



# **NEON Terrestrial Plant Productivity and Biomass Technical Working Group**

## ***2020 Annual Report***



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National Ecological Observatory Network (NEON) is a project sponsored by the National Science Foundation and proudly operated by Battelle.

# Introduction

Since its inception, NEON has relied on expertise within the science, education, and engineering communities to advise on key areas impacting the design, construction, and maintenance of the observatory with the goal to optimize its operation. Currently, two types of external advisory bodies support staff and leadership in making key decisions that guide all of NEON's activities: the Science, Technology & Education Advisory Committee (STEAC) and Technical Working Groups (TWGs). Both bodies are comprised of experts nominated to serve in these roles who are selected by NEON staff following a rigorous selection process.

NEON currently relies upon input from 22 TWGs. These groups play an important role by providing input to NEON's data collection and processing methods and ensuring that NEON infrastructure, data, and programs are a valuable community resource. Working groups are participatory and advisory; they are often tasked with providing input on issues that have scientific, educational, engineering, or operational implications.

This document includes a summary of activities, recommendations, and NEON's response to those recommendations for the Terrestrial Plant Productivity and Biomass TWG during the 2020 funding year (November 2019-October 2020).

The Terrestrial Plant Productivity and Biomass Technical Working Group advises which methods, protocols, and equipment are employed to create robust ground-based estimates of live and dead woody biomass, woody and herbaceous productivity, coarse downed wood volume and density, fine and coarse litterfall, belowground plant biomass, and leaf area index across a suite of different vegetation types. The TWG also considers optimal spatial and temporal integration of ground-based measurements with remote-sensing hyperspectral and LiDAR datasets (i.e., the NEON AOP system), and with data streams generated by the NEON Terrestrial Instrument System. Finally, the TWG is also deeply invested in determining how NEON Plant Biomass and Productivity data products can be optimized to enhance usability and value for the NEON end-user community.

## Q1 – November 2019-January 2020

### Summary of Activities

For the Vegetation Structure protocol, the group discussed a previous TWG recommendation to measure a subset of Tower Plots annually, and to measure the full suite of Tower Plots every 5 years. The TWG focused on whether all growth forms should be measured annually in the subset at as many sites as possible or whether slow-growth increment sites with dendrometer bands should be treated differently than faster-growth sites.

For the Coarse Downed Wood protocol, the TWG discussed which criteria are appropriate for suspending sampling due to lack of qualifying particles. The TWG Chair (Dr. Christopher Gough) proposed that the TWG discuss drafting a memo to the NSF regarding NEON creation of an official derived above-ground biomass data product based on existing NEON plant productivity and biomass products; the TWG aimed to discuss this idea further in Q2.

## TWG Recommendations

For Vegetation Structure implementation in Tower Plots, the TWG recommended annual measurement of all growth forms in the Tower Plot subset wherever possible; the TWG also recognized that annual measurement of small growth forms at some sites may not be possible if very slow growth results in small increments cannot be detected on an annual basis, or if impact on sensitive vegetation affects plot integrity (e.g., deep bryophyte layers; dense, thorny, and brittle desert vegetation rooted in biocrust, etc.).

For Coarse Downed Wood sampling, the TWG recommended using Vegetation Structure to determine if qualifying vegetation is present, and at sites with qualifying vegetation, to conduct CDW tallies every 5 years if transects at > 10% of plots intersect a particle. The TWG emphasized the importance of reporting zeroes, and the TWG Field Science representative indicated that it takes very little time to conduct tallies when few particles are present.

## NEON Response

For Vegetation Structure, the NEON TWG lead took a proposal to the Ops-IPT to measure all woody growth forms on an annual basis in the Tower Plot subset, regardless of slow-growth vs. faster-growth increment status. This proposal was approved by the Ops-IPT.

For Coarse Downed Wood, the protocol author took a proposal to the OS-IPT to clarify sampling suspension guidance in the protocol based on TWG recommendations.

## Q2 – February 2020-April 2020

### Summary of Activities

The second quarter of AY2020 was dominated by discussing a proposal to create higher-level NEON derived data products for above-ground plant biomass and productivity. These products are of great interest to a large number of external NEON data users. Following the initial meeting in February, the group focused on creating a NEON plant above-ground biomass higher-level data product as a first step. Subsequent meetings in March and April were devoted to determining how the NEON 'Herbaceous clip harvest' and 'Woody vegetation structure' data products could be combined to create this product. The TWG brought in additional expertise to craft a proposal for estimating uncertainty for woody biomass, and the group made significant progress drafting this proposal for ultimate delivery to the NSF.

### TWG Recommendations

The TWG recommended drafting a proposal for submission to NSF to create a NEON above-ground biomass higher-level data product in order to optimize Observatory offerings and meet a significant scientific need within the ecological community. The group recommended that the lower-level 'Herbaceous clip harvest' and 'Woody vegetation structure' data products be combined at each site (dependent on presence/absence of qualifying vegetation), and that a major component of the work involves estimating biomass uncertainty in a robust manner.

## NEON Response

The NEON TWG lead drafted an outline of a proposal for the putative higher-level NEON biomass data product. The NEON lead continues to work with a subset of TWG members to complete the proposal and outline which components of the proposed work require NEON staff to complete, which work TWG members will complete, and which resources already exist to support the proposed work.

## Q3 – May 2020-July 2020

### Summary of Activities

In the third quarter of AY2020, the Plant Productivity TWG continued working on a proposal to create a higher-level NEON plant above-ground biomass data product. Discussions focused on uncertainty estimation and biomass estimation for smaller shrub growth forms. The NEON lead is currently responsible for working with the TWG Chair to incorporate the shrub biomass estimation strategy and finalize the memo for delivery to NSF.

### TWG Recommendations

The TWG recommended completing a proposal to create a NEON above-ground biomass data product for delivery to NSF.

## NEON Response

Using the outline created by the NEON lead in Q2, the TWG identified members to add specific content to the memo.

## Q4 – August 2020-October 2020

### Summary of Activities

NEON POC Dr. Meier reached out to the TWG to obtain guidance for measuring large Ohia trees in Domain 20 that have prop roots that join the main bole far above current 'Measurement Height' limits of 200 cm. Additionally, the TWG Chair and Dr. Meier have continued to develop a memo to propose development of a derived Plant Biomass data product.

### TWG Recommendations

Domain 20 Ohia question: TWG recommended use of ladders, which is standard practice in CTFS plots and described by Condit.

## NEON Response

Domain 20 Ohia question: D20 manager and staff do not want to implement the ladder recommendation made by the TWG due to safety concerns; NEON POC (Dr. Meier) currently working with D20 staff to determine whether alternate methods with an extension pole are acceptable.