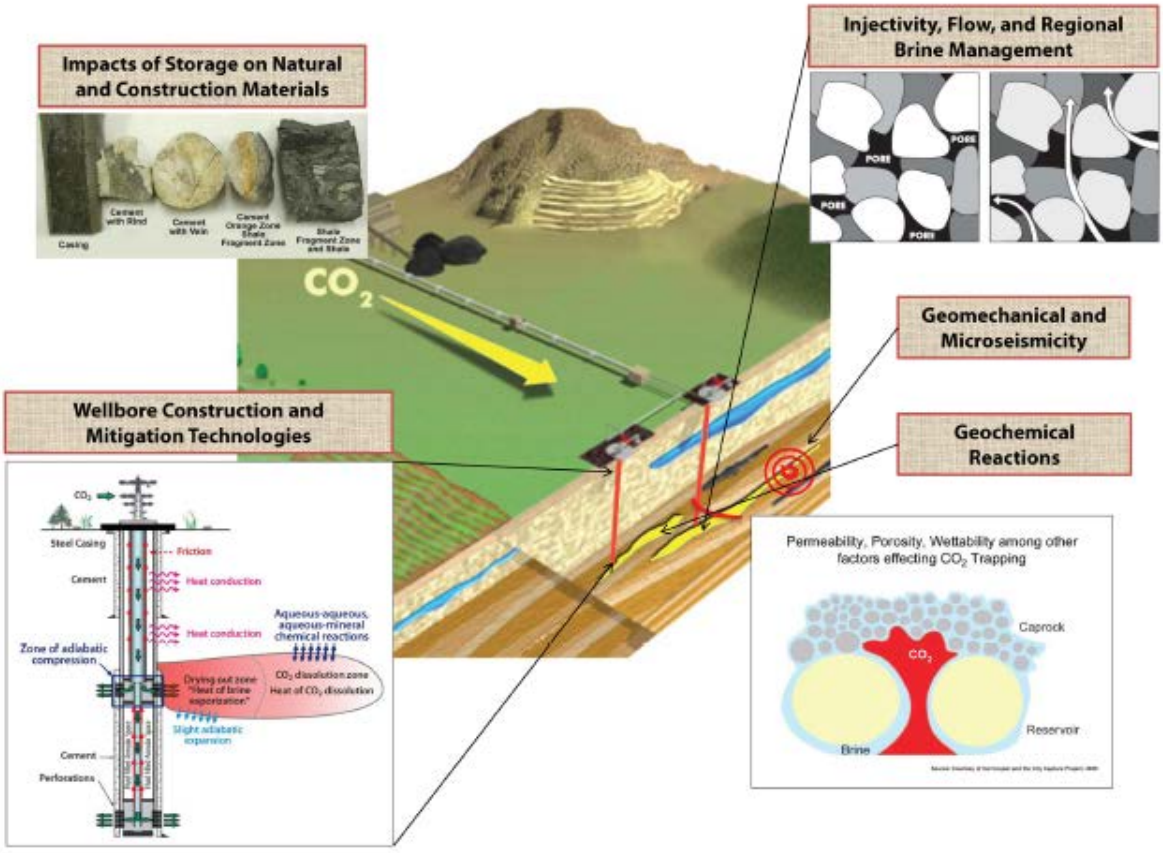
Geologic carbon storage involves the injection of supercritical carbon dioxide (CO_2) into deep geologic formations (injection zones) overlain by sealing formations (confining zone) that create a geologic barrier that prevents CO_2 from migrating out of the storage formation. Current research and field studies are focused on developing a better understanding of the science of and technologies for storing CO_2 in reservoirs of five different rock types: clastic formations, carbonate formations, deep, unmineable coal seams, organic-rich shales, and basalt interflow zones.

The Carbon Storage Program supports research to develop technologies that can improve containment and injection operations, increase reservoir storage efficiency, and mitigate potential release of CO_2 in all types of storage formations through the Geologic Storage and Simulation and Risk Assessment (GSRA) Technology Area. Research conducted in the near and long term will augment existing technologies to ensure permanent storage of CO_2 for the emerging CO_2 storage industry. The program supports research that will improve the nation's scientific understanding in six key technologies: (1) wellbore; (2) mitigation; (3) fluid flow, pressure, and water management; (4) geomechanical impacts; (5) geochemical impacts; and (6) risk assessment.

The figure below illustrates the geologic storage concept and the various research efforts underway within the GSRA Technology Area. The Carbon Storage Program supports research to develop technologies that can improve containment and injection operations, increase reservoir storage efficiency, and mitigate potential releases whether CO_2 is stored in depleted oilfields, coal seams, or saline formations.



Computer simulators (models) predict the movement and behavior of underground CO_2 and serve as critical tools for identifying, estimating, and mitigating risks arising from CO_2 injection into the subsurface. They are used to facilitate more effective site characterization, design injection operations, provide the basis for MVA operations, and predict the eventual stabilization and long-term fate of injected CO_2.

Computer simulators can also be used to predict geochemical and thermal changes that may occur in the reservoir; geomechanical effects on the target formation, seals, and release pathways such as faults, fractures, and wellbores; and biological effects in the presence of supercritical CO_2.

Risk assessment (or more formally, risk analysis, which tailors the development of effective risk assessment protocols and models to individual CO_2 storage sites) is often performed during the early stages of a project to facilitate site selection, communicate project goals and procedures to the public, and aid regulators in permitting the project. Risk assessment is also used to identify potential site problems and develop mitigation procedures to facilitate immediate corrective action should a problem arise. Risk quantification is necessary to support site selection and inform project developers as they design MVA protocols and well designs. Risk assessment results are used to help operators determine long-term project costs and potential liabilities and make decisions on decommissioning and long-term stewardship. The uncertainty surrounding identified risks decreases as the simulation models are refined with new data, which help provide a more accurate risk assessment and mitigation plan for each project site. Both qualitative and quantitative protocols are being developed to ensure the safe and permanent storage of CO_2. Results from the simulation models are incorporated into risk assessments on both a project-by-project and larger basin-scale basis. As CCS is deployed in major basins, macro model results will be needed to manage reservoir pressure, plume migration, and potential risks for multiple CO_2 injection projects across the basin. More information on the Carbon Storage Program's simulation and risk assessment technologies is available in the Best Practices Manual titled**,** *Risk Analysis and Simulation for Geologic Storage of CO_2***.**