

FY 2011 FINAL TECHNICAL REPORT
NATIONAL GEOLOGICAL AND GEOPHYSICAL
DATA PRESERVATION PROGRAM

Award No. G11AP20161

Virginia Geologic Information Catalog

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ABSTRACT

The Department of Mines, Minerals and Energy - Division of Geology and Mineral Resources (DGMR) serves as Virginia's geological survey. The primary mission of the Division is to gather and disseminate geologic and mineral resources information that supports sustainable development and a more productive economy. Since the early 1900's, DGMR (and its predecessors in name) has maintained and added to collections of geologic materials including reference rock specimens and associated thin sections, core samples, well cuttings, and fossils that are presently stored in warehouse facilities in Charlottesville. The Division also maintains collections of geologic maps, historical photographs, aerial photographs, geophysical and geochemical datasets, manuscripts and publications, and mineral locality information.

Recognizing the need to both preserve these valuable collections and improve the ability of staff and customers to search for, cross-reference, and access key information, DGMR implemented a long range data preservation plan. With support from the U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP), the Division is standardizing and consolidating key data collections into the Virginia Geologic Information Catalog (VGIC). The VGIC database system features a map-based web browser interface to serve internal and external customers alike. Continued programming support for the VGIC also provides the optimal means for creating feature-specific metadata in the format that serves the priority needs of the USGS ScienceBase Catalog.

For the grant year starting July 1, 2011 and ending June 30, 2012, DGMR added four priority data collections with the associated metadata to the VGIC. The VGIC enables DGMR staff and customers to conduct searches based on keywords and geographic coordinates. As a key deliverable, DGMR uploaded 21,629 feature-specific metadata records for the four Virginia data collections to the ScienceBase Catalog using the USGS web site:

<https://www.sciencebase.gov/catalog/>

In addition to uploading metadata records, DGMR also continued the physical inventory of a large historic collection of rock, mineral, and fossil specimens acquired from the University of Virginia in 2008, and digital scanning of unpublished historical paper documents collectively known as the DGMR Economic Geology Mineral Resource Files collection.

INTRODUCTION

The Department of Mines, Minerals and Energy's (DMME's) Division of Geology and Mineral Resources (DGMR) collects, maintains, and distributes information related to the geology, mineral and energy resources, and geologic hazards of Virginia. The Division's customers include the general public, schools and educational programs, mineral and energy production industries, construction industries, land use planning authorities, and local, state, and federal government agencies.

DGMR seeks to improve our customers' ability to locate and wisely develop or conserve rock, mineral, water, and energy resources. A key strategy to achieve this objective is to enhance the organization and accessibility of the geologic information contained in the DGMR archives. The archives comprise a variety of collections of geologic materials and data that vary in format, size, and complexity. The format of our published and unpublished map products that depict geologic, geophysical, geochemical, mineral and energy resources data includes hard copy media (paper, mylar, sepia, etc) and digital data. The collections also include historic photographs, rock thin sections, results of petrographic and microscopic analyses, geochemical laboratory results, reports on groundwater and mineral spring characteristics, historic and out-of-print publications, well logs, well cuttings, drill cores, and extensive collections of rock, mineral, and fossil specimens. These collections continue to grow as DGMR gathers new data.

Supported by a FY 2007 Phase 1 grant from the U.S. Geological Survey (USGS) National Geological and Geophysical Data Preservation Program (NGGDPP), DGMR identified and characterized existing inventories of physical materials, maps and other key data sets. In FY 2008, and again supported by NGGDPP grant funds, DGMR began standardizing and consolidating its data collections into a centralized system called the Virginia Geologic Information Catalog (VGIC). Enhancements including on-line access to this catalog have significantly improved the ability to search for and access geologic information using web-based search tools. In the three-year period from FY 2009 to FY 2011, DGMR added twelve prioritized data collections to the VGIC. Feature-specific metadata records describing these collections were uploaded to the ScienceBase Catalog at the close of each respective grant year.

PURPOSE AND JUSTIFICATION

DGMR customers with an interest in geologic information are currently able to browse the *DMME Web Store*, an on-line electronic commerce site at the URL: <https://www.dmme.virginia.gov/commerce/>, and purchase hard copy products, or alternatively download scanned versions for free in PDF format. The *Web Store* provides a full listing of the titles of reports and maps that have been published as part of DGMR's publication series, and includes a comprehensive index and list of keywords. An extensive amount of unpublished information, also part of the DGMR archives, has recently become available from the on-line Virginia Geologic Information Catalog.

To better manage the archival of geologic materials and information in the VGIC, and ensure that these resources are readily accessible to customers, DGMR developed a long range data preservation plan. This plan includes best management practices for archival methods, converting key information from non-digital format to digital, developing metadata, enabling web-based access, and participating in the effort to build the National Digital Catalog (now ScienceBase Catalog). Since most geologic information is tied to a geographic location on the earth, DGMR has established the goal of delivering and enabling searches using the VGIC based on key spatial information. A web-based mapping interface enables searches using geographic

coordinates, allowing direct access to the information by clicking on points, polygons, and polylines that represent available data. The VGIC also delivers site-specific metadata for each data set. For many commonly requested data sets, DGMR is able to provide scanned digital versions in PDF format. Examples include core logs, seismic lines, sample descriptions, and results of chemical analyses.

The VGIC serves as a database management system for the organization, management, preservation, and distribution of data. Among the many benefits of this system, the following are expected for the specified customer groups:

General Public, Education, and Business:

- Direct and timely (24hr x 7d) access to a wide range of geologic information in a downloadable format;
- Eliminates costs of travel to DMME offices, data copying, shipping, etc;
- Ability to search for geologic information based on specified geographic locations;
- Access to unpublished and out-of-print data.

Land Use Planners:

- Direct and timely (24hr x 7d) access to GIS data for incorporating into comprehensive land use and transportation infrastructure plans.

State and Federal Government:

- Enables internal DMME staff and other government agencies to quickly search for available geologic information to serve their needs;
- Reduces the response times to customer requests;
- Reduces the costs of data handling, copying, and shipping.

STRATEGY FOR LONG-TERM DATA PRESERVATION

The work accomplished to date has effectively advanced DGMR's long range data preservation goals, which are:

1. Data collections will be preserved for future generations;
2. Data collections will be organized and stored in a secure and accessible manner;
3. Data collections will be incorporated into the Virginia Geologic Information Catalog;
4. Data collections will be standardized, consolidated, and normalized;
5. The Virginia Geologic Information Catalog will be accessible on-line.

This project ensures that all of DGMR's geologic information is preserved, standardized, and accessible to its customers in a secure, robust relational database that is readily queried using keywords and geographic coordinates.

FY 2011 GOALS

For FY 2011 (July 1, 2011 to June 30, 2012) DGMR proposed to expand the VGIC by adding four prioritized data collections, and continuing the inventory of other collections. The prioritized collections were to be integrated into a comprehensive Microsoft SQL-Server

relational database, which serves as the VGIC database management system. Site-specific metadata were to be developed for each data collection. All metadata developed for this project was to comply with the USGS National Catalog Metadata Products requirements.

Building upon the work accomplished as part of the NGGDPP-supported programs in FY 2007 through FY 2010, the activities for work proposed for FY 2011 included the tasks listed below:

NGGDPP Objective 1 – Inventory Collections

- a. Continue to organize, inventory, and assess the completeness of documentation for an estimated 10,000 Virginia specimens in the UVA Collection.
- b. Inventory the DGMR Economic Geology Mineral Resource Files collection of historic reports and documents.
- c. Enter inventory results in the USGS on-line survey.

NGGDPP Objective 2 – Create Metadata

- a. Define database fields, table structure, relationships, indices, and queries based on key attributes identified for four selected DGMR Collections.
- b. Program user interfaces for data entry, querying, viewing, and reporting.
- c. Review and edit data records for accuracy and completeness.
- d. Develop feature-specific metadata (meeting National Digital Catalog Metadata standards) for each collection. Upload an estimated 12,140 metadata records to the ScienceBase Catalog using the established procedure.

Final Technical Report

- a. Complete and deliver Final Technical Report that summarizes all activities and accomplishments for FY 2011.

FY 2011 RESULTS

NGGDPP Objective 1 – Inventory Collections

An inventory of the UVA Mineral and Rock Collection was initiated in FY 2010 and continued throughout the FY 2011 grant year. The inventory provides a basic characterization of the contents and condition of this vast collection of over 10,000 physical specimens acquired by donation from the University of Virginia (UVA) in 2008. The collection is presently stored in the DGMR warehouse facility in Charlottesville. Current activities in FY 2012 include preparation of feature-specific metadata for key specimens in this collection.

The Economic Geology Mineral Resource Files collection consists of over 9,500 paper records. These documents include historic reports documenting site visits to inactive mines, letters to and from mineral operators and land owners, unpublished laboratory analytical reports, field notes, photographs, sketch maps, and historic newspaper and periodical clippings pertaining to inactive mine and prospect locations throughout Virginia. The collection inventory was added to the National Digital Catalog via the inventory template located at <http://ndc.sciencebase.gov/>

NGGDPP Objective 2 – Create Metadata

Four priority data collections were targeted for metadata creation in FY 2011. Following an extensive quality control review, the feature-specific metadata records were formatted using the guidelines provided in the USGS document *Metadata Profile for the National Digital Catalog*. The metadata records were submitted to the USGS in the extensible markup language

file format (.xml) at the close of the FY 2011 grant year. A total of 21,629 feature-specific metadata records were uploaded to the ScienceBase Catalog using the USGS web site: <https://www.sciencebase.gov/catalog/>. **Note that the number of records actually uploaded during FY 2011 exceeded the original estimate (178%) for these collections.**

The four collections, with the native format shown in parenthesis included:

1. Historic Topographic Maps Collection (paper maps, Excel spreadsheet index) – contains 268 records of topographic maps at the scale 1:62,500 (publication years 1894-1962) and 45 records of topographic maps at the scale 1:125,000 (publication years 1884-1911).
2. Historic Photographs Collection (contact paper and slide film format) – included 9,180 photographs and film slides taken or collected by staff geologists and other professional geoscientists working in Virginia. The photographs depict geologic features, documentation of significant geologic events (floods, earthquakes, landslides, etc), historic mining activities and mineral resources, etc. The feature specific metadata record includes all available information that documents the location, date the image was taken, context, and other significant attributes.
3. Aerial Photographs Collection (paper contact sheets) – a collection of 7,622 aerial photographs dating from 1936 to 2001. The aerial photographs are both low and high altitude coverage filed by flight elevation (scale), quadrangle ID, and year taken. Stereographic coverage is available for many of the photos. The photos are currently stored at the DGMR office in Charlottesville.
4. UVA Rock, Mineral and Fossil Collection (physical specimens) – the inventory of Virginia mineral specimens was completed and included 4,514 metadata records uploaded to the ScienceBase Catalog. The inventory of Virginia reference rock and fossil specimens is on-going in FY 2012.

Table 1 shows the current status of Virginia’s data collections in the USGS ScienceBase Catalog and indicates the number of uploaded records for each of the prioritized collections from FY 2008 and FY 2011. The table also shows the number of estimated records for collections that are targeted for FY 2012.

TABLE 1. Key DGMR Data Collections				
<i>NGGDPP Collection ID</i>	<i>Collection Name</i>	<i>Number of metadata records uploaded to the National Digital Catalog</i>	<i>Year uploaded</i>	<i>Progress Summary</i>
P0826	Fossil repository	1,141	FY 2010	Inventory completed in FY 2007; access from VGIC in FY 2012.
P1233	Well cuttings	7,376	FY 2010	Inventory completed in FY 2007; access from VGIC in FY 2012.
P1246	Historic uranium exploration information	1,320	FY 2010	Inventory completed in FY 2007; access from VGIC in FY 2012.
P0637	Rock cores	447	FY 2008	Inventory completed in FY 2007; access from VGIC in FY 2010.
P1229	Rock (specimen) repository	7,712	FY 2008	Inventory completed in FY 2007; access from VGIC in FY 2010.

P1231	Historic topographic maps	313	FY 2011	Inventory completed in FY 2007; access from VGIC and DMME Web Store in FY 2011.
P1232	Historic photographs	9,180	FY 2011	Inventory completed in FY 2007; access to metadata records from VGIC in FY 2011.
P1111	DGMR Publications Index	5,237	FY 2008	Inventory completed in FY 2007; access from VGIC in FY 2010.
P0830	Rock thin sections	11,320	FY 2012	Inventory completed in FY 2007; metadata creation will begin in FY 2012.
P0835	Carbonate geochemical database	6,193	FY 2009	Inventory completed in FY 2007; access from VGIC in FY 2010.
P0836	Aerial photographs	7,622	FY 2011	Inventory completed in FY 2007; access to metadata records from VGIC in FY 2011.
P0838	Silica geochemical database	400	FY 2012	Inventory completed in FY 2007; metadata creation will begin in FY 2012.
P0839	Clay materials analyses	850	FY 2012	Inventory completed in FY 2007; metadata creation will begin in FY 2012.
P0840	Geophysical data	1,734	FY 2009	Inventory completed in FY 2007; access from VGIC in FY 2012.
P0841	Borehole database	6,721	FY 2009	Inventory completed in FY 2007; access from VGIC in FY 2012.
P0843	Sinkhole maps	336	FY 2010	Inventory completed in FY 2007; access from VGIC in FY 2012.
P1362	Mineral resources inventory (MRV)	10,442	FY 2009	Inventory completed in FY 2007; access from VGIC in FY 2012.
P1442	Unpublished geologic maps	670	FY 2008	Inventory completed in FY 2007; access from VGIC in FY 2010.
P1653	Coal quality database	401	FY 2009	Inventory completed in FY 2007; access from VGIC in FY 2010.
	UVA Mineral and Fossil Collection	4,514	FY 2011 FY 2012	Inventory of Virginia mineral portion of collection completed in FY 2010; metadata (partial) uploaded in FY 2011; remaining metadata creation to begin in FY 2012.
	Economic Geology Mineral Resources Files	9,500+	FY 2012	Inventory completed in FY 2011; document scanning and digital conversion will continue during FY 2012; metadata creation to begin in FY 2012.
TOTAL		~93,430+		

In addition to the specific grant deliverables described above, DGMR continued development of the Virginia Geologic Information Catalog (VGIC) during the year, with additional datasets added to the Microsoft SQL-Server database application by DMME programming support staff. Table structure, relationships, and other design criteria were established, together with user interface screens to allow data entry, querying, and reporting. The database is hosted on a DMME server currently located in the DMME Big Stone Gap office. Access to the VGIC is available from the portal:

<http://www.dmme.virginia.gov/DGMR/MapsPubs.shtml>

FY 2012 WORK PLAN

Activities related to the FY 2012 grant period are currently underway as of September 1, 2012. For FY 2012, DGMR plans to add five priority data collections to the VGIC, providing web-enabled access for our valued customers and at the same time provide metadata documentation for an estimated 18,770 data records to the ScienceBase Catalog. The data collections include: rock thin sections, silica geochemical database, clay materials database, UVA collection specimens database, and the DGMR Economic Geology Mineral Resource files collection. All records will be checked for quality assurance to eliminate duplicates, ensure geographic accuracy, and maintain data standardization for all required data attributes.

The work accomplished as part of the FY 2012 grant year will be summarized in the Final Technical Report that will be submitted to USGS during the 4th quarter FY 2012 (July-Sept 2013). The report will describe the metadata records for the prioritized data collections identified above, which will be formatted to meet the National Catalog Metadata Products standards. The metadata records will be submitted to the USGS in the extensible markup language file format (.xml) at the close of the grant year, and it is anticipated that these records will be added to the ScienceBase Catalog at that time.

PROJECT PERSONNEL

Principal Investigator – William L. Lassetter, Jr.

Mr. Lassetter has worked with the Department of Mines, Minerals, and Energy since April 2000, and has managed the DGMR Economic Geology program since November 2005. As an economic geologist, he has worked with many of DGMR's data collections, having supervised staff activities that included data gathering, data entry, quality control, and metadata creation and maintenance. William will be closely involved with the quality control review of data records contained in all of the collections, supporting the development of data entry/reporting capabilities in the Virginia Geologic Information Catalog, and reviewing metadata deliverables. (M.S., Hydrogeology, 1996, University of Nevada, Reno; B.S., Geology, 1980, Virginia Tech).

Information Systems Specialist – Christina M. Wood-Smith

Ms. Wood-Smith has 20 years of experience in digital data management and applications development. Her most recent accomplishments include implementation and providing technical support for the DMME web-based forms management system that supports over 2,000 mineral mining customers. Christina's expertise in best management practices in regards to digital data accessibility and data archival methods is an asset to the preservation of key DGMR data collections. (M.S., Management Information Systems, 1994, University of Virginia; M.E., Systems Engineering, 1994, University of Virginia; B.S., Management Information Systems, 1989, University of Virginia).

Senior Programming Analyst – Matthew Stanley

Mr. Stanley started his career with DMME as a student intern in 2001, working part time until college graduation in 2004. After working two years as the Assistant Computer Systems Manager for Wise County Public Schools, Matthew returned to DMME in 2006. Mr. Stanley coordinates the development of the VGIC user input screens, system database tables, and programs to export the metadata deliverables. (B.S. Computer Information Systems, 2004, University of Virginia College at Wise).

Geologic Data Specialist – Michael R. Enomoto

Mr. Enomoto has been a key member of DGMR's NNGDPP team since September 2008. Supported by NNGDPP grant funds in FY 2008 through FY 2011 his primary responsibilities are for the inventory, digital compilation, and quality control assessment of the extensive DGMR data collections. (B.S. Geology, 1978, California State University at Long Beach).

Minerals Curator – Rudolph J. Bland, Jr.

Mr. Bland joined the DGMR team as a part-time staff member in 2010. Supported by NNGDPP grant funds, he completed the initial inventory of the UVA Mineral and Rock Collection. As the former curator of the mineral and rock collection at the University of Virginia in the 1960s, Mr. Bland is uniquely qualified to provide essential support to several tasks that are part of the FY 2011 and FY 2012 approved scope of work. These tasks include sorting, identification, and cataloging of mineral, rock, and fossil specimens contained in the DGMR repositories. Mr. Bland also assists in the preparation of metadata records that are part of the deliverables to the USGS at the end of the grant year.