Study: Tropical wetlands hold more carbon than temperate marshes

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In one of the first comparisons of its kind, researchers have demonstrated that wetlands in tropical areas are able to absorb and hold onto about 80 percent more carbon than can wetlands in temperate zones.

The scientists extracted soil cores from wetlands in Costa Rica and in Ohio and analyzed the contents of the sediment from the past 40 years. Based on their analysis, they estimated that the tropical wetland accumulated a little over 1 ton of carbon per acre per year, and the temperate wetland accumulated .6 tons of carbon per acre per year.

The temperate Ohio wetland in the study covers almost 140 acres, meaning it sequesters 80 tons of carbon per year. The tropical wetland covers nearly 290 acres and stores 300 tons of carbon each year.

"Finding out how much carbon has accumulated over a specific time period gives us an indication of the average rate of carbon sequestration, telling us how valuable each wetland is as a carbon sink," said William Mitsch, senior author of the study and an environment and natural resources professor at Ohio State University. "We already know wetlands are outstanding coastal protection systems, and yet wetlands continue to be destroyed around the planet. Showing that wetlands are gigantic carbon sequestration machines might end up being the most convincing reason yet to preserve them."

Mitsch, also director of the Wilma H. Schiermeier Olentangy River

Wetland Research Park at Ohio State, conducted the study with graduate student Blanca Bernal, who presented a poster on this research Wednesday (10/8) at the Geological Society of America joint meeting in Houston.

Often called the "kidneys" of the environment, wetlands act as buffer zones between land and waterways. In addition to absorbing carbon and holding onto it for years, wetlands filter out chemicals in water that runs off from farm fields, roads, parking lots and other surfaces.

But wetlands are also a natural source of methane, and bacteria present during the decay of organic material cause wetlands to release this greenhouse gas into the atmosphere.

"A big issue in wetland science is how carbon sequestration balances against the release of greenhouse gases," Mitsch said. "Methane is a more effective greenhouse gas than is carbon dioxide in terms of how much radiation it absorbs, but it also oxidizes in the atmosphere. Carbon dioxide does not degrade – it is an end product. If you take that into account, I think wetlands are very effective systems for sequestering carbon."

Mitsch and Bernal collected soil cores from Old Woman Creek, a freshwater wetland near Lake Erie in northern Ohio, and from a similar flow-through wetland located at EARTH University in northeastern Costa Rica. Old Woman Creek had accumulated between 16 and 18 centimeters (about 7 inches) of sediment since 1964, while the Costa Rican wetland accumulated between 30 and 38 centimeters (12 to 15 inches) of sediment during the same time period.

To determine the age of the sediments, the researchers used radiometric dating with cesium-137. Above-ground nuclear testing in the mid-20th century left behind the cesium-137 compound as a marker in sediments

throughout the world. Based on how deep cesium-137 was detected in the soil cores, the researchers were able to date sediment from each wetland that has built up since 1964, the year the concentration of the compound reached its peak.

The tropical wetland sediment was more densely packed with carbon. Its average carbon density was 110 grams of carbon per kilogram of soil (almost 1.8 ounces for every pound of soil), while the Ohio wetland's average carbon density was less than half that, 53 grams of carbon per kilogram of soil (.86 ounces per pound).

Mitsch and Bernal plan to conduct additional comparisons of carbon sequestration in wetlands from different climates to look for patterns that might inform policymakers who are exploring carbon storage options across the world as a strategy to offset greenhouse gas emissions.

Source: Ohio State University