NSRC Progress Report 2022

The State of the Northeastern Forest Carbon Cycle: High-Resolution Carbon Accounting for the Regional Forest Sector

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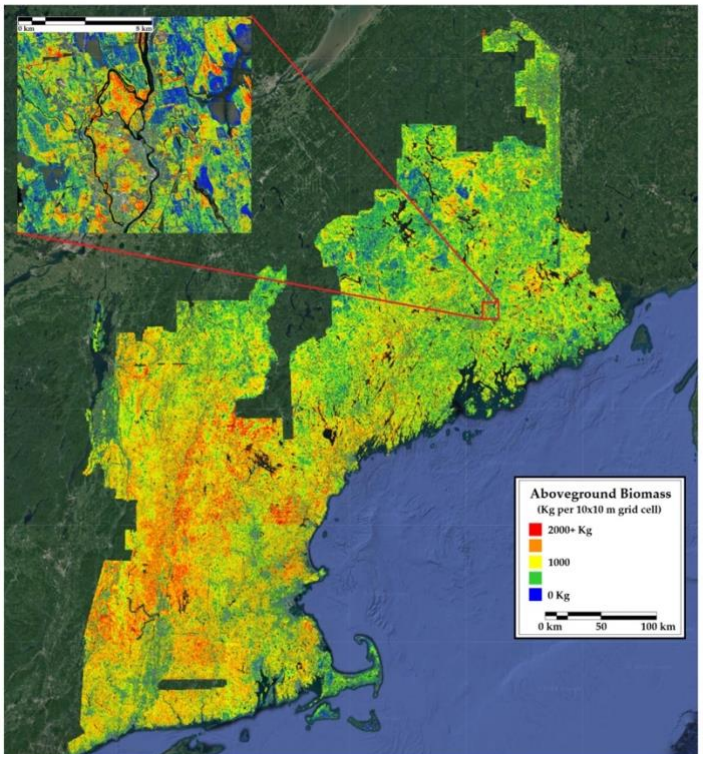
Project Abstract

Ten Northeast and Mid-Atlantic states have joined in the Regional Greenhouse Gas Initiative to develop strategies and policies for reducing greenhouse gas emissions and mitigating their carbon impacts. These include New York, Vermont, New Hampshire, and Maine. NSRC researchers will develop and report a spatially and temporally explicit carbon budget for the forest sector of the northeastern states that is comprehensive of the major components.

Researchers will build on current inventory-based carbon estimation methods by integrating state-of-the-art remote sensing data and techniques for wall-to-wall mapping of forest biomass dynamics at high spatial and temporal resolution. This approach improves estimation accuracy and precision for all of the major carbon pools and transfers in the forest-sector carbon budget of the northeastern states, including soil storage, aquatic export, harvest removals, and the fate of wood products. Finally, they will reconcile and translate the scientific budget with the key policy questions including the current and potential forest-sector carbon offsets to regional- and state-level fossil fuel emissions. The overall result will be a comprehensive estimate of the average annual net forest carbon sink, which will be compared to state-level emissions data to calculate the offset provided by forest carbon uptake.



A 10 m resolution forest inventory map of aboveground biomass in New England. Included is a 12 km inset of a representative portion of the region.

Progress in 2022

We can report important progress on each of the two major goals of this project, namely to (1) build a forest sector carbon accounting system for the NSRC region and (2) develop a reporting framework that meets stakeholder requirements. First, we have demonstrated an accounting system that synthesizes existing data for the forest sector and reconciled this information within the larger carbon budget for the state of Maine. Budget construction was based largely on an analysis of US Forest Service Forest Inventory and Analysis data for forestlands and wood products. Our budget was used in the state's Ninth Biennial Greenhouse Gas Emissions report allowing, for the first time, the calculation of the state's "net emissions." The results suggest carbon sequestration in the forest

sector offsets about 75% of the state's gross emissions, a headline that has recently received major attention in Maine.

In addition to these broader, public impacts of our work, we have also made important progress "under the hood" with respect to the technical and methodological aspect of this project. To "initialize" our forest carbon book-keeping, we are using high-resolution maps of forest biomass across the region developed by area-based modeling of available airborne LiDAR data (See figure). To implement carbon stock changes and transfers in the accounting framework, we are using updated results from Landsat-derived disturbance mapping over the region. In September, we held a "Maine Forest Carbon" workshop with 40+ participants to demonstrate these data products to stakeholders and get feedback on their utility and potential for future work.

Plans for 2023

The priority next steps are to address these technical issues in the remote sensing data products needed for the carbon accounting framework. First, we are working to fill in the spatial gaps and expand the geographic coverage of the original, LiDAR-derived forest biomass maps for more complete, wall-to-wall coverage. Second, we are working to temporally update the Landsat-derived disturbance data sets to the most current time frame (i.e., covering through year 2022). Additionally, an important activity for 2023 will be assembling growth curve models that can be used in the book-keeping framework to estimate carbon stocks of the major pools relative to forest type and age. To develop these, we plan to assess approaches based on FIA and other, plot-level analysis in addition to multi-year LiDAR and photo-based modeling approaches.

Collaboration

We continue to hold regular meetings with our USFS collaborator, Chris Woodall, to report on project progress and ensure alignment of our work with the broader goals of the USFS in carbon management and climate mitigation initiatives. We also continue to work closely with the Maine Department of Environmental Protection in developing "version 2" of the state carbon budget to be included in the Tenth Biennial state GHG emissions report (December 2023).

Products

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Wei, X., J. Zhao, D.J. Hayes, L. Li, A. Daigneault, and H. Zhu (2023) A life cycle and product type based estimator for quantifying the carbon stored in wood products, *Carbon Balance and Management*, 18, 1, doi.org/10.1186/s13021-022-00220-y.