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Digital geologic map of the Coeur d'Alene district, Idaho and Montana

by

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Introduction

Geologic data from a generalized geologic map of the Coeur d'Alene mining district by [Gott and Cathrall \(1980\)](#) was entered into a geographic information system (GIS) as part of a larger effort to create regional digital geology for the Pacific Northwest. The map area is located in northern Idaho and extends across the state border into western Montana ([Fig. 1](#)). This open-file report discusses the methods used to convert the Coeur d'Alene geologic map data into a digital format, documents the file structures, and explains how to download the digital files from the USGS public access [World Wide Web site](#) on the Internet.

We gratefully acknowledge Arthur A. Bookstrom for his review of this report.

Data Sources, Processing, and Accuracy

Plate 1 from [Gott and Cathrall \(1980\)](#) was the primary source of geologic data. Maps by [Hobbs and others \(1965\)](#) and [Wallace and Hosterman \(1956\)](#) were used to attribute the faults.

The 1:62,500-scale paper geologic map ([Gott and Cathrall, 1980, pl. 1](#)) was digitized into PC ARC/INFO using four latitude and longitude pairs for registration points. All four registration points were within the western portion of the map area. These registration points were visually transferred from the corresponding 1:62,500-scale topographic quadrangle maps to the geologic map, because the labeled latitude and longitude locations on the published geologic map did not register well with those on the topographic quadrangle maps. All faults with known offset were digitized as right-reading arcs and assigned right-reading decorated line patterns. The resulting digital map was attributed, converted to ARC/INFO, and then plotted to check for digitizing and attributing errors and to verify the fit with real-world coordinates (mathematically generated points of latitude and longitude).

The digital map ([Plates 1 and 2](#)) had to be adjusted (rubbersheeted), because the digitized eastern margin of the map (115° 30' W longitude) plotted about 1,175 ft (360m) west of the known (mathematically generated) line of longitude. Fourteen additional registration points were digitized from several 1:62,500-scale paper topographic quadrangle maps in order to create links throughout the geologic map. Each link connected a point location in the digital geologic map to its corresponding point location on the topographic map. The geologic map was then rubbersheeted using the links to shift the fourteen points to their proper position, thus adjusting the arcs and polygons. The final digital map ([Plates 1 and 2](#)) represents the best fit between the original published paper geologic map and known coordinates of latitude and longitude; however, there are several instances where stream drainages on the paper topographic quadrangle maps are offset by as much as 260 ft (80m) from corresponding Quaternary alluvium on a paper plot of the geologic map coverage. Therefore, the overall accuracy of the digital map is probably no better than +/- 100m.

The faults were attributed using both text and plates from [Hobbs and others \(1965\)](#) and [Wallace and Hosterman \(1956\)](#), the two sources that [Gott and Cathrall \(1980\)](#) used to compile their geologic map.

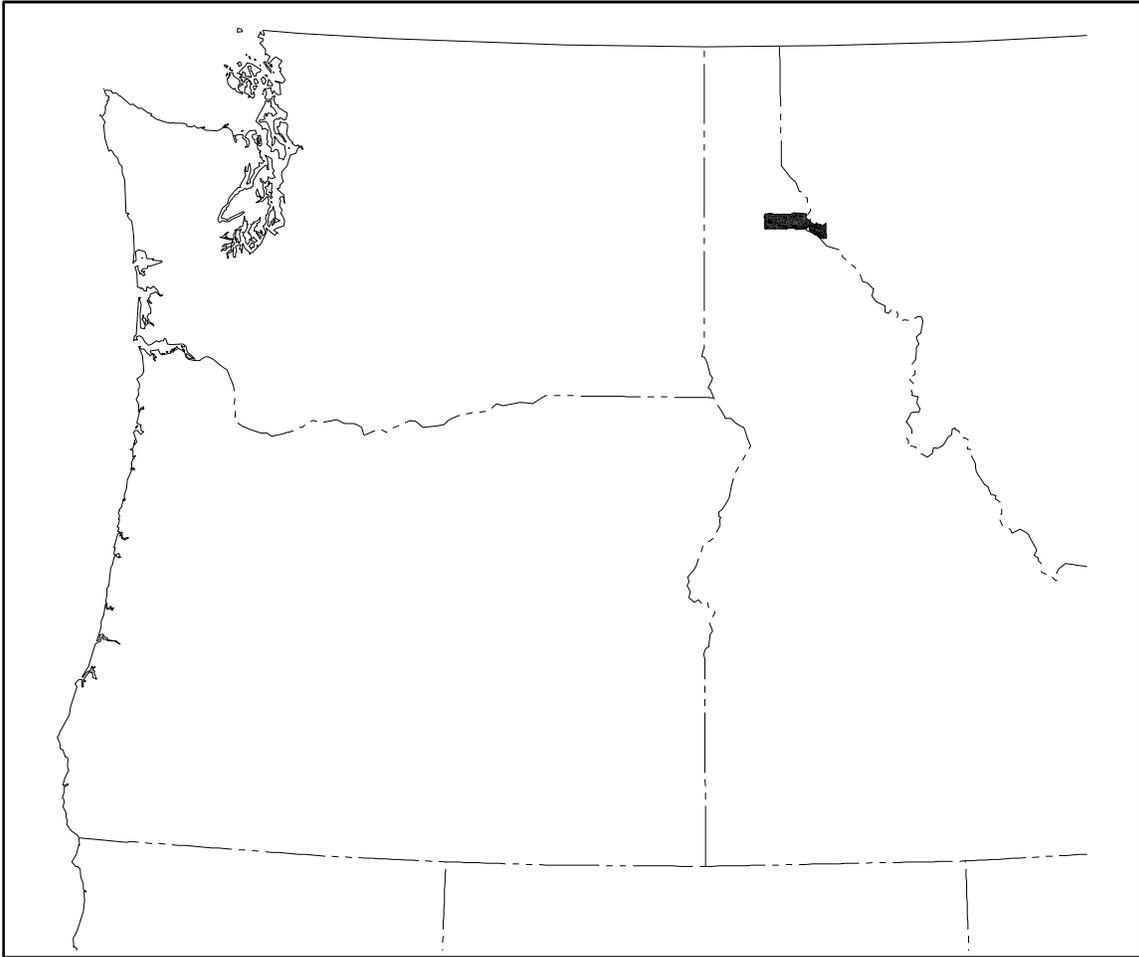


Figure 1. Index map showing the geographic extent of the digital geologic map of the Coeur d'Alene district (black fill).

GIS Documentation

The Coeur d'Alene digital geologic map consists of an arc attribute table, CDA.AAT, that points to the CDA.CON, CDA.STR, and CDA.REF look-up tables and a polygon attribute table, CDA.PAT, that points to the CDA.RU and CDA.REF look-up tables. These tables are all described below.

Descriptions of the items identifying contacts, boundaries, and structures in the arc attribute table, CDA.AAT, are as follows:

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
linecode	29	3	Numeric code used to identify type of linear feature. Linecodes < 100 are used for contacts and boundaries which are described in the CDA.CON look-up table. Linecodes > 100 and < 600 represent structural features which are described in the CDA.STR look-up table.
name	32	30	Name given to structural feature.
source	62	4	Numeric code used to identify the data source for the linear feature. Complete references for the sources are listed in the CDA.REF look-up table.

Descriptions of the items identifying geologic units in the polygon attribute table, CDA.PAT, are as follows:

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
unit	17	4	Numeric code used to identify the geologic unit which is described in the CDA.RU look-up table.
source	21	4	Numeric code used to identify the data source for the geologic unit. Complete references for the sources are listed in the CDA.REF look-up table.

Attribute descriptions for items in the contacts and boundaries look-up table, CDA.CON, are as follows:

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
linecode	1	3	Numeric code used to identify the type of contact or boundary. (This item also occurs in CDA.AAT).
symbol	4	3	Line symbol number used by ARC/INFO to plot arc. (Symbol numbers refer to lineset plotter.)
type	7	10	Major type of line, i.e., contact, water, ice, outcrop, political, neat, limit.
modifier	17	20	Line type modifier, i.e., approx., concealed, gradational.
certainty	37	15	Degree of line type certainty, i.e., inferred, uncertain. No entry implies 'certain'.
desc	52	100	Written description or explanation of contact or boundary.

Attribute descriptions for items in the structures look-up table, CDA.STR, are as follows:

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
linecode	1	3	Numeric code used to identify the type of structural feature. (This item also occurs in CDA.AAT).
symbol	4	3	Line symbol number used by ARC/INFO to plot arc. Symbol numbers refer to lineset carto. All faults with known offset were digitized as right-reading arcs and were assigned symbol numbers for right-reading decorated line patterns.
type	7	10	Major type of structure, i.e., fault, fracture, fold, other.
horizontal	17	20	Type of horizontal fault movement, i.e., strike-slip, left-lateral, right-lateral. No entry implies 'unknown'.
vertical	37	20	Type of vertical fault movement, i.e., normal, low-angle, reverse, thrust, detachment, vertical. No entry implies 'unknown'.
fold	57	15	Type of fold, i.e., anticline, syncline, monocline.
plunge	72	15	Type of plunge on fold, i.e., horizontal, plunging, plunging in, plunging out.
accuracy	87	15	Line type modifier indicating degree of accuracy, i.e., approximate, concealed, gradational.
certainty	102	15	Degree of line type certainty, i.e., inferred, uncertain. No entry implies 'certain'
desc	117	100	Written description or explanation of structural feature.

Attribute descriptions for items in the lithology (rock unit) look-up table, CDA.RU, are as follows:

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
unit	1	4	Numeric code used to identify geologic unit. (This item also occurs in CDA.PAT).
label	5	10	Geologic unit label used in the map proper to identify map unit.
symbol	15	3	Shade symbol number used by ARC/INFO to plot a filled/shaded polygon. (Shade symbol numbers refer to shadeset calcomp1.)
name	18	7	The prefix portion of the geologic unit label that does not include subscripts. (If no subscripts are used in the label, then the 'name' entry is the same as the 'label' entry.)
ss	25	3	The suffix portion of the geologic unit label that includes subscripts.
lith	28	20	Major type of lithology, i.e., unconsolidated sediment, sedimentary, metasedimentary, intrusive, extrusive, metamorphic, water, ice.
desc	48	100	Formal or informal unit name
minage	148	7	Minimum age of lithologic unit, i.e., CRET, TERT, PCY

(cont.)

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
maxage	155	7	Maximum age of lithologic unit
mindate	162	4	Minimum age (in millions of years) if an age date was performed.
maxdate	166	4	Maximum age (in millions of years) if an age date was performed.

Attribute descriptions for items in the data source look-up table, CDA.REF, are as follows:

ITEM NAME	START COLUMN	ITEM LENGTH	ATTRIBUTE DESCRIPTION
source	1	4	Numeric code used to identify data source. (This item also occurs in CDA.AAT and in CDA.PAT).
scale	5	10	Scale of source map. (This is the scale of the map that was digitized or scanned to produce the digital map.)
authors	15	100	Author(s) or compiler(s) of source map entered as last name, first name or initial, and middle initial.
year	115	4	Source map publication date
reference	119	250	Remainder of reference in USGS reference format.

Obtaining Digital Data

The digital geologic map is available in ARC/INFO export format with associated data files. These data and map images are maintained in a polyconic map projection:

Projection: Polyconic
Central Meridian: 116° W
Origin of Projection: 47° 30' N
Units: meters

To obtain copies of the digital data, do the following:

Download the digital files from the USGS public access World Wide Web site on the Internet:

URL = <http://pubs.usgs.gov/of/1996/of96-299/>

The Internet sites contain the Coeur d'Alene district digital geologic map both in ARC/INFO export file format (cda.e00) and as a HPGL2 plot file (cda.hp), as well as the

associated data files and ARC/INFO macro programs which are used to plot the map at a scale of 1:62,500. Use of this data requires a GIS that is capable of reading ARC/INFO Export formatted files, a computer capable of reading UNIX ASCII files, and a plotter that can interpret HPGL2. To use these files on a DOS computer, they must be put through a UNIX-to-DOS filter.

Obtaining Paper Maps

Paper copies of the digital geologic map are not available from the USGS at this time. However, with access to the Internet and access to a large-format color plotter, a 1:62,500-scale paper copy of the map can be made, as follows:

1. Download the digital version of the complete map from the USGS public access World Wide Web site on the Internet.

URL = <http://pubs.usgs.gov/of/1996/of96-299/>

This Internet site contains one file, **cda.hp**, which is in HPGL2 graphics language.

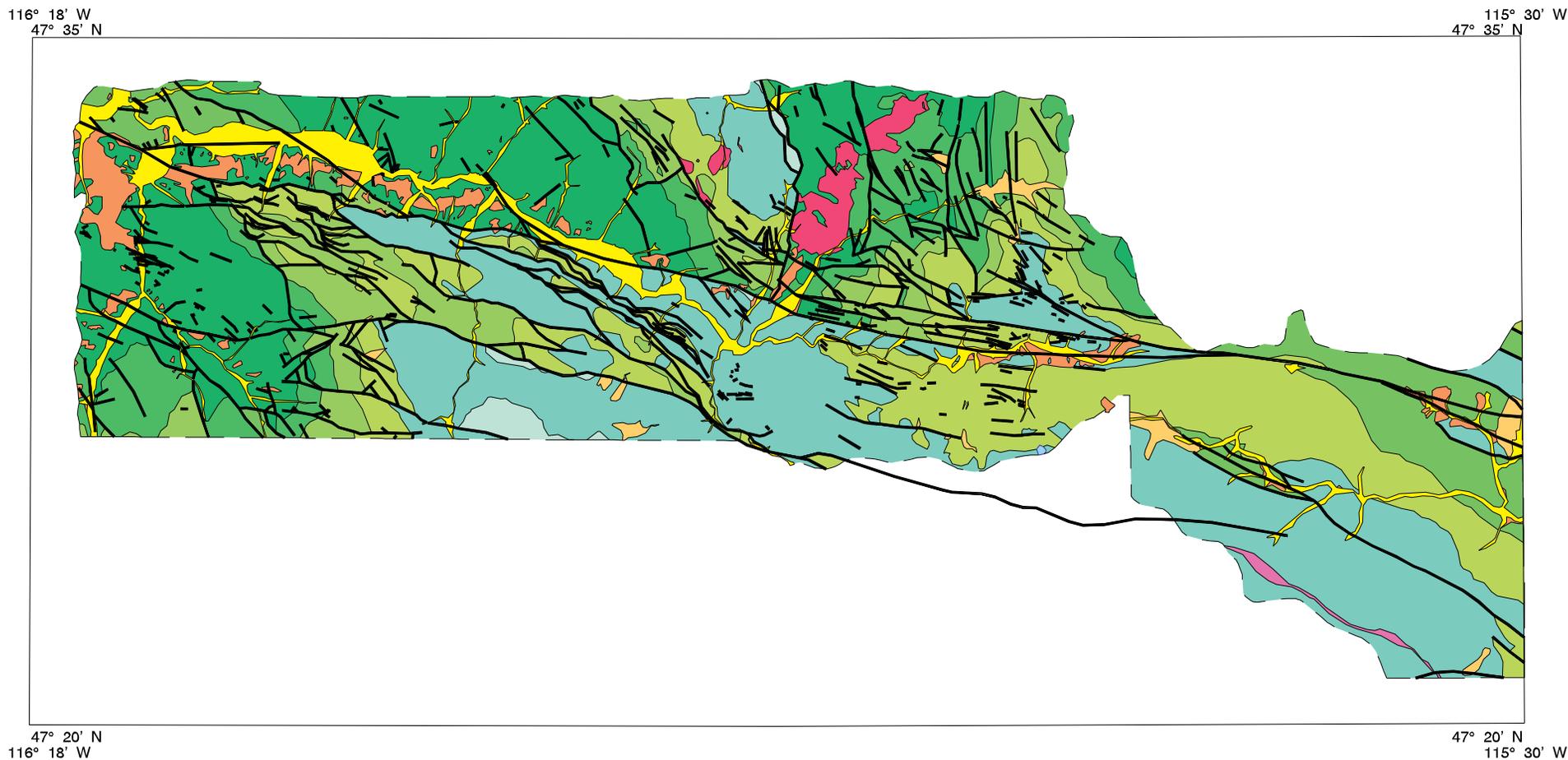
2. This file can be plotted by any large-format graphics plotter which can interpret the HPGL2 language. The finished plot is 24 by 47 inches.

Paper copies of the map can also be created by obtaining one of the versions of the digital files as described above, and then creating a plot file in a GIS.

References Cited

- Gott, G.B. and Cathrall, J.B., 1980, Geochemical-exploration studies in the Coeur d'Alene district, Idaho and Montana: U.S. Geological Survey Professional Paper 1116, 63 p. and 7 plates.
- Hobbs, S.W., Griggs, A.B., Wallace, R.E., and Campbell, A.B., 1965, Geology of the Coeur d'Alene district, Shoshone County, Idaho: U.S. Geological Survey Professional Paper 478, 139 p. and 10 plates.
- Wallace, R.E. and Hosterman, J.W., 1956, Reconnaissance geology of western Mineral County, Montana: U.S. Geological Survey Bulletin 1027-M, p. 575-612, 4 plates.

	Qal – Alluvium		Yrb – Revett and Burke forma- tions (undifferentiated) of the Ravalli Group, Belt Supergroup
	Qg – Glacial and glaciofluvial deposits		Yp – Pritchard Formation, Belt Supergroup
	QTog – Channel and terrace gravels		water
	Km – Monzonite and associated rocks		Contact
	Yws – Wishards sill		Fault
	Ysp – Striped Peak Formation of the Missoula Group, Belt Supergroup		
	Yw – Wallace Formation, Belt Supergroup		
	Ys – St. Regis Formation of the Ravalli Group, Belt Supergroup		
	Yr – Revett Formation of the Ravalli Group, Belt Supergroup		
	Yb – Burke Formation of the Ravalli Group, Belt Supergroup		



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