DIGITAL MAPPING TECHNIQUES 2013

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The contents of this document are provisional

See Presentations and Proceedings from the DMT Meetings (1997-2013)

http://ngmdb.usgs.gov/info/dmt/
Introduction

A core mission of the USGS Mineral Resource Program (MRP) is the collection and dissemination of information on mineral resources. This information is used by the USGS, other government agencies including State and Federal agencies, private industry, and the general public. An accurate, up-to-date mineral deposit database facilitates the conduct of ongoing USGS projects, the management of national resources in the United States, and the formulation of national minerals strategies.

The USGS is currently upgrading its national mineral deposit database to provide accurate and up-to-date geospatial information on mineral deposits and occurrences. Core tasks include: data acquisition, compilation of relevant geologic and production information, database design, mineralogic characterization of mine features from satellite remote sensing data, and data delivery. This poster summarizes activities related to the first core area, data acquisition.

Data acquisition is divided into three tasks: 1) acquiring features related to mining activity and mineral deposits from USGS topographic maps; 2) collecting information from other sources such as geologic maps and reports; and 3) compiling available mineral production, resource, and reserve data.

Background

The USGS and the US Bureau of Mines (USBM) developed national-scale mine and mineral deposit databases in the 1960s. The USGS, which maintained the Mineral Resources Data System (MRDS), acquired custody of the USBM Minerals Availability System (MAS) and Minerals Industry Location System (MILS) databases after closure of the USBM in 1996. In 2000, these databases were merged into a single ORACLE database consisting of approximately 300,000 records and over 200 data fields. Public access to this information continues to be provided at the MRDATA website: http://mrdata.usgs.gov.

A large volume of information maintained in the MRDS was compiled prior to the development and widespread use of modern geospatial technologies. In addition, the managing agencies had similar yet different scopes; these subtleties were reflected in the complex MRDS database structure. Consequently, issues related to accuracy of mine feature locations and the consistency/completeness of attribute information persisted. The USGS Mineral Deposit Database Project (USMIN), started in 2012, is a new initiative to modernize the mineral resource database for the U.S.

Objectives

The objective of the USMIN project is to develop and publish a comprehensive geospatial database of mineral deposits which will include information on geology, production, resources, history, and development status. The database will form a geographic database layer that can be accessed by the community of users that extends beyond the geoscience and mineral exploration communities. It facilitates the use of USGS data by mining companies, assessing the impacts of lands and mine-related environmental impacts, assessing the value of mineral resources from satellite remote sensing data, and data delivery. This poster summarizes activities related to the first core area, data acquisition.

The USGS 1:24,000-scale topographic map collection currently depicts the extensive prospecting in the area. Mining features are now being captured in the USMIN database. The red and yellow points are from the USGS MRDS database. The colored topographic symbols reflect the extent of exploration in the area. This database does not reflect this activity.

Work Flow

Work Flow

Much of the work to date involves the development of procedures and work flows to capture the location and area of mineral deposits and related mine features to the database. The work flow includes a number of quality control steps and development of feature-level metadata at each stage. Using the new USGS Historical Topographic Maps Collection, all mine feature symbols on georeferenced, 7.5-minute (1:24,000-scale) topographic quadrangles are being digitized on a state-by-state basis. This process renders not only a complete picture of mining activity in an area, but an approximate time line of when these activities occurred.

Features captured in the Climax Mine Area, Leadville, CO.

Features captured in the Carlin Trend in Nevada.

Quality Control (QC)

Procedures used to verify data accuracy include:

- Checking tabular data and spatial accuracy at the feature level (point, polygon)
- Verifying topology for polygonal features and correcting errors such as inadvertent slivers, gaps, and overlaps.
- Reviewing tabular for topographical errors and to ensure completeness and consistency of records.
- Spot checking a random 20% of the quadrangle areas (by state) for:
  - Locational accuracy of features
  - Completeness of features captured within each 7.5-minute quadrangle
  - Accuracy of attribute value fields (for example dates and names of quadrangles)

Work Flow Automation

Scripts have been developed to automate routine workflow, including the identification, downloading, and reformatting of scanned georeferenced topographic quadrangles. Specifically, these scripts automate:

- Obtaining digital 7.5 minute quadrangles and converting to ArcGIS format
- Staging of required datasets
- Quality Control - selects a random 20% sample of 7.5-minute quadrangles to be reviewed

Other Tasks

The compilation of mineral resource information from sources other than topographic maps is also occurring. An extensive literature and web search is being conducted to obtain historic, non-digital information, as well as to update existing digital information. This review has yielded an extensive collection of geologic maps, reports, and ancillary databases. Historic commodity maps are currently being converted to digital geospatial information - perhaps for the first time. Ultimately this information will serve as important sources of new geologic, production, and resource data, as well as historical and development information, to the USMIN database.

Status

Since September 2012, preliminary mine feature capture for Washington, Utah, Colorado, and the northern portion of the Great Basin has been completed. A Nevada Bureau of Mines and Geology mine feature data set served as the starting point for that state. These data were reviewed and modified to confirm to the USMIN database structure. Data for the other states are now in review.

The above code sample gathers USGS 7.5-minute topographic maps from a master folder and subdivides and organizes them according to 30 x 60 minute (1:100,000 scale) working areas.

The USMIN Team thanks you!

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Building the U.S. Mineral Resource Database - One Mine Feature at a Time

Routine QC checks are made at each phase of the project.