

Geothermal Resources of Montana

Compiled by
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Data for thermal springs and most thermal wells in Montana are in the accompanying tables. For additional information about the geothermal resources of Montana contact the Montana Bureau of Mines and Geology. Published literature is listed in Kautio, S.A., and Sonderegger, J.L., 1980. Annotated bibliography of the geothermal resources of Montana. Montana Bureau of Mines and Geology Bulletin 110, 25 p.

Geothermal data compiled by the
Montana Bureau of Mines and Geology

Map available free of charge from: Montana Bureau of Mines and Geology, Montana College of Mineral Science and Technology, Butte, Montana 59701



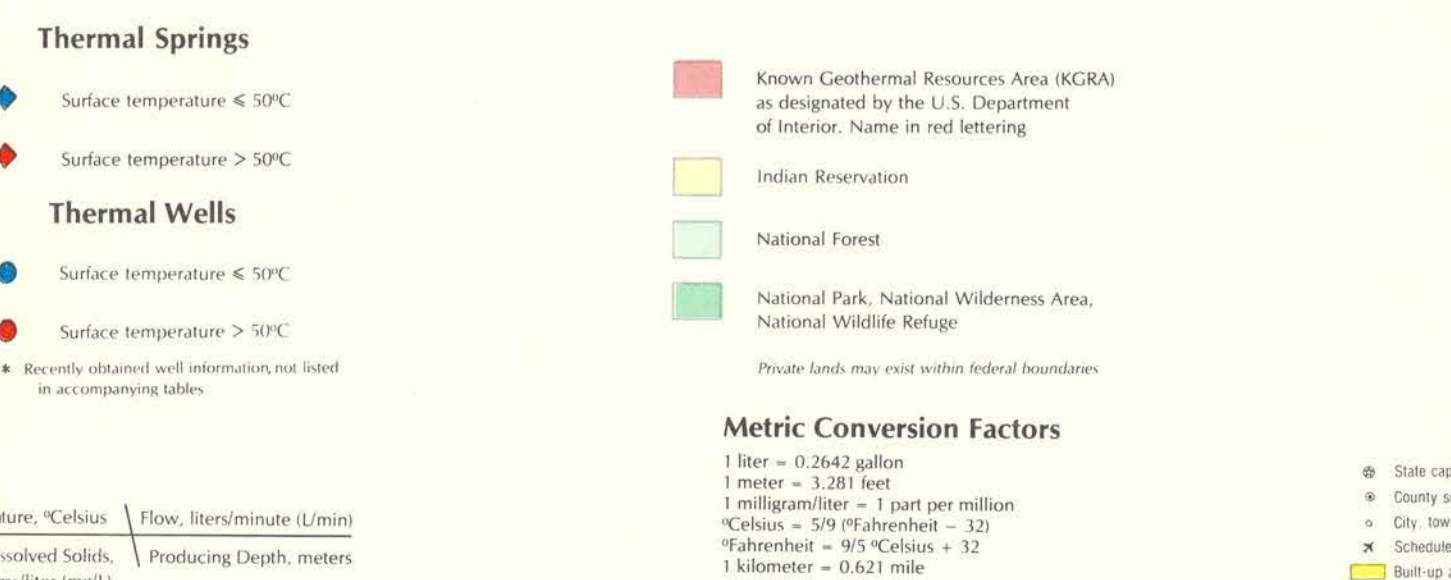
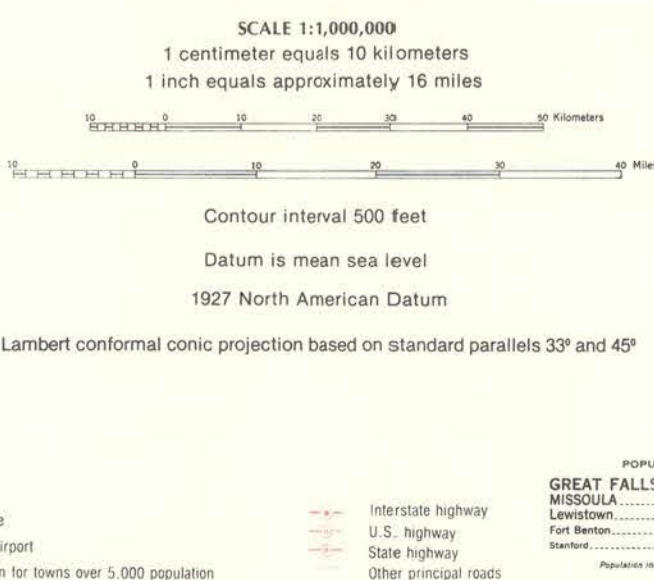
Division of Geothermal Energy
United States Department of Energy

Map produced by David M. Clark, NCA/NMGS/DC, and Ronald H. Smith, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado/NMGA, Boulder, Colorado, in cooperation with the Earth Science Laboratory/University of Utah Research Institute, Salt Lake City, Utah.

Digital thermal well and spring data available from GEOTHBMA Project, U.S. Geological Survey, 445 Middlefield Road, MS4A, Menlo Park, California 94025.

Base map data is reduced from 1:500,000 scale topographic map of Montana (U.S. Geological Survey, 1969).

Scale: 1:1,000,000
1 centimeter equals 10 kilometers
1 inch equals approximately 16 miles



Low-Temperature Geothermal Waters
Existing knowledge does not permit the inference that thermal water will be found everywhere within the gray areas, nor do the boundaries represent precise knowledge of the areal extent of geothermal systems or aquifers.
Bounded darker gray. Areas where discovery and development of additional sources of low-temperature (less than 100°C) water for direct heat application are highly probable. Areas are defined on the basis of thermal springs and/or thermal wells, plus geothermal settings generally favorable for recovery of thermal water at depths of less than 1000 meters.
Unbounded lighter gray. West of the 109th meridian: Areas which, because of their geologic history and similarity to areas with known thermal systems, are expected to contain geothermal resources suitable for direct heat applications, in addition to the depicted wells and springs. The primary exploration targets are valleys of sedimentary units less than 1000 meters in depth receiving water from deeper basement sources. North of Carbon the area is significantly expanded to maintain private data confidentiality.
East of the 109th meridian: Area without thermal springs or shallow thermal wells, but which contains the Madison Group and deeper aquifers with water temperatures of 60°C (140°F) or greater (modified from U.S. Geological Survey Open File Report 81-426). In much of the area wells may be deeper than 2000 meters. Holes of opportunity may be economically viable; however, conservatism or slippage of the water and/or limited well yield caused by low aquifer permeability or cementing of casing may prevent utilization of this resource. Most successful wells have been located near structural highs. Potential users of this resource are advised to contact the Montana Bureau of Mines and Geology for information about specific areas.

Heat Flow
▲ 70 Heat flow in milliwatts/m²
1 milliwatt/m² = 0.024 Heat Flow Unit (HFU)
See Sain, J.H., and Lachenbruch, A.H., 1979. Heat flow and conduction-dominated thermal regimes in Alaska, ILL, et al. Assessment of geothermal resources of the United States 1976. U.S. Geological Survey Circular 790.

Thermal Springs
◆ Surface temperature < 50°C
◆ Surface temperature 50-90°C
◆ Surface temperature > 90°C

Thermal Wells
● Surface temperature < 50°C
● Surface temperature 50-90°C
● Surface temperature > 90°C

◆ Recent status well (no information listed in accompanying table)

Metric Conversion Factors
1 liter = 0.2642 gallon
1 meter = 3.281 feet
1 milligram/liter = 1 part per million
1 Celsius = 1.8 Fahrenheit + 32
1 kilometer = 0.621 mile

● State capital
○ County seat
○ City, town, or village
○ Scheduled service stop
● Built-up area shown for towns over 5,000 population

— Interstate highway
— U.S. highway
— State highway
— Other principal roads

Contour interval 500 feet
Datum is mean sea level
1927 North American Datum
Lambert conformal conic projection based on standard parallels 33° and 45°