TOS SITE CHARACTERIZATION REPORT: DOMAIN 04

PREPARED BY	ORGANIZATION	DATE
Rachel Krauss	SCI	04/16/2018
Courtney Meier	SCI	04/16/2018
Michael Patterson	SCI	01/27/2017
Oliver Smith	SCI	09/11/2017

APPROVALS	ORGANIZATION	APPROVAL DATE
Kate Thibault	SCI	11/12/2018
Mike Stewart	SYS	11/12/2018

RELEASED BY	ORGANIZATION	RELEASE DATE
Judy Salazar	CM	11/20/2018

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CHANGE RECORD

REVISION	DATE	ECO#	DESCRIPTION OF CHANGE
A	10/13/2017	ECO-05049	Initial Release
B	11/20/2018	ECO-05648	• Added soil pit information table • Added percent cover of bryophyte to the plant diversity table

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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 two sites in the Atlantic Neotropical 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.011033	TIS Site Characterization Report
RD[05]	NEON.DOC.001648	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 04 OVERVIEW: ATLANTIC NEOTROPICAL DOMAIN

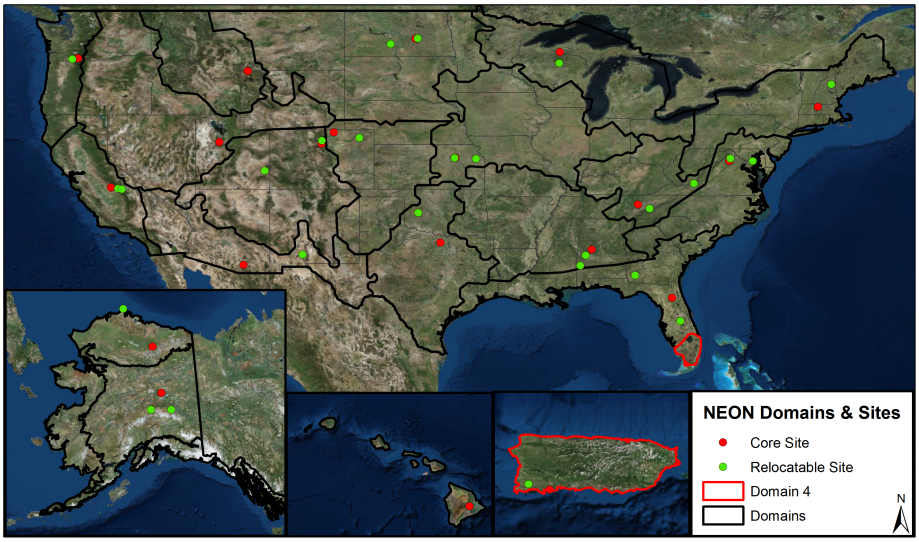

Figure 1: NEON project map with Domain 04 highlighted in red.

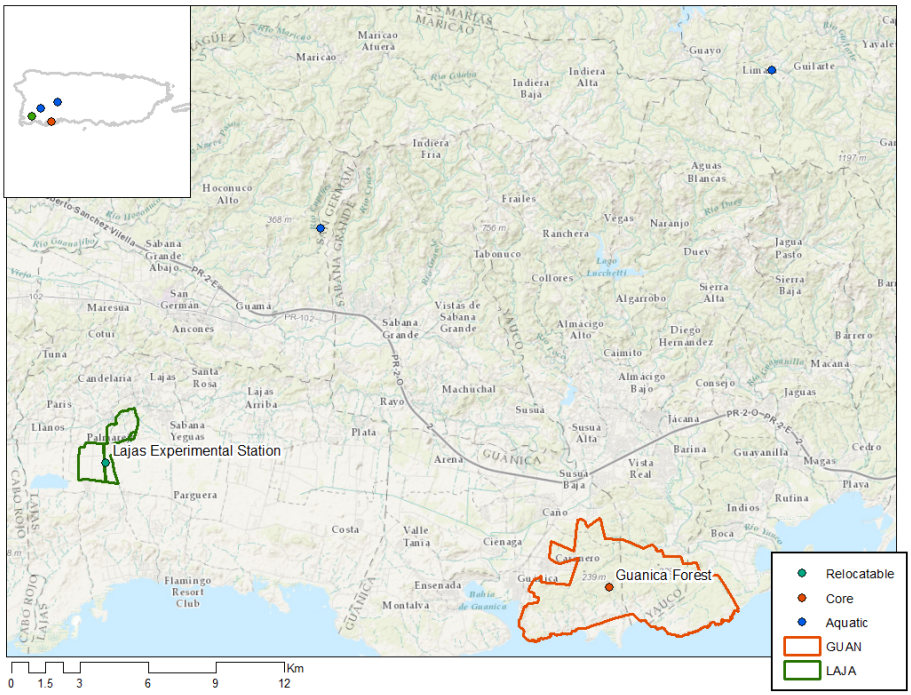

Figure 2: Site boundaries within Domain 04.

The Atlantic Neotropical Domain includes Puerto Rico and the southern tip of Florida. Invasive species and climate impacts are key grand challenge themes in D4, particularly on the island of Puerto Rico, which has a high level of native biodiversity and whose weather patterns are heavily influenced by the ocean. Both NEON sites are located in the south western dry forest zone of Puerto Rico. The Puerto Rico ecosystems also serve as a proxy model to extend comparative understandings to other tropical systems.

- States included in the domain: Puerto Rico and Florida
- Core site: Guanica Forest
- Relocatable 1: Lajas Experimental Station
- Science themes: Invasive Species, Agriculture, Climate Impacts

4 CORE SITE- GUANICA FOREST (GUAN)

Located along the southern coast of Puerto Rico, Guanica Dry Forest Reserve is the largest remaining tract of tropical dry coastal forest in the world and part of the International Biosphere Reserve network. The forest receives just 790-860mm of rainfall annually, with January- March typically the driest months (Matos-Torres, 2006).

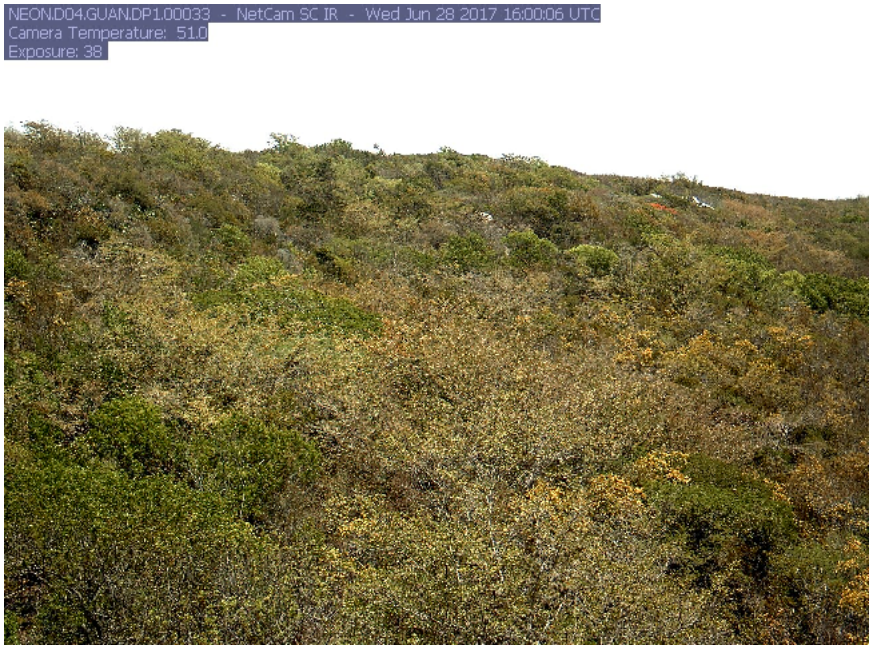

Figure 3: Phenocamera image for GUAN.

Note: 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: State Forest, Department of Natural and Environmental Resources, Commonwealth of Puerto Rico
- Located in: Guanica and Yauco Municipio
- Sampling Area: 28 km^2
- Plot Elevation: 5-215m
- Dominant vegetation type: Guanica Dry Forest Reserve is home to over 700 plant species and divided into three groups; upland deciduous forest, semi-evergreen forest, and the scrub forest closest to the shore. The vegetation is thick and dense with many multiple stemmed trees (Dunphy et al, 2000). Dominant canopy species include *Gymnanthes lucida* and *Pisonia albida*. Two common understory species are *Croton humilis* and *Eugenia foetida*.
- General management: Forty square kilometers were designated as a commonwealth forest in 1919 and disturbance since has been minimal (Dunphy et al, 2000). The reserve is open to the public and there are numerous trails and roads.

- Plot Selection: NEON TOS Distributed Base Plots, Distributed Mammal Grids, Distributed Bird Grids, Distributed Mosquito Points, Tower Base Plots, and Tower Phenology plots were allocated across the site following NEON standard criteria and avoiding existing research. Due to dense, thorny vegetation Distributed Tick Plots were allocated as free form 120-160m transects rather than the standard square 160m transect. Due to the hard limestone substrate, beetle pitfall traps are located where digging is possible within the Distributed Base Plot instead of the standard placement along the cardinal vertices. Each pitfall trap has a minimum buffer of 15m from other traps.

4.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at GUAN according to a spatially balanced and stratified-random design (RD[3]). The 2001 National Land Cover Database (NLCD) was selected for stratification because of the consistent and comparable data availability across the United States. At the GUAN site, vegetation along the coast were erroneously classified as grassland herbaceous by the NLCD. Erroneously classified vegetation was not included in the initial TOS sampling design, and the site will be reclassified with data from NEON's remote-sensing platform in the first years of Observatory operations. When re-classification is complete, TOS Distributed base 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.

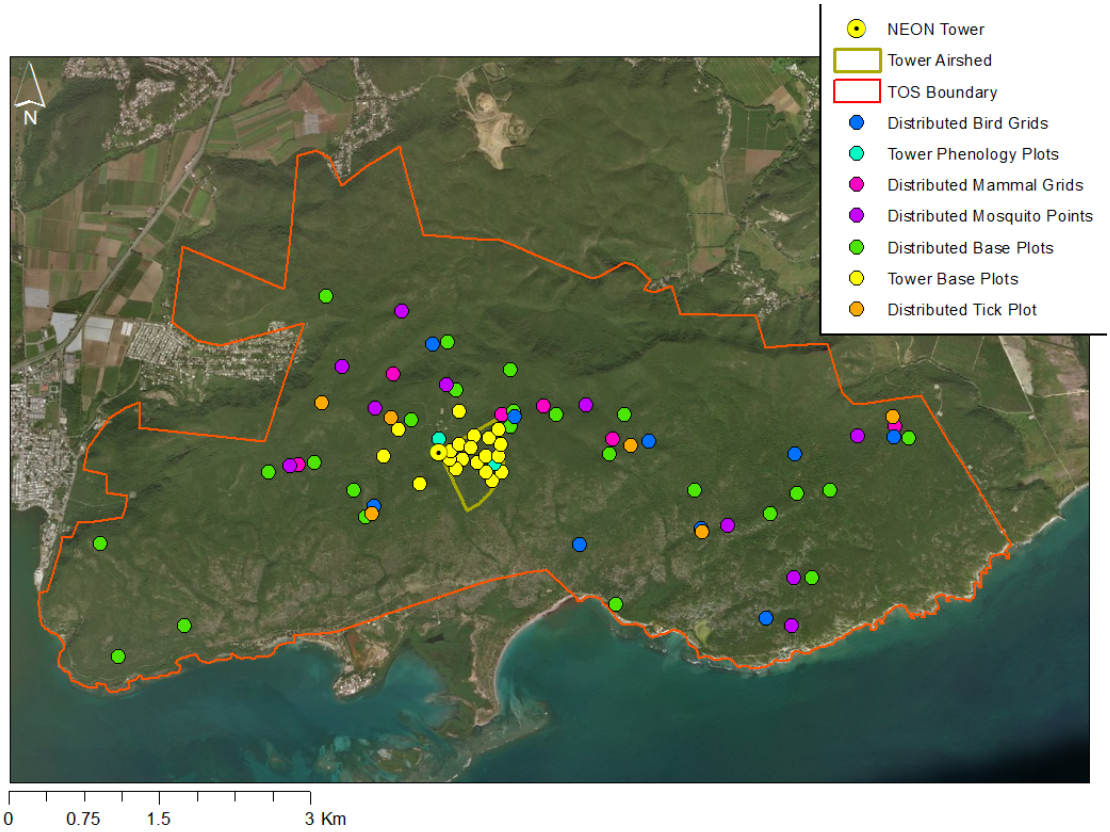

Figure 4: Map of TOS plot centroids within the NEON TOS sampling boundary at GUAN.

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

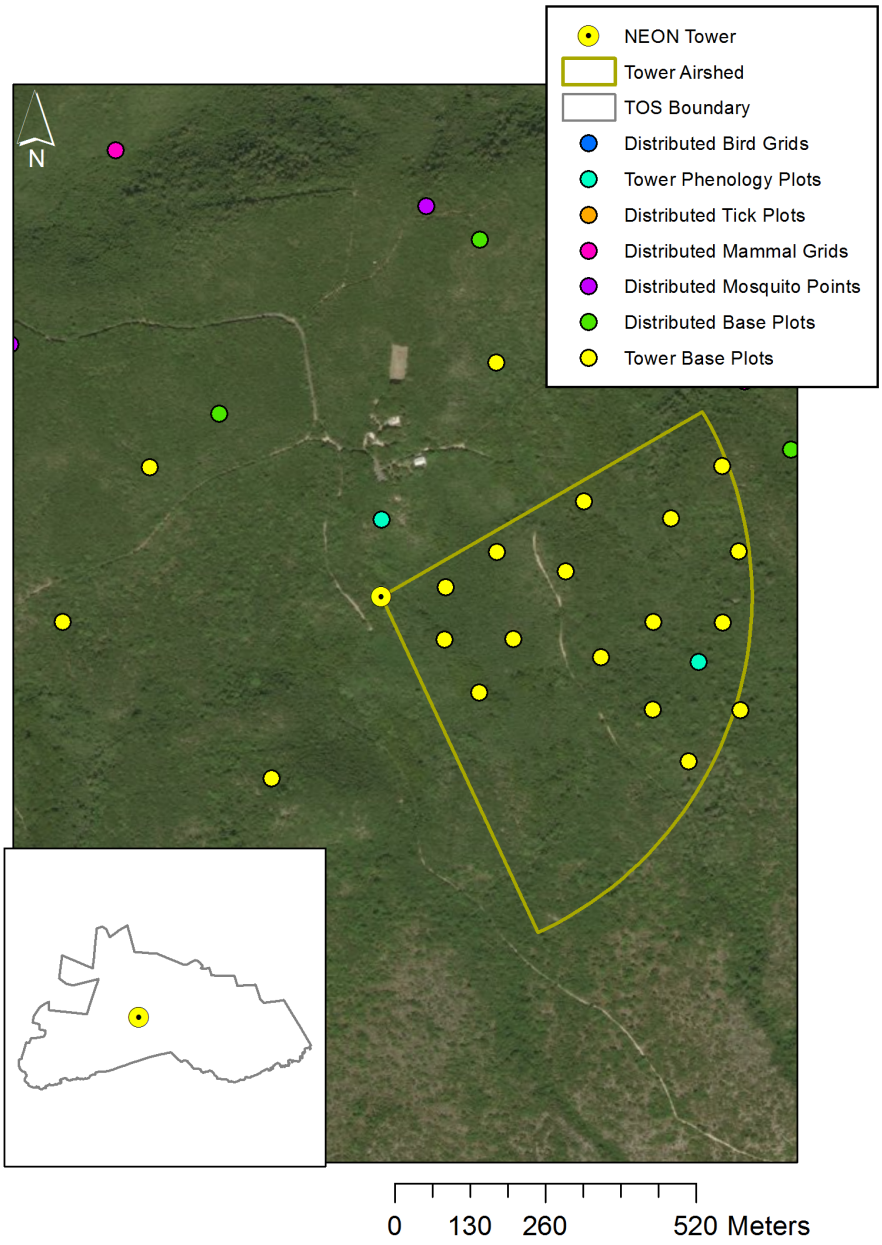

Figure 5: Map of the tower airshed and TOS plot centroids at GUAN.

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 GUAN.

NLCD Class	Site Area (km^2)	Percent (%)
Evergreen Forest	26.14	92.23
Grassland Herbaceous	1.9	6.71
Woody Wetlands	0.07	0.26
Developed Low Intensity	0.07	0.25
Shrub Scrub	0.07	0.24
Open Water	0.03	0.11
Developed Medium Intensity	0.02	0.08
Barren Land	0.02	0.05
Cultivated Crops	0.01	0.03
Developed Open Space	0.01	0.02

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 GUAN.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Evergreen Forest	24
Distributed	Bird Grid	Evergreen Forest	9
Distributed	Mosquito Point	Evergreen Forest	10
Distributed	Tick Plot	Evergreen Forest	6
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 evergreen forest.

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

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Beetles	10
Distributed	Base Plot	Evergreen Forest	Canopy Foliage Chemistry	10
Distributed	Base Plot	Evergreen Forest	Coarse Downed Wood	20
Distributed	Base Plot	Evergreen Forest	Digital Hemispherical Photos for Leaf Area Index	20

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Herbaceous Biomass	20
Distributed	Base Plot	Evergreen Forest	Plant Diversity	24
Distributed	Base Plot	Evergreen Forest	Soil Biogeochemistry	6
Distributed	Base Plot	Evergreen Forest	Soil Microbes	6
Distributed	Base Plot	Evergreen Forest	Vegetation Structure	20

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 GUAN.

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: GUAN

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.

However, greenness status does not tease apart seasonal patterns at tropical sites like GUAN (see Figure 6 below). Working with colleagues from the University of Puerto Rico and local NEON staff it was determined to use

precipitation data (see Figure 7) as the primary driver in guiding temporal aspects of TOS sampling in Puerto Rico. Precipitation data from 1980-2015 was analyzed from Ensenada station which is approximately 5 kilometers from GUAN. Peak herbaceous biomass and woody production are assumed to occur during the wet-season (Aug-Nov).

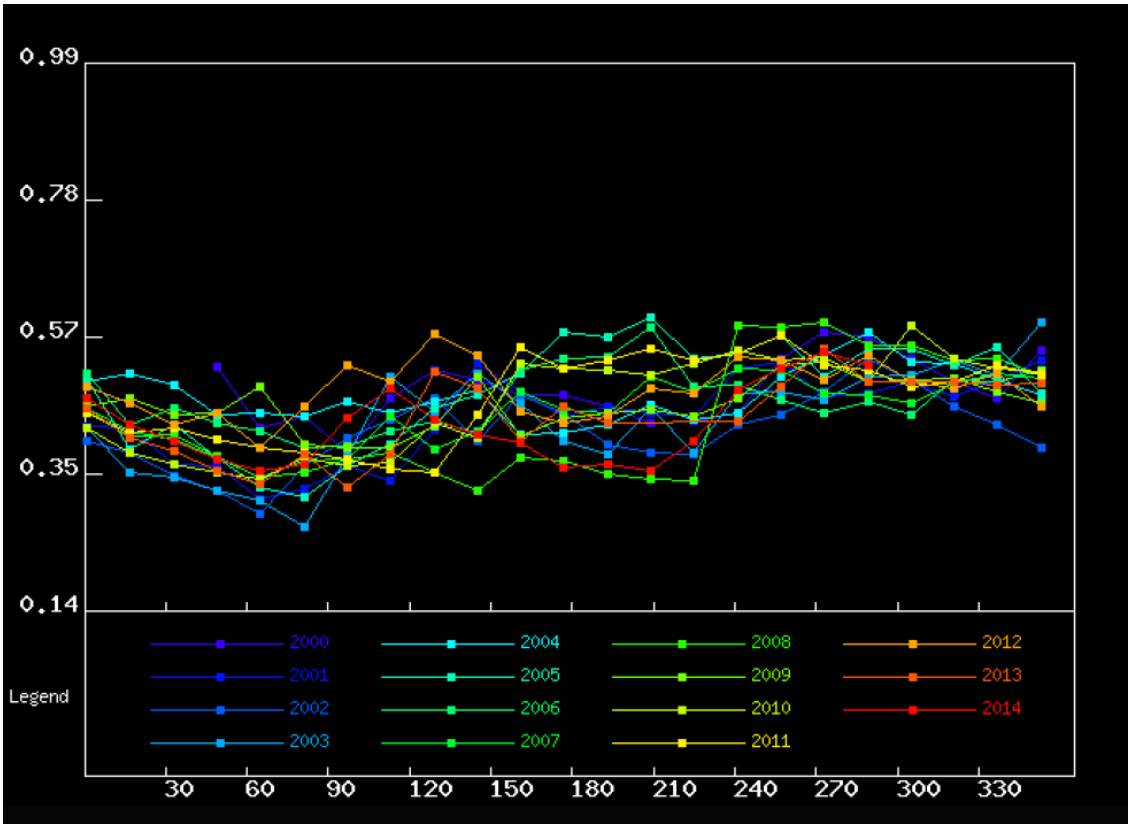

Figure 6: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON GUAN site.

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: 2000-2014
- User selected area: 2.25 km x 2.25 km box, Centroid Latitude: 17.971, Longitude: -66.8688 (WGS84 datum)

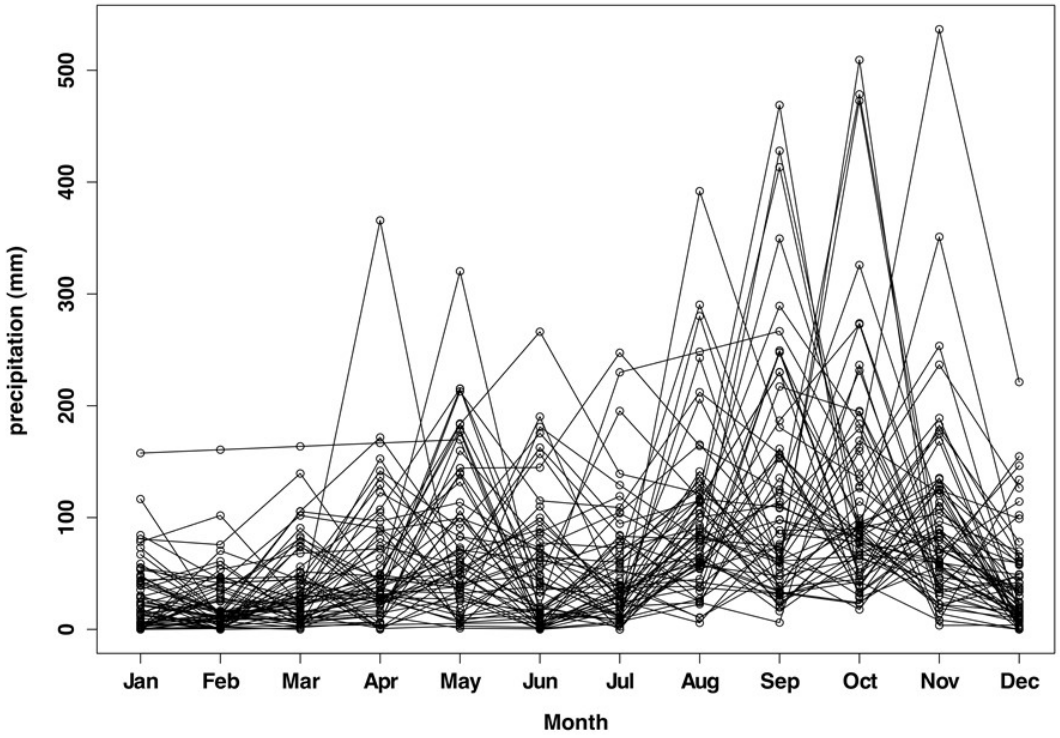

Figure 7: Monthly precipitation at Ensenada, Puerto Rico, 1980-2015. Data from Dr. Catherine Hulshof, personal communication.

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 April 2015. 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.

4.3.2 Results

Table 5: Soil Pit Information at GUAN.

Latitude	Longitude	Soil Family	Soil Order
17.96882	-66.86888	Coarse-loamy - carbonatic - isohyperthermic Typic Haplocalcids	Aridisol

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

Table 6: Fine root mass per depth increment (cm) at GUAN.

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	6.15	1.87
10	20	6.81	1.38
20	30	3.42	2.7
30	40	2.99	3.46
40	50	2.04	1.64
50	60	3.42	0.58
60	70	18.74	18.8
70	80	1.12	0.29
80	90	0.63	0.58
90	100	0.13	0.05
100	120	0.11	0.05
120	140	0.09	0.1
140	160	0.01	0
160	180	0.03	0.03
180	200	0.02	0.02

Table 7: Cumulative fine root mass as a function of depth (cm) at GUAN.

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	615.07	186.79
10	20	1296.41	274.04
20	30	1638.37	486.68
30	40	1936.92	231.07
40	50	2140.53	160.41
50	60	2482.6	156.86
60	70	4357.04	1955.74
70	80	4468.9	1966.49

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
80	90	4531.44	2022.39
90	100	4544.01	2022.17
100	120	4565.8	2015.99
120	140	4583.46	2034.08
140	160	4585.4	2034.25
160	180	4591.86	2033.6
180	200	4595.33	2037.05

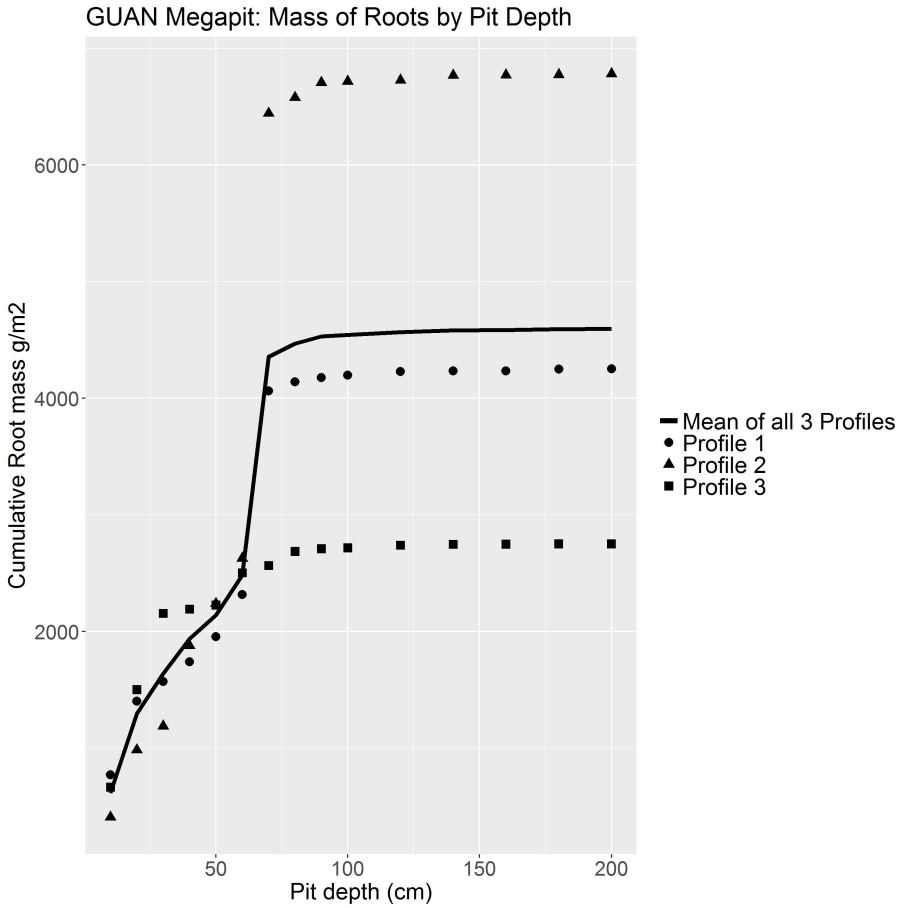

Figure 8: Cumulative root mass by pit depth at GUAN.

Table 8: Fine root biomass sampling summary data at GUAN.

Total Pit Depth (cm)	200
Total Mean Cumulative Mass at 30cm (g per m^2)	1638.37

Total Mean Cumulative Mass at 100cm (g per m^2)	4544.01
Total Mean Cumulative Mass (g per m^2)	4595.33

4.4 Plant Characterization and Phenology Species Selection

4.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff during November 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.

4.4.2 Results

Table 9: Site plant characterization and phenology species summary at GUAN.

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
GYLU	*Gymnanthes lucida* Sw.	1	4	0.22	NA
GUOF	*Guaiacum officinale* L.	10	<1	NA	1.06
CLTE3	*Clitoria ternatea* L.	100	NA	NA	<1
BOURR	*Bourreria* sp.	11	2	NA	0.39
PIAL3	*Pisonia albida* (Heimerl) Britton ex Standl.	12	<1	NA	0.65
CAHA9	*Capparis hastata* Jacq.	13	<1	0.05	NA

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
KRFE	*Krugiodendron ferreum* (Vahl) Urb.	14	<1	0.03	NA
BUSI	*Bursera simaruba* (L.) Sarg.	15	<1	NA	0.59
RAAC	*Randia aculeata* L.	16	<1	0.03	NA
WEFR	*Wedelia fruticosa* Jacq.	17	1	0.01	NA
PIUN	*Pithecellobium unguis-cati* (L.) Benth.	18	<1	0.03	NA
BUGL	*Bunchosia glandulosa* (Cav.) DC.	19	NA	0.04	NA
CRLU2	*Croton lucidus* L.	2	3	0.22	NA
BUBU	*Bucida buceras* L.	20	<1	NA	0.51
ERRO3	*Erythroxylum rotundifolium* Lunan	21	<1	0.03	NA
CODI8	*Coccoloba diversifolia* Jacq.	22	<1	0.02	NA
POACEA	Poaceae sp.	23	<1	NA	NA
DILA10	*Distictis lactiflora* (Vahl) DC.	24	<1	NA	0.12
ARCA20	*Argythamnia candicans* Sw.	25	<1	NA	NA
POFL20	*Poitea florida* (Vahl) Lavin	26	<1	0.01	NA
ERAR17	*Erythroxylum areolatum* L.	27	<1	0.02	NA
GUSA	*Guaiacum sanctum* L.	28	<1	NA	0.15
LAEX	*Lantana exarata* Urb. & Ekman	29	<1	0.02	NA
EUFO3	*Eugenia foetida* Pers.	3	3	0.21	NA
GUKR	*Guettarda krugii* Urb.	30	<1	0.01	NA
ARFA	*Argythamnia fasciculata* (Vahl ex A. Juss.)	31	<1	0.01	NA
SCFR	*Schaefferia frutescens* Jacq.	32	<1	0.01	NA
THMO4	*Thrinax morrisii* H. Wendl.	33	NA	0.02	NA
HEJA	*Helicteres jamaicensis* Jacq.	34	<1	0.01	NA

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
COKR	*Coccoloba krugii* Lindau	35	<1	<1	NA
REUN	*Reynosia uncinata* Urb.	36	<1	0.01	NA
HACA2	*Haematoxylum campechianum* L.	37	NA	0.01	NA
COMI	*Coccoloba microstachya* Willd.	38	<1	<1	NA
COAR3	*Colubrina arborescens* (Mill.) Sarg.	39	<1	NA	NA
LELE10	*Leucaena leucocephala* (Lam.) de Wit	4	2	<1	1.09
MAPO6	*Machaonia portoricensis* Baill.	40	NA	0.01	NA
SEPO4	*Serjania polyphylla* (L.) Radlk.	41	<1	NA	0.05
EXCA	*Exostema caribaeum* (Jacq.) Schult.	42	<1	0.01	NA
SANSE	*Sansevieria* sp.	43	<1	NA	NA
ROAC2	*Rochefortia acanthophora* (DC.) Griseb.	44	<1	<1	NA
SIOB	*Sideroxylon obovatum* Lam.	45	<1	<1	NA
PIAC	*Pictetia aculeata* (Vahl) Urb.	46	<1	NA	NA
CAXY	*Cassine xylocarpa* Vent.	48	NA	<1	NA
CRBE4	*Croton betulinus* Vahl	49	<1	NA	NA
GAST2	*Galactia striata* (Jacq.) Urb.	5	NA	NA	2.08
CAFL2	*Capparis flexuosa* (L.) L.	50	<1	NA	<1
EUAX	*Eugenia axillaris* (Sw.) Willd.	51	<1	<1	NA
CODO	*Comocladia dodonaea* (L.) Urb.	52	<1	<1	NA
BOSU2	*Bourreria succulenta* Jacq.	53	<1	NA	<1
STEM3	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	54	<1	NA	0.04

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
ACRE4	*Acacia retusa* (Jacq.) Howard	55	<1	NA	0.03
CENI	*Celosia nitida* Vahl	57	<1	NA	<1
LADI3	*Lasiacis divaricata* (L.) Hitchc.	58	<1	NA	NA
CRDI8	*Croton discolor* Willd.	59	<1	<1	NA
SWMA2	*Swietenia mahagoni* (L.) Jacq.	6	<1	NA	1.89
ACFA	*Acacia farnesiana* (L.) Willd.	60	NA	NA	0.05
MAUN3	*Macfadyena unguis-cati* (L.) A.H. Gentry	61	<1	NA	<1
SESI3	*Senna siamea* (Lam.) Irwin & Barneby	62	NA	NA	0.04
HEPU17	*Heteropterys purpurea* (L.) Kunth	63	<1	NA	0.01
TRVO	*Tragia volubilis* L.	64	<1	NA	NA
TOVO	*Tournefortia volubilis* L.	65	<1	NA	0.02
TAHE	*Tabebuia heterophylla* (DC.) Britton	66	<1	<1	0.02
CRRH	*Crossopetalum rhacoma* Crantz	67	NA	<1	NA
ZIRE	*Ziziphus reticulata* (Vahl) DC.	68	NA	<1	NA
JABE	*Jacquinia berteroi* Spreng.	69	<1	<1	NA
THSTP	*Thouinia striata* Radlk. var. *portoricensis* (Radlk.) Votava & Alain	7	<1	0.1	NA
CAIN5	*Capparis indica* (L.) Druce	70	<1	NA	NA
SASE6	*Savia sessiliflora* (Sw.) Willd.	70	<1	NA	NA
JAFL	*Jasminum fluminense* Vell.	72	<1	NA	0.01
COHI3	*Corchorus hirsutus* L.	73	<1	NA	NA
BEDI2	*Bernardia dichotoma* (Willd.) M??ll. Arg.	74	<1	NA	NA

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
PLPOP	*Pleopeltis polypodioides* (L.) Andrews & Windham ssp. *polypodioides*	74	<1	NA	NA
CODI5	*Commelina diffusa* Burm. f.	76	<1	NA	NA
PAED	*Passiflora edulis* Sims	76	<1	NA	NA
FABACE	Fabaceae sp.	78	NA	NA	0.01
DESMO	*Desmodium* sp.	79	<1	NA	NA
EURH	*Eugenia rhombea* (Berg) Krug & Urb.	8	2	0.05	NA
JACU3	*Jacquemontia cumanensis* (Kunth) Kuntze	80	<1	NA	<1
PHEP	*Phyllanthus epiphyllanthus* L.	81	<1	NA	NA
CITR2	*Cissus trifoliata* (L.) L.	82	<1	NA	<1
AGSI2	*Agave sisalana* Perrine	84	NA	<1	NA
ACAS	*Achyranthes aspera* L.	85	<1	NA	NA
BROMEL	Bromeliaceae sp.	85	<1	NA	NA
IPST2	*Ipomoea steudelii* Millsp.	87	<1	NA	<1
CAPPA	*Capparis* sp.	88	<1	NA	NA
CRFL23	*Croton flavens* L.	88	<1	NA	NA
EULI	*Eugenia ligustrina* (Sw.) Willd.	88	<1	NA	NA
EUPE8	*Euphorbia petiolaris* Sims	88	<1	NA	NA
LEQU	*Leptocereus quadricostatus* (Bello) Britton & Rose	88	<1	NA	NA
PASU3	*Passiflora suberosa* L.	88	<1	NA	NA
SADO7	*Samyda dodecandra* Jacq.	88	<1	NA	NA
AMEL	*Amyris elemifera* L.	9	<1	0.08	NA
CACTAC	Cactaceae sp.	95	<1	NA	NA
CRHU	*Croton humilis* L.	95	<1	NA	NA
MALVAC	Malvaceae sp.	95	<1	NA	NA
CHSI	*Chromolaena sinuata* (Lam.) R.M. King & H. Rob.	98	NA	NA	<1

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
AGMI4	*Agave missionum* Trel.	99	NA	<1	NA

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

Table 10: Per plot breakdown of species richness, diversity, and herbaceous cover at GUAN.

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
GUAN_042	23	1.77	85	0
GUAN_043	21	2.34	158	1.25
GUAN_044	25	2.89	41	0
GUAN_045	23	2.34	107	0.25
GUAN_046	25	2.24	145	0
GUAN_047	21	2.24	91	0
GUAN_048	17	2.09	97	0.5
GUAN_049	21	2.43	63	0.69
GUAN_050	13	1.83	29	0
GUAN_051	22	2.27	167	0
GUAN_052	19	2.32	117	0
GUAN_053	14	1.83	187	0.56
GUAN_054	22	2.52	111	0.31
GUAN_055	18	2.24	96	0
GUAN_056	21	2.46	59	0
GUAN_057	22	2.28	159	0
GUAN_058	21	2.22	139	0.12
GUAN_059	20	2.45	88	0
GUAN_060	20	1.93	121	0
GUAN_061	19	2.18	49	0.06
Bryophyte Mean				0.19

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.

4.5 Beetles

4.5.1 Site-Specific Methods

Beetle site characterization was conducted in February of 2014 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Ten pit fall traps were set for two weeks. No carabids were caught during site characterization work. For more information on this protocol and data product numbers see Appendix A.

4.6 Mosquitoes

4.6.1 Site-Specific Methods

Mosquito site characterization was conducted in February of 2014 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. No pathogen testing was performed. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

4.6.2 Results

Table 11: Mosquito identification results at GUAN.

Sample ID	Scientific Name	Gender	Count
GUAN.February2014.SC.1	*Aedes aegypti*	female	2
GUAN.February2014.SC.1	*Aedes taeniorhynchus*	female	199
GUAN.February2014.SC.1	*Culex erraticus*	female	1
GUAN.February2014.SC.1	*Culex* spp.	female	1

4.7 Ticks

4.7.1 Site-Specific Methods

Tick drags were conducted at GUAN in February of 2014 to test protocol methods and calculate capture rates. No ticks were captured or seen during site characterization work. For more information on this protocol and data product numbers see Appendix A.

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]).

Allan, J.D., Barnthouse, L.W., Prestbye, R.A. and Strong, D.R., 1973. On foliage arthropod communities of Puerto Rican second growth vegetation. Ecology, 54(3), pp.628-632.

Beltrán, W., & Wunderle, J. M. (2014). Temporal Dynamics of Arthropods on Six Tree Species in Dry Woodlands on the Caribbean Island of Puerto Rico. Journal of Insect Science, 14(1), 199. http://doi.org/10.1093/jisesa/ieu061

Bloxam, Q.M. and Tonge, S.J., 1995. Amphibians: suitable candidates for breeding-release programmes. Biodiversity and Conservation, 4(6), pp.636-644.

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.

Dunphy, B.K., Murphy, P.G. and Lugo, A.E., 2000. The tendency for trees to be multiple-stemmed in tropical and subtropical dry forests: studies of Guanica forest, Puerto Rico. Tropical Ecology, 41(2), pp.161-168.

Genet, K.S., Genet, J.A., Burton, T.M. and Murphy, P.G., 2001. The lizard community of a subtropical dry forest: Guanica forest, Puerto Rico. Tropical Ecology, 42(1), pp.97-109.

Little, E.L. & F.H. Wadsworth. 1964. Common Trees of Puerto Rico and the Virgin Island. USDA Forest Service, Agr. Handbook 249

Matos-Torres, J.J., 2006. Habitat characterization for the Puerto Rican Crested Toad (Peltophryne [Bufo] lemur) at Guánica State Forest, Puerto Rico (Doctoral dissertation, MS thesis, University of Puerto Rico, Puerto Rico).

Murphy, P.G., A.E. Lugo, A.J. Murphy & D.C. Nepstad. 1995. The dry forests of Puerto Rico's south coast. pp. 178-209. In: A.E. Lugo & C. Lowe (eds.) Tropical Forests: Management and Ecology. Springer-Verlag, New York.

5 RELOCATABLE SITE 1- LAJAS EXPERIMENTAL STATION (LAJA)

The Lajas Research and Development Center (CID) is one of six Agricultural Experiment Stations in Puerto Rico. It is located in the Lajas Valley in the southwest corner of the Island.

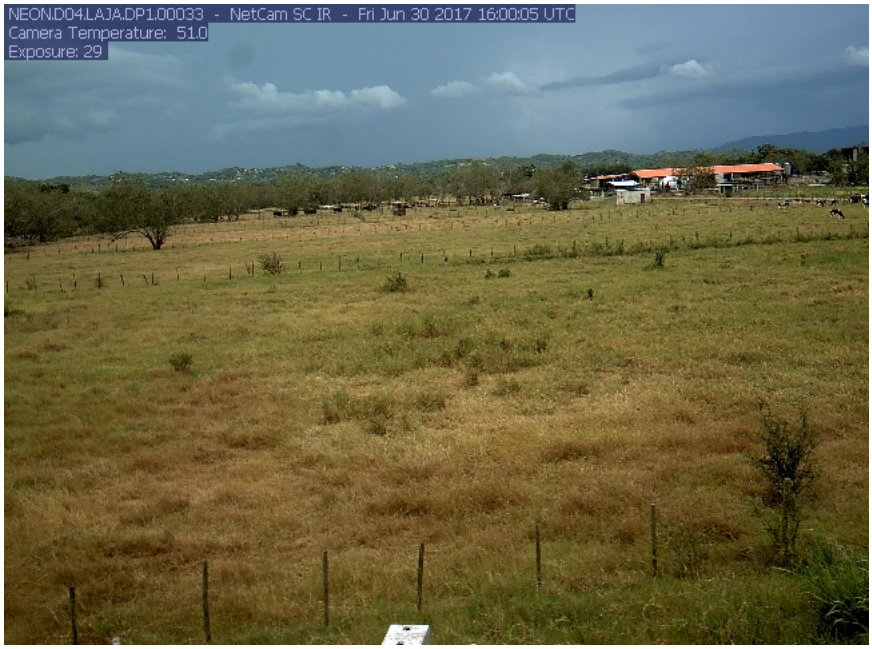

Figure 9: Phenocamera image for LAJA.

Note: 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: Agricultural Experimental Station- University of Puerto Rico
- Located in: Lajas Municipio
- Sampling Area: 3.95km^2
- Plot Elevation: 10-15m
- Dominant vegetation type: Crop types will rotate depending on existing research priorities.
- General management: The Lajas Research and Development Center was founded in 1946 in an effort to conduct research towards the development of agriculture in the Lajas Valley. Animal science and agricultural research both take place at the center (Agricultural Experimental Station, 2017).
- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research.

5.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at LAJA according to a spatially balanced and stratified-random design (RD[3]). The 2001 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.

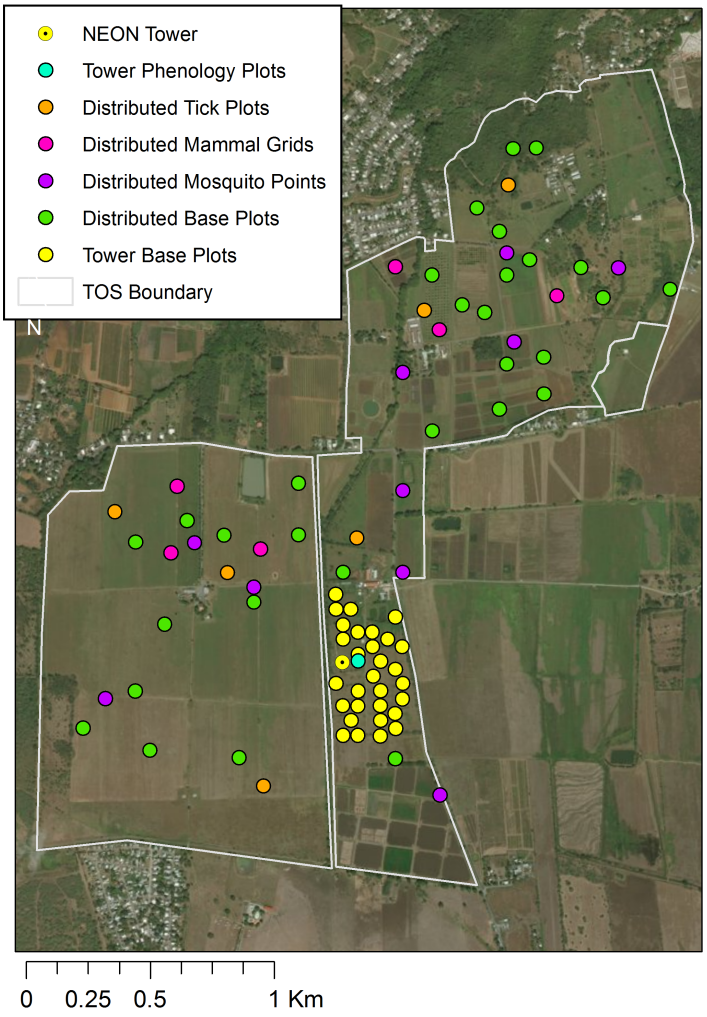

Figure 10: Map of TOS plot centroids within the NEON TOS sampling boundary at LAJA.

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

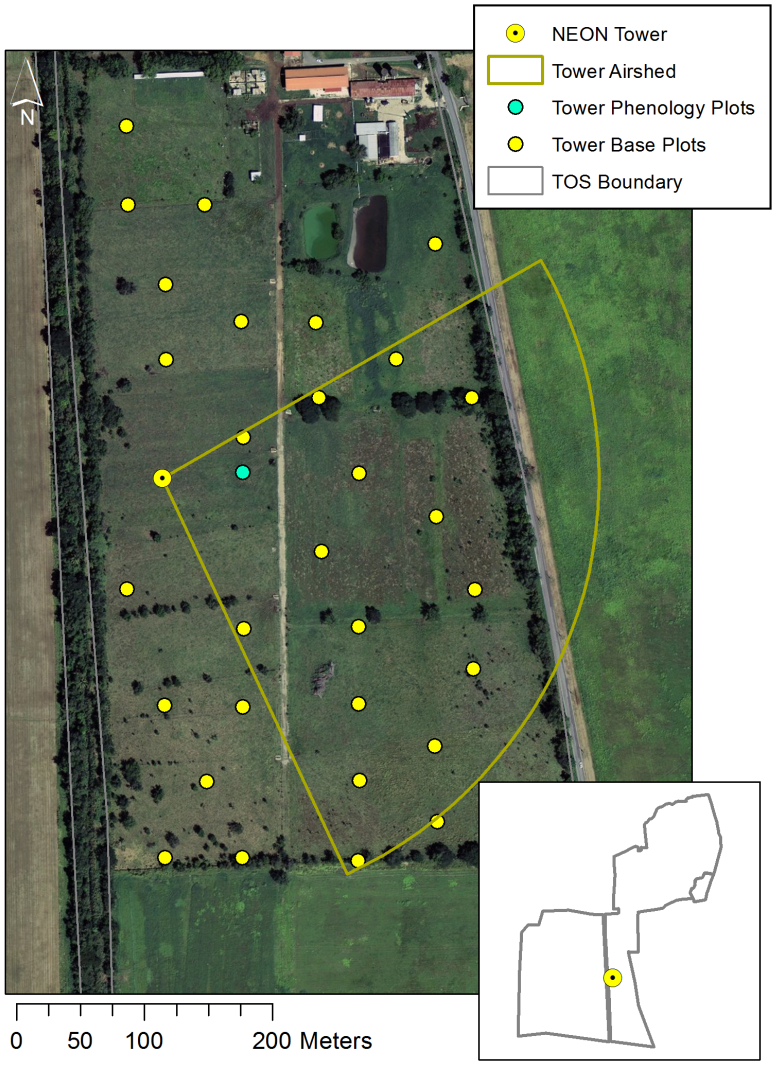

Figure 11: Map of the tower airshed and TOS plot centroids at LAJA.

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

Table 12: NLCD land cover classes and area within the TOS site boundary at LAJA.

NLCD Class	Site Area (km^2)	Percent (%)
Pasture Hay	1.87	44.93
Cultivated Crops	0.93	22.22
Grassland Herbaceous	0.73	17.64
Evergreen Forest	0.29	6.89
Developed Low Intensity	0.13	3.2
Shrub Scrub	0.1	2.29
Developed Open Space	0.08	1.82
Developed Medium Intensity	0.04	0.91

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 13: NLCD land cover classes and TOS plot numbers at LAJA.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Cultivated Crops	8
Distributed	Base Plot	Evergreen Forest	4
Distributed	Base Plot	Grassland Herbaceous	7
Distributed	Base Plot	Pasture Hay	11
Distributed	Mosquito Point	Cultivated Crops	2
Distributed	Mosquito Point	Evergreen Forest	1
Distributed	Mosquito Point	Grassland Herbaceous	2
Distributed	Mosquito Point	Pasture Hay	5
Distributed	Tick Plot	Cultivated Crops	1
Distributed	Tick Plot	Evergreen Forest	1
Distributed	Tick Plot	Grassland Herbaceous	1
Distributed	Tick Plot	Pasture Hay	3
Tower	Base Plot	NA	30
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 pasture hay.

Table 14: Number of Distributed Base plots per NLCD land cover class per protocol at LAJA.

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Cultivated Crops	Beetles	2
Distributed	Base Plot	Evergreen Forest	Beetles	1
Distributed	Base Plot	Grassland Herbaceous	Beetles	2
Distributed	Base Plot	Pasture Hay	Beetles	5
Distributed	Base Plot	Cultivated Crops	Birds	4
Distributed	Base Plot	Evergreen Forest	Birds	1
Distributed	Base Plot	Grassland Herbaceous	Birds	3
Distributed	Base Plot	Pasture Hay	Birds	8
Distributed	Base Plot	Cultivated Crops	Canopy Foliage Chemistry	4
Distributed	Base Plot	Evergreen Forest	Canopy Foliage Chemistry	1
Distributed	Base Plot	Grassland Herbaceous	Canopy Foliage Chemistry	3
Distributed	Base Plot	Pasture Hay	Canopy Foliage Chemistry	8
Distributed	Base Plot	Cultivated Crops	Coarse Downed Wood	5
Distributed	Base Plot	Evergreen Forest	Coarse Downed Wood	2
Distributed	Base Plot	Grassland Herbaceous	Coarse Downed Wood	3
Distributed	Base Plot	Pasture Hay	Coarse Downed Wood	10
Distributed	Base Plot	Cultivated Crops	Digital Hemispherical Photos for Leaf Area Index	5
Distributed	Base Plot	Evergreen Forest	Digital Hemispherical Photos for Leaf Area Index	2
Distributed	Base Plot	Grassland Herbaceous	Digital Hemispherical Photos for Leaf Area Index	3
Distributed	Base Plot	Pasture Hay	Digital Hemispherical Photos for Leaf Area Index	10
Distributed	Base Plot	Cultivated Crops	Herbaceous Biomass	5
Distributed	Base Plot	Evergreen Forest	Herbaceous Biomass	2
Distributed	Base Plot	Grassland Herbaceous	Herbaceous Biomass	3
Distributed	Base Plot	Pasture Hay	Herbaceous Biomass	10
Distributed	Base Plot	Cultivated Crops	Plant Diversity	8
Distributed	Base Plot	Evergreen Forest	Plant Diversity	4
Distributed	Base Plot	Grassland Herbaceous	Plant Diversity	7
Distributed	Base Plot	Pasture Hay	Plant Diversity	11
Distributed	Base Plot	Cultivated Crops	Soil Biogeochemistry	1

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Soil Biogeochemistry	1
Distributed	Base Plot	Grassland Herbaceous	Soil Biogeochemistry	1
Distributed	Base Plot	Pasture Hay	Soil Biogeochemistry	3
Distributed	Base Plot	Cultivated Crops	Soil Microbes	1
Distributed	Base Plot	Evergreen Forest	Soil Microbes	1
Distributed	Base Plot	Grassland Herbaceous	Soil Microbes	1
Distributed	Base Plot	Pasture Hay	Soil Microbes	3
Distributed	Base Plot	Cultivated Crops	Vegetation Structure	5
Distributed	Base Plot	Evergreen Forest	Vegetation Structure	2
Distributed	Base Plot	Grassland Herbaceous	Vegetation Structure	4
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 15: Number of Tower Plots per protocol at LAJA.

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	1

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: LAJA

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.

However, greenness status does not tease apart seasonal patterns at tropical sites like LAJA (see Figure 12 below). Working with colleagues from the University of Puerto Rico and local NEON staff it was determined to use precipitation data (see Figure 7) as the primary driver in guiding temporal aspects of TOS sampling in Puerto Rico. Precipitation data from 1980-2015 was analyzed from Ensenada station which is approximately 20 kilometers from LAJA. Peak herbaceous biomass and woody production are assumed to occur during the wet-season (Aug-Nov).

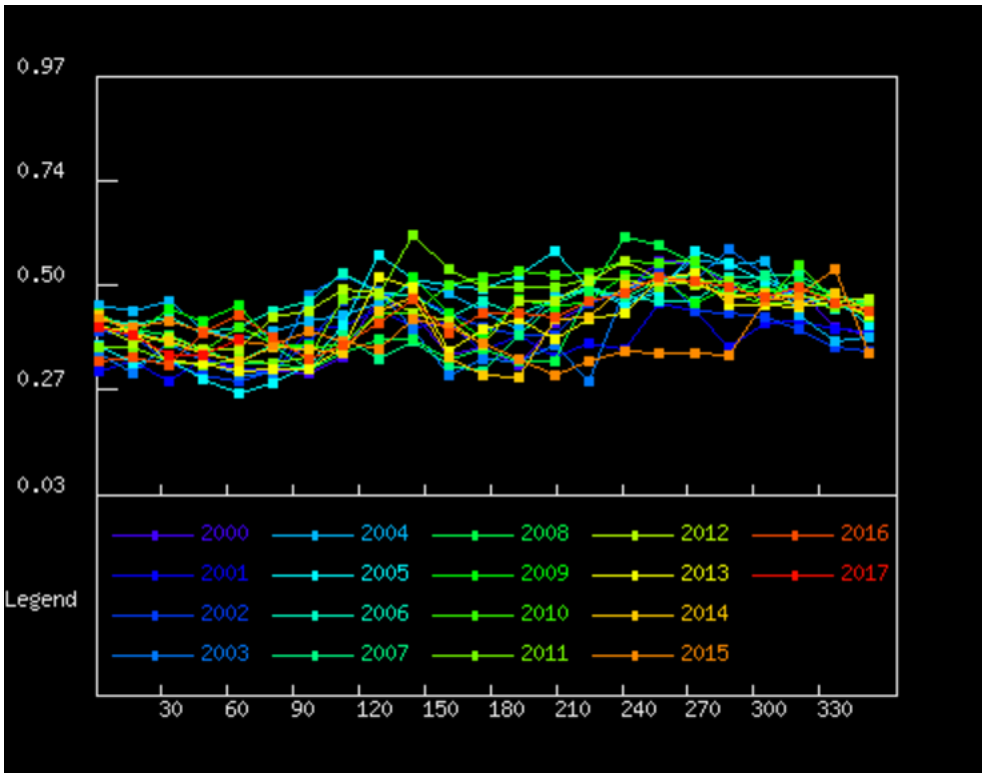

Figure 12: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON LAJA site.

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: 2000-2014

- User selected area: 2.25 km x 2.25 km box, Centroid Latitude: 18.02125, Longitude: -67.0769 (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 April 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 16: Soil Pit Information at LAJA.

Latitude	Longitude	Soil Family	Soil Order
18.02184	-67.07608	Fine - mixed - superactive - isohyperthermic Sodic Haplusterts	Vertisol

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

Table 17: Fine root mass per depth increment (cm) at LAJA.

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	1.09	0.54
10	20	0.68	0.28
20	30	0.38	0.15
30	40	0.28	0.1
40	50	0.16	0.09
50	60	0.16	0.1
60	70	0.13	0.05
70	80	0.15	0.08
80	90	0.16	0.11
90	100	0.11	0.07

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
100	120	0.13	0.08
120	140	0.21	0.09
140	160	0.26	0.04
160	180	0.18	0.11

Table 18: Cumulative fine root mass as a function of depth (cm) at LAJA.

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	109.18	54.29
10	20	177.02	80.68
20	30	215.19	84.22
30	40	242.93	90.61
40	50	259.24	93.31
50	60	275.57	103.45
60	70	288.97	106.13
70	80	303.76	112.54
80	90	320.09	123.22
90	100	331.39	129.71
100	120	358.29	144.24
120	140	401.2	149.81
140	160	453.14	157.83
160	180	489.15	136.58

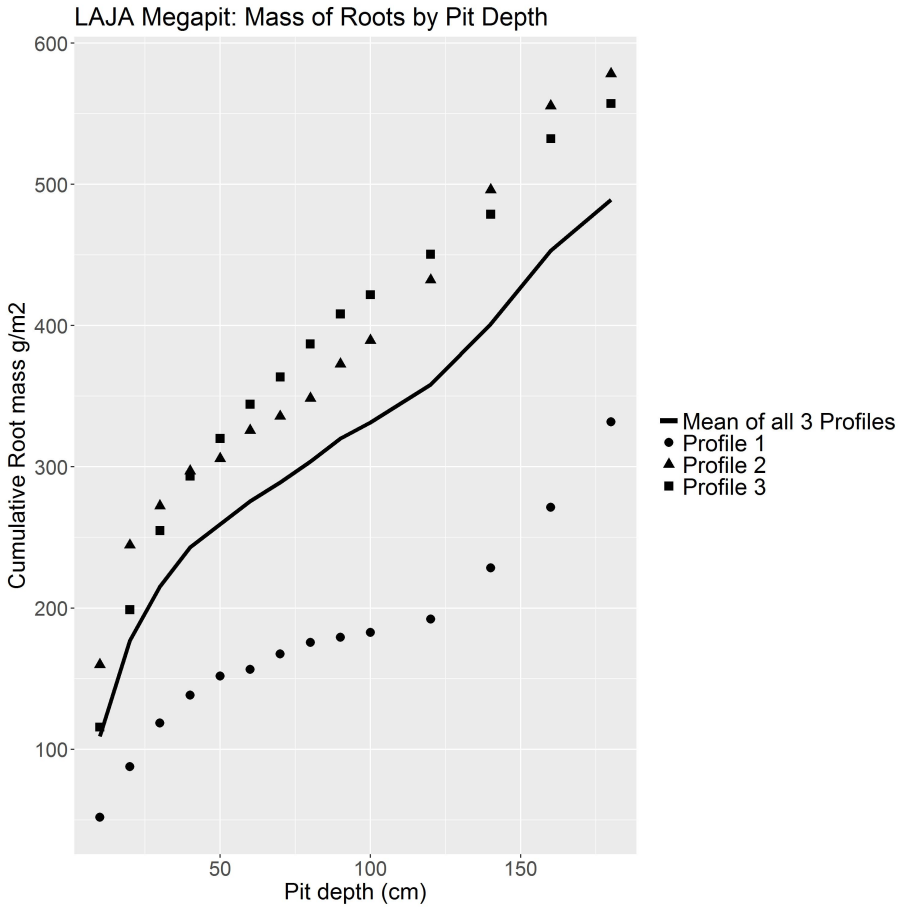

Figure 13: Cumulative root mass by pit depth at LAJA.

Table 19: Fine root biomass sampling summary data at LAJA.

Total Pit Depth (cm)	180
Total Mean Cumulative Mass at 30cm (g per m^2)	215.19
Total Mean Cumulative Mass at 100cm (g per m^2)	331.39
Total Mean Cumulative Mass (g per m^2)	489.15

5.4 Plant Characterization and Phenology Species Selection

5.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff during April of 2016. 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 20: Site plant characterization and phenology species summary at LAJA.

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
PIDU	*Pithecellobium dulce* (Roxb.) Benth.	1	<1	NA	1.96
WIAM	*Wissadula amplissima* (L.) R.E. Fries	10	<1	NA	NA
PASPA2	*Paspalum* sp.	11	<1	NA	NA
CYCI4	*Cyanthillium cinereum* (L.) H. Rob.	12	<1	NA	NA
ALLE	*Albizia lebbeck* (L.) Benth.	13	<1	NA	NA
MEPY	*Melochia pyramidata* L.	13	<1	NA	NA
CYRO	*Cyperus rotundus* L.	16	<1	NA	NA
MIPU8	*Mimosa pudica* L.	17	<1	NA	NA
LUOC	*Ludwigia octovalvis* (Jacq.) P.H. Raven	18	<1	NA	NA
POOL	*Portulaca oleracea* L.	19	<1	NA	NA
CYNL80	*Cynodon nlemfuensis* Vanderyst	2	53	NA	NA

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
AMDU	*Amaranthus dubius* Mart. ex Thell.	20	<1	NA	NA
MACA5	*Malachra capitata* (L.) L.	20	<1	NA	NA
PAHY	*Parthenium hysterophorus* L.	20	<1	NA	NA
ECCO2	*Echinochloa colona* (L.) Link	23	<1	NA	NA
PHUR	*Phyllanthus urinaria* L.	23	<1	NA	NA
RUNUN	*Ruellia nudiflora* (Engelm. & A. Gray) Urb. var. *nudiflora*	25	<1	NA	NA
URMA3	*Urochloa maxima* (Jacq.) R. Webster	3	10	NA	NA
DIAN	*Dichanthium annulatum* (Forssk.) Stapf	4	7	NA	NA
PALA8	*Panicum laxum* Sw.	5	6	NA	NA
MACO6	*Malvastrum coromandelianum* (L.) Garcke	6	1	NA	NA
ACAS	*Achyranthes aspera* L.	7	<1	NA	NA
PHFR11	*Phyla fruticosa* (Mill.) Kennedy	8	<1	NA	NA
ALVA2	*Alysicarpus vaginalis* (L.) DC.	9	<1	NA	NA

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

Table 21: Per plot breakdown of species richness, diversity, and herbaceous cover at LAJA.

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover
LAJA_041	7	1.45	176
LAJA_042	4	0.21	90
LAJA_043	6	0.32	67
LAJA_044	5	0.93	93
LAJA_045	6	0.87	107
LAJA_046	8	0.62	87

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover
LAJA_047	9	1.42	126
LAJA_048	9	1.16	102
LAJA_049	10	1.07	93
LAJA_050	12	1.71	219
LAJA_051	6	0.94	118
LAJA_052	11	1.64	126
LAJA_053	6	0.87	98
LAJA_054	12	1.92	245
LAJA_055	8	0.49	89
LAJA_056	9	1.4	114
LAJA_057	3	0.06	89
LAJA_058	5	0.74	81
LAJA_059	6	0.47	97
LAJA_060	8	1	101
LAJA_061	8	1.5	191
LAJA_062	3	0.04	79
LAJA_063	4	0.29	86
LAJA_064	9	0.41	69
LAJA_065	4	0.81	151
LAJA_066	6	0.66	102
LAJA_067	9	0.7	87
LAJA_068	6	1.33	150
LAJA_069	12	1.65	119
LAJA_070	5	1.08	108

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. No bryophyte cover was recorded in LAJA Tower Base Plots.

5.5 Beetles

5.5.1 Site-Specific Methods

Beetle site characterization was conducted in February of 2014 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Ten pit fall traps were set for two weeks. No carabids were caught during site characterization work. For more information on this protocol and data product numbers see Appendix A.

5.6 Mosquitoes

5.6.1 Site-Specific Methods

Mosquito site characterization was conducted in February of 2014 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. No pathogen testing was performed. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

5.6.2 Results

Table 22: Mosquito identification results at LAJA.

Sample ID	Scientific Name	Gender	Count
LAJA.February2014.SC.1	*Aedes aegypti*	female	5
LAJA.February2014.SC.1	*Anopheles albimanus*	female	1
LAJA.February2014.SC.1	*Anopheles* spp.	female	2
LAJA.February2014.SC.1	*Culex erraticus*	female	185
LAJA.February2014.SC.1	*Culex habilitator*	female	122
LAJA.February2014.SC.1	*Culex nigripalpus*	female	52
LAJA.February2014.SC.1	*Culex* spp.	female	77
LAJA.February2014.SC.1	*Culex* spp.	male	2
LAJA.February2014.SC.1	*Mansonia dyari*	female	44
LAJA.February2014.SC.1	*Mansonia flaveola*	female	11
LAJA.February2014.SC.1	*Psorophora jamaicensis*	female	10
LAJA.February2014.SC.1	*Uranotaenia lowii*	female	9
LAJA.February2014.SC.1	*Uranotaenia sapphirina*	female	45
LAJA.February2014.SC.1	*Uranotaenia* spp.	male	2

5.7 Ticks

5.7.1 Site-Specific Methods

Tick drags were conducted at LAJA in February of 2014 to test protocol methods and calculate capture rates. No ticks were collected or seen during site characterization work. For more information on this protocol and data product numbers see Appendix A.

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]). For statewide references see the GUAN Species Reference List.

Agricultural Experimental Station (2017). *UPR:Lajas*. Retrieved from http://www.eea.uprm.edu/

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.

6 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.

7 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 23: 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
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

Name	Description	Identification Code
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