Planning levels of resolution content in the national geological mapping database

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Most mapping shows land-surface features
Weather forecasts come from dynamic maps of the atmosphere.
The first subsurface layer is bathymetry.
Beneath that is soil mapping by agricultural agencies.
Then, underground structures, and geology
Geological mapping is needed for:

- Energy
- Minerals
- Water
- Hazards
- Environment
- Waste
- Engineering
- Research
2D geological mapping
3D geological mapping
Drillhole data

- acquire
- digitize
- georeference
- categorize
Geophysics

- EM
- Seismic
- Radar
- Borehole surveys
- Marine geophysics
- Gravity, magnetics
The current approach to geological mapping in the USA was outlined in the 1980s by USGS, AASG, and advisory committees, starting with a meeting in Illinois in 1982.
As a result, the National Geologic Mapping Act (NGMA) became Law in 1992
“The purpose of this Act is to expedite the production of a geologic-map data base for the Nation, to be located within the United States Geological Survey”
The National Geologic Mapping Act (NGMA) mandated the National Cooperative Geologic Mapping Program (NCGMP), consisting of geological mapping by federal, state, and university partners, made consistent and available as the National Geologic Map Database (NGMDB)
Under NCGMP, about $25M is distributed annually to support geological mapping by federal, state, and university partners; partners spend about an equal amount, for a total of ~$50M/year.
NGMDB Standards and Databases

Information standards
- Metadata standard
- Cartographic standard
- Digital map standard
- Database standard

NGMDB
- Publication database
- Paleontology database
- Lexicon database
- Mapping database

As part of NCGMP, the NGMDB Project has coordinated development of standards and databases under the leadership of Dave Soller.

The National Geologic Map Database

Developing a distributed archive of standardized geologic information for the nation.
Our principal forum for the development of geologic map standards in the US is the annual DMT workshop, which was held in Minneapolis this year.
2013: The most recent USGS planning called for collaboration leading to 1) seamless nationwide geological maps, 2) 3D maps that will for example improve understanding of sedimentary basin processes, and 3) 4D modeling that will elucidate the operation of processes through time.
2014: The Association of American State Geologists (AASG) unanimously passed a resolution on geologic mapping that is fully compatible with USGS planning in Lexington, Kentucky on June 11, 2014.
Last year, we held the NCGMP Decadal Strategic Planning Workshop from August 9th to 11th in Denver.
Renewing the National Cooperative Geologic Mapping Program as the Nation’s Authoritative Source for Modern Foundational Geologic Knowledge

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The strategic plan was completed in May 2017
How shall we build a national, regularly-updated, well-coordinated, multi-resolution, seamless, 3D, material-properties-based geological mapping database?

We seem to need 1) 2D, 2) X-S, 3) 3D of the layers, 4) basement 2D/3D – in that order?

Which resolution level should we start with?

Next, we need an implementation plan.

![Flat Gantt Chart](image)
Resolution

- Global
- Continental
- National
- County
- Urban
County 2D

Montana Bureau of Mines and Geology
To some degree, we will want to zoom in to the engineering scale.
## Resolution

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<th>Global</th>
<th>Continental</th>
<th>State/National</th>
<th>County/Quadrangle</th>
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<tr>
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<td>One layer</td>
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<tr>
<td>Layered rocks</td>
<td>Half dozen layers</td>
<td>A dozen or more</td>
<td>Formations</td>
<td>Formations +</td>
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<tr>
<td>Basement</td>
<td>Basement</td>
<td>Basement</td>
<td>Basement</td>
<td>Basement</td>
</tr>
</tbody>
</table>

**Preliminary outline for discussion**

A challenge presently being addressed is the planning of levels of resolution content in the national geological mapping database.
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