Hydromorphic Soils

NE-1038 (2009-2014)

The Importance of Wetland Soils

Soils form in the presence of excess water in riverine, coastal, permanently submerged (subaqueous), and other wetland areas across the northeastern US. Federal, state, local, and private entities have requested information about these soils in order to manage shellfish stocks, plan dredging and waste disposal, and construct stable roads, bridges, docks, and dams. Fluctuations in water levels also affect the ability of wetlands to store carbon and filter water.

NE-1038 scientists are trying to get a picture of what is happening to subaqueous soils impacted by aquaculture. The condition of the soils is indicative of water quality, tidal fluctuation, and how much energy is coming in. University of Rhode Island photo.

Managing these soils and the resources and activities that depend on them requires an understanding of hydrology—the movement, distribution, and quality of water—among these soils and how it varies across the region. Legislative decisions about wetlands require more precise mapping. Identifying hydric soils (soils that are permanently or seasonally saturated by water) is a key to on-site delineation of wetlands. However, some hydric soils fail to develop the typical morphology of wetland soils and are difficult to identify without revised guidelines and tools.

Multistate Research Project Improves Soil Identification & Soil Resource Management

Soil scientists are working together under Multistate Research Project NE-1038 to improve identification, classification, and management of hydromorphic, hydric, and subaqueous soils. The multistate approach enabled researchers to sample soils and conduct studies in a wide variety of climates and wetland settings.

NE-1038's research has increased the amount of data for soils that were previously difficult to sample and under-represented in the national soils database. Participating scientists documented physical and chemical properties of hydromorphic, hydric, and subaqueous soils. NE-1038 researchers also evaluated potential indicators of hydric soils and identified specific indicators that can be used in the field to assess wetland hydrologic characteristics. Based on work at sites in Delaware, Maryland, Pennsylvania, and West Virginia, new hydric soil indicators were incorporated in region-wide guidelines. These indicators could impact wetland restoration efforts by helping to assess pre-disturbed hydrology. Researchers also developed better models to predict the landscape distribution of hydric and subaqueous soils. Soil characterization and distribution modeling augments wetland mapping in the region. Better soil data and mapping are critical to region-wide efforts to assess impacts on the ecosystem services that soils provide. For example, Rhode Island researchers used field tests and models to predict the best soils for oyster aquaculture and measure the impact of sedimentation and ocean acidification on oyster survival.

At Pennsylvania State University, NE-1038 scientists assessed the impacts of fracking on wetlands. Researchers installed soil moisture, temperature, and groundwater pressure sensors to monitor the water table in the vicinity of natural gas development sites. Sensor data were used to develop more accurate models of wetland areas susceptible to damage from gas infrastructure. Researchers also documented that drilling infrastructure is changing surface hydrology of the landscape. Altering the hydrology of an area can have detrimental effects on existing vegetation, amphibian habitat, and carbon storage as well as road placement and maintenance. Understanding how fracking disturbs the land and hydrology is critical to protecting both natural resources and the built environment.

NE-1038 scientists extract cores of sediment from wetlands to look at soil characteristics like color, porosity, and carbon content. Photos by Jim Turenne, USDA-NRCS.

NE-1038 scientists dig holes in research plots on wetlands to measure soil layers and see how water moves through the soil. Photos by Jim Turenne, USDA-NRCS.

Want to know more?

This project was supported, in part, through USDA's National Institute of Food and Agriculture by the Multistate Research Fund established in 1998 by the Agricultural Research, Extension, and Education Reform Act to encourage and enhance multistate, multidisciplinary research on critical issues that have a national or regional priority. Additional funds were provided by contracts and grants to participating scientists. For more information: *http:/nera.umd.edu*.

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Alabama A&M University
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University of Delaware
University of Kentucky
University of Maryland
University of Massachusetts
Pennsylvania State University
University of Rhode Island
Virginia Polytechnic Institute and State University
West Virginia University

Impact Statement compiled by Sara Delheimer.

Pennsylvania State University researchers also developed a model that predicts excess saturation across the landscape. This model is laying the foundation for development of a real-time, online weather forecasting tool that will help farmers determine when fertilizer should be applied in the Chesapeake Bay watershed.

Based on study findings, NE-1038 scientists developed better methods for quantifying soil organic carbon in different wetland soils. Rhode Island researchers found that subaqueous soils sequester as much carbon as terrestrial soils, suggesting that global carbon accounting metrics be revised to more strongly consider subaqueous soil sequestration. More accurate measurements of soil carbon also helped scientists model the effects of wetland condition (from pristine to degraded) on the amount of carbon stored. Maryland scientists found that soil organic carbon stocks were substantially greater in natural landscapes when compared with landscapes drained or cultivated for agriculture in the Delmarva Bay area. Findings like this illustrate the benefits of wetland restoration on carbon sequestration. Furthermore, University of Maryland scientists showed that the marshes Maryland's coastal communities depend on will disappear as sea level rises if the soils are unable to store biomass and organic carbon. Altogether, NE-1038's data and models are critical for developing strategies to increase carbon sequestration in soils and minimize global warming.

NE-1038 Data Used Widely

NE-1038's multistate framework has made findings and data more useful to major agencies, such as the USDA, Army Corps of Engineers, and Environmental Protection Agency, which all work in a region-wide context. For example, working groups, like the Mid-Atlantic Hydric Soils Committee, who offer guidance to regional regulatory bodies (e.g., the New England Water Pollution Control Commission) were able to use soils information from NE-1038 because it is not restricted by state boundaries. NE-1038 also provided soil characterization data to the Natural Resources Conservation Service (NRCS) for their national soils database, and five new soil series were accepted by the NRCS Soil Survey Division. Additionally, NE-1038's approach to classifying shallow water substrate was approved by the Federal Geographic Data Committee and included in the national Coastal and Marine Ecological Classification Standard.

Over the past five years, NE-1038 has provided a forum for disseminating information about wetland systems and associated soils. NE-1038 scientists have been responsible for most of the hydric soils training received by the soil science professional and regulatory communities. For example, the group led the annual Northeast Regional Pedology Field Tour for graduate students, NRCS soil scientists, and other agency leaders. NE-1038 also hosted a workshop on identifying, evaluating, and testing hydric soil and trained over 20 members of the Mid-Atlantic and New England Hydric Soil Technical Committees to better estimate soil organic carbon content. Data from NE-1038 studies are also being used to train Pennsylvania Bureau of Forestry personnel to monitor soil and hydrologic changes due to shale-gas infrastructure.