Estimates of CO_2 Storage Capacity in the Mississippian Madison and Lower Cretaceous Saline Aquifer Systems of North-Central North America

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ABSTRACT

The Mississippian Madison and the Lower Cretaceous Aquifer Systems have been evaluated by the Plains CO_2 Reduction (PCOR) Partnership as potential sinks in north-central North America for the geological sequestration of carbon dioxide (CO_2). These aquifer systems were selected for evaluation because of their regional continuity, hydrodynamic characteristics, fluid properties, and proximity to large anthropogenic sources of CO_2. Data for the U.S. portion of the regional aquifer systems were obtained from U.S. Geological Survey reports, while data for the Canadian portion was provided by the Alberta Geological Survey. Specific areas included in the calculations include the Williston and Powder River Basin portions of the Mississippian Madison Aquifer System, and the Alberta, Williston, Powder River, and Denver–Julesberg Basin portions of the Lower Cretaceous Aquifer System. Reconnaissance-level estimates of CO_2 storage capacities were developed using a straightforward approach that considers area, thickness, porosity, and solubility of CO_2 in the reservoir water (based on salinity) at spatially varying pressures and temperatures. Depth to the top of the formation was also considered and storage was only considered viable where the top of the formation was deeper than 2500 feet. The Mississippian Madison Aquifer System in the U.S. portions of the Williston and Powder River Basins was calculated to have a maximum capacity of 60 billion tons. The Lower Cretaceous Aquifer Systems in the Alberta, Williston, Powder River, and Denver–Julesberg Basins was calculated to have a maximum capacity of 160 billion tons.