2009 AASG/USGS Geoscience Data Preservation Techniques Workshop

14 & 15 July 2009
Indiana University-Bloomington

Abstracts

Betty Adrian
U.S. Geological Survey, Denver

Physical Collections: How to Create a Valuable National Resource

The United States Geological Survey (USGS) has a long history of managing geological and geophysical "physical" collections. Beginning in 1970 and continuing through the 1980's, the USGS Mineral Resources Program (MRP) collected and analyzed 60,000 samples each year through assessment programs in Alaska, the conterminous United States, and in California. These collections are archived in Denver (Denver Federal Center, Building 810) and comprise about 3,000,000 items. The USGS Core Research Center (CRC; also located in Building 810), houses rock core from over 8,500 boreholes representing about 1,700,000 feet of rock core from 35 States and cuttings from 54,000 boreholes representing 238,000,000 feet of drilling in 28 States. The USGS has developed innovative and cost-effective methods for curating, storing, and preserving these physical collections and making them available to research scientists. Examples include:

- Using a side-loading forklift to allow pallet storage racks to be installed with narrower aisles for efficient use of warehouse space;
- Storing cuttings in paper envelopes labeled with sample locations in uniform cartons for easy access on shelves;
- Slabbing full-diameter cores, photographing clean surfaces for display on the CRC website, and reboxing in tray-style custom boxes that store on shelves like books in a library;
- Storing thin-section collections in labeled drawers so they are easily found and accessed; and
- Providing a web-based digital catalog of sample locations and metadata with GIS capability.

Sharing and exchanging solutions like these among the data preservation community will increase researchers' ability to access and use the significant geoscience data collections of State, Federal, and academic institutions.

M. Lee Allison
Arizona Geological Survey, Tucson
and
Linda C. Gundersen
U.S. Geological Survey, Reston, Virginia

The AASG-USGS Geoscience Information Network (GIN)

Significant developments have occurred since 2007 when the AASG and USGS agreed to jointly develop a national, distributed, interoperable, data network based on open-source standards and common protocols. Most significantly, a grant from NSF is underwriting development of key components for data discovery and access and forthcoming demonstrations of these services to state geological surveys. A GIN web catalog service is being implemented for the National Digital Catalog and National Geologic Map Database and subsequently with USGS' comprehensive science catalog.

Productive partnerships have been formed in the last two years. The 21-nation OneGeology-Europe (1G-E) consortium is including compatibility with GIN as part of a European Union spatial data infrastructure. GIN and 1G-E technical leaders are working together on common standards and architecture.

The Marine Metadata Interoperability Initiative agreed to make their services and software for semantic ontologies and related functions available as a set of GIN-enabled applications.

An emerging initiative in the international petroleum community to establish common metadata standards is adopting GIN to provide "end-to-end" integration of data access and discovery. Similarly, a 13-institution coalition competing to build a National Geothermal Database with the U.S. Dept. of Energy has selected GIN as the architecture for its system.

Additional partnerships exist with the CUAHSI Hydrologic Information System and the iPlant Collaborative to share standards and architecture; with ESRI for a compatible geology data model in ArcGIS software; and with Schlumberger-MetaCarta for accessing geospatial data using geographic search.

Joseph Bamberger
New York State Geological Survey/New York State Museum, Albany

Digital and Physical Preservation and Storage of Well Cutting Samples of the New York State Geological Survey

The New York State Geological Survey's Reservoir Characterization Group is preserving and repackaging its collection of about 380,000 well-cutting samples from 1,934 wells using commercially available storage kits and sample folders. The samples are now in traditional brown paper 5x3 inch paper envelopes, with about 50 envelopes stored tightly packed in 18x3x5 inch cardboard boxes. The boxes and envelopes containing well cuttings are more than 80 years old and are deteriorating. They will not effectively store and preserve the samples into the next century. Further, storage boxes take up space on shelving units, limiting storeroom capacity. Transferring the samples to transparent, archival-quality vials ensures preservation of the material and allows direct viewing of as many as 50 samples at one time in their storage trays. Otherwise, the user has to open multiple paper envelopes and extract the contents of each for examination. In addition, present "boxes and envelope" storage is cumbersome for digital photography. Since photographs of the well cuttings are intended for publication on the Empire State Oil and Gas Information System and New York State Geological Survey's website, ease of photographic access is significant. Once the samples are housed in transparent vials, many samples can be viewed in the same image. Finally, it is both expensive and cumbersome to transport samples of well cuttings to professional meetings for viewing by other professionals. Digital images available via the internet will reduce the need for transport of the physical samples.

Brian J. Buczkowski
U.S. Geological Survey, Woods Hole, Massachusetts

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

Section 351 of the Energy Policy Act of 2005 (Public Law No: 109-58) established the National Geological and Geophysical Data Preservation Program (NGGDPP). The Program has supported inventorying and cataloging collection data and physical sample holdings by Department of the Interior bureaus and State Geological Surveys. The NGGDPP launched an effort to identify and highlight policies and procedures throughout the Federal and State geologic communities to develop best practices in the fields of data management, sample curation, and metadata generation. These best practices will provide information to State Geological Surveys, the U.S. Geological Survey (USGS), and other research institutions with information to make prudent, well-informed archival and business decisions. NGGDPP and State Geological Surveys have examples of best management practices for sample preservation, sample data (digital, photographic, descriptive) organization, and metadata generation. These best practices will be documented in a USGS White Paper and on the Web in a wiki-style discussion page. Best practices will be shared with the larger geological community for review and recommendations to assist development and implementation of policies and procedures.

Wolfgang Grunberg, Ryan C. Clark, and Stephen M. Richard
Arizona Geological Survey, Tucson

Implementation of OGC catalog service for the Web

To promote access to metadata and increase visibility of our data holdings through online catalog search applications, we are implementing a catalog service using the Open Geospatial Consortium (OGC) Catalog Services for the Web (CSW). We are using Deegree (www.deegree.org), a free, open-source Java-based implementation. Steps in the implementation are: (1) Export records from our existing database into XML files that mimic the table and field structure of our metadata database. 2. Transform the XML into ISO 19115 compliant XML using XSLT. 3. Load records into the Deegree native metadata store using CSW transaction operations. The most difficult part of the implementation process has been determining the precise schema mapping from our metadata schema to an ISO 19115 MD_Metadata record that will load into the Deegree data store and performing the necessary XML transformation. Import using the existing insert transaction with ISO 19115 metadata separates implementation-specific transformation operations from internal implementation details of the Deegree CSW. This should make out-of-the-box Deegree implementation more portable.

Ronald Klass
Illinois State Geological Survey, Champaign

Illinois State Geological Survey Approach to Data Preservation

The ISGS is responsible for creating and managing a wide range of physical and digital collections. These collections have been managed in various ways. Our primary well database has been centrally managed for over 20 years, providing a standard location and window to much of our data. We are working to better educate staff about data management of project- and user-level datasets not centrally managed. We have also developed a database of our data holdings, both physical and digital, to track important data and raise awareness of other data throughout the survey. In the early 1970s we built a facility to house our growing core and cuttings collection.

New data and existing data in non-digital formats present many challenges including resource availability, staff education and involvement, and new or increasing infrastructure needs. Infrastructure is particularly challenging, as our core storage facility has been near capacity for over a decade, limiting what we can accept and forcing us to warehouse some cores on pallets in pole barns. The NGGDPP provided an opportunity to assess our collections and additional resources to increase their usability and impetus to develop an over-arching data preservation plan.

Michael D. Laine, Thomas Dempster, and Steve Bowman
Utah Geological Survey, Salt Lake City

The Utah Core Research Center - Utah's Largest Collection of Well Cores and Cuttings for Petroleum Industry and Academic Research, Workshops, and Short Courses

The Utah Core Research Center (UCRC) offers students, educators, and other researchers access to Utah's most comprehensive collection of geological specimens for thesis and academic research, workshops, and classroom studies. UCRC holdings include subsurface samples from more than 3600 wells, core from more than 800 wells, samples from major tar sand and oil shale deposits, and type oils from all the producing formations in the state. The UCRC collection also contains representative samples from Utah's coal mines, metallic mineral deposits, industrial rocks and minerals, geothermal wells, sediment and brine from Great Salt Lake, and surface stratigraphic sections.

The UCRC has upgraded and replaced scientific equipment to provide technical support for researchers using the geologic collection. Analytical data, geophysical logs, and reports by donors may also be available. Destructive testing is allowed with restrictions and advanced permission. The UCRC can quickly accommodate client needs such as workshops, classroom space, large-scale sampling, digital imaging, and other research requirements.

Donald G. Mikulic
Illinois State Geological Survey, Champaign
and
Joanne Kluessendorf
Weis Earth Science Museum, University of Wisconsin-Fox Valley, Menasha

A Tale of Two Cities: Problems Related to Preserving Geological Samples and Data Generated by Public Works Projects

In recent years, large-scale water treatment facilities were built in the Chicago and Milwaukee metropolitan areas. The Metropolitan Water Reclamation District of Greater Chicago began construction in the late 1960s. The Milwaukee Metropolitan Sewerage District project started in the 1970s. Planning for these publicly-funded projects included extensive geotechnical studies by private consultants that generated large volumes of samples, unpublished data, and "published" reports. These projects were the first comprehensive and systematic geologic studies in the largest metropolitan areas of their respective states. Both Districts have allowed scientific use of their geologic information and have donated samples to their state geological surveys. However long-term scientific access, use, and preservation of these materials is unresolved despite decades of effort. For example, thousands of feet of core were recovered during the projects, creating long-term storage problems. Efforts to reduce the volume of samples by discarding "redundant" cores and other materials have resulted in loss of critical information. It is clear that using existing stratigraphic interpretations, lithologic descriptions, or photographs will not provide detail needed for modern stratigraphic interpretation. Original cores have to be restudied with this new perspective in mind. These examples demonstrate the need for support from future large-scale publicly funded projects to study and preserve samples and data produced by these projects.

Frances Pierce
U.S. Geological Survey, Reston
and
John C. Steinmetz
Indiana Geological Survey, Bloomington

Why hold a Workshop? Why here? Why now?

The National Geological and Geophysical Data Preservation Program (NGGDPP) established two advisory committees recommended by its 2006 Program Implementation Plan: the National Digital Catalog and the Financial and Technical Assistance committees. Both committees have representatives from Department of the Interior agencies and state geological surveys and are charged with developing operating policies for the program. The committees met last November and agreed the program successfully communicates with the State Geologists. However, they felt it was important to talk directly with people who commonly write the proposals and do the work to provide a common understanding of program goals and expectations. In addition, they felt it would be useful to bring state representatives together with U.S. Geological Survey colleagues to share best practices in data preservation, metadata creation, and development of the National Digital Catalog.

We also want to help make the proposal process easier and increase your chances for success. To that end, here are our top ten recommendations on how to increase your chances for funding:

1. Read NGGDPP Implementation plan, available on the program web site
2. Read Program Announcement carefully, address each point explicitly, don't make reviewers work too hard!
3. Be painfully clear why you've chosen to inventory or create metadata for a given collection
4. If there is a possibility the data you are proposing to include is available from another source (e.g. state oil and gas commission), make the case for why your geological survey is the sole source
5. Explain the specific role each staff member will play on proposed project
6. Document prior work, the panel cannot rely on previous years' proposals
7. Have a Long-Range Data-Preservation Plan in place and show how the work you propose relates to it
8. Participate in NGGDPP committees and proposal review panels
9. Call with questions, e-mail with questions, send passenger pigeon with questions; JUST ASK, we're here to help
10. Start submitting your proposal to Grants.gov ONE WEEK in advance of due date!

Our goal is to create a data-preservation community of practice, and we look forward to working with you to accomplish that goal.

Sarah Ramdeen
University of North Carolina, Chapel Hill
and
Florida Geological Survey, Tallahassee

Qualitative study of data preservation practices at State Geological Surveys

This project is gathering information on habits and practices of geological data repository managers. Participants will be interviewed about methods they are using to preserve their collections and what resources they consulted to develop their methods. They will be asked about how they view their role in their institution and how they think the tasks they perform are valued. Subjects for the study will be employees of state geological surveys who manage geological samples and data for their institutions. I will target participants who have taken part in the National Geological and Geophysical Data Preservation Program (NGGDPP). NGGDPP requires organizations taking part in the grant program to create a long-range data-preservation plan for their collections to qualify for future funding.

It is common for a professional geologist to assume the role of archivist or curator of a geologic collection without training in accession and preservation. My research will explore how these individuals develop long-range plans, what methods they plan to use in the future, and why they chose those methods. I want to discover if they know of existing archival practices and how they approach archival or curatorial planning on their own. Knowing how they decide what materials to preserve and how they share information outside their organizations may provide insights on best practices for sharing accession and preservation information.

Brian Reece
U.S. Geological Survey, Austin

Data rescue and recovery: A prototype project to unlock 100+ years of USGS data

USGS archives contain information currently at risk. For decades, field technicians have visited remote sites to gather streamflow measurements; for some locations data have been collected for more than a century. Technicians documented, mostly on paper, conditions that control streamflow including upstream diversions, activity by beavers, changes in vegetation (by flooding or by invasive species), geomorphologic changes, and historic flood information obtained from interviewing landowners. This data rescue and recovery project is a prototype to make USGS water data widely available and easily accessible, reducing the risk of its loss. Data for more than 100 years of photos, measurements, reports, maps, and other data from a comprehensive data rescue operation for one USGS streamgaging station is available via the Web. Methods developed during this effort are being applied to recover data for other streamgaging sites.

Stephen M. Richard, Wolfgang Grunberg, and Ryan C. Clark
Arizona Geological Survey, Tucson

Developing a catalog service profile for the US GIN network

We are developing a catalog service profile to enable interoperability between different metadata registries (catalogs). Benefits of interoperable catalogs include increased ease of finding metadata records and reduced effort by the user community to develop interfaces to search and retrieve records from these catalogs. A community catalog service profile for the US GIN network will need to accommodate a wide variety of resource types, including those registered in the GEON catalog, the National Digital Catalog for the NGGDP program, and the NGMDB map catalog. We are comparing content indexed in these existing and planned catalogs with existing CSW profiles for ISO 19115/119 and FGDC, with the goal of reusing an existing profile to the maximum extent possible. Work to implement prototype catalog services suggests that more 'best practice' specifications are necessary to achieve interoperable catalog services in which a client could seamlessly connect to different catalog servers. We will report on profile development in our presentation.

Gregory A. Schumacher
H. R. Collins Laboratory, Division of Geological Survey, Ohio Department of Natural Resources, Delaware, Ohio

Core Preservation and Consolidation Project Reclaims Wasted Shelf Space

Existing collections currently fill 90% or more of available storage capacity in nearly two thirds of the nation's geologic material repositories. This lack of space means many repositories cannot accept new materials. The National Geological and Geophysical Data Preservation Program was created to preserve the nation's geoscience collections and, with enough resources, expand the nation's repositories and archives. Meanwhile, the nation's repositories may reclaim storage space by altering the way they store their core.

The Ohio Department of Natural Resources, Division of Geological Survey, recently completed a core preservation and consolidation project to preserve core stored in damaged and deteriorating cardboard boxes and increase available shelf space for storing core at the Horace R. Collins Laboratory. The project reclaimed wasted space on 26 shelves used to store 14 small-diameter cores in oversized cardboard boxes. The reclaimed shelf space allowed storage of an additional 2775 m of 5.1 cm core or nearly 950 m of 10.2 cm core. A cost/benefit analysis compared the cost of college intern labor and new core boxes to the cost of building more storage space, buying and installing new shelving, and shipping and handling. Reclaiming shelf space saved nearly $35,000. Thus, geoscience collection managers may want to consider similar projects to maximize existing storage capacity.

Susan Seitz and Lawrence K. Freeman
Alaska Division of Geological and Geophysical Surveys, Fairbanks

Alaska GMC Inventory Database: A plan for a web-based geologic sample library

The Alaska Geologic Materials Center (GMC) stores geologic materials collected from Alaska. The GMC houses non-proprietary rock core and cuttings that represent nearly 12 million feet of energy resource exploration and production drilling; nearly a quarter million feet of diamond-drilled core samples from hard-rock mineral holes; over 5,000 boxes of surface samples; and various processed samples including petrographic thin sections, and micropaleo glass slides.

The Alaska Division of Geologic and Geophysical Surveys (DGGS) is developing a mobile, web-based inventory system for GMC's surface samples and hard-rock drill core. The ultimate goals are to integrate the sample library with existing DGGS sample location and analysis information and to create an online, geographic search engine of the GMC materials. Some obstacles to overcome are samples lacking geo-referenced information, unheated storage units without internet access for real-time tracking, and the design of an application flexible enough to accommodate our diversity of geologic materials with various levels of documentation.

The Java/J2EE based data entry application and upload utility in development uses DGGS's centralized Oracle database as the back end. A Java servlet queries the inventory data from Oracle into the proper metadata XML format for submission to the National Digital Catalog.

The GMC search engine is also a Java-based website, integrated with DNR's Alaska Mapper allowing users to make spatial and text based queries of GMC materials. The search results link samples to analytical data and publications on the DGGS website, and can be exported to Microsoft Excel or PDF format.

David R. Soller and Nancy R. Stamm
U.S. Geological Survey, Reston, Virginia

The National Geologic Map Database (NGMDB)

Congress mandated the USGS and the Association of American State Geologists to provide a National Geologic Map Database (NGMDB; http://ngmdb.usgs.gov) of standardized, spatial geoscience information. In this partnership, collaboration occurs with the private sector, universities, and geological survey agencies in other countries. The NGMDB is a hybrid – with some parts centralized and some distributed; some map information is held by various cooperators (for example, State geological surveys). Through the NGMDB website, users can browse and query the Database, and gain access to the source information wherever it is.

Throughout the NGMDB project's thirteen years, its principal responsibility has been service to the geoscience profession and the public. Resources include:

1. A Map Catalog of bibliographic citations for ~83,000 publications released by 370 organizations, with links to online GIS data or map images;
2. The U.S. Geologic Names Lexicon, a standard reference for the Nation's stratigraphic nomenclature;
3. A database showing areas currently being mapped by the USGS and State geological surveys;
4. A prototype Web-mapping system containing standardized national and regional information;
5. A set of Web interfaces to allow access to these products; and
6. A set of standards and guidelines to promote more efficient management and use of spatial geoscience information.

We are redesigning and integrating the NGMDB databases and Web interfaces to create new search interfaces and other methods for accessing the content. We invite comments and suggestions during this process.

John C. Steinmetz
Indiana Geological Survey
and
Frances Pierce
U.S. Geological Survey, Reston

The National Geological and Geophysical Data Preservation Program: Its origin, status, and future

In the mid-to late 1990s, the U.S. Department of Energy sponsored several investigations that were carried out by the American Geological Institute to examine the feasibility, practicality, and implementation of what became known as the National Geoscience Data Repository System. For various reasons, largely related to strategy and funding, the System died in its infancy. Nevertheless, there was enough interest in geoscience data preservation that the National Research Council (NRC) undertook a study to examine this in 2000. The NRC published *Geoscience Data and Collections: National Resources in Peril*, in 2001. The Association of American State Geologists (AASG) used recommendations from this study to work with members of Congress to create enabling legislation for "The National Geological and Geophysical Data Preservation Program (NGGDPP)," as part of the National Energy Policy Act of 2005.

The Act called for the U.S. Geological Survey to present an implementation plan and to administer the program. The plan, submitted to Congress in 2006, outlined a distributed system of national and state data archives, a National Digital Catalog, and a means to provide technical and financial assistance through an awards process. When adequately funded, the program would award funds for the development of physical and digital infrastructure, outreach, and special needs (that is, data rescues). While the AASG has worked continuously since 2005 to seek full congressional appropriation of $30 million for each of the five years the program is authorized, funding has fallen short. Nevertheless, the USGS has provided nearly $1 million in each of the last three years, matched by state funds, to begin a modest awards program and build the National Digital Catalog.

Reauthorization of the NGGDPP is due in 2010, and the AASG is working with Congress to seek reauthorization for another 10 years and to identify some "appropriations champions" to sponsor full appropriation of this important program.

Tim Wahl and Harvey Thorleifson
Minnesota Geological Survey, St. Paul

Minnesota Geological Survey information systems

The Minnesota Geological Survey is systematically improving web-accessible information systems, to provide information on every publication released since 1872.

These information systems include:

- 40,000 searchable page scans
- 600 raster map files
- Curation and cataloging commonly accessed drillhole databases and samples
- Enhancements to state magnetic, gravity, and rock property databases
- Compilation of a state geochemical database
- A new multilayered state geologic map
- Compilation of web-optimized detailed geologic mapping layers
- Improved quantitative specification of material properties of groundwater systems, such as hydrogeologic properties; and,
- Acceleration and enhancement of the core MGS program, the multilayered County Geologic Atlases

Jerry Weisenfluh and Patrick Gooding
Kentucky Geological Survey, Lexington

Cataloging Kentucky Core Materials for Discovery and Metadata Generation

The Kentucky Geological Survey Well Sample and Core Library houses more than 3,000 cores collected from within the state. Originally, the focus of cataloging these materials was to determine the geographic location of the wells and describe the physical state and storage of the boxes. In the past two years, we have added information about the cores to make it easier to find geologic samples of various kinds and to support creation of metadata records for the National Geological and Geophysical Data Preservation Program catalog. New information includes geologic age and domain, purpose of drilling, availability of detailed descriptions and sample analyses, stratigraphic depths, and box details.

The inventory database facilitates creation of NGGDPP site-level metadata. A Web-based program was created to generate text files in XML format that can be imported into the national catalog. Future work will create similar information for other kinds of geologic materials and KGS digital data holdings.

Live demonstrations:

Jerry Weisenfluh
Kentucky Geological Survey, Lexington

The Kentucky Geological Survey uses Web search functions and internet maps to make geoscience data holdings available to the public. This demonstration will show various tools developed to facilitate data distribution and linkages between databases and online maps.

Fieldtrips

Ruth Lilly Auxiliary Library Facility
Vaughn W. Nuest, Ruth Lilly Auxiliary Library Facility, Indiana University

The Ruth Lilly Auxiliary Library Facility (ALF) is a high-density shelving facility designed to alleviate space constraints in the Indiana University Libraries. It provides low-cost housing with conservation-level environmental controls for library materials. Low-use materials, archives, manuscripts, as well as rare and fragile materials are transferred to the ALF from many campus library locations. The facility also includes a state-of-the-art preservation laboratory as well as space and staff for accessioning and lending materials from the secure collections vault with a capacity of approximately 2,800,000 bound volumes. The field trip will emphasize the materials handling aspects of large collections of items, with special attention to efficiencies in handling, storing, and accessioning items from such a collection.

IGS Mine Map Preservation Laboratory
Elke Pessl and Rebecca Meyer, Indiana Geological Survey

The Indiana Geological Survey (IGS) has been working for over 20 years to establish a reliable and accurate underground coal mine map system. The Indiana Coal Mine Information System (CMIS) had been built extensively upon photo images of mine maps; thus the accuracy was not always at a level that would allow precise location determination of all underground voids. In response to the 2002 Quecreek Mine disaster in Pennsylvania, the U.S. Mine Safety and Health Administration (MSHA) realized that incomplete and faulty mine maps were to blame – due to the lack of accessibility to the final mine map. To obviate future such events, MSHA and the Office of Surface Mining (OSM) began supporting the development of accurate and readily available underground mine maps for every state. The MSHA/OSM-funded initiative has allowed the IGS research staff to investigate techniques to flatten and stabilize original mine maps; and scan, digitize, orthorectify, georeference, and archive them. The integration of the digital images and associated data into the IGS GIS, and how those data are served to the public were developed by CMIS staff. The field trip will emphasize the techniques developed through decades of investigations.

Fieldtrips
(continued)

IGS Petroleum Database Management System
Charly Zuppann, Indiana Geological Survey

The Petroleum Database Management System (PDMS) is a Web application designed to distribute petroleum-related information from the Indiana Geological Survey (IGS). The database contains information on more than 70,000 petroleum-related wells drilled in Indiana. The data include information on well locations, completion zones, logs, operators, lease names, tests, hydrocarbon shows, samples, cores, geologic formations and tops, and much more. The PDMS is built around three modules: 1) the Well Record Tables; 2) the Map Viewer, which together with the Well Record Tables, provide two interfaces for viewing petroleum well information; and 3) the Fields and Production summaries, which summarize oil, gas, and gas storage fields, and historical oil production.

Well Record Tables. Well data are displayed in tables. Viewing and downloading well records is only possible in the Well Record Tables. The well data are organized in outline form where each well is identified by the IGS ID, a unique number that represents a unique location on the ground. The IGS ID provides the link between the Well Record Tables and the Map Viewer. Each well is subdivided in to a series of "events" that make up the well's history. Data for each well event are contained in subtables that are linked to that event.

Map Viewer. The Map Viewer is an interface that displays interactive maps of petroleum well data. This map viewer is connected to the Well Record Tables when detailed information is needed.

Fields and Production. Summary information on oil, gas, and gas storage fields can be searched for by field name. Field production histories for oil fields are shown in tables and graphs.