Digital geologic map of part of the Thompson Falls 1:100,000 quadrangle, Idaho

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Introduction

The geology of the Thompson Falls 1:100,000 quadrangle, Idaho was compiled by Reed S. Lewis in 1997 onto a 1:100,000-scale greenline mylar of the topographic base map for input into a geographic information system (GIS). The resulting digital geologic map GIS can be queried in many ways to produce a variety of geologic maps. Digital base map data files (topography, roads, towns, rivers and lakes, etc.) are not included: they may be obtained from a variety of commercial and government sources. This database is not meant to be used or displayed at any scale larger than 1:100,000 (e.g., 1:62,500 or 1:24,000).

The map area is located in north Idaho (Fig. 1). This open-file report describes the geologic map units, the methods used to convert the geologic map data into a digital format, the Arc/Info GIS file structures and relationships, and explains how to download the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet.

We thank Steve Box, Tom Frost, and Brian White for their technical reviews and Nancy Shock for a digital review.

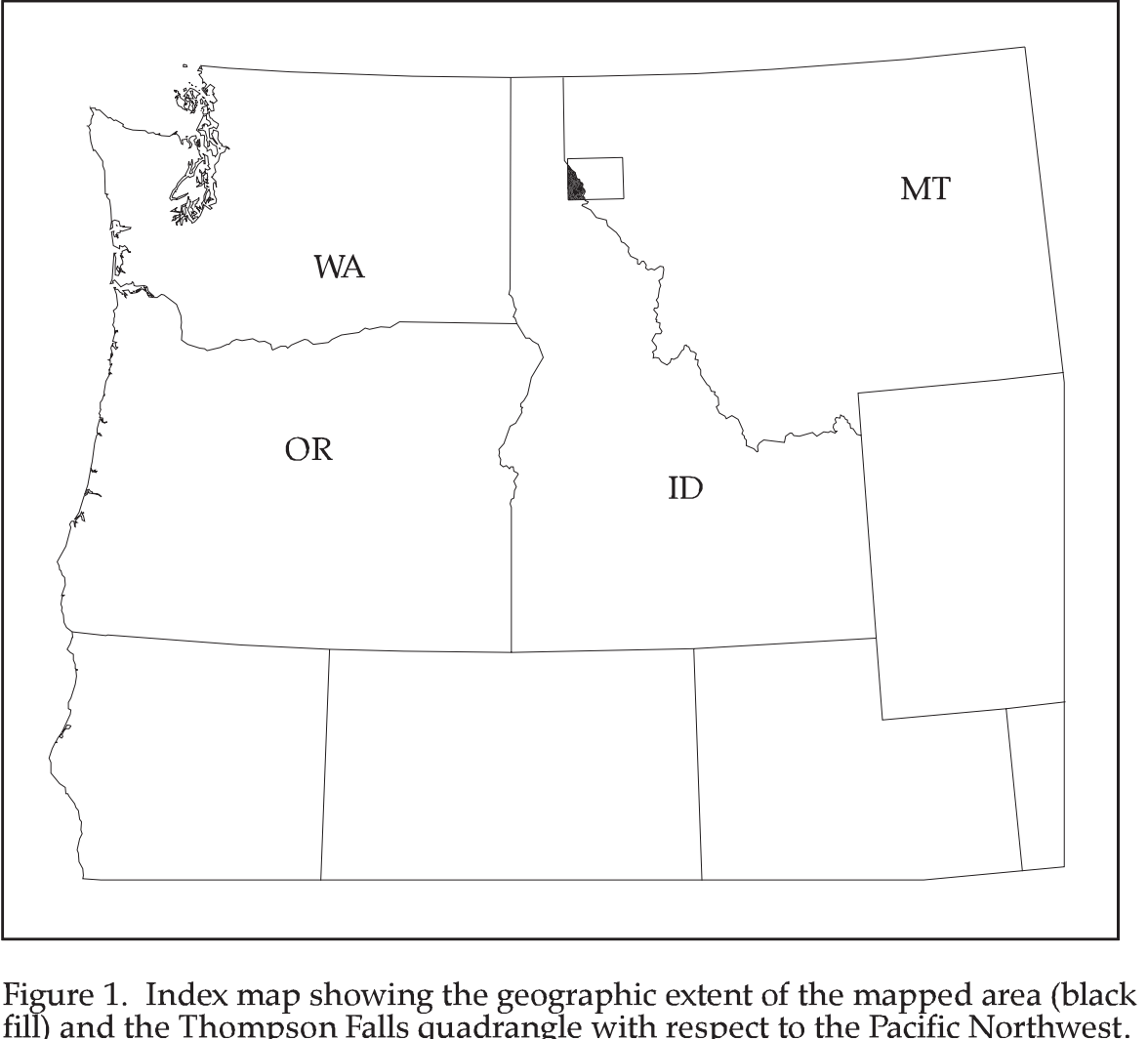


Figure 1. Index map showing the geographic extent of the mapped area (black fill) and the Thompson Falls quadrangle with respect to the Pacific Northwest.

Description of Map Units

The geologic map was compiled primarily from Griggs (unpublished field maps dated 1961-1969, 1973), Harrison and others (1986), Hobbs and others (1965), Hosterman (1956) and Ransome and Calkins (1908) (see Fig. 2, areas 1-6). Additional map sources used were Gibson and others (1941), Schalck (1989), Shenon (1938), Umpleby and Jones (1923), and B.G. White (written commun., 1997) (see Fig. 2, areas A-E).

Qa ALLUVIAL DEPOSITS (HOLOCENE)--Stream deposits in modern drainages.

Qg GLACIAL DEPOSITS (QUATERNARY)--Poorly sorted and poorly stratified, unconsolidated deposits principally of glacial origin. Includes till in lateral and ground moraines as well as outwash and minor modern stream alluvium.

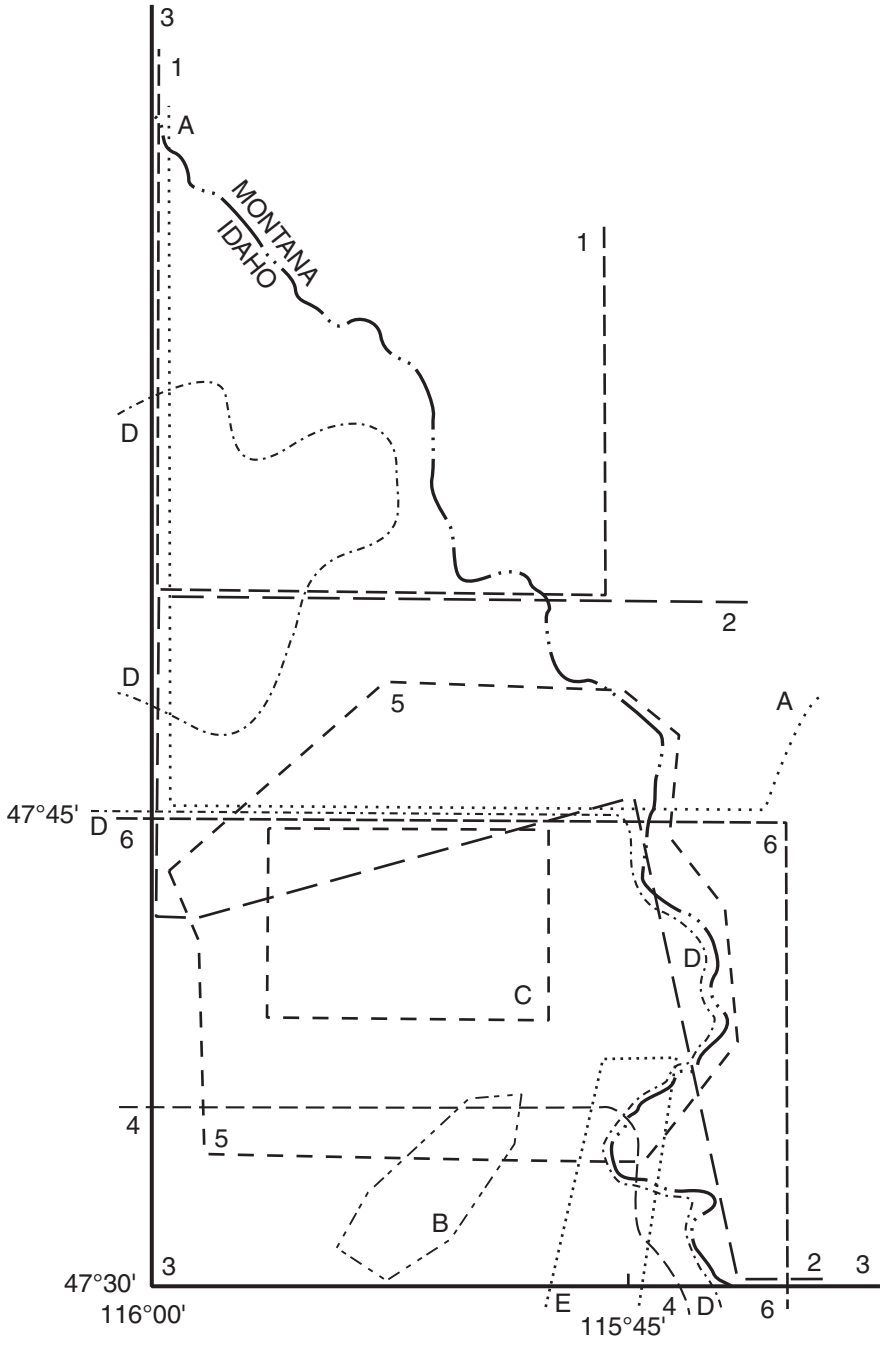
Tsm SEDIMENT (MIOCENE)--Unconsolidated, poorly sorted, fluvial sediment 70 to 330 m above the present stream levels. Ranges in size from clay to boulders and is derived from local sources (Hosterman, 1956).

Kms MONZONITE AND SYENITE (CRETACEOUS)--Small stocks of hornblende monzonite, porphyritic hornblende monzonite, alkali-feldspar syenite, and pyroxene syenite (Schlack, 1989). Age determinations have yielded conflicting dates, but emplacement ages of about 100 Ma are likely (Marvin and others, 1984; Schlack, 1989).

Ysp STRIPED PEAK FORMATION (MIDDLE PROTEROZOIC)--Interbedded quartzite and argillite with some arenaceous dolomitic beds; usually thinly bedded (Hobbs and others, 1965). Colors range from purplish gray and very pale pink to gray and green. Mud cracks and ripple marks common.

Ywu WALLACE FORMATION, UPPER MEMBER (MIDDLE PROTEROZOIC)--Predominantly thinly laminated medium- to dark-gray argillite; some interbedded light-gray quartzite and arenaceous dolomite (Hobbs and others, 1965).

Ywml WALLACE FORMATION, MIDDLE AND LOWER MEMBERS, UNDIVIDED (MIDDLE PROTEROZOIC)--Light-gray dolomitic and calcareous quartzite interbedded with medium- to dark-gray argillite (Hobbs and others, 1965). Some impure dolomite beds near top. Ripple marks, small scale crossbedding, and molar-tooth and ovoid structures in some layers. Mapped asYwl by Hobbs and others (1965).



Primary sources:

1. Griggs, unpub. mapping a.
2. Griggs, unpub. mapping b.
3. Harrison and others, 1986
4. Hobbs and others, 1965
5. Hosterman, 1956
6. Ransome and Calkins, 1908

Additional Map References

A. Gibson and others, 1941
B. Schalck, 1989.
C. Shenon, 1938.
D. Umpleby and Jones, 1923
E. White, B.G., unpub mapping.

Figure 2. Location map showing primary sources of compilation data (areas 1-6) and additional map references (A-E).

Ysr ST. REGIS FORMATION (MIDDLE PROTEROZOIC)--Thick-bedded impure to pure quartzite at base, grading upward to interbedded and interlaminated impure quartzite and argillite that comprise bulk of formation (Hobbs and others, 1965). Characteristically thin bedded and many layers laminated. Predominantly purplish red and grayish red; argillite is darker. Some carbonate-bearing beds, mostly in upper part. Ripple marks, mud cracks, and mud-chip breccia in some layers.

Yr REVETT FORMATION (MIDDLE PROTEROZOIC)--Thick-bedded white to light-gray quartzite containing interbedded impure and nearly pure quartzite in upper and lower parts, and a few widely spaced argillite partings (Hobbs and others, 1965). Crossbedded and laminated in part.

Ybk BURKE FORMATION (MIDDLE PROTEROZOIC)--Light- to greenish-gray fine-grained impure quartzite with lesser amounts of nearly white to light-gray nearly pure to pure quartzite (Hobbs and others, 1965). Beds predominantly 5 to 20 cm thick. Ripple marks and pseudoconglomerate are common.

Ypu PRICHARD FORMATION, UPPER MEMBER (MIDDLE PROTEROZOIC)--Light-gray to nearly white pure to impure quartzite interbedded with laminated argillite (Hobbs and others, 1965). Quartzite beds 5 to 45 cm thick. Ripple marks and graded bedding are common.

Ypl PRICHARD FORMATION, LOWER MEMBER (MIDDLE PROTEROZOIC)--Banded dark-gray argillite, laminated in part; weathers rusty red (Hosterman, 1956).

Data Sources, Processing, and Accuracy

Lewis'greenline mylar inked with the geologic data was electronically scanned to create a raster digital image, converted to vector, polygon and point GIS layers, and minimally attributed by a contractor (Optronics Specialty Co., Inc., Northridge, CA). This initial product, with latitude and longitude registration tics digitized from the scanned image, was remitted to the U.S. Geological Survey in an Arc/Info EXPORT format in scanner units. The tic points were used to transform the digital files to calculated latitude-longitude points for a Universal Transverse Mercator (zone 11, with a -5,000,000 m y-offset) map projection. The RMS errors[1] resulting from the file transformations were small (7.350 meters, see Appendix A). The digital files were then augmented with an interim geologic map data model (or data base), further attributed and edited, and then plotted and compared to the original greenline mylar of the geologic map to check for digitizing and attributing errors. All processing by the U.S. Geological Survey was done in Arc/Info version 7.1.1 installed on a Sun Ultra workstation.

The overall accuracy (with respect to the location of lines and points) of the digital geologic map (see Figs. 3 and 4 for pagesize versions) is probably no better than +/- 7 meters. This digital database is not meant to be used or displayed at any scale larger than 1:100,000 (e.g., 1:62,500 or 1:24,000).

[1] The root mean square error (RMS error) describes the deviation between the tic locations in the input file and those in the output file. It is an indication of the quality of the derived transformation and is a measure of the quality of the original scanned materials. The transformation report of errors for each tic point is given in Appendix A.

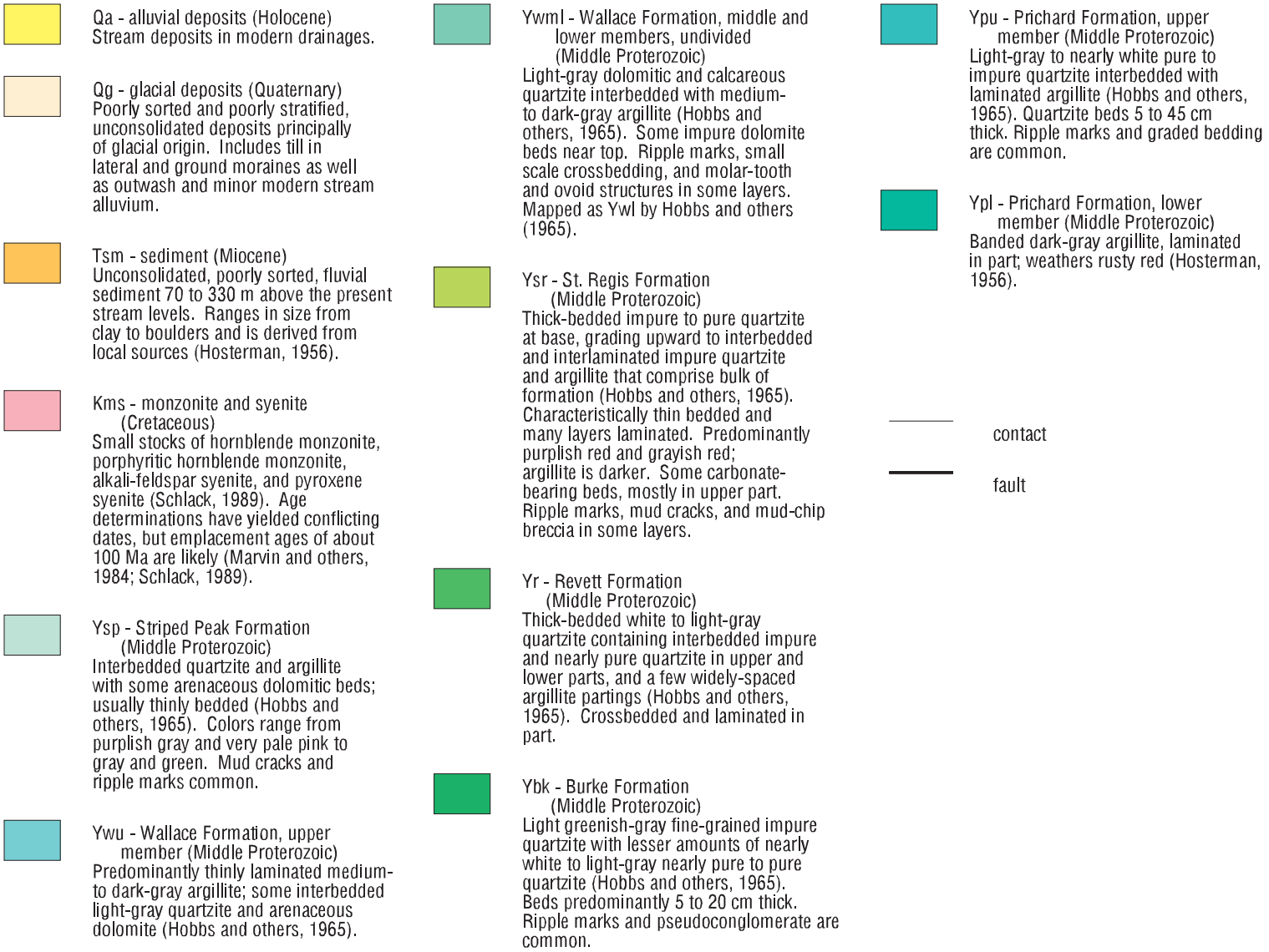


Figure 3. Explanation for the Simplified Digital Geologic Map of the Thompson Falls 1:100,000 quadrangle, Idaho

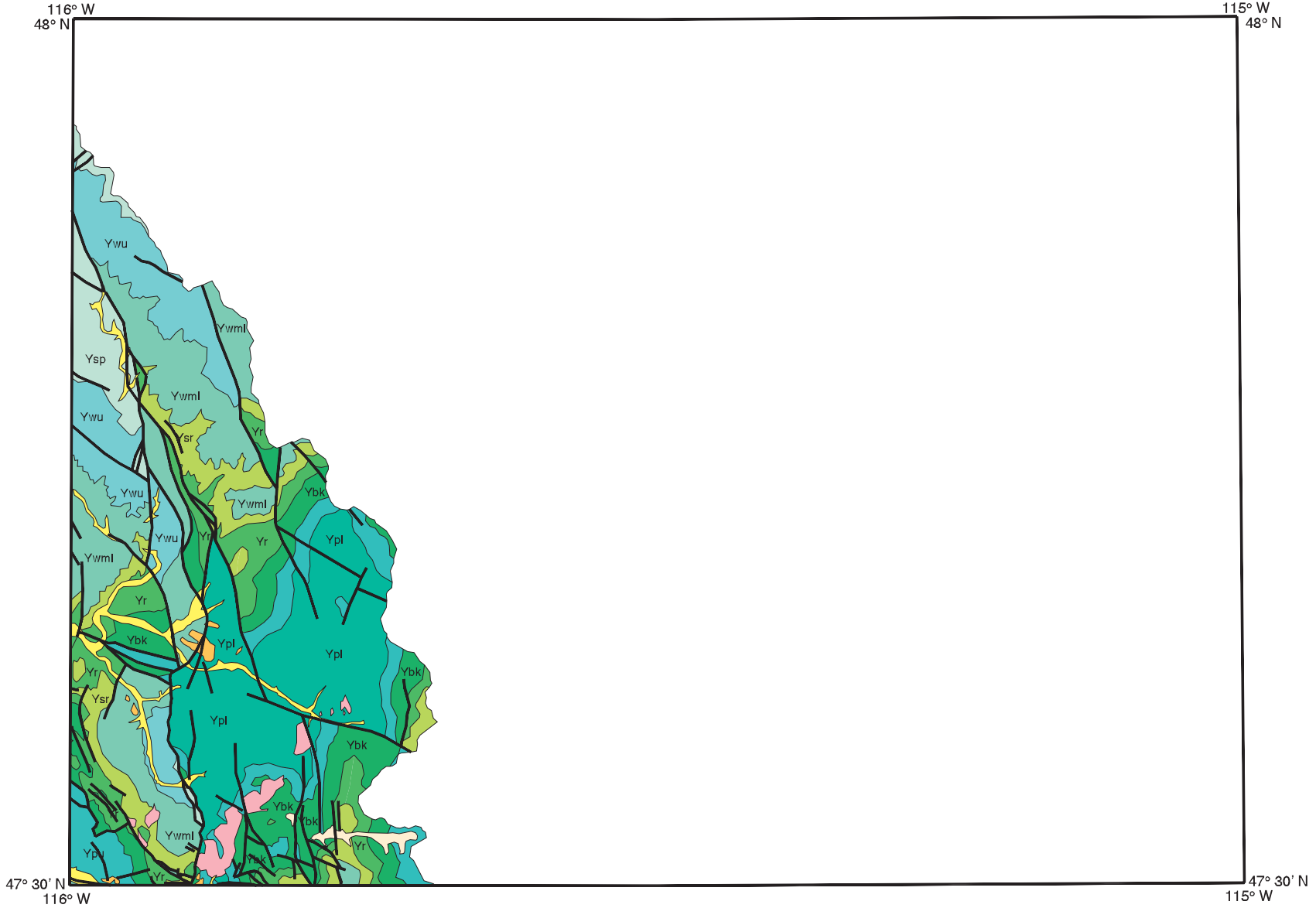


Figure 4. Simplified Digital Geologic Map of the Thompson Falls 1:100,000 quadrangle, Idaho

GIS Documentation

The digital geologic map of the Thompson Falls 1:100,000 quadrangle, Idaho includes a geologic linework arc attribute table, TF100K.AAT, that relates to the TF100K.CON, TF100K.STR and TF100K.REF files; a rock unit polygon attribute table, TF100K.PAT, that relates to the TF100K.RU and TF100K.REF files; and a geologic map symbol point attribute table, TFPNT.PAT, that relates to the TFPNT.SYM and TFPNT.REF files (see Fig. 5). These data files are described below.

Linear Features

Descriptions of the items identifying linear features such as contacts, boundaries (e.g., lines of latitude and longitude, state boundaries) and structures in the arc (or line) attribute table, TF100K.AAT, are as follows:

TF100K.AAT			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
linecode	integer	3	Numeric code used to identify type of linear feature. Linecodes < 100 are used for contacts and boundaries which are described in the TF100K.CON file. Linecodes > 100 and < 600 represent structural features which are described in the TF100K.STR file.
name	character	30	Name given to structural feature.
source	integer	4	Numeric code used to identify the data source for the linear feature. Complete references for the sources are listed in the TF100K.REF file.

Attribute descriptions for items in the contact (and boundary) look-up table, TF100K.CON (for use with the PLOTTER.LIN lineset), are as follows:

TF100K.CON			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
linecode	integer	3	Numeric code (a value < 100) used to identify type of contact or boundary. (This item also occurs in TF100K.AAT.)
symbol	integer	3	Line symbol number used by Arc/Info to plot line. (Symbol numbers refer to the **PLOTTER.LIN lineset**.)
type	character	10	Major type of line, e.g., contact, state boundaries, lines of latitude and longitude used for neatlines.
modifier	character	20	Line type modifier, i.e., approximate, concealed, gradational. No entry implies 'known.'
certainty	character	15	Degree of certainty of contact or boundary, i.e., inferred, uncertain. No entry implies 'certain.'
desc	character	100	Written description or explanation of contact or boundary.

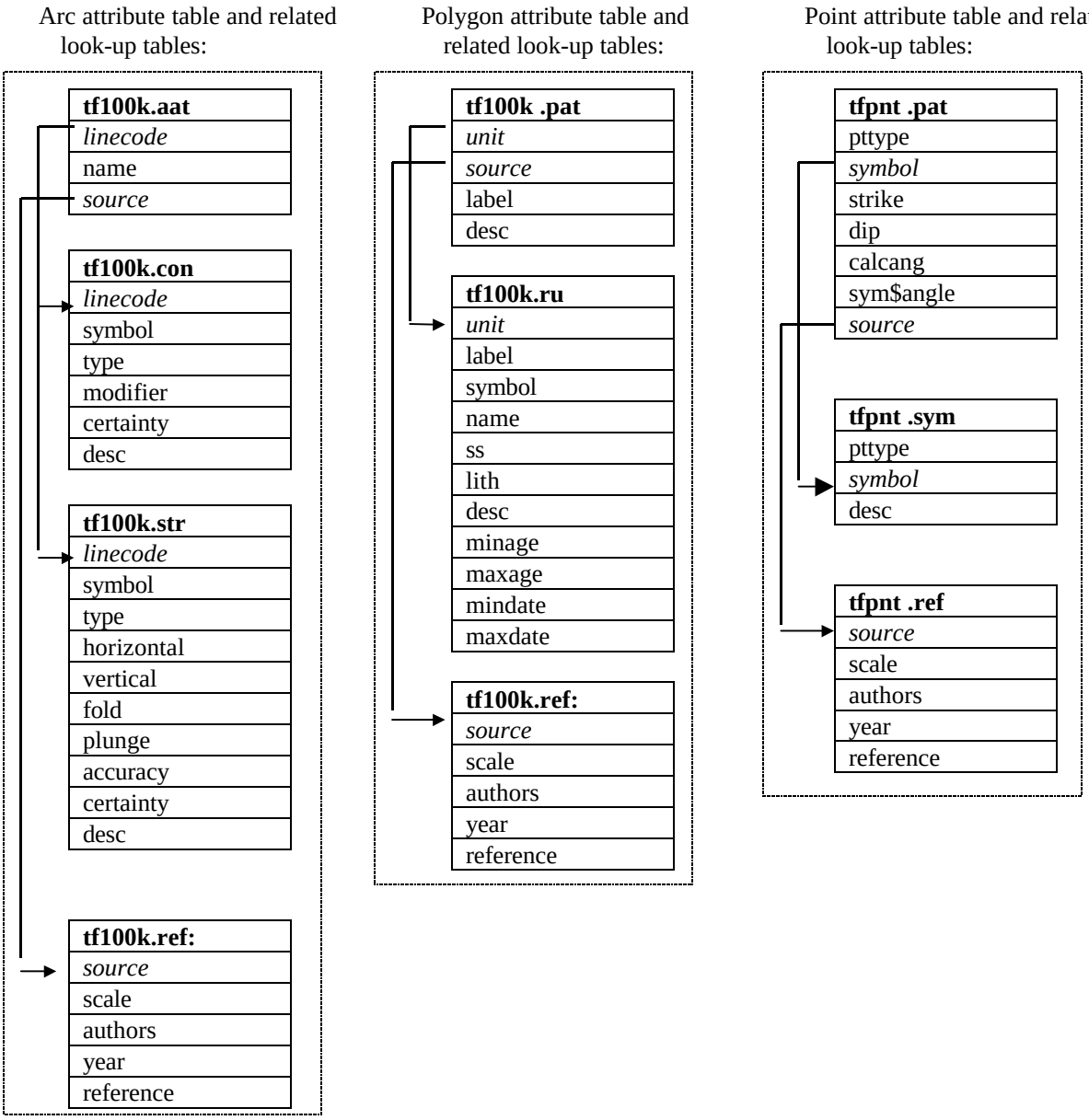


Figure 5: Relationships between feature attribute tables and look-up tables.

Attribute descriptions for items in the structure look-up table, TF100K.STR [for use with the GEOLOGY.LIN lineset (Fitzgibbon and Wentworth, 1991)], are as follows:

TF100K.STR			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
linecode	integer	3	Numeric code (a value > 100 and < 600) used to identify type of structural feature. (This item also occurs in TF100K.AAT.)
symbol	integer	3	Line symbol number used by Arc/Info to plot line. (Symbol numbers refer to the **GEOLOGY.LIN lineset** (Fitzgibbon and Wentworth, 1991).)
type	character	10	Major type of structure, i.e., fault, fracture, fold, other.
horizontal	character	20	Type of horizontal fault movement, e.g., left-lateral, right-lateral. No entry implies 'unknown.'
vertical	character	20	Type of vertical fault movement, e.g., normal. No entry implies 'unknown.'
fold	character	15	Type of fold, e.g., anticline, syncline.
plunge	character	15	Type of plunge on fold, i.e., horizontal, plunging, plunging in, plunging out.
accuracy	character	15	Line type modifier indicating degree of accuracy, i.e., approximately located, concealed, gradational. No entry implies 'known.'
certainty	character	15	Degree of certainty of contact or boundary, i.e., inferred, uncertain. No entry implies 'certain.'
desc	character	100	Written description or explanation of structural feature.

Areal Features

Descriptions of the items identifying geologic units in the polygon attribute table, TF100K.PAT, are as follows:

TF100K.PAT			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
unit	integer	4	Numeric code used to identify the rock unit which is described in the TF100K.RU look-up table. (This item also occurs in TF100K.RU.)
source	integer	4	Numeric code used to identify the data source for the rock unit. Complete references for the sources are listed in the TF100K.REF file.
label	character	10	Rock unit label (abbreviation) used to label unit on map. (This item was joined from the tf100k.ru look-up table.)
desc	character	100	Formal or informal unit name. (This item was joined from the tf100k.ru look-up table.)

Attribute descriptions for items in the lithology (rock unit) look-up table, TF100K.RU (for use with the CALCOMP1.SHD shadeset), are as follows:

TF100K.RU			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
unit	integer	4	Numeric code used to identify rock unit. (This item also occurs in TF100K.PAT.)
label	character	10	Rock unit label (abbreviation) used to label unit on map.
symbol	integer	3	Shadeset symbol number used by Arc/Info to plot a filled/shaded polygon. (The symbol numbers used in this file refer to the **CALCOMP1.SHD shadeset**.)
name	character	7	The prefix portion of the rock unit label that does not include subscripts. (If subscripting is not used in the original unit label, then the 'name' entry is the same as the 'label' entry.)
ss	character	3	The suffix portion of the rock unit label that includes subscripts.
lith	character	20	Major type of lithostratigraphic unit, i.e., unconsolidated sediments, sedimentary rocks, metasedimentary rocks, intrusive rocks, extrusive rocks, metamorphic rocks, water, ice.
desc	character	100	Formal or informal unit name
minage	character	7	Minimum stratigraphic age of lithologic unit, i.e., CRET, TERT, PCY.
maxage	character	7	Maximum stratigraphic age of lithologic unit
mindate	integer	4	Minimum radiometric age (in millions of years) if determined.
maxdate	integer	4	Maximum radiometric age (in millions of years) if determined.

Point Features

Descriptions of the items identifying geologic map symbols are given in the point attribute table, TFPNT.PAT, which is defined as follows:

TFPNT.PAT			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
pttype	character	32	Type of point symbol, e.g., strike and dip of inclined bedding. (This item also occurs in the TFPNT.SYM file.)
symbol	integer	3	Marker symbol number used by Arc/Info to identify type of structural map symbol. Symbol numbers refer to the **GEOSCAMP2.MRK markerset** (Matti and others, 1997). (This item also occurs in the TFPNT.SYM file.)
strike	integer	3	Strike of bedding. Strike is an azimuthal angle (measured in degrees from 0 to 360 in a clockwise direction from North).
dip	integer	3	Dip of bedding. This value is an angle measured (in degrees from 0 to 90) down from the horizontal; thus a horizontal dip is 0 degrees and a vertical dip is 90 degrees.
calcang	integer	4	An interim value used to calculate sym$angle. The structural map symbol in the GEOSCAMP2.MRK markerset (Matti and others, 1997) had to be rotated to achieve its proper map orientation. For the strike and dip symbols, calcang = strike - 270.
sym$angle	integer	4	The angle used to mathematically rotate the map point symbol to its proper orientation on the map. This item was set equal to the pseudoitem '$angle' (calc sym$angle = $angle).
source	integer	4	Numeric code used to identify the data source for the geologic map symbol. Complete references for the sources are listed in the TFPNT.REF file.

Attribute descriptions for items in the geologic map symbols look-up table, TFPNT.SYM, [for use with the GEOSCAMP2.MRK markerset (Matti and others, 1997)], are as follows:

TFPNT.SYM			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
pttype	character	32	Type of point symbol, e.g., strike and dip of inclined bedding, strike and dip of inclined cleavage. (This item also occurs in the TFPNT.PAT file.)
symbol	integer	3	Marker symbol number used by Arc/Info to identify type of geologic map symbol. Symbol numbers refer to the **GEOSCAMP2.MRK markerset** (Matti and others, 1997).
desc	character	250	Written description or explanation of map symbol.

Source Attributes

Descriptive source or reference information for the TF100K and TFPNT Arc/Info coverage files is stored in the TF100K.REF and TFPNT.REF files respectively. Attribute descriptions for items in the TF100K.REF and TFPNT.REF data source files are as follows:

TF100K.REF / TFPNT.REF			
ITEM NAME	ITEM TYPE	ITEM WIDTH	ATTRIBUTE DESCRIPTION
source	integer	4	Numeric code used to identify the data source. (This item also occurs in the TF100K.AAT, TF100K.PAT, and TFPNT.PAT files.)
scale	integer	10	Scale of source map. (This value is the denominator of the proportional fraction that identifies the scale of the map that was digitized or scanned to produce the digital map.)
authors	character	100	Author(s) or compiler(s) of source map entered as last name, first name or initial, and middle initial.
year	integer	4	Source (map) publication date
reference	character	250	Remainder of reference in USGS reference format.

Obtaining Digital Data

The complete digital version of the geologic map is available in Arc/Info interchange (or 'EXPORT') format with associated data files. These data and map images are maintained in a Universal Transverse Mercator (UTM) map projection:

Projection:	UTM
Zone:	11
Y-offset (false northing):	-5,000,000 meters
Units:	meters

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

1. Download the digital files from the USGS public access World Wide Web site on the Internet: **URL = http://wrgis.wr.usgs.gov/open-file/of99-438/**

or

2. Anonymous FTP from **wrgis.wr.usgs.gov,** in the directory
   pub/open-file/of99-438/

The Internet sites contain the digital geologic map of part of the Thompson Falls 1:100,000 quadrangle, Idaho both in Arc/Info interchange-format files (tf100k.e00 and tf100k.e00) and as an HPGL2 plot file (tf100k.hp) of the map area, as well as the associated data files and Arc/Info macro program which is used to plot the map at a scale of 1:100,000.

To manipulate this data in a geographic information system (GIS), you must have a GIS that is capable of reading Arc/Info interchange-format files.

Obtaining Paper Maps

Paper copies of the digital geologic map are not available from the USGS. However, with access to the Internet and access to a large-format color plotter that can interpret HPGL2 (Hewlett-Packard Graphics Language), a 1:100,000-scale paper copy of the map can be made, as follows:

1. Download the plot file of the map, **tf100k.hp,** from the USGS public access World Wide Web site on the Internet using the
URL = http://wrgis.wr.usgs.gov/open-file/of99-438

or

2. Anonymous FTP the plot file, **tf100k.hp,** from: **wrgis.wr.usgs.gov,** in the directory:
   pub/open-file/of99-438/
3. This file can be plotted by any large-format color plotter that can interpret HPGL2. The finished plot is about 29 inches by 39 inches.

Paper copies of the map can also be created by obtaining the digital files as described above and then creating a plot file in a GIS, using the Arc/Info macro language (AML) program, tf100k.aml, included in the data package.

References Cited

Fitzgibbon, Todd T. and Wentworth, Carl M., 1991, ALACART user interface - executable AML code and demonstration maps: U.S. Geological Survey Open-File Report 91-587A (as updated October 17, 1996 for version 3.1), URL = **http://wrgis.wr.usgs.gov/docs/software/software.html**

Gibson, Russell, Jenks, W. F., and Campbell, Ian, 1941, Stratigraphy of the Belt series in Libby and Trout Creek quadrangles, northwestern Montana and northern Idaho: Geological Society of America Bulletin, v. 52, no. 3, p. 363-379, scale 1:180,000 (approx.).

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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., 10 plates, scale 1:24,000.

Hosterman, J.W., 1956, Geology of the Murray area, Shoshone County, Idaho: U.S. Geological Survey Bulletin 1027-P, p. 725-748, scale 1:62,000.

Marvin, R.F., Zartman, R.E., Obradovich, J.D. and Harrison, J.E., 1984, Geochronometric and lead isotope data on samples from the Wallace 1- by 2-degree quadrangle, Montana and Idaho: U.S. Geological Survey Miscellaneous Field Studies Map MF-1354-G, scale 1:250,000.

Matti, J.C., Miller, F.K., Powell, R.E., Kennedy, S.A., Bunyapanasarn, T.P., Koukladas, C., Hauser, R.M., and Cossette, P.M., 1997, Geologic-point attributes for digital geologic-map data bases produced by the Southern California Areal Mapping Project (SCAMP): U.S. Geological Survey Open-File Report 97-859, 7 p.

Ransome, F.L. and Calkins, F.C., 1908, The geology and ore deposits of the Coeur d'Alene district, Idaho: U.S. Geological Survey Professional Paper 62, 203 p., scale 1:62,500.

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Shenon, P.J., 1938, Geology and ore deposits near Murray, Idaho: Idaho Bureau of Mines and Geology Pamphlet 47, 44 p.

Umpleby, J.B. and Jones, E.L., Jr., 1923, Geology and ore deposits of Shoshone County, Idaho: U. S. Geological Survey Bulletin 732, 156 p., scale 1:250,000.

U.S. Geological Survey, 1993, 1:100,000-scale digital line graph (DLG) data - hydrography and transportation, Area 13 – Northwestern states: U.S. Geological Survey, US GeoData (optional format), CD-ROM.

Appendix A - Transformation report for Thompson Falls GIS

Three Arc/Info files were remitted to the USGS from the contractor. Each of the three files had to be transformed to a UTM map projection (zone 11, y-shift = -5,000,000 meters). The errors for each latitude and longitude tic used in the transformation were the same for each of the three transformed files and are given below. The report identifies a root mean square (RMS) error of 7.350 meters.

Arc: transform tfgeo1 tfgeo2 affine
Transforming coordinates for coverage tfgeo1

Scale (X,Y) = (2539.930,2539.720) Skew (degrees) = (0.003)
Rotation (degrees) = (1.115) Translation = (573977.416,258440.517)
RMS Error (input,output) = (0.003,7.350)

Affine X = Ax + By + C
Y = Dx + Ey + F
A = 2539.449 B = -49.289 C = 573977.416
D = 49.422 E = 2539.242 F = 258440.517

tic id	input x / output x	input y / output y	x error	y error
451	0.548	0.992		
	575315.438	260995.594	4.232	-9.184
382	0.614	11.936		
	574957.188	288779.781	-9.395	-0.235
313	0.686	22.876		
	574597.438	316565.156	-5.935	-3.356
452	7.962	0.962		
	594144.062	261268.203	5.379	8.662
453	15.372	0.946		
	612972.562	261601.406	-5.338	0.666
383	8.000	11.902		
	593696.188	289052.156	9.488	5.726
314	8.032	22.844		
	593246.562	316837.312	1.213	5.522
384	15.372	11.886		
	612435.062	289385.094	-7.696	-3.477
315	15.378	22.830		
	611895.438	317169.938	8.105	1.421
454	22.790	0.954		
	631800.875	261995.219	3.318	-5.635
385	22.756	11.900		

	631173.750	289778.625	4.419	3.447
316	22.718	22.840		
	630544.125	317563.125	-1.855	-3.577
455	30.202	0.992		
	650628.938	262449.656	-3.689	2.694
386	30.132	11.934		
	649912.188	290232.688	-4.667	0.102
317	30.064	22.876		
	649192.562	318016.781	2.420	-2.777

Appendix B - List of digital files in the Thompson Falls GIS

--Use the '00import.aml' to IMPORT all of the *.E00 files for use in Arc/Info.
--Use the Arc/Info 'DRAW' command to plot the *.GRA file to your screen. (Make sure the display is set with the Arc/Info 'DISPLAY' command.)
--Use the Arc/Info 'HPGL2' command to create HPGL2 files from the *.GRA file.
--Use the UNIX 'lpr -P<plotter_name> tf100k.hp' command to send the tf100k.hp file to a large-format color plotter that can interpret Hewlett-Packard Graphics Language.
--To re-create the *.GRA file, open the ArcPlot module, enter 'display 1040', enter a new filename for the graphics file, enter '&run tf100k' (and at the ARC prompt, enter 'display 9999 3' and 'draw <new filename> to draw the GRA file to your screen).

Primary Arc/Info interchange-format files (tf*.e00) for the digital geology:

- tf100k.e00
- tfpnt.e00

Plot files
Plot files in Arc/Info graphics (*.gra) and HPGL2 map plot (*.hp) formats for the geologic map plate:

- tf100k.gra /.hp

Additional Arc/Info interchange-format files (*.e00) necessary to re-create the geologic map plate:

- calcomp1.shd.e00 - shadeset
- fnt038.e00 - font 38
- fnt040.e00 - font 40
- geoscamp2.mrk.e00 - markerset
- tfallsu11[1].e00 - exterior boundary of the Thompson Falls quadrangle

AML, graphics, key, lineset and text files necessary to re-create the geologic map plate:

- scale2a.aml - plots scale bar on plate
- tf100k.aml - program that creates a graphics file of the geologic map of the Thompson Falls quadrangle, Idaho.
- index_tf.gra - index map graphic displayed on map plate (showing location of the Thompson Falls quadrangle with respect to the Pacific Northwest).
- tf_line.key - lineset symbol values and descriptive text for lines on the map plate
- tf_pol.key - shadeset symbol values and descriptive text for geologic map units on the map plate
- tf_sym.key - markerset symbol values and descriptive text for map symbols (markers) on the map plate
- geology.lin - lineset
- geo.prj - a text file used to identify real-world (geographic) coordinates - for use in adding latitude and longitude notation around the margins of the map quadrangle
- u11.prj - a text file to identify UTM, zone 11 map projection - for use in adding latitude and longitude notation around the margins of the map quadrangle
- tfcrd.txt - text file listing map credits on the map plates
- tfdisc.txt - disclaimer statement text file
- tfref.txt - text file listing map references on the map plates

[1] an 'u11' suffix indicates UTM, zone 11 map projection with y-shift = 5,000,000 meters.

Appendix C - Arc/Info Macro Language program (tf100k.aml) used to plot the geologic map of the Thompson Falls quadrangle

```
/*  tf100k.aml, 11/24/98, pd
/************************
/*  This Arc/Info Macro Language (AML) program will plot the geologic map plate for the Thompson Falls, ID 1:100,000-scale quadrangle.

/*  To run this AML:
/*     1. Type 'ap' at the 'Arc:' prompt to enter the ArcPlot module,
/*     2. Type 'display 1040' at the 'Arcplot:' prompt to create a GRA file,
/*     3. Enter a filename of your own choosing at the 'Enter ARC/INFO Graphics filename :' prompt for the GRA to be created,
/*     4. Type '&run tf100k' at the 'Arc:' prompt to start the program,
/*     5. Enter 'quit' to exit the ArcPlot module
/*     6. At the 'Arc:' prompt, type 'display 9999 3' to set the display window
/*     7. At the next 'Arc:' prompt, enter 'draw <quadname>' -- there is no need to use the GRA extension.
/*     8. Run the Arc/Info HPGL2 command to convert the GRA file to an HPGL2 file, i.e., hpgl2 tf100k tf100k.hp # 1.0 opaque # 0 # # # cal.dat
/*     9. Execute the UNIX 'lpr' command to print the 1:100,000-scale geologic map plot on your plotter, i.e., lpr -Ppicasso tf100k.hp
/*************************

clear
clearselect

pagesize 40.5 29.0
pageunits inches
mapunits meters
mapscale 100000
mapposition ll 0.0 2.5
mapangle -1.0

&set cover1 tf100k
&set pntcover tfpnt
&set quad tfallsu11
&set key1 tf_pol.key
&set key2 tf_line.key
&set key3 tf_sym.key
&s credits tfcrd.txt
&s refs tfref.txt
&s disclaimer tfdisc.txt
/* -->where 'cover1' contains contacts and structures and rock units; 'pntcover' contains structural symbols; and 'quad' is the quadrangle boundary.

mape %quad%
maplimits 0.0 2.4 32 27

/*draw outside box
linesymbol 9
linecolor 1
box 0.5 0.5 39 28.5

textquality proportional
textfont 94021
linedelete all
lineset plotter
lineset carto

/* cut marks
markerset plotter
markersymbol 1
markersize 0.1
marker 0 0
marker 0 29
marker 39.5 0
marker 39.5 29
markerset water

&label shadepolys
/* color polygons for geologic rock units
shadedelete all
shadeset calcomp1
polygonshade %cover1% unit %cover1%.ru

&label linework
/* plot contacts and boundaries
linedelete all
lineset geology.lin
res %cover1% arcs linecode gt 0 and linecode lt 40
arclines %cover1% linecode %cover1%.con
asel %cover1% arcs
linedelete all
lineset carto.lin
```

```
res %cover1% arcs linecode gt 40 and linecode
lt 100
arclines %cover1% linecode %cover1%.con
asel %cover1% arcs

&label structure
/* plot faults and fold axes, etc. with line
patterns
linedelete all
lineset geology.lin
res %cover1% arcs linecode gt 100 and linecode
lt 600
arclines %cover1% linecode %cover1%.str
asel %cover1% arcs

&label mapquad
/* plot quadrangle boundary
linedelete all
lineset plotter
linesymbol 5
arcs %quad%

/* plot state boundary
linedelete all
lineset carto.lin
res %cover1% arcs linecode eq 71
arclines %cover1% linecode %cover1%.con
asel %cover1% arcs

&label geolabels
textsize 0.10
res %cover1% poly area gt 300000
labeltext %cover1% unit %cover1%.ru cc
asel %cover1% poly
res %cover1% poly unit = 226
res %cover1% poly area gt 285000 and area le
300000
labeltext %cover1% unit %cover1%.ru cc
asel %cover1% poly

&label points
/* plot points for map symbols
markerdelete all
markerset geology.mrk
pointmarkers %pntcover% symbol

/*  plot annotation for all points
textset font.txt
/* annotext cover subclass # {level...level}
/*annotext %pntcover% dip # 1 2
annotext %pntcover% dip # 1

&label titles
textfont 93715
textquality kern
textsize 0.5
move 1.5 27.5
text 'U.S. DEPARTMENT OF THE INTERIOR'
move 1.5 26.9
text 'U.S. GEOLOGICAL SURVEY'
move 38 27.5
text 'Open-File Report 99-438' lr
move 38 26.9
text 'Plate 1' lr
textfont 93711
textsize 0.7
move 16.2 2.6
text 'Digital Geologic Map of part of the Thompson
Falls 1:100,000 quadrangle, Idaho' lc
textsize 0.5
move 16.2 2.0
text 'by Reed S. Lewis and Pamela D. Derkey' lc
move 16.2 1.2
text '1999' lc

&label explan
/* plot explanation - geologic units
shadedelete all
shadeset calcomp1
textfont 93711
textsize 0.20
move 32.0 25.7
text 'Explanation'
textsize 0.12
textquality proportional
textfont 94021
keyarea 32.0 17.5 40.4 25.45
keybox 0.6 0.35
keyseparation 0.2 0.2
keyshade %key1% nobox

&label linekey
/* plot explanation - line key
linedelete all
lineset geology.lin
keyarea 32.0 11.0 40.4 17.4
keybox 0.6 0.0
keyline %key2% nobox

&label markers
/* plot explanation - marker key
markerdelete all
markerset geology.mrk
/*keyarea 32.0 11.5 40.4 10.5
keymarker %key3% nobox

&label refs
/* plot references
```

```
textfont 93711
textsize 0.20
textcolor 1
move 32.0 11.6
text 'References'
move 32.0 11.4
textsize 0.12
textquality proportional
textfont 94021
textfile %refs%

&label disclaimer
textfont 93713
textquality proportional
textsize 0.12
move 35.22 2.2
textfile %disclaimer%

&label credits
/*plot credits
textfont 94021
textquality proportional
textsize 0.12
move 25.5 3.8
textfile %credits%

&label proj
/*plot map projection notes
textfont 94021
textquality proportional
textsize 0.12
move 1.8 3.7
text 'map projection: UTM, zone 11'

/* plot scale bars
linedelete all
lineset plotter
textfont 94021
textsize 0.12
&r scale2a 4.77 2.1 other 100000

&label index-map
plot index_tf.gra box 32.0 4.00 35 6.00
textfont 93713
textquality proportional
textsize 0.12
move 32.0 3.95
text 'Index map showing Thompson Falls
quadrangle'

&label lat-long
/* plot neat line labels (latitude and longitude)
mape %quad%
linecolor 1
mapprojection geo.prj u11.prj
neatline -116 47.5 -115 48.0 geo.prj
neatlinehatch 0.125 0.125 0.2 0 geo.prj
textset font.txt
textsymbol 1
textsize 8 pt
textstyle typeset
textoffset -0.35 0.15
neatlinelabels 0.125 top all geo.prj dms
'%1%!pat1857; %2%!pat1727; %3%!pat1728'
textoffset -0.75 0.0
neatlinelabels 0.125 left all geo.prj dms
'%1%!pat1857; %2%!pat1727; %3%!pat1728'

&label done
quit
display 9999 3
draw tf100k
&return
```

Appendix D - Metadata (tf100k.met)

```
Identification_Information:
  Citation:
    Citation_Information:
      Originator: Reed S. Lewis
      Originator: Pamela D. Derkey
      Publication_Date: 1999
      Title:
        Digital geologic map of part of the Thompson Falls 1:100,000 quadrangle,
        Idaho
      Edition: version 1.0
      Geospatial_Data_Presentation_Form: map
      Series_Information:
        Series_Name: Open-File Report 99-438
        Issue_Identification: tf100k.e00, tfpnt.e00

      Publication_Information:
        Publication_Place: Spokane WA
        Publisher: U.S. Geological Survey

      Online_Linkage: URL = http://wrgis.wr.usgs.gov/open-file/of99-438
  Description:
    Abstract:
      The geology of the Thompson Falls 1:100,000 quadrangle, Idaho was
      compiled by Reed S. Lewis in 1997 onto a 1:100,000-scale topographic
      base map for input into an Arc/Info geographic information system
      (GIS).  The digital geologic map database can be queried in many ways
      to produce a variety of derivative geologic maps.

    Purpose:
      This dataset was developed to provide geologic map GIS of the
      Idaho portion of the Thompson Falls 1:100,000 quadrangle for use
      in future spatial analysis by a variety of users.

      This database is not meant to be used or displayed at any scale
      larger than 1:100,000 (e.g., 1:62,500 or 1:24,000).

    Supplemental_Information:
      This GIS consists of two major Arc/Info datasets: one line and
      polygon file (tf100k) containing geologic contacts and structures
      (lines) and geologic map rock units (polygons), and one point file
      (tfpnt) containing structural data.

  Time_Period_of_Content:
    Time_Period_Information:
      Single_Date/Time:
        Calendar_Date: 1999
    Currentness_Reference: publication date

  Status:
    Progress: complete
```

Maintenance_and_Update_Frequency:
Plan to update with a new geologic map data model, perhaps in 2000.

Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -116.0
East_Bounding_Coordinate: -115.0
North_Bounding_Coordinate: 48.00
South_Bounding_Coordinate: 47.50

Keywords:
Theme:
Theme_Keyword_Thesaurus: none
Theme_Keyword: geology
Theme_Keyword: geologic map
Place:
Place_Keyword_Thesaurus: none
Place_Keyword: Idaho
Place_Keyword: Thompson Falls
Place_Keyword: Shoshone County
Place_Keyword: Pacific Northwest
Place_Keyword: USA

Access_Constraints:

Use_Constraints:
This digital database is not meant to be used or displayed at any scale larger than 1:100,000 (e.g., 1:62,500 or 1:24,00).

Any hardcopies utilizing these data sets shall clearly indicate their source. If the user has modified the data in any way they are obligated to describe the types of modifications they have performed on the hardcopy map. User specifically agrees not to misrepresent these data sets, nor to imply that changes they made were approved by the U.S. Geological Survey.

Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Pamela D. Derkey
Contact_Organization: U.S. Geological Survey
Contact_Position: geologist
Contact_Address:
Address_Type: mailing and physical address
Address: 904 W. Riverside Ave., Rm. 202
City: Spokane
State_or_Province: WA
Postal_Code: 99201
Country: USA
Contact_Voice_Telephone: 1-509-368-3114
Contact_Facsimile_Telephone: 1-509-368-3199
Contact_Electronic_Mail_Address: pderkey@usgs.gov

Data_Set_Credit:
Reed S. Lewis (contractor) compiled the geology onto stable-base material;
Optronics Specialty Co., Inc. scanned the geologic map and provided minimally attributed Arc/Info interchange-format files to the USGS;
Pamela D. Derkey (USGS) imported the files, transformed them to UTM zone 11 (with a y-shift) and attached and attributed an interim geologic map data model;
Thomas P. Frost (USGS) visually compared the hard copy plots with the source;
Jon R. Oblad (EWU) annotated the point data for output at a scale of 1:100,000.

Native_Data_Set_Environment:
SunOS, 5.5.1, sun4u UNIX
ARC/INFO version 7.1.1

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
Attribute accuracy was verified by manual comparison of the source with hard copy printouts and plots.

Logical_Consistency_Report:
Polygon and chain-node topology present.
Polygons intersecting the neatline are closed along the border.
Segments making up the outer and inner boundaries of a polygon tie end-to-end to completely enclose the area. Line segments are a set of sequentially numbered coordinate pairs. No duplicate features exist nor duplicate points in a data string. Intersecting lines are separated into individual line segments at the point of intersection. Point data are represented by two sets of coordinate pairs, each with the same coordinate values. All nodes are represented by a single coordinate pair which indicates the beginning or end of a line segment. The neatline was generated by mathematically generating the four sides of the quadrangle, densifying the lines of latitude and projecting the file to UTM zone 11 (with a y-shift).

Completeness_Report:
All geologic units were compiled from previously existing geologic maps ranging in scale from 1:24,000 to 1:250,000.

Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
The horizontal positional accuracy for the digital data is no better than +/- 7 meters based on the transformation RMS error. It was tested by visual comparison of the source with hard copy plots.

Lineage:
Source_Information:

Source_Citation:
Citation_Information:
Originator: Griggs, A.B.
Publication_Date: not published
Title:
Unpublished geologic maps of the Bloom Peak 7.5-, Burke 15-, Cooper Gulch 15-, Gem Peak 7.5-, Noxon 7.5- and Taylor Peak 7.5-minute quadrangles, Idaho
Geospatial_Data_Presentation_Form: map
Publication_Information:
Publication_Place: Denver CO
Publisher: U.S. Geological Survey Field Records Library
Source_Scale_Denominator: 24,000
Source_Scale_Denominator: 62,500
Type_of_Source_Media: paper maps
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1961-1969
Source_Currentness_Reference: date of field mapping
Source_Citation_Abbreviation: Griggs, unpublished field notes
Source_Contribution: These field maps were used in the map compilation.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Harrison, J.E.
Originator: Griggs, A.B.
Originator: Wells, J.D.
Publication_Date: 1986
Title:
Geologic and structure maps of the Wallace 1- by 2-degree quadrangle, Montana and Idaho
Geospatial_Data_Presentation_Form: map
Series_Information:
Series_Name: Miscellaneous Investigations Series
Issue_Identification: Map I-1509A
Publication_Information:
Publisher: U.S. Geological Survey
Source_Scale_Denominator: 250,000
Type_of_Source_Media: paper maps
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1986
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Harrison and others, 1986
Source_Contribution: This map was used in the map compilation.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Hobbs, S.W.
Originator: Griggs, A.B.
Originator: Wallace, R.E.
Originator: Campbell, A.B.

Publication_Date: 1965
Title: Geology of the Coeur d'Alene district
Geospatial_Data_Presentation_Form: map
Series_Information:
Issue_Identification: Professional Paper 478
Publication_Information:
Publisher: U.S. Geological Survey
Source_Scale_Denominator: 24,000
Type_of_Source_Media: paper maps
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1965
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Hobbs and others, 1965
Source_Contribution: These maps were used in the map compilation.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Hosterman, J.W.
Publication_Date: 1956
Title: Geology of the Murray area, Shoshone County, Idaho
Geospatial_Data_Presentation_Form: map
Series_Information:
Issue_Identification: Bulletin 1027-P
Publication_Information:
Publisher: U.S. Geological Survey
Source_Scale_Denominator: 62,500
Type_of_Source_Media: paper map
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1956
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Hosterman, 1956
Source_Contribution: This map was used in the map compilation.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Gibson, Russell
Originator: Jenks, W.F.
Originator: Campbell, Ian
Publication_Date: 1941
Title:
Stratigraphy of the Belt series in Libby and Trout
Creek quadrangles, northwestern Montana and northern
Idaho
Geospatial_Data_Presentation_Form: maps?
Series_Information:
Series_Name: Geological Society of America Bulletin
Issue_Identification: vol. 52, no. 3, p. 363-379
Publication_Information:
Publisher: Geological Society of America
Source_Scale_Denominator: 180,000

Type_of_Source_Media: paper maps?
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1941
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Gibson and others, 1941
Source_Contribution:
This source was used as a secondary source in compiling the geologic map.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Ransome, F.L.
Originator: Calkins, F.C.
Publication_Date: 1908
Title:
The geology and ore deposits of the Coeur d'Alene district, Idaho
Geospatial_Data_Presentation_Form: maps
Series_Information:
Issue_Identification: Professional Paper 62
Publication_Information:
Publisher: U.S. Geological Survey
Source_Scale_Denominator: 62,500
Type_of_Source_Media: paper map
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1908
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Ransome and Calkins, 1908
Source_Contribution: This map was used in the map compilation.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Schalck, D.K.
Publication_Date: 1989
Title:
The geology and alteration of the Gem stocks, Shoshone County, Idaho: in V.E. Chamberlain, R.M. Breckenridge, and Bill Bonnichsen (editors), Guidebook to the geology of northern and western Idaho and surrounding area
Geospatial_Data_Presentation_Form: map
Series_Information:
Issue_Identification: Bulletin 28
Publication_Information:
Publisher: Idaho Geological Survey
Publication_Place: Moscow, Idaho
Source_Scale_Denominator: unknown
Type_of_Source_Media: paper map
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:

```
        Calendar_Date: 1989
      Source_Currentness_Reference: publication date
    Source_Citation_Abbreviation: Schalck, 1989
    Source_Contribution:
      This source was used as a secondary source in compiling
      the geologic map.
  Source_Information:
    Source_Citation:
      Citation_Information:
        Originator: U.S. Geological Survey
        Publication_Date: 1993
        Title:
          1:100,000-scale digital line graph (DLG) data -
          hydrography and transportation, Area 13 --
          Northwestern states
        Geospatial_Data_Presentation_Form: digital line graph (DLG) data
        Series_Information:
          Series_Name: US GeoData (optional format)
        Publication_Information:
          Publisher: U.S. Geological Survey
    Source_Scale_Denominator: 100,000
    Type_of_Source_Media: CD-ROM
    Source_Time_Period_of_Content:
      Time_Period_Information:
        Single_Date/Time:
          Calendar_Date: 1993
      Source_Currentness_Reference: publication date
    Source_Citation_Abbreviation: USGS, 1993
    Source_Contribution:
      This source provided the eastern boundary of the map
      area (Idaho-Montana) boundary in a digital format.
  Source_Information:
    Source_Citation:
      Citation_Information:
        Originator: Shenon, P.J.
        Publication_Date: 1938
        Title: Geology and ore deposits near Murray, Idaho
        Geospatial_Data_Presentation_Form: map?
        Series_Information:
          Issue_Identification: Pamphlet 47
        Publication_Information:
          Publication_Place: Moscow, Idaho
          Publisher: Idaho Bureau of Mines and Geology
    Source_Scale_Denominator: unknown
    Type_of_Source_Media: paper map?
    Source_Time_Period_of_Content:
      Time_Period_Information:
        Single_Date/Time:
          Calendar_Date: 1938
      Source_Currentness_Reference: publication date
    Source_Citation_Abbreviation: Shenon, 1938
    Source_Contribution:
      This source was used as a secondary source in compiling
      the geologic map.
```

```
    Source_Information:
      Source_Citation:
        Citation_Information:
          Originator: Umpleby, J.B.
          Originator: Jones, E.L., Jr.
          Publication_Date: 1923
          Title: Geology and ore deposits of Shoshone County, Idaho
          Geospatial_Data_Presentation_Form: map
          Series_Information:
            Issue_Identification: Bulletin 732
          Publication_Information:
            Publisher: U.S. Geological Survey
      Source_Scale_Denominator: 250,000
      Type_of_Source_Media: paper map
      Source_Time_Period_of_Content:
        Time_Period_Information:
          Single_Date/Time:
            Calendar_Date: 1923
        Source_Currentness_Reference: publication date
      Source_Citation_Abbreviation: Umpleby and Jones, 1923
      Source_Contribution:
        This secondary source provided additional information
        in compiling the geologic map.
    Process_Step:
      Process_Description:
        Geologic map information from source maps were reduced to a
        scale of 1:100,000 using a copy machine, then manually compiled
        onto a stable-base copy of the USGS 1:100,000-scale topographic
        quadrangle map and manually labeled.
      Process_Description:
        Stable-base map was scanned and converted from
        a raster to a vector format (in scanner units).
      Process_Description:
        Digital files were transformed to UTM zone 11 (meters),
        with a RMS error (input,output) = (0.003, 7.350), and
        attributed using an interim geologic map data model.
        The data were checked for position by comparing plots
        of the digital data to the source.
      Process_Date: 1998

  Spatial_Data_Organization_Information:
    Direct_Spatial_Reference_Method: Vector
    Point_and_Vector_Object_Information:
      SDTS_Terms_Description:
        SDTS_Point_and_Vector_Object_Type: Point
        Point_and_Vector_Object_Count: 230
        SDTS_Point_and_Vector_Object_Type: String
        Point_and_Vector_Object_Count: 744
        SDTS_Point_and_Vector_Object_Type: GT-polygon composed of chains
        Point_and_Vector_Object_Count: 231

  Spatial_Reference_Information:
    Horizontal_Coordinate_System_Definition:
      Planar:
```

```
      Grid_Coordinate_System:
        Grid_Coordinate_System_Name: Universal Transverse Mercator
        Universal_Transverse_Mercator:
          UTM_Zone_Number: 11
          Transverse_Mercator:
            Scale_Factor_at_Central_Meridian: implied
            Longitude_of_Central_Meridian: implied
            Latitude_of_Projection_Origin: implied
            False_Easting: 0.000
            False_Northing: -5,000,000 meters
      Planar_Coordinate_Information:
        Planar_Coordinate_Encoding_Method: coordinate pair
        Coordinate_Representation:
          Abscissa_Resolution: not determined
          Ordinate_Resolution: not determined
        Planar_Distance_Units: METERS
    Geodetic_Model:
      Horizontal_Datum_Name: North American Datum of 1927
      Ellipsoid_Name: Clarke 1866
      Semi-major_Axis: 6378206.4
      Denominator_of_Flattening_Ratio: 294.98

Entity_and_Attribute_Information:
  Overview_Description:
    Entity_and_Attribute_Overview:
      The 'Digital geologic map of part of the Thompson Falls 1:100,000
      quadrangle, Idaho' Open-File Report 99-438 contains a detailed
      description of each attribute code and a reference to the
      associated map symbols on the map source materials.
      The GIS includes a geologic linework arc attribute table,
      tf100k.aat, that relates to the tf100k.con (contact look-up
      table), tf100k.str (structure look-up table), and tf100k.ref
      (source reference look-up table) files; a rock unit polygon
      attribute table, tf100k.pat, that relates to the tf100k.ru
      (rock unit look-up table) and tf100k.ref (source reference
      look-up table) files; and a geologic map symbol point
      attribute table, tfpnt.pat, that relates to the tfpnt.sym
      (structural point data look-up tables) and tfpnt.ref (source
      reference look-up table) files.
    Entity_and_Attribute_Detail_Citation: see PDF of text on website.

Distribution_Information:
  Distributor:
    Contact_Information:
      Contact_Organization_Primary:
        Contact_Organization: U.S. Geological Survey Information Services
      Contact_Address:
        Address_Type: mailing and physical address
        Address: Open-File Reports, Box 25286
        City: Denver
        State_or_Province: CO
        Postal_Code: 80225
        Country: USA
      Contact_Voice_Telephone: 1-303-202-4200
```

Contact_Facsimile_Telephone: 1-303-202-4695

Contact_Information:
Contact_Person_Primary:
Contact_Person: Pamela D. Derkey
Contact_Organization: U.S. Geological Survey
Contact_Position: Database Administrator
Contact_Address:
Address_Type: mailing and physical address
Address: 904 West Riverside, Rm. 202
City: Spokane
State_or_Province: WA
Postal_Code: 99201
Country: USA
Contact_Voice_Telephone: 1-509-368-3114
Contact_Facsimile_Telephone: 1-509-368-3199
Contact_Electronic_Mail_Address: pderkey@usgs.gov
Contact_Information:
Contact_Organization_Primary:
Contact_Organization:
U.S. Geological Survey - Earth Science Information
Office
Contact_Address:
Address_Type: mailing and physical address
Address: 904 West Riverside, Rm. 135
City: Spokane
State_or_Province: WA
Postal_Code: 99201
Country: USA
Contact_Voice_Telephone: 1-509-368-3130
Contact_Facsimile_Telephone: 1-509-368-3194
Contact_Electronic_Mail_Address: esnfic@mailmcan1.wr.usgs.gov
Hours_of_Service: 8:00 a.m. - 4:30 p.m., Pacific time zone
Distribution_Liability:
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