

DIGITAL MAPPING TECHNIQUES 2019

The following was presented at DMT'19
(May 19 – 22, 2019 - Montana Technological
University)

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2019)

<http://ngmdb.usgs.gov/info/dmt/>

Discussion Session – “Building digital repositories, and using them – For example, NGMDB’s Phase Three” By Dave Soller (U.S. Geological Survey) and Harvey Thorleifson (Minnesota Geological Survey)

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Abstract

Geologic mapping is an essential service provided by geological surveys and partners that is needed by society for resource management, hazards resilience, infrastructure design, and research. Information is transitioning from static publications to ever-changing, machine-readable databases, and US Geological Survey (USGS) and AASG have committed to moving toward seamless 3D geological mapping. The National Geologic Mapping Act authorized the National Cooperative Geologic Mapping Program, whose purpose is to build the National Geologic Map Database (NGMDB). The NGMDB consists of Phase One – the catalog, Phase Two – the standards, and Phase Three – the GIS database; and Phase One is mature, the Phase Two metadata standard, digital map standard, cartographic standard, and database standard are now complete and in maintenance, and Phase Three pilots are complete.

Members of the Association of American State Geologists (AASG) therefore are urging Congress to direct immediate implementation of NGMDB Phase Three as a seamless, zoomable 3D geology for the Nation. AASG is contending that paper maps will remain the foundation of our activity; that State Geologists should be the principal contributors to the database; that Fedmap play a role in causing state contributions to gradually be more consistent state to state; that Statemap be the primary vehicle for delivering new federal funds for geologic mapping; that Edmap be strengthened; that new funding should enhance Phase Three infrastructure and state contributions; that the database consist of detailed, national, and continental-resolution progressively-more-seamless 2D and 3D mapping of sediments, cover rocks, and basement rocks; that states be paid to update their contributions every ~1 to 3 years; that states be paid to annually update a scoring of status; that 3D first be compiled at 1:5M; that there be new arrangements to support engineering; that a spectrum of new and old methods be used; and that we work closely with neighbors and soil mapping.



Digital Mapping Techniques

Butte, Montana

May 19 – 22, 2019

10:30 – 11:10 am Discussion Session – “Building digital repositories, and using them – For example, NGMDB’s Phase Three”

This session will begin with technical discussions on building and managing repositories, including comments received in response to a recent DMT listserv inquiry on that subject. Presentation and discussion will then transition to how the NGMDB’s repository (“Phase Three” of the project plan) can be used to support NCGMP’s strategic vision for a 3D framework of the Nation.

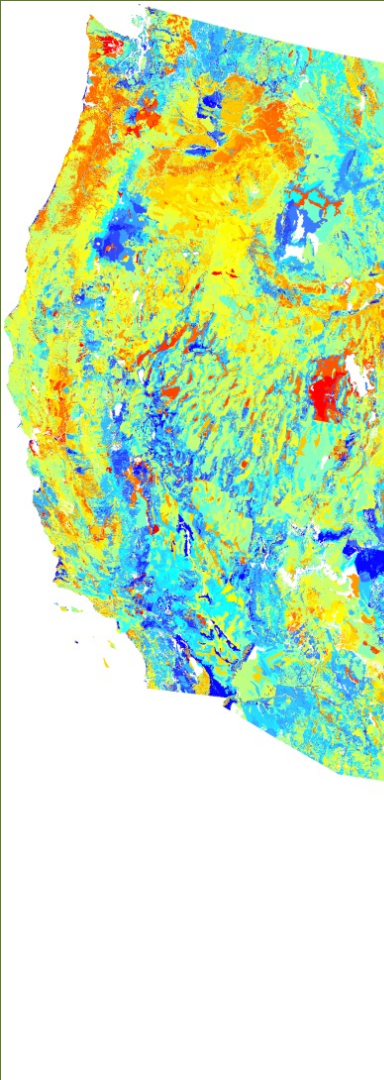
By Dave Soller (U.S. Geological Survey) and Harvey Thorleifson (Minnesota Geological Survey)

PROGRESS

DRAFT IMPLEMENTATION PLAN FOR THE USGS/AASG NATIONAL GEOLOGIC MAP DATABASE PHASE THREE

INTRODUCTION

- **Geological mapping is a spatial accounting of observed and inferred solid earth materials**
- **The term applies to surveys broader than the scope of land ownership or leasing**
- **Geological mapping is needed for resource and hazards management, engineering, and research**
- **Geological mapping is a major activity for teams of professionals at geological surveys**
- **Peer-reviewed, authored, innovative paper geological maps with a thorough legend and a series number are a durable format that will remain the foundation of our activity**



- Like all mapping, geology is transitioning from a publication paradigm to a database paradigm
- In the US, soil mapping can be looked to as a model for the future of geological mapping
- Published maps will be static documentation underpinning living, machine-readable databases
- Users will benefit if these evergreen databases are consistent, seamless, complete jurisdiction-wide from onshore to offshore, regularly updated, queryable, zoomable, 3D, and compatible with neighbors
- This will require, for each resolution level, 2D and 3D sediment, cover rock, and basement mapping
- For geology of the US, this transition is called National Geologic Map Database (NGMDB) Phase Three

ARRANGEMENTS

- **Geologic mapping as we know it was defined in the 1980s by US Geological Survey (USGS), Association of American State Geologists (AASG), and advisory committees**
- **In 1992, the National Geologic Mapping Act (NGMA) mandated the National Cooperative Geologic Mapping Program (NCGMP), with mapping and training by federal (Fedmap), state (Statemap), and university (Edmap) partners**
- **Under NCGMP, ~\$25M has been appropriated annually; other USGS sectors, other federal agencies, and states, spend a similar amount, bringing the annual total to ~\$50M/yr**
- **The NGMA requires that mapping be made consistent and available as the USGS/AASG NGMDB**

- **The NGMDB became the successor of the Index to Geologic Maps (GEOINDEX), the Geologic Names of the United States (GEONAMES), and the Geologic Map Data file (GEOMAPFIL)**
- **In 1995, the NGMDB conceptual design was for a distributed system - a single Internet-searchable point of public access for browsing and query of a catalog of metadata, and a distributed system of metadata, paper publication availability, digital data sets, and interpretive information**
- **Accelerating web usage and the escalating need for standardized digital methods caused work on NGMDB to accelerate in 1996**
- **Participants at an April 1996 workshop on 'Digital Geologic Maps for the Future' at GSA Cordilleran focused on the need to assemble maps over large areas without losing underlying data**



Geology for a Changing World

A Science Strategy for the Geologic Division
of the U.S. Geological Survey, 2000–2010

U.S. Geological Survey Circular 1172



- **USGS and AASG participants at a May 1996 meeting at Kentucky Geological Survey committed to developing standards for digital geological mapping**
- **A meeting in St Louis in 1996 outlined tasks for work groups; the first Digital Mapping Techniques (DMT) conference in 1997 was a result**
- **The 1998 NGMDB report outlined three phases – the catalog, the standards, and the database**
- **The 1999 report indicated priority for a catalog, and a wait for technological progress to allow an interactive, map-based display**
- **In 1999, progress was made on a database standard by the Data Model Steering Committee**
- **In 2000, Phase Three was clarified as a proposal for the long-term development of a living database**

PROGRESS

PHASE 1 build the map catalog and related databases

PHASE 2 develop standards for maps and databases

PHASE 3 build an online database of digital geologic map information

In 2001, it was clarified that Phase Three should be built from edge-matched geologic maps; managed as a coherent body of map information rather than discrete map products; updated by authorized persons; and standardized

- In 2002, the image library was established as a middle ground between the catalog and the planned online database
- In 2003, Phase Three was reoriented to focus on data input tools and science language
- In 2005, it was stated in NGMDB reporting that Phase Three would be straightforward if all agencies used the same terminology, data model, and computer platform – but this was seen as not being realistic, so translation mechanisms for 2D and 3D geology were anticipated, possibly developed by the NSF Geon Project

PROGRESS • In 2008, NGMDB work was focused on the database standard

PHASE 1 build the map catalog, and related databases.

PHASE 2 develop standards for maps and databases.

PHASE 3 build an online database of digital geologic maps.

• **Late 1990s implementation efforts thus clarified that NGMDB will consist of:**

- ***Phase One, building the map catalog, and related databases***
- ***Phase Two, developing standards for maps and databases***
- ***Phase Three, building an online database of digital geologic map information***



PLANNING

- Since the 1990s, USGS planning has repeatedly called for seamless 3D geological mapping
- In 2014, AASG concurred by unanimously passing the

BUDGET JUSTIFICATIONS

Lexington Resolution

and Performance Information
Fiscal Year 2020

- In 2017, the NCGMP plan called for excellence, partnering, technology, and national 3D geology

U.S. GEOLOGICAL SURVEY

- Also in 2017, an Executive Order called for comprehensive, machine-readable topographic, geological, and geophysical surveys to ensure that we can access vital mineral commodities
- NCGMP therefore is now focused on designing, building, and interpreting a seamless 3D geology for the Nation, based on prior and new geologic map publications at local to regional scales – thus construction of a digital twin of our landmass, fulfilment of NGMDB Phase Three, and supporting the EarthMAP concept

NOTICE: These budget justifications are prepared for the Interior, Environment and Related Agencies Appropriations Subcommittees. Approval for release of the justifications prior to their printing in the public record of the Subcommittee hearings may be obtained through the Office of Budget of the Department of the Interior.



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