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Patterns and controls on island-wide aboveground biomass accumulation in second-growth forests of Puerto Rico

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... of biomass accumulation in second-growth tropical **forests** following land use abandonment is important for informing ecosystem carbon models and **forest restoration** efforts. There is an urgent need for a broad ...

Authors: Sebastián Martinuzzi, Bruce D. Cook, Eileen H. Helmer, Michael Keller, Dexter Locke, Humfredo Marcano-Vega, María Uriarte, Douglas C. Morton

Keywords: [carbon](#), [forest succession](#), [lidar](#), [restoration](#), [tropical forests](#)

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Year: 2022

Patterns and controls on island-wide aboveground biomass accumulation in second-growth forests of Puerto Rico

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Year: 2022

Type: Scientific Journal (JRNL)

Station: International Institute of Tropical Forestry

DOI: <https://doi.org/10.1111/btp.13122>

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Abstract

Understanding the heterogeneity of biomass accumulation in second-growth tropical forests following land use abandonment is important for informing ecosystem carbon models and forest restoration efforts. There is an urgent need for a broad sample of second-growth forests to enhance our knowledge of carbon accumulation in human-dominated landscapes, especially for older forests. Puerto Rico has predominantly second-growth forests, ranging in age from approximately 25 to more than 80 years. We used an island-wide sample of airborne lidar from the NASA Goddard Lidar, Hyperspectral, and Thermal (G-LiHT) Airborne Imager collected on March 2017, forest inventory data, and data on forest age, precipitation, soils, and land use to estimate aboveground biomass stocks in moist and wet, second-growth tropical forests. Biomass accumulation rates in Puerto Rico were lower, on average, than in other Neotropical forests. Median biomass across >16,700 ha of older second-growth forests was 105 Mg ha⁻¹, and sampled biomass rarely surpassed 250 Mg ha⁻¹. Differences in biomass by age were large and persistent across different substrates and land uses, with a plateau in the pattern of island-wide biomass accumulation after about 33 years. A spatial regression model showed that multiple factors were related to biomass accumulation, including time since abandonment, geologic substrate, past land use as coffee or pasture, precipitation, topographic wetness index, and slope. Our findings have important consequences for the total carbon storage and expected climate mitigation benefits of large-scale reforestation efforts, and highlight the value of airborne lidar for quantifying biomass variability in complex tropical landscapes.

Keywords

[carbon](#), [forest succession](#), [lidar](#), [restoration](#), [tropical forests](#)

Citation

Martinuzzi, Sebastián; Cook, Bruce D.; Helmer, Eileen H.; Keller, Michael; Locke, Dexter H.; Marcano Vega, Humfredo; Uriarte, María; Morton, Douglas C. 2022. Patterns and controls on island wide aboveground biomass accumulation in second growth forests of Puerto Rico. Biotropica. 15: 26-. <https://doi.org/10.1111/btp.13122>.

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