GEOLOGIC MAP DATASETS OF THE CUSTER AND GALLATIN NATIONAL FORESTS OF SOUTH-CENTRAL MONTANA, IN ARC/INFO FORMAT

Edited by

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Open-File Report

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Includes geologic map datasets digitized from the following USGS publications:

Geologic maps of western and northern parts of Gallatin National Forest, south-central Montana: U.S. Geological Survey Geologic Investigations Series Map I-2584, 1997, *by A.B. Wilson and J.E. Elliott*

Generalized geologic map of the Absaroka-Beartooth study area, south-central Montana: Plate 1 of U.S. Geological Survey Open-File Report 93-207, 1993, *compiled by B.S. Van Gosen, J.E. Elliott, E.J. LaRock, E.A. du Bray, R.R. Carlson, and M.L. Zientek*

Geologic map of the Custer National Forest in the Pryor Mountains, Montana: Figure 2 of U.S. Geological Survey Open-File Report 96-256, 1996, *compiled by A.B. Wilson and B.S. Van Gosen*

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Contents

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This text file describes digital data for the Custer and Gallatin National Forests, Montana.

All of the maps provided in this database have the same projection. This projection is Universal
Transverse Mercator (UTM), in meters, zone 12, the central meridian is 111 degrees west, and there are
no false northings or eastings.

DISCLAIMER

This database was prepared by an agency of the U. S. Government. Neither the United States Government, nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed in this report, or represents that its use would not infringe on privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the Government or any agency thereof. Any views and opinions of the authors expressed herein do not necessarily state or reflect those of the Government or any agency thereof.

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Graphical map depictions on this CD-ROM are intended to be used within the map scale limits applicable to the source data. Although software enables the user to show images on the CD-ROM at various scales, the user is cautioned that enlarging the maps beyond a scale of 1:126,720 is not warranted.

The original contacts of each geologic map must conform to the topographic base map on which it is compiled. Because the topography of one map may not coincide precisely with that of another topographic map constructed at a different time and scale for a particular area, it follows that the geology compiled on one topographic base may necessitate adjustment of geologic contacts in some areas to fit the topographic base of the geologic map.

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ABSTRACT

This CD-ROM contains four digital geologic maps of the Custer and Gallatin National Forests in ARC/INFO and SDTS (Spatial Data Transfer Standard) formats. An index map showing the locations of the geologic map areas included in this report is provided in the attached data file INDEXMAP.PDF, which can be viewed with the free software Adobe Acrobat Reader. The original geologic maps were completed by members of the U.S. Geological Survey (USGS) during mineral resource assessment studies of these National Forest lands. These geologic maps were originally released separately as paper publications, either as plates in summary reports of individual study areas or as an individual USGS map product (explained below in more detail). The original geologic map bases, the materials used to create the published paper maps, were either digitized or scanned and vectorized. The resulting digital line work and polygons were attributed in ARC, and these files were proofed and edited to match the original source maps. The resulting ARC/INFO and SDTS data sets are provided herein as GIS databases for use in spatial analyses by a variety of users. Note that a topographic base is provided only for the western and northern parts of the Gallatin National Forest (in the data files WESTERN.PDF and NORTHERN.PDF, respectively).

The Custer and Gallatin National Forests include many discrete parcels of land across southern Montana. Mineral resources are an important land management issue in many areas of these Forest lands because of historic metal mining that is potentially associated with metal rich-acidic mine water drainage, and recent exploration and mining activity. Proximity to Yellowstone National Park and large wilderness areas poses land-use controversies because recreational use and habitat preservation often compete with resource development. The USGS conducts mineral resource assessments to assist the USDA Forest Service in meeting their legislated mandate to include the best available scientific information in issuing land-use decisions, preparing environmental impact statements, and updating Forest management plans. At the request of the USDA Forest Service, the USGS conducted mineral resource evaluations of the Custer and Gallatin National Forests. The USGS compiled the existing data and collected new data regarding the geology; known mines, prospects, and mineral occurrences; energy resources; regional geophysics (gravity and magnetics); and rock and stream sediment geochemistry at the Forest Service map scale of 1:126,720 (one inch on the map equals two miles on the ground). These data provided the basis for the USGS mineral resource assessments. USGS assessment procedures and the significant conclusions and publications derived from these studies are described by Hammarstrom and others (1998).

For each study area in the Custer and Gallatin National Forests, USGS personnel prepared geologic maps to assist the mineral assessments; each was compiled at a scale of 1:126,720 from geologic data sources at a variety of scales. The four data sets in this release represent geologic maps in digital ARC/INFO and SDTS formats for four of these study areas, from west to east (refer to INDEXMAP.PDF): (1) the western Gallatin National Forest area, (2) the northern Gallatin National Forest area, (3) the Absaroka-Beartooth study area, and (4) the Pryor Mountains area. The four GIS data sets are organized by study area as follows:

(1) Data files for the western Gallatin National Forest area are within the directory titled WESTGAL.
(2) Data files for the northern Gallatin National Forest area are within the directory titled NORTHGAL.
(3) Data files for the Absaroka-Beartooth study area are within the directory titled ABSA.
(4) Data files for the Pryor Mountains area are within the directory titled PRYOR.

The USGS also provided an energy and mineral resource assessment of a fifth study area of the Custer National Forest, the Ashland Division area (Van Gosen, 1996). A new geologic map for this area was not needed because an adequate geologic map already existed and the surficial geology within the study area comprised only two map units. Thus, we did not include a digital rendition of the Ashland Division area geologic map in this release.

Geologic maps of the western and northern parts of Gallatin National Forest were originally

published by Wilson and Elliott (1995) in a digital format. The digital maps were released in the data form of the USGS-produced digitizing/editing software program GSMAP (Selner and Taylor, 1993). The Wilson and Elliott (1995) digital (GSMAP) release also includes black & white paper renditions of the geologic maps. These maps were subsequently published in color as USGS Geologic Investigations Series Map I-2584 (Wilson and Elliott, 1997) and made available in PDF format on the world-wide web at http://greenwood.cr.usgs.gov/maps/covers/i-2584/i2584.html. The geologic maps were prepared to assist a USGS mineral and energy resource assessment of the western and northern parts of the Gallatin National Forest, which included Forest lands areas west and north of the previously studied Absaroka-Beartooth study area. Results of this USGS study will be published in Hammarstrom and others (in press). The original compilation and digitization of these geologic maps was performed by A.B. Wilson using GSMAP (Wilson and Elliott, 1995). These GSMAP data were converted in GSMCAD to DXF format by A.B. Wilson, and transferred to ARC by G.N. Green via the DXFARC tool. The lines and polygon attributes were checked against the original and corrected to match the published map as necessary. Shadeset and lineset attributes were added by G.N. Green in ARC. The digital database was quality checked against the original published map (Wilson and Elliott, 1997) by A.B. Wilson and B.S. Van Gosen. Data files in ARC/INFO and SDTS formats that can be used to construct the digital geologic map for the western part of Gallatin National Forest, an area that includes the Madison and Gallatin Ranges, are provided in the directory WESTGAL, along with a metadata text file. Data files in ARC/INFO and SDTS formats that can be used to construct the digital geologic map for the northern part of Gallatin National Forest, an area that includes the Bridger Range and Crazy Mountains, are provided in the directory NORTHGAL, along with a metadata text file.

The largest concentrations of mineral resources and active mining in the Custer and Gallatin National Forests occur in the Absaroka Range and Beartooth Mountains region. For this reason, the USGS began its assessment work in this region, designating it the Absaroka-Beartooth study area for discussions. Study results were published in USGS Open-File Report 93-207 (Hammarstrom and others, 1993). The geologic map used in this assessment was compiled by B.S. Van Gosen and included as a black & white paper sheet with a map scale of 1:126,720 as plate 1 in the open-file report. Subsequently, Jeffrey T. Silkwood of the USDA Forest Service in Missoula, Montana, digitally scanned the original stable-base clear-film material used to print the geologic map for the report. He then attributed the scanned digital line work and polygons in ARC/INFO, checked and corrected line and polygon attributes as necessary, and added shadeset and lineset attributes. J.T. Silkwood supplied these data files to the USGS in Denver for additional editing as needed. This ARC database was further edited by G.N. Green of the USGS to correct minor deviations from the published source geologic map. The final digital database was quality checked against the original map by B.S. Van Gosen. Data files in ARC/INFO and SDTS formats that can be used to construct this geologic map are provided in the directory ABSA, along with a metadata text file.

The Custer National Forest lands within the Pryor Mountains of south-central Montana were evaluated by Van Gosen and others (1996). A geologic map of this study area was included as figure 2 (p. 4) in the report. This geologic map, presented at a scale of 1:126,720 in the report, was originally compiled and digitized in GSMAP from 1:24,000-scale geology by A.B. Wilson and field checked by Wilson and Van Gosen. These GSMAP data files were transferred to ARC via the GENERATE tool by G.N. Green. The line and polygon attributes were checked against the original map and corrected as necessary by Green, and shadeset and lineset attributes were added in ARC. The resulting digital database was quality checked against the original by A.B. Wilson and B.S. Van Gosen. Data files in ARC/INFO and SDTS formats that can be used to construct this geologic map are provided in the directory PRYOR, along with a metadata text file.

REFERENCES CITED

Hammarstrom, J.M., and others, 1998, Mineral resource assessment--Custer & Gallatin National Forests, Montana: U.S. Geological Survey Open-File Report 98-517, 2-page Fact Sheet and http://pubs.usgs.gov/openfile/of98-517.

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Hammarstrom, J.M., Zientek, M.L., and Elliott, J.E., eds., 1993, Mineral resource assessment of the Absaroka-Beartooth study area, Custer and Gallatin National Forests, Montana: U.S. Geological Survey Open-File Report 93-207, 296 p., 19 plates.

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Wilson, A.B., and Elliott, J.E., 1997, Geologic maps of western and northern parts of Gallatin National Forest, south-central Montana: U.S. Geological Survey Geologic Investigations Series Map I-2584, 2 sheets, scale 1:126,720 and http://greenwood.cr.usgs.gov/maps/covers/i-2584/i2584.html.

DATABASE STRUCTURE – ARC/INFO and SDTS

This database consists of four directories containing ARC/INFO interchange files and associated auxiliary files, as well as subdirectories containing associated SDTS files, which may be used to create four separate geologic maps. The four directories are named WESTGAL, NORTHGAL, ABSA, and PRYOR, as explained in the preceding text.

Directory: WESTGAL (USGS Geologic Investigations Series Map I-2584, sheet 1)

Data files:	FNT003.E00	ARC/INFO interchange file that can be used to create the fonts labeling the map units on the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 1
	GEOL.KEY	Text file providing a description of the map units
	LOAD.AML	ARCPLOT command that recreates the database structure of this directory
	MAPBAR.AML	ARCPLOT command that creates the map-scale bar
	PROJECT.TXT	Text file describing the projection applied to this database
	WESTERN.AML	ARCPLOT command that creates the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 1
	WESTERN.BOX	Text file for the map legend in the description of map units shown on USGS Geologic Investigations Series Map I-2584, sheet 1
	WESTERN.E00	ARC/INFO interchange file that can be used to create the database for sheet 1 of USGS Geologic Investigations Series Map I-2584
	WESTERN.LIN	Text file for the explanation of map symbols shown on USGS Geologic Investigations Series Map I-2584, sheet 1
	WESTERN.MET	Metadata file
	WESTERN.PDF	"Portable Document Format" file that can be viewed with the free software Adobe Acrobat Reader
	WESTERN.RTL	A Hewlett Packard graphics plot file ("Raster Transfer Language") format
	W_DECO.E00	ARC/INFO interchange file that can be used to create the decorations on the line work shown on the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 1
	W_TICK.E00	ARC/INFO interchange file that can be used to create the latitude-longitude tic marks shown on the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 1

| | \SDTS | WESTERN.EOO in SDTS (Spatial Data Transfer Standard) |

Directory: NORTHGAL (USGS Geologic Investigations Series Map I-2584, sheet 2)

Data files:	FNT003.E00	ARC/INFO interchange file that can be used to create the fonts labeling the map units on the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 2
	GEOL.KEY	Text file providing a description of the map units
	LOAD.AML	ARCPLOT command that recreates the database structure of this directory
	MAPBAR.AML	ARCPLOT command that creates the map-scale bar
	NORTHERN.AML	ARCPLOT command that creates the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 2
	NORTHERN.BOX	Text file for the map legend in the description of map units shown on USGS Geologic Investigations Series Map I-2584, sheet 2
	NORTHERN.E00	ARC/INFO interchange file that can be used to create the database for sheet 2 of USGS Geologic Investigations Series Map I-2584
	NORTHERN.LIN	Text file for the explanation of map symbols shown on USGS Geologic Investigations Series Map I-2584, sheet 2
	NORTHERN.MET	Metadata file
	NORTHERN.PDF	"Portable Document Format" file that can be viewed with the free software Adobe Acrobat Reader
	PROJECT.TXT	Text file describing the projection applied to this database
	NORTHERN.RTL	A Hewlett Packard graphics plot file ("Raster Transfer Language") format
	N_DECO.E00	ARC/INFO interchange file that can be used to create the decorations on the line work shown on the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 2
	N_TICK.E00	ARC/INFO interchange file that can be used to create the latitude-longitude tic marks shown on the geologic map of USGS Geologic Investigations Series Map I-2584, sheet 2
	\SDTS	NORTHERN.EOO in SDTS (Spatial Data Transfer Standard)

Directory: ABSA (plate 1 of USGS Open-File Report 93-207)

Data files:	ABSAROKA.AML	ARCPLOT command that creates the geologic map of USGS Open-File Report 93-207, plate 1.

ABSAROKA.E00	ARC/INFO interchange file that can be used to create the database for plate 1 of USGS Open-File Report 93-207
ABSAROKA.MET	Metadata file
ABSAROKA.PDF	"Portable Document Format" file that can be viewed with the free software Adobe Acrobat Reader (must use version 4.0 or higher of Acrobat Reader due to the large size of the map).
ABSAROKA.RTL	A Hewlett Packard graphics plot file ("Raster Transfer Language") format
COMMENTS.TXT	Comments by Jeffrey T. Silkwood regarding this database in his letter accompanying transfer of the data to the USGS
DIKES.E00	ARC/INFO interchange file that can be used to create the dikes shown on the geologic map of USGS Open-File Report 93-207, plate 1
FAULTS.E00	ARC/INFO interchange file that can be used to create the faults shown on the geologic map of USGS Open-File Report 93-207, plate 1
FNT003.E00	ARC/INFO interchange file that can be used to create the fonts labeling the map units on the geologic map of USGS Open-File Report 93-207, plate 1
GEOL.KEY	Text file providing a description of the map units
GEOL_SYM.E00	ARC/INFO interchange file that can be used to create the map symbols shown on the geologic map of USGS Open-File Report 93-207, plate 1 (supplied by Jeffrey T. Silkwood)
LOAD.AML	ARCPLOT command that recreates the database structure of this directory
MAPBAR.AML	ARCPLOT command that creates the map-scale bar
PROJECT.TXT	Text file describing the projection applied to this database
\SDTS	ABSAROKA.EOO in SDTS (Spatial Data Transfer Standard)

Directory: PRYOR (figure 2 of USGS Open-File Report 96-256)

Data files:	DECO.E00	ARC/INFO interchange file that can be used to create the decorations on the line work shown on the geologic map of USGS Open-File Report 96-256, figure 2 (p. 4).
	FNT003.E00	ARC/INFO interchange file that can be used to create the fonts labeling the map units shown on the geologic map of USGS Open-File Report 96-256, figure 2 (p. 4).
	FOLDS.E00	ARC/INFO interchange file that can be used to create the

fold axes shown on the geologic map of USGS Open-File Report 96-256, figure 2 (p. 4).

GEOL.KEY	Text file providing a description of the map units
LOAD.AML	ARCPLOT command that recreates the database structure of this directory
MAPBAR.AML	ARCPLOT command that creates the map-scale bar
PROJECT.TXT	Text file describing the projection applied to this database
PRYOR.AML	ARCPLOT command that creates the geologic map of USGS Open-File Report 96-256, figure 2 (p. 4).
PRYOR.BOX	Text file for the map legend in the description of map units shown on the geologic map of USGS Open-File Report 96-256, figure 2 (p. 4).
PRYOR.E00	ARC/INFO interchange file that can be used to create the database for figure 2 (p. 4) of USGS Open-File Report 96-256.
PRYOR.MET	Metadata file
PRYOR.PDF	"Portable Document Format" file that can be viewed with the free software Adobe Acrobat Reader
PRYOR.RTL	A Hewlett Packard graphics plot file ("Raster Transfer Language") format
PRY_TIC.E00	ARC/INFO interchange file that can be used to create the latitude-longitude tic marks shown on the geologic map of USGS Open-File Report 96-256, figure 2 (p. 4).
\SDTS	PRYOR.EOO in SDTS (Spatial Data Transfer Standard)