

3.2.1.6 WETLAND RESTORATION, MANAGEMENT, AND CARBON SEQUESTRATION

Technology Description

Wetlands, including coastal zones, estuaries and marshes, northern tundra and peatlands, total about 2.8×10^9 ha, about 7% of the Earth's land surface and 11.6% of the United States. Wetlands present an important opportunity for carbon sequestration and greenhouse gas offsets by virtue of their potential for restoration using known and innovative land management methods. Equally important is protection of wetlands in northern and temperate latitudes from carbon loss with global warming. Because they are inherently highly productive and accumulate large below-ground stocks of organic carbon, restoring lost wetlands and protecting those that remain clearly represents an immediate and large opportunity for enhancing terrestrial carbon sequestration.

System Concepts

- Wetlands are inherently among the most productive ecosystems on earth, with 7% of total land area contributing 10% of global net primary productivity.
- Climatic condition is the single most important factor in determining success in protecting carbon stored in existing wetlands. Fire, permafrost melt, sea-level rise and more frequent droughts will significantly affect wetlands.
- Carbon sequestration can be enhanced through application of proven engineered wetlands technology.

Representative Technology or Practices

- Restoration of riparian zones, estuaries and tidal marshes, mangrove forests, bottomland hardwood forests and other wetland systems.
- Management of periodically flooded rice fields and floodplains.
- Protection of existing wetlands, in particular, peatlands, bogs, and other northern latitude wetlands that might otherwise become large sources of gaseous carbon with global warming.

Technology/Practice Status and Application

- Limited data exist as to the actual quantification of sequestered carbon by wetland type and location.
- Wetland restoration has centered on wildlife habitat, water quality improvement, erosion control, shoreline restoration, but not carbon sequestration.
- Efforts to manage northern wetlands in danger of becoming massive sources of carbon to the atmosphere do not exist.

Current Research, Development, and Demonstration

RD&D Goals

- Evaluate the extent to which various management practices on restored wetlands have enhanced carbon sequestration.
- Delineate and quantify carbon stocks in U.S. wetlands by region and type.
- Assess the vulnerability of wetland carbon stocks to human activity and climate change.
- Develop and demonstrate integrated management strategies for wetland carbon sequestration.

RD&D Challenges

- Quantify carbon accrual in wetlands to enable better estimates of their potential for carbon sequestration in coming decades.
- Identify cost-effective management approaches and technologies to mitigate loss of carbon from wetlands in northern latitudes.
- Construct and verify models that couple hydrology, ecosystem processes and carbon sequestration.
- Devise workable fire management techniques for wetlands that are compatible with wildfire suppression strategies.

RD&D Activities

- Ongoing research to evaluate wetland restoration methods.
- Demonstration projects are ongoing in select regions, including the lower Mississippi River valley and delta with mixed results. It has proven difficult to recreate native wetland vegetation assemblages.
- New demonstration projects with industry, including DOE-sponsored work with the Tennessee Valley Authority, have recently been initiated with limited results to date.

Recent Progress

- Wetland loss and degradation has been recognized and new programs implemented to regulate development activities that adversely affect wetland functions. Loss of wetlands in the 1990s was 80% lower than the 1980s.
- The U.S. Department of Transportation has established a goal of replacing 1.5 acres for every acre of wetland impacted within 10 years.