Campus Forest Carbon Project Technical Guidance Document

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CFCP contributions to UMD's Climate Action Plan and connection to MD

The Campus Forest Carbon Project (CFCP) is a student-led research project within the University of Maryland's (UMD) Department of Geographical Students funded by the UMD's Sustainability Fund. This project aims to advance UMD's climate neutrality goals by including land-based carbon into the climate action plan and annual greenhouse gas (GHG) inventory. Over the past decade, the NASA Carbon Monitoring System (CMS) has been partnering with the State of Maryland to implement a new remote sensing based methodology to quantify and monitor forest carbon for inclusion within the State's 2030 Greenhouse Gas Reduction Plan and the 2020 Greenhouse Gas Emissions Inventory. As Maryland's flagship university, the CFCP implements for UMD the same remote sensing based methods used at the state scale to monitor forest carbon dynamics across university owned and managed properties from 2011-2021. This technical document outlines the distinctive application of the state product for UMD.

CFCP approach leveraging NASA CMS products for campus

The CFCP annually subsets the statewide NASA CMS/UMD carbon monitoring product over campus properties. The NASA CMS provides aboveground carbon stock and flux estimates to characterize forest carbon dynamics by coupling a process-based ecosystem model with high-resolution airborne and satellite-based remote sensing data. Specifically, NASA CMS utilizes LiDAR data and NAIP optical imagery to measure existing canopy height and produce aboveground biomass (AGB) estimates. NASA CMS science products are highly advantageous for campus-level carbon monitoring because it is geospatially explicit, updated annually, high-resolution (30m), heavily calibrated and validated using USFS Forest Inventory Analysis data, and matches state-scale MD climate policy. The primary difference being its application to a smaller spatial domain. Using a python script we developed, we completed a historical analysis of annual forest carbon change from 2011-2021 across UMD's full campus and nine satellite properties: Beltsville, Clarksville, Garret4H, Western MD, Paint Branch, Upper Malboro, Wye, Poplar Hill, and Salisbury. We calculated these values in MTCO2e and

noted when campus was a carbon source and sink based on either negative or positive net flux values respectively.

Implementation across different time scales

To incorporate these estimates into UMD's GHG inventory, the CFCP had to make adjustments across three different time scales. First, from 2011-2020, we are able to directly implement the statewide product in estimating net carbon flux. However, due to the data latency of the North American Forest Dynamics (NAFD) products, the dataset we use to estimate carbon gains and losses, we provide carbon gains, losses, stocks, and net flux from 2011 to 2016 only. After 2016, we lose the geospatially explicit coverage that NAFD provides and estimate net flux from 2017 to 2020 using Global Forest Watch (GFW) data, a dataset less sensitive to tracking disturbance rates at smaller spatial domains. For 2021 specifically, we depart from the state's methods and only report net flux because of the continued NAFD data latency and the lack of 2021 statewide carbon product. Here, we calculate the average net flux from 2011-2020 to estimate the net 2021 flux. As new remote sensing data becomes available, campus can update these annual estimates to reflect the most updated science.

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