



EERC

EERC Technology... Putting Research into Practice

The Plains CO₂ Reduction (PCOR) Partnership

Fifth Annual Conference on Carbon Capture and Sequestration

Alexandria, Virginia

May 11, 2006



Phase II Partners



Eagle Operating Inc.



Fischer Oil and Gas, Inc.



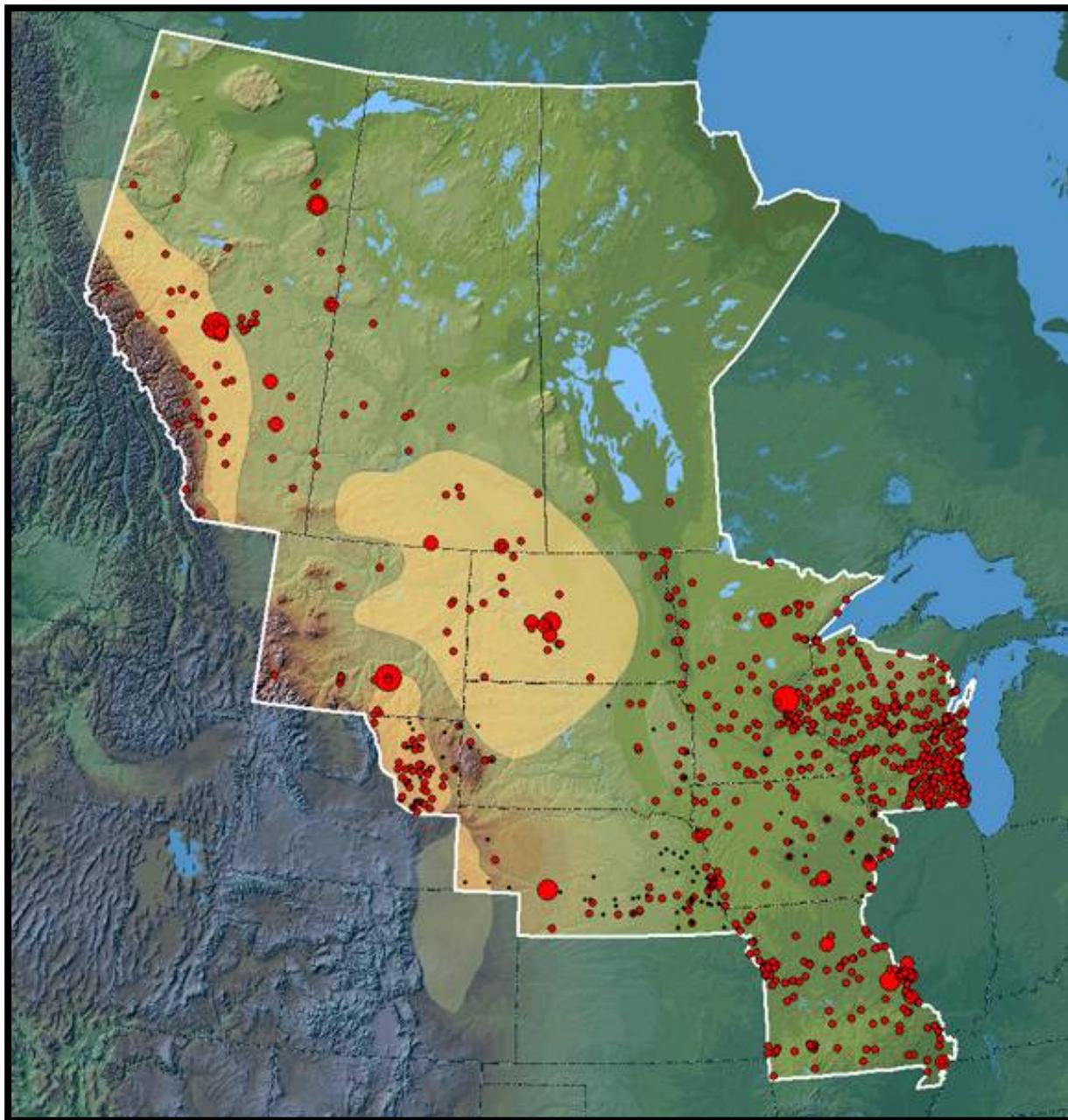
Industrial Commission of North Dakota
Oil and Gas Research Council



Industrial Commission of North Dakota
Lignite Research, Development and Marketing Program



Sinks and Sources



Sources

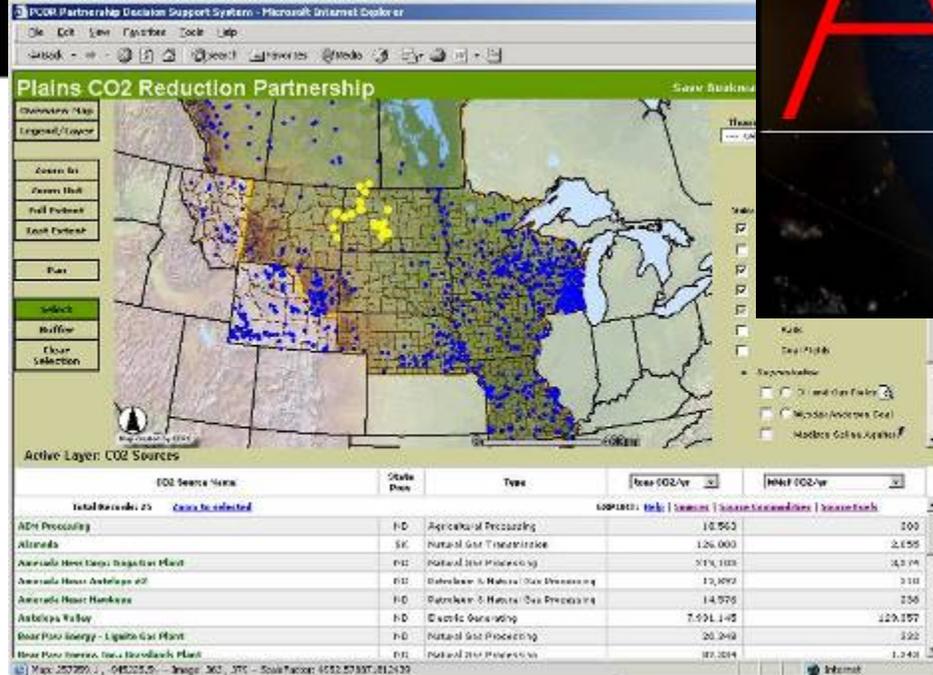
1367 stationary
sources

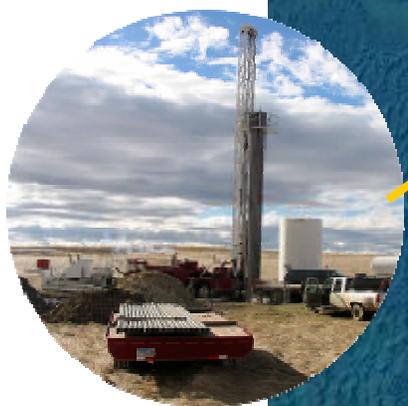
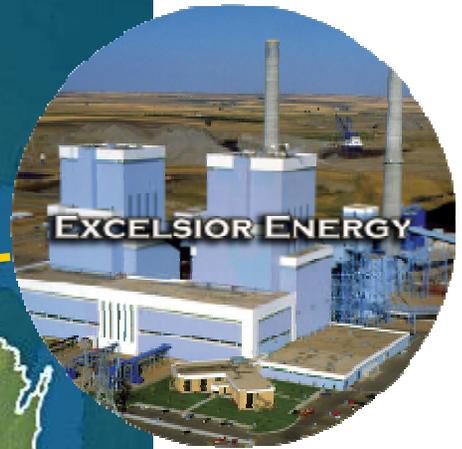
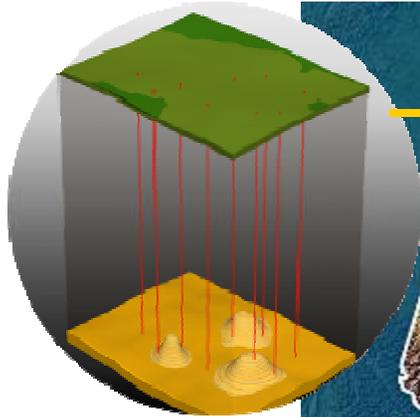
Total CO₂ emissions:
619 million tons/yr

PCOR Partnership Region

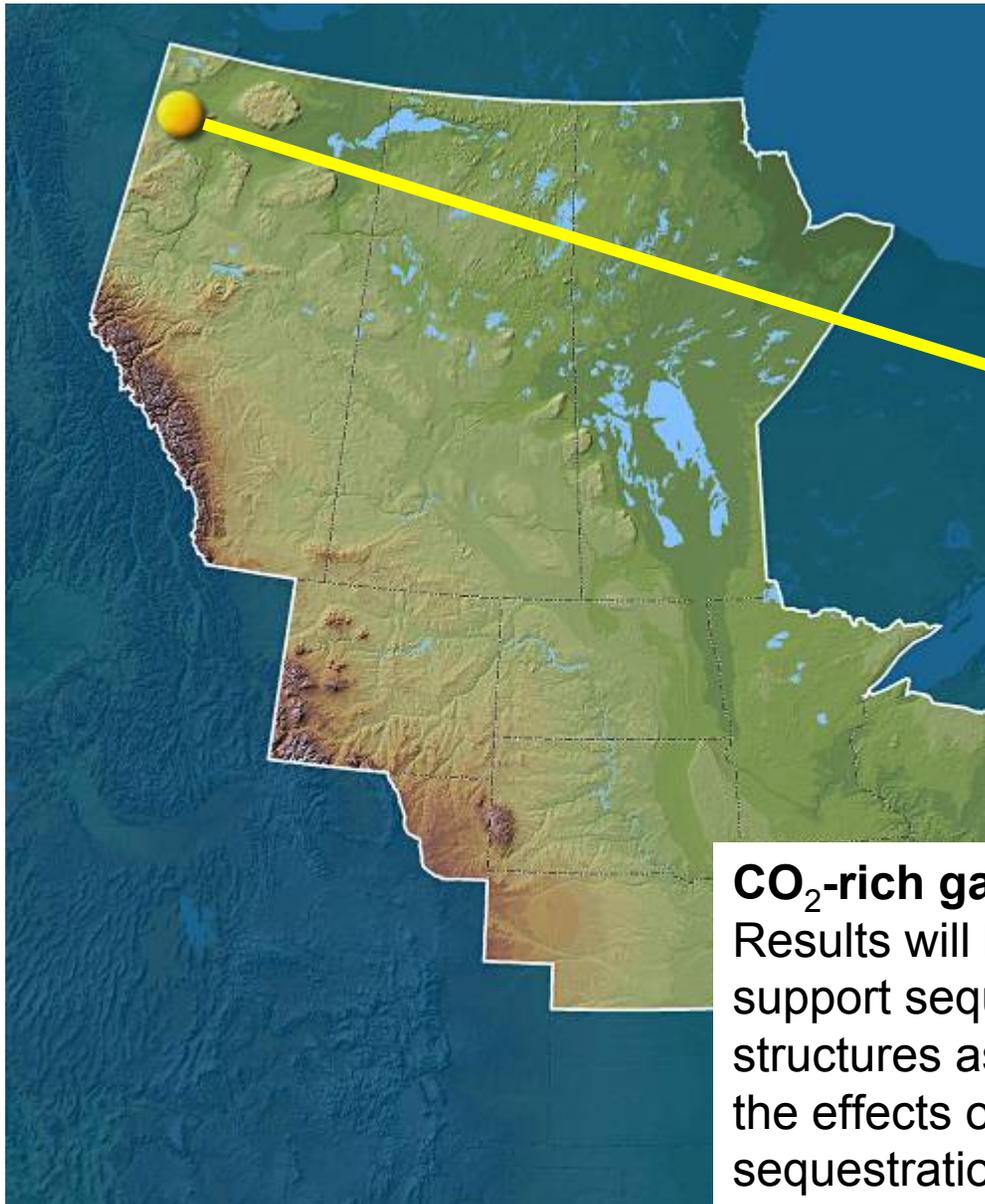
Geological CO₂
sequestration capacity
estimated thus far:
>218 billion tons

PCOR Partnership Products



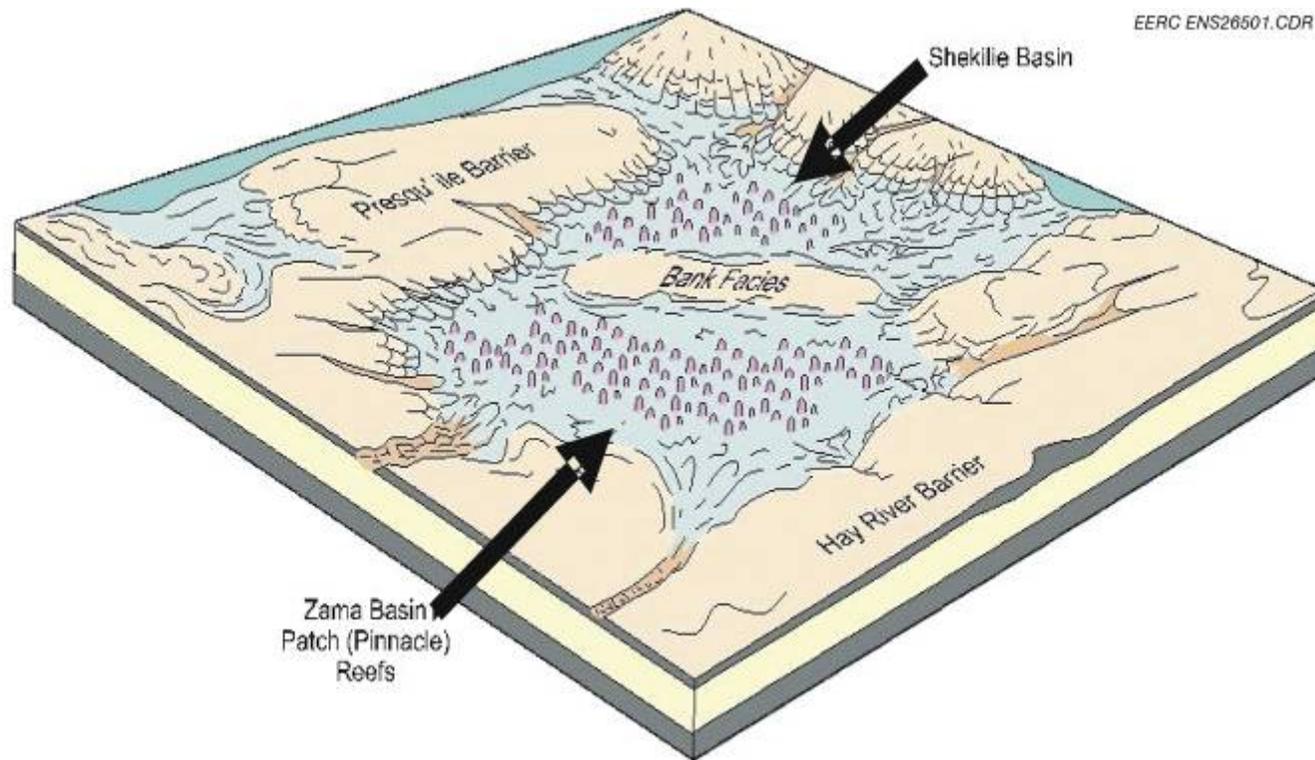


Zama, Alberta

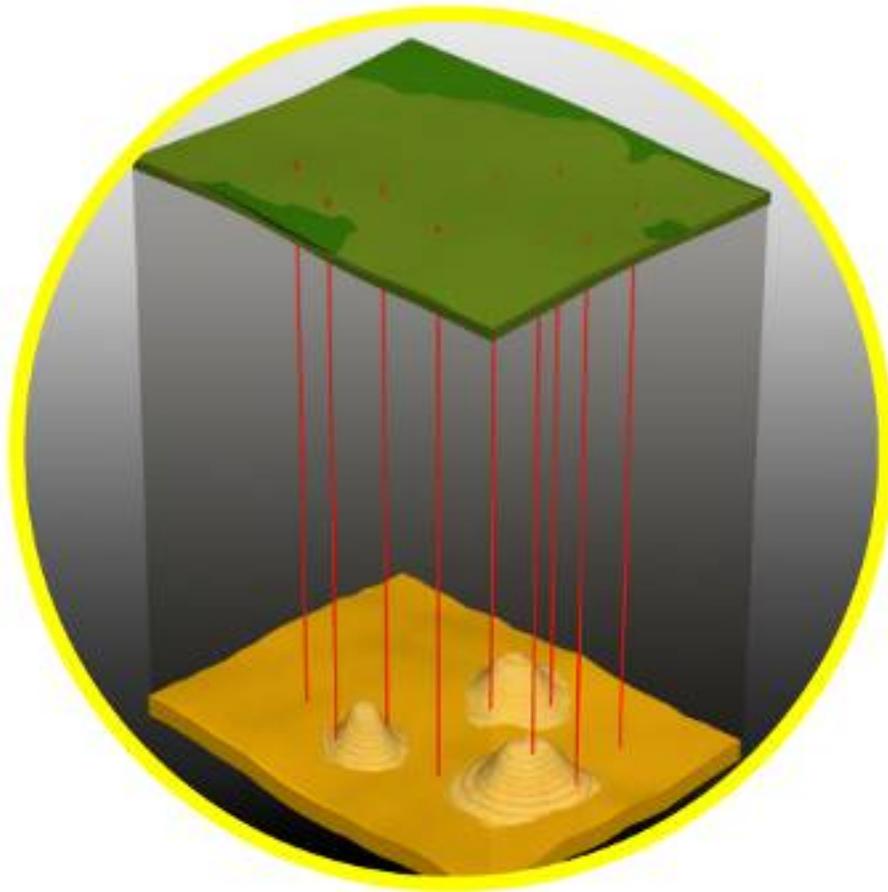


CO₂-rich gas in a pinnacle reef structure –
Results will help to determine the best practices to support sequestration in these unique geologic structures as well as further our understanding of the effects of H₂S on tertiary oil recovery and CO₂ sequestration.

Pinnacle Setting



Zama Pinnacle Reef



Injection of acid gas stream from nearby gas-processing plant.

- 60% CO₂
- 40% H₂S

Approximately 200,000 tonnes of CO₂ will be injected during demo period.

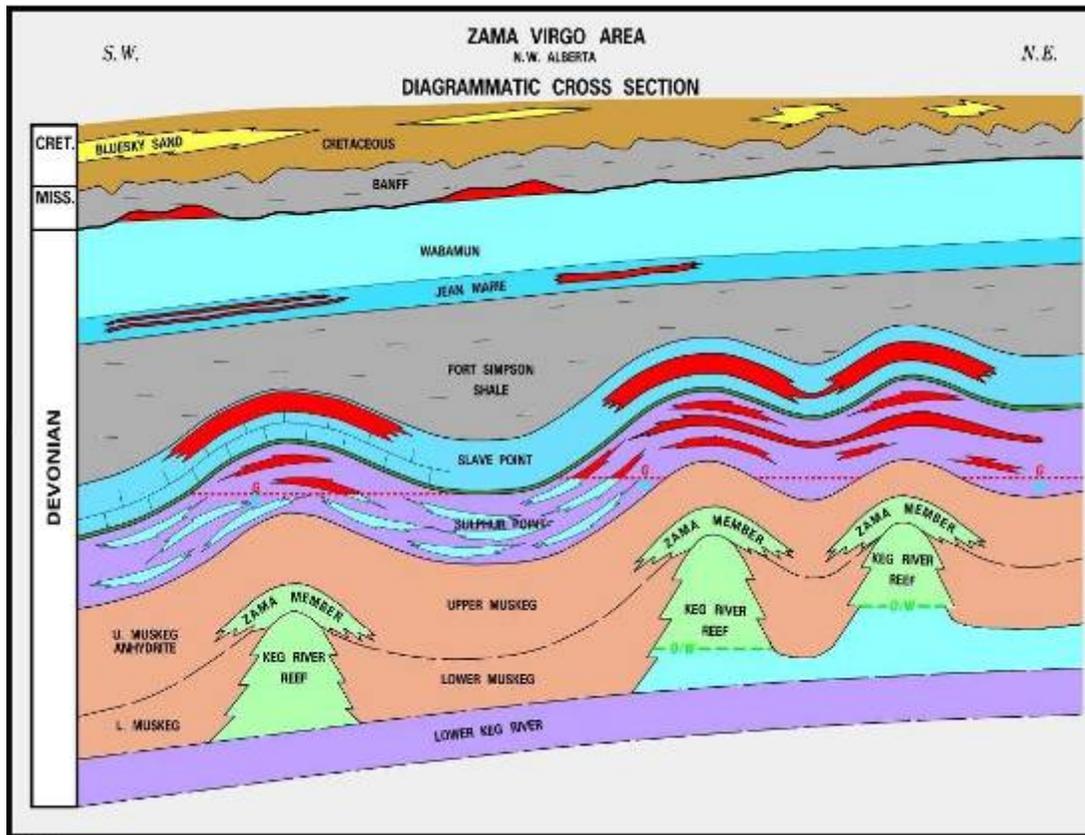
Zama Scales of Examination

- Reservoir scale
 - Zama F Pool and immediately underlying and overlying confining units: Lower Keg River Fm limestone and Muskeg Fm anhydrite.
- Local scale
 - Zama F Pool and a few adjacent pinnacle reefs.
 - Entire stratigraphic column from basement to surface.
- Regional or subbasin scale
 - Relevant data from basement to surface over the entire Zama oil field/subbasin.
- Basin scale
 - Flow regime of the underlying Keg River aquifer.



Zama Pinnacle Reef

MMV Operations



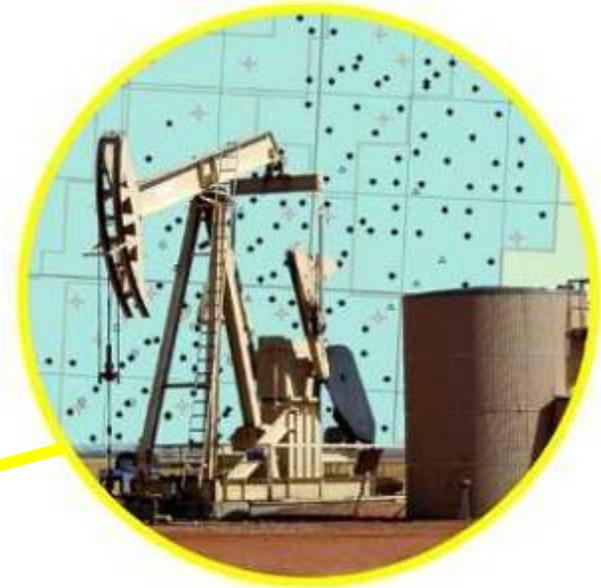
- Monitor the CO₂/H₂S plume:
 - Reservoir pressure monitoring.
 - Wellhead and formation fluid sampling (oil, water, gas).
 - Geochemical changes in wells.
- Early warning of reservoir failure:
 - Pressure monitoring of injection well, reservoir, and overlying formations.
 - Geochemical monitoring of overlying formations.

Zama Laboratory Work for MMV

- Using cores from demonstration sites.
- Physicochemical reactions between injected gas, fluids, and rocks.
 - Mineralization
 - Partitioning (oil, gas, water, rock)



Beaver Lodge, North Dakota



- CO₂ in a deep oil reservoir – CO₂ will be injected into an oil-bearing zone at great depth in the Beaver Lodge oil field.
- Minimum of 3000 tonnes of CO₂ will be injected during demo period.

Lignite for CO₂ Sequestration and ECBM

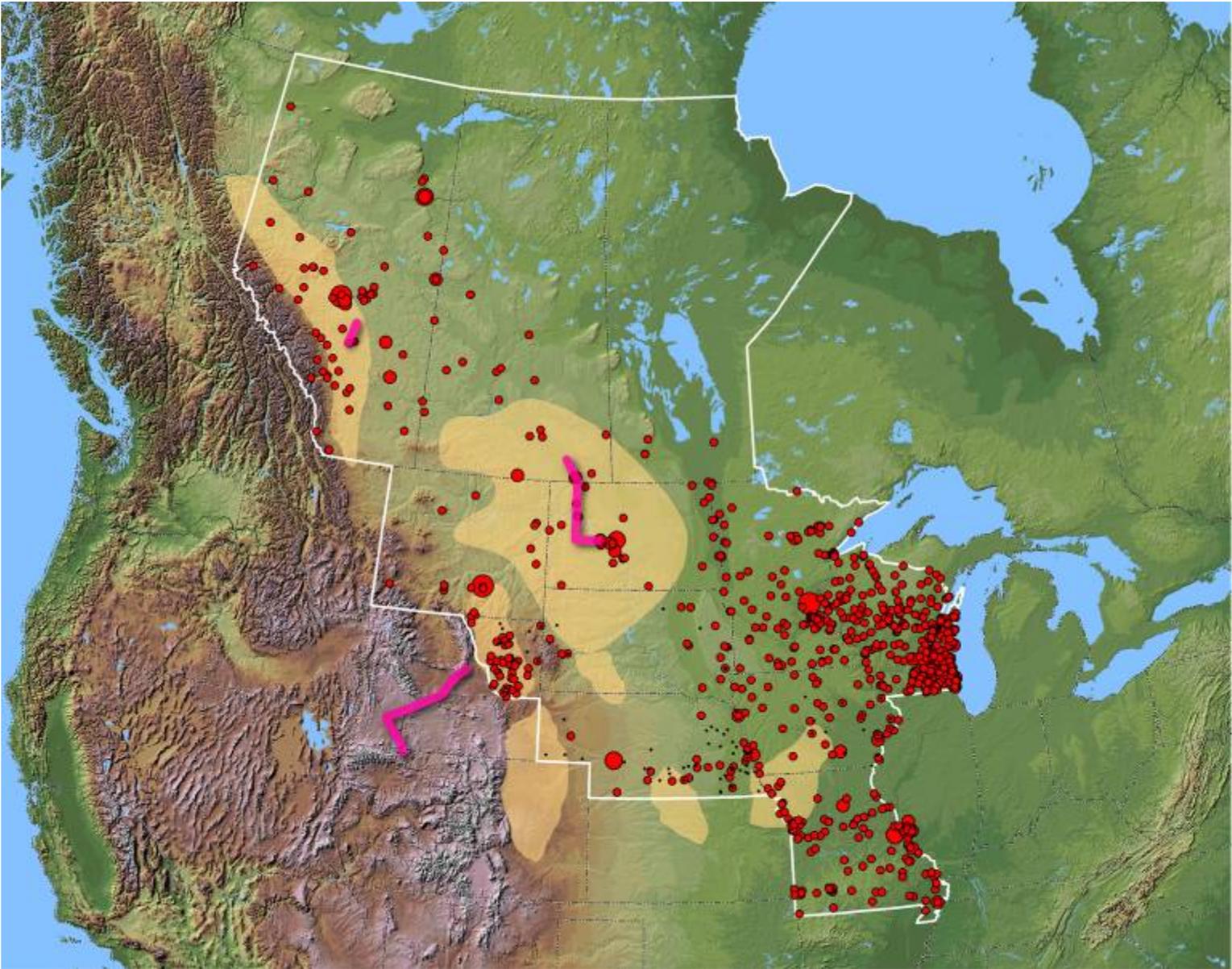


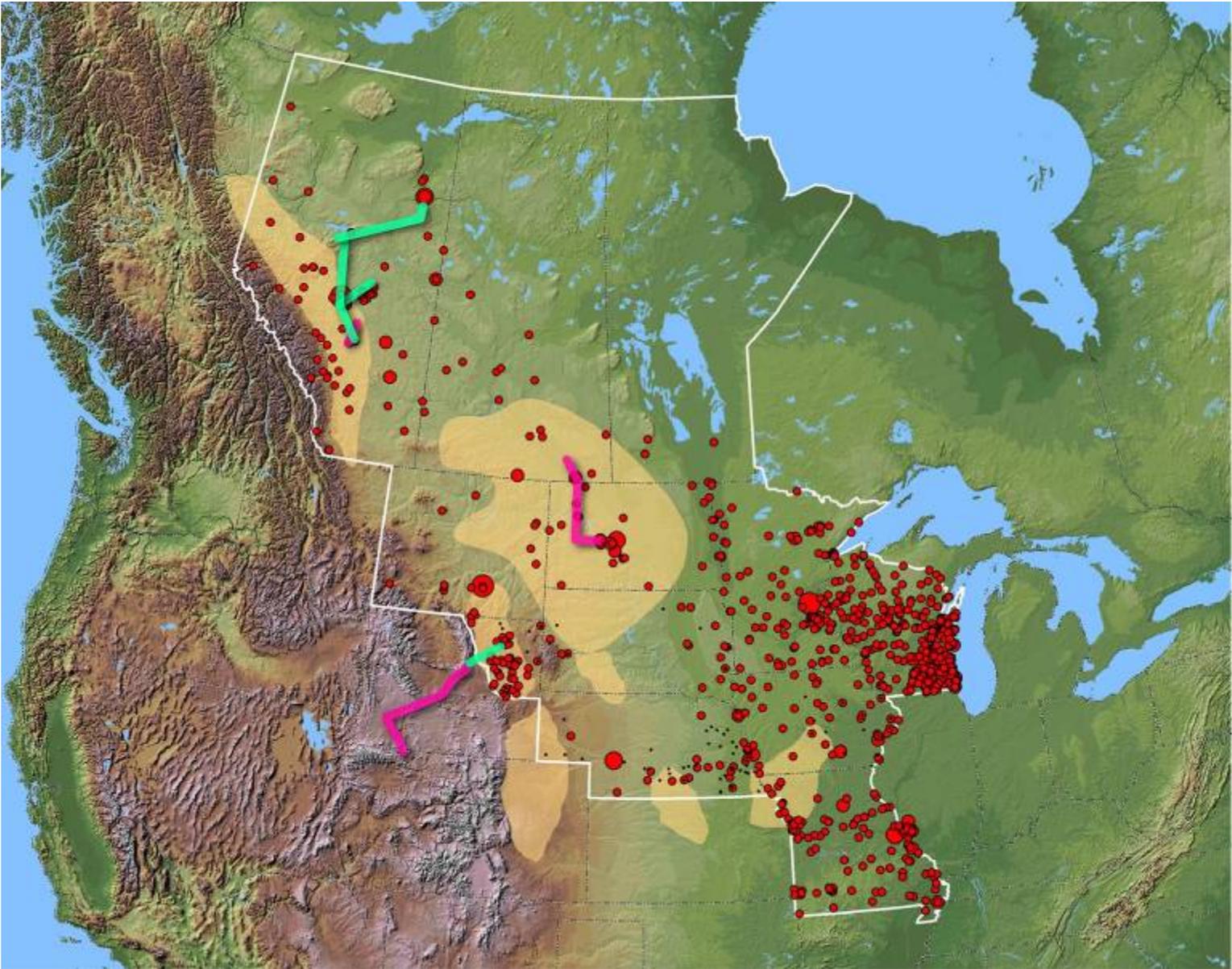
- CO₂ in an unminable lignite seam – CO₂ will be injected for both CO₂ sequestration and enhanced coalbed methane production.
- State of North Dakota is providing surface and mineral rights access; hoping to drill this summer.

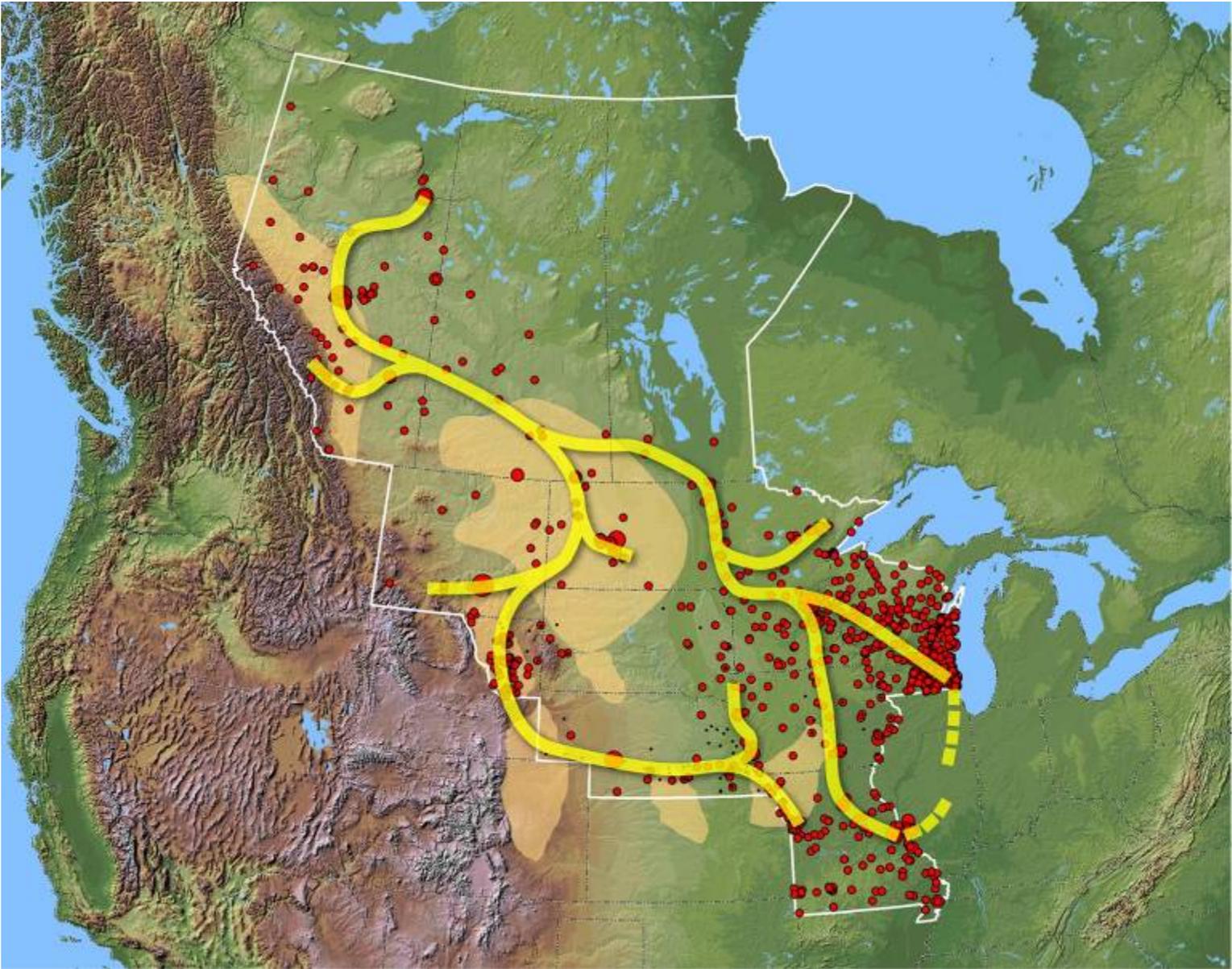
Terrestrial Demonstration

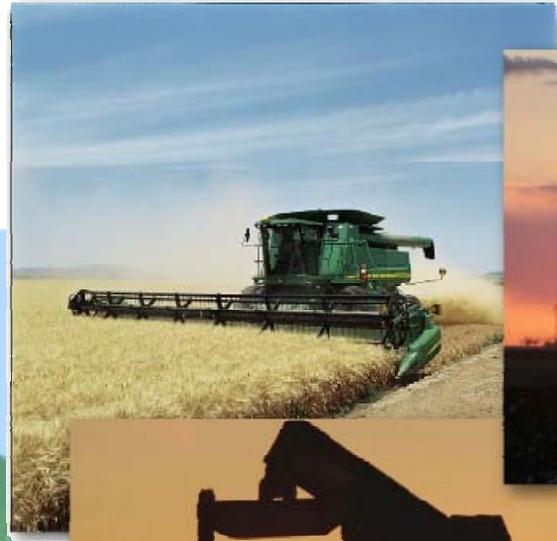


Out of the Air – into the Soil – A managed wetland will be implemented in north-central South Dakota to demonstrate practices that will improve CO₂ uptake. The results will help to optimize CO₂ storage, monitoring, and verification methods and facilitate the monetization of terrestrial carbon offsets in the region and elsewhere.









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