# TOS SITE CHARACTERIZATION REPORT: DOMAIN 02

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See configuration management system for approval history.

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# CHANGE RECORD

| REVISION | DATE | ECO# | DESCRIPTION OF CHANGE |
|---|---|---|---|
| A | 01/05/2017 | ECO-04382 | Initial Release |
| B | 12/05/2018 | ECO-05647 | • Added Phenocam images<br>• Added Sampling Season Section<br>• Added soil pit information table<br>• Added percent cover of bryophyte to the plant diversity table<br>• Updated introduction language to the site information, biomass, and plant sections |

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# 1 DESCRIPTION

## 1.1 Purpose

Domain and site-specific information collected and described here is used to inform the execution of protocols for the NEON Terrestrial Observation System (TOS), and complements the official NEON TOS data products generated from each site. In addition, the TOS spatial layout and plot allocation is described for each site within the domain.

## 1.2 Scope

This document includes any site specific characterization methods and the results of characterization efforts for each of the three sites in the Mid-Atlantic domain. For more information about the sampling methods, reference the TOS Site Characterization Methods Document (RD[06]). The geographic coordinates for all TOS sampling locations can be found in the Reference Documents area of the NEON Data Portal and are provided with TOS data product downloads.

# 2 RELATED DOCUMENTS AND ACRONYMS

## 2.1 Applicable Documents

Applicable documents contain information that shall be applied in the current document. Examples are higher level requirements documents, standards, rules and regulations.

| | | |
|---|---|---|
| AD[01] | NEON.DOC.004300 | EHSS Policy, Program, and Management Plan |
| AD[02] | NEON.DOC.050005 | Field Operations Job Instruction Training Plan |
| AD[03] | NEON.DOC.000909 | TOS Science Design for Ground Beetle Abundance and Diversity |
| AD[04] | NEON.DOC.000910 | TOS Science Design for Mosquito Abundance, Diversity and Phenology |
| AD[05] | NEON.DOC.000912 | TOS Science Design for Plant Diversity |
| AD[06] | NEON.DOC.000915 | TOS Science Design for Small Mammal Abundance and Diversity |
| AD[07] | NEON.DOC.000914 | TOS Science Design for Plant Biomass and Productivity |
| AD[08] | NEON.DOC.000001 | NEON Observatory Design |

## 2.2 Reference Documents

Reference documents contain information complementing, explaining, detailing, or otherwise supporting the information included in the current document.

| | | |
|---|---|---|
| RD[01] | NEON.DOC.000008 | NEON Acronym List |
| RD[02] | NEON.DOC.000243 | NEON Glossary of Terms |
| RD[03] | NEON.DOC.000913 | TOS Science Design for Spatial Sampling |
| RD[04] | NEON.DOC.011046 | TIS Site Characterization Report |
| RD[05] | NEON.DOC.001589 | AIS Site Characterization Report |
| RD[06] | NEON.DOC.003885 | TOS Site Characterization Methods |
| RD[07] | NEON.DOC.000481 | TOS Protocol and Procedure: Small Mammal Sampling |
| RD[08] | NEON.DOC.014041 | TOS Protocol and Procedure: Breeding Landbird Abundance and Diversity |
| RD[09] | NEON.DOC.014042 | TOS Protocol and Procedure: Plant Diversity Sampling |
| RD[10] | NEON.DOC.000987 | TOS Protocol and Procedure: Measurement of Vegetation Structure |
| RD[11] | NEON.DOC.014040 | TOS Protocol and Procedure: Plant Phenology |
| RD[12] | NEON.DOC.001709 | TOS Protocol and Procedure: Bryophyte Productivity |

## 2.3 Acronyms

| Acronym | Definition |
|---|---|
| BOLD | Barcode of Life Datasystems |
| NLCD | National Land Cover Database |

# 3 DOMAIN 02 OVERVIEW: MID-ATLANTIC DOMAIN

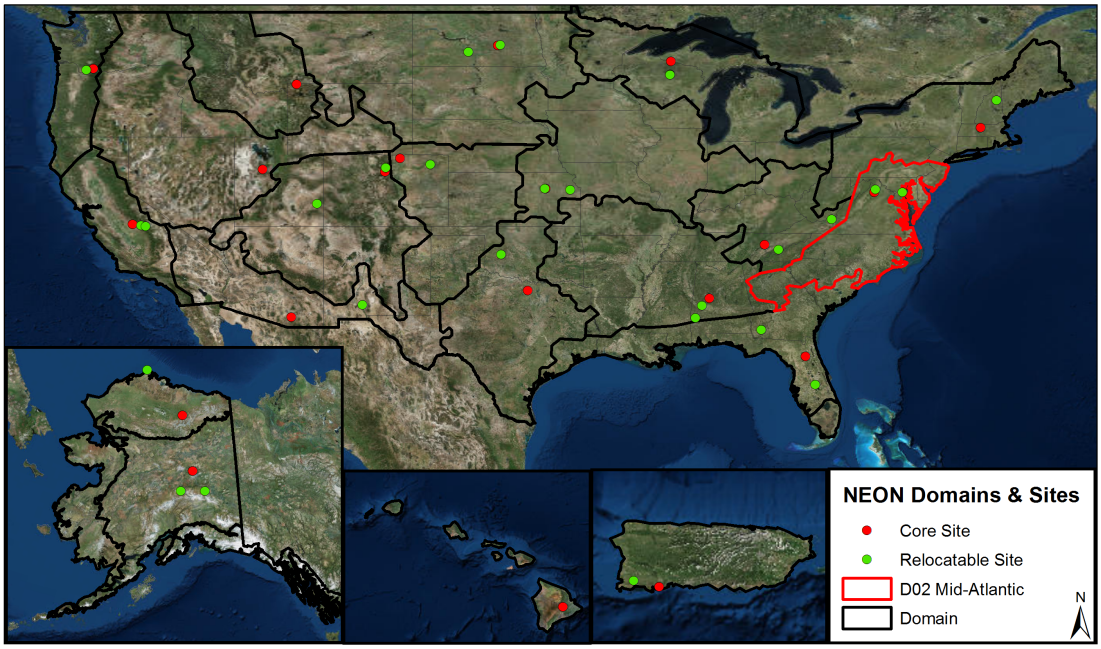


Figure 1: NEON project map with Domain 02 highlighted in red.

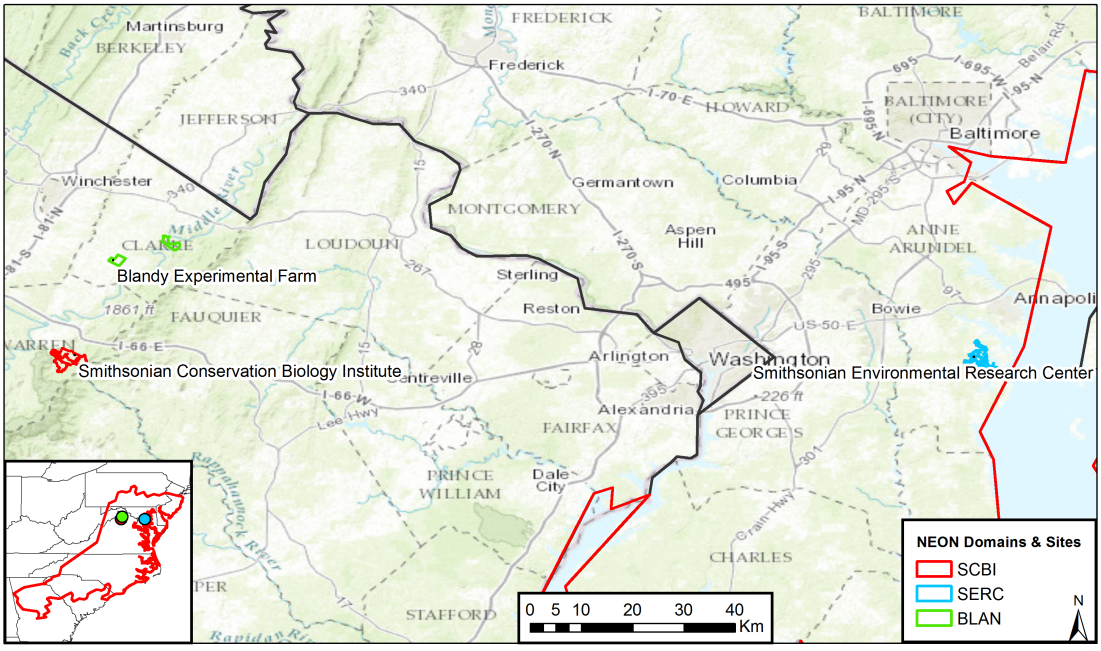


Figure 2: Site boundaries within Domain 02.

The Mid-Atlantic domain sites are located in a broad matrix of land use types: urban and suburban environments, agriculture, fallow lands, managed and national forests, and national parks. The three sites are located in managed forests, coastal forest, and managed and fallow shrub land, respectively. Each site is influenced by the surrounding landscape and land use types, and as such, addresses the increasing impact of land use change on ecosystem processes, aquatic systems, biodiversity, infectious disease and invasive species.

- States included in the domain: Delaware, Georgia, Maryland, New Jersey, North Carolina, Pennsylvania, South Carolina, Virginia, and West Virginia
- Core site: Smithsonian Conservation Biology Institute
- Relocatable 1: Smithsonian Environmental Research Center
- Relocatable 2: Blandy Experimental Farm
- Science themes: Invasive Species, land-use change

# 4 CORE SITE- SMITHSONIAN CONSERVATION BIOLOGY INSTITUTE (SCBI)

The SCBI site consists of mature (> 100 year) and young (< 40 year) secondary forest that is primarily deciduous and indicative of hardwood forests in the Middle Atlantic Domain.

The Smithsonian Conservation Biology Institute facilitates and promotes research programs in Front Royal, Virginia, the National Zoo in Washington, DC, and at field-research and training sites around the world.


Figure 3: Phenocamera image for SCBI. The phenocamera is located at the top of the NEON tower and faces north. Phenocamera images are available at https://phenocam.sr.unh.edu/webcam/network/table/.

Key Characteristics:

- Site host: Smithsonian Institution
- Located in: Warren County, Virginia
- Sampling Area: 9.87 $km^2$
- Plot Elevation: 250-575m
- Dominant vegetation type- The forest at SCBI is dominated by oak, hickory, ash and tulip popular (*Liriodendron tulipifera*). Young forests are dominated by white ash (*Fraxinus americana*), black locust (*Robinia pseudoacacia*), and dogwood (*Cornus* spp.) . Invasive tree species are present along edges and in disturbed

habitat, and include (autumn olive (*Elaeagnus umbellata*), tree-of-heaven (*Ailanthus altissima*), princess tree (*Paulownia tomentosa*).

- At the SCBI, the forest was logged multiple times during the past 300 years and was managed mostly as farmland when acquired by the federal government in 1909. In 1975 the site was acquired by the Smithsonian to support the Smithsonian's National Zoo's wildlife conservation programs.
- The NEON Aquatic Site, Posey Creek, is located west of the NEON tower at SCBI. See the AIS site characterization report for more details (RD[05]).
- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research (see next section for more detail.

### 4.1 TOS Spatial Sampling Design

TOS plots were allocated at SCBI according to a spatially balanced and stratified-random design (RD[3]). The 2006 National Land Cover Database (NLCD) was selected for stratification because of the consistent and comparable data availability across the United States. At SCBI, some of the mixed forest was erroneously classified as evergreen forest by the NLCD. Due to this uncertainty, these parts of the landscape will not be sampled initially. The evergreen forest pixels will be reclassified with data from NEON's remote-sensing platform, and TOS sampling plots will be reallocated to proportionally represent the re-classified vegetation. TOS Tower Plots were allocated according to a spatially balanced design in and around the NEON tower airshed (RD[03]). The maps below depict the plot locations for the first year of NEON sampling. Some plot locations may change over time due to logistics, safety, and science requirements. Please visit the NEON website (http://www.neonscience.org) for updated plot locations at each site.

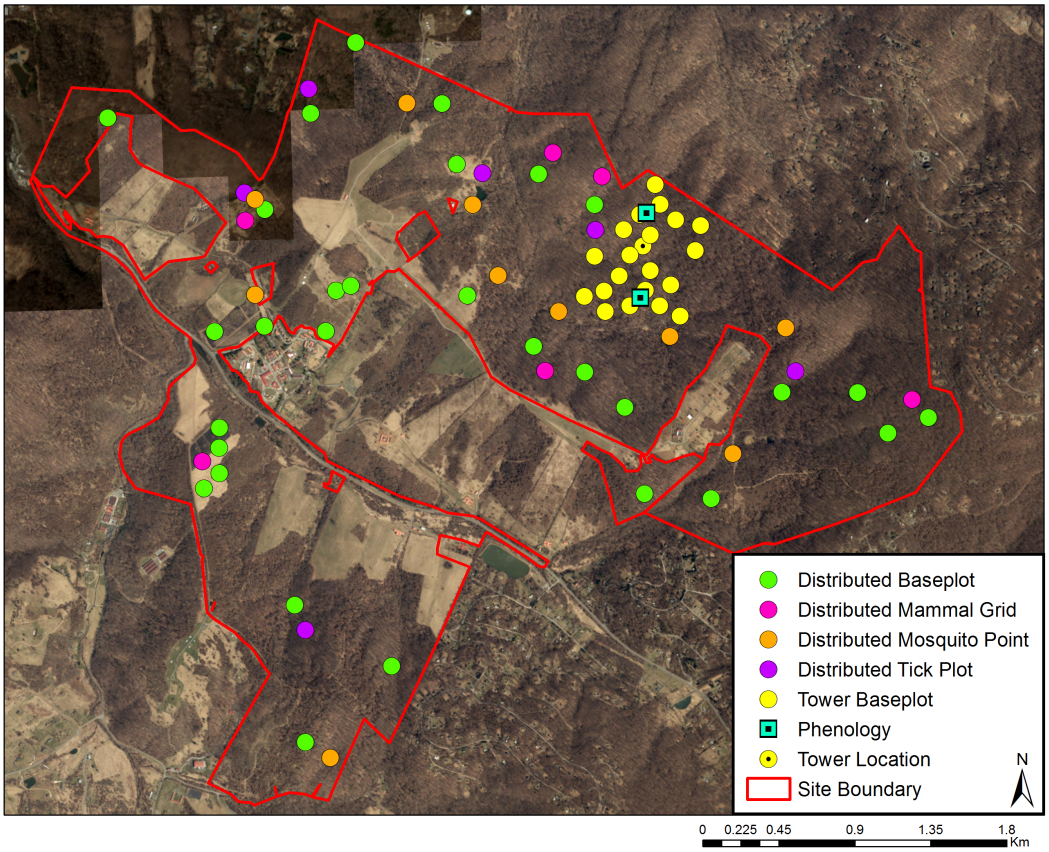


Figure 4: Map of TOS plot centroids within the NEON TOS sampling boundary at SCBI.

For a list of protocols associated with each plot see tables below; for additional spatial design information see RD[03].

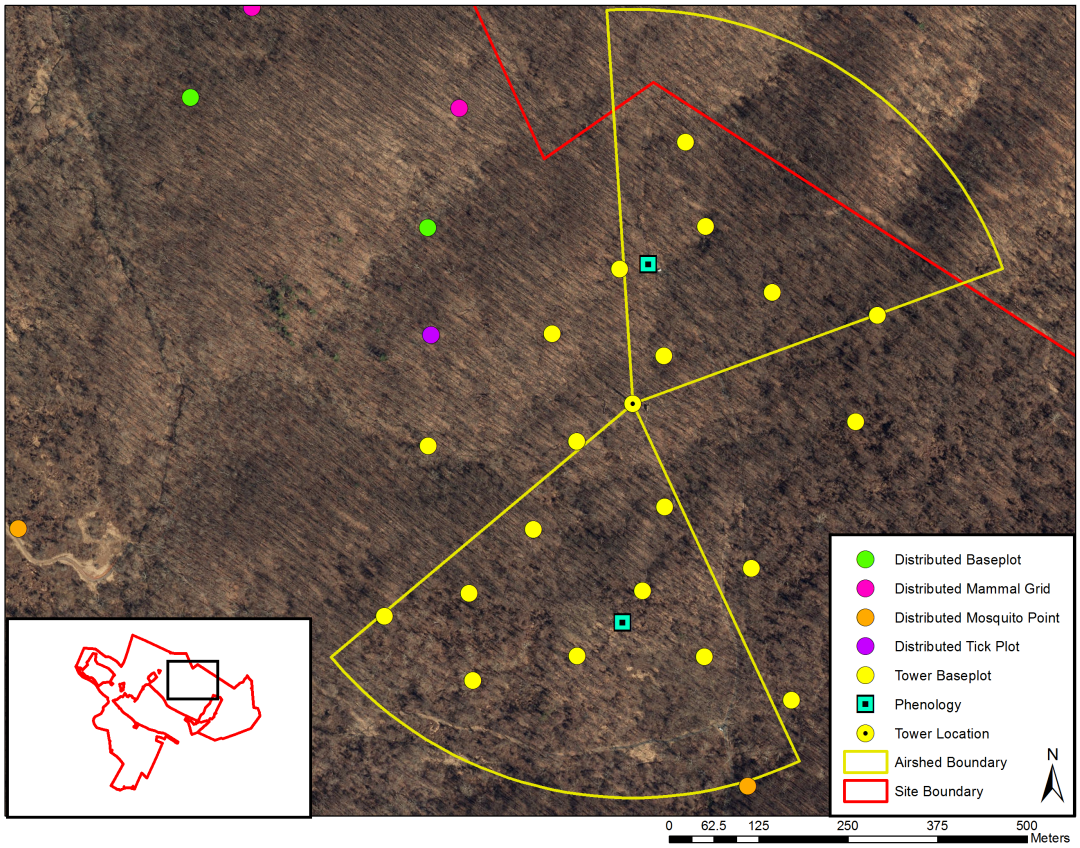


Figure 5: Map of the tower airshed and TOS plot centroids at SCBI.

More information about the tower airshed can be found in the FIU site characterization report (RD[04]).

Table 1: NLCD land cover classes and area within the TOS site boundary at SCBI.

| NLCD Class | Site Area ($km^2$) | Percent (%) |
|---|---|---|
| Deciduous Forest | 7.47 | 75.27 |
| Pasture Hay | 1.31 | 13.17 |
| Developed Open Space | 0.53 | 5.39 |
| Evergreen Forest | 0.51 | 5.13 |
| Developed Low Intensity | 0.06 | 0.64 |
| Mixed Forest | 0.03 | 0.34 |

Note: Any NLCD land cover classes less than 5% will not be sampled. Additionally, no sampling will take place in Water, Developed, or Barren Land NLCD classes.

Table 2: NLCD land cover classes and TOS plot numbers at SCBI.

| Plot Type | Plot Subtype | NLCD Class | Number of Plots Established |
|---|---|---|---|
| Distributed | Base Plot | Deciduous Forest | 18 |
| Distributed | Base Plot | Pasture Hay | 12 |
| Distributed | Mammal Grid | Deciduous Forest | 4 |
| Distributed | Mammal Grid | Pasture Hay | 2 |
| Distributed | Mosquito Point | Deciduous Forest | 7 |
| Distributed | Mosquito Point | Pasture Hay | 3 |
| Distributed | Tick Plot | Deciduous Forest | 4 |
| Distributed | Tick Plot | Pasture Hay | 2 |
| Tower | Base Plot | NA | 20 |
| Tower | Phenology Plot | NA | 2 |

Note: NLCD land cover classes are not used to stratify Tower Plots which are located in and around the NEON tower airshed. The dominant NLCD land cover type within the airshed is deciduous forest.

Table 3: Number of Distributed Base Plots per NLCD land cover class per protocol at SCBI.

| Plot Type | Plot Subtype | NLCD Class | Protocols | Number of Plots |
|---|---|---|---|---|
| Distributed | Base Plot | Deciduous Forest | Beetles | 7 |
| Distributed | Base Plot | Pasture Hay | Beetles | 3 |
| Distributed | Base Plot | Deciduous Forest | Birds | 18 |
| Distributed | Base Plot | Pasture Hay | Birds | 6 |
| Distributed | Base Plot | Deciduous Forest | Canopy Foliage Chemistry | 9 |
| Distributed | Base Plot | Pasture Hay | Canopy Foliage Chemistry | 1 |
| Distributed | Base Plot | Deciduous Forest | Coarse Downed Wood | 14 |
| Distributed | Base Plot | Pasture Hay | Coarse Downed Wood | 6 |
| Distributed | Base Plot | Deciduous Forest | Digital Hemispherical Photos for Leaf Area Index | 14 |
| Distributed | Base Plot | Pasture Hay | Digital Hemispherical Photos for Leaf Area Index | 6 |
| Distributed | Base Plot | Deciduous Forest | Herbaceous Biomass | 14 |
| Distributed | Base Plot | Pasture Hay | Herbaceous Biomass | 6 |
| Distributed | Base Plot | Deciduous Forest | Plant Diversity | 18 |
| Distributed | Base Plot | Pasture Hay | Plant Diversity | 12 |
| Distributed | Base Plot | Deciduous Forest | Soil Biogeochemistry | 4 |

| Plot Type | Plot Subtype | NLCD Class | Protocols | Number of Plots |
|---|---|---|---|---|
| Distributed | Base Plot | Pasture Hay | Soil Biogeochemistry | 2 |
| Distributed | Base Plot | Deciduous Forest | Soil Microbes | 4 |
| Distributed | Base Plot | Pasture Hay | Soil Microbes | 2 |
| Distributed | Base Plot | Deciduous Forest | Vegetation Structure | 14 |
| Distributed | Base Plot | Pasture Hay | Vegetation Structure | 6 |

Note: Distributed Base Plots typically support more than one TOS protocol; 'Number of Plots' cannot be added to get total TOS Distributed Base Plot number.

Table 4: Number of Tower Plots per protocol at SCBI.

| Plot Type | Plot Subtype | Protocols | Number of Plots |
|---|---|---|---|
| Tower | Base Plot | Canopy Foliage Chemistry | 4 |
| Tower | Base Plot | Coarse Downed Wood | 20 |
| Tower | Base Plot | Digital Hemispherical Photos for Leaf Area Index | 3 |
| Tower | Base Plot | Herbaceous Biomass | 20 |
| Tower | Base Plot | Litterfall and Fine Woody Debris | 20 |
| Tower | Base Plot | Plant Belowground Biomass | 20 |
| Tower | Base Plot | Plant Diversity | 3 |
| Tower | Base Plot | Soil Biogeochemistry | 4 |
| Tower | Base Plot | Soil Microbes | 4 |
| Tower | Base Plot | Vegetation Structure | 20 |
| Tower | Phenology | Plant Phenology | 2 |

Note: Tower Base Plots typically support more than one TOS protocol; 'Number of Plots' cannot be added to get the total TOS Tower Base Plot number.

### 4.2 Sampling Season Characterization: SCBI

For numerous TOS protocols, the length of the sampling season, the number of bouts, and when those bouts occur is dictated by the seasonal status of the plant community. By monitoring 'greenness' on a 16 day interval, the MODIS/Terra EVI phenology product provides consistent, reliable insight into plant community phenology and intensity at the continental scale. For those protocols for which timing is standardized by greenness transitions and/or peak green status, NEON has utilized these data as the primary means of guiding temporal aspects of TOS sampling at each site.

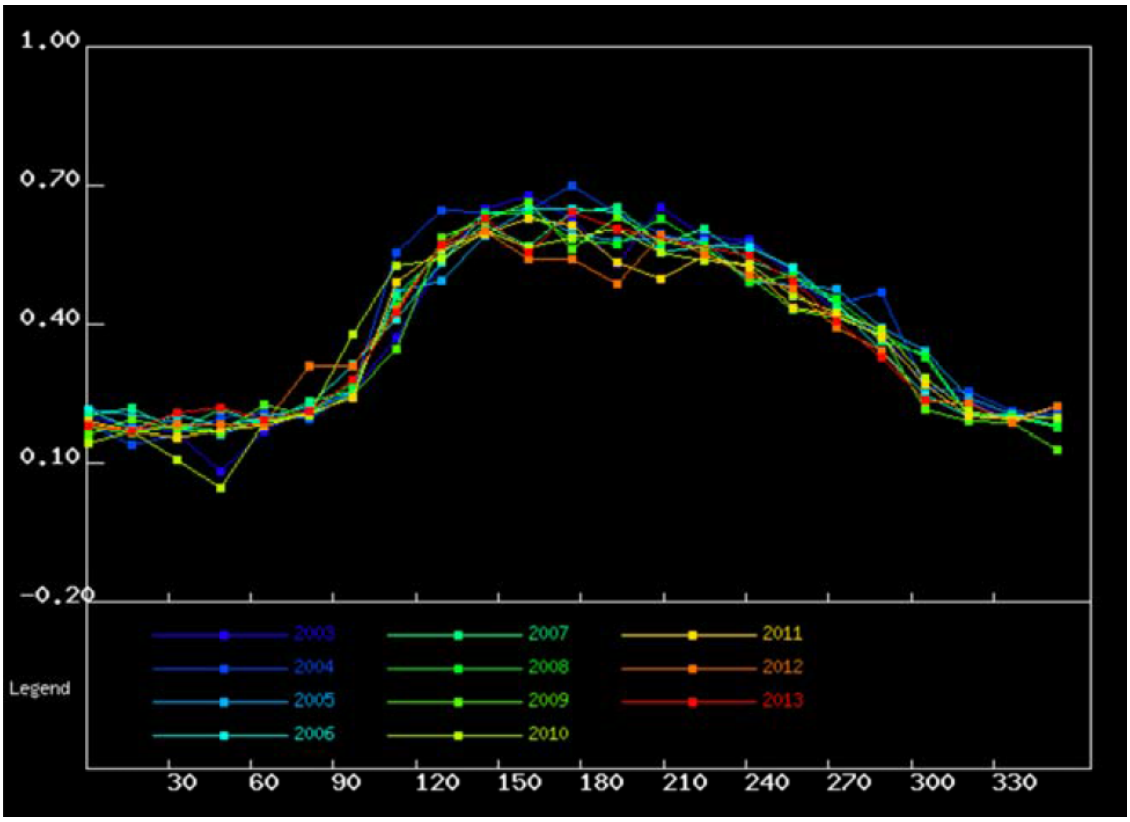


Figure 6: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON SCBI site.

Table 5: Average MODIS-EVI greenness dates for the NEON SCBI site, based on data from 2003-2013 (DOY, with MM/DD in parentheses).

| Average Increase | Average Maximum | Average Decrease | Average Minimum |
|---|---|---|---|
| 85<br>(03/27) | 150<br>(05/31) | 220<br>(08/09) | 320<br>(11/17) |

MODIS Product Details

- Product: MODIS-EVI phenology product, 16 day interval, 250 m grid, data included from all pixels with acceptable quality within user-defined square that roughly overlaps the TOS site boundary.
- Date range: 2003-2013
- User selected area: 10.25 km x 10.25 km box, Centroid Latitude: 38.89292, Longitude: -78.1395 (WGS84 datum)

## 4.3 Belowground Biomass

### 4.3.1 Site-Specific Methods

Belowground biomass characterization data were collected down to a depth of 200 cm by NEON staff in May 2013. Since the NEON protocol for long-term, operational sampling of belowground biomass only collects data to a depth of 30 cm, the belowground biomass site characterization data are critical for scaling belowground biomass measurements to greater depths; see the TOS Science Design for Plant Biomass, Productivity, and Leaf Area Index (AD[7]) for more information. Samples were collected following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Roots were sorted to two diameter size categories ($\leq$ 2 mm and 2-30 mm) and by root status (live or dead). The tables below summarize all the belowground biomass less than or equal to 30 mm diameter; size class data and more information can be found by searching the NEON data portal for the data product numbers in Appendix A.

### 4.3.2 Results

Table 6: Soil Pit Information at SCBI.

| Latitude | Longitude | Soil Family | Soil Order |
|---|---|---|---|
| 38.89209 | -78.13764 | Loamy-skeletal - mixed - active - mesic Ultic Hapludalfs | Alfisol |

Soil Profile was described by Natural Resource Conservation Service (NRCS).

Table 7: Fine root mass per depth increment (cm) at SCBI.

| Upper Depth | Lower Depth | Mean (mg per $cm^3$) | Std Dev |
|---|---|---|---|
| 0 | 10 | 4.73 | 3.12 |
| 10 | 20 | 1.62 | 0.83 |
| 20 | 30 | 1.21 | 0.55 |
| 30 | 40 | 0.56 | 0.39 |
| 40 | 50 | 0.75 | 0.63 |
| 50 | 60 | 1.15 | 1.52 |
| 60 | 70 | 0.16 | 0.17 |
| 70 | 80 | 0.09 | 0.08 |
| 80 | 90 | 0.04 | 0.01 |
| 90 | 100 | 0.02 | 0.03 |
| 100 | 120 | 0.23 | 0.12 |
| 120 | 140 | 1.21 | 0.49 |
| 140 | 160 | 1.55 | 1.47 |

| Upper Depth | Lower Depth | Mean (mg per $cm^3$) | Std Dev |
|---|---|---|---|
| 160 | 180 | 0.14 | 0.09 |
| 180 | 200 | 0.03 | 0.03 |

Table 8: Cumulative fine root mass as a function of depth (cm) at SCBI.

| Upper Depth | Lower Depth | Mean Cumulative (g per $m^2$) | Cumulative Std Dev |
|---|---|---|---|
| 0 | 10 | 472.95 | 312.2 |
| 10 | 20 | 634.48 | 393.04 |
| 20 | 30 | 755.16 | 345.31 |
| 30 | 40 | 811.27 | 308.42 |
| 40 | 50 | 885.98 | 277.21 |
| 50 | 60 | 1000.67 | 201.23 |
| 60 | 70 | 1017.15 | 201.55 |
| 70 | 80 | 1026.47 | 198.67 |
| 80 | 90 | 1030.55 | 200.13 |
| 90 | 100 | 1032.82 | 200.03 |
| 100 | 120 | 1077.97 | 221.61 |
| 120 | 140 | 1319.23 | 178.11 |
| 140 | 160 | 1629.03 | 162.84 |
| 160 | 180 | 1657.54 | 165.02 |
| 180 | 200 | 1663.49 | 169.49 |

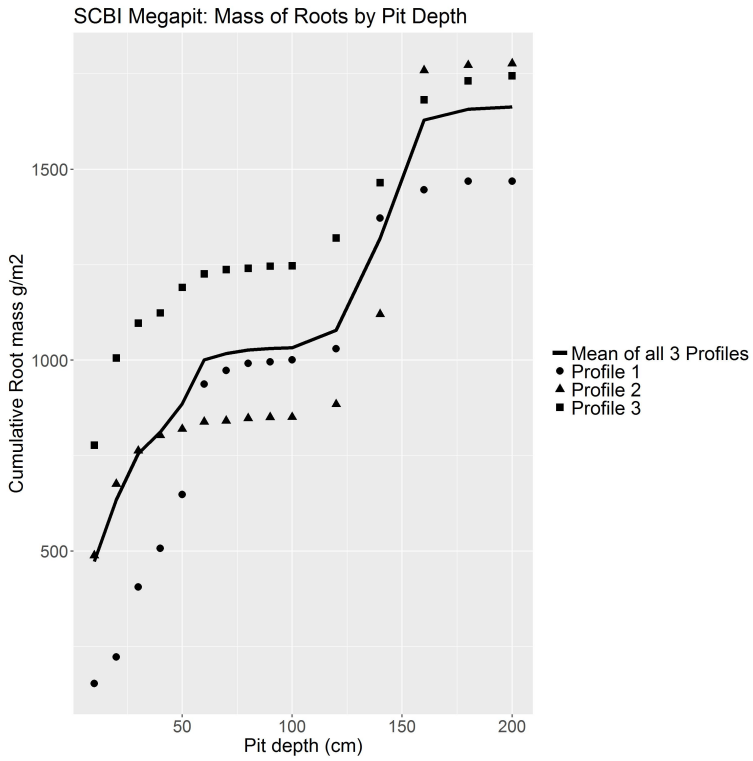


Figure 7: Cumulative root mass by pit depth at SCBI.

Table 9: Fine root biomass sampling summary data at SCBI.

| | |
|---|---|
| Total Pit Depth (cm) | 200 |
| Total Mean Cumulative Mass at 30cm (g per $m^2$) | 755.16 |
| Total Mean Cumulative Mass at 100cm (g per $m^2$) | 1032.82 |
| Total Mean Cumulative Mass (g per $m^2$) | 1663.49 |

## 4.4 Plant Characterization and Phenology Species Selection

### 4.4.1 Site-Specific Methods

Plant characterization data were collected by an external contractor during the summer of 2013. Plant characterization data inform sampling procedures for plant phenology and plant productivity protocols.

The overall ranking ("Rank" in the table below) was calculated based on three separate measurements. Overall ranking weights are influenced by the number of species within each grouping.

1. Mean percent cover values were calculated based on species specific cover estimation for all plant species under 3m tall in eight 1m by 1m subplots per plot; see the TOS Protocol and Procedure: Plant Diversity Sampling (RD[09]) for more information.
2. Mean canopy area values were calculated based on all species specific shrub canopy diameter measurements within the entire plot or subplot; see the TOS Protocol and Procedure: Measurement of Vegetation Structure (RD[10]) for more information.
3. Mean ABH (area at breast height) measurements were calculated based on diameter at breast height measurements for all woody vegetation with a diameter greater than 1cm at 130cm height within the entire plot or subplot; see the TOS Protocol and Procedure: Measurement of Vegetation Structure (RD[10]) for more information.

The standard field methods and ranking calculations are further outlined in TOS Site Characterization Methods (RD[6]). For more information on this protocol and data product numbers see Appendix A.

### 4.4.2 Results

Table 10: Site plant characterization and phenology species summary at SCBI.

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| LITU | *Liriodendron tulipifera* L. | 1 | <1 | NA | 13.38 |
| MIVI | *Microstegium vimineum* (Trin.) A. Camus | 2 | 11 | NA | NA |
| FRAM2 | *Fraxinus americana* L. | 3 | 9 | NA | 1.84 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| QUAL | *Quercus alba* L. | 4 | <1 | NA | 2.99 |
| QURU | *Quercus rubra* L. | 5 | <1 | NA | 2.97 |
| QUVE | *Quercus velutina* Lam. | 6 | <1 | NA | 2.86 |
| LIBE3 | *Lindera benzoin* (L.) Blume | 7 | 2 | NA | 0.17 |
| AMBR2 | *Amphicarpaea bracteata* (L.) Fernald | 8 | 2 | NA | NA |
| SYOR | *Symphoricarpos orbiculatus* Moench | 9 | 2 | NA | NA |
| CAGL8 | *Carya glabra* (Mill.) Sweet | 10 | <1 | NA | 1.64 |
| ALPE4 | *Alliaria petiolata* (M. Bieb.) Cavara & Grande | 11 | 1 | NA | NA |
| LOJA | *Lonicera japonica* Thunb. | 12 | 1 | NA | NA |
| ULMUS | *Ulmus L.* Ulmus L. | 13 | 1 | NA | 0.34 |
| QUMO4 | *Quercus montana* Willd. | 14 | NA | NA | 1.23 |
| CATO6 | *Carya tomentosa* (Lam.) Nutt. | 15 | <1 | NA | NA |
| CECAC | *Cercis canadensis* L. var. *canadensis* | 16 | <1 | NA | 0.16 |
| ELRI | *Elymus riparius* Wiegand | 17 | <1 | NA | NA |
| PAQU2 | *Parthenocissus quinquefolia* (L.) Planch. | 18 | <1 | NA | NA |
| RUFL | *Rubus flagellaris* Willd. | 19 | <1 | NA | NA |
| GATR3 | *Galium triflorum* Michx. | 20 | <1 | NA | NA |
| NYSY | *Nyssa sylvatica* Marshall | 21 | <1 | NA | 0.77 |
| VIPU3 | *Viola pubescens* Aiton | 22 | <1 | NA | NA |
| POVI2 | *Polygonum virginianum* L. | 23 | <1 | NA | NA |
| CILU | *Circaea lutetiana* L. | 24 | <1 | NA | NA |
| JUNI | *Juglans nigra* L. | 25 | NA | NA | 0.66 |
| CAOV3 | *Carya ovalis* (Wangenh.) Sarg. | 26 | NA | NA | 0.63 |
| UVPE | *Uvularia perfoliata* L. | 27 | <1 | NA | NA |
| CACO15 | *Carya cordiformis* (Wangenh.) K. Koch | 28 | <1 | NA | 0.48 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| VEOC | *Verbesina occidentalis* (L.) Walter | 29 | <1 | NA | NA |
| FESU3 | *Festuca subverticillata* (Pers.) Alexeev | 30 | <1 | NA | NA |
| ACRU | *Acer rubrum* L. | 31 | <1 | NA | 0.37 |
| FAGR | *Fagus grandifolia* Ehrh. | 32 | NA | NA | 0.4 |
| SMRO | *Smilax rotundifolia* L. | 33 | <1 | NA | NA |
| SAAL5 | *Sassafras albidum* (Nutt.) Nees | 34 | <1 | NA | 0.13 |
| PHLE5 | *Phryma leptostachya* L. | 35 | <1 | NA | NA |
| TORA2 | *Toxicodendron radicans* (L.) Kuntze | 35 | <1 | NA | NA |
| CYVIV | *Cynoglossum virginianum* L. var. *virginianum* | 37 | <1 | NA | NA |
| TIAM | *Tilia americana* L. | 38 | <1 | NA | 0.3 |
| GACI2 | *Galium circaezans* Michx. | 39 | <1 | NA | NA |
| CACA18 | *Carpinus caroliniana* Walter | 40 | NA | NA | 0.29 |
| SACA15 | *Sanicula canadensis* L. | 41 | <1 | NA | NA |
| SMTA2 | *Smilax tamnoides* L. | 42 | <1 | NA | NA |
| CEOC | *Celtis occidentalis* L. | 43 | <1 | NA | 0.05 |
| POPE10 | *Polygonum perfoliatum* L. | 44 | <1 | NA | NA |
| COFL2 | *Cornus florida* L. | 45 | <1 | NA | 0.09 |
| PIST | *Pinus strobus* L. | 46 | NA | NA | 0.22 |
| PLOC | *Platanus occidentalis* L. | 47 | NA | NA | 0.21 |
| ASTR | *Asimina triloba* (L.) Dunal | 48 | <1 | NA | 0.08 |
| BOVI | *Botrychium virginianum* (L.) Sw. | 49 | <1 | NA | NA |
| GECA7 | *Geum canadense* Jacq. | 50 | <1 | NA | NA |
| ROPS | *Robinia pseudoacacia* L. | 51 | <1 | NA | 0.07 |
| ROMU | *Rosa multiflora* Thunb. | 52 | <1 | NA | 0 |
| CEOR7 | *Celastrus orbiculatus* Thunb. | 53 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| CARA8 | *Carex radiata* (Wahlenb.) Small | 54 | <1 | NA | NA |
| PRSES | *Prunus serotina* Ehrh. var. *serotina* | 55 | <1 | NA | 0.08 |
| POCE4 | *Polygonum cespitosum* Blume, nom. inq. | 56 | <1 | NA | NA |
| VITIS | *Vitis* sp. | 57 | <1 | NA | NA |
| ARTR | *Arisaema triphyllum* (L.) Schott | 58 | <1 | NA | NA |
| SOCA4 | *Solidago caesia* L. | 58 | <1 | NA | NA |
| CAAM8 | *Carex amphibola* Steud. | 60 | <1 | NA | NA |
| SOUL2 | *Solidago ulmifolia* Muhl. ex Willd. | 60 | <1 | NA | NA |
| ASPL | *Asplenium platyneuron* (L.) Britton, Sterns & Poggenb. | 62 | <1 | NA | NA |
| LEVI2 | *Leersia virginica* Willd. | 62 | <1 | NA | NA |
| FRNI | *Fraxinus nigra* Marshall | 64 | NA | NA | 0.09 |
| VITR2 | *Viola triloba* Schwein. | 65 | <1 | NA | NA |
| PRAV | *Prunus avium* (L.) L. | 66 | <1 | NA | 0.07 |
| DIVI4 | *Dioscorea villosa* L. | 67 | <1 | NA | NA |
| ELHY | *Elymus hystrix* L. | 67 | <1 | NA | NA |
| SACA13 | *Sanguinaria canadensis* L. | 67 | <1 | NA | NA |
| GALA4 | *Galium latifolium* Michx. | 70 | <1 | NA | NA |
| HAVI4 | *Hamamelis virginiana* L. | 71 | NA | NA | 0.07 |
| LOMA6 | *Lonicera maackii* (Rupr.) Herder | 72 | <1 | NA | 0 |
| CAREX | *Carex* sp. | 73 | <1 | NA | NA |
| POAC4 | *Polystichum acrostichoides* (Michx.) Schott | 73 | <1 | NA | NA |
| VIPR | *Viburnum prunifolium* L. | 75 | <1 | NA | 0.03 |
| RUPH | *Rubus phoenicolasius* Maxim. | 76 | <1 | NA | 0 |
| CABL | *Carex blanda* Dewey | 77 | <1 | NA | NA |
| RUOC | *Rubus occidentalis* L. | 77 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| BRPU6 | *Bromus pubescens* Muhl. ex Willd. | 80 | <1 | NA | NA |
| ELCA4 | *Elymus canadensis* L. | 80 | <1 | NA | NA |
| STPU | *Stellaria pubera* Michx. | 80 | <1 | NA | NA |
| AGPU | *Agrimonia pubescens* Wallr. | 83 | <1 | NA | NA |
| DUIN | *Duchesnea indica* (Andrews) Focke | 83 | <1 | NA | NA |
| OSLO | *Osmorhiza longistylis* (Torr.) DC. | 83 | <1 | NA | NA |
| AMAR3 | *Amelanchier arborea* (Michx. f.) Fernald | 87 | NA | NA | 0.04 |
| CAPL5 | *Carex platyphylla* Carey | 89 | <1 | NA | NA |
| LACO3 | *Lapsana communis* L. | 89 | <1 | NA | NA |
| POAL3 | *Poa alsodes* A. Gray | 89 | <1 | NA | NA |
| RUPE3 | *Rubus pensilvanicus* Poir. | 89 | <1 | NA | NA |
| VISO | *Viola sororia* Willd. | 89 | <1 | NA | NA |
| ELUM | *Elaeagnus umbellata* Thunb. | 94 | <1 | NA | 0 |
| ACRA7 | *Actaea racemosa* L. | 95 | <1 | NA | NA |
| ACVI | *Acalypha virginica* L. | 95 | <1 | NA | NA |
| CETE | *Celtis tenuifolia* Nutt. | 95 | <1 | NA | NA |
| DENU4 | *Desmodium nudiflorum* (L.) DC. | 95 | <1 | NA | NA |
| DIBO2 | *Dichanthelium boscii* (Poir.) Gould & C.A. Clark | 95 | <1 | NA | NA |
| ULAM | *Ulmus americana* L. | 100 | NA | NA | 0.03 |
| FRPE | *Fraxinus pennsylvanica* Marshall | 102 | NA | NA | 0.02 |
| QUCO2 | *Quercus coccinea* Münchh. | 103 | NA | NA | 0.02 |
| GASP5 | *Galearis spectabilis* (L.) Raf. | 104 | <1 | NA | NA |
| GLHE2 | *Glechoma hederacea* L. | 104 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| MECA3 | *Menispermum canadense* L. | 104 | <1 | NA | NA |
| PIPU2 | *Pilea pumila* (L.) A. Gray | 104 | <1 | NA | NA |
| PATO2 | *Paulownia tomentosa* (Thunb.) Siebold & Zucc. ex Steud. | 108 | NA | NA | 0.02 |
| ACNEN | *Acer negundo* L. var. *negundo* | 110 | <1 | NA | 0 |
| QUFA | *Quercus falcata* Michx. | 111 | NA | NA | 0.02 |
| AIAL | *Ailanthus altissima* (Mill.) Swingle | 112 | <1 | NA | 0.01 |
| BETH | *Berberis thunbergii* DC. | 113 | <1 | NA | 0 |
| CAAP5 | *Carex appalachica* J. Webber & P.W. Ball | 114 | <1 | NA | NA |
| CAMU4 | *Carex muehlenbergii* Schkuhr ex Willd. | 114 | <1 | NA | NA |
| CRCA9 | *Cryptotaenia canadensis* (L.) DC. | 114 | <1 | NA | NA |
| EUPU21 | *Eutrochium purpureum* (L.) E.E. Lamont | 114 | <1 | NA | NA |
| LYCI | *Lysimachia ciliata* L. | 114 | <1 | NA | NA |
| MOFI | *Monarda fistulosa* L. | 114 | <1 | NA | NA |
| MUSO | *Muhlenbergia sobolifera* (Muhl. ex Willd.) Trin. | 114 | <1 | NA | NA |
| OXDI2 | *Oxalis dillenii* Jacq. | 114 | <1 | NA | NA |
| THTH2 | *Thalictrum thalictroides* (L.) Eames & B. Boivin | 114 | <1 | NA | NA |
| DIVI5 | *Diospyros virginiana* L. | 123 | <1 | NA | 0 |
| JUCI | *Juglans cinerea* L. | 124 | NA | NA | 0.01 |
| PIVI2 | *Pinus virginiana* Mill. | 125 | NA | NA | 0.01 |
| ACPL | *Acer platanoides* L. | 126 | NA | NA | 0.01 |
| AGAL5 | *Ageratina altissima* (L.) R.M. King & H. Rob. | 127 | <1 | NA | NA |
| CATO6 | *Carya tomentosa* (Lam.) Nutt. | 127 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| CARYA | *Carya* sp. | 127 | <1 | NA | NA |
| DAGL | *Dactylis glomerata* L. | 127 | <1 | NA | NA |
| ELPU2 | *Elaeagnus pungens* Thunb. | 127 | <1 | NA | NA |
| ERHI2 | *Erechtites hieraciifolia* (L.) Raf. ex DC. | 127 | <1 | NA | NA |
| HUJA | *Humulus japonicus* Siebold & Zucc. | 127 | <1 | NA | NA |
| MARA7 | *Maianthemum racemosum* (L.) Link | 127 | <1 | NA | NA |
| MEOF2 | *Melissa officinalis* L. | 127 | <1 | NA | NA |
| RARER2 | *Ranunculus recurvatus* Poir. var. *recurvatus* | 127 | <1 | NA | NA |
| SYMPH4 | *Symphyotrichum* sp. | 127 | <1 | NA | NA |
| CHVI3 | *Chionanthus virginicus* L. | 140 | NA | NA | 0 |
| CADE12 | *Castanea dentata* (Marshall) Borkh. | 141 | NA | NA | 0 |
| QUMU | *Quercus muehlenbergii* Engelm. | 142 | NA | NA | 0 |
| ILVE | *Ilex verticillata* (L.) A. Gray | 144 | NA | NA | 0 |
| COAL2 | *Cornus alternifolia* L. f. | 146 | NA | NA | 0 |
| SACA12 | *Sambucus canadensis* L. | 147 | NA | NA | 0 |
| RUAL | *Rubus allegheniensis* Porter | 148 | NA | NA | 0 |
| COAM3 | *Corylus americana* Walter | 149 | NA | NA | 0 |
| CRPR2 | *Crataegus pruinosa* (Wendl. f.) K. Koch | 150 | NA | NA | 0 |
| VIRE7 | *Viburnum recognitum* Fernald | 151 | NA | NA | 0 |
| RUPE3 | *Rubus pensilvanicus* Poir. | 152 | <1 | NA | NA |
| PRPE3 | *Prunus persica* (L.) Batsch | 154 | NA | NA | NA |

Note:Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov). Vegetation structure data were repurposed from SCBI SIGEO Large Forest Dynamics Plot measurements (Bourg,2013) and not from NEON Tower Base Plots.

Table 11: Per plot breakdown of species richness, diversity, and herbaceous cover at SCBI.

| Plot ID | Species Richness | Shannon Diversity Index | Percent Total Herbaceous Cover |
|---|---|---|---|
| 1189 | 11 | 2.13 | 22 |
| 1317 | 22 | 2.55 | 77 |
| 1573 | 12 | 2.22 | 29 |
| 16421 | 27 | 2.71 | 156 |
| 1829 | 34 | 2.78 | 167 |
| 2085 | 26 | 2.55 | 160 |
| 2147 | 11 | 2.05 | 34 |
| 2341 | 18 | 2.53 | 55 |
| 25573 | 37 | 2.75 | 159 |
| 2597 | 16 | 2.52 | 31 |
| 29157 | 51 | 3.39 | 235 |
| 33317 | 16 | 2.32 | 39 |
| 36837 | 33 | 2.68 | 135 |
| 42981 | 30 | 2.52 | 87 |
| 44773 | 35 | 2.91 | 184 |
| 64293 | 15 | 2.28 | 50 |
| 64485 | 23 | 2.19 | 126 |
| 741 | 38 | 3.12 | 200 |
| 7717 | 16 | 1.83 | 160 |
| 99 | 19 | 2.37 | 55 |

Note: Percent herbaceous cover was measured by species and then added together to calculate the percent total herbaceous cover for each plot. The plots used for plant diversity measurements were temporarily established for characterization purposes only. All plots listed above are within the SCBI tower airshed.

Bryophyte percent cover data were used to determine which sites qualify for implementation of the Bryophyte Productivity protocol. However, bryophyte productivity sampling was discontinued in 2018 and NEON no longer implements this protocol. No bryophyte cover was recorded in SCBI Tower Base Plots.

## 4.5 Beetles

### 4.5.1 Site-Specific Methods

Beetle site characterization was conducted in June 2013 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Beetle site characterization data were collected to start site level

teaching collections. All beetle samples were pooled before being sent for identification. For DNA sequence data generated as a result of these efforts, visit the Barcode of Life Datasystems (BOLD) at http://www.boldsystems.org. For more information on this protocol and data product numbers see Appendix A.

### 4.5.2 Results

Table 12: Beetle identification results at SCBI.

| Sample ID | Scientific Name | Sex |
|---|---|---|
| NEONTcarabid8125 | *Galerita bicolor* | U |
| NEONTcarabid8126 | *Galerita bicolor* | U |
| NEONTcarabid8127 | *Galerita bicolor* | U |
| NEONTcarabid8128 | *Galerita bicolor* | U |
| NEONTcarabid8129 | *Dicaelus elongatus* | F |
| NEONTcarabid8130 | *Poecilus lucublandus* | U |
| NEONTcarabid8131 | *Poecilus lucublandus* | U |
| NEONTcarabid8132 | *Chlaenius aestivus* | M |
| NEONTcarabid8133 | *Poecilus lucublandus* | M |
| NEONTcarabid8134 | *Poecilus lucublandus* | U |
| NEONTcarabid8135 | *Poecilus lucublandus* | U |
| NEONTcarabid8136 | *Amara aenea* | M |
| NEONTcarabid8137 | *Amara impuncticollis* | F |
| NEONTcarabid8138 | *Trichotichnus fulgens* | F |
| NEONTcarabid8139 | *Trichotichnus fulgens* | M |

U =‘unidentified’

## 4.6 Mosquitoes

### 4.6.1 Site-Specific Methods

Mosquito site characterization was conducted in June 2013 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]) to test protocol methods and start site level species lists. All mosquitoes were pooled before being sent for identification. No pathogen testing was performed. For more information on this protocol and data product numbers see Appendix A.

### 4.6.2 Results

Table 13: Mosquito identification results at SCBI.

| Sample ID | Scientific Name | Individual Count |
|---|---|---|
| SCBI.May2013.SC.1 | *Culex restuans* | 54 |

## 4.7 Ticks

### 4.7.1 Site-Specific Methods

Tick drags were conducted in June 2013 to test protocol methods and calculate capture rates. All tick samples were pooled before being sent for identification. No pathogen testing was performed. For more information on this protocol and data product numbers see Appendix A.

### 4.7.2 Results

Table 14: Tick identification results at SCBI.

| Sample ID | Scientific Name | Number Adult Male | Number of Adult Females | Number of Nymphs |
|---|---|---|---|---|
| SCBI_000.20130528.SC.1 | *Ixodes scapularis* | 0 | 0 | 3 |
| SCBI_000.20130528.SC.1 | *Amblyomma americanum* | 7 | 4 | 4 |

## 4.8 Species Reference Lists

A review of the literature for taxonomic lists of interest for each site was conducted prior to field work. In the case of vertebrates that NEON may capture (e.g., reptiles, amphibians, small mammals), these lists were often required to secure permits. Key references identified in this effort are listed below. Species lists and associated references for small mammals and breeding landbirds can be found in the appendices of the respective protocols (RD[07], RD[08]).

Bousquet, Y. 2012. Catalogue of Geadephaga (Coleoptera, Adephaga) of America, north of Mexico. ZooKeys, (245), 1-1722.

Bourg, N.A., W.J. McShea, J.R. Thompson, J.C. McGarvey, and X. Shen. 2013. Initial census, woody seedling, seed rain, and stand structure data for the SCBI SIGEO Large Forest Dynamics Plot. Ecology 94(9): 2111-2112.

Cass, W. B., W. W. Hochstedler, and A. B. Williams. 2012. “Forest Vegetation Status in Shenandoah National Park Long-Term Ecological Monitoring Summary Report 2003-2011.” Natural Resource Data Series NPS/MIDN/NRDS 353.

Centers for Disease Control and Prevention. (2015). *Geographic distribution of ticks that bite humans.* Retrieved from http://www.cdc.gov/ticks/geographic/_distribution.html

Darsie Jr., R. F., and R. A. Ward. 2005. Identification and geographical distribution of the mosquitoes of North America, North of Mexico. University Press of Florida, Gainesville.

Mitchell, Joseph C., Sherry C. Rinehart, John F. Pagels, Kurt A. Buhlmann, and Christopher A. Pague. 1997. "Factors Influencing Amphibian and Small Mammal Assemblages in Central Appalachian Forests." Forest Ecology and Management 96: 65-76.

Virginia Department of Game & Inland Fisheries. (2016). Wildlife Information. Retrieved from http://www.dgif.virginia.gov/wildlife/information

# 5 RELOCATABLE SITE 1- SMITHSONIAN ENVIRONMENTAL RESEARCH CENTER (SERC)

The Smithsonian Environmental Research Center (SERC) includes a wide variety of terrestrial, wetland, and estuarine habitats. The site is indicative of coastal hardwood forests in the Middle Atlantic Domain.


Figure 8: Phenocamera image for SERC. The phenocamera is located at the top of the NEON tower and faces north. Phenocamera images are available at https://phenocam.sr.unh.edu/webcam/network/table/.

Key Characteristics:

- Site host: Smithsonian Institution
- Located in: Anne Arundel county, Maryland
- Sampling Area: 10.23 $km^2$
- Plot Elevation: -2-45m
- Dominant vegetation type: Dominant tree species include yellow poplar(*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), and American sweetgum (*Liquidambar styraciflua*).
- General management: Selective logging occurs at the north end of the property. The majority of the forest in the property is well preserved for research use.
- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research (see next section for more detail).

## 5.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at SERC according to a spatially balanced and stratified-random design (RD[3]). The 2006 National Land Cover Database (NLCD) was selected for stratification because of the consistent and comparable data availability across the United States. TOS Tower Plots were allocated according to a spatially balanced design in and around the NEON tower airshed (RD[03]). The maps below depict the plot locations for the first year of NEON sampling. Some plot locations may change over time due to logistics, safety, and science requirements. Please visit the NEON website (http://www.neonscience.org) for updated plot locations at each site.

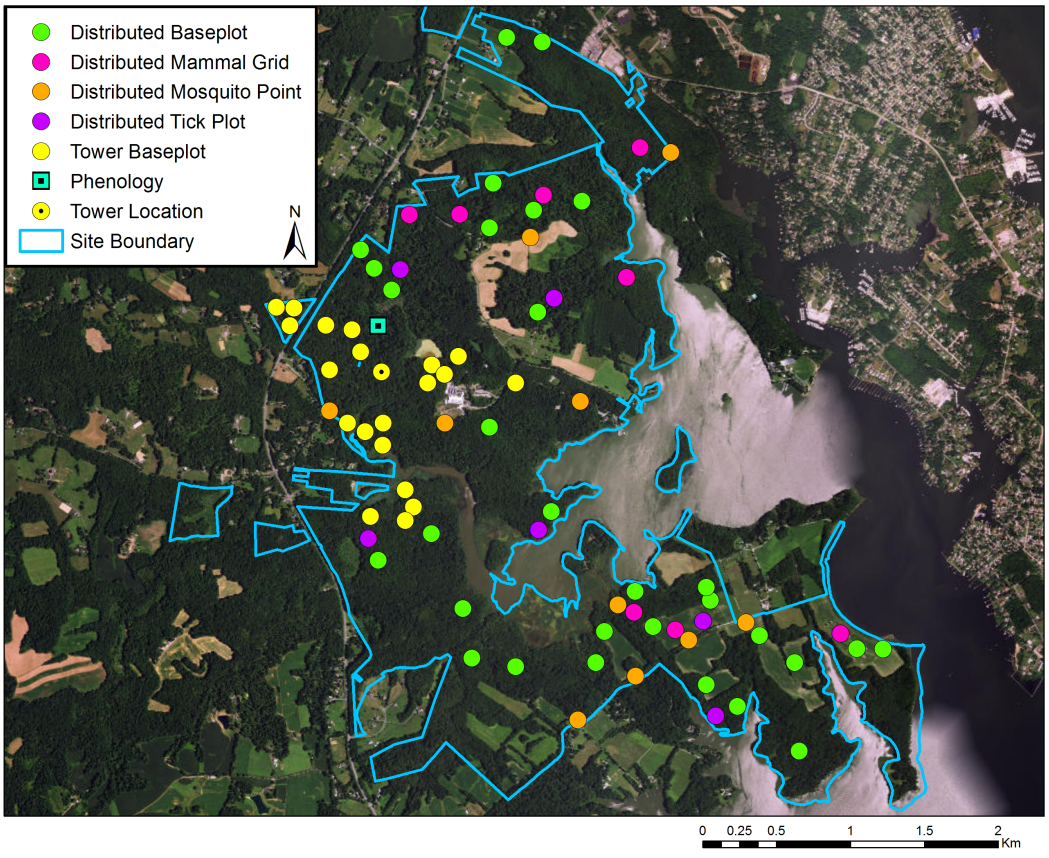


Figure 9: Map of TOS plot centroids within the NEON TOS sampling boundary at SERC.

For a list of protocols associated with each plot see tables below; for additional spatial design information see RD[03].

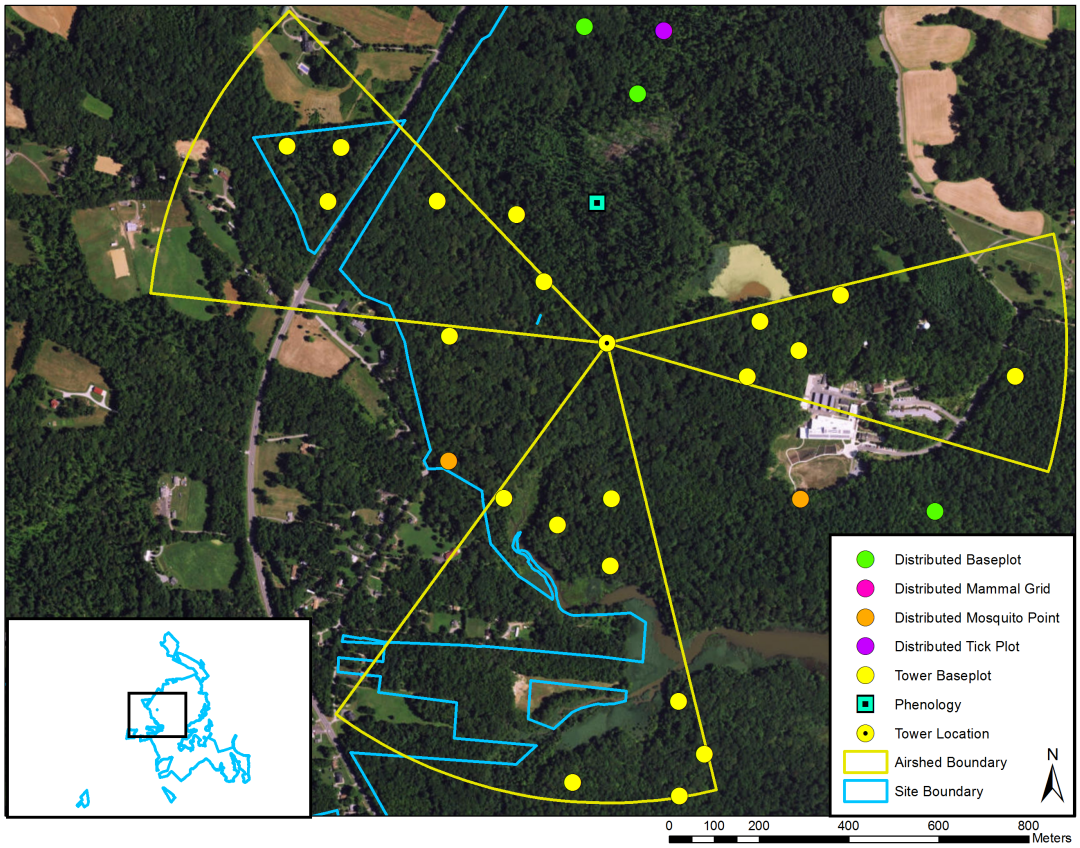


Figure 10: Map of the tower airshed and TOS plot centroids at SERC.

More information about the tower airshed can be found in the FIU site characterization report (RD[04]).

Table 15: NLCD land cover classes and area within the TOS site boundary at SERC.

| NLCD Class | Site Area ($km^2$) | Percent (%) |
|---|---|---|
| Deciduous Forest | 4.68 | 44.57 |
| Woody Wetlands | 2.76 | 26.3 |
| Cultivated Crops | 0.95 | 9.08 |
| Emergent Herbaceous Wetlands | 0.59 | 5.62 |
| Pasture Hay | 0.44 | 4.16 |
| Developed Open Space | 0.3 | 2.89 |
| Open Water | 0.3 | 2.81 |
| Mixed Forest | 0.21 | 1.99 |
| Evergreen Forest | 0.16 | 1.53 |
| Shrub Scrub | 0.09 | 0.88 |
| Developed Low Intensity | 0.02 | 0.15 |

Note: Any NLCD land cover classes less than 5% will not be sampled. Additionally, no sampling will take place in Water, Developed, or Barren Land NLCD classes.

Table 16: NLCD land cover classes and TOS plot numbers at SERC.

| Plot Type | Plot Subtype | NLCD Class | Number of Plots Established |
|---|---|---|---|
| Distributed | Base Plot | Cultivated Crops | 9 |
| Distributed | Base Plot | Deciduous Forest | 21 |
| Distributed | Mammal Grid | Deciduous Forest | 6 |
| Distributed | Mammal Grid | Cultivated Crops | 2 |
| Distributed | Mosquito Point | Cultivated Crops | 2 |
| Distributed | Mosquito Point | Deciduous Forest | 8 |
| Distributed | Tick Plot | Cultivated Crops | 1 |
| Distributed | Tick Plot | Deciduous Forest | 5 |
| Tower | Base Plot | NA | 20 |
| Tower | Phenology Plot | NA | 1 |

Note: NLCD land cover classes are not used to stratify Tower Plots which are located in and around the NEON tower airshed. The dominant NLCD land cover type within the airshed is deciduous forest.

Table 17: Number of Distributed Base plots per NLCD land cover class per protocol at SERC.

| Plot Type | Plot Subtype | NLCD Class | Protocols | Number of Plots |
|---|---|---|---|---|
| Distributed | Base Plot | Cultivated Crops | Beetles | 1 |
| Distributed | Base Plot | Deciduous Forest | Beetles | 9 |
| Distributed | Base Plot | Cultivated Crops | Birds | 4 |
| Distributed | Base Plot | Deciduous Forest | Birds | 20 |
| Distributed | Base Plot | Cultivated Crops | Canopy Foliage Chemistry | 2 |
| Distributed | Base Plot | Deciduous Forest | Canopy Foliage Chemistry | 8 |
| Distributed | Base Plot | Cultivated Crops | Coarse Downed Wood | 3 |
| Distributed | Base Plot | Deciduous Forest | Coarse Downed Wood | 17 |
| Distributed | Base Plot | Cultivated Crops | Digital Hemispherical Photos for Leaf Area Index | 3 |
| Distributed | Base Plot | Deciduous Forest | Digital Hemispherical Photos for Leaf Area Index | 17 |
| Distributed | Base Plot | Cultivated Crops | Herbaceous Biomass | 3 |
| Distributed | Base Plot | Deciduous Forest | Herbaceous Biomass | 17 |
| Distributed | Base Plot | Cultivated Crops | Plant Diversity | 9 |
| Distributed | Base Plot | Deciduous Forest | Plant Diversity | 21 |
| Distributed | Base Plot | Cultivated Crops | Soil Biogeochemistry | 1 |
| Distributed | Base Plot | Deciduous Forest | Soil Biogeochemistry | 5 |
| Distributed | Base Plot | Cultivated Crops | Soil Microbes | 1 |
| Distributed | Base Plot | Deciduous Forest | Soil Microbes | 5 |
| Distributed | Base Plot | Cultivated Crops | Vegetation Structure | 3 |
| Distributed | Base Plot | Deciduous Forest | Vegetation Structure | 17 |

Note: Distributed Base Plots typically support more than one TOS protocol; 'Number of Plots' cannot be added to get total TOS Distributed Base Plot number.

Table 18: Number of Tower Plots per protocol at SERC.

| Plot Type | Plot Subtype | Protocols | Number of Plots |
|---|---|---|---|
| Tower | Base Plot | Canopy Foliage Chemistry | 4 |
| Tower | Base Plot | Coarse Downed Wood | 20 |
| Tower | Base Plot | Digital Hemispherical Photos for Leaf Area Index | 3 |
| Tower | Base Plot | Herbaceous Biomass | 20 |
| Tower | Base Plot | Litterfall and Fine Woody Debris | 20 |

| Plot Type | Plot Subtype | Protocols | Number of Plots |
|---|---|---|---|
| Tower | Base Plot | Plant Belowground Biomass | 20 |
| Tower | Base Plot | Plant Diversity | 3 |
| Tower | Base Plot | Soil Biogeochemistry | 4 |
| Tower | Base Plot | Soil Microbes | 4 |
| Tower | Base Plot | Vegetation Structure | 20 |
| Tower | Phenology | Plant Phenology | 2 |

Note: Tower Base Plots typically support more than one TOS protocol; 'Number of Plots' cannot be added to get total TOS Tower Base Plot number.

## 5.2 Sampling Season Characterization: SERC

For numerous TOS protocols, the length of the sampling season, the number of bouts, and when those bouts occur is dictated by the seasonal status of the plant community. By monitoring 'greenness' on a 16 day interval, the MODIS/Terra EVI phenology product provides consistent, reliable insight into plant community phenology and intensity at the continental scale. For those protocols for which timing is standardized by greenness transitions and/or peak green status, NEON has utilized these data as the primary means of guiding temporal aspects of TOS sampling at each site.

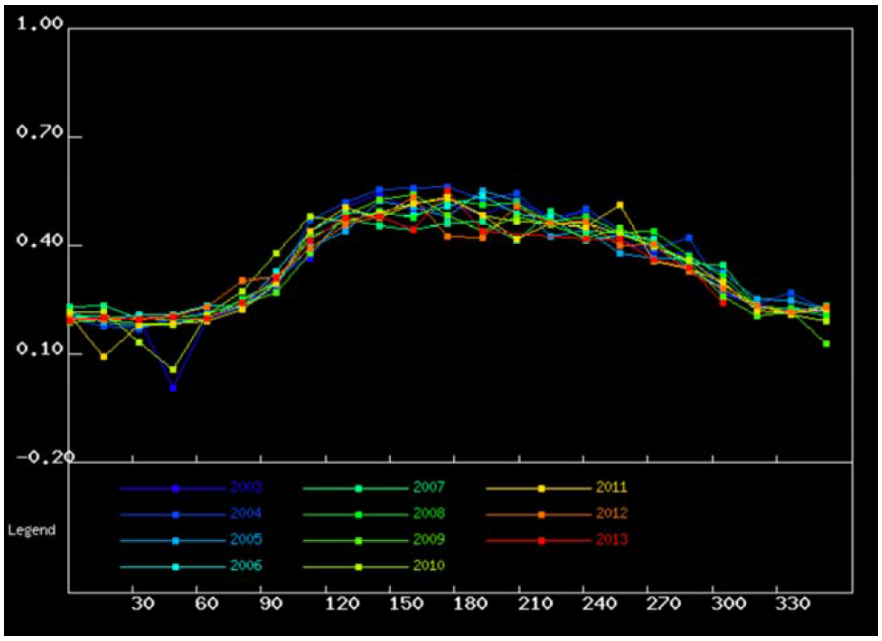


Figure 11: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON SERC site.

Table 19: Average MODIS-EVI greenness dates for the NEON SERC site, based on data from 2003-2013 (DOY, with MM/DD in parentheses).

| Average Increase | Average Maximum | Average Decrease | Average Minimum |
|---|---|---|---|
| 80 (03/22) | 155 (06/05) | 220 (08/09) | 325 (11/22) |

MODIS Product Details

- Product: MODIS-EVI phenology product, 16 day interval, 250 m grid, data included from all pixels with acceptable quality within user-defined square that roughly overlaps the TOS site boundary.
- Date range: 2003-2013
- User selected area: 10.25 km x 10.25 km box, Centroid Latitude: 38.89008, Longitude: -76.56001 (WGS84 datum)

## 5.3 Belowground Biomass

### 5.3.1 Site-Specific Methods

Belowground biomass characterization data were collected down to a depth of 180 cm by NEON staff in May 2014. Since the NEON protocol for long-term, operational sampling of belowground biomass only collects data to a depth of 30 cm, the belowground biomass site characterization data are critical for scaling belowground biomass measurements to greater depths; see the TOS Science Design for Plant Biomass, Productivity, and Leaf Area Index (AD[7]) for more information. Samples were collected following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Roots were sorted to two diameter size categories ($\leq$ 4 mm and 4-30 mm) and by root status (live or dead). The tables below summarize all the belowground biomass less than or equal to 30 mm diameter; size class data and more information can be found by searching the NEON data portal for the data product numbers in Appendix A.

### 5.3.2 Results

Table 20: Soil Pit Information at SERC.

| Latitude | Longitude | Soil Family | Soil Order |
|---|---|---|---|
| 38.89124 | -76.55884 | Fine-loamy - mixed - active - mesic Aquic Hapludults | Ultisol |

Soil Profile was described by Natural Resource Conservation Service (NRCS).

Table 21: Fine root mass per depth increment (cm) at SERC.

| Upper Depth | Lower Depth | Mean (mg per $cm^3$) | Std Dev |
|---|---|---|---|
| 0 | 10 | 3.66 | 2.1 |
| 10 | 20 | 4.04 | 1.76 |
| 20 | 30 | 1.05 | 1.28 |
| 30 | 40 | 1.62 | 0.68 |
| 40 | 50 | 0.67 | 0.67 |
| 50 | 60 | 0.09 | 0.08 |
| 60 | 70 | 0.85 | 1.19 |
| 70 | 80 | 0.41 | 0.47 |
| 80 | 90 | 0.15 | 0.11 |
| 90 | 100 | 0.17 | 0.17 |
| 100 | 120 | 0.07 | 0.05 |
| 120 | 140 | 0.05 | 0.03 |
| 140 | 160 | 0.04 | 0.04 |
| 160 | 180 | 0.07 | 0.04 |

Table 22: Cumulative fine root mass as a function of depth (cm) at SERC.

| Upper Depth | Lower Depth | Mean Cumulative (g per $m^2$) | Cumulative Std Dev |
|---|---|---|---|
| 0 | 10 | 366.41 | 210.46 |
| 10 | 20 | 769.99 | 68.32 |
| 20 | 30 | 874.76 | 66.2 |
| 30 | 40 | 1036.67 | 30.89 |
| 40 | 50 | 1103.22 | 52.21 |
| 50 | 60 | 1112.59 | 51.38 |
| 60 | 70 | 1197.18 | 154.65 |
| 70 | 80 | 1238.11 | 135.28 |
| 80 | 90 | 1253.4 | 129.07 |
| 90 | 100 | 1270.2 | 124.56 |
| 100 | 120 | 1283.77 | 114.88 |
| 120 | 140 | 1294.5 | 110.29 |
| 140 | 160 | 1303.47 | 112.15 |
| 160 | 180 | 1316.83 | 108.98 |

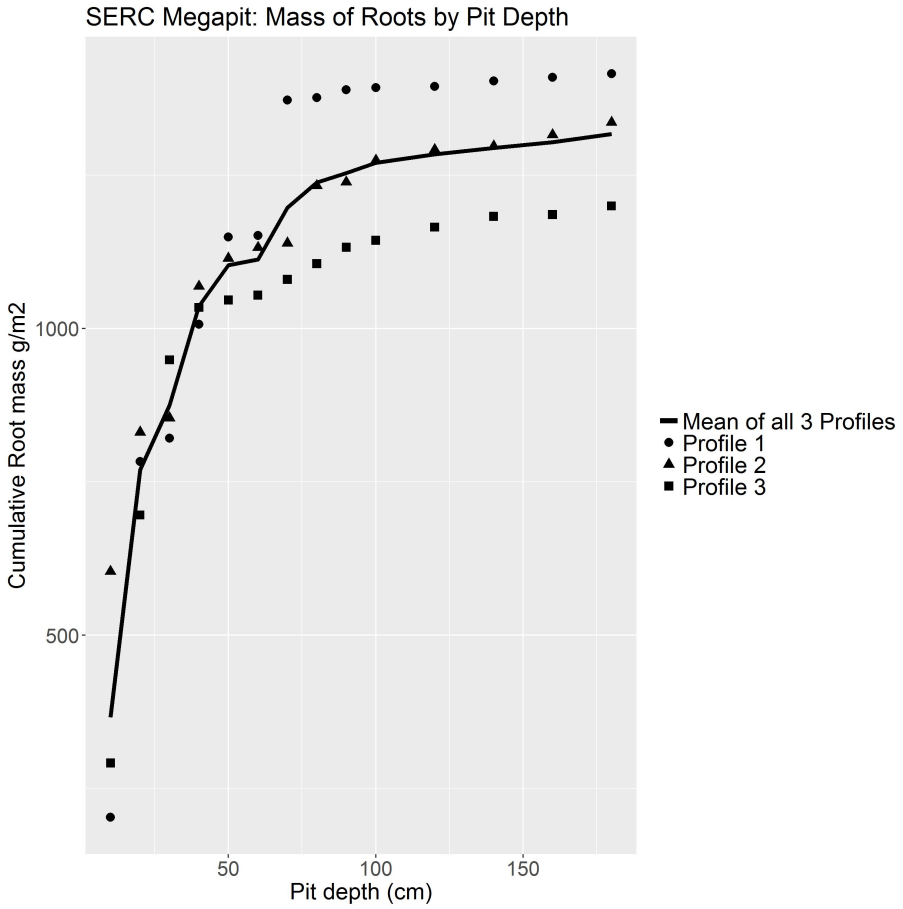


Figure 12: Cumulative root mass by pit depth at SERC.

Table 23: Fine root biomass sampling summary data at SERC.

| | |
|---|---|
| Total Pit Depth (cm) | 180 |
| Total Mean Cumulative Mass at 30cm (g per $m^2$) | 874.76 |
| Total Mean Cumulative Mass at 100cm (g per $m^2$) | 1270.2 |
| Total Mean Cumulative Mass (g per $m^2$) | 1316.83 |

## 5.4 Plant Characterization and Phenology Species Selection

### 5.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff during June of 2015. Plant characterization data inform sampling procedures for plant phenology and plant productivity protocols.

The overall ranking ("Rank" in the table below) was calculated based on three separate measurements. Overall ranking weights are influenced by the number of species within each grouping.

1. Mean percent cover values were calculated based on species specific cover estimation for all plant species under 3m tall in eight 1m by 1m subplots per plot; see the TOS Protocol and Procedure: Plant Diversity Sampling (RD[09]) for more information.
2. Mean canopy area values were calculated based on all species specific shrub canopy diameter measurements within the entire plot or subplot; see the TOS Protocol and Procedure: Measurement of Vegetation Structure (RD[10]) for more information.
3. Mean ABH (area at breast height) measurements were calculated based on diameter at breast height measurements for all woody vegetation with a diameter greater than 1cm at 130cm height within the entire plot or subplot; see the TOS Protocol and Procedure: Measurement of Vegetation Structure (RD[10]) for more information.

The standard field methods and ranking calculations are further outlined in TOS Site Characterization Methods (RD[6]). For more information on this protocol and data product numbers see Appendix A.

### 5.4.2 Results

Table 24: Site plant characterization and phenology species summary at SERC.

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| LITU | *Liriodendron tulipifera* L. | 1 | 1 | NA | 12.39 |
| FAGR | *Fagus grandifolia* Ehrh. | 2 | 4 | 0.029 | 3.85 |
| LIST2 | *Liquidambar styraciflua* L. | 3 | <1 | 0.007 | 5.94 |
| LIBE3 | *Lindera benzoin* (L.) Blume | 4 | 3 | 0.024 | 0.04 |
| ILOP | *Ilex opaca* Aiton | 5 | <1 | 0.001 | 0.04 |
| QUAL | *Quercus alba* L. | 6 | <1 | NA | 1.8 |
| ACRU | *Acer rubrum* L. | 7 | <1 | NA | 1.32 |
| CACA18 | *Carpinus caroliniana* Walter | 8 | 2 | NA | 0.25 |
| KALA | *Kalmia latifolia* L. | 9 | <1 | 0.017 | 0.07 |
| NYSY | *Nyssa sylvatica* Marshall | 10 | <1 | NA | 1.05 |
| QURU | *Quercus rubra* L. | 11 | <1 | NA | 0.92 |
| CAGL8 | *Carya glabra* (Mill.) Sweet | 12 | <1 | NA | 0.7 |
| CATO6 | *Carya tomentosa* (Lam.) Nutt. | 13 | <1 | NA | 0.69 |
| QUVE | *Quercus velutina* Lam. | 15 | <1 | NA | 0.59 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| LOJA | *Lonicera japonica* Thunb. | 16 | 2 | NA | 0 |
| FRAM2 | *Fraxinus americana* L. | 17 | <1 | NA | 0.21 |
| AMELA | *Amelanchier* sp. | 18 | <1 | 0.007 | 0.03 |
| QUMO4 | *Quercus montana* Willd. | 19 | NA | NA | 0.43 |
| ROMU | *Rosa multiflora* Thunb. | 20 | 1 | NA | 0 |
| PAQU2 | *Parthenocissus quinquefolia* (L.) Planch. | 21 | <1 | NA | 0 |
| ACNE2 | *Acer negundo* L. | 22 | <1 | NA | 0.28 |
| PLOC | *Platanus occidentalis* L. | 23 | NA | NA | 0.27 |
| ARTR | *Arisaema triphyllum* (L.) Schott | 24 | <1 | NA | NA |
| QUFA | *Quercus falcata* Michx. | 25 | <1 | NA | 0.22 |
| RUPH | *Rubus phoenicolasius* Maxim. | 26 | <1 | NA | NA |
| BETH | *Berberis thunbergii* DC. | 27 | <1 | NA | NA |
| MIVI | *Microstegium vimineum* (Trin.) A. Camus | 28 | <1 | NA | NA |
| LEVI2 | *Leersia virginica* Willd. | 29 | <1 | NA | NA |
| VIOLA | *Viola* sp. | 30 | <1 | NA | NA |
| CARYA | *Carya* sp. | 31 | <1 | NA | 0.01 |
| QUERC | *Quercus* sp. | 32 | <1 | NA | 0.18 |
| POAC4 | *Polystichum acrostichoides* (Michx.) Schott | 33 | <1 | NA | NA |
| POPE | *Podophyllum peltatum* L. | 34 | <1 | NA | NA |
| PIVI2 | *Pinus virginiana* Mill. | 35 | NA | NA | 0.13 |
| ULMUS | *Ulmus* sp. | 36 | <1 | NA | 0.11 |
| POIN5 | *Potentilla indica* (Andrews) Th. Wolf | 37 | <1 | NA | NA |
| MIRE | *Mitchella repens* L. | 38 | <1 | NA | NA |
| TORA2 | *Toxicodendron radicans* (L.) Kuntze | 39 | <1 | NA | 0.01 |
| CIAR2 | *Cinna arundinacea* L. | 40 | <1 | NA | NA |
| VITIS | *Vitis* sp. | 41 | <1 | NA | 0.03 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| BOCY | *Boehmeria cylindrica* (L.) Sw. | 42 | <1 | NA | NA |
| VIAC | *Viburnum acerifolium* L. | 43 | <1 | NA | NA |
| VACO | *Vaccinium corymbosum* L. | 44 | <1 | NA | 0 |
| COFL2 | *Cornus florida* L. | 45 | <1 | NA | 0.04 |
| VACCI | *Vaccinium* sp. | 47 | <1 | NA | NA |
| GECA7 | *Geum canadense* Jacq. | 48 | <1 | NA | NA |
| PRSES | *Prunus serotina* Ehrh. var. *serotina* | 49 | <1 | NA | 0.02 |
| AMBR2 | *Amphicarpaea bracteata* (L.) Fernald | 50 | <1 | NA | NA |
| VIPR | *Viburnum prunifolium* L. | 51 | <1 | NA | NA |
| QUFA | *Quercus falcata* Michx. | 52 | <1 | NA | 0.22 |
| SMRO | *Smilax rotundifolia* L. | 53 | <1 | NA | NA |
| GAAP2 | *Galium aparine* L. | 54 | <1 | NA | NA |
| DIVI5 | *Diospyros virginiana* L. | 55 | NA | NA | 0.05 |
| EUAM9 | *Euonymus americanus* L. | 56 | <1 | NA | NA |
| CYVIV | *Cynoglossum virginianum* L. var. *virginianum* | 57 | <1 | NA | NA |
| ASTR | *Asimina triloba* (L.) Dunal | 58 | <1 | NA | 0 |
| CASW | *Carex swanii* (Fernald) Mack. | 59 | <1 | NA | NA |
| OSCL | *Osmorhiza claytonii* (Michx.) C.B. Clarke | 59 | <1 | NA | NA |
| PATO2 | *Paulownia tomentosa* (Thunb.) Siebold & Zucc. ex Steud. | 61 | NA | NA | 0.04 |
| CAREX | *Carex* sp. | 62 | <1 | NA | NA |
| SACA15 | *Sanicula canadensis* L. | 63 | <1 | NA | NA |
| RUBUS | *Rubus* sp. | 64 | <1 | NA | NA |
| PRAV | *Prunus avium* (L.) L. | 65 | <1 | NA | 0.03 |
| GACI2 | *Galium circaezans* Michx. | 66 | <1 | NA | NA |
| CEOR7 | *Celastrus orbiculatus* Thunb. | 67 | <1 | NA | 0 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| CADE12 | *Castanea dentata* (Marshall) Borkh. | 68 | NA | NA | 0.03 |
| SAAL5 | *Sassafras albidum* (Nutt.) Nees | 69 | <1 | NA | 0.02 |
| JUVIV | *Juniperus virginiana* L. var. *virginiana* | 70 | NA | NA | 0.02 |
| POACEA | Poaceae sp. | 71 | <1 | NA | NA |
| PEVI13 | *Persicaria virginiana* (L.) Gaertn. | 71 | <1 | NA | NA |
| ROPS | *Robinia pseudoacacia* L. | 73 | NA | NA | 0.02 |
| BENI | *Betula nigra* L. | 74 | NA | NA | 0.02 |
| BOVI8 | *Botrypus virginianus* (L.) Michx. | 75 | <1 | NA | NA |
| CILU | *Circaea lutetiana* L. | 75 | <1 | NA | NA |
| HEHE | *Hedera helix* L. | 77 | <1 | NA | NA |
| PEAR13 | *Persicaria arifolia* L | 78 | <1 | NA | NA |
| ARSP2 | *Aralia spinosa* L. | 79 | <1 | NA | NA |
| CARA2 | *Campsis radicans* (L.) Seem. ex Bureau | 80 | <1 | NA | NA |
| IMCA | *Impatiens capensis* Meerb. | 80 | <1 | NA | NA |
| SOLID | *Solidago* sp. | 80 | <1 | NA | NA |
| ONSE | *Onoclea sensibilis* L. | 83 | <1 | NA | NA |
| CALU5 | *Carex lurida* Wahlenb. | 84 | <1 | NA | NA |
| FESU3 | *Festuca subverticillata* (Pers.) Alexeev | 84 | <1 | NA | NA |
| LYCOP2 | *Lycopodium* sp. | 84 | <1 | NA | NA |
| ALPE4 | *Alliaria petiolata* (M. Bieb.) Cavara & Grande | 87 | <1 | NA | NA |
| CHMA3 | *Chimaphila maculata* (L.) Pursh | 87 | <1 | NA | NA |
| CRATA | *Crataegus* sp. | 87 | <1 | NA | NA |
| DESMO | *Desmodium* sp. | 87 | <1 | NA | NA |
| PHLE5 | *Phryma leptostachya* L. | 87 | <1 | NA | NA |
| CILU | *Circaea lutetiana* L. | 92 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| EPVI2 | *Epifagus virginiana* (L.) W.P.C. Barton | 92 | <1 | NA | NA |
| VIDE | *Viburnum dentatum* L. | 92 | <1 | NA | NA |
| KALMI | *Kalmia* sp. | 95 | NA | NA | 0 |
| ASTERA | Asteraceae sp. | 96 | <1 | NA | NA |
| LIGUS2 | *Ligustrum* sp. | 96 | <1 | NA | NA |
| MARA7 | *Maianthemum racemosum* (L.) Link | 96 | <1 | NA | NA |
| SCDI8 | *Sceptridium dissectum* (Spreng.) Lyon | 99 | <1 | NA | NA |
| OXALI | *Oxalis* sp. | 99 | <1 | NA | NA |
| POBI2 | *Polygonatum biflorum* (Walter) Elliott | 99 | <1 | NA | NA |
| ACNE2 | *Acer negundo* L. | 102 | <1 | NA | 0.28 |
| CARDA | *Cardamine* sp. | 102 | <1 | NA | NA |
| OPPY3 | *Ophioglossum pycnostichum* (Fernald) A. Love & D. Love | 102 | <1 | NA | NA |
| POACEASPP | Poaceae sp. | 102 | <1 | NA | NA |
| QUERCSPP | *Quercus* sp. | 102 | <1 | NA | NA |
| CARA8 | *Carex radiata* (Wahlenb.) Small | 108 | <1 | NA | NA |
| EUDI16 | *Eurybia divaricata* (L.) G.L. Nesom | 108 | <1 | NA | NA |
| GALIU | *Galium* sp. | 108 | <1 | NA | NA |
| GAOB | *Galium obtusum* Bigelow | 108 | <1 | NA | NA |
| GOPU | *Goodyera pubescens* (Willd.) R. Br. | 108 | <1 | NA | NA |
| LAMIAC | Lamiaceae sp. | 108 | <1 | NA | NA |
| MYMA | *Myosotis macrosperma* Engelm. | 108 | <1 | NA | NA |
| OPPY3 | *Ophioglossum pycnostichum* (Fernald) A. Love & D. Love | 108 | <1 | NA | NA |
| PINUS | *Pinus* sp. | 108 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| POA | *Poa* sp. | 108 | <1 | NA | NA |
| PRUNU | *Prunus* sp. | 108 | <1 | NA | NA |
| RAAB | *Ranunculus abortivus* L. | 108 | <1 | NA | NA |
| RARER2 | *Ranunculus recurvatus* Poir. var. *recurvatus* | 108 | <1 | NA | NA |
| VISA | *Vicia sativa* L. | 108 | <1 | NA | NA |
| CACO15 | *Carya cordiformis* (Wangenh.) K. Koch | 123 | NA | NA | 0 |
| AIAL | *Ailanthus altissima* (Mill.) Swingle | 124 | NA | NA | NA |
| PEPE35 | *Persicaria perfoliata* (L.) H. Gross | NA | <1 | NA | NA |

Note:Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov).

Table 25: Per plot breakdown of species richness, diversity, and herbaceous cover at SERC.

| Plot ID | Species Richness | Shannon Diversity Index | Percent Total Herbaceous Cover | Bryophyte Percent Cover |
|---|---|---|---|---|
| SERC_043 | 46 | 3.25 | 111 | 0 |
| SERC_044 | 28 | 2.62 | 51 | 2.88 |
| SERC_045 | 32 | 3.31 | 24 | 0 |
| SERC_046 | 21 | 2.67 | 28 | 0 |
| SERC_047 | 31 | 2.18 | 97 | 0 |
| SERC_048 | 34 | 2.66 | 92 | 0.25 |
| SERC_049 | 27 | 2.66 | 49 | 0.12 |
| SERC_050 | 21 | 2.12 | 35 | 1.62 |
| SERC_051 | 13 | 1.62 | 44 | 17.56 |
| SERC_052 | 30 | 2.8 | 87 | 0.88 |
| SERC_053 | 38 | 2.38 | 138 | 0.72 |
| SERC_054 | 26 | 2.84 | 32 | 0.81 |
| SERC_055 | 36 | 3.18 | 76 | 0.88 |
| SERC_056 | 35 | 2.58 | 90 | 0.19 |
| SERC_057 | 21 | 1.95 | 62 | 1 |
| SERC_058 | 33 | 2.7 | 83 | 0.44 |

| Plot ID | Species Richness | Shannon Diversity Index | Percent Total Herbaceous Cover | Bryophyte Percent Cover |
|---|---|---|---|---|
| SERC_059 | 37 | 2.73 | 134 | 0.94 |
| SERC_060 | 31 | 2.87 | 87 | 3 |
| SERC_061 | 42 | 2.69 | 136 | 0.22 |
| SERC_062 | 35 | 2.28 | 158 | 1.88 |
| Bryophyte Mean | | | | 1.86 |

Note: Percent herbaceous cover was measured by species and then added together to calculate the percent total herbaceous cover for each plot.

Bryophyte percent cover data were used to determine which sites qualify for implementation of the Bryophyte Productivity protocol. However, bryophyte productivity sampling was discontinued in 2018 and NEON no longer implements this protocol.

## 5.5 Beetles

### 5.5.1 Site-Specific Methods

Beetle site characterization was conducted in June 2013 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Beetle site characterization data were collected to start site level teaching collections. All beetle samples were pooled before being sent for identification. For DNA sequence data generated as a result of these efforts, visit the Barcode of Life Datasystems (BOLD) at http://www.boldsystems.org. For more information on this protocol and data product numbers see Appendix A.

### 5.5.2 Results

Table 26: Beetle identification results at SERC.

| Sample ID | Scientific Name | Sex |
|---|---|---|
| NEONTcarabid8125 | *Galerita bicolor* | U |
| NEONTcarabid8126 | *Galerita bicolor* | U |
| NEONTcarabid8127 | *Galerita bicolor* | U |
| NEONTcarabid8128 | *Galerita bicolor* | U |
| NEONTcarabid8129 | *Dicaelus elongatus* | F |
| NEONTcarabid8130 | *Poecilus lucublandus* | U |
| NEONTcarabid8131 | *Poecilus lucublandus* | U |
| NEONTcarabid8132 | *Chlaenius aestivus* | M |
| NEONTcarabid8133 | *Poecilus lucublandus* | M |

| Sample ID | Scientific Name | Sex |
|---|---|---|
| NEONTcarabid8134 | *Poecilus lucublandus* | U |
| NEONTcarabid8135 | *Poecilus lucublandus* | U |
| NEONTcarabid8136 | *Amara aenea* | M |
| NEONTcarabid8137 | *Amara impuncticollis* | F |
| NEONTcarabid8138 | *Trichotichnus fulgens* | F |
| NEONTcarabid8139 | *Trichotichnus fulgens* | M |

## 5.6 Mosquitoes

### 5.6.1 Site-Specific Methods

Mosquito site characterization was conducted in June 2013 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]) to test protocol methods and start site level species lists. All mosquitoes were pooled before being sent for identification. No pathogen testing was performed. For more information on this protocol and data product numbers see Appendix A.

### 5.6.2 Results

Table 27: Mosquito identification results at SERC.

| Sample ID | Scientific Name | Individual Count |
|---|---|---|
| SERC.20140721.SC.1 | *Aedes canadensis* | 1 |
| SERC.20140721.SC.1 | *Aedes cantator* | 1 |
| SERC.20140721.SC.1 | *Aedes vexans* | 2 |
| SERC.20140721.SC.1 | *Anopheles quadrimaculatus* | 3 |
| SERC.20140721.SC.1 | *Culex salinarius* | 155 |
| SERC.20140721.SC.1 | *Culex species* | 1 |
| SERC.20140721.SC.1 | *Anopheles crucians complex* | 49 |

## 5.7 Ticks

### 5.7.1 Site-Specific Methods

Tick drags were conducted in June 2013 to test protocol methods and calculate capture rates. All tick samples were pooled before being sent for identification. No pathogen testing was performed. For more information on this protocol and data product numbers see Appendix A.

### 5.7.2 Results

Table 28: Tick identification results at SERC.

| Sample ID | Scientific Name | Number Adult Male | Number of Adult Females | Number of Nymphs |
|---|---|---|---|---|
| SERC_000.20140702.SC.1 | *Dermacentor variabilis* | 0 | 1 | 0 |
| SERC_000.20140702.SC.1 | *Amblyomma americanum* | 0 | 0 | 1 |

## 5.8 Species Reference Lists

A review of the literature for taxonomic lists of interest for each site was conducted prior to field work. In the case of vertebrates that NEON may capture (e.g., reptiles, amphibians, small mammals), these lists were often required to secure permits. Key references identified in this effort are listed below. Species lists and associated references for small mammals and breeding landbirds can be found in the appendices of the respective protocols (RD[07], RD[08]). See the SCBI species reference list section for statewide resources.

Bousquet, Y. 2012. Catalogue of Geadephaga (Coleoptera, Adephaga) of America, north of Mexico. ZooKeys, (245), 1-1722.

Centers for Disease Control and Prevention. (2015). *Geographic distribution of ticks that bite humans.* Retrieved from http://www.cdc.gov/ticks/geographic/_distribution.html

Darsie Jr., R. F., and R. A. Ward. 2005. Identification and geographical distribution of the mosquitoes of North America, North of Mexico. University Press of Florida, Gainesville.

Perry, Matthew C., Peter C. Osenton, and Cindy S. Stoll.(1998) “Biological Diversity of Created Forested Wetlands in Comparison to Reference Forested Wetlands in the Bay Watershed”. In G.Therres, M.lattery, and E. Deems(Eds.),Paper presented at The Conservation of Biological Diversity: A Key to the Restoration ofthe Chesapeake Bay Ecosystem and Beyond Conference, Annapolis, Maryland (pp.261-68). Maryland Department of Natural Resources.

# 6 RELOCATABLE SITE 2- BLANDY EXPERIMENTAL FARM (BLAN)

The Blandy Experimental Farm contains several land use types typically found in rural-suburban landscapes. This mix of woodland, successional fields, pastures, and small ponds is typical and representative in the Middle Atlantic Domain. This site will be under increasing ecological pressure from urbanization within the rapidly growing megapolitan area.

The Blandy Experimental Farm property was too small for NEON's Distributed Plot activities and additonal land at Casey Tree Farm 10 kms northeast of the tower was selected for Distributed Plot sampling. The Casey Tree Farm site is also a mix of woodland, hay fields, and tree nurseries.


Figure 13: Phenocamera image for BLAN. The phenocamera is located at the top of the NEON tower and faces north. Phenocamera images are available at https://phenocam.sr.unh.edu/webcam/network/table/.

Key Characteristics:

- Site host: University of Virginia and Casey Trees
- Located in: Clarke county, Virginia
- Sampling Area: Blandy Experimental Farm- 2.69km$^2$, Casey Tree Farm- 3.03km$^2$
- Plot Elevation: 115-195m

- Dominant vegetation type- The Blandy site is dominated by fallow scrubland. Goldenrod (*Solidago altissima*) and hay crops are two of the dominant vegetation types. Successional shrubs and fragmented secondary forests surround the site. The Casey Tree Farm site includes a tree nursery and hay fields surrounded by deciduous woodland.
- General management: The mission of Blandy Experimental Farm is to increase understanding of the natural environment through research and education and is home to a vibrant research community. Casey Tree Farm was gifted to Casey Trees in 2008 as a site for tree nurseries and to enhance their core mission through research, collaboration, and environmental stewardship.
- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research (see next section for more detail).

### 6.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at BLAN according to a spatially balanced and stratified-random design (RD[3]). The 2006 National Land Cover Database (NLCD) was selected for stratification because of the consistent and comparable data availability across the United States. TOS Tower Plots were allocated according to a spatially balanced design in and around the NEON tower airshed (RD[03]). The maps below depict the plot locations for the first year of NEON sampling. Some plot locations may change over time due to logistics, safety, and science requirements. Please visit the NEON website (http://www.neonscience.org) for updated plot locations at each site.

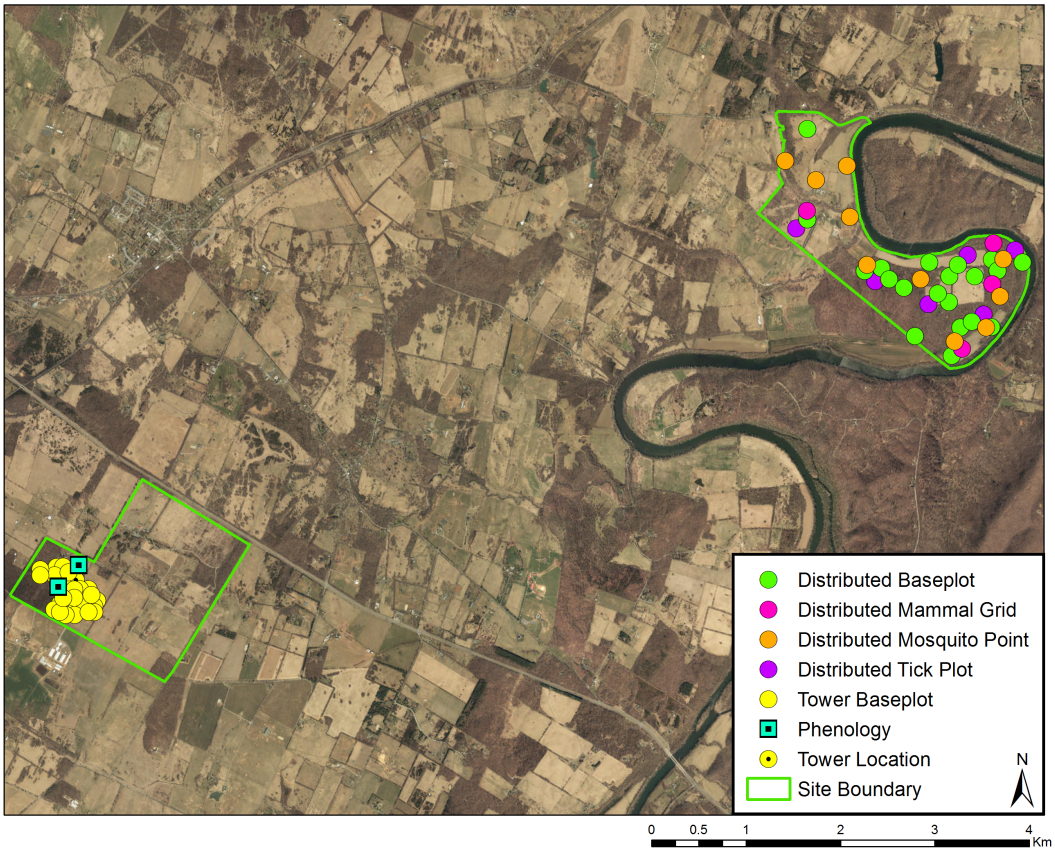


Figure 14: Map of TOS plot centroids within the NEON TOS sampling boundary at BLAN. The Blandy Experimental Farm property is in the southwest corner and includes the TOS Tower Plots. Casey Tree Farm is the northeast property and contains the TOS Distributed Plots.

For a list of protocols associated with each plot see tables below; for additional spatial design information see RD[03].

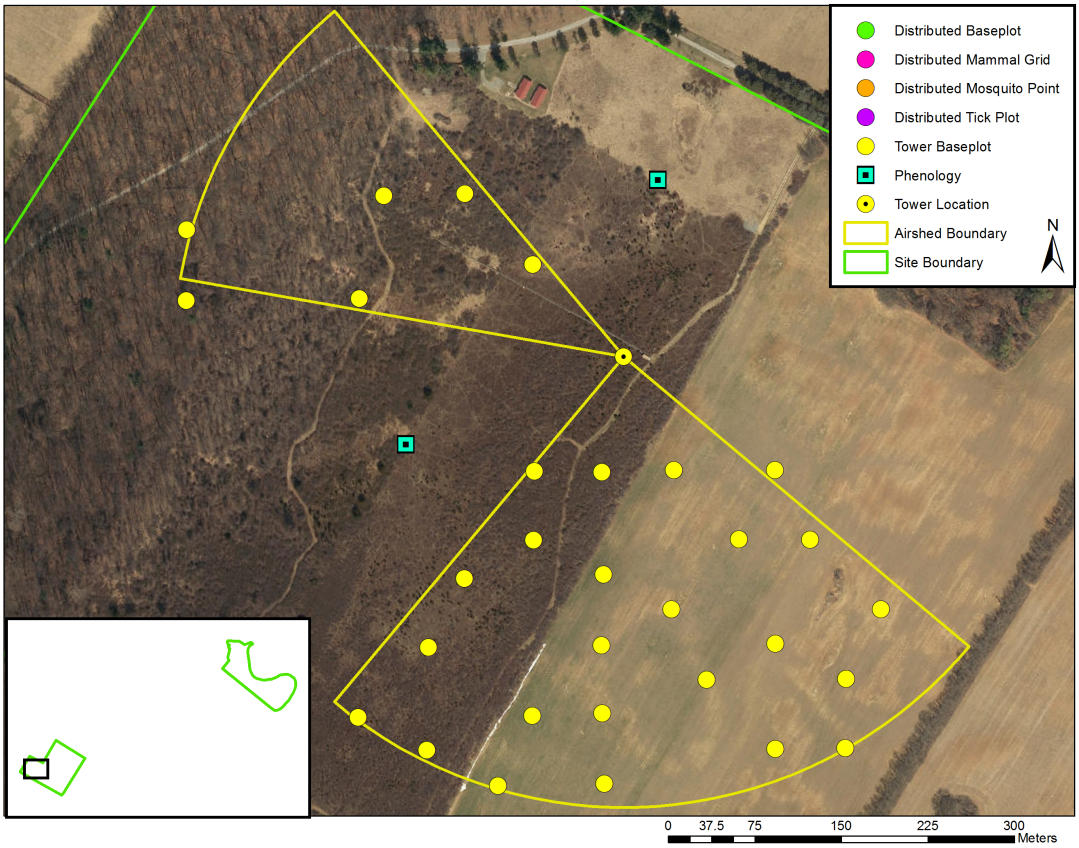


Figure 15: Map of the tower airshed and TOS plot centroids at the Blandy Experimental Farm Property.

More information about the tower airshed can be found in the TIS site characterization report (RD[04]).

Table 29: NLCD land cover classes and area within the TOS site boundary at BLAN.

| NLCD Class | Site Area ($km^2$) | Percent (%) |
|---|---|---|
| Deciduous Forest | 1.55 | 50.83 |
| Pasture Hay | 1.23 | 40.36 |
| Developed Open Space | 0.17 | 5.68 |
| Open Water | 0.04 | 1.3 |
| Evergreen Forest | 0.03 | 0.92 |
| Mixed Forest | 0.02 | 0.59 |
| Woody Wetlands | 0.01 | 0.33 |

Note: Any NLCD land cover classes less than 5% will not be sampled. Additionally, no sampling will take place in Water, Developed, or Barren Land NLCD classes.

Table 30: NLCD land cover classes and TOS plot numbers at BLAN.

| Plot Type | Plot Subtype | NLCD Class | Number of Plots Established |
|---|---|---|---|
| Distributed | Base | Deciduous Forest | 10 |
| Distributed | Base | Pasture Hay | 10 |
| Distributed | Mammal | Pasture Hay | 2 |
| Distributed | Mammal | Deciduous Forest | 2 |
| Distributed | Mosquito | Pasture Hay | 4 |
| Distributed | Mosquito | Deciduous Forest | 6 |
| Distributed | Tick | Pasture Hay | 3 |
| Distributed | Tick | Deciduous Forest | 3 |
| Tower | Base Plot | NA | 30 |
| Tower | Phenology Plot | NA | 2 |

Note: NLCD land cover classes are not used to stratify Tower Plots which are located in and around the NEON tower airshed. The dominant NLCD land cover types within the airshed include: cultivated crops, shrub scrub, and deciduous forest.

Table 31: Number of Distributed Base plots per NLCD land cover class per protocol at BLAN.

| Plot Type | Plot Subtype | NLCD Class | Protocols | Number of Plots |
|---|---|---|---|---|
| Distributed | Base Plot | Deciduous Forest | Beetles | 6 |
| Distributed | Base Plot | Pasture Hay | Beetles | 4 |
| Distributed | Base Plot | Deciduous Forest | Birds | 6 |
| Distributed | Base Plot | Pasture Hay | Birds | 5 |
| Distributed | Base Plot | Deciduous Forest | Canopy Foliage Chemistry | 9 |
| Distributed | Base Plot | Pasture Hay | Canopy Foliage Chemistry | 7 |
| Distributed | Base Plot | Deciduous Forest | Coarse Downed Wood | 10 |
| Distributed | Base Plot | Pasture Hay | Coarse Downed Wood | 10 |
| Distributed | Base Plot | Deciduous Forest | Digital Hemispherical Photos for Leaf Area Index | 10 |
| Distributed | Base Plot | Pasture Hay | Digital Hemispherical Photos for Leaf Area Index | 10 |
| Distributed | Base Plot | Deciduous Forest | Herbaceous Biomass | 10 |
| Distributed | Base Plot | Pasture Hay | Herbaceous Biomass | 10 |
| Distributed | Base Plot | Deciduous Forest | Plant Diversity | 10 |
| Distributed | Base Plot | Pasture Hay | Plant Diversity | 10 |
| Distributed | Base Plot | Deciduous Forest | Soil Biogeochemistry | 3 |

| Plot Type | Plot Subtype | NLCD Class | Protocols | Number of Plots |
|---|---|---|---|---|
| Distributed | Base Plot | Pasture Hay | Soil Biogeochemistry | 3 |
| Distributed | Base Plot | Deciduous Forest | Soil Microbes | 3 |
| Distributed | Base Plot | Pasture Hay | Soil Microbes | 3 |
| Distributed | Base Plot | Deciduous Forest | Vegetation Structure | 10 |
| Distributed | Base Plot | Pasture Hay | Vegetation Structure | 10 |

Note: Distributed Base Plots typically support more than one TOS protocol; 'Number of Plots' cannot be added to get total TOS Distributed Base Plot number.

Table 32: Number of Tower Plots per protocol at BLAN.

| Plot Type | Plot Subtype | Protocols | Number of Plots |
|---|---|---|---|
| Tower | Base Plot | Canopy Foliage Chemistry | 4 |
| Tower | Base Plot | Coarse Downed Wood | 30 |
| Tower | Base Plot | Digital Hemispherical Photos for Leaf Area Index | 3 |
| Tower | Base Plot | Herbaceous Biomass | 30 |
| Tower | Base Plot | Litterfall and Fine Woody Debris | 30 |
| Tower | Base Plot | Plant Belowground Biomass | 30 |
| Tower | Base Plot | Plant Diversity | 3 |
| Tower | Base Plot | Soil Biogeochemistry | 4 |
| Tower | Base Plot | Soil Microbes | 4 |
| Tower | Base Plot | Vegetation Structure | 30 |
| Tower | Phenology | Plant Phenology | 2 |

Note: Tower Base Plots typically support more than one TOS protocol; 'Number of Plots' cannot be added to get total TOS Tower Base Plot number.

### 6.2 Sampling Season Characterization: BLAN

For numerous TOS protocols, the length of the sampling season, the number of bouts, and when those bouts occur is dictated by the seasonal status of the plant community. By monitoring 'greenness' on a 16 day interval, the MODIS/Terra EVI phenology product provides consistent, reliable insight into plant community phenology and intensity at the continental scale. For those protocols for which timing is standardized by greenness transitions and/or peak green status, NEON has utilized these data as the primary means of guiding temporal aspects of TOS sampling at each site.

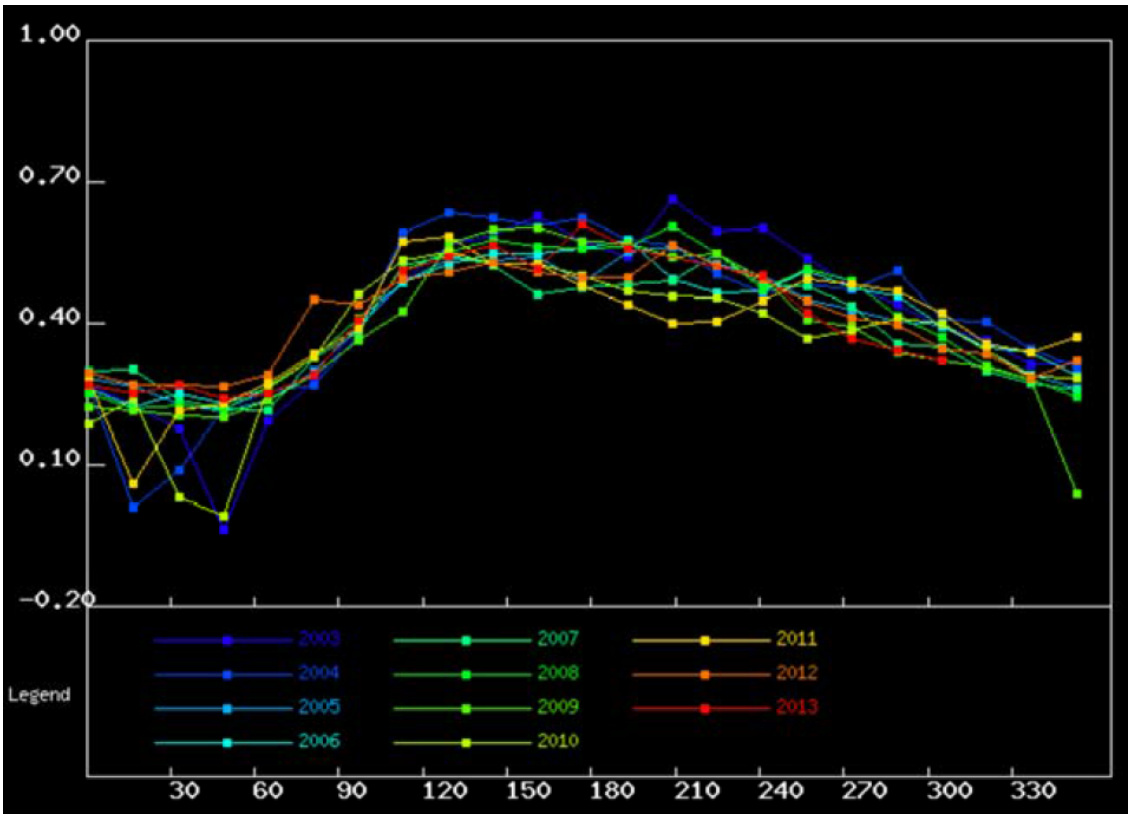


Figure 16: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON BLAN site.

Table 33: Average MODIS-EVI greenness dates for the NEON BLAN site, based on data from 2003-2013 (DOY, with MM/DD in parentheses).

| Average Increase | Average Maximum | Average Decrease | Average Minimum |
|---|---|---|---|
| 75<br>(03/17) | 150<br>(05/31) | 210<br>(07/30) | 310<br>(11/07) |

MODIS Product Details

- Product: MODIS-EVI phenology product, 16 day interval, 250 m grid, data included from all pixels with acceptable quality within user-defined square that roughly overlaps the TOS site boundary.
- Date range: 2003-2013
- User selected area: 10.25 km x 10.25 km box, Centroid Latitude: 39.06026, Longitude: -78.07164 (WGS84 datum)

## 6.3 Belowground Biomass

### 6.3.1 Site-Specific Methods

Belowground biomass characterization data were collected down to a depth of 180 cm by NEON staff in January 2013. Since the NEON protocol for long-term, operational sampling of belowground biomass only collects data to a depth of 30 cm, the belowground biomass site characterization data are critical for scaling belowground biomass measurements to greater depths; see the TOS Science Design for Plant Biomass, Productivity, and Leaf Area Index (AD[7]) for more information. Samples were collected following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Roots were sorted to two diameter size categories ($\leq$ 2 mm and 2-30 mm) and by root status (live or dead). The tables below summarize all the belowground biomass less than or equal to 30 mm diameter; size class data and more information can be found by searching the NEON data portal for the data product numbers in Appendix A.

### 6.3.2 Results

Table 34: Soil Pit Information at BLAN.

| Latitude | Longitude | Soil Family | Soil Order |
|---|---|---|---|
| 39.06044 | -78.07115 | Fine - mixed - subactive - mesic Ultic Hapludalfs | Alfisol |

Soil Profile was described by Natural Resource Conservation Service (NRCS).

Table 35: Fine root mass per depth increment (cm) at BLAN.

| Upper Depth | Lower Depth | Mean (mg per $cm^3$) | Std Dev |
|---|---|---|---|
| 0 | 10 | 3.46 | 1.25 |
| 10 | 20 | 0.99 | 0.89 |
| 20 | 30 | 0.29 | 0.09 |
| 30 | 40 | 0.24 | 0.2 |
| 40 | 50 | 0.49 | 0.31 |
| 50 | 60 | 0.4 | 0.28 |
| 60 | 70 | 0.29 | 0.34 |
| 70 | 80 | 0.1 | 0.07 |
| 80 | 90 | 0.03 | 0.01 |
| 90 | 100 | 0.06 | 0.01 |
| 100 | 120 | 0.03 | 0.02 |
| 120 | 140 | 0.08 | 0.04 |
| 140 | 160 | 0.02 | 0.01 |

| Upper Depth | Lower Depth | Mean (mg per $cm^3$) | Std Dev |
|---|---|---|---|
| 160 | 180 | 0.07 | 0.07 |

Table 36: Cumulative fine root mass as a function of depth (cm) at BLAN.

| Upper Depth | Lower Depth | Mean Cumulative (g per $m^2$) | Cumulative Std Dev |
|---|---|---|---|
| 0 | 10 | 346.09 | 124.67 |
| 10 | 20 | 445.23 | 114.6 |
| 20 | 30 | 474.15 | 123.55 |
| 30 | 40 | 497.71 | 142.97 |
| 40 | 50 | 546.64 | 129.09 |
| 50 | 60 | 586.71 | 102.05 |
| 60 | 70 | 616.11 | 70.48 |
| 70 | 80 | 625.95 | 67.9 |
| 80 | 90 | 629.11 | 68.6 |
| 90 | 100 | 634.77 | 69.47 |
| 100 | 120 | 639.97 | 69.2 |
| 120 | 140 | 655.36 | 70.56 |
| 140 | 160 | 660.14 | 68.97 |
| 160 | 180 | 674.63 | 78.86 |

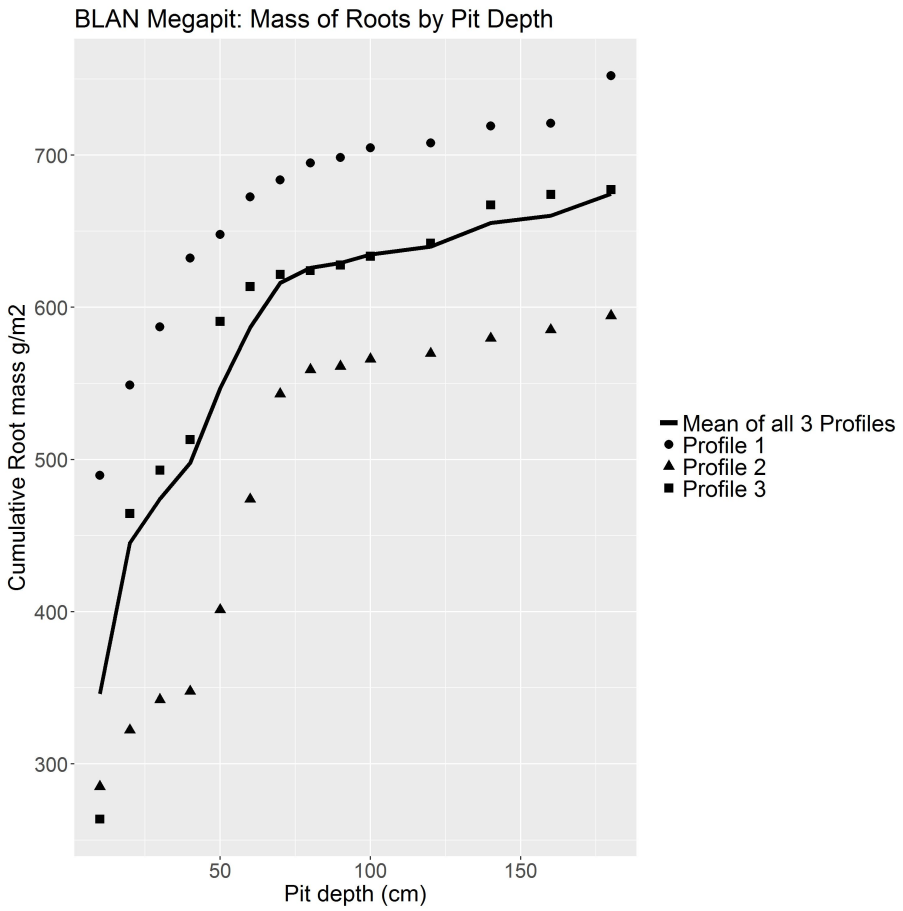


Figure 17: Cumulative root mass by pit depth at BLAN.

Table 37: Fine root biomass sampling summary data at BLAN.

| Total Pit Depth (cm) | 180 |
|---|---|
| Total Mean Cumulative Mass at 30cm (g per $m^2$) | 474.15 |
| Total Mean Cumulative Mass at 100cm (g per $m^2$) | 634.77 |
| Total Mean Cumulative Mass (g per $m^2$) | 674.63 |

## 6.4 Plant Characterization and Phenology Species Selection

### 6.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff in June 2015.Plant characterization data informs sampling procedures for plant phenology and plant productivity protocols.

The overall ranking ("Rank" in the table below) was calculated based on three separate measurements. Overall ranking weights are influenced by the number of species within each grouping.

1. Mean percent cover values were calculated based on species specific cover estimation for all plant species under 3m tall in eight 1m by 1m subplots per plot; see the TOS Protocol and Procedure: Plant Diversity Sampling (RD[09]) for more information.
2. Mean canopy area values were calculated based on all species specific shrub canopy diameter measurements within the entire plot or subplot; see the TOS Protocol and Procedure: Measurement of Vegetation Structure (RD[10]) for more information.
3. Mean ABH (area at breast height) measurements were calculated based on diameter at breast height measurements for all woody vegetation with a diameter greater than 1cm at 130cm height within the entire plot or subplot; see the TOS Protocol and Procedure: Measurement of Vegetation Structure (RD[10]) for more information.

The standard field methods and ranking calculations are further outlined in TOS Site Characterization Methods (RD[6]). For more information on this protocol and data product numbers see Appendix A.

### 6.4.2 Results

Table 38: Site plant characterization and phenology species summary at BLAN.

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| RHDA | *Rhamnus davurica* Pall. | 1 | 7 | 0.72 | 0.21 |
| LOMA6 | *Lonicera maackii* (Rupr.) Herder | 2 | <1 | 0.32 | 0.12 |
| JUNI | *Juglans nigra* L. | 3 | <1 | 0.006 | 2.06 |
| ZEMA | *Zea mays* L. | 4 | 13 | NA | NA |
| CEOC | *Celtis occidentalis* L. | 5 | <1 | NA | 1.49 |
| QUAL | *Quercus alba* L. | 6 | NA | NA | 0.84 |
| LIBE3 | *Lindera benzoin* (L.) Blume | 7 | <1 | 0.092 | 0.02 |
| CEOR7 | *Celastrus orbiculatus* Thunb. | 8 | 3 | NA | 0.34 |
| SOAL6 | *Solidago altissima* L. | 9 | 6 | NA | NA |
| PIST | *Pinus strobus* L. | 10 | NA | NA | 0.51 |
| CAGL8 | *Carya glabra* (Mill.) Sweet | 11 | NA | NA | 0.29 |
| TEDA | *Tetradium daniellii* (Benn.) T.G. Hartley | 13 | <1 | NA | 0.15 |
| TRITI | *Triticum* sp. | 14 | 1 | NA | NA |
| LOJA | *Lonicera japonica* Thunb. | 15 | <1 | NA | 0.04 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| AIAL | *Ailanthus altissima* (Mill.) Swingle | 16 | NA | NA | 0.11 |
| POLYG4 | *Polygonum* sp. | 17 | <1 | NA | NA |
| JUVIV | *Juniperus virginiana* L. var. *virginiana* | 18 | NA | NA | 0.03 |
| LOIN | *Lobelia inflata* L. | 19 | <1 | NA | NA |
| RHSC3 | *Rhodotypos scandens* (Thunb.) Makino | 20 | <1 | NA | NA |
| MIVI | *Microstegium vimineum* (Trin.) A. Camus | 21 | <1 | NA | NA |
| BRIN2 | *Bromus inermis* Leyss. | 22 | <1 | NA | NA |
| PRUNUSPP | *Prunus* sp. | 23 | NA | NA | 0.05 |
| TORA2 | *Toxicodendron radicans* (L.) Kuntze | 24 | <1 | NA | NA |
| ASTR | *Asimina triloba* (L.) Dunal | 25 | NA | NA | 0.02 |
| LYAR6 | *Lysimachia arvensis* (L.) U. Manns & Anderb. | 26 | <1 | NA | NA |
| PRSES | *Prunus serotina* Ehrh. var. *serotina* | 27 | <1 | NA | 0.03 |
| POIN5 | *Potentilla indica* (Andrews) Th. Wolf | 28 | <1 | NA | NA |
| VITIS | *Vitis* sp. | 29 | <1 | NA | 0.02 |
| ACNEN | *Acer negundo* L. var. *negundo* | 30 | NA | NA | NA |
| PAQU2 | *Parthenocissus quinquefolia* (L.) Planch. | 31 | <1 | NA | 0.01 |
| RUPH | *Rubus phoenicolasius* Maxim. | 32 | <1 | NA | NA |
| ELYMU | *Elymus* sp. | 33 | <1 | NA | NA |
| RUBUS | *Rubus* sp. | 33 | <1 | NA | NA |
| OXALI | *Oxalis* sp. | 35 | <1 | NA | NA |
| PRSES | *Prunus serotina* Ehrh. var. *serotina* | 36 | <1 | NA | 0.03 |
| CILU | *Circaea lutetiana* L | 37 | <1 | NA | NA |
| FRAM2 | *Fraxinus americana* L. | 38 | NA | NA | 0.02 |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| POACEA | Poaceae sp. | 40 | <1 | NA | NA |
| ALPE4 | *Alliaria petiolata* (M. Bieb.) Cavara & Grande | 41 | <1 | NA | NA |
| SOHA | *Sorghum halepense* (L.) Pers. | 42 | <1 | NA | NA |
| LISI | *Ligustrum sinense* Lour. | 43 | NA | 0.002 | NA |
| GAVE | *Galium verum* L. | 44 | <1 | NA | NA |
| BROMU | *Bromus* sp. | 45 | <1 | NA | NA |
| RUBUSSPP | *Rubus* sp. | 45 | <1 | NA | NA |
| GLHE2 | *Glechoma hederacea* L. | 47 | <1 | NA | NA |
| IMCA | *Impatiens capensis* Meerb. | 48 | <1 | NA | NA |
| POLYG4SPP | *Polygonum* sp. | 49 | <1 | NA | NA |
| PEVI13 | *Persicaria virginiana* (L.) Gaertn. | 50 | <1 | NA | NA |
| RUAL | *Rubus allegheniensis* Porter | 50 | <1 | NA | NA |
| SOCAC4 | *Solanum carolinense* L. var. *carolinense* | 52 | <1 | NA | NA |
| GIBI2 | *Ginkgo biloba* L. | 53 | NA | 0.001 | NA |
| ANOD | *Anthoxanthum odoratum* L. | 54 | <1 | NA | NA |
| CYPERA | Cyperaceae sp. | 54 | <1 | NA | NA |
| APCA | *Apocynum cannabinum* L. | 56 | <1 | NA | NA |
| SACA15 | *Sanicula canadensis* L. | 57 | <1 | NA | NA |
| GECA7 | *Geum canadense* Jacq. | 58 | <1 | NA | NA |
| HAVI2 | *Hackelia virginiana* (L.) I.M. Johnst. | 59 | <1 | NA | NA |
| BRASSI | Brassicaceae sp. | 60 | <1 | NA | NA |
| CIRSI | *Cirsium* sp. | 61 | <1 | NA | NA |
| GLTR | *Gleditsia triacanthos* L. | 62 | NA | NA | 0 |
| AMAR2 | *Ambrosia artemisiifolia* L. | 63 | <1 | NA | NA |
| DIGIT2 | *Digitaria* sp. | 64 | <1 | NA | NA |
| PIPU2 | *Pilea pumila* (L.) A. Gray | 65 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| SYOR | *Symphoricarpos orbiculatus* Moench | 66 | <1 | NA | NA |
| ARTR | *Arisaema triphyllum* (L.) Schott | 67 | <1 | NA | NA |
| TAOF | *Taraxacum officinale* F.H. Wigg. | 67 | <1 | NA | NA |
| VEBL | *Verbascum blattaria* L. | 67 | <1 | NA | NA |
| VERON | *Veronica* sp. | 67 | <1 | NA | NA |
| FESU3 | *Festuca subverticillata* (Pers.) Alexeev | 71 | <1 | NA | NA |
| PHLE5 | *Phryma leptostachya* L. | 72 | <1 | NA | NA |
| TRIFO | *Trifolium* sp. | 72 | <1 | NA | NA |
| VEAL | *Verbesina alternifolia* (L.) Britton ex Kearney | 72 | <1 | NA | NA |
| SOLID | *Solidago* sp. | 75 | <1 | NA | NA |
| ACMI2 | *Achillea millefolium* L. | 76 | <1 | NA | NA |
| HEHE5 | *Heliopsis helianthoides* (L.) Sweet | 76 | <1 | NA | NA |
| POA | *Poa* sp. | 76 | <1 | NA | NA |
| ROMU | *Rosa multiflora* Thunb. | 76 | <1 | NA | NA |
| STELL | *Stellaria* sp. | 76 | <1 | NA | NA |
| MOVE | *Mollugo verticillata* L. | 81 | <1 | NA | NA |
| PHYSA | *Physalis* sp. | 81 | <1 | NA | NA |
| PLMA2 | *Plantago major* L. | 81 | <1 | NA | NA |
| SMRO | *Smilax rotundifolia* L. | 81 | <1 | NA | NA |
| ACRH | *Acalypha rhomboidea* Raf. | 85 | <1 | NA | NA |
| COAR4 | *Convolvulus arvensis* L. | 85 | <1 | NA | NA |
| ERAN | *Erigeron annuus* (L.) Pers. | 85 | <1 | NA | NA |
| LIGUS2 | *Ligustrum* sp. | 85 | <1 | NA | NA |
| POPE | *Podophyllum peltatum* L. | 85 | <1 | NA | NA |
| RUOB | *Rumex obtusifolius* L. | 85 | <1 | NA | NA |
| SACA13 | *Sanguinaria canadensis* L. | 85 | <1 | NA | NA |
| SOAL6 | *Solidago altissima* L. | 85 | 6 | NA | NA |
| VIMI2 | *Vinca minor* L. | 85 | <1 | NA | NA |

| Taxon ID | Scientific Name | Rank | Mean Percent Cover | Mean Canopy Area per $m^2$ | Mean ABH ($cm^2$ per $m^2$) |
|---|---|---|---|---|---|
| VIOLA | *Viola* sp. | 85 | <1 | NA | NA |
| ALVI | *Allium vineale* L. | 95 | <1 | NA | NA |
| CAREX | *Carex* sp. | 95 | <1 | NA | NA |
| CARYA | *Carya* sp. | 95 | <1 | NA | NA |
| ERHI12 | *Erechtites hieraciifolia* (L.) Raf. ex DC. | 95 | <1 | NA | NA |
| EUPHO | *Euphorbia* sp. | 95 | <1 | NA | NA |
| GAAP2 | *Galium aparine* L. | 95 | <1 | NA | NA |
| MUSC | *Muhlenbergia schreberi* J.F. Gmel. | 95 | <1 | NA | NA |
| POAV | *Polygonum aviculare* L. | 95 | <1 | NA | NA |
| TOAR | *Torilis arvensis* (Huds.) Link | 95 | <1 | NA | NA |
| VETH | *Verbascum thapsus* L. | 95 | <1 | NA | NA |

Note:Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov).

Table 39: Per plot breakdown of species richness, diversity, and herbaceous cover at BLAN.

| Plot ID | Species Richness | Shannon Diversity Index | Percent Total Herbaceous Cover | Bryophyte Percent Cover |
|---|---|---|---|---|
| BLAN_031 | 7 | 0.43 | 37 | 0.5 |
| BLAN_032 | 28 | 2.3 | 162 | 2.69 |
| BLAN_033 | 14 | 2.27 | 17 | 0.83 |
| BLAN_034 | 8 | 0.75 | 21 | 0 |
| BLAN_035 | 9 | 1.59 | 20 | 5.69 |
| BLAN_036 | 24 | 2.37 | 94 | 6.56 |
| BLAN_037 | 8 | 0.52 | 44 | 0.88 |
| BLAN_038 | 10 | 0.71 | 36 | 0.25 |
| BLAN_039 | 9 | 0.46 | 52 | 0.25 |
| BLAN_040 | 9 | 1.64 | 16 | 0.69 |
| BLAN_041 | 19 | 2.05 | 154 | 15.69 |
| BLAN_042 | 6 | 0.29 | 37 | 0 |
| BLAN_043 | 7 | 1.39 | 11 | 0.44 |

| Plot ID | Species Richness | Shannon Diversity Index | Percent Total Herbaceous Cover | Bryophyte Percent Cover |
|---|---|---|---|---|
| BLAN_044 | 15 | 2.28 | 53 | 1.81 |
| BLAN_045 | 9 | 0.49 | 42 | 0.25 |
| BLAN_046 | 4 | 0.15 | 39 | 0.06 |
| BLAN_047 | 31 | 2.76 | 123 | 0.75 |
| BLAN_048 | 23 | 2.85 | 35 | 0.12 |
| BLAN_049 | 13 | 1.64 | 38 | 2.25 |
| BLAN_050 | 15 | 1.97 | 45 | 0.5 |
| BLAN_051 | 11 | 1.89 | 17 | 1.81 |
| BLAN_052 | 10 | 1.82 | 36 | 14.38 |
| BLAN_053 | 24 | 1.99 | 148 | 3 |
| BLAN_054 | 8 | 0.46 | 38 | 0.25 |
| BLAN_055 | 18 | 1.43 | 100 | 0.06 |
| BLAN_056 | 9 | 0.66 | 37 | 0.44 |
| BLAN_057 | 11 | 1.48 | 216 | 3.06 |
| BLAN_059 | 8 | 0.46 | 41 | 0.06 |
| BLAN_060 | 10 | 1.78 | 20 | 0.62 |
| BLAN_063 | 23 | 2.18 | 94 | 0.67 |
| Bryophyte Mean | | | | 2.02 |

Note: Percent herbaceous cover was measured by species and then added together to calculate the percent total herbaceous cover for each plot.

Bryophyte percent cover data were used to determine which sites qualify for implementation of the Bryophyte Productivity protocol. However, bryophyte productivity sampling was discontinued in 2018 and NEON no longer implements this protocol.

## 6.5 Beetles

### 6.5.1 Site-Specific Methods

No beetle site characterization was conducted at BLAN. For more information on this protocol and data product numbers see Appendix A.

### 6.6 Mosquitoes

#### 6.6.1 Site-Specific Methods

No mosquito site characterization was conducted at BLAN.For more information on this protocol and data product numbers see Appendix A.

### 6.7 Ticks

#### 6.7.1 Site-Specific Methods

No tick site characterization was conducted at BLAN. For more information on this protocol and data product numbers see Appendix A.

### 6.8 Species Reference Lists

A review of the literature for taxonomic lists of interest for each site was conducted prior to field work. In the case of vertebrates that NEON may capture (e.g., reptiles, amphibians, small mammals), these lists were often required to secure permits. Key references identified in this effort are listed below. Species lists and associated references for small mammals and breeding landbirds can be found in the appendices of the respective protocols (RD[07], RD[08]). See the SCBI species reference list section for statewide resources.

Bousquet, Y. 2012. Catalogue of Geadephaga (Coleoptera, Adephaga) of America, north of Mexico. ZooKeys, (245), 1-1722.

Centers for Disease Control and Prevention. (2015). *Geographic distribution of ticks that bite humans.* Retrieved from http://www.cdc.gov/ticks/geographic/_distribution.html

Darsie Jr., R. F., and R. A. Ward. 2005. Identification and geographical distribution of the mosquitoes of North America, North of Mexico. University Press of Florida, Gainesville.

University of Virginia Blandy Experimental Farm. *Species Lists for Blandy Experimental Farm*. Retrieved from http://blandy.virginia.edu/research/species-lists-for-blandy

## 7 REFERENCES

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, *PE&RS*, Vol. 77(9):858-864.

USDA, NRCS. 2016. The PLANTS Database (http://plants.usda.gov, 1 August 2016). National Plant Data Team, Greensboro, NC 27401-4901 USA.

# 8 APPENDIX A: DATA PRODUCT NUMBERS

For more information on the sampling protocols and the latest observatory data visit http://data.neonscience.org/data-product-catalog and search by name or code number.

Table 40: NEON data product names and descriptions.

| Name | Description | Identification Code |
|---|---|---|
| Root sampling (megapit) | Fine root biomass in 10cm increments (first 1m depth) and 20cm increments (from 1m to 2m depth) from soil pit sampling | NEON.DOM.SITE.DP1.10066 |
| Soil physical properties (Megapit) | Soil taxonomy, horizon names, horizon depths, as well as soil bulk density, porosity, texture (sand, silt, and clay content) in the <= 2 mm soil fraction for each soil horizon. Data were derived from a sampling location expected to be representative of the area where the Instrumented Soil Plots per site are located and were collected once during site construction. Also see distributed soil data products. | NEON.DOM.SITE.DP1.00096 |
| Soil chemical properties (Megapit) | Total content of a range of chemical elements, pH, and electrical conductivity in the <= 2 mm soil fraction for each soil horizon. Data were derived from a sampling location expected to be representative of the area where the Instrumented Soil Plots per site are located and were collected once during site construction. Also see distributed soil data products. | NEON.DOM.SITE.DP1.00097 |
| Woody plant vegetation structure | Structure measurements, including height, canopy diameter, and stem diameter, as well as mapped position of individual woody plants | NEON.DOM.SITE.DP1.10098 |
| Plant presence and percent cover | Plant species presence as observed in multi-scale plots: species and associated percent cover at 1-m2 and plant species presence at 10-m2, 100-m2 and 400-m2 | NEON.DOM.SITE.DP1.10058 |
| Plant phenology observations | Phenophase status and intensity of tagged plants | NEON.DOM.SITE.DP1.10055 |
| Plant foliar stable isotopes | Field collection metadata describing the sampling of sun-lit canopy foliar tissues for stable isotope compositions. Also includes raw data returned from the laboratory. | NEON.DOM.SITE.DP1.10053 |
| Plant foliar physical and chemical properties | Plant sun-lit canopy foliar physical (e.g., leaf mass per area) and chemical properties reported at the level of the individual. | NEON.DOM.SITE.DP1.10026 |

| Name | Description | Identification Code |
|---|---|---|
| Non-herbaceous perennial vegetation structure | Field measurements of individual non-herbaceous perennial plants (e.g. cacti, ferns) | NEON.DOM.SITE.DP1.10045. |
| Ground beetles sampled from pitfall traps | Taxonomically identified ground beetles and the plots and times from which they were collected. | NEON.DOM.SITE.DP1.10022 |
| Ground beetle sequences DNA barcode | CO1 DNA sequences from select ground beetles | NEON.DOM.SITE.DP1.10020 |
| Mosquitoes sampled from CO2traps | Taxonomically identified mosquitoes and the plots and times from which they were collected | NEON.DOM.SITE.DP1.10043 |
| Mosquito-borne pathogen status | Presence/absence of a pathogen in a single mosquito sample (pool) | NEON.DOM.SITE.DP1.10041 |
| Mosquito sequences DNA barcode | CO1 DNA sequences from select mosquitoes | NEON.DOM.SITE.DP1.10038 |
| Ticks sampled using drag cloths | Abundance and density of ticks collected by drag and/or flag sampling (by species and/or lifestage) | NEON.DOM.SITE.DP1.10093 |
| Tick-borne pathogen status | Presence/absence of a pathogen in each single tick sample | NEON.DOM.SITE.DP1.10092 |