

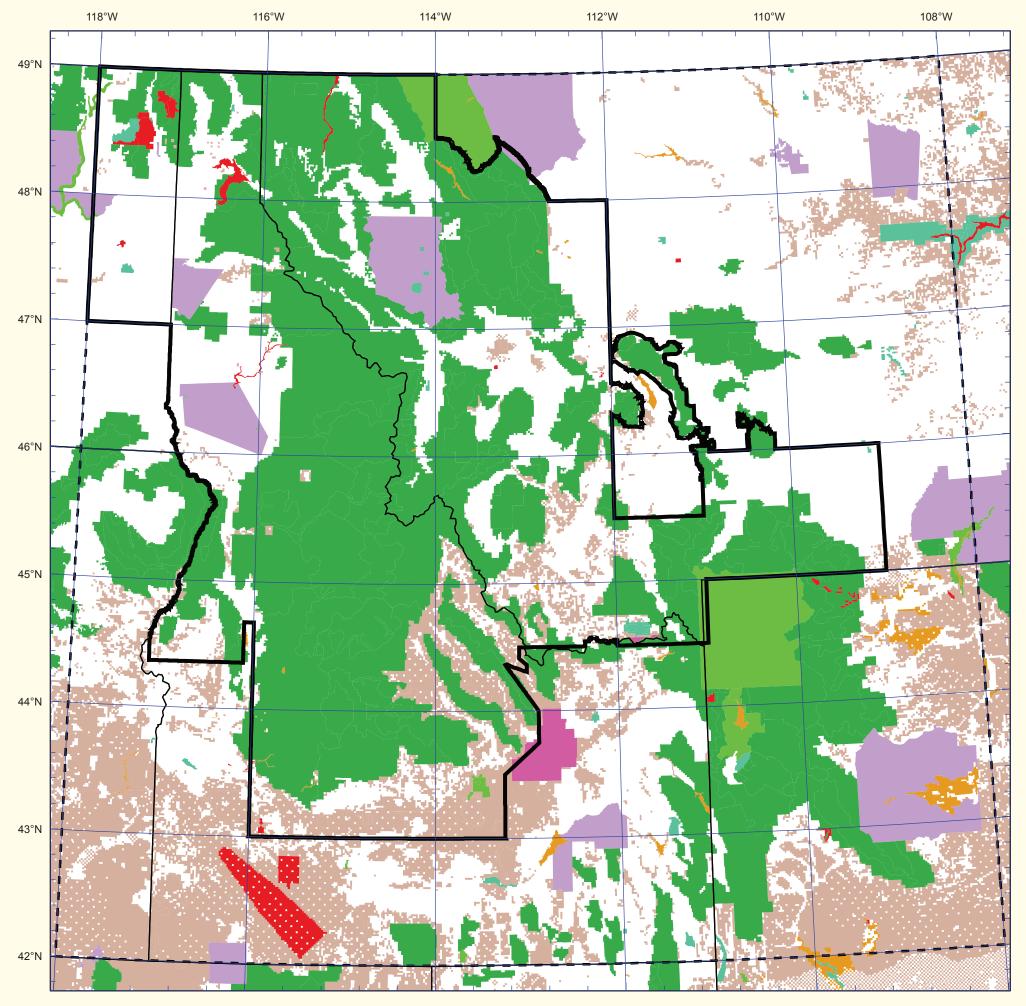
USGS Headwaters Province project, Idaho, Montana, and Washington – an overview of publications supporting land-use planning in the Northern Rocky Mountains Michael L. Zientek and Karen Lund

U.S. Geological Survey Open-File Report 2005-1382

Introduction

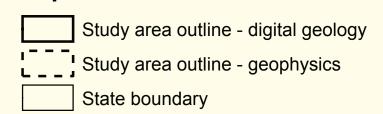
To meet Forest Service goals of integrating geoscience information into the land-planning process, USGS scientists published geologic maps and databases and conducted topical studies for the Northern Rocky Mountains. Regionally consistent digital data sets provided to the USFS can be integrated with other natural resource data to address a wide range of issues related to land-use, forest health, hazards, and resource development. Regional datasets include a spatial geologic database, the locations of active mines and significant minerals deposits, and geophysical data sets that depict crustal structure. New geologic maps for the Salmon and Payette National Forests and several 1° quadrangles were published. USGS scientists and collaborators studied the large, undeveloped copper deposits in the Revett Formation, the Blackbird cobalt deposits, the Montana-Idaho porphyry belt, and the Butte copper-molybdenum deposit and provided information critical for understanding the potential for mineral exploration and development in this environmentally sensitive area. Other studies characterized control of basement structure on mineral endowment, geochemical effects of wildfire, and geochemistry of mined and unmined geologic terrains. The Headwaters Province project was conducted in collaboration with the University of Idaho, Idaho Geological Survey, and Montana Bureau of Mines and Geology. Our research and publications provide objective information and analysis related to minerals issues to support those who make decisions regarding national security, land use, resource policy, and environmental or public health and safety by providing new mineral resource, mineral environmental, and geologic information in easily used digital formats at scales appropriate for regional decisions.

Index map



Index map showing the study area in relation to Federally managed lands.

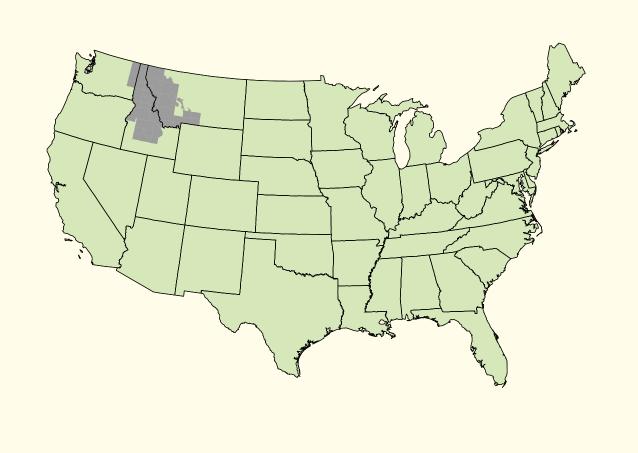
Explanation

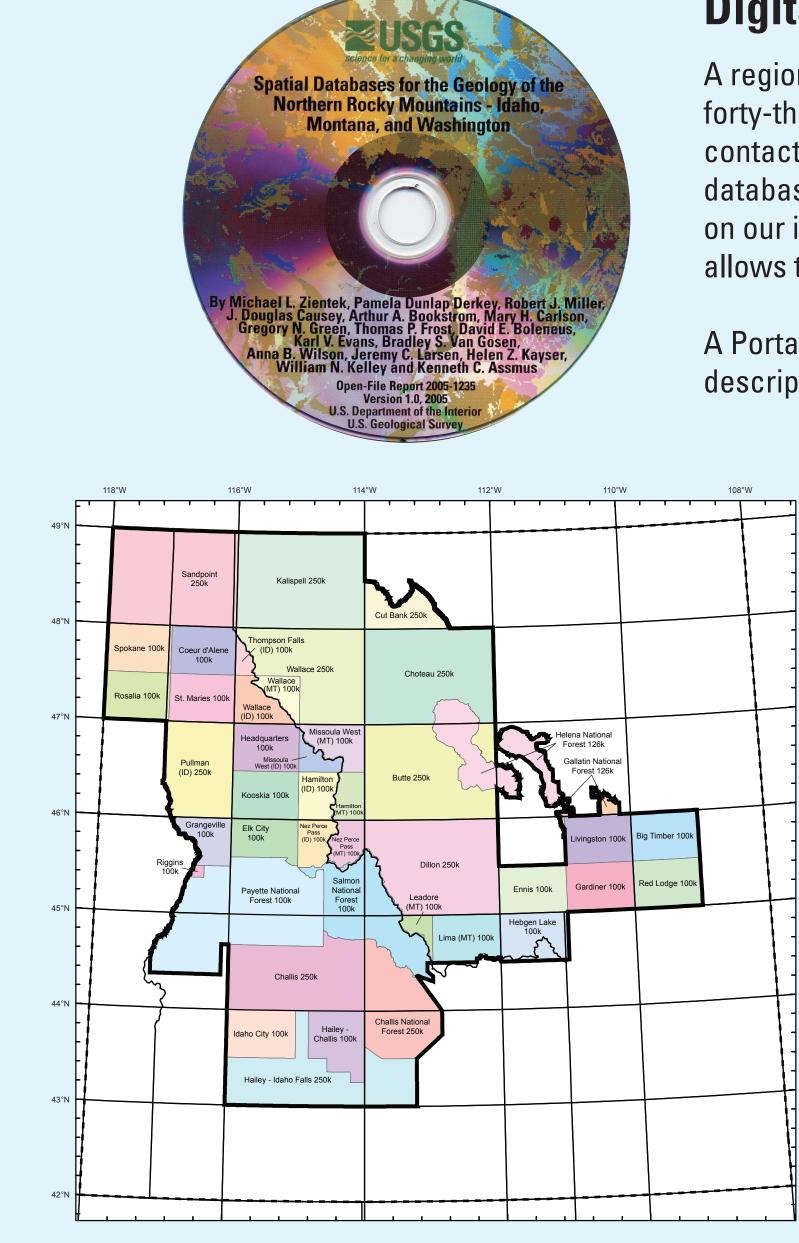


Federally Owned Land



National Park Service Other Agencies (DOE,...

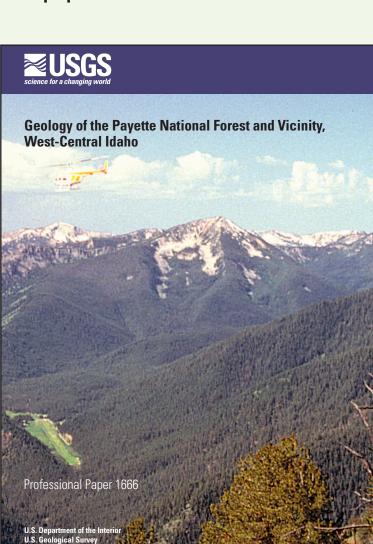


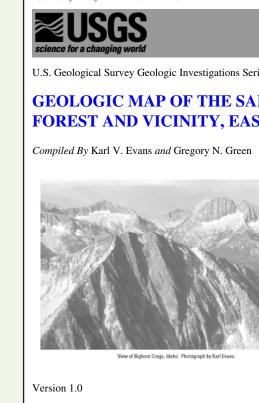


Index of the 43 geologic maps used as the principal source of information for the regional geologic spatial database.

New geologic mapping

digital geologic maps and 5 digital versions of previously released map compilations. Three of the new map products are featured here.





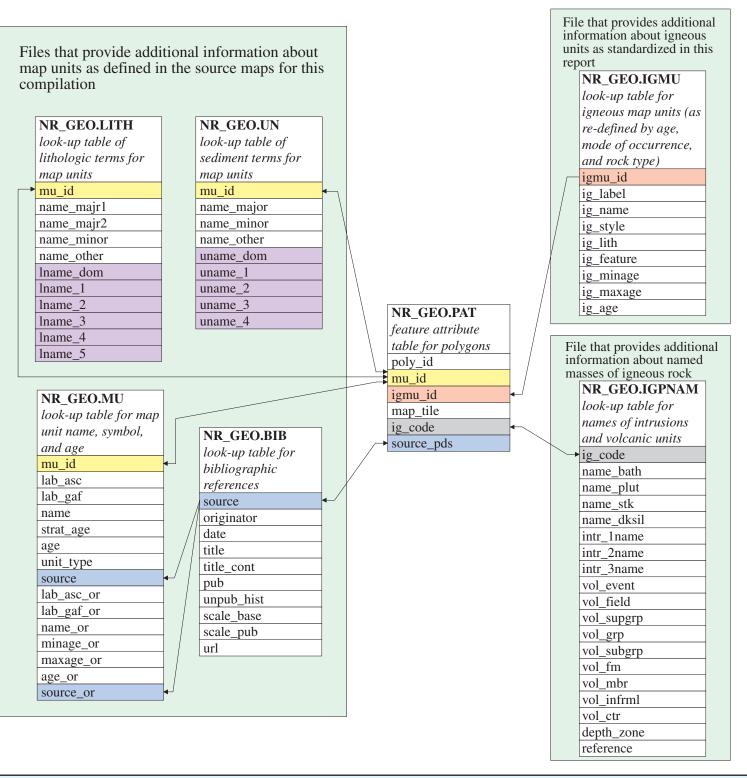
Lund, Karen, 2005, Geology of the Payette National Forest and vicinity, west-central Idaho: U.S. Geological Survey Professional Paper 1666, 2 plates and digital databases [URL http://pubs.usgs.gov/pp/2005/1666/].

2 sheets, scale 1:100,000

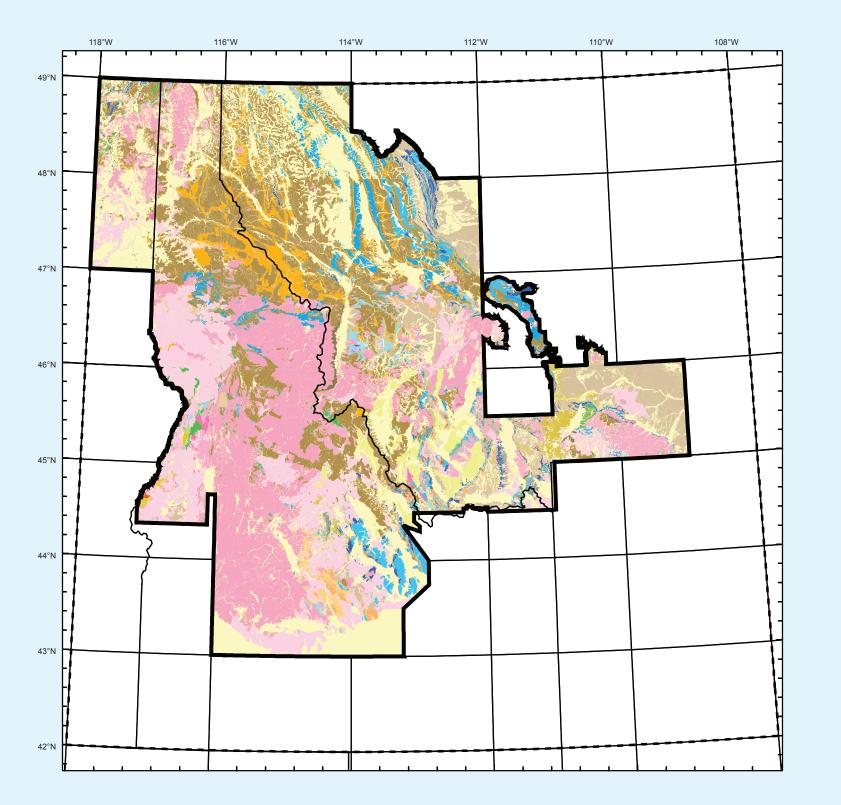
Digital geologic mapping

A regionally-consistent and integrated geologic spatial database for the Northern Rocky Mountains of Montana, Idaho, and eastern Washington, brings together forty-three 1:100,000- to 1:250,000-scale digital geologic maps into a common database format. This ArcInfo® coverage contains over 226,000 lines (representing contacts, faults, fold axes, dikes, sills, veins, garnet isograd, boundaries) and over 80,000 polygons (representing geologic units; Zientek and others, 2005). The database represents the original content of the published maps and provides easily-used and consistent attribute content. We have also added information based on our interpretations of published reports. In particular, we have added attribute information that 1) classifies igneous rocks by age, composition, and name, and 2) allows the creation of derivative maps based on lithology.

A Portable Document File with information on unit name, unit label, map unit description, an information source, and a list of references cited in the map unit descriptions accompanies the database.



Three schemes are used to classify polygons and lines in this spatial database. The first scheme is based on the original map units defined in the source maps used to compile this database. The second approach uses the age, composition, and mode of occurrence to define igneous map units. The last approach uses the names of igneous intrusions and volcanic units to define map units.

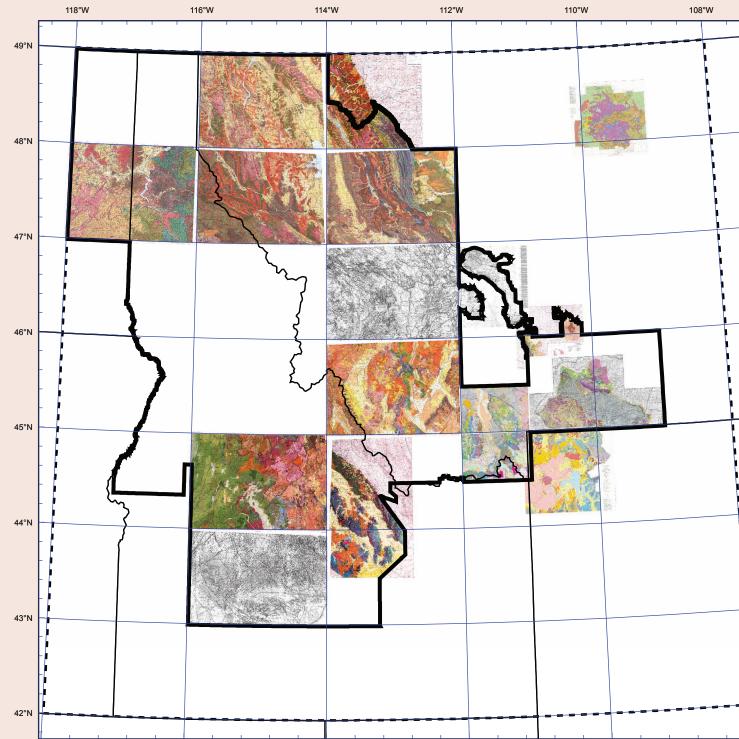


Lithologic map derived by symbolizing attributes in the field Iname_2 in the table NR_GEO.LITH for the regional spatial database.

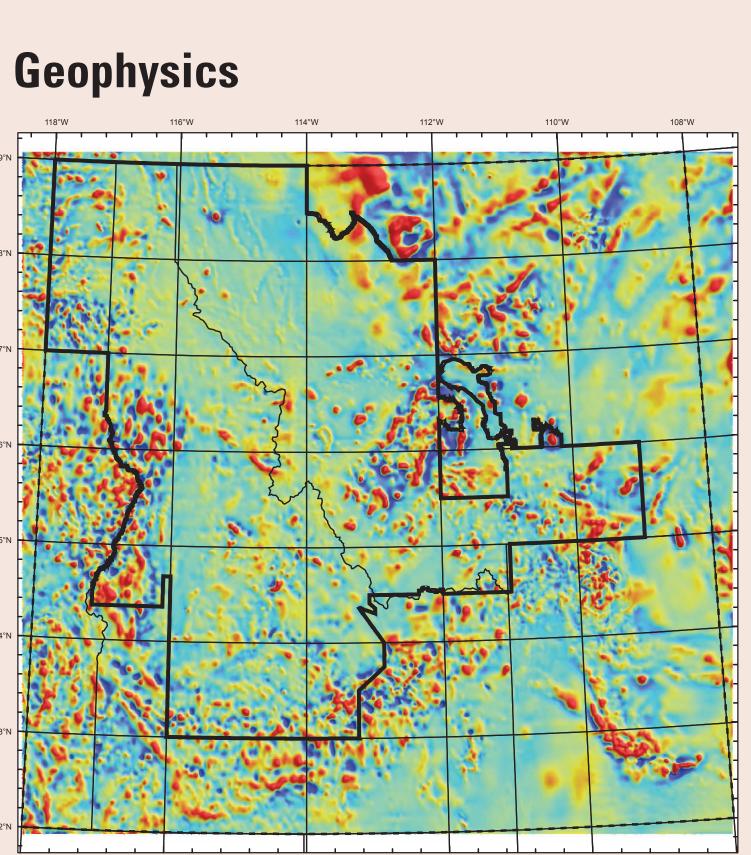
The USGS published 7 new digital geologic maps and 9 digital versions of previously published maps. This project also provided support to the Idaho Geological Survey that lead to the publication of 2 new



Rectified geologic maps



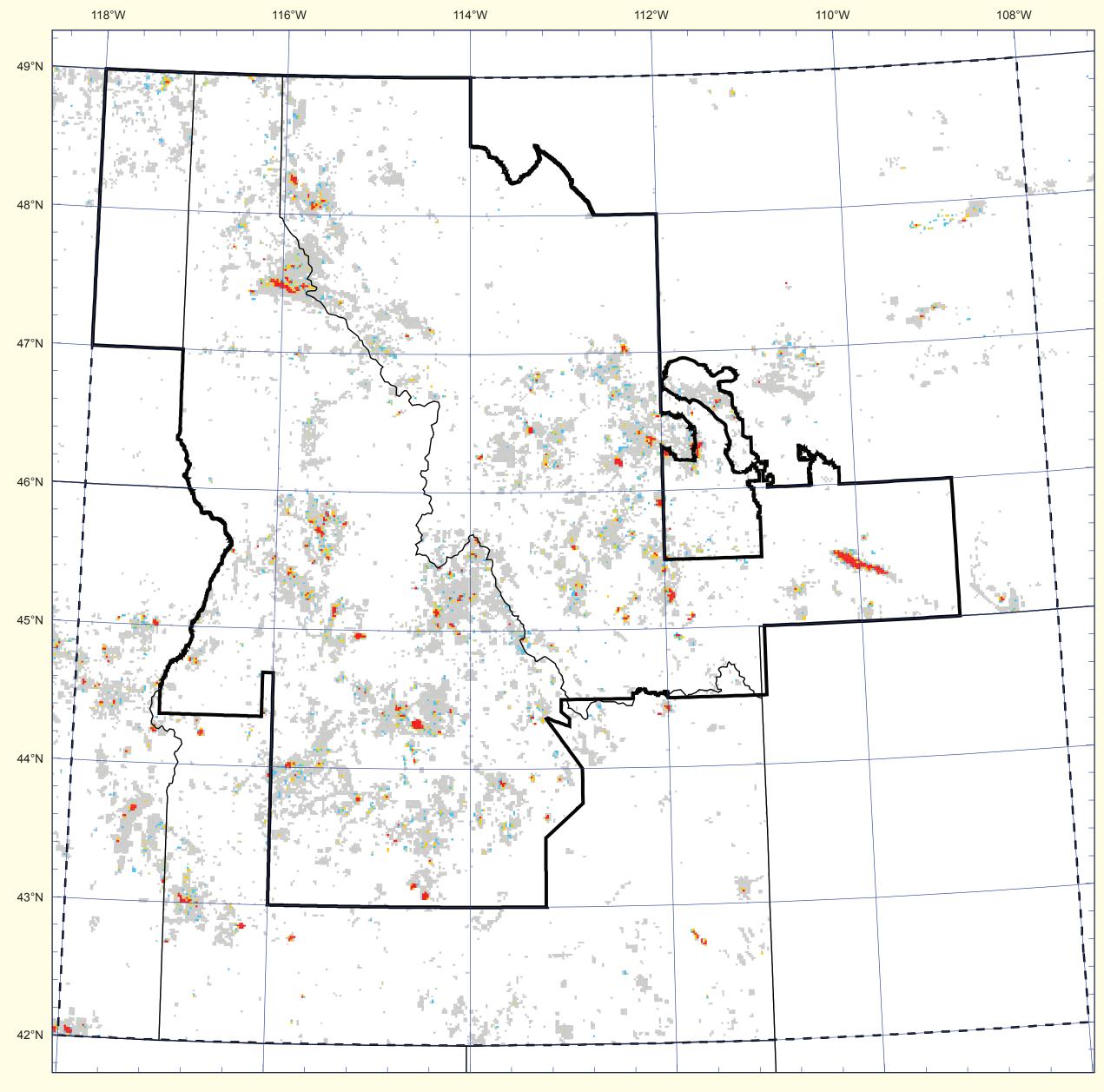
Rectified images provide a quick and easy way to view the geospatia context of published geologic maps. Larsen and others (2004) published rectified images of 42 geologic maps covering parts of the study area; 17 of them are shown in this illustration.



Aeromagnetic and gravity surveys, and their various derivative maps provide an efficient means of delineating subsurface geology and structure over areas at varying scales. These techniques are particularly useful for investigating areas that are covered by thick, surficial deposits. Mankinen and others (2004) briefly describe techniques to enhance particular anomaly characteristics, present 15 gravity and magnetic maps for this study area, and suggest ways in which they can be used.

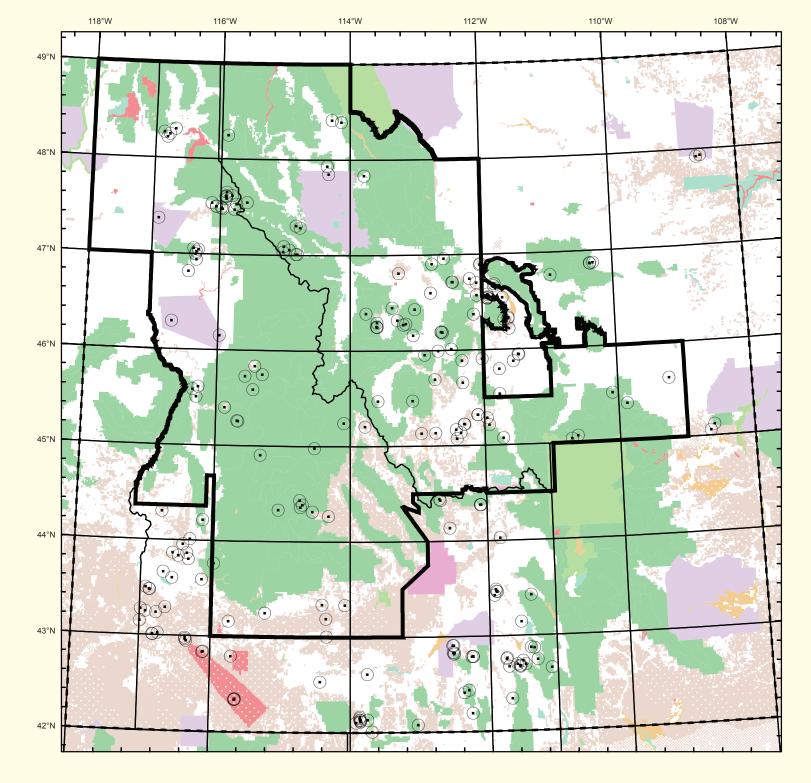
As an example, this map shows the intermediate-wavelength magnetic potential. To create this map, aeromagnetic data of the study area was first transformed to their magnetic potential and then filtered using matched bandpass filters to isolate dominate wavelengths within the dataset. The intermediate wavelength data shown here highlight magnetic sources in the upper crust.

Mine claim density



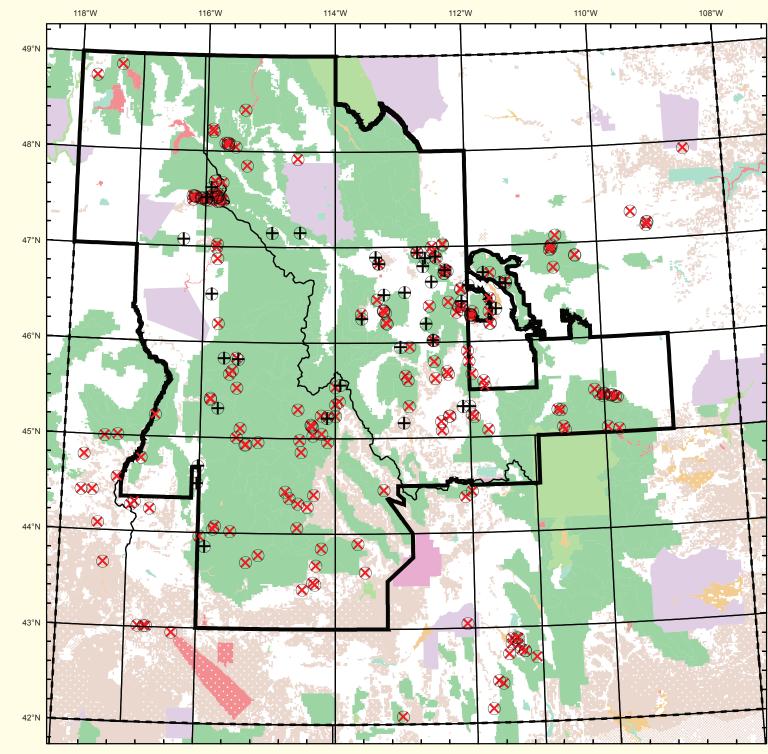
A process was developed to extract statistical data about mining claims from the U.S. Bureau of Land Management's Mining Claim Recordation System (Causey, 2005). Mining claim database tables for the United States were provided by BLM in text format and imported into a Microsoft® Access2000 database in January, 2004. Data from two tables in the BLM LR2000 database were summarized through a series of database queries to determine a number that represents active mining claims in each Public Land Survey section for each of the years from 1976 to 2003. This illustration shows the density of active lode mining claims in 2003 – warmer colors indicate higher density of claims. Gray indicates sections with inactive mining claims.

Active mines



A tabulation of active mines and mine-related facilities identified 226 sites within Idaho and western Montana where materials were mined or processed during at least one continuous 30 day interval over the four yea period ending December 31, 2000 (Spanski, 2001). Thirty-two records describe processing or plant sites. Of the remaining 194 mining sites, 66 describe sites where valuable metals are recovered from the ores produced. The remaining 128 records describe sites where industrial minerals or saleable commodities are produced. Through the last decade of the 20th century, industrial and salable commodity mine output in the two state region has remained steady, whereas metal mining has experienced a steady decline. By the close of the year 2000, 36 metal mining sites remained active, representing a 45 percent decline over the last 4 vears.

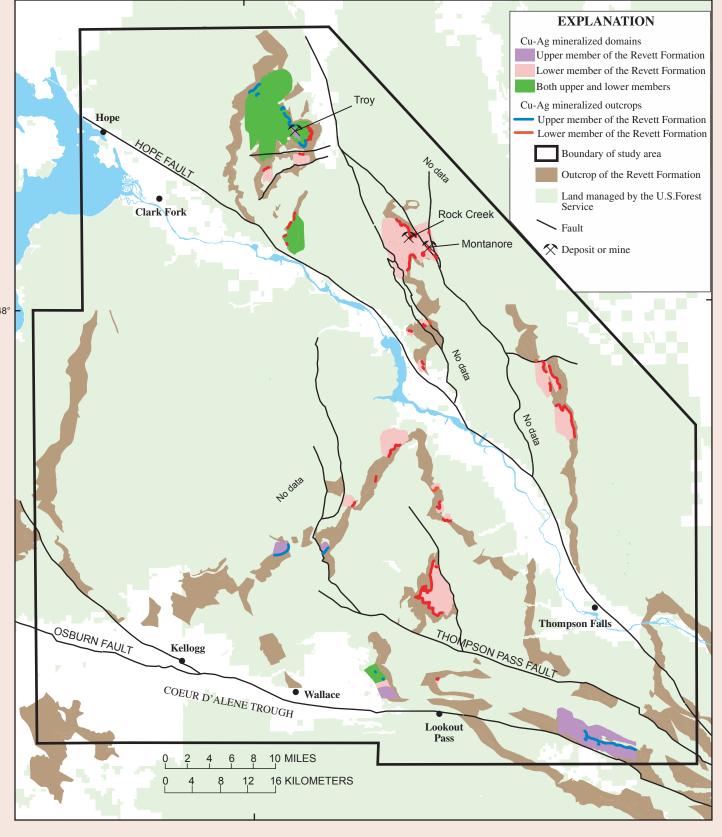
Significant deposits



A total of 256 significant deposit sites are identified by location and deposit-type (Spanski, 2004). Of the 256 sites, 208 have some history of past or present production, of which 23 are currently producing and mining could resume at 7 others on short notice with a rise in commodity prices. There are 166 sites where the presence of a significant resource has been recognized, of which 49 have no prior history of development. Due to the presence of a significant resource, these 166 sites are candidates for consideration when addressing issues associated with management of near-term mineral development.

Metallic and industrial mineral deposits

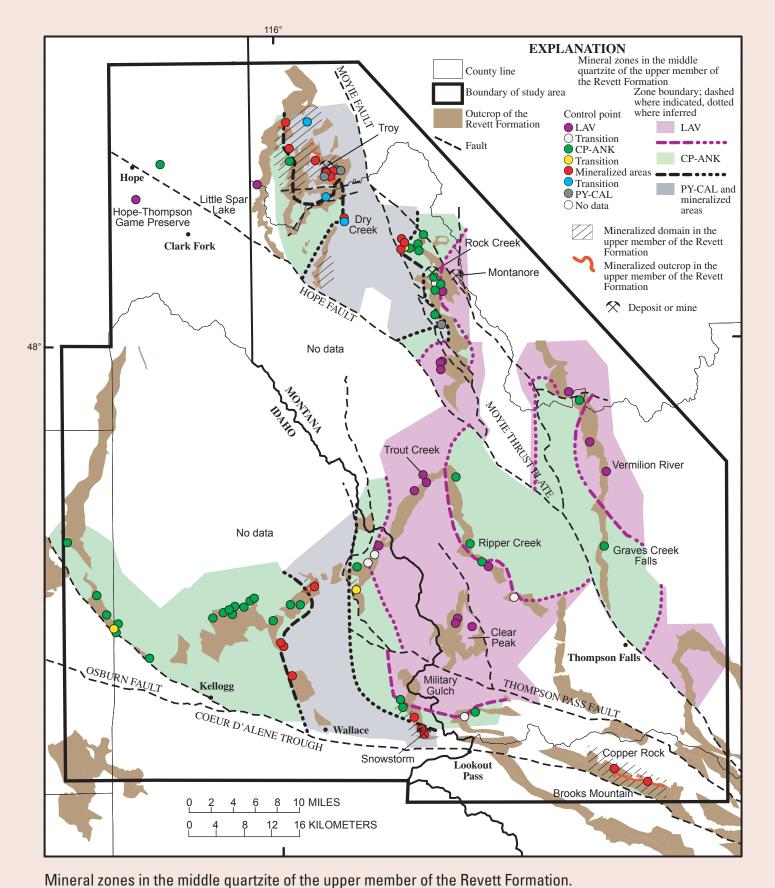
Placer gold and garnet deposits

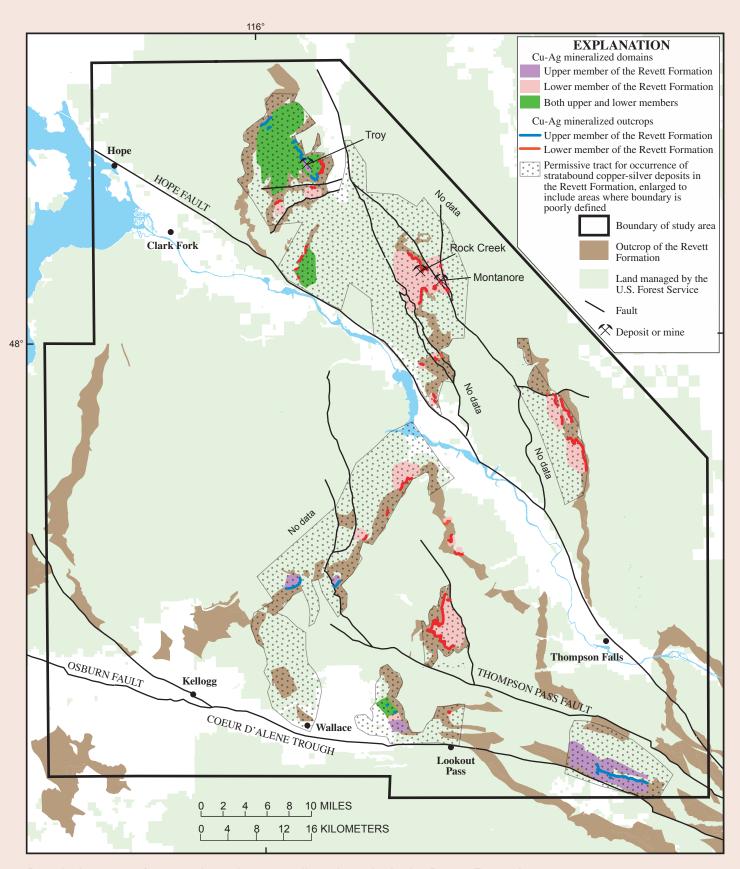


Stratabound copper-silver deposits, Revett Formation

l areas X Deposit or mine 0 2 4 6 8 10 MILES 0 4 8 12 16 KILOMETERS Mineral zones in the A–D beds of the lower member of the Revett Formation.

Mineralized domains in the western Montana copper belt.





Permissive tracts for stratabound copper-silver deposits in the Revett Formation

The western Montana copper belt in western Montana and northern Idaho contains several large stratabound copper-silver deposits in fine- to medium-grained guartzite beds of the Revett Formation of the Mesoproterozoic Belt Supergroup. Estimates of undeveloped resources, mostly from the world-class Rock Creek-Montanore deposits, and lesser amounts at the Troy Mine, total more than 2.6 million t Cu and 2,360 t Ag in 368 million t of ore. The Rock Creek-Montanore and Troy deposits are among the largest stratabound copper-silver deposits of any type in North America and contain about 15 percent of the copper in such deposits in North America.

The Revett Formation, which consists of subequal amounts of argillite, siltite, and quartzite, is informally divided into lower, middle, and upper members on the basis of the proportions of the dominant rock types. Mineral deposits in the Revett Formation occur mostly in the A-D beds of the lower member and in the middle quartzite of the upper member.

The deposits are concentrated along a preore pyrite/hematite interface in relatively coarse grained, thick quartzite beds that acted as paleoaquifers for ore fluids. The deposits are characterized by mineral zones (alteration-mineral assemblages) that are a useful guide to the locations of mineral deposits. In particular, the gradational zone between the chalcopyrite-ankerite and pyrite-calcite zones is the site of most mineral deposits.

The interpretation of permissive tracts for undiscovered mineral deposits in the Revett Formation is based on (1) the location of 57 Revett-subtype stratabound copper-silver deposits and occurrences, (2) 40 diamond-drill cores and 86 measured sections, and (3) geologic maps of the Revett Formation. In addition to plates and illustrations, this information is documented in ArcInfo interchange files and spreadsheets.

References cited:

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Series 106, 17 p. [URL http://pubs.usgs.gov/ds/106/]. Mankinen, E.A., Hildenbrand, T.G., Zientek, M.L., Box, S.E. Bookstrom, A.A., Carlson, M.H., and Larsen, J.C., 2004, Guide to geophysical data for the northern Rocky Mountains and adjacent areas, Idaho, Montana, Washington, Oregon, and Wyoming: U.S. Geological Survey Open-File Report 2004-1413, 34 p. [URL http://pubs.usgs.gov/of/2004/1413/].

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