DIGITAL MAPPING TECHNIQUES  2016

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The contents of this document are provisional

See Presentations and Proceedings from the DMT Meetings (1997-2016)

http://ngmdb.usgs.gov/info/dmt/
Montana’s 1:100K Seamless Geodatabase: Progress and Challenges

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In December 2015, the Montana Bureau of Mines and Geology (MBMG) released its 1:100,000-scale NCGMP09-based geodatabase that seamlessly combines 79 existing (legacy) 1:100,000-scale geologic maps, 5 of which were originally published by the USGS. The geodatabase currently covers approximately 80 percent of Montana (fig. 1), but will eventually include the entire state as additional 1:100,000 geologic maps are completed. The MBMG began creating the geodatabase in 2012 in response to our geologic map users who were requesting a statewide, seamless digital geologic map.

Figure 1. Current extent (May 2016) of Montana’s seamless 1:100,000-scale geologic map geodatabase. The geodatabase is available as an ArcGIS map service (www.mbm.mtech.edu/gis-ArcGISservices.asp) or as an ArcGIS map package (ftp://sun2.mtech.edu/pub/geology/Seamless_geology_100k.mpk).

The seamless geodatabase was created by migrating existing ArcInfo coverages of our legacy geologic maps into the NCGMP09 template. Some major challenges that the MBMG faced while creating the geodatabase included edgematching across map boundaries and distilling a consistent set of codes for the 839 geologic formations in the geodatabase. The feature classes currently available include ContactsAnd Faults, MapUnitPolys, OtherLines (folds axes, dikes, etc), OrientationDataPoints, GlacialAndSurficialLines, and CartographicLines (cross-section lines from original maps). On-going work includes completing the attribute tables, the NCGMP09 DataSourcePolys feature class, the required look-up tables (DataSources, DescriptionOfMapUnits, and Glossary) and general editing of the geologic data.

The seamless geodatabase is available as an ArcGIS map service (www.mbm.mtech.edu/gis-ArcGISservices.asp) or as an ArcGIS map package (ftp://sun2.mtech.edu/pub/geology/Seamless_geology_100k.mpk). The MBMG also created a geodatabase of its legacy maps to preserve the original geologic data. The legacy data are available in the same web locations as the seamless data. In the future, all map updates and corrections will be to the seamless geodatabase.
Montana’s 1:100K Seamless Geodatabase
Progress and Challenges

Katie McDonald and Paul Thale
Montana Bureau of Mines and Geology
DMT 2016
OUTLINE

• Seamless geodatabase progress
  - “Completed” components
  - Challenges converting to NCGMP09
  - In-progress components
• Accessing the data
• Is seamless data getting used?
• Future work
  - Updates/Revisions

Why

• Regional geologic and hydrologic investigations, seamless geologic data needed
• Long-term goal of STATEMAP advisory committee – entire state at 1:100K
1:100K SEAMLESS GEODATABASE

Status

- Released Dec 2015 (ArcGIS map service)
- NCGMP09 Template
- 79 maps (5 USGS)
- 15 quads to add/map
  - 2 by Fall 2016
  - 3 in progress (☆)
  - NW in ~2020
CURRENT COMPONENTS

NCGMP09 “as needed” feature class

NCGMP09 “required” feature class
IN-PROGRESS COMPONENTS

NCGMP09 “required” feature classes/tables

Attribute Tables
- Complete
- Revise??

(from USGS Suquamish quad, WA) (from MBMG seamless geodatabase)
Challenges - Contacts, Faults, Polygons

- ArcInfo Coverages to ArcMap feature classes
- Edgematching
- Colors
- Codes

~ 3 years GIS & Geologist
Better!
MapUnitPolys

• 839 Map Units
  - Quaternary alluvium (Qal) to Archean ultramafic rocks

• 114,840 Polygons
  - 8,327 Qal – most common

• 15 more maps to add!
Description of Map Units (DMU) Table

NCGMP09 Fields
- Map Unit
- Label
- Name
- Full Name
- Age
- Description
- General Lithology
- General Lithology Confidence

MBMG additional fields (???)
- Name
  - Supergroup, Group, Formation, Member
- Age
  - Era, Eon, Period, Epoch
- Rock Class
  - Sedimentary, Igneous, Metamorphic ...
- Thickness
  - Minimum, Maximum
- Map
  - Map(s) where unit occurs
### MBMG “DMU” Table (in-progress)

#### Managing Codes

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<th>Codes</th>
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#### Hydro Staff - for modelling

- Different code, same Group
- Review & revise

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*Note: The table is in-progress and subject to review and revision.*
Unit Descriptions

- Cut and paste from existing maps
- How much detail???
- Hyperlink to original map??

**Tan: Andesite**

Andesite sills that pre-date folding in the Tobacco Root Mountains.

**Tre: Renova Formation**

Melrose area: Light orangish pink and very light gray, tuffaceous, sandy siltstone, and fine-grained sandstone, tuff, and bentonitic mudstone, with sparse lenses of coarser clasts, primarily volcanic that range from granules to small cobbles. Contains Chadronian (Eocene) vertebrate fossils in the Trapper Creek area (Tabrum and Nichols, 2001) and unidentifiable fossil bone fragments to the south. Thickness about 150 m (500 ft; Richards and Pardee, 1925).

Sassman Gulch area: (Tysdal and others, 1994) Light gray to pale yellowish brown and grayish orange-pink sandstone, siltstone, and local claystone. Sandstone, fine- to coarse-grained, calcareous in some areas, and locally contains boulders as large as 25 cm (10 in) in diameter. Rochester area: Light yellowish to medium brown, slightly bentonitic mudstone with flecks of organic matter.
Reviewing and Editing

- Same data in different feature classes
- Coding mistakes – correct code is 13.60

Other Lines

Dikes, lineaments, folds, veins, unconformity, terrace, silcrete, scarp, glacial extent, glacial channel, glacial lake margin

Glacial And Surficial Lines

Glacial extent, glacial channel, glacial lake margin

Line code 13.60 (Glacial extent)

Line code 13.43 (Margin of glacially scoured basin)
Folds

- All fold axes currently coded 5.1.1 (anticline)
- Decorations (points) – correct symbols
- Will correct line codes

Montana is not anti-synclinal!
OtherLines – More Editing/Decisions

Dikes

• Legacy Maps
  - Same line type, different meanings
  - Concealed dikes

• NCGMP09/FGDC
  - 6 line type choices
  - No concealed dike symbol

• Using “Notes” column in attribute table to capture information if no FGDC symbol

Legends from Legacy Maps
Point Data Editing

- Legacy maps (pre 2013)
  - One symbol for foliation
  - In seamless, all coded 8.3.2 ( = secondary, metamorphic or tectonic foliation)

- Seamless, using NCGMP09/FGDC template
  - Many choices
  - Need to capture author’s intent from legacy maps, e.g. volcanic flow foliation

![Diagram showing foliation symbols and directions](image-url)
Also available as a Map Package via FTP site

ftp://sun2.mtech.edu/pub/geology/Seamless_geology_100k.mpk
Is seamless geodatabase getting used?

**Web Service “Hits” - 2016**

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<th>Month</th>
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<td>May</td>
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</table>

**LEGACY USAGE (Jan – May 2016)**

- 20,764 – Pdfs/digital downloads for 68 of 79 1:100K maps
FUTURE WORK

• Finish tables, edit existing data
• Developing a policy for revisions (monthly? quarterly?)
  - Revisions will be to seamless geodatabase, not legacy digital data
• Add additional data
  - Age dates
  - Geochemical analyses
  - Fossil locations
  - Other data??
QUESTIONS

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