Best Practices in Policy and Management for Geological Sample Preservation and Metadata Standards

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U.S. Department of the Interior
U.S. Geological Survey

Mission Statement

"...establish minimum standards and best practices for the preservation and archiving of the various geologic data and collections, including consistent inventory standards where appropriate. Establish guidelines for the proper preservation of physical samples, as well as original data and derived information stored on various paper and digital media. Coordinate efforts with other organizations that are dedicated to the exchange of information in the geosciences."

FY 2007 Implementation Plan Goals

NGGDPP Implementation Plan, 2006

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Mission Statement

The goal of this report

- **Emphasize data quality and availability**
- **Define common practices and standards**
- **Highlight data preservation practices that have been proven to be the best in their field**
  - *Federal Component*
  - *State Component*
  - *Academia and Industry*

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Vision Statement

Best Practices White Paper

- **Resource for individuals, institutions and repositories**
  - Provide case studies in effective management
  - Identify key issues and standards that need to be addressed by repositories
  - Provide direction and sources for repositories to look to for improving their facilities
    - *Suppliers*
    - *Vendors*
    - *Reports and publications*

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Vision Statement

Future Directions

- **White Paper as a living document**
  - Additions and suggestions incorporated and practices improved as time goes by
- **Be accessible and interactive to participating parties for review, revision and addition**
  - Forum for community discussion and sharing of resources and ideas

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Content of the White Paper

Topics Addressed

- **Collections and Holdings**
  - Physical Samples
  - Paper & Analog Records
  - Digital Records
- **Formatting, Processing & Issues**
  - Updating formats
  - Cataloging and Metadata
  - Safety, Risk Management and Continuing Operations
  - Communication, Education and Outreach
  - Facility Design, Infrastructure and Staffing

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Standards

What are Standards?

*"something used as a measure, norm or model in comparative evaluations; a required or **agreed level** of quality or attainment."*

National Standards and Best Practices for U.S. Museums, 2008

- **Reflect broadly accepted views**
- **Reflect areas where things actually go wrong**
- **Change over time**

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Minimum Standards

- **All repositories have two main goals:**
  - Preserve the **integrity** and **longevity** of their collections
  - Provide **access** to their collections
- **How these are accomplished are based on the nature of collections and the capabilities of repositories**
  - Means, Motive and Opportunity…

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Best Practices

- **What are "Best Practices?"**
  - Carries an implication of the **final answer**?
  - The **Best** way of doing things?
- **A means to seek improved and applied methods**
  - Lead to the development of newer, ***better*** strategies for data and geoscience sample management

Courtesy of www.despair.com

Best Practices

- **Think of them as *Extra Credit***
  - Exemplary methods
  - Models for optimal performance
- **Provide point of departure**
  - Assist in management decisions
  - Help assess what techniques are available and how they can be applied to individual cases

Physical Samples

Earth Science Sample Collections

- **Cores**
  - Rock, sediment, ice…
- **Cuttings**
- **Rock samples**
- **Mineral specimens**
- **Fossils**
  - Micro, macro, slides…
- **Sediment and soil**
- **Groundwater samples**

Courtesy of Dann Blackwood, USGS

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Physical Samples

As principle:

- **Different types of samples require different storage environments, and methods of pre-storage preparation and curation**
- **All samples are subject to having their fundamental scientific and commercial values increased as knowledge and information about them increase**
- **All are equally subject to lessening of value through physical degradation and loss of information and documentation**

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Physical Samples

Concerns addressed in this chapter:

- **Environmental control**
  - Collection needs
- **Preparing samples for accession**
- **Metadata and cataloging**
  - Minimum criteria for indexing
  - Consistent inventory standards
- **Access to the collections**
  - Loan and sampling
  - Security

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Physical Samples

- **Like analog records, physical sample archives require environmental controls that exclude the ambient environment, and maintain optimal conditions to preserve the longevity of their holdings.**

Texas Bureau of Economic Geology Houston Research Center

Preservation Standards

Environmental Control

- **Maintain control of storage conditions**
- **Assess the future use of the samples and act accordingly**
  - Nature of research
  - Duration of storage
  - *What practices are available to suit your needs?*

Courtesy of Maine Geological Survey

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Best Practice

Ice Cores - NICL

- **The main sample storage area maintains a temperature of -35 ºC to promote the longevity of the core**
  - Prevent melting and mitigate sublimation
- **The cold laboratory area, including a Class 100 clean room, is maintained at -22 ºC**
  - Paleoclimate research
- **The facility is provided with four levels of backups and safety systems in order to insure a well-controlled environment for the cores**

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Best Practice

Marine Sediments - USGS Woods Hole

- **The refrigerated room maintains a temperature of +4 ºC, and the freezer runs at –20 ºC**
  - Geochemical and geophysical properties research
  - Minimize organic growth
- **Dried samples that do not require special environmental storage conditions are kept in long-term storage at the Marine Operations Facility warehouse**

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Best Practice

Hard Rock Samples

- **Need to be protected from damage due to exposure to natural hazards** (*i.e.*, extreme weather, etc.)
  - The assurance of reasonably protected indoor storage is widely recognized as ***crucial*** for any sample archive
- **Ideally in characteristic low-humidity, climate-controlled warehouses such as the USGS Denver Core Research Center or the Bureau of Economic Geology Houston Research Center**

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Preservation Standards

Accession Standards

- **Preparation for projected use and duration of study**
- **Label samples clearly**
- **Keep records of collection holdings**
- **Have appropriate containers**
  - *What suits your needs?*
  - Other methods of preservation available?
    - *Photography*
    - *Scanning*

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Best Practice

Sample Preparation

- **Cuttings and Splits - Florida Geological Survey**
  - Drill core cuttings, typically kept in 50 gram aliquots, are either washed or unwashed, depending on whether drilling mud may be safely removed from the rock type (clay cuttings are generally not washed)
  - Washed and unwashed splits of cuttings may both be retained for archiving
- **Ice Cores - NICL**
  - Ice cores require atmospheric isolation in vapor barrier sleeves inside reduced circulation reflective capped cardboard tubes

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Best Practice

Sample Archiving

- **Sample Accession - Kentucky Geological Survey**
  - Cores are immediately identified
  - Metadata recorded
    - *depth intervals*
    - *sequence numbers of boxes*
    - *total span depth*
    - *condition of core*
  - Containers (boxes) are repaired or replaced as needed: wood crates replaced with cardboard
  - “Call numbers” are assigned, labels printed, and box numbers (separate from other sample identification numbers) assigned, all before cores are placed on pallets and racked.

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Preservation Standards

Cataloging and Metadata

- Common fields
  - Leads to interoperability
- As much information to be clear and specific
- Standards of information quality
  - Defined metadata standards

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Preservation Standards

Cataloging and Metadata

Defining Metadata

Metadata are information about data and/or geospatial services, such as content, source, vintage, spatial scale, accuracy, projection, responsible party, contact phone [information], method of collection, and other descriptions... Reliable metadata, structured in a standardized manner, are essential to ensuring that geospatial data are used appropriately and that any resulting analysis is credible.

Office of Management and Budget, 2002

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Best Practice

The National Digital Catalog

- The U.S. Geological Survey NGGDPP has undertaken the opportunity of creating a National Digital Catalog
- This Catalog will act as a common-format clearinghouse for data from Federal sources, State Surveys and other contributing sources
- This Catalog also serve as a comprehensive service for data discovery by either linking data sources to a common interface, or by holding data for service to the Catalog for repositories without the capability to directly link to or be harvested by the NDC

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Best Practice

Indexing Samples – National Museum of Natural History

- Current information management system:
- EMu – Electronic Museum system
  - Internet interface
  - Can handle large catalog

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Preservation Standards

Access to Collections

- **Repositories are obliged to establish policy that balances**
  - Safety and preservation of collections
  - Availability and usability
- **Make provisions for**
  - Requesting
  - Loaning
  - Destructive analysis
  - Altered samples

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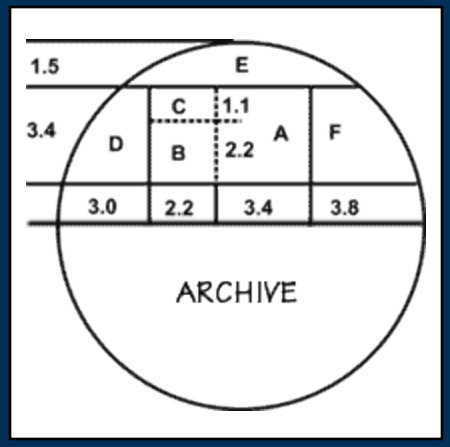
Best Practice

Access and Availability - NICL

- **Sample requests made to a Sample Allocation Committee**
  - Based on scientific merit of the proposal
  - Availability of the requested segment
- **Sample availability**
  - Core Location maps & inventory Master List *http://nicl.usgs.gov/inventory.nicl*
  - Cut diagrams



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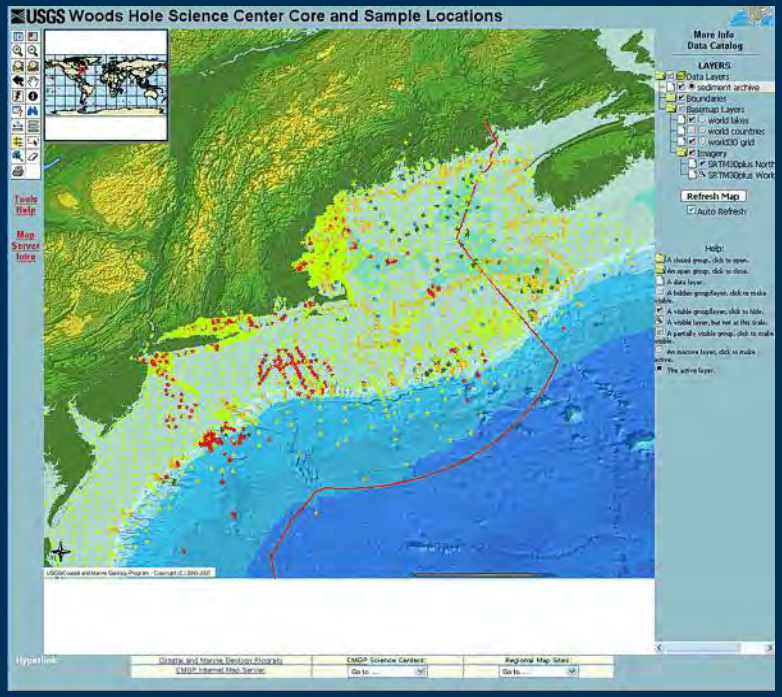
Best Practice

Procedural Documentation – USGS Woods Hole

- **Archival Policy Handbook**
  - USGS Open-File Report 2006-1187
  - Transparency in policy and procedure
- **Online Database**
  - Search holdings
  - IMS, text and Google Earth interface



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Resources

Procedural Techniques

- **The National Ice Core Laboratory**
  http://nicl.usgs.gov/
  - **Website details collection, accession and archival procedures**
  - **Contacts for tours and examining the cores**
- **USGS Woods Hole**
  http://woodshole.er.usgs.gov/operations/ia/samples.php
  - **Ocean Floor Samples portal**
  - **Describes archival procedures and accessing the collection**
- **Kentucky Geological Survey**
  http://www.uky.edu/KGS/core_library/
  - **Well Sample and Core Library portal**

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Resources

Indexing and Cataloging

- **Smithsonian NMNH & EMu**
  http://collections.nmnh.si.edu/
    - Collections Index for National Museum of Natural History

  http://www.kesoftware.com/content/view/19/337/lang,en/
    - Software and download information
- **National Digital Catalog**
  http://datapreservation.usgs.gov/catalog.shtml
    - Project Information
    - Metadata templates, FAQs and samples

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Continuing the Process

Standards are *Community Based*

- **2009 GSA Technical Session №158**

Best Practices and Solutions for Geological and Geophysical Data Preservation

- Deadline for Abstract submission **August 11**

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