DIGITAL MAPPING TECHNIQUES 2021

The following was presented at DMT’21
(June 7 - 10, 2021 - A Virtual Event)

The contents of this document are provisional

See Presentations and Proceedings from the DMT Meetings (1997-2021)

http://ngmdb.usgs.gov/info/dmt/
As part of the U.S. GeoFramework Initiative discussion topic, Jessica Czajkowski (Washington Geological Survey) and Mark Yacucci (Illinois State Geological Survey) held an interactive session using Mentimeter to conduct real-time polling of staff-level opinions on agency capabilities (e.g., staffing levels and skill sets, and available data sets) to participate in the NCGMP U.S. GeoFramework Initiative. Polling questions pertained to data types and formats, data management, map scale users, availability, and formats, stratigraphic correlations, GeMS, GIS, 3D modeling, copyright, and other topics. Most questions were aimed at State Geological Surveys, and several questions were asked of USGS staff. In parallel with similar Mentimeter polling of State Geologists and USGS managers during the U.S. GeoFramework Initiative Strategic Implementation Workshop a month prior, polling results reflected the high degree of variability across State Geological Surveys regarding their data availability, types, formats, and processes, their enterprise systems, and technical ability to contribute to the U.S. GeoFramework Initiative.

After the polling, brief breakout discussions identified some key issues and potential including:

1. The need for better subsurface information (e.g., water well locations). In some cases, a state can’t yet create GIS compilations, but could use the funds to clean up ancillary data useful for geologic mapping.
2. Administrative issues (e.g., GIS staff funding and retention, centralized staff serving multiple agencies, software purchasing requirements) may determine a State's ability to participate.
3. More long term (i.e., more than one year) predictability in funding is essential for planning a States's participation in this Initiative. Especially for hiring plans and various science issues such as prioritization for converting legacy maps to GeMS.
Staff-Level Survey of Capabilities for the USGS GeoFramework Initiative

Digital Mapping Techniques, June 2021
Is your state building, maintaining or considering ancillary databases regardless of participation in the GeoFramework Initiative?
Does your state collect and manage borehole and(or) water well information?

Yes: 53
No: 3
Does your state collect and manage oil and gas well information?

Yes: 45
No: 8

Total: 53
Does your state collect and manage coal resource information?

Yes: 37
No: 16
Does your state collect and manage paleontologic information?

Yes: 33
No: 17
Does your state collect and manage geochronologic information?

Yes: 38
No: 13
Does your state collect and manage geochemical information?

Yes: 45
No: 5
Does your state collect and manage geophysical information?

Yes: 46
No: 5
How are your ancillary data managed?

- Single databases: 7
- Comprehensive database: 2
- Separate files: 7
- Some of each: 38
Does your survey have an up-to-date, in-house statewide stratigraphic chart?

- Yes: 23
- No: 18
- We rely on Geolex: 7
Does your survey have a statewide geologic names lexicon?

- Yes: 11
- No: 16
- Unsure: 16
- We use Geolex: 9

Total: 52
Is your survey currently able to create GeMS (Level 2 or 3) files?

Yes: 42
No: 12
Does your survey plan to use GeMS for non-USGS deliverables?

- Yes: 9
- No: 23
- In part: 21
Does your state have the resources to convert high-priority paper maps to GeMS?

- Yes: 30
- No: 23
Does your state have the resources to convert high-priority GIS files to GeMS?
Does your state have the resources to export geologic map data from your corporate system to GeMS?

- Yes: 22
- No: 14
- Not applicable: 11
Does your survey have a database schema suitable for creating regional compilations?

Yes: 31
No: 17
If your survey is creating subsurface data such as top of rock or thickness of unconsolidated materials, what is the format?

- Raster: 8
- Vector: 6
- Both: 22
- Not applicable: 11
Does your survey create or plan to create 3D data or models?

- Yes: 40
- No: 11
Does your survey copyright your publications?

- Yes: 4
- No: 24
- Some publications are copyrighted: 5
- Unknown: 16
States: Based on your current mapping inventory, could your state compile a seamless statewide 2D map in GeMS at an appropriate scale?

- We already have done this or could easily do this: 21
- We would need to mix multiple scales of mapping to make seamless: 18
- We cannot compile a statewide map without having gaps: 12
FedMappers: Is your desired output product a 1:50,000 or less detailed geologic map?

- Yes: 64%
- No: 36%
FedMappers: Can your basic or applied research objectives be addressed by 1:50,000 or less detailed geologic mapping?

- Yes: 43%
- No: 36%
- Unsure: 21%
States: Do you have the ability to partner with neighboring states for edgemapping or stratigraphic issues?

- 40%: We partner regularly with or without legal agreements, contracts in place.
- 24%: We occasionally partner for smaller projects.
- 4%: Our state is limited by policy or mandate from such partnerships.
- 20%: We have never done this in the past, but are open to it.
- 12%: There is some geographic variability in our ability to partner.
States: Characterize your state's borehole data. (check all that apply)

- 12 states have a spatially complete dataset that meets most of our needs.
- 15 states have a state's data that is patchy or mostly shallow.
- 3 states don't have subsurface data compiled.
- 18 states have subsurface data that has quality issues or is poorly located.
- 13 states have a dataset that can accommodate statewide data.
States: What are some of the limitations your survey faces with respect to the technicalities of going 3D? (Check all that apply)

- Limited network storage space: 16
- Limited capabilities for data processing: 21
- Poor enterprise GIS solutions: 17
- Limited staff expertise or resources: 41
- Lack of data: 27
- Other limitations: 16
For those that checked 'Other', please briefly describe what the challenges are:

- We have no limitations
- Limited funding and staff availability
- Software options and funding
- Funding
- 3d gridding is difficult
- Difficulty getting software approved
- GIS Staff centralization
- No staff position committed to GIS/database
- The quality of some of the subsurface data is not good enough for 3D usage
For those that checked 'Other', please briefly describe what the challenges are

<table>
<thead>
<tr>
<th>Challenge</th>
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<tbody>
<tr>
<td>limited time money and staff and so far 3-D work has been specific to projects</td>
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<td>Verification of borehole locations. Wildly variable skill level for geologic picks through the years (students with minimal exp to PGs with decades exp)</td>
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<tr>
<td>Funding</td>
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<tr>
<td>software/computing</td>
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<tr>
<td>GIS staff/time</td>
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<tr>
<td>Funding</td>
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<tr>
<td>limited budget, access to software limited</td>
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<tr>
<td>Need to invest more in GIS staff and software</td>
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For mappers, lack of 3d product need. 3d data and products are more in the realm of water and oil and gas geos.
States: Does your state have a current software solution in place for modeling in 3D? (Check all that apply)

- Esri: 30
- Open Source: 3
- Other proprietary solution: 13
- Solutions tried thus far have been unsatisfactory: 7
- Unsure: 13
FedMappers: Does your Fedmap project involve a partnership with a state survey to get the work done?

- Yes: 7
- No: 3
- Unsure: 1
FedMappers: Does your Fedmap project involve modeling in 3D?

- Yes: 2
- No: 3
- Maybe: 5
FedMappers: If your project creates 3D models, are they site specific or regional?
Everyone: Please rank the importance to your state for each factor with respect to the GeoFramework Initiative 3D output standards

1st: Clear requirements to create models
2nd: Ease of access to modeling
3rd: Reproducibility of models (access to inputs, frameworks, and outputs)
4th: Clear requirements to distribute models to users
5th: Ease of conversion from one format to another
6th: Clear requirements to display models
7th: Format flexibility
8th: Display performance
States: What scale of 3D map data will best meet the needs of the stakeholders in your state?

- 12k: 1
- 24k: 9
- Between 24 and 100k: 13
- 250k: 0
- 500k: 0
- 750k: 0
- Uncertain: 11
- Different stakeholders need different scales: 14
State Surveys: Which stakeholder group in your state are likely users of geologic 3D map data? (check all that apply)
States: Who do you envision/wish to perform the actual 3D modeling of your state?

- **USGS will incorporate the data for my state into a regional or national model**: 9%
- **We hope to partner with other states/fedmap to accomplish modeling as a team**: 43%
- **We will likely perform the 3D modeling ourselves for later synthesis into national model**: 48%
FedMappers: Will national-scale 3D geologic model data address the research objectives of Fedmap at large?

- Yes: 1
- Somewhat: 6
- No: 4
- Unsure: 5
Check all that apply: What collaboration tools for GIS, GeMS, and mapping information do you currently use or want to use?
If you said other, what is it?

- https://gitter.im/gems-schema/community
- interacting-cooperating with adjacent states to resolve issues
- Monthly lunch bag gatherings
- GMAC meetings
- CDEFG Meetings
- Attending seminars - see what is going on outside of my group
- USGS Community for Data Integration
- Gitter