understand land-use changes, particularly in the western counties. In conjunction with other indicators, well locations and densities of wells per unit land area can help document land use change. For example, the Ground-Water Information Center provided some 'wells drilled per year per county' data to EQC for its 'Where do we stand?' report of 1996. Those data were used in Figure 4 of that report and were discussed on page 7. If new data for an updated report are requested, Assessment Program staff would be happy to assist in the interpretation of the data and could help prevent some of the confusion contained in the first report regarding the significance of the water-well drilling information. For example, interpretations such as those shown in the following maps for Ravalli County could be used to illustrate growth in the numbers of wells per section during a given time period.


Wells per square mile:
as of January 1, 1980
Ravalli County, Montana
October 1999
County boundary
Township lines
City of Hamilton
Roads and highways
Major streams
Federal Lands
State Lands
0 to 2 wells per section
3 to 16 wells per section
17 to 32 wells per section
33 to 64 wells per section
65 to 96 wells per section
97 to 128 wells per section
> 128 wells per section
2 0 2 4 6 Miles
N
Well-location data are from the Montana Ground-Water Information Center, Montana Bureau of Mines and Geology, Butte, Montana. Wells per square mile calculation based on records with completion dates earlier than January 1, 1980.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