Analysis of Permo-Triassic Formations as Potential Confining Systems for CO_2 Sequestration in Wyoming

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Carbon capture and geologic storage (CCGS) is a mitigation option under investigation to reduce the amount of carbon dioxide (CO_2) in the atmosphere. In order for geologic formations to be deemed suitable for storage, the site must be fully characterized before injection and sequestration can begin. At the Rock Springs Uplift (RSU) in southwestern Wyoming, two reservoirs, the Mississippian Madison Limestone and Pennsylvanian Weber/Tensleep Sandstone, have been identified for potential CCGS. Fluid inclusion volatile work from the Rock Springs Uplift and Moxa Arch to the west indicates that the Triassic Dinwoody Formation, correlative to the Permo-Triassic Goose Egg Formation in eastern and central Wyoming, is stratigraphically the lowest of several possible confining systems at this sequestration site. The Goose Egg and Dinwoody formations are known to contain interbedded anhydrite layers [gypsum at the surface], and extensive evaporite deposits are exposed in the Goose Egg in central Wyoming. These evaporites are approximately 90 m thick and are laterally extensive across outcrops, though the thickness may have been altered due to structural deformation. Evaporite deposits make excellent seals in hydrocarbon reservoirs and have the potential to seal CCGS reservoirs. Characterization of these formations will make it possible to determine the confining ability of sealing units at the RSU and other potential sequestration sites throughout Wyoming.

Using data from well logs, cores, measured sections, and strontium isotopes from anhydrite layers, it is possible to characterize the properties of the Goose Egg and Dinwoody formations, and to assess the effectiveness of the confining system at the RSU CO_2 sequestration site. The lithology, extent, and thickness of these units have been well studied, but the Permo-Triassic age relationships are still under debate within the scientific community. 87Sr/86Sr isotope ratios from anhydrite make it possible to identify a marine, regionally extensive depositional setting of these units, allow for more accurate dating of anhydrite deposition, and better constrain the age relationships.