Strongest sinks of carbon are in dynamic landscapes

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The strongest forest carbon sinks in eastern forests are within landscapes not completely dominated by forests. Using a new framework for forest carbon accounting, a team of USDA Forest Service scientists found that landscapes with 50-60 percent forest land use had statistically the same sink strength as landscapes with 90-100 percent forest.

"Monitoring Network Confirms Land Use Change is a Substantial Component of the Forest Carbon Sink in the Eastern United States," a study by Forest Service scientists and collaborators, describes land use change as a substantial part of a strong forest carbon sink in the Eastern United States. The study was published today in the journal *Scientific Reports*.

"Land use has changed dramatically throughout the nation's history, and as we become a more urban nation - 83 percent of our population now lives in urban areas - we will certainly see continued fluctuation in how we use land," said Michael T. Rains, Director of the Northern Research Station and Forest Products Laboratory. "Land use accounting of forest carbon will benefit Americans across our country by helping ensure that effective forest management contributes to reducing the effects of a changing climate by maximizing carbon storage."

The contemporary forest carbon sink of the eastern U.S. is still affected by the conversion of forests to pastures or croplands beginning 300 years ago and extending into the early 20th century. At times, younger or recovering forests can annually sequester more carbon than more fully

mature forests. A combination of these old farms being abandoned and overtaken by forests in recent decades and the evolution of modern forest management has helped increase the strength of the forest carbon sink in a region that includes the Great Lakes states, New England and Appalachia.

Scientists with the Northern Research Station and Southern Research Station used region-wide forest inventory data to examine forest carbon pools by three general land use categories: forest, agriculture, and settlement/other. An examination of mean annual change in forest carbon stocks across the three land use classes showed the highest rates of net carbon increase were found in landscapes with moderately high forest area and minor amounts of agriculture; forest carbon stocks increased in almost every land use change situation except when forest land use loss exceeded 6 percent.

Land use change is recognized as an important part of the forest carbon equation, but this is the first study to address land use accounting of forest carbon stock emissions/transfers across the East's diverse forest ecosystems. "Protecting forests may not be the only approach to sequestering more carbon from the atmosphere," said Christopher Woodall, a research forester with the Northern Research Station and the study's lead author. "An additional approach that our research indicates has merit is to emphasize establishing new forests and ensuring forest growth across multiple land use landscapes."

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