

Opportunities for research data discovery and reuse - lessons learned from 20 years of geospatial data platform evolution

Karl Benedict, Director of Research Data Services, UNM Libraries

March 19, 2018

Overview

- Introduction
- Development of the *National Spatial Data Infrastructure*
- Getting Local - the *New Mexico Resource Geographic Information System*
- Lessons Learned
- Where from Here?

Building on three decades of data management, analysis, and visualization experience - particularly in the areas of database design and geospatial data management - and over 20 years of web application development experience, with an emphasis on web-based data discovery and access tools, this presentation is intended to illustrate the lessons that have been learned from the development of several generations of applications intended to facilitate effective discovery, access, and use of increasingly large collections of geospatial (and ultimately more general) data. Highlighting these lessons can help inform decision making about the strategies and tools developed and selected to enable more effective research data preservation, discovery, and sharing in our current context of increased attention to maximization of the impact of research investments in research data creation and documentation.

Introduction



A consideration of the initiative that began in the Mid-1990s to establish a US *National Spatial Data Infrastructure* highlights some similarities with the development and expansion of requirements for increased public access to research data as a product of funded research projects and in association with publications. In the nearly 25 years since the initiation of the NSDI program, the evolution of the NSDI, both as a national program, and as a collection of local repositories that constitute the network, can provide insights into how a still emerging system for preserving and sharing research data may be developed and grown.

Critical questions of system interoperability, adoption of standards, and architectural models are as relevant today in the context of our emerging network of data repositories as they were 25 years ago when a distributed network of geospatial data providers was envisioned as the national-scale NSDI.

Development of the NSDI

Federal Register

Vol. 59, No. 71

Wednesday, April 13, 1994

Presidential Documents

Title 3—

Executive Order 12906 of April 11, 1994

The President

Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure

Geographic information is critical to promote economic development, improve our stewardship of natural resources, and protect the environment. Modern technology now permits improved acquisition, distribution, and utilization of geographic (or geospatial) data and mapping. The National Performance Review has recommended that the executive branch develop, in cooperation with State, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology.

NOW, THEREFORE, by the authority vested in me as President by the Constitution and the laws of the United States of America; and to implement the recommendations of the National Performance Review; to advance the goals of the National Information Infrastructure; and to avoid wasteful duplication of effort and promote effective and economical management of resources by Federal, State, local, and tribal governments, it is ordered as follows:

Section 1. Definitions. (a) “National Spatial Data Infrastructure” (“NSDI”) means the technology, policies, standards, and human resources necessary

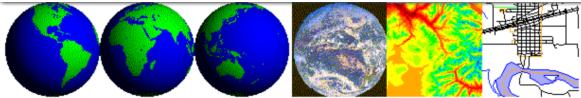
In April 1994 President Clinton signed Executive Order 12906 entitled *Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure*. ([link](#)).

Through this Executive Order the *National Geospatial Data Clearinghouse* was established as a “a distributed network of geospatial data producers, managers, and users linked electronically.”

Key elements of the clearinghouse model included:

- A distributed network of clearinghouse nodes that published their data holdings using an open standard protocol (z39.50 with geospatial extensions)
- Adoption of a shared documentation (metadata) standard
 - in 1998 the FGDC *Content Standard for Digital Geospatial Metadata (revised June 1998)*
 - More recently the recommendation to adopt the ISO family of 191xx standards
- A focus on public access to geospatial data
- Required (of Federal agencies) use of the clearinghouse prior to expending funds on the acquisition of new data
- Development of data standards
 - National Digital Geospatial Data Framework

1997 - Basic Federated Search



FGDC Clearinghouse Referral Server

New -- [Check Status of all NSDI Clearinghouse Nodes](#)

This server enables public search for digital spatial data at registered NSDI Clearinghouse Nodes through the following interfaces at the FGDC and Master Environmental Library (MEL) at the Naval Research Lab, a partner in the development of Clearinghouse:

- [Query Clearinghouse Sites using HTML](#)
[\[Reston Gateway\]](#) [\[JHU Gateway\]](#)
- [Query Clearinghouse Sites using Java interface](#)
- [Query MEL Sites using HTML with imagemap map](#)
- [Former \(Prototype\) Clearinghouse Gateway](#)

Go to [National Hydro Dataset Server](#) Home Page...

Register your server

If you have created a searchable Z39.50 Clearinghouse Server using Isite and would like to register it with the FGDC so others can use the above interfaces to access it, please [register your server](#).

[to FGDC Home Page](#) --- [to Clearinghouse Home Page](#)

Website created and maintained by ddinebert@usgs.gov

The initial release of the FGDC Clearinghouse was a simple web interface, and an underlying z39.50 search service that executed a provided search across the registered clearinghouse nodes.



The Clearinghouse Registry

Federal Geographic Data Committee (FGDC)

Status	Catalog Server	Country	Server Software
Active	Africa Data Dissemination Service	United States	CNIDR zserver v2.07i
Active	Alamo Area Council of Governments	United States	CNIDR zserver v2.07i-NT
Active	Alaska Geospatial Data Clearinghouse	United States	Isite
Active	Alaska State Geospatial Data Clearinghouse (ASGDC)	United States	Isite
Active	Anchorage Alaska Geospatial Data Clearinghouse Node	United States	SMMS 3.0
Active	Argentina - IGM - Instituto Geografico Militar	Argentina	Isite
Active	Arizona Clearinghouse Node for Spatial Data	United States	Isite
Active	Arkansas GeoLibrary	United States	Isite
Active	Australia - WALIS Interragator - Environmental Impact Statements	Australia	Isite
Active	Australia - WALIS Interragator - Spatial Data	Australia	Isite
Active	Australia - ACT Spatial Data Directory	Australia	Isite
Active	Australia - AUSLIG Data Directory	Australia	Isite
Active	Australia - Australian Hydrographic Office- Product Metadata Directory	Australia	Isite
Active	Australia - BRS - Incorporating Other Commonwealth Data	Australia	Isite
Active	Australia - Bureau of Meteorology	Australia	Isite

The initial release of the FGDC Clearinghouse was a simple web interface, and an underlying z39.50 search service that executed a provided search across the registered clearinghouse nodes. Each clearinghouse node was running their own local search service (typically based on the ISite server platform (site) that had been extended to support geospatial searches within the z39.50 standard) based upon locally produced FGDC metadata records.

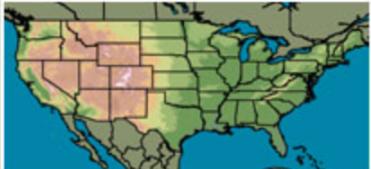
At its peak (in 2002-2003), the FGDC clearinghouse node network included over 250 contributors, including a significant number of international nodes - transforming the network from an implementation of the NSDI into a *Global Spatial Data Infrastructure* (GSDI).

2003 - A Platform for Discovering Data *and* Services

The screenshot shows the geodata.gov homepage with a blue header featuring the site's logo and a banner image of the Golden Gate Bridge, the Statue of Liberty, and the Grand Canyon.

Make a Map

Launch: [The National Map](#)



Search for Data

Search all the data in this site

About This Site

How to find the maps & data you need and how to publish your data here.
GOS Partnerships

Help

Quick Start Guide
How Do I Publish Data Collection
Activities
Contact Us

The geodata.gov Marketplace

Find out about the latest geographic data sharing and acquisition initiatives.

Information Center

Standards, tools, and resources.

Publish Data

Login

What's New

Latest events

Data Categories

- ...> [Administrative and Political Boundaries](#)
- ...> [Agriculture and Farming](#)
- ...> [Atmosphere and Climatic](#)
- ...> [Biology and Ecology](#)
- ...> [Business and Economic](#)
- ...> [Cadastral](#)
- ...> [Cultural, Society, and Demographic](#)
- ...> [Elevation and Derived Products](#)
- ...> [Environment and Conservation](#)
- ...> [Geological and Geophysical](#)
- ...> [Human Health and Disease](#)
- ...> [Imagery and Base Maps](#)
- ...> [Inland Water Resources](#)
- ...> [Locations and Geodetic Networks](#)
- ...> [Oceans and Estuaries](#)
- ...> [Transportation Networks](#)
- ...> [Utilities and Communication](#)

Learn About Specific Applications Areas

- Disaster response & assessment
- Recreation and tourism

Learn About Mapping Current Events

- Weather Events



In 2003 the Geospatial One-Stop (GOS) platform was released as a successor to the FGDC Clearinghouse. GOS provided a number of methods for integrating metadata into its search platform, including continued support for z39.50 ISite nodes but also adopting a model for harvesting FGDC metadata records from contributing organizations. As part of the registration process organizations could also register Open Geospatial Consortium map services published using the *Web Map Server* (WMS) standard. This registration process allowed GOS to provide a platform for both discovering these services, but also for using these services to allow users to view data hosted by providers within the GOS platform without having to download the underlying data.

2009 - A new platform

DATA.GOV

HOME | CATALOG | ABOUT | FAQ | CONTACT US | SUGGEST OTHER DATASETS |

DISCOVER.
PARTICIPATE.
ENGAGE.

Search Data.gov catalog by category, agency, or both

All Categories
All Agencies

SEARCH (Click here for advanced search)

VIEW THE ENTIRE DATA CATALOG ▶

FEATURED DATASET:
NATIONAL WEATHER SERVICE (NWS)
National Operational Hydrologic Remote Sensing Center (NOHRSC)
— Snow Water Equivalents

The National Weather Service (NWS) National Operational Hydrologic Remote Sensing Center (NOHRSC) provides comprehensive snow observations, analyses, data sets and map products. Available to all, these products specifically support a wide variety of government and private-sector applications in water resource management, disaster and emergency preparedness, weather and flood forecasting, agriculture, transportation, and commerce.

VIEW THIS DATASET ▶

1 2 3 4 5

Welcome to Data.gov

The purpose of Data.gov is to increase public access to high value, machine readable datasets generated by the Executive Branch of the Federal Government. Although the initial launch of Data.gov provides a limited portion of the rich variety of Federal datasets presently available, we invite you to actively participate in shaping the future of Data.gov by suggesting additional datasets and site enhancements to provide seamless access and use of your Federal data. Visit today with us, but come back often. With your help, Data.gov will continue to grow and change in the weeks, months, and years ahead.

How to use Data.gov

Data.gov includes a searchable **data catalog** that includes access to data in two ways: through the "raw" data catalog and using tools. Please note that by accessing datasets or tools offered on Data.gov, you agree to the **Data Policy**, which you should read before accessing any dataset or tool. If there are additional datasets that you would like to see included on this site, please **suggest more datasets** here. For more information on how to use Data.gov, **view our tutorial**.

DATA.GOV Data Policy | Accessibility | Contact Info | Privacy Policy

As part of the Obama administration's Open Government Initiative the Data.gov web portal was established as a central access point for datasets produced by executive branch federal agencies. As part of the establishment of the Data.gov platform, the geospatial metadata that had been searchable through GOS were migrated into the new platform and made available through catalog.data.gov search interface.



DATA TOPICS IMPACT APPLICATIONS DEVELOPERS CONTACT

DATA CATALOG

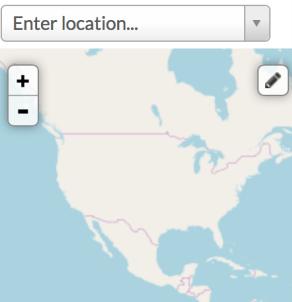
Home / Datasets Organizations ?

Search datasets...



Datasets ordered by Popular

Filter by location Clear



Map tiles & Data by OpenStreetMap, under CC BY SA.

Topics Clear All

Local Government (16595)

AAPI (1109)

Climate (616)

Agriculture (561)

Education (365)

Show More Topics

233,703 datasets found

Demographic Statistics By Zip Code ↗ 1510 recent views

City of New York — Demographic statistics broken down by zip code

[CSV](#) [RDF](#) [JSON](#) [XML](#)



College Scorecard ↗ 1329 recent views

Department of Education — College Scorecards make it easier for students to search for a college that is a good fit for them. They can use the College Scorecard to find out more about a...

[HTML](#) [Zipped CSV](#) [CSV](#) [CSV](#) [CSV](#) [CSV](#) 1 more in dataset



ZIP Code Data ↗ 1219 recent views

Department of the Treasury — This study provides detailed tabulations of individual income tax return data at the state and ZIP code level.

[HTML](#)



U.S. Chronic Disease Indicators (CDI) ↗ 1190 recent views

U.S. Department of Health & Human Services — CDC's Division of Population Health provides cross-cutting set of 124 indicators that were developed by consensus and that allows states and territories and large...

[CSV](#) [RDF](#) [JSON](#) [XSL](#)

The catalog.data.gov search interface provides a much richer set of browse and search tools than had been provided within GOS, and presented much more detailed information about available data formats and supported services for registered datasets.

NSDI Summary

- The NSDI development process was initiated in the mid-90s in an effort to maximize the impact and availability of geospatial and associated documentation
- To streamline the development of the system a number of standards were developed/adopted
 - The FGDC Content Standard for Geospatial Metadata
 - The z39.50 standard (with geospatial extensions) for distributed metadata search
 - The ISO 191xx standards as they were released in the early 2000's
 - Open Geospatial Consortium standards: e.g. WMS, WFS, WCS, CSW
 - Data standards for *framework* data were established

- Metadata were at the core of the system and enabled development throughout the lifecycle of the NSDI system

Getting Local - the *New Mexico Resource Geographic Information System*

 RGIS
RESOURCE GEOGRAPHIC INFORMATION SYSTEM

ABOUT GET DATA WEB SERVICES FAQ GIS IN PRACTICE RESOURCES GLOSSARY DONATE



FORT WINGATE, NEW MEXICO
Source: EDAC Image Archive

NEW RGIS GET DATA WEBMAP SERVICES GIS IN PRACTICE

Check out our [New RGIS Data Portal \(Beta\)](#). If you're new to the site view our [YouTube Video Tutorials](#). You can provide feedback at clearinghouse@edac.unm.edu

 **Image Archive Program:** The Image Archive Program maintained by the Earth Data Analysis Center at the University of New Mexico hosts the largest collection of historical aerial photography data for New Mexico and the US Southwest. The collection also includes space shuttle imagery, satellite imagery, topographic maps, and digital data. To learn more [click here](#).

From the Earth Data Analysis Center web site, New Mexico Resource Geographic Information System information page. The current RGIS Clearinghouse can be accessed at <http://rgis.unm.edu>

RGIS The New Mexico Resource Geographic Information System (RGIS) was designated as the state digital geospatial data clearinghouse by the New Mexico Legislature in 2013. NM RGIS is the state's only geospatial data clearinghouse and has been hosted and managed by EDAC for over 23 years.

The RGIS Program was created by the NM Legislature in 1988 and was designed, developed specifically by the EDAC and the Bureau of Business and Economic Research (BBER) at the University of New Mexico.

The RGIS data clearinghouse hosts a wide variety of geospatial data for New Mexico. Data sets available for download include political and administrative boundaries, place names and locations, census data (current and historical), 28 years of digital orthophotography, 80 years of historic aerial photography, satellite imagery, elevation data, transportation data, wildfire boundaries and natural resource data.

The data are publicly available on <http://rgis.unm.edu>. Data sets that are too large are available for purchase. To place a custom order, contact clearinghouse via phone (505) 277-3622 or via email clearinghouse@edac.unm.edu.

1998-2001 - An online brochure

The screenshot shows the RGIS website homepage. On the left is a vertical sidebar with a black background and white text links:

- RGIS HOME
- NEW @ RGIS
- RGIS Website Map
- RGIS PROGRAM
- CLEARINGHOUSE: DATA & METADATA
- TRAINING
- RGIS REPORTS
- RGIS NEWS & NOTES
- OTHER GIS LINKS

The main content area has a light gray background. At the top is a yellow banner with the text "Welcome to RGIS" and a Zia symbol. Below the banner is a navigation bar with links: "New @ RGIS", "Website Map", "Program", "Clearinghouse", "Training", "Reports", "News & Notes", and "Other GIS Links".

Two boxes are present in the center:

- Training Opportunities**
ESRI
Arc/Info Training
- Project Notes:**
New Mexico
FGDC Framework Project

A section titled "The Program" contains text about the RGIS program's mission and components. It also includes a "Last Update" timestamp and copyright information for the University of New Mexico.

The online presence of RGIS became available in 1998 with the creation of the first RGIS website as an online information resource about the program and the data products available for order through the clearinghouse's office.

In conjunction with the development of the RGIS website, the program also, as an early collaborator with the FGDC's NSDI initiatives established an FGDC Clearinghouse node as part of the nationwide clearinghouse network. This clearinghouse node was based on a collection of FGDC metadata records that had been created through support of FGDC through their Cooperative Agreement Program (CAP).

[Home](#)
[News](#)

[Website Map](#)



[Reports](#)

[News & Notes](#)

[GIS Links](#)

[GISAC Directory](#)



Welcome to RGIS

The New Mexico Resource Geographic Information System (RGIS) is a cooperative Program between the University of New Mexico (UNM) and the State of New Mexico General Services Department (GSD). Representatives from three UNM Public Service and Research Units (Earth Data Analysis Center (EDAC), Bureau of Business and Economic Research (BBER), and New Mexico Engineering Research Institute (NMERI)) comprise the RGIS Team and manage the Program. Program components include a Clearinghouse, database development, technical support, training, geographic information coordination, and project support for state agencies and local government.

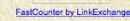
The Program is dedicated to advancing applications of geographic information system technology within New Mexico's State agencies, local government and private industry. GIS technology is an important tool for managing business and government. The Program provides access to data, training, and technical support for users desiring to incorporate geographic information into their decision making processes. Outreach programs to county and local governments encourage effective and efficient management through coordinated development of geographic information. The RGIS Program is a focal point and clearinghouse for spatial geographic information and related technologies in New Mexico.

new **Product Announcement**
New RGIS Data on CD ROM!

•[New @ RGIS](#) •[Website Map](#) •[RGIS Program](#) •[Training](#)
 •[Clearinghouse](#) •[Reports](#) •[News & Notes](#) •[GIS Links](#) •[UCGIS](#)

Contact Information:
 Amelia M. Budge
 Telephone (505) 277-3622, ext 231
 FAX (505) 277-3614
 Postal address:
 University of New Mexico
 Bataanier West, Room 111
 Albuquerque, NM 87131-6031
 Electronic mail:
 Information abudge@spock.unm.edu
 Webmaster webmaster@spock.unm.edu

Click [here](#) for a map to Earth Data Analysis Center.



Copyright © 1999
 The University of New Mexico Earth Data Analysis Center
 All Rights Reserved

12

2001-2011 - An online catalog

RGIS Home	FAQ's	Reference Map	Glossary	Order Help
Program	<h3>Welcome to RGIS</h3> <p>The New Mexico Resource Geographic Information System (RGIS) is a cooperative program between the University of New Mexico (UNM) and the State of New Mexico Information Technology Commission (ITC). RGIS is dedicated to advancing applications of geographic information system technology within New Mexico's State agencies, local government and private industry.</p> <p>RGIS provides access to data, training, and technical support for geographic information users, as well as those who desire to incorporate geographic information into their processes and applications.</p> <p>The RGIS team and program management is comprised of three UNM public service and research units:</p> <ul style="list-style-type: none">• Earth Data Analysis Center (EDAC),• Bureau of Business and Economic Research (BBER), and• New Mexico Engineering Research Institute (NMERI). <p>Program components include:</p> <ul style="list-style-type: none">• Clearinghouse services;• Database development;• Technical support, training, and geographic information coordination;• Geographic information coordination, and• Project support for state agencies and local government.			
Clearinghouse				
Data				
Partners				
Contact				
GISAC				
Links				
Disclaimer and Privacy Policy				
County E-911 Roads				

In 2001 the previous RGIS website was replaced with a dynamic web site that provided the previous program information, but also allowed users to browse and perform basic search functions within the system to identify datasets of interest, preview some datasets, and download those data in available pre-processed formats.

[RGIS Home](#)
[FAQ's](#)
[Reference Map](#)
[Glossary](#)
[Order Help](#)

Menu Key

Click on icon to expand menu

NEW **New Data**

	Boundaries
	Digital Orthophotos
	Land Ownership
	PLSS (Township, Range, Section)
	Topographic Maps

All Data

	Boundaries
	Cities and Towns
	Climate
	Digital Orthophotos
	Elevation
	Geographic Place and Feature Names
	Geology
	Land Ownership
	Land Use/Land Cover
	PLSS (Township, Range, Section)
	Quad Grids and Geodetic Control
	Shaded Relief
	Socioeconomic Data
	Soils
	Topographic Maps
	Transportation
	Vegetation
	Water Resources

[Extent Search](#) [Free Text Search](#)

NEW Indicates datasets added in the last 90 days.

Boundaries — Records 1- 10 of 254

Next 10

File Description (link to metadata)	Extent	Image	Arc Export	Shape	File	MrSID Download viewer
1980 Census Tracts (TIGER)	New Mexico	View	Download	Download		
1980 Subcounty Areas (TIGER)	New Mexico	View	Download	Download		
Bernalillo County 2000 Census Tracts	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Block Groups	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Blocks	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Subcounty Areas	Bernalillo County	View	Download	Download		
Bernalillo County 2000 Census Block Groups	Bernalillo County	View	Download	Download		
Bernalillo County 2000 Census Blocks	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Tracts	Bernalillo County	View	Download	Download		
Bureau of Land Management Grazing Allotments	New Mexico	View	Download	Download		

Quick Access to a Page of Data Listings:
(≤10/page)

[1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) [12](#) [13](#) [14](#) [15](#) [16](#) [17](#) [18](#) [19](#) [20](#) [21](#) [22](#) [23](#) [24](#) [25](#) [26](#)

[\[All Entries\]](#)
(limited to no more than 1000 entries/page)

Alphabetical Groups:
(≤10/page)

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

Notice: These data have been collected from a variety of public sources. Any use or recompilation of these data are the responsibility of the user. They should not be used to establish legal title, boundary lines, or locations of improvements. RGIS expressly disclaims all liability regarding the accuracy or completeness of these data.

2008 - Targeted integration of OGC Services

[RGIS Home](#)
[FAQ's](#)
[Reference Map](#)
[Glossary](#)
[Order Help](#)

Menu Key

Click on icon to expand menu

NEW New Data

Boundaries
Digital Orthophotos
Land Ownership
PLSS (Township, Range, Section)
Topographic Maps

All Data

Boundaries
Cities and Towns
Climate
Digital Orthophotos
Elevation
Geographic Place and Feature Names
Geology
Land Ownership
Land Use/Land Cover
PLSS (Township, Range, Section)
Quad Grids and Geodetic Control
Shaded Relief
Socioeconomic Data
Soils
Topographic Maps
Transportation
Vegetation
Water Resources

Extent Search [Free Text Search](#)

NEW Indicates datasets added in the last 90 days.

Boundaries — Records 1- 10 of 254

Next 10 →

File Description (link to metadata)	Extent	Image	Arc Export	Shape	File	MrSID Download viewer
1980 Census Tracts (TIGER)	New Mexico	View	Download	Download		
1980 Subcounty Areas (TIGER)	New Mexico	View	Download	Download		
Bernalillo County 2000 Census Tracts	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Block Groups	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Blocks	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Subcounty Areas	Bernalillo County	View	Download	Download		
Bernalillo County 2000 Census Block Groups	Bernalillo County	View	Download	Download		
Bernalillo County 2000 Census Blocks	Bernalillo County	View	Download	Download		
Bernalillo County 1990 Census Tracts	Bernalillo County	View	Download	Download		
Bureau of Land Management Grazing Allotments	New Mexico	View	Download	Download		

Quick Access to a Page of Data Listings:
(≤10/page)

[1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) [12](#) [13](#) [14](#) [15](#) [16](#) [17](#) [18](#) [19](#) [20](#) [21](#) [22](#) [23](#) [24](#) [25](#) [26](#)

[[All Entries](#)] (limited to no more than 1000 entries/page)

Alphabetical Groups:
(≤10/page)

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

Notice: These data have been collected from a variety of public sources. Any use or recompilation of these data are the responsibility of the user. They should not be used to establish legal title, boundary lines, or locations of improvements. RGIS expressly disclaims all liability regarding the accuracy or completeness of these data.

In 2008 the RGIS web site was enhanced to provide dynamically generated Open Geospatial Consortium Web Map Services (WMS) for a subset of newly added imagery and other datasets within the system. This was intended to both support direct user interaction with the data content of the system without having to download the underlying data, and also provide dynamically generated previews that were added to web-based views of the metadata associated with data in the system.

2011-Present - Adoption of a full Services Oriented Architecture

The screenshot shows the homepage of the RGIS website. At the top, there's a banner with a landscape image and the text "RGIS New Mexico Resource Geographic Information System Program". Below the banner is a dark blue navigation bar with links for Home, About, FAQ, Feedback, User Guide, Glossary, Web Services, Order Help, Get Data, Log In, and Register. A search bar with placeholder text "Quick search by title [] and by place []" is positioned above the main content area. To the right of the search bar are links for "Browse for Data" and "Advanced Search". The main content area features a heading "Welcome to the RGIS Clearinghouse" and a brief description of the program's purpose. It includes three buttons: "Browse for Data" (with a search icon), "Advanced Spatial Search" (with a map icon), and "Web Services" (with a server icon). Below these buttons is a link to "Discover data by browsing through a hierarchical listing of data categories". At the bottom of the page is a green footer bar with a Twitter icon and a "Join the conversation" link. The footer also contains copyright information: "All content Copyright © 2004 - 2011 by the Earth Data Analysis Center" and "Send all comments to [webmaster](#)".

In 2011 a complete redesign of the RGIS system was released that was based upon a tiered Services Oriented Architecture (SOA) that was developed with support of the National Science Foundation's EPSCoR program, the NM RGIS program, and NASA. This system was designed to provide a degree of separation between the data management components of the system and the interfaces through which custom client applications (such as the RGIS clearinghouse web site, the EPSCoR data portal, a member node of the DataONE network, and processes that populated the web accessible folders upon which the RGIS Data.gov materials are based) interact with the data managed in the underlying platform. The service interfaces use the REST web service architecture based upon the HTTP web protocol. The services provided by the platform include standard-based OGC Web Mapping, Web Feature, and Web Coverage Services (WMS, WFS, and WCS respectively), and custom services that enable data discovery, and data and metadata download.

RGIS New Mexico Resource Geographic Information System Program

[Home](#) | [About](#) | [FAQ](#) | [Feedback](#) | [User Guide](#) | [Glossary](#) | [Web Services](#) | [Order Help](#) | [Get Data](#)

Filter data by Title

Filter data by when updated

- All
- 90 days
- 6 months
- 1 year

Filter data by Theme

- All RGIS
- Area Code Change - New Mexico
- Boundaries
- Cadastral
- Census Data
- Cities and Towns
- Climate
- Digital Orthophotography
- Elevation
- Emergency Management
- Geographic Place and Feature Names
- Geology
- Historic Aerial Photography
- Land Ownership
- Land Use/Land Cover
- Links
- NMDOF
- PLSS (Township, Range, Section)
- Quad Grids and Geodetic Control
- Satellite Imagery
- Shaded Relief
- Socioeconomic Data
- Soils
- State Forestry
- Topographic Maps
- Transportation
- USGS Quadrangles by County
- Vegetation
- Water Resources
- Wildfire

Define Area of Interest by Placename _____ or Quadrangle _____

Current theme: Digital Orthophotography

Prev 1 2 3 4 5 6 7 8 9 10 ... 577 Next

Advanced Search

Showing 15 of 86560 results.

Dataset title/description	Last update
 2010 Southwestern Jemez Restoration Project, E535106 NW NW	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, E635106 NE NE	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, E635106 NE NW	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, E635106 NW NE	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, F535106 NE NE	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, F535106 NE NW	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, F535106 NW SW	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, F535106 SE NW	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	
 2010 Southwestern Jemez Restoration Project, F535106 SE SW	05/07/2014
Download: tif sid	Metadata: wms wcs Map: preview
Theme: Digital Orthophotography	

Under the Hood - The GStoRE Platform

The screenshot shows the GStoRE V3 API Documentation homepage. At the top, there's a dark header bar with the text "GStoRE V3" and navigation links for "Stable", "Experimental", and "Architecture". Below the header is a large title section with the heading "GStoRE V3 API Documentation" and a subtitle "Geographic Storage, Transformation and Retrieval Engine Version 3". Underneath this, there are three main sections: "Architecture", "Stable API", and "Experimental API", each with a brief description and a green "View docs" button.

Architecture
A brief description of the GStoRE architecture.
[View docs](#)

Stable API
Versioned, stable services.
[View docs](#)

Experimental API
Services listed as experimental may undergo significant changes to the routing or service responses. Use at your own risk.
[View docs](#)

The *Geographic Storage, Transformation and Retrieval Engine* (GStoRE) is the the data management and servie platform that manages hundreds of thousands of individual data objects and their associated metadata, and provides web-accessible services that support the full suite of service options: *Create, Read, Update, and Delete* of data objects and metadata. Through these services a system (local or remote) can (with appropriate access permissions) interact with the platform to discovery data, access data in a variety of supported formats, make use of geospatial data and visualization services defined by the OGC, and view dataset documentation in a variety of formats. The services provided by the platform also enable the development of client applications that provide different target audiences (whether human or machine) with customized interfaces that are specifically designed to meet their particular needs. Current client applications enabled by the GStoRE platform include:

- The RGIS data clearinghouse link
- The NM EPSCoR Data portal link
- DataONE member nodes link
- Data.gov lin
- Workflows that register data and associated metadata into UNM's Institutional Repository link

The screenshot shows the "Stable API" section of the GStoRE V3 API Documentation. It features a dark header bar with the text "GStoRE V3" and navigation links for "Stable", "Experimental", and "Architecture". Below the header, the section is titled "Stable API" with a sub-subtitle "Service Description". There are four blue links: "Dataset Streaming", "Dataset Downloads", "Dataset Documentation", and "OGC Services".

Stable API

These services represent the stable API. The routing and response structure is unlikely to change or, if changes are made, every effort is made to maintain backwards compatibility.

Search

Data Objects
Datasets within a collection
Category Facets
Geospatial Lookups

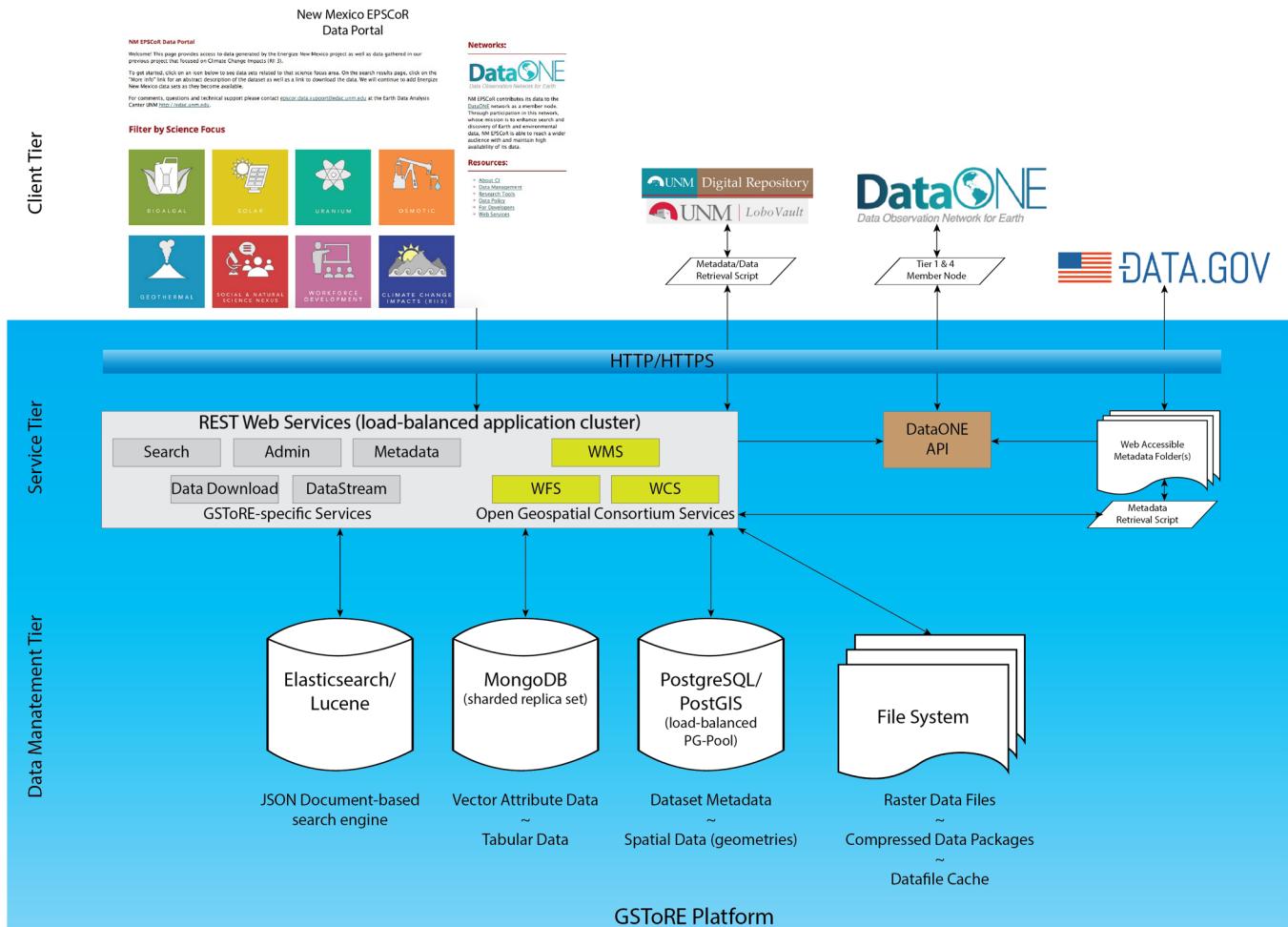
Datasets

Service Description
Dataset Streaming
Dataset Downloads
Dataset Documentation

Web Services

[OGC Services](#)

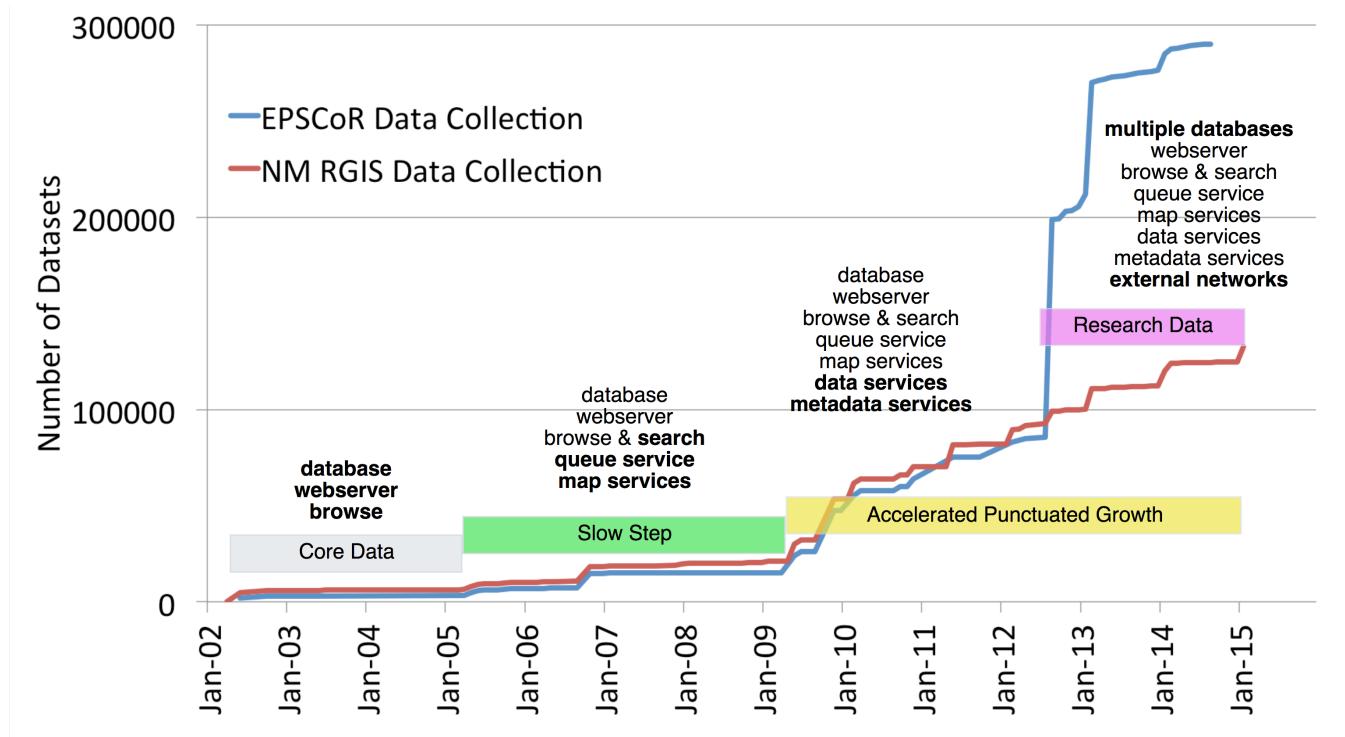
GSToRE Architectural Model



Summary

- 1998-2001: Static Web Site
 - Thousands of datasets
 - A focus on a static web presence with contact information for obtaining hard-copy disks of data
- 2001-2011: Vertically Integrated Online Catalog
 - Tens of thousands of datasets
 - A database driven online catalog
 - Tight integration between underlying database platform and web application
 - Objective of rich metadata for all objects in the system
 - (later) Integration of Open Geospatial Services for some data
- 2011-Present: Adoption of a three-tiered Services Oriented Architecture (SOA)
 - Hundreds of thousands of datasets
 - Enables the development of multiple interfaces on top of the core platform
 - Supports interaction at scale
 - Both standards-based (OGC) and custom (via web standards) services

Increasing demands lead to architectural changes



Lessons Learned

- Browsing is only effective for relatively small collections of materials
- Search is increasingly important as collection size and diversity grows
- Automation tools enabled by API's are essential for work with collections at scale
- **Metadata must be robust**
 - Discovery
 - Understanding
 - Use
- Distributed systems are a reality and a necessity ==> interoperability/standards

Applying These Lessons to the Current Research Data Repository Landscape



A cursory examination of the *Registry of Research Data Repositories* (re3data.org) suggests that while there are a large number of data repositories that have been created and registered (2036), only a relatively small number provide an Application Programming Interface:

- FTP (326)
- NetCDF (78)
- OAI-PMH (159)
- OpenDAP (45)
- REST (287)
- SOAP (67)
- SPARQL (26)
- SWORD (32)
- other (230)

A large number of metadata standards:

- ABCD - Access to Biological Collection Data (10)
- AVM - Astronomy Visualization Metadata (1)
- CF (Climate and Forecast) Metadata Conventions (28)
- CIF - Crystallographic Information Framework (5)
- CIM - Common Information Model (3)
- CSMD-CCLRC Core Scientific Metadata Model (1)
- DCAT - Data Catalog Vocabulary (7)
- DDI - Data Documentation Initiative (117)
- DIF - Directory Interchange Format (30)
- Darwin Core (22)
- DataCite Metadata Schema (83)
- Dublin Core (185)
- EML - Ecological Metadata Language (22)
- FGDC/CSDGM - Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata (69)
- FITS - Flexible Image Transport System (8)
- Genome Metadata (1)
- ISA-Tab (8)
- ISO 19115 (116)
- International Virtual Observatory Alliance Technical Specifications (4)
- MIBBI - Minimum Information for Biological and Biomedical Investigations (7)
- OAI-ORE - Open Archives Initiative Object Reuse and Exchange (7)

- PROV (2)
- RDF Data Cube Vocabulary (21)
- Repository-Developed Metadata Schemas (47)
- SDMX - Statistical Data and Metadata Exchange (2)
- other (54)

And a wide range of data types:

- Archived data (461)
- Audiovisual data (389)
- Configuration data (55)
- Databases (389)
- Images (1024)
- Networkbased data (120)
- Plain text (961)
- Raw data (915)
- Scientific and statistical data formats (1274)
- Software applications (371)
- Source code (113)
- Standard office documents (1209)
- Structured graphics (750)
- Structured text (628)
- other (729)

These characteristics highlight areas for improvement (or criteria for selection) for the large universe of data repositories:

- Increased support for more robust and cross-disciplinary metadata standards
- Increased implementation of standard CRUD services accessible through public APIs
- Development of capabilities for providing data and metadata using a variety of data formats and documentation standards for delivery to other systems.

Questions

