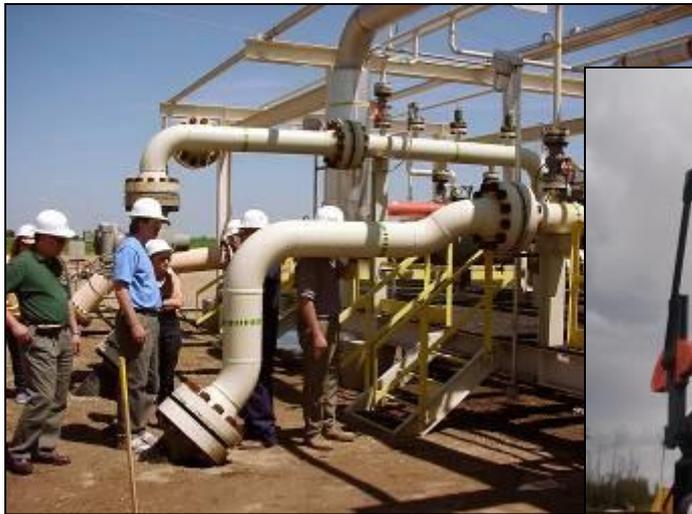
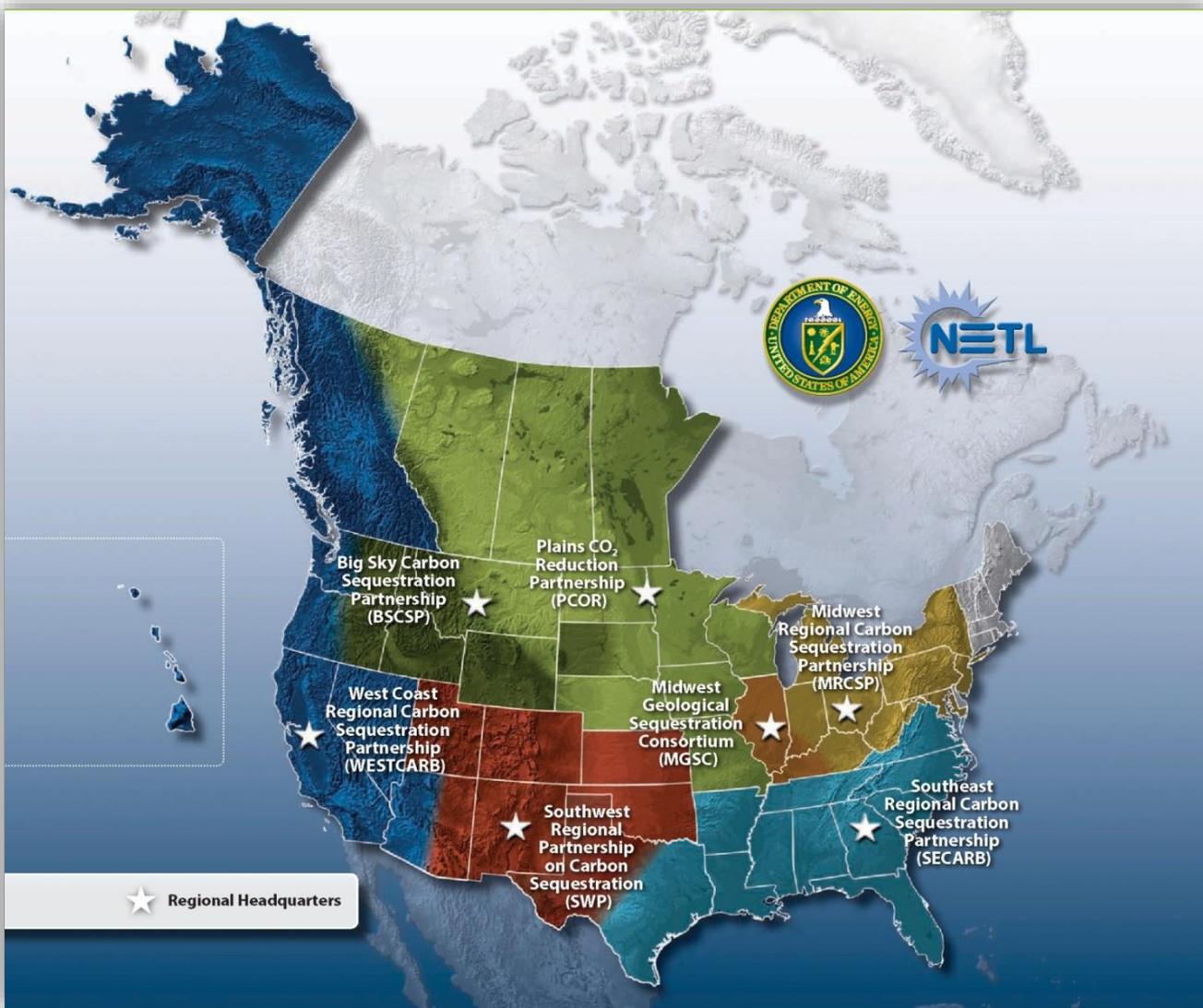


CARBON MANAGEMENT

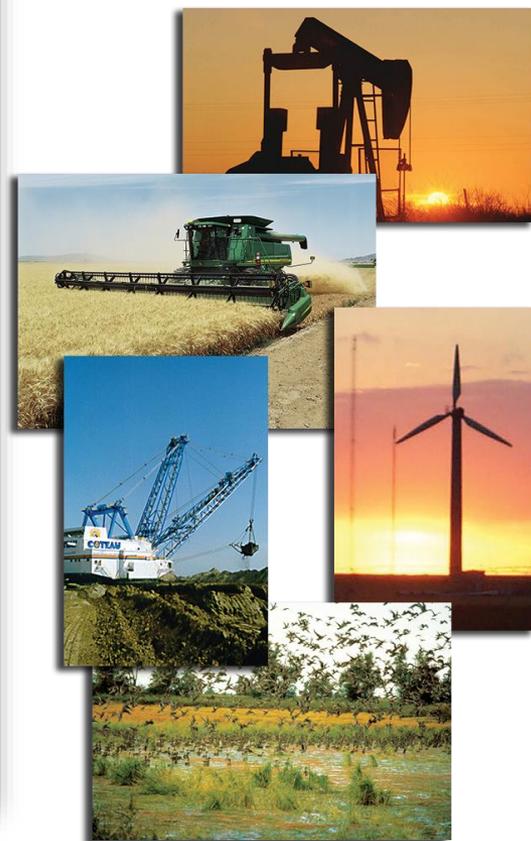
- A carbon management strategy is often required and always desirable for permitting major industrial sources of CO₂ emissions.
- Carbon management options vary significantly based on plant type, economics, geography, and geology.



PCOR PARTNERSHIP REGION



- Nine states
- Four Canadian provinces
- 1,382,089 mi²

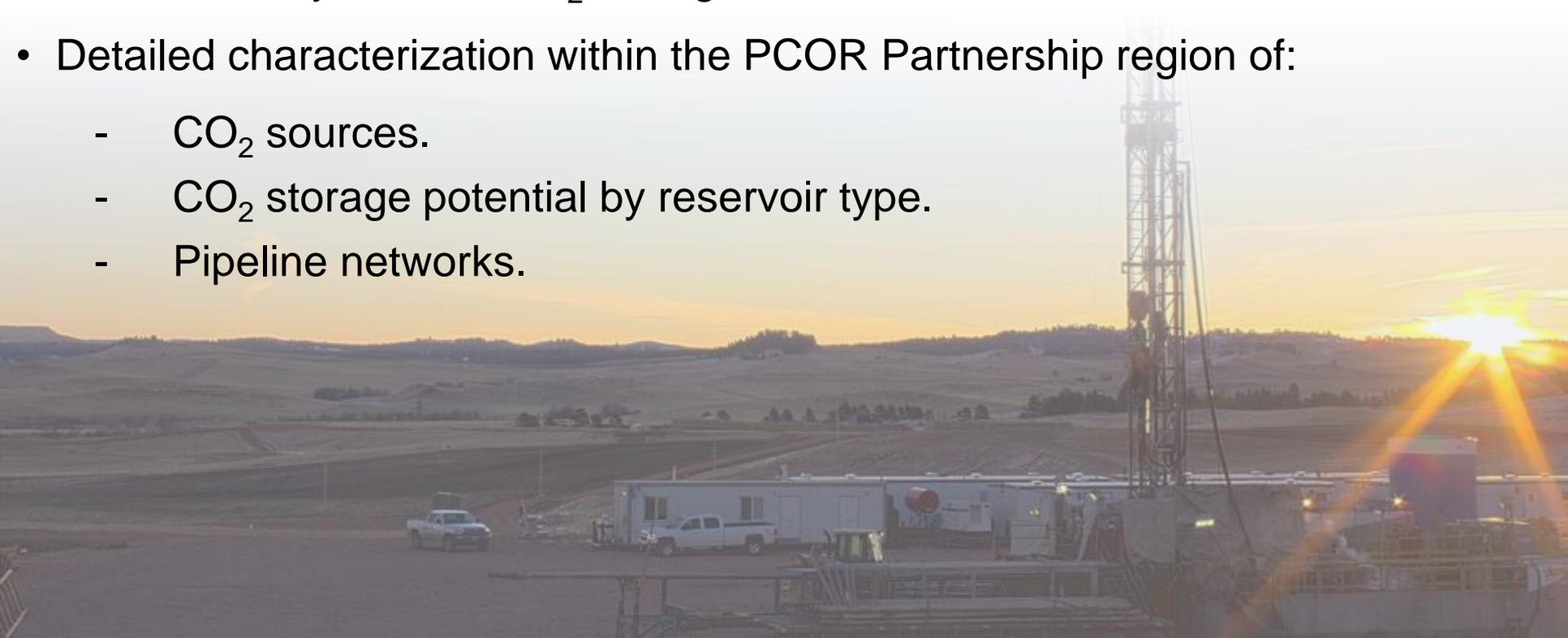


PCOR PARTNERSHIP

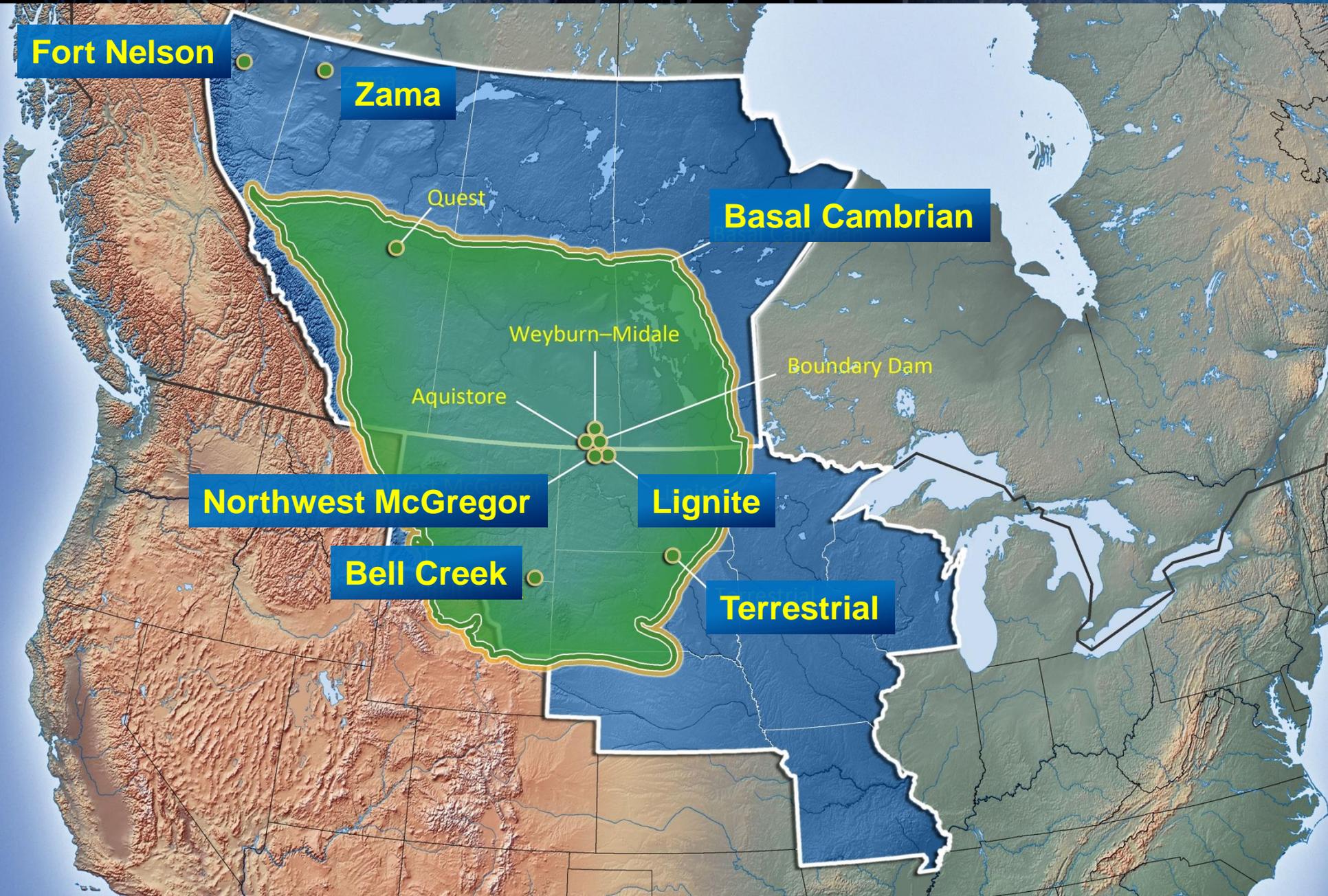
PCOR Partnership 2003 – Present

PCOR PARTNERSHIP OBJECTIVES

- Safely and permanently achieve CO₂ storage on a commercial scale.
- Demonstrate that deep saline formations and oil and gas reservoirs are viable sinks with significant storage capacity.
- Establish monitoring, verification, and accounting (MVA) methods to safely and effectively monitor CO₂ storage.
- Detailed characterization within the PCOR Partnership region of:
 - CO₂ sources.
 - CO₂ storage potential by reservoir type.
 - Pipeline networks.



PCOR PARTNERSHIP FIELD-BASED PROJECTS



Fort Nelson

Zama

Quest

Basal Cambrian

Weyburn-Midale

Boundary Dam

Aquistore

Northwest McGregor

Lignite

Bell Creek

Terrestrial

RESEARCH AND DEVELOPMENT PROGRAMS, OPPORTUNITIES FOR TECHNOLOGY COMMERCIALIZATION
WORLD-CLASS **TERRESTRIAL** CLASS
CENTERS OF EXCELLENCE
ENVIRONMENTAL TECHNOLOGIES



NORTH DAKOTA FIELD DEMONSTRATIONS



BOUNDARY DAM – AQUISTORE



RESEARCH AND DEVELOPMENT PROGRAMS, OPPORTUNITIES FOR TECHNOLOGY COMMERCIALIZATION

BELL CREEK

WORLD-CLASS CENTERS OF EXCELLENCE ENVIRONMENTAL TECHNOLOGIES



2014

ONE MILLION
TONNES OF CO₂ INJECTED

Bell Creek Water Analyses Results
Prepared for Denbury Onshore, LLC



INTERNATIONAL RECOGNITION IN CCS

- Two PCOR Partnership projects have been recognized by the CSLF
 - Zama
 - Fort Nelson Carbon Capture and Storage (CCS) Feasibility Project

Carbon
Sequestration
Leadership
Forum

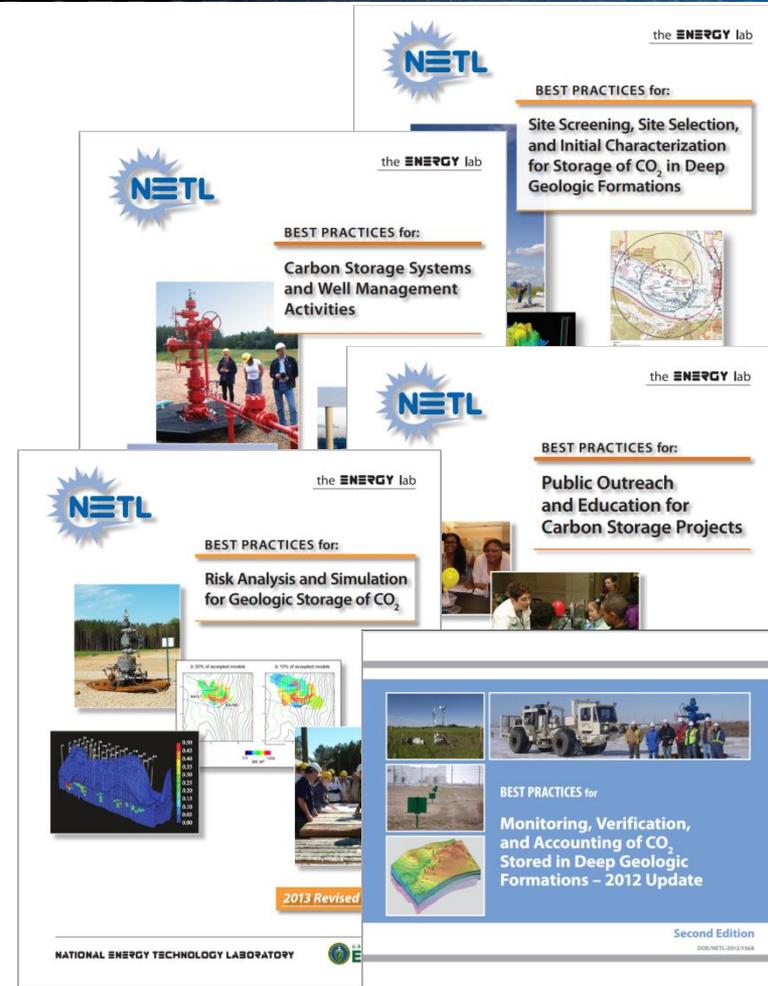
Mission
A ministerial-level international climate change initiative focused on the development of improved, cost effective CCS

Purpose
Make technologies broadly available internationally;
Identify and address wider issues

25 members
24 countries and the European Commission

EERC CCS EXPERTISE

- Ranges from capture to injection and site monitoring.
 - Well versed in aspects of regulations and policies, geological investigation, field implementation, and public interest and outreach.
- Instrumental in updating several DOE CCS/carbon capture, utilization, and storage (CCUS) best practices manuals.



PCOR PARTNERSHIP OUTREACH ACTIVITIES

Reducing Our Carbon Footprint

The Role of Markets

Out of the Air - Into the Soil

Land Practices That Reduce Atmospheric Carbon Levels

Nature in the Balance

CO₂ Sequestration

Global Energy and Carbon

Tracking Our Footprint

Managing Carbon Dioxide

The Geologic Solution

Installing a Casing-Conveyed Permanent Downhole Monitoring System

RCSP Water Working Group

Carbon Capture and Storage: Protecting Freshwater Resources

Introduction
The overall goal of carbon-capture and storage (CCS) is to inject carbon-dioxide (CO₂) that has been captured from a point source, such as a power plant, into a deep underground storage formation and ensure that it remains there. Maintaining the security of the CO₂ is critical to protecting our water resources. This fact sheet identifies the keys to successfully protect water resources during CCS, and introduces the working regulatory framework set up for that purpose.

CCS and CO₂ Containment
The commercial geologic injection of fluids has been done safely in the United States for decades and currently occurs under the Underground Injection Control Program, which is the regulatory state and federal regulatory agency that sets the large volume of fluids are injected for waste disposal, enhanced oil recovery (EOR), and fluid hydrocarbon and natural gas storage (Table 1). The subsurface systems encountered during CCS (Figure 1) are similar to those encountered during the deep injection activities identified in Table 1.

Keys to Successful Protection of Water Resources
The keys to water resource protection during CCS include: detailed site characterization, sound well construction and operation protocols, and comprehensive monitoring and

Table 1. Injection Well Types in the United States^{1,2}

Well Type/Class	Number of Wells	Comments ³
Oil and Gas Related Injection Wells (Class 0)	~70000	Over 2 billion gallons of brine injected into EOR associated with 80% of the oil produced in the United States.
Injection Wells (Class 1) and Injection Wells (Class 2) Other than Class 2E	~1100	As of March 2008, 1172 Class 2E wells exist in total. Only 10 have been converted to the U.S. CCS standards.
Natural Gas Storage	400 active storage facilities in 36 states; 80 more	5000 to 7000 BSCF of natural gas in storage facilities.
Liquid Hydrocarbon Storage (Class 0)	100	Part of U.S. Strategic Petroleum Reserve.
Heat-Exchange (Class 1) as Defined by RCSP ⁴	100	Generally located at industrial facilities.
Nonhydrocarbon Industrial Waste (Class 0)	200	Generally operates in various geologic basins, including Kansas and Louisiana.

1. Information from the U.S. EIA (2008).
2. Information from the U.S. EIA (2008).
3. Information from the U.S. EIA (2008).
4. Information from the U.S. EIA (2008).

ATLAS

4th Edition, Revised

PCOR Partnership
Plain CO₂ Reduction (PCOR) Partnership
Federal Environmental Security Research Initiative (FESRI)



WEBSITE

PCOR Partnership
Plains CO₂ Reduction (PCOR) Partnership
Practical, Environmentally Sound CO₂ Sequestration

PARTNERS ONLY | KIDS | EDUCATORS | CONTACT US | search

Regional Storage Potential

Matching CO₂ sources with potential CO₂ storage sites in the region

The PCOR Partnership

Through the PCOR Partnership, over 100 stakeholders collaborate to help make safe, practical carbon capture, utilization, and storage (CCUS) projects a reality.

Featured Documentary: Global Carbon and Energy

- Fact Sheets
- Watch Videos
- CCS Basics
- Let's Get Technical

- EDUCATE
- INFORM
- SHARE