

FY 2010 FINAL TECHNICAL REPORT
NATIONAL GEOLOGICAL AND GEOPHYSICAL
DATA PRESERVATION PROGRAM

Award No. G10AP00107

Virginia Geologic Information Catalog

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ABSTRACT

As part of the Virginia Department of Mines, Minerals and Energy, the Division of Geology and Mineral Resources (DGMR) serves as Virginia's geological survey. The Division is responsible for gathering and disseminating geologic and mineral resources information, and encouraging the wise use and sustainable development of resources to support 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 SQL-database platform utilizes 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, 2010 and ending June 30, 2011, DGMR added four high 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 9,785 feature-specific metadata records for these four Virginia data collections to the ScienceBase Catalog using the USGS web site:

<http://my.usgs.gov/catalog/item/search?search=&contactType=Data+Owner&party=18271&contExtName=Global&itemType=Physical%20Collection>

DGMR also accomplished several other important data preservation goals during the grant year including: (1) initiation of a physical inventory of a historic collection of over 9,000 Virginia rock, mineral, and fossil specimens acquired from the University of Virginia, the UVA Mineral and Rock Collection; (2) re-storage of historic geologic maps and other key documents within newly-acquired pH-neutral map storage folders in DGMR's existing flat file storage facilities; and (3) completed the digital conversion of twelve 9-track magnetic tape reels holding valuable seismic data.

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, and will also provide feature-specific metadata through a web-based search tool. In FY 2009 and FY 2010, DGMR staff added a total of nine prioritized data collections to the VGIC. Feature-specific metadata records describing these data 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 currently browse the *DMME Web Store*, an on-line electronic commerce site at the URL: <https://www.dmme.virginia.gov/commerce/>, or browse the *Catalog of Publications and Maps*, a document that is available in hard copy and digital PDF format. The *Web Store* and *Catalog* provide 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 is also part of the DGMR archives, but is not readily available. Access to this unpublished data is typically accomplished by contacting a DGMR staff member. Starting in 2009, State budget and staff reductions have made it especially challenging for remaining DGMR staff to effectively serve it's customers, highlighting the substantial need to advance the development of the digital 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 will also deliver site-specific metadata for each data set. For many commonly requested data sets, DGMR will be able to provide scanned digital versions. Examples include core logs, seismic lines, sample descriptions, and results of chemical analyses.

The VGIC will serve 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 will ensure that all of DGMR's geologic information is preserved, standardized, and accessible to all of its customers in a secure, robust relational database that is readily queried using keywords and geographic coordinates.

FY 2010 GOALS

For FY 2010 (July 1, 2010 to June 30, 2011) DGMR proposed to expand the VGIC by adding four prioritized data collections, and completing the initial inventory of a fifth collection. The five collections are among those most frequently requested, and most include digital data.

The prioritized collections were to be integrated into a comprehensive Microsoft SQL-Server relational database, which serves as the VGIC platform. Site-specific metadata were to be developed for each data collection. All metadata developed as part of this project will comply with the USGS National Catalog Metadata Products requirements.

Building upon the work accomplished as part of the NGGDPP-supported program in FY 2007, FY 2008, and FY 2009, the activities and timeline for work proposed for FY 2010 included the tasks listed below:

NGGDPP Priority I - Collection Inventory

(July 1, 2010 – June 30, 2011)

- a. Organize, inventory, and assess the completeness of documentation for an estimated 9,000 Virginia specimens in the UVA Collection.
- b. Develop a preservation plan for the UVA Collection.
- c. Enter inventory results in the USGS on-line survey.

NGGDPP Priority II - Metadata for the USGS ScienceBase Catalog

(July 1, 2010 – June 30, 2011)

- 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 9,700 metadata records to the ScienceBase Catalog using the established procedure.

NGGDPP Priority III - Digital Infrastructure

(July 1, 2010 – August 30, 2010)

- a. Acquire 400 acid-free map folders for storing highest priority “at-risk” historic map collections.
- b. Contract the digital conversion of twelve 9-track magnetic tapes holding seismic data to CD-ROM or DVD media.
- c. Modify or develop feature-specific metadata (meeting National Digital Catalog Metadata standards) for each converted dataset. Upload an estimated 12 metadata records to the USGS ScienceBase Catalog using the established procedure.

Final Technical Report

(April 1, 2011 – June 30, 2011)

- a. Complete and deliver Final Technical Report that summarizes all activities and accomplishments for FY 2010.

FY 2010 RESULTS

NGGDPP Priority I - Collection Inventory

A preliminary inventory of the UVA Mineral and Rock Collection was accomplished during this grant year, providing a basic characterization of the contents of this vast collection of physical specimens acquired by donation from the University of Virginia (UVA) in 2008. The results of this inventory were entered into the USGS on-line survey via the ScienceBase Catalog to create a new data collection category.

The UVA Mineral and Rock Collection contains over 9,000 minerals, rocks and fossil specimens that were at risk of imminent disposal or dispersal by UVA due to the lack of adequate storage facilities. The collection includes many valuable and irreplaceable geologic specimens collected in Virginia by UVA students and faculty that were at one time displayed in the Lewis Brooks Hall of Natural Science, which opened in 1877. Among the scarce records available for this collection are indications that the collection at one time also included specimens collected as part of the Lewis and Clark Expedition (1804-1806), donated by Thomas Jefferson to the University. Following the closure of the UVA Department of Geology in the 1960s, the collection was moved to various warehouse storage areas, where it was largely forgotten and inadequately preserved. Inventory records for the collection are incomplete and deteriorating rapidly.

The UVA Collection is presently stored in the DGMR warehouse facility in Charlottesville, but remains in a highly disorganized state in old disintegrating wooden boxes stacked on pallets as they were loaded for transport from UVA (Photo 1). Large components of the collection are at significant risk of losing what little identification information remains for individual specimens. With assistance from a grant-supported, part-time Geologic Technician, the collection is now being sorted and catalogued (Photo 2). Current activities in FY 2011 include preparation of feature-specific metadata for key specimens in this collection.



Photo 1. Pallets of mineral and rock specimens acquired from UVA in 2008.



Photo 2. Catalogued and preserved mineral and rock specimens in the DGMR Rock Repository.

NGGDPP Priority II - Metadata for the National Digital Catalog

Four high-priority data collections were targeted for metadata creation in FY 2010. 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 2010 grant year. A total of 9,785 feature-specific metadata records were uploaded to the ScienceBase Catalog using the USGS web site:

<http://my.usgs.gov/catalog/item/search?search=&contactType=Data+Owner&party=18271&contExtName=Global&itemType=Physical%20Collection>

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

1. Paleontological Collection (MS Access database) – contains 742 records of documented fossil localities and specimens in Virginia.
2. Oil and Gas Well Cuttings Collection (Excel spreadsheet) – includes 7,376 records for rock cuttings from oil and gas wells completed in Virginia. The physical samples are presently stored in the DGMR well cuttings repository in Charlottesville.
3. Historic Uranium Exploration Information Collection (scanned documents) - a collection of about 1,500 documents, maps, reports, drill hole logs, etc., associated with the historic

exploration for mineral resources at the Coles Hill uranium deposit, located in Pittsylvania County.

4. Sinkhole Maps Collection (paper maps) – consists of 167 USGS 7.5-minute quadrangle maps showing sinkhole locations that were derived from remote sensing analysis, field studies, and examination of aerial photographs.

Table 1 shows the current status of Virginia’s NGGDPP collections in the USGS ScienceBase Catalog and indicates the number of uploaded records for each of the prioritized collections from FY 2008 and FY 2010. The table also shows the number of estimated records for collections that are targeted for FY 2011.

TABLE 1. Summary of key data collections held by the Virginia Division of Geology and Mineral Resources

Collection Name	Type	Number of Records / Units	USGS Inventory Status	Metadata Completion Status
Fossil repository	Physical	742	FY 2007	FY 2010
Oil and Gas Well Cuttings	Physical	7,376	FY 2007	FY 2010
Uranium Exploration	Digital and analog	1,500	FY 2007	FY 2010
Rock cores	Physical	447	FY 2007	FY 2008
Rock (specimen) repository	Physical	7,712	FY 2007	FY 2008
Historic topographic maps	Maps	640	FY 2007	FY 2011
Historic photographs	Photographs	1,500	FY 2007	FY 2011
DGMR Publications Index	Maps, reports	5,237	FY 2007	FY 2008
Thin sections	Physical	11,320	FY 2007	
Carbonate geochem database	Digital	6,193	FY 2007	FY 2009
Aerial photographs	Photographs	8,000	FY 2007	FY 2011
Silica geochemical database	Paper files	399	FY 2007	
Clay materials analyses	Paper files	850	FY 2007	
Geophysical data	Digital, mixed	1,734	FY 2007	FY 2009
Borehole database	Digital	6,721	FY 2007	FY 2009
Sinkhole maps	Paper maps	167	FY 2007	FY 2010
Mineral resources inventory	Digital	10,442	FY 2007	FY 2009
Unpublished geologic maps	Paper maps	670	FY 2007	FY 2008
Coal quality database	Digital	401	FY 2007	FY 2009
UVA Rock/Mineral/Fossils	Physical	9,000+	FY 2010	FY 2011
Economic Geology Files	Paper files	9,500	FY 2011	
TOTAL		>76,000		

NGGDPP Priority III - Digital Infrastructure

Historic map collections in the DGMR archives, including topographic maps and unpublished geologic maps were previously inventoried and characterized with support from NGGDPP in FY 2007, FY 2008, and FY 2009. These paper and film documents are stored in existing metal flat file cabinets in the DGMR office in Charlottesville. In FY 2010, DGMR purchased and distributed 1000 lignin-free, pH-buffered, large-format map folders for long term storage and preservation of these documents. The Microchamber model MF-2430 map folders,

together with pH-balanced, archival Microchamber interleaving paper, were acquired from Conservation Resources Intl., based in Springfield, VA. The folders are 0.02” in thickness, with external dimensions of 24” x 30” (Photos 3, 4). USGS NGGDPP grant funds supported 50% of this purchase, which was matched in equal share by DGMR state funds.



Photo 3. Lignin-free, pH-buffered large format map preservation folders.

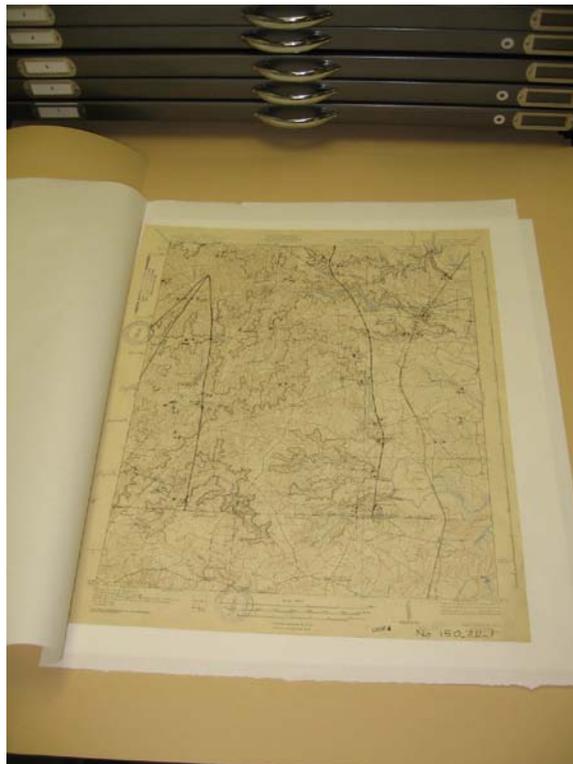


Photo 4. Unpublished geologic map data stored in Microchamber interleaving pH-buffered paper.

The inventory and review of DGMR's geophysical data collection in FY 2009 highlighted the need to convert key seismic data sets originally recorded on 9-track magnetic tapes to modern digital media that can be used in present-day modeling and display software applications. With financial support from the USGS NNGDPP, DGMR contracted for the digital conversion to DVD media of twelve 9-track magnetic tapes containing seismic data collected in 1988 in regions of Rockingham County that are presently under intense scrutiny by oil and gas companies for potential Devonian shale gas resources. The digital conversion was completed by Ovation Data Services, Inc., based in Houston, TX. Feature-specific metadata for these datasets were appended to the Geophysical Data Collection in the USGS ScienceBase Catalog.

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 Big Stone Gap office. Access to the VGIC was expanded to include a map-enabled portal, <http://www.dmme.virginia.gov/DgmrGoogleMap/frmMain.aspx>, and a text-based query portal, <https://www.dmme.virginia.gov/DgmrInquiry/frmMain.aspx>, allowing on-line access to many of the key data collections.

FY 2011 WORK PLAN

Activities related to the FY 2011 grant period are currently underway. For FY 2011, DGMR plans to add four 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 12,140 data records to the ScienceBase Catalog. Further, DGMR plans to ensure the preservation of a valuable collection of unpublished historic paper documents identified as the Economic Geology Mineral Resource Files by scanning an estimated 9,500 paper documents. 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 2011 grant year will be summarized in the Final Technical Report that will be submitted to USGS during the 3rd quarter FY 2011 (April-June 2012). The report will describe the metadata records for the four 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 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 will be 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 will coordinate 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 NGGDPP team since September 2008. Supported by NGGDPP grant funds in FY 2008, FY 2009, and FY 2010 he completed the inventory and assessments of the extensive DGMR rock sample and core collections, the historic geologic map collection, and the geophysical data collection. He is presently compiling metadata for other high priority collections contained in DGMR's archives. Michael has an extensive background working with seismic data on various media and will be a valuable asset in coordinating the digital conversion of DGMR data and creating the feature-specific metadata records. (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 NGGDPP 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 approved scope of work. These tasks include sorting, identification, and cataloging of mineral, rock, and fossil specimens contained in the DGMR repositories. Mr. Bland will also assist in the preparation of metadata records that are part of the deliverables to the USGS at the end of the grant year.