

Laying the Foundation for a Dynamic Geologic Map of Virginia

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Abstract

The Virginia Division of Geology and Mineral Resources (DGMR) is taking several approaches to expand access to accurate and up-to-date geologic maps of Virginia. In 1996, DGMR began converting existing geologic maps to digital format in order to accommodate increased demands for digital data. This effort has been supported by the U.S. Geological Survey’s (USGS) STATEMAP program since 2003. In 2009, DGMR began migrating geologic maps of multiple scales and generations to a multimap enterprise ArcSDE geodatabase. This endeavor includes transferring the 1993 Geologic Map of Virginia from shapefile format to a geodatabase format based on the USGS National Cooperative Mapping Program’s data model, “NCGMP09” (http://pubs.usgs.gov/of/2010/1335/pdf/usgs_of2010-1335_NCGMP09.pdf). This geodatabase design includes both feature-level metadata and symbology. The integration of digital mapping, at a variety of scales within the State geologic map, will allow customers to find the most accurate and current digital geologic data for a given area.

DGMR will also begin providing access to georeferenced images of published geologic maps in a Web map service utilizing Esri’s ArcGIS Image Server. This allows ready access to all published mapping and gives users the opportunity to compare different geologic interpretations reflected on geologic maps from different eras of mapping.

By enabling the geodatabase design model to interact with the DGMR online store and map download site, DGMR will be able to distribute geologic maps and information in a variety of standard and flexible formats. Access to these data products will be made available through the Department of Mines, Minerals and Energy’s Web map application, spatial data download site, and published Web map services.

Introduction

Since the publication of the 1841 “Geologic Map of Virginia and West Virginia” (Hotchkiss, 1879), the State of Virginia has seen multiple generations of statewide geologic interpretations. Recently, geospatial advances have allowed geologists to deliver mapping products more efficiently. Such advances have enabled DGMR to provide more accurate and current maps, including offering a variety of digital products. DGMR has taken some initial steps to improve access to geologic map data from current individual map storage systems into fully interactive map services. This includes creating a “foundation,” or host map that will house a system to access geologic map data.

Foundation Structure

Since Virginia only has statewide geologic map coverage at the 1:500,000 scale, DGMR decided the foundation for its digital products would be the 1:500,000-scale 1993 Geologic Map of Virginia (DGMR, 1993; fig. 1). The digital version of this map was created by digitizing the paper map to a shapefile, which was then converted into a file geodatabase. In addition, the geodatabase version contains feature classes representing various aspects of the 1:500,000-scale paper map, including:

- Map unit polygons
- State boundary and shoreline
- Contact lines
- Fault lines
- Dikes and thin-bed lines.

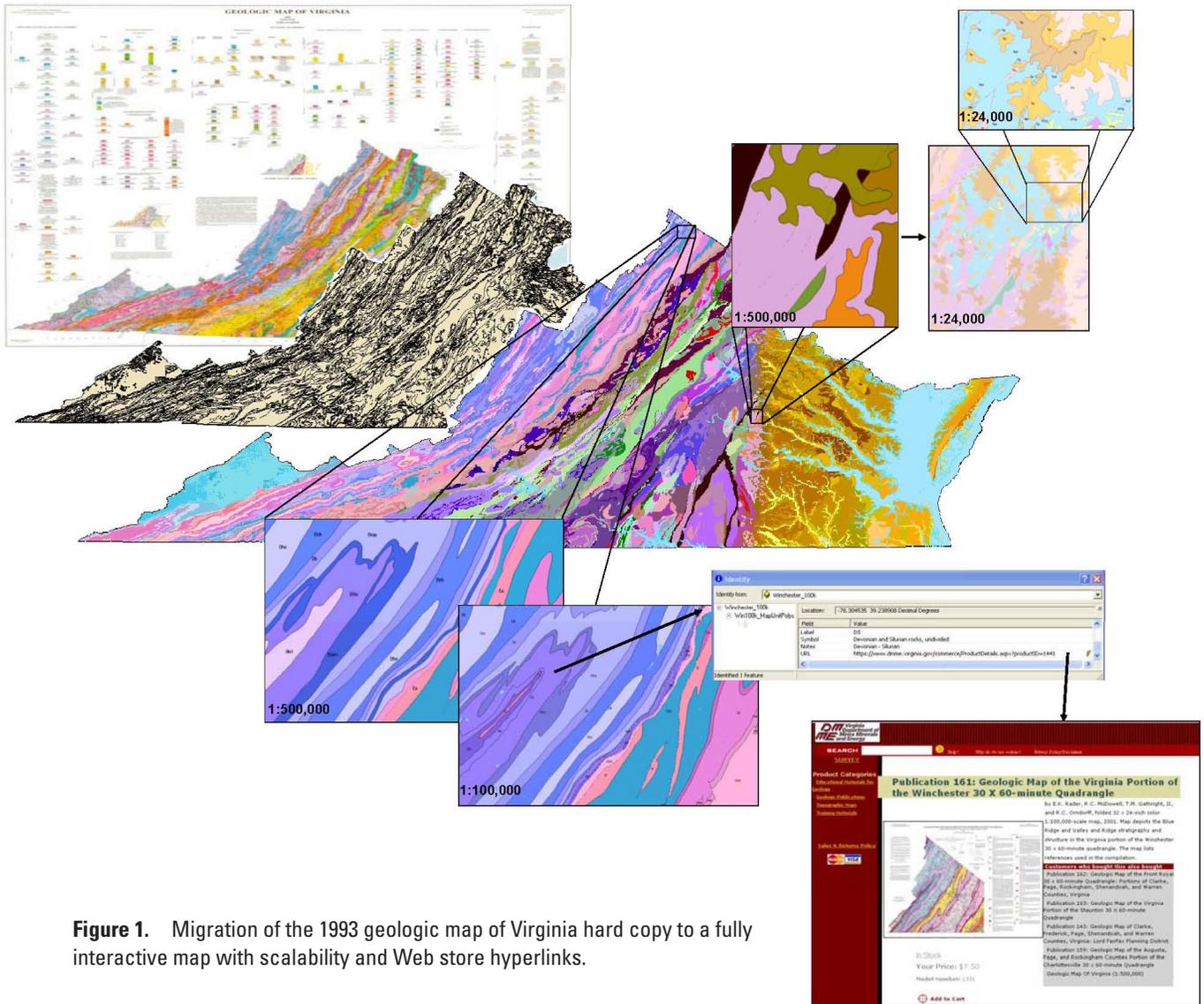


Figure 1. Migration of the 1993 geologic map of Virginia hard copy to a fully interactive map with scalability and Web store hyperlinks.

Each feature class contains assigned representations from the Federal Geographic Data Committee’s (FGDC) Digital Cartographic Standard for Geologic Map Symbolization (Federal Geographic Data Committee, 2006). The map unit polygons feature class contains two sets of color representations: a primary lithology representation and a geologic age representation. Also included in the geodatabase are annotation classes that label each geologic unit using a geologic age font. The digital version of the 1:500,000-scale geologic map of Virginia accommodates multiple functions for interactive use, such as:

- Query capabilities
- Seamless scalability for access to larger scale maps
- Attributes of map unit polygons and faults
- Hypertext links to DGMR’s Web store.

The foundational map and functionality were made available in ArcExplorer, at <http://explorer.arcgis.com/?open=3519ff0d314245e3ab5728c3749a5b44>.

Building on the Foundation

DGMR will publish the basemap geodatabase to an ArcSDE Enterprise Geodatabase. In the future, geologic maps of other scales will also be incorporated into the ArcSDE Enterprise Geodatabase and will be accessible as Web map services (fig. 2). ArcSDE will provide dynamic map capabilities and versioning for multiauthor use, but will also have multimap capacity for scalability functions and a service-oriented architecture. This ArcSDE geodatabase will host DGMR’s collection of file geodatabases that hold maps of multiple scales and generations, and distribute these features to application services.

Incorporating ArcSDE will allow DGMR to convey geologic mapping data through two different portals: a Web map application supplied by the Virginia Department of Mines, Minerals and Energy (DMME) and through Esri’s ArcExplorer Online. The Virginia DMME is currently

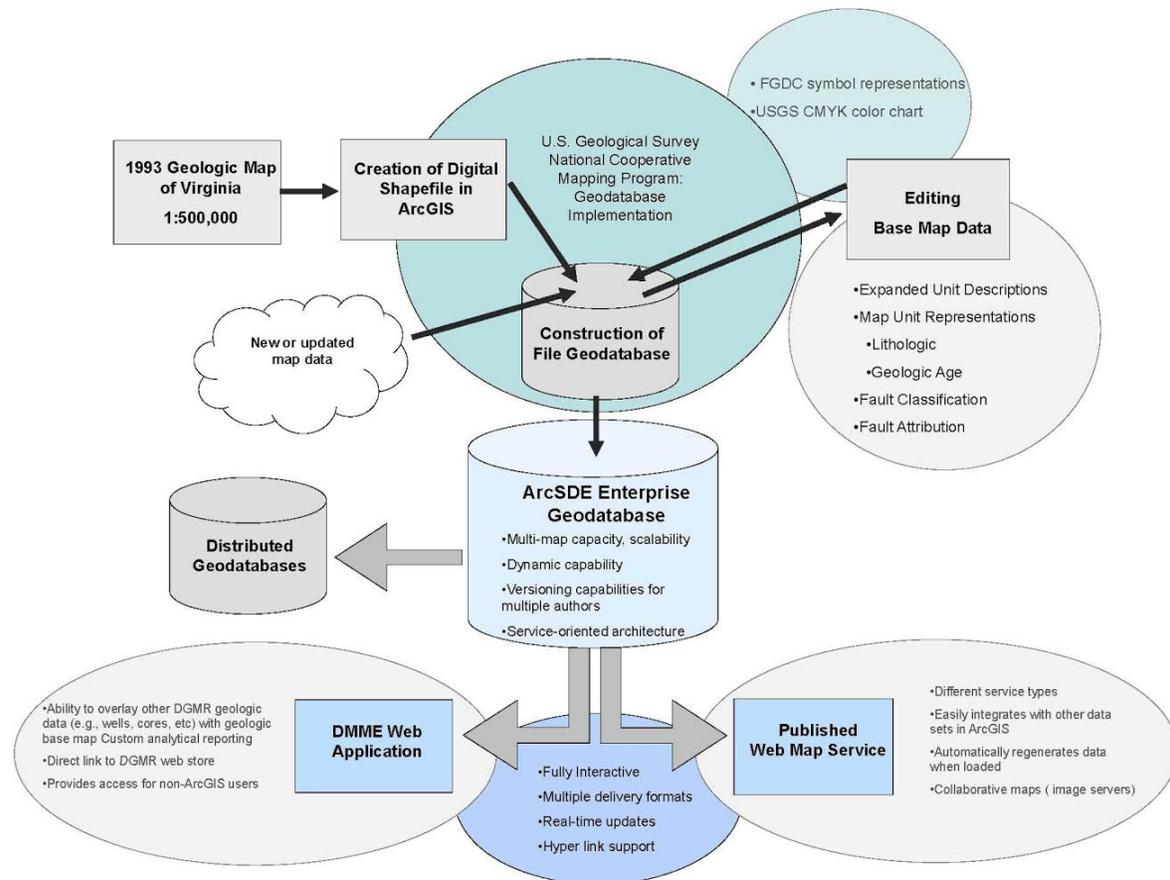


Figure 2. Work flow diagram displaying process for providing geologic maps through ArcSDE Enterprise Geodatabases.

building a department-wide Web map application for spatial data supplied by its multiple divisions, including DGMR. The DMME Web application will be available in a Web browser, which will offer non-ArcGIS users the opportunity to navigate without ArcGIS. Web map service users will have access to the interactive geologic map, along with the capability of integrating other spatial data in ArcGIS. The service will automatically regenerate map updates from DGMR.

Esri's ArcExplorer Online will offer DGMR more local control of our published Web map services and will enable us to serve a variety of digital map products, including Web map services, map packages, browser maps, and shapefiles. With multiple methods to serve our mapping products, DGMR will be able to broaden customer outreach. Currently, DGMR provides an interactive map service, which can be found online at <http://explorer.arcgis.com/?open=3519ff0d314245e3ab5728c3749a5b44>.

Additionally, users will have the ability to view other DGMR geologic data, such as well and core data, and extract custom analytical reports. The Web map services will also provide users with direct links to DGMR's Web store for product purchasing at <https://www.dmme.virginia.gov/commerce/>. DGMR plans to provide all existing scanned

geologic maps as georeferenced images using ArcGIS Image Server in both services. These maps are also available on the USGS's National Geologic Map Database Web site (<http://ngmdb.usgs.gov>). All delivery options point users in the direction of DGMR's online Web store for access to PDFs and hard copies of each map.

References

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