Compilation of Geologic Data in the Midwest Regional Carbon Initiative (MRCI)

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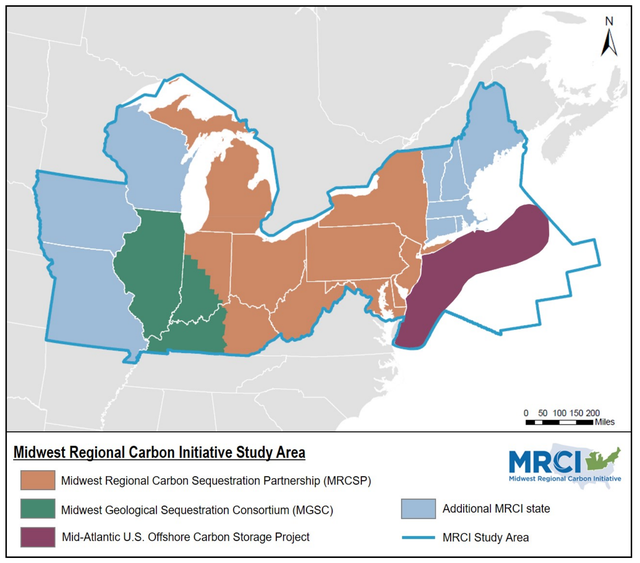
Abstract

The Midwest Regional Carbon Initiative (MRCI) project is a new twenty-state collaborative research project funded by the U.S. Department of Energy. The goal of the project is to accelerate the deployment of carbon capture, utilization, and storage (CCUS) in the Midwest and Northeastern United States. The MRCI project is co-led by Battelle in Columbus, Ohio, and the Illinois State Geological Survey in Champaign, Illinois, and consists of a partnership of industry, state geological surveys, and universities across the region. The project builds on the past research conducted in the Midwest Geological Sequestration Consortium (MGSC, Illinois Basin) and the Midwestern Regional Carbon Sequestration Partnership (MRCSP, central and northern Appalachian Basin, Central Arches, Michigan Basin).

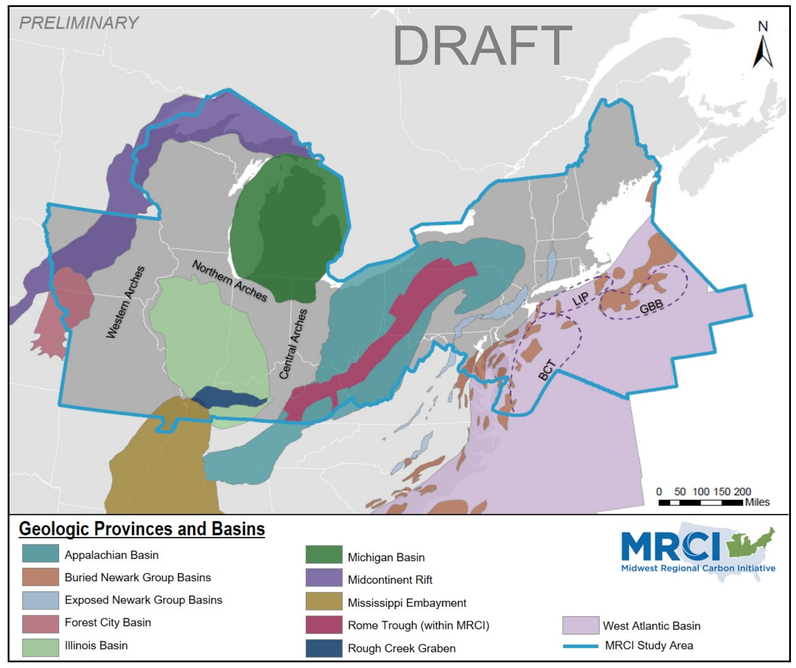
Research for the project is divided into five tasks. The Kentucky Geological Survey is co-lead on Task 2, advancing critical knowledge and addressing key geologic research challenges for CCUS deployment in the region. For Task 2, the geological team will gather and organize existing geologic information from the previous carbon sequestration partnerships to make the data more accessible and to help identify data gaps, and technical challenges towards the establishment of CCUS in the region.

The project is in its first year. Herein, we introduce the project and describe some of the goals and expected results of geologic data compilation tasks.

Study Area



The MRCI study area is composed of the previous MRCSP (orange) and MGSC (green), and the Mid-Atlantic Offshore (mauve) from previous U.S. Department of Energy-sponsored projects, and states added to the effort (blue). The region consists of several basins, arches, rifts, and offshore areas (from Gupta and Greenberg, 2021).



The maps and information shown on this poster labeled as "draft" are preliminary and are used to show the types of data being compiled for the project. Please treat as draft diagrams and do not copy or use for other purposes. Finished maps and data will be available on the MRCI website.

Organization and Tasks

The overall objective of Task 2 is to facilitate regional deployment of integrated CCUS by advancing the critical knowledge and capabilities needed for successful storage operations toward commercial deployment. Advancing critical knowledge will be accomplished through five subtasks, based on gathering and organizing existing geologic information from the previous partnerships into a regional data system:

- 2.1 Defining subregional CCUS systems
- 2.2 Defining Precambrian basement faulting/stress
- 2.3 Developing industrial partnership and regional technical collaboration
- 2.4 Conducting regional/subregional analysis
- 2.5 Assessing and managing risk for potential commercial-scale storage complexes

The Kentucky Geological Survey is currently co-leading tasks 2.1 and 2.2, in cooperation with Battelle and many other state geological surveys throughout the region.

Task 2.1

The objective of Task 2.1 is to identify and map Carbon Storage (CS) and Carbon Utilization and Storage (CUS) systems (collectively referred to as CCUS systems) throughout the MRCI region. The geologic team has begun to assemble stratigraphic columns for the twenty-state region and correlate key reservoirs, confining intervals, and important regional seals which occur at depths of 2,600 ft. or more beneath the surface.

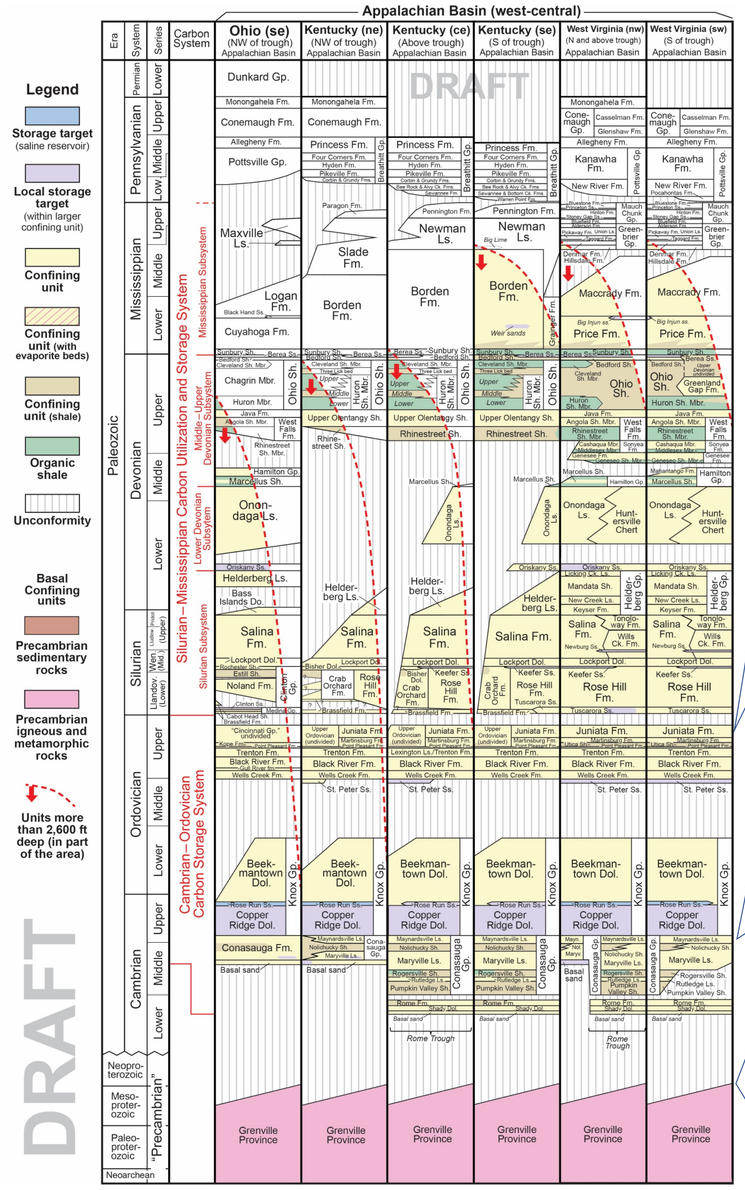
Columns are color coded relative to carbon storage (saline reservoir, local reservoirs, confining intervals, etc.). The geologic team has also begun to gather and inventory the large amount of maps (isopachs, structure, etc.) and data sets generated by the previous partnerships. Key horizons from the different basins will be stitched together into new regional maps and previous maps will be organized stratigraphically by region to facilitate easier use by stakeholders.

Task 2.2

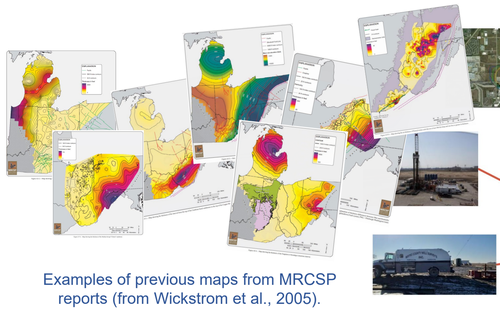
The objective of Task 2.2 is geologic characterization of the Precambrian basement across the study area, including (1) data inventory of Precambrian well penetrations, (2) structure, (3) faulting, (4) state-of-stress, and (5) terrains and rock properties.

Regional data is being gathered and draft maps are being compiled to characterize basement across the region in order to assess risk of induced seismicity from overlying carbon storage.

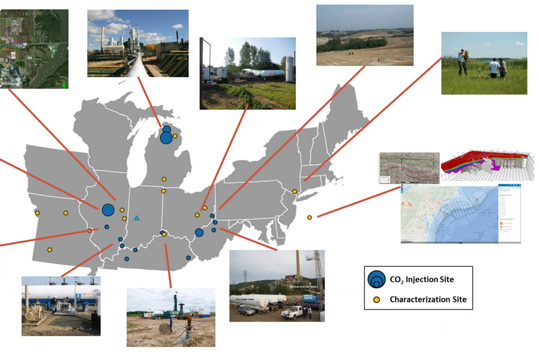
This project is ongoing. Presentations and reports from the project, will be posted on the MRCI website when finished.



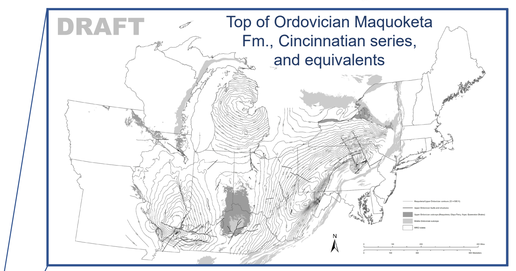
Example draft stratigraphic columns for part of the Appalachian Basin including eastern Kentucky, southeastern Ohio, and western West Virginia. Areas are divided based on their position in arches or basins, and subdivided relative to deep tectonic structures (in and out of the Rome Trough or Rough Creek Graben). Units in columns are colored where they are typically more than 2,600 ft deep (the approximate depth for CO_2 to be in its supercritical state) in the represented region. The arches and basins part of the MRCI region will be represented by thirty or more stratigraphic columns.

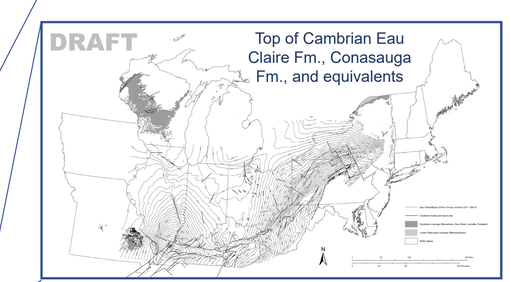


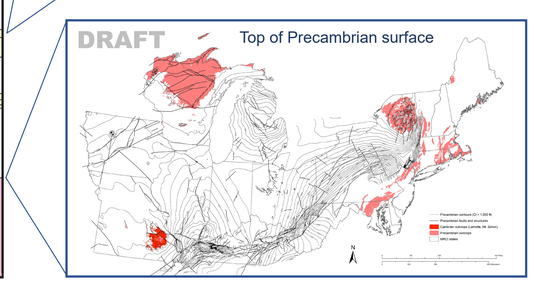
Examples of previous maps from MRCSP reports (from Wickstrom et al., 2005).



Project site locations from previous carbon storage partnerships (from Gupta and Greenberg, 2021).



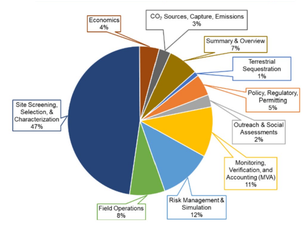




Maps of three stratigraphic horizons used to define carbon systems in the basin and arches region. These draft maps were compiled from smaller subregional maps. Each is currently being revised and updated.

MRCI is compiling data, results, and past experience from the previous partnerships from more than 500 reports, presentations, posters, technical papers, and datasets.

CCUS Research Categories in MRCI Region



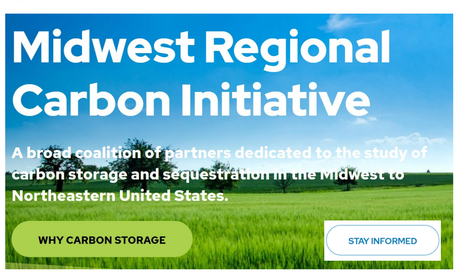
Data and results are being compiled and organized stratigraphically into regional databases for use in analyses of regional carbon storage systems (chart from Gupta and Greenberg, 2021).

References

Gupta, N., and Greenberg, S., 2021, Midwest Regional Carbon Initiative (MRCI) - Regional Initiative to accelerate CCUS deployment in Midwestern and Northeastern USA: MRCI Annual Stakeholder Meeting Presentation, Feb, 18, 2021, online at www.midwestccus.org/

Wickstrom, L.H., Venteris, E.R., Harper, J.A., McDonald, J., Slucher, E.R., Carter, K.M., Greb, S.F., Wells, J.G., Harrison, W.B., Nuttall, B.C. and Riley, R.A., 2005, Characterization of geologic sequestration opportunities in the MRCSP region: U.S. Department of Energy, MRCSP Phase I Task Report, October 2003–September, 2005, 160 p.

For more information:



www.midwestccus.org/

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