United States Department of Agriculture

Natural Resources Conservation Service
Conservation Effects Assessment Project
Key Findings of CEAP–Wetlands Component

Effects of USDA Wetland Conservation Programs in the Mid-Atlantic Coastal Plain Region

Wetland functions (i.e. pollutant mitigation, carbon sequestration, and support of habitat biodiversity) recover upon wetland restoration, however, rates of recovery vary among the functions.

The Mid-Atlantic Regional (MIAR) Wetland Conservation Effects Assessment Project (CEAP-Wetland) is one of several USDA Conservation Effects Assessment Project Wetland National Component regional assessments undertaken to collect and interpret data on ecosystem functions provided by wetlands restored through USDA conservation programs. The MIAR CEAP-Wetland study employed a multiscale approach in the Mid-Atlantic portion (Maryland, Delaware, New Jersey, Virginia, and North Carolina) of the Gulf Atlantic Coastal Flat Physiographic Province (Figure 1) , focusing on the effects and effectiveness of depressional non-tidal wetland restorations. Study activities at 48 sites were conducted along a wetland alteration gradient, including hydrologically restored (18) and relatively undisturbed natural (14) wetlands, as well as prior converted croplands (PCCs, 16). Overall, study results indicate a trend of wetland functional recovery following restoration, but rates of recovery vary among wetland functions, and intra-regional differences were significant.

Wetland Conservation and WRP in the Mid-Atlantic Coastal Plain Region

- The MIAR study covers ~58,000 sq. km in the eastern United States, including areas of the Gulf Atlantic Coastal Flats Physiographic Province.
- The region is predominantly natural land cover (forested 18%; scrub-shrub 8%; grassland-herbaceous 3%; palustrine wetland 31%; estuarine wetland 4%) and 28% high agricultural density areas (Delmarva and eastern central North Carolina).
- Wetlands are abundant. Most of the area's wetlands are forested or scrub-shrub wetlands located in floodplains, between drainage systems in broad flats, and in upland depressions. Riparian, depressional, and flats wetlands are common and tend to be concentrated in certain areas.
- Mid-Atlantic wetlands provide critical ecosystem services, including the provision of freshwater, regulation of pollutants (e.g., nutrients, pesticides), floodwater storage, and support for biotic communities, which in turn enhance the provision of multiple ecosystem services.
- Regional wetland conservation practices included wetland restoration, pond construction, habitat management conservation buffers, water management, and grazing/access management.

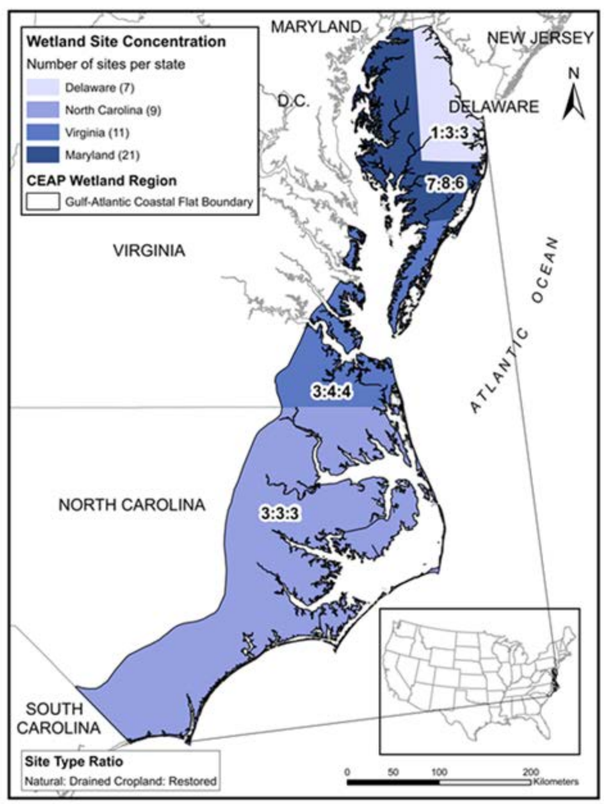

Figure 1: MIAR CEAP-Wetland study site locations, by state and wetland type.

Wetland Restoration Effects on Carbon Sequestration

- In Delaware, Maryland, and Virginia, natural wetlands have significantly higher soil carbon stocks (21 ± 5 kg C m^{-2}) than PCCs (8 ± 2 kg C m^{-2}). The historic loss of ≈60% of soil carbon following land conversion to agriculture was likely due to drainage, alteration of plant communities, and cultivation.
- Soil carbon stocks were lower in restored wetlands (5 ± 1 kg C m^{-2}) relative to PCCs (8 ± 2 kg C m^{-2}). This may, in part, be due to the relatively young age (5-10 years) of the restorations in addition to implementation practices (excavation vs. hydrologic modifications).
- Wetland restoration via excavation causes an initial, significant decrease in soil carbon stocks. In contrast, less invasive hydrologic restoration approaches (e.g., ditch plugs and berms) did not decrease soil carbon.
- Sequestration of soil carbon is typically a slow process, likely taking decades or longer for restored wetlands to recover soil carbon levels comparable to natural wetlands.

Wetland Restoration Effects on Soil Characteristics and Mitigation of Pollutants (Nutrients)

- Soil pH in the natural wetlands were extremely acid (pH≈4.3). The restored wetlands were moderately acid (pH≈5.9) and comparable to PCCs (pH≈6.0) most likely due to liming.
- Soil N content of the natural wetlands was higher (0.3-0.5% N) than in restored and prior converted sites (≤0.2%).
- The C/N ratios were highest in the natural wetlands (13.8 to 19.7), followed by restored wetlands (9.1 to 9.3) and PCCs (7.5 to 9.3).
- Nitrate conversion processes important for pollutant mitigation are substantial within both PCCs and restored wetlands.

Effects of Wetland Restoration on Regulation of Hydrologic Flows and Mitigation of Natural Hazards (Flooding)

- Wetland restoration in the MIAR helps to support the regulation of hydrologic flows and natural hazards (e.g., flooding).
- Natural wetlands exhibited relatively continuous flow into adjacent streams in contrast to PCCs, which provided flashier, pulsed flows directly after precipitation events.
- Restored wetlands exhibited surface water flows intermediate to natural wetlands and PCCs.

Effects of Wetland Restoration on Support for Habitat Biodiversity

- Wetland restoration has a strong, positive effect on plant and amphibian biodiversity and community quality, but restored communities were significantly different than natural wetlands.
- A total of 204 plant species were observed across the three site types with 71 plant species found in natural sites, 134 in restored sites, and 34 in PCC sites.
- Restored wetlands were hotspots of plant biodiversity, surpassing the diversity of natural wetlands. However restored wetlands are early successional ecosystems dominated by native herbaceous vegetation, whereas natural wetlands are dominated by native woody plants.
- A total of 43 species of amphibians were surveyed in the MIAR, of which 28 species use depressional wetlands for reproduction.
- Total species and mean number of species based on all life history stages encountered was similar between restored and natural wetlands, and both wetland types contained twice the number of species detected at PCCs.