

GEOLOGY

The MBMG is regarded as the primary source of geological products and services in support of decision making by Montana's government agencies, its businesses, and the public. The MBMG provides easily accessible information on geology, geologic hazards, and mineral, oil and gas, and geothermal resources.

Geologic Mapping and Hazards Program

- Geologic maps are the fundamental tool for earth scientists and provide the foundation for MBMG's applied earth science programs.
- Approximately 82% of Montana is mapped at 1:100,000 and larger scales. Our long-term goal is 100% coverage at the 1:100,000-scale.
- In a typical year, our maps are viewed or downloaded from the MBMG website approximately 95,000 times.
- Geologic maps have a broad range of practical applications, including growth-management planning, transportation planning, resource use and protection, hazard and risk assessment, education, scientific research, and recreation.

Detailed Geologic Maps



Our geologic maps are critical for managing Montana's natural resources. Current mapping in the Dillon area encompasses two active talc mines, large areas of public and private land, and is an area with active faults.

Geologic Hazards



The 1935 Helena earthquakes included an M 6.3 quake on Oct. 18 and an M 6.0 on Oct. 31, plus thousands of felt aftershocks. At least four citizens died and 60 percent of the buildings in Helena were damaged, including the Bryant School, shown above.

FOR MORE INFORMATION:

Additional information about the Geology and Hazards Programs is available at:

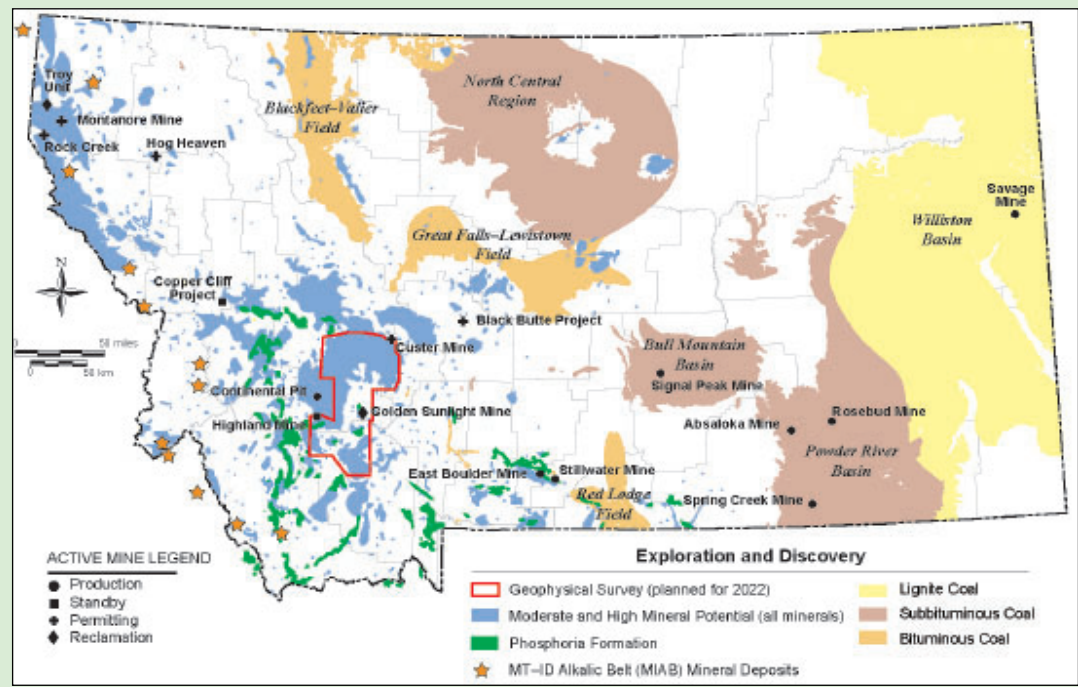
<https://www.mbm.mtech.edu>

Geologic maps and related information are available for purchase at the MBMG or for free download from our website.

Data Preservation and Critical Minerals

World events and rapid advances in extraction and application technology have expanded interest in non-traditional minerals to support energy resiliency and national defense. Often referred to as "critical minerals," these commodities are essential to national security and the U.S. economy, and occur as rocks, minerals, or elements concentrated in specific rock formations in Montana.

Exploration for ore deposits and evaluation of non-traditional sources of critical minerals begin with the compilation of data from past mining and mineral extraction centers. Our ongoing efforts to update our data has us well poised for inquiries from Federal agencies such as the U.S. Geological Survey, Dept. of Defense, and Dept. of Energy as well as mining and exploration companies. The Critical Mineral Commodity Potential Map below was compiled from in-house records and donated information related to historic mineral assessments, our abandoned-inactive mines inventory, and production data from our mine archives database. The Data Preservation Program supports the MBMG's upcoming participation in exploration and evaluation of critical minerals in known ore deposits, suspected ore deposits, existing mines and mine waste, and coal.



MBMG GROUNDWATER PROGRAMS

The MBMG has two legislatively mandated groundwater programs established to provide essential water information. The Ground Water Assessment Program (GWAP) was designed to delineate principal aquifers across broad regions of the state, track the long-term changes in groundwater storage, and make the information widely available. The Ground Water Investigation Program (GWIP) conducts targeted research on issues related to groundwater development, groundwater/surface-water interaction, and groundwater quality. The interagency Groundwater Steering Committee helps guide and advise both programs.

Ground Water Assessment Program Statewide Aquifer Characterization

Tracking Montana's Groundwater

- Systematically monitoring 800 wells in principal aquifers across the State
- Tracking aquifer response to climatic, developmental, or land-use factors
- Cooperators: Tribes, local water quality districts, and conservation districts

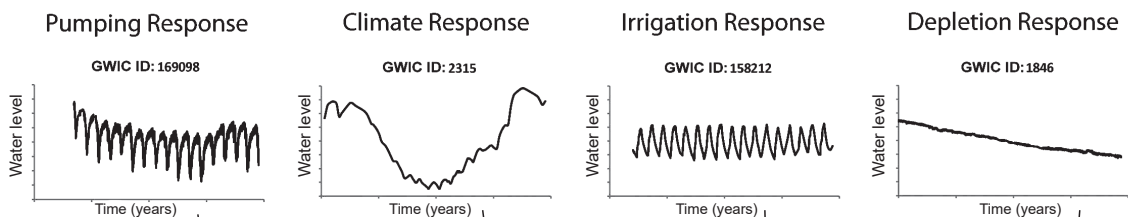
Mapping Montana's Aquifers

- Mapping regional groundwater flow and assessing groundwater quality
- To date, have produced 78 maps and reports describing Montana's aquifers, groundwater flow systems, and groundwater quality

Delivering Groundwater Information

- Ground Water Information Center (GWIC), Montana's groundwater repository (mbmgwic.mtech.edu/)
- Information available at no charge.
- Well logs, maps, reports
- More than 47,000 unique users

Groundwater responds to short-term and long-term stresses



Flathead Valley

Long-term monitoring in the western and southern portions of the valley shows statistically significant decreases in groundwater elevations interpreted to be related to pumping.

Musselshell River

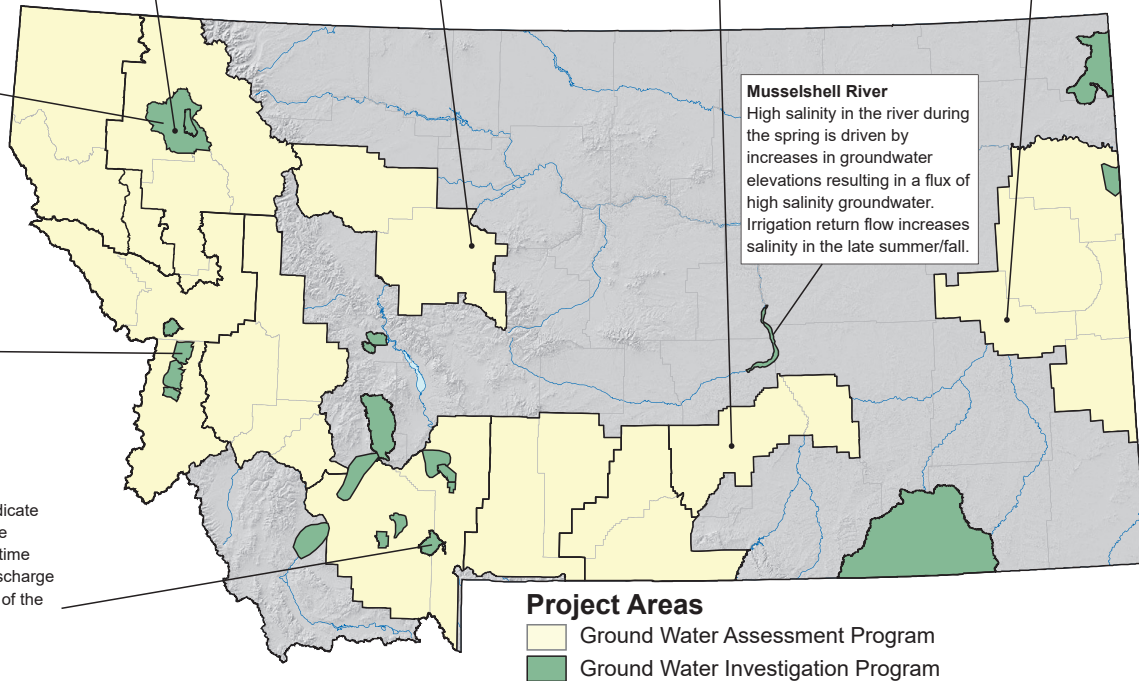
High salinity in the river during the spring is driven by increases in groundwater elevations resulting in a flux of high salinity groundwater. Irrigation return flow increases salinity in the late summer/fall.

Lolo Creek

Groundwater model simulations suggest that existing and new development plays a minimal role in the dewatering of the creek.

Big Sky

Groundwater model simulations indicate that high-intensity pumping from the Meadow Village aquifer over short time periods will reduce groundwater discharge from the aquifer to the Middle Fork of the Gallatin River.



Ground Water Investigation Program Stakeholder-Driven Site-Specific Investigations

Current Investigation Topics

- Groundwater sustainability in response to increasing residential, irrigation, and commercial demands
- Effects of groundwater pumping on surface-water flows
- Changes in water quality due to subdivision development

2022 Investigation Areas

- Billings—Evaluating sustainability with increased groundwater
- Eureka—Examining the connection between groundwater and surface water
- Big Hole River—Determining the effects of irrigation on river flows

Products

- Over 33 peer-reviewed MBMG published reports
- Groundwater flow models available for public use
- Results used for water rights decisions, water resource development, and county planning