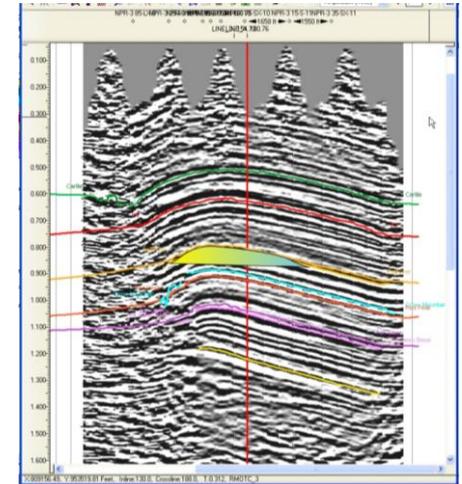
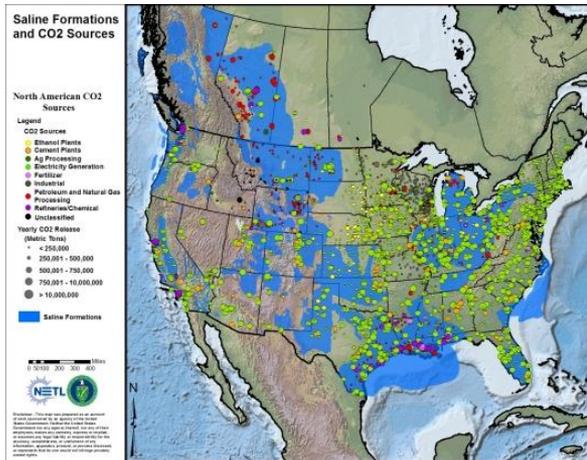


NatCarb:

National Carbon Sequestration Database and Geographic Information System



J. Alexandra Hakala

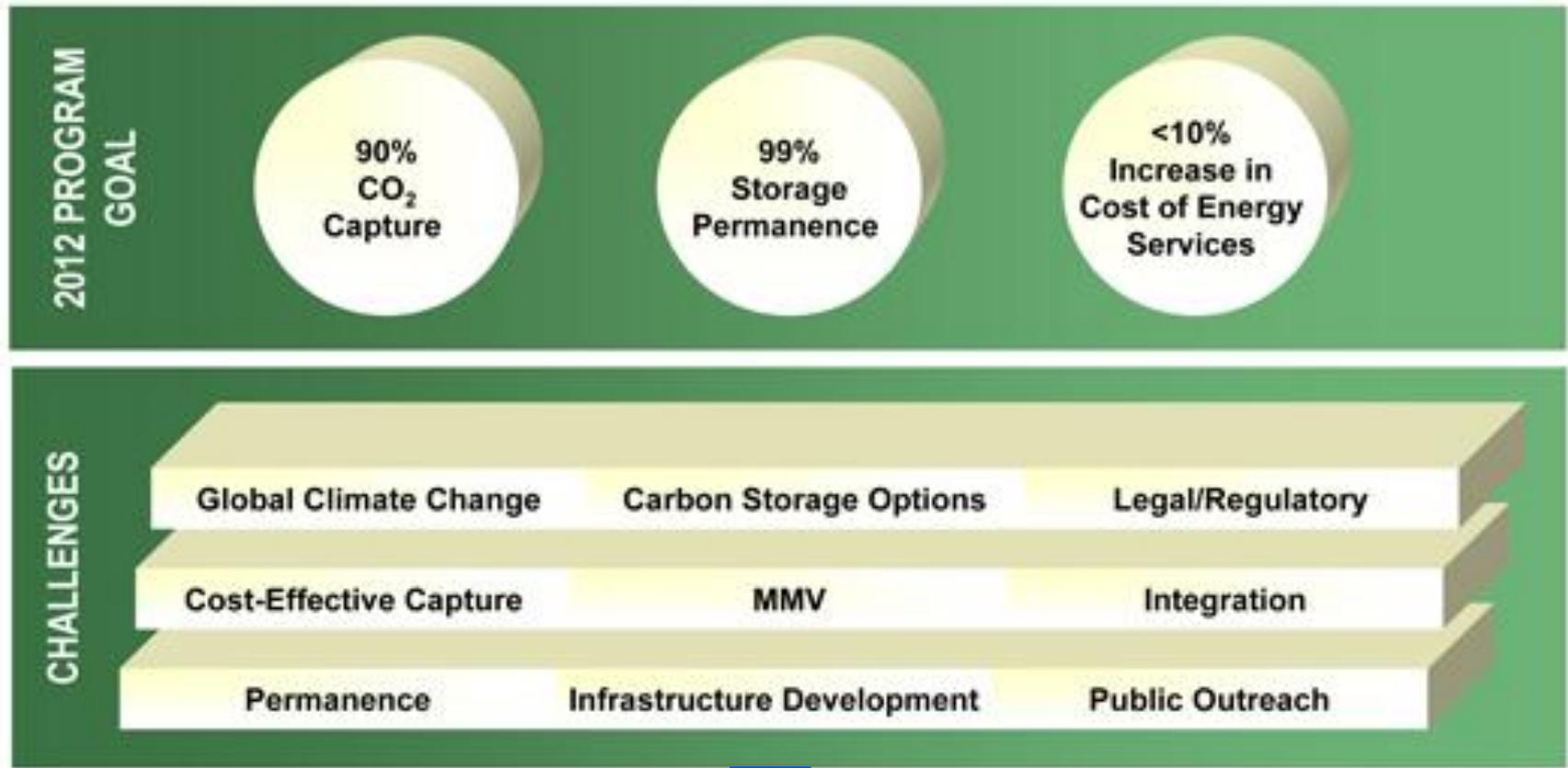
Geosciences Division, NETL Office of Research and Development

Tim Carr

**Department of Geology and Geography, West Virginia University /
NETL Faculty Associate**

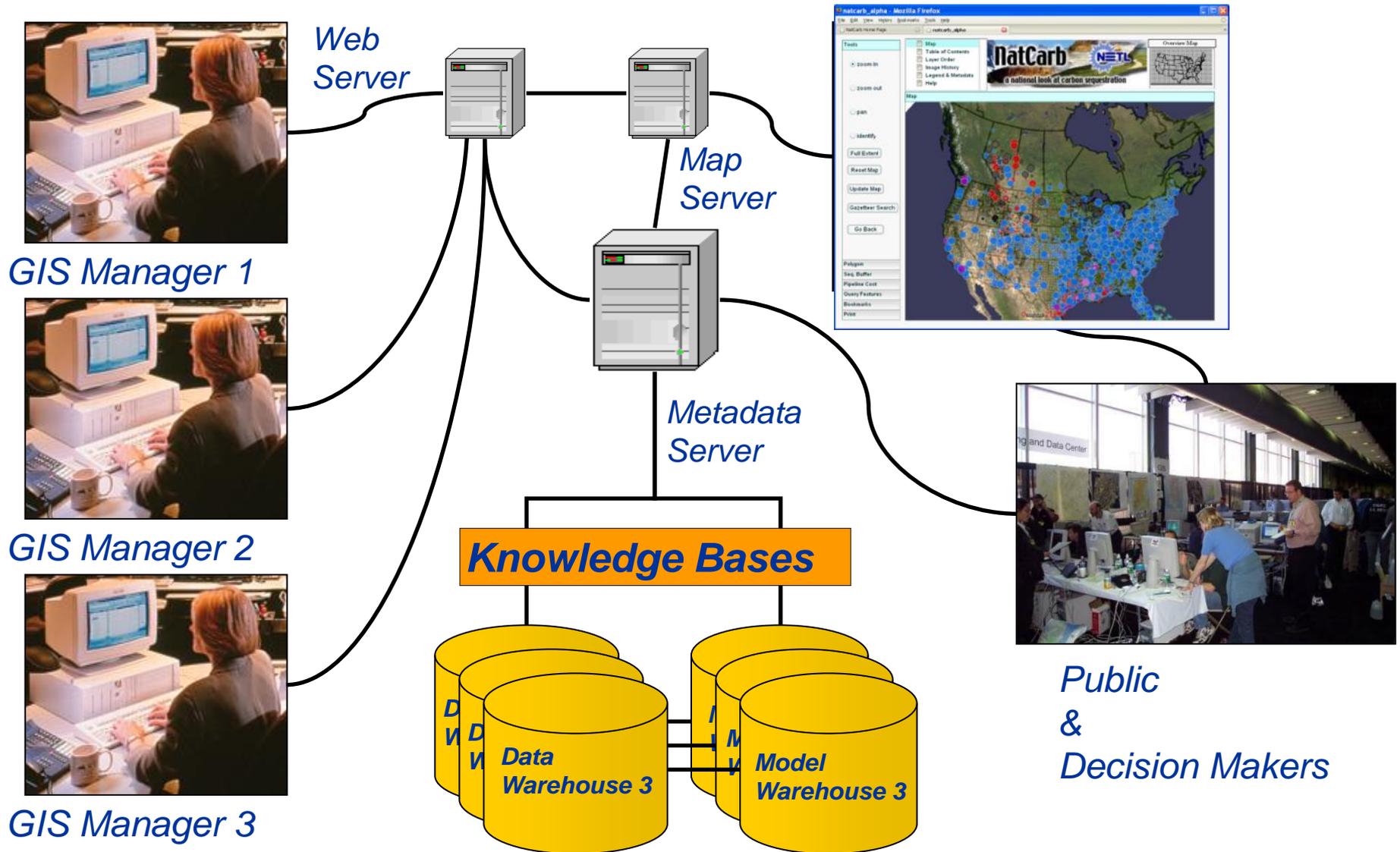
Cast of Thousands

Successful CO₂ storage will require effective solutions for a variety of challenges

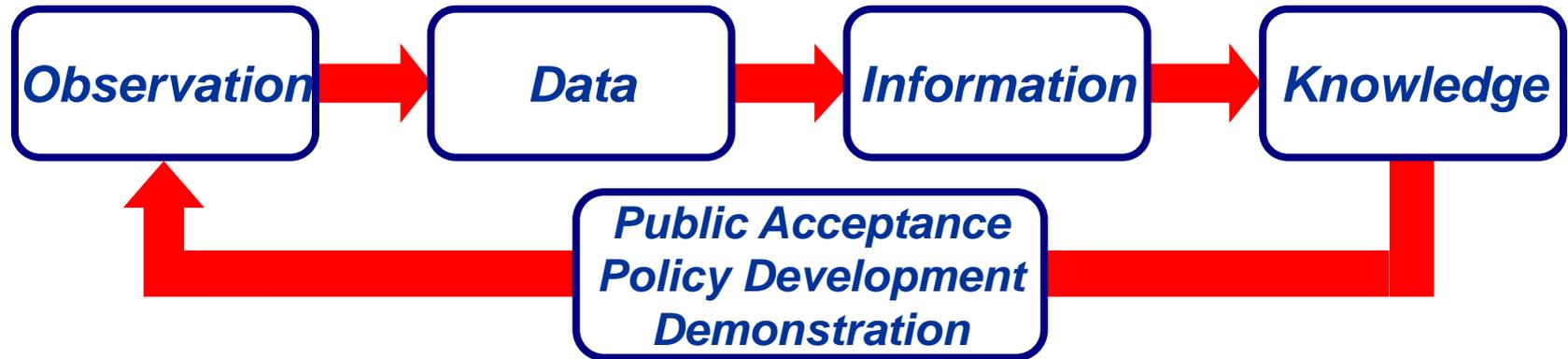


Carbon cyberinfrastructure (CCI) can address economic, social and technical challenges associated with CCS

Cyberinfrastructure as Glue



Challenges in CCS Learning Process



- **Sharing Exponentially Increasing Amounts of Data**
 - Heterogeneity of data, software and hardware
- **Lack of Tools Dealing with Voluminous Data Sets**
 - Organizing, Storing, Preserving, Retrieving, Browsing, Processing & Visualization
- **Need for Time Critical Learning**
 - Temporally Obsolete Knowledge for Time-Critical Applications
 - Allocation of Computational and Networking Resources
- **Conduct Analyses at Regional to Global Spatial Scales**
- **Curation of Data and Preservation of Scientific Analyses**
- **Learning Process as a Collaborative Process**
 - Teams, Agencies, Communities & States



ABOUT NETL

KEY ISSUES & MANDATES

RESEARCH

TECHNOLOGIES

Oil & Natural Gas Supply

Coal & Power Systems

Carbon Sequestration

▸ Program Overview

▸ Capture

▸ Storage

▸ Monitoring, Verification, and Accounting

▸ Simulation & Risk Assessment

▸ CO₂ Use/Reuse

▸ Regional Partnerships

▸ Systems & Analysis

▸ NatCarb

▸ FAQs

▸ Reference Shelf

▸ Contacts

Hydrogen & Clean Fuels

Technology Transfer

ENERGY ANALYSIS

SOLICITATIONS & BUSINESS

EDUCATION

Home > Technologies > Carbon Sequestration > NatCarb

Technologies
NatCarb

www.netl.doe.gov/natcarb

The National Carbon Sequestration Database and Geographic Information System (NatCarb) is a geographical information system (GIS)-based tool developed to provide a national view of carbon capture and storage (CCS) potential in the United States and Canada, and to provide all stakeholders with improved online tools for the display and analysis of CCS data.

NatCarb will provide CCS data both through user-friendly web tools such as Google Earth™ and Google Maps™, and through high-end GIS and database query tools. Maps and background information from the 2008 Carbon Sequestration Atlas of the United States and Canada are available as links in the navigation menu to the right, or as Adobe PDF files below. Interactive CO₂ sources and storage maps are provided below, along with a link to the experimental viewer.

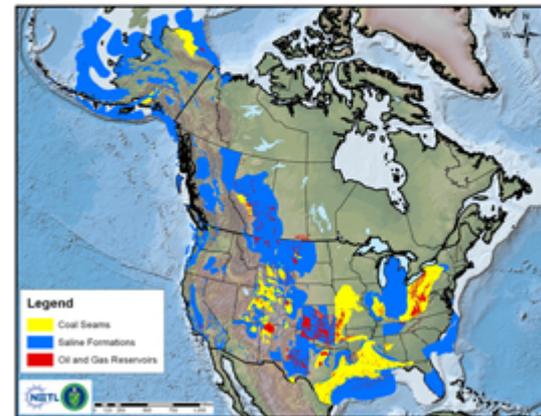
- [Background](#)
- [CO₂ Sources](#)
- [CO₂ Storage](#)
- [Partnership Activities](#)
- [Methodologies](#)
- [Maps](#)
- [Downloads](#)
- [Contacts](#)

- [2008 Carbon Sequestration Atlas II of the United States and Canada – Version 2](#)
- [Interactive CO₂ Sources Map](#)
- [Interactive CO₂ Storage Locations Map](#)
- [Experimental NatCarb Viewer](#)

Announcements and Updates

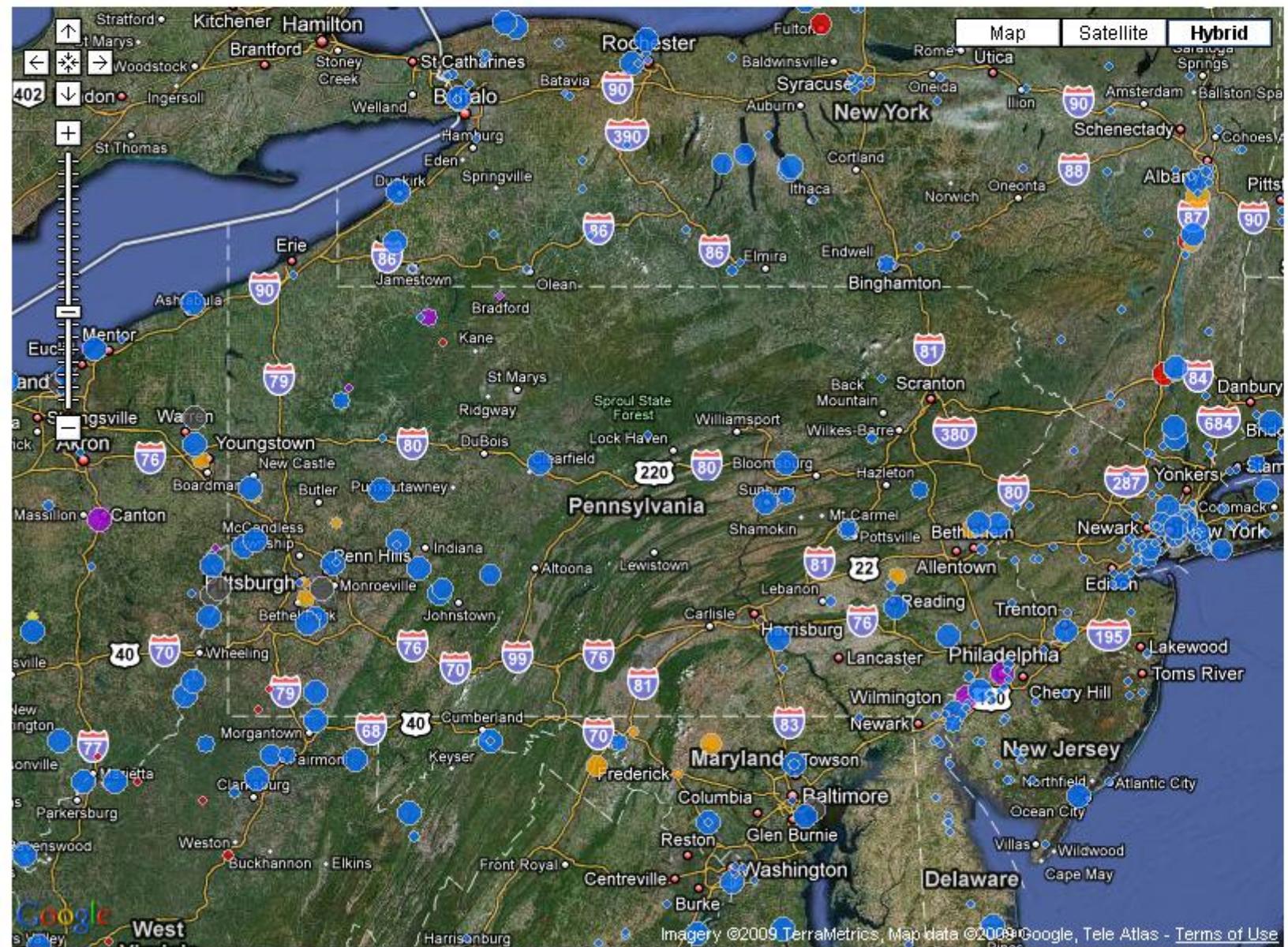
- August 27, 2009 – [Department of Energy Announces More than \\$8.4 Million for Regional Sequestration Technology Training Projects](#)

CLICK ON GRAPHIC TO ENLARGE



Map of North American CO₂ Storage Locations.

[Download Summary Data](#)



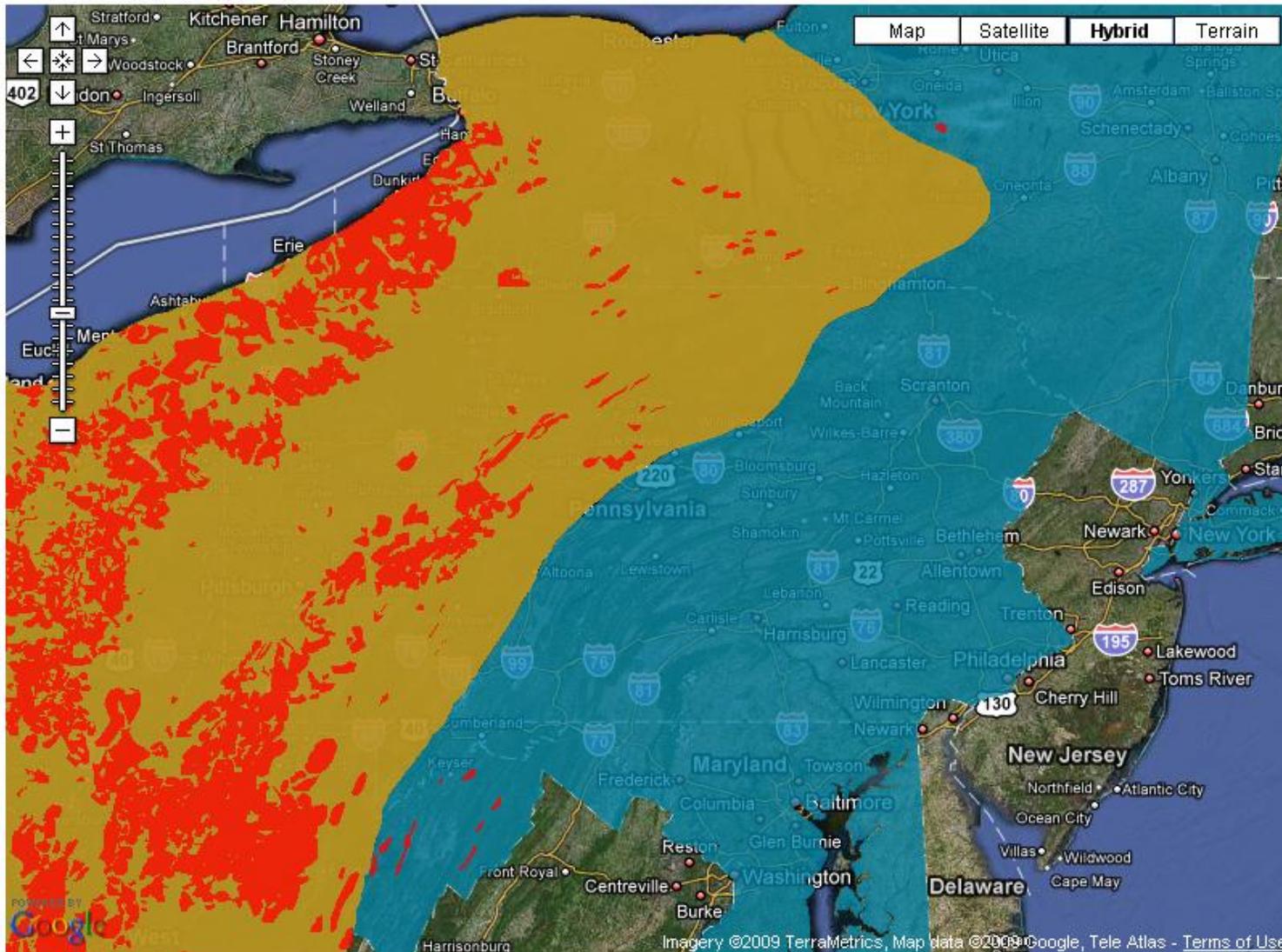
CO2 Sources

- Ag Processing
- Electricity Gen
- Fertilizer
- Industrial
- Petroleum & N
- Refineries/Che
- Unclassified

Zoom To

Unmineable Coal Seams Deep Saline Formations Oil and Gas Reservoirs

[Download Summary Data](#)



CO2 Sinks

-  Unmineable Coal Seams
-  Deep Saline Formations
-  Oil and Gas Reservoirs

NETL Carbon Capture and Storage Database

- Included as link from NatCarb webpage
- Example of how NatCarb serves as a central resource for investigators to access CCS data

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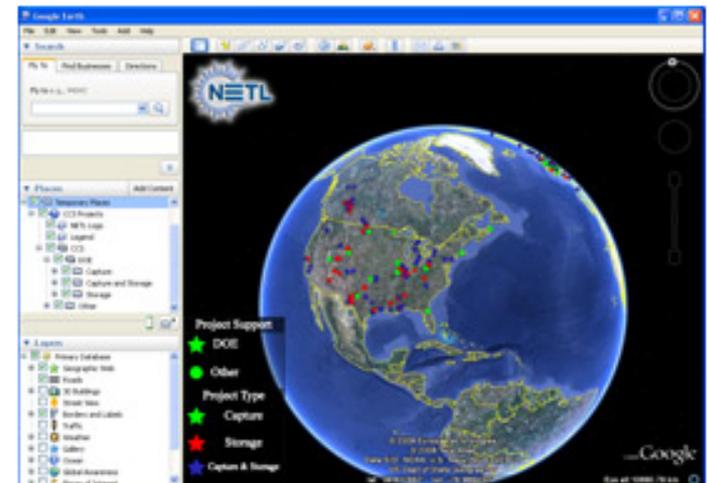
▶ Regional Partnerships

▶ Systems & Analysis

Carbon Sequestration

NETL Carbon Capture and Storage Database

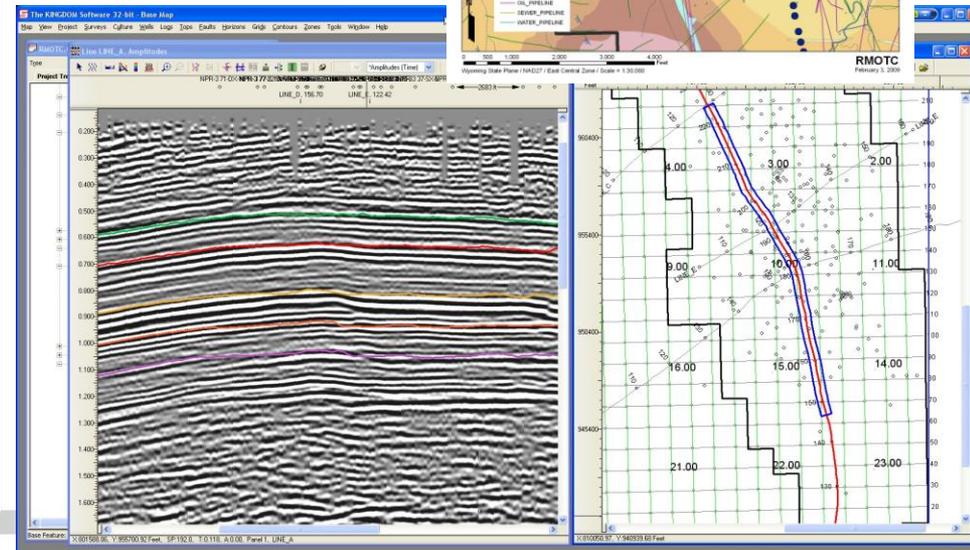
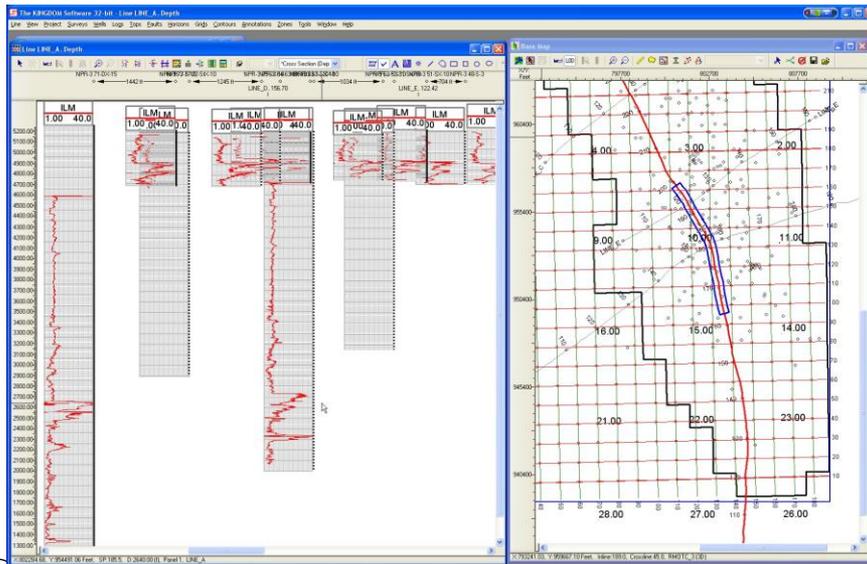
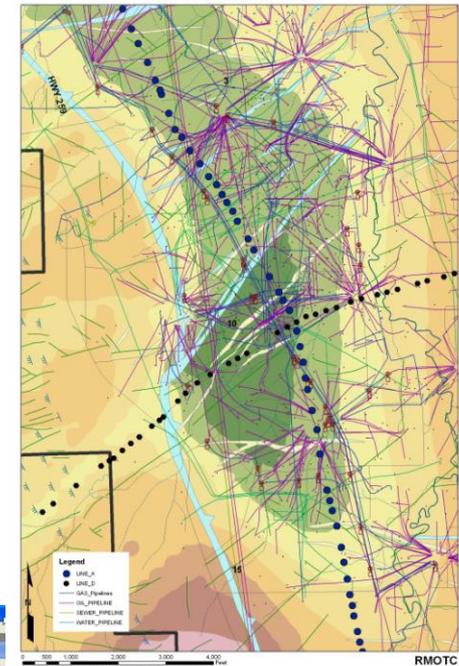
Welcome to the Carbon Capture and Storage database assembled by NETL. The database includes both active and proposed Carbon Capture and Storage (CCS) projects world-wide. Information in the database regarding technologies being developed for capture, evaluation of sites for sequestration of carbon dioxide (CO₂), estimation of project costs and anticipated dates of completion for projects are sourced from publically available information. This database provides the public with information regarding efforts by various industries, public groups, and governments towards development and eventual deployment of CCS technology. This is an active database that will be updated as information regarding these or new projects are released to the public.



Incorporation of Rocky Mountain Oilfield Test Site Data

- **10,000-acre operating oil field**
 - ~1,300 historical well bores
 - 600 producing wells in nine producing reservoirs
- **Reservoirs range in depth from 300 ft. to 5,500 ft.**
- **Detailed site characterization includes GIS, well logs, and seismic information for modeling CO₂ injection activities**

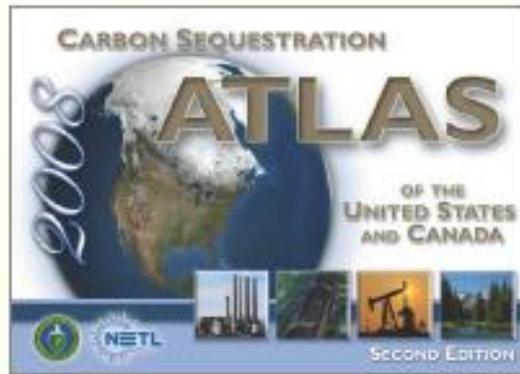
NPR-3 BASE MAP



Developing Research Tools into NatCarb that Require Large-Scale and Region-Specific Data

Coal Seam $G_{CO_2} = AhC\rho E$

Saline Formation $G_{CO_2} = Ah\phi\rho E$



2008 CO ₂ Capacity Estimates by Partnership				
	Unmineable Coal Seams		Saline Formations	
	Low	High	Low	High
	Billion Metric Tons of CO ₂			
Big Sky	12.1	12.1	460.9	1,831.5
MGSC	1.7	2.4	29.2	116.6
MRCSP	0.8	0.8	49.6	199.1
PCOR	10.7	10.7	185.6	185.6
SECARB	43.8	63.0	2,274.6	9,098.4
SWP	0.7	1.8	92.4	368.9
WESTCARB	86.8	86.8	204.5	818.2
Total	157.0	178.0	3,297.0	12,618.0

Intergovernmental Panel on Climate Change, 2005

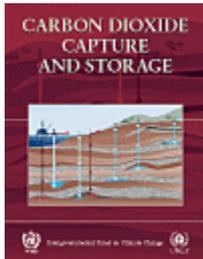


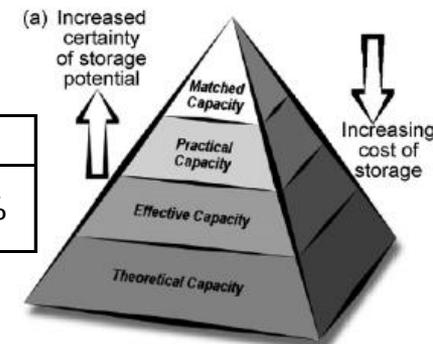
Table 5.2 Storage capacity for several geological storage options. The storage capacity includes storage options that are not economical.

Reservoir type	Lower estimate of storage capacity (GtCO ₂)	Upper estimate of storage capacity (GtCO ₂)
Oil and gas fields	675*	900*
Unmineable coal seams (ECBM)	3-15	200
Deep saline formations	1000	Uncertain, but possibly 10 ⁴

* These numbers would increase by 25% if "undiscovered" oil and gas fields were included in this assessment.

Uncertainty in Parameters

	A	h	ρ	C or ϕ	E	G _{CO2}	Goal
Unmineable Coal Seams and Deep Saline Formations	?	?	?	?	?	?	+/- 30%



Incorporating Site Characterization Projects

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- ▶ [Background](#)
- ▶ [CO₂ Sources](#)
- ▶ [CO₂ Storage](#)
- ▶ [Partnership Activities](#)
- ▶ [Methodologies](#)
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- **Data can be accessed through NatCarb CCI interface**
- **Organize data by site**
 - Background Information on Site Characterization projects can be included as independent NatCarb tab
 - Links to regional and site-specific GIS data with appropriate Metadata files as layers within NatCarb
 - Links to detailed data acquired as part of the DOE Site Characterization project
 - Well logs, 3D seismic, groundwater information, etc.
- **To organize and present data that will support regional projects and promote site characterization program**

ON GRAPHIC TO ENLARGE



NatCarb Maps

In addition to contributing national maps to the [2008 Carbon Sequestration Atlas II of the United States and Canada – Version 2](#), the NatCarb project offers different resources for those individuals needing maps:

- [2008 Atlas](#) – 2008 Carbon Sequestration Atlas II of the United States and Canada – Version 2.
- [CO₂ Sources Map](#) – Map displaying the location and relative magnitude of a variety of CO₂ stationary sources.
- [CO₂ Storage Locations Map](#) – Map displaying CO₂ storage locations.
- [Experimental NatCarb Viewer](#) – Interactive map displaying the location and relative magnitude of a variety of CO₂ stationary sources and storage locations.
- [Map Library](#) – Archive of NatCarb maps presenting carbon capture and storage data
- [Custom request](#) – Template for submitting requests for maps not available in the Map Library.
- [Data downloads](#) – Links to the GIS data files used in creating the 2008 Carbon Sequestration Atlas of the United States and Canada.

Map Resources

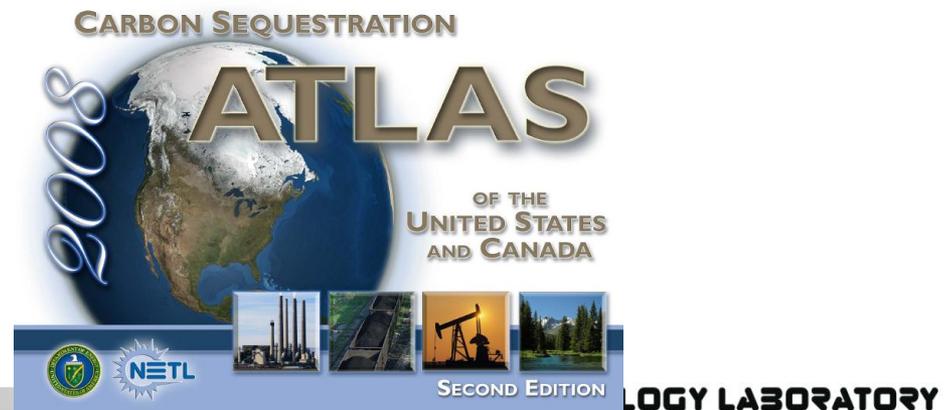
- [2008 Atlas](#)
- [CO₂ Sources Map](#)
- [CO₂ Storage Locations Map](#)
- [Experimental NatCarb Viewer](#)
- [Map Library](#)
- [Custom request](#)
- [Data downloads](#)

**Saline Formations
and CO₂ Sources**



NatCarb and the Atlas

- **NatCarb: National Carbon Sequestration Database and Geographic Information System**
- **Atlas: Carbon Sequestration Atlas of the United States and Canada**
- **Data collected and managed by regional projects (e.g., Site Characterization, Regional Partnerships) and provided through NatCarb is used for the Atlas**
 - CO₂ source and storage maps; CO₂ source emission and storage resource estimates
 - Current Atlas data may serve as helpful tool for Site Characterization projects and vice versa



CARBON SEQUESTRATION

2010

ATLAS

OF THE
UNITED STATES
AND CANADA



SECOND EDITION