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40-Year Forest Study Reveals New Insights on Carbon

Press Contact: Clarisse Hart, Harvard Forest Outreach Manager
978-756-6157; hart3@fas.harvard.edu

The middle-aged forests of the East Coast may not look like carbon-storing powerhouses. But the blanket of green stretching from the bayou to Maine holds the majority of forest carbon in the United States. New England forests alone take in enough carbon each year to offset nearly half the region's household carbon dioxide emissions.

What scientists don't quite understand is how these forests are getting the job done.

A meticulous, 4-decade study tracking more than 6,000 individual trees at the Harvard Forest in Central Mass., published this month in the *Journal of the Torrey Botanical Society*, sheds new light on how eastern forests are packing on the carbon pounds.

"This forest has grown steadily over the past 42 years," says Audrey Barker-Plotkin, licensed forester and the Site & Research Manager at the Harvard Forest. "Today it's about 110 years old, and we haven't seen the carbon accumulation level off yet."

Measuring trees in the study area, a 7-acre stretch of woods dominated by red oak and red maple, takes a crew of several scientists about three weeks to complete. The plot has been re-measured 4 times since the initial census by soil scientist Walter Lyford in 1969.

Kate Eisen, lead author of the study and a graduate student at Cornell University, notes that over time, more and more of the carbon in this forest has been concentrated into a few large red oak trees. "As long as the oaks are not destroyed by a major disturbance event, they should continue to dominate the canopy and the forest's total biomass," says Eisen.

Over the course of the 40-year study, Eisen says red maple – a common species in eastern forests – has been taking up less and less space. Young birch and beech saplings have been growing to fill in the gaps. "We think the Lyford Grid is fairly typical of forests in this region," says Eisen. "Deer browsing and a lack of forest fires have prevented red oak from regenerating successfully in the understory."

Barker-Plotkin notes that scientifically, a detailed, long-term study like this one is rare. "Another forester once wrote, 'Permanent plots deserve to be treated as living national monuments'" she says. "I don't think this plot has yet revealed its most interesting dynamics. How long will this 40-year trend of carbon accumulation last? When will a major disturbance hit the oak canopy? We're planning the next census for the plot's 50th anniversary, in 2019."

Eisen adds that extending the study will improve their understanding of carbon dynamics and their ability to predict what's coming next for forests in the future.

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The Harvard Forest, founded in 1907 and located in Petersham, Mass., is Harvard University's outdoor laboratory and classroom for ecology and conservation, and a Long-Term Ecological Research (LTER) site funded by the National Science Foundation. Its 3,700 acre property is one of the oldest and most intensively studied research forests in the U.S. Open to the public year-round, the site includes educational and research facilities, a museum, and recreational trails. More information can be found at http://harvardforest.fas.harvard.edu/.

Photos and the complete scientific paper are available upon request.

For an interview with one or more of the scientists, contact Clarisse Hart, Harvard Forest Outreach Manager (hart3@fas.harvard.edu; 978-756-6157).