NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

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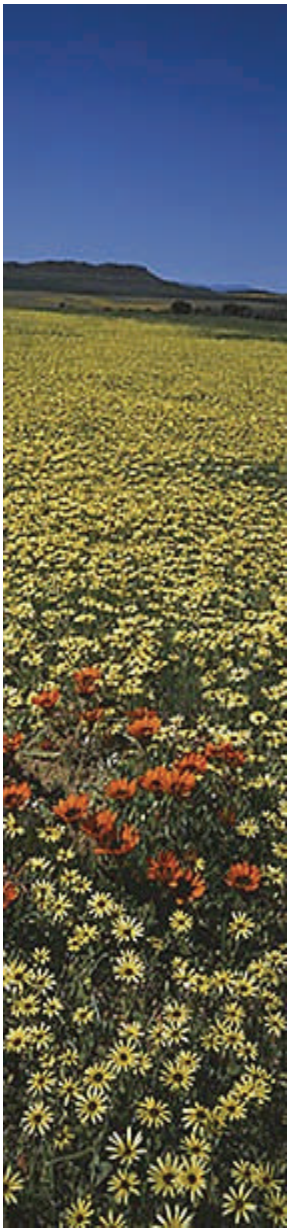

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Risks and Challenges in Managing Scientific Records

Federal scientists and engineers work in an ever increasing and complex technological landscape creating, researching, and developing data in networked collaborative environments which complicate records management practices, data archiving and electronic storage. Problems occur when scientific records are improperly stored and maintained and when they become alienated from the sponsoring agency that created them. Paper-based and electronic records that are kept for long periods of time, often decades, without being properly maintained, will deteriorate. Unauthorized removal of federal scientific records from their originating laboratories and workspaces can result in the damage, loss, or misuse of the records, and ultimately adverse legal action.

The records produced by Federal agencies with science missions generally, but not exclusively, fall into three major categories. **Research and Development (R&D)** records derive from applied science and technology (e.g., space vehicles, military hardware, fossil fuel and nuclear energy applications). R & D records include those that document the formulation of goals, evaluation and selection of proposals, and oversight and quality control. They include data collection and observation, analysis, and project administration, and are often maintained at a variety of sites in different formats, as a major project may be subdivided into specific pieces. **Environmental health and safety** records can originate from processes such as the disposal and monitoring of hazardous and toxic wastes and the cleanup and restoration of damaged sites. **Observational data** from the physical sciences consists of information about our physical universe (e.g., atmospheric storms, deep ocean currents, earthquakes, and energy emitted by a supernova). Observational data is often maintained centrally in data centers (e.g., NOAA's National Climactic Data Center).

EPA scientist testing water for pesticides (1972).

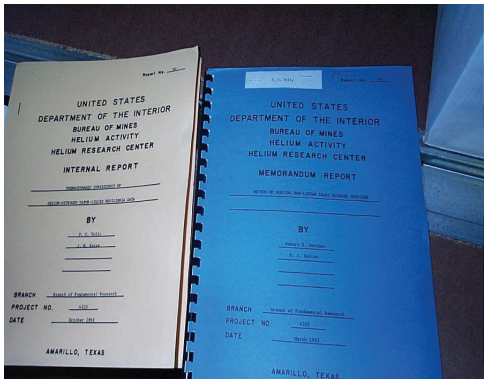
Records enable and support an agency's work to fulfill its mission. Since records contain information, a valuable resource, it is essential to take a systematic approach to the management of records. Good recordkeeping is especially important to agencies with scientific missions. For example, many scientific observations performed by Federal agencies are of events that can never be repeated

exactly. Once lost, such data can never be replaced. Observed data provides a baseline to determine rates of change and frequency of occurrence of unusual events. Data can be used in the future for different purposes than they were created for. This characteristic can be due to (a) new scientific concepts that involve using data and (b) new technologies for manipulating data. Reanalysis of data, even in the distant future, may bring new understanding. Observational data is both a history of natural occurrences and a record of human accomplishment. Transient natural phenomena [e.g., floods, earthquakes, etc.] are not reproducible.

Some government science agencies have developed ways and means for properly caring for their records that can serve as 'best practices' for other such agencies. For example, one agency has implemented a written procedure for scientific records appraisal to help ensure early identification of important data and classification of that data under established retention guidelines. Another agency has developed a "Collection Policy and Deposit Form" for its scientists to use when closing out project records that says what constitutes Federal scientific records and provides a protocol on how to arrange, describe, and deliver the closed records to the designated archives and records function for continued maintenance and eventual transfer to NARA. Other science agencies are currently undertaking large scale digitization projects to selectively preserve and distribute science data that now appears only in older paper records that are unindexed or are in danger of deterioration.

However, recordkeeping challenges and risks are also evident where Federal agencies engage in science missions. A 2006 NARA study of R&D records confirmed what many NARA records analysts have observed over the past several decades when working with science agencies. The study mentioned that scientists and engineers in laboratories have a history of managing their records however they see fit; in some cases this involves the scientists taking records with them when they retire or go to another job. One of the reasons given for this behavior was that scientists and engineers do not view their work as something they only do at the office; many think of their work as their 'lives' and the records they create are part of that life. Scientists sometimes spend years on a specific project and do not wish to give up the records they create to the Federal government when they retire.

As a result, records become alienated from offices and sometimes end up in the attics, garages or home



"Orphaned" science records from the defunct U.S. Bureau of Mines.

offices of the scientists, or are carried off to the scientist's next job at a private research laboratory, educational institution, or at another government agency. Scientific records that are removed from laboratories and offices may suffer damage, loss, or misuse.

In instances where science records are turned over to the government at the end of a project or career, they are sometimes left in disarray for others to sort through and process. Some Federal scientific records have even found their way into non-Federal archival repositories, institutions, or other entities, because the scientist, or his/her surviving family members chose to "give" away what they did not own,

Fifty years' worth of records of a deceased U.S Government scientist left in basement offices.

without NARA ever having been consulted or in any way involved in the transfer of custody.

Another problem in agencies that produce scientific records is that in some cases the administrative staff does not understand how to properly manage records; they have never received formal records management training, and therefore manage their scientific records the best they can. De-centralized filing contributes to the problem as well. Unlike centralized file areas, which consolidate a number of different types of records in discrete locations, de-centralized filing can cause records to become stored in undesirable locations, such as scientist's own offices and cubicles.

We have witnessed situations where important scientific records are allowed to sit in agencies for long periods of time, sometimes never being sent to NARA, or to another offsite storage area, and are therefore not preserved properly. Inspections of some science agencies have revealed situations where records went unmanaged and left to deteriorate in sub-basements, broom closets and even restrooms. One NARA records analyst reported seeing scien-

tific records housed in plain brown boxes that were left in flooded basements, covered with cobwebs and the remains of dead insects and vermin, and stored in warehouses adjacent to lockers filled with flammable

Boxes of science records being stored unprotected on a vehicle garage floor.

liquids; or underneath of crumbling ceilings with falling debris raining down from above.

Digital records that are created by scientists and engineers require even more careful, systematic management throughout the records lifecycle in order to protect and preserve scientific information. The ability to store data electronically has never been easier and this can put documentation at risk. The use of thumb drives or external hard drives allows for instant duplication and portability of information, but this storage medium has never been considered for long term storage; electronic scientific data can deteriorate and become corrupt after only a short time. The factors contributing to the deterioration or loss of digital data include decay of the storage media; reliance on outmoded formats or systems (hardware and /or software); and inaccuracies introduced in the reading, writing, or transmission of data. Additionally, data may become isolated and put at risk of being discarded because the record creator is no longer around.

A newer complicating factor for scientific records is the use of "cloud computing," a recent technology that allows users to access and use shared data and computing services via the Internet or a Virtual Private Network, using a scalable range of resources without having to build infrastructure to support these resources within their own environments or networks. The term "cloud" metaphorically refers to the Internet itself. Federal Computer Week recently noted that the U.S. Department of Energy national laboratories are making use of cloud computing technology as a way to achieve cost savings in performing scientific computations. Users have no direct access to the servers on which the information resides; the only access to the data is through the Internet. Some critics have questioned the security inherent in the system, and any guarantees against fraudulence or loss of data has lately come under scrutiny. This technology is relatively new, and the ramifications concerning records management standards are as yet not fully known. Federal scientists should exercise great care when using this

Scientific records stored in disarray in close proximity to low-level radioactive minerals.

technological platform. Until strict assurances of impenetrable firewalls are in place, and the possibility of any fraudulence is removed from such digital storage, extreme caution should be exercised. That being said, however, several Federal agencies are already using cloud computing on a limited basis. NARA recently released a set of Frequently Asked Questions (FAQs) which provide some guidance in this area (see http://www.archives.gov/records-mgmt/faqs/cloud.html).

Beginning in 2006, NARA began collaborating with scientific data creating agencies to develop strategies for ensuring the long term preservation of scientific research and data collections. The focus is on building awareness of the need to manage, preserve, and make available the Nation's scientific research, and to leverage combined knowledge, expertise, and resources to assure long-term preservation and ac-

Closed research project records, unarranged and unindexed, in boxes labeled only with the lead scientist's name.

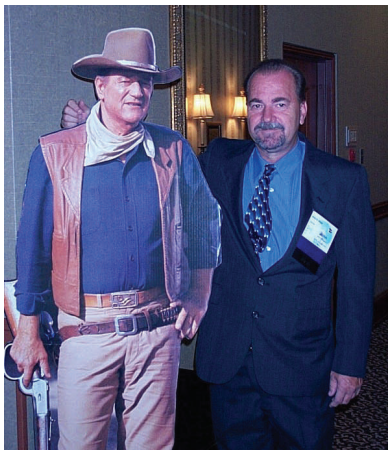
cess. NARA also plans to develop cooperative strategies, using a "community of practice" approach, with organizations and agencies such as CENDI, NOAA, FEA, USGS, and EPA. The goal is to address digital preservation and access challenges early in the lifecycle, using both the NARA appraisal policy and the Open Archive Information Systems (OAIS) Reference Model as the conceptual framework. Under this initiative, NARA will create practical tools for agencies to adopt; it will advocate and socialize strategies and tools; it will visit agencies where there is a common interest in the goals of the working group; it will develop questionnaires for circulation and comment to the community of practice; it will publish results as tools for other science data-creating agencies; and it will continue to engage agencies on emerging challenges in this area.

Agencies must encourage scientists and engineers to properly manage their records while they are still in their possession, and then systematically transfer inactive project files from their offices, servers, and work areas, to agency records managers as soon as possible after project closure to facilitate timely record schedule implementation. This result may be accomplished by emphasizing that better care of records early in the life cycle will help ensure that important records are not lost through neglect. NARA assistance also may be sought to instruct scientists on the importance of good records management practices.

For more information, see the NARA publication "Documenting Your Public Service" at http://www.archives.gov/records-mgmt/publications/documenting-your-public-service.html.

Steve Adams, Mark Ferguson, Nancy Merz, and David Miller of the NARA Rocky Mountain Region contributed to this article. Photographs courtesy of the National Archives and NARA—Rocky Mountain and Pacific Regions.

Farewell, John Mangers



John Mangers (right).

John Mangers, Deputy Director of the Federal Records Center, is retiring after **29** years of dedicated service to the National Archives and Records Administration. John is one of the most popular employees to have passed through our doors. He always gives 110% to his work and his positive, easy-going attitude and keen knowledge of center operations have served the Rocky Mountain Region well for three decades. He is a veteran of the Viet Nam war and started with the FRC as an Archives Aid in 1982. There is not one task that John has not performed over the years including searching records, working with agencies and researchers, records intake, disposal, and relocation of records. John worked his way up through the ranks to his present position and is an excellent front line supervisor who is fair-minded and treats his employees well. John is a highly proficient golfer and we expect that he will spend much of his time on the links around Denver in his retirement, and with his wife, Robin, his sons, and his grandchildren. We wish you only the best, John—thanks for all your years of service!

NARA Rocky Mountain Region *Tentative* Training Schedule for FY 2011

Date	Course Title	Location
January 11, 2011	Basic Records Operations	Albuquerque, NM
January 12-13, 2011	Electronic Records Management	Albuquerque, NM
February 23-24, 2011	Creating & Maintaining Agency Business Information (KA2)	Albuquerque, NM
March 1-2, 2011	Records Scheduling (KA3)	Albuquerque, NM
March 3-4, 2011	Records Schedule Implementation (KA4)	Albuquerque, NM
March 8-9, 2011	Asset & Risk Management (KA5)	Albuquerque, NM
March 10, 2011	Records Management Program Development (KA6)	Albuquerque, NM
May 3, 2011	Basic Records Operations	Albuquerque, NM
May 4-5, 2011	Electronic Records Management	Albuquerque, NM
July 19, 2011	Basic Records Operations	Denver, CO
July 20-21, 2011	Electronic Records Management	Denver, CO
TBD	Emergency Planning & Response for Vital Records & Essential Information	TBD—Denver, CO or Billings, MT
August 2011 Date TBD	Electronic Records Forum	Denver, CO

Workshops will be posted after October 1, 2010. **Dates and classes are subject to change.**
For information contact Rocky Mountain Region, Telephone: 303-407-5720, E-mail: workshop.denver@nara.gov
NARA does not discriminate on the basis of race, sex, color, national origin, disability, religion, age, sexual orientation, and status as parent in its records management training