TOS SITE CHARACTERIZATION REPORT: DOMAIN 17

PREPARED BY	ORGANIZATION	DATE
Rachel Krauss	SCI	05/16/2018
Courtney Meier	SCI	05/16/2018
Michael Patterson	SCI	01/27/2017
Oliver Smith	SCI	06/08/2017

APPROVALS	ORGANIZATION	APPROVAL DATE
Mike Stewart	SYS	11/14/2018

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

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CHANGE RECORD

REVISION	DATE	ECO#	DESCRIPTION OF CHANGE
A	07/19/2017	ECO-04860	Initial Release
B	11/20/2018	ECO-05657	• Added Phenocam images • 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 three sites in the Pacific Southwest 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.011076	TIS Site Characterization Report
RD[05]	NEON.DOC.003536	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
TOS	Terrestrial Observation System

3 DOMAIN 17 OVERVIEW: PACIFIC SOUTHWEST DOMAIN

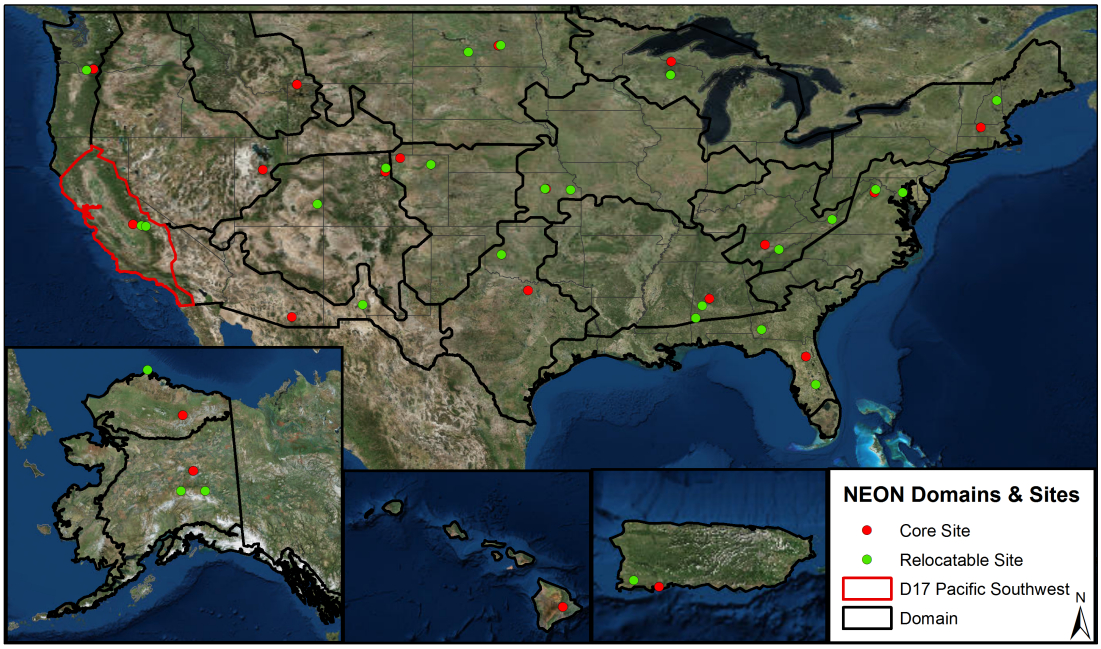

Figure 1: NEON project map with Domain 17 highlighted in red.

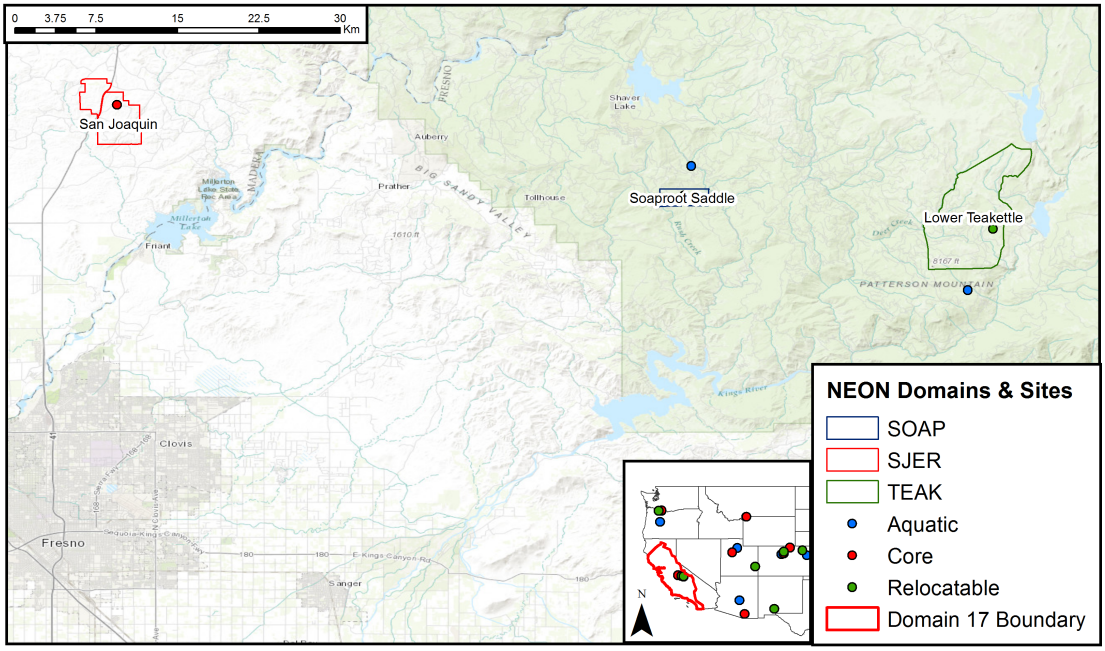

Figure 2: Site boundaries within Domain 17.

The three sites in domain 17 are located along an elevational gradient starting in the San Joaquin Valley and rising into the high peaks of the Sierra Nevada Mountains. Located east of Fresno, the three sites were selected to monitor local variation in precipitation and snow pack depth associated with orographic effects. All three D17 sites are also home to flux towers associated with the Southern Sierra Critical Zone Observatory (CZO), which collects data on water, carbon, and nutrient cycling across the rain-snow transition in the southern Sierra Nevada.

- States included in the domain: California
- Core site: San Joaquin
- Relocatable 1: Soaproot Saddle
- Relocatable 2: Lower Teakettle
- Science themes: Climate Impacts

4 CORE SITE- SAN JOAQUIN (SJER)

The San Joaquin Experimental Range is located 40km north of Fresno in the western foothills of the Sierra Nevada. The climate is Mediterranean, with cool and wet winters giving way to hot and dry summers. The San Joaquin Experimental Range was established in 1934 and is California's first range research station (San Joaquin Experimental Range, 2017).

Key Characteristics:

- Site host: U.S. Forest Service
- Located in: Madera County, CA
- Sampling Area: 18.2 km^2
- Plot Elevation: 240-505m
- Dominant vegetation type: SJER contains open woodland dominated by blue oak (*Quercus douglasii*), interior live oak (*Q.wislizeni*) , California foothill Pine (*Pinus sabiniana*) , scattered shrubs, and herbaceous plants. Dominant shrub species include wedgeleaf ceanothus (*Ceanothus cuneatus*), chaparral whitehorn (*C. leucodermis*), and manzanita (*Arctostaphylos* sp.). Herbaceous plants are generally annual grasses, various legumes, and invasive (*Bromus*) species (San Joaquin Experimental Range, 2017).
- General management: More than 500 scientific publications have been written from research at the San Joaquin Experimental Range ranging from studies on sustainable grazing systems, long term bird counts, and community responses to prescribed fire burns. The site is continuously grazed and also operates as an outdoor laboratory for local schools and universities (San Joaquin Experimental Range, 2017).
- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research.

4.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at SJER 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.

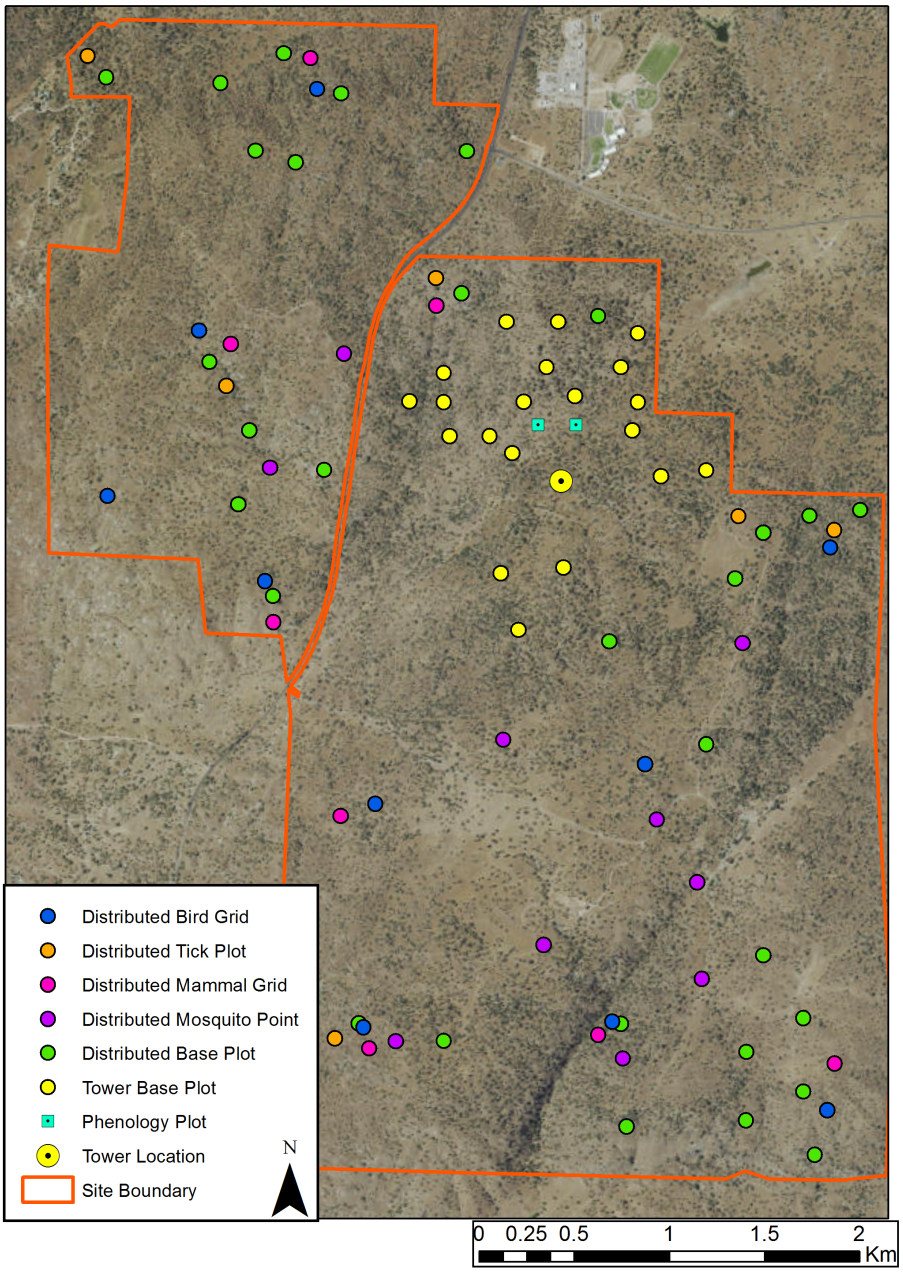

Figure 3: Map of TOS plot centroids within the NEON TOS sampling boundary at SJER.

For a list of protocols associated with each plot see tables below; for additional spatial design information see

RD[03].

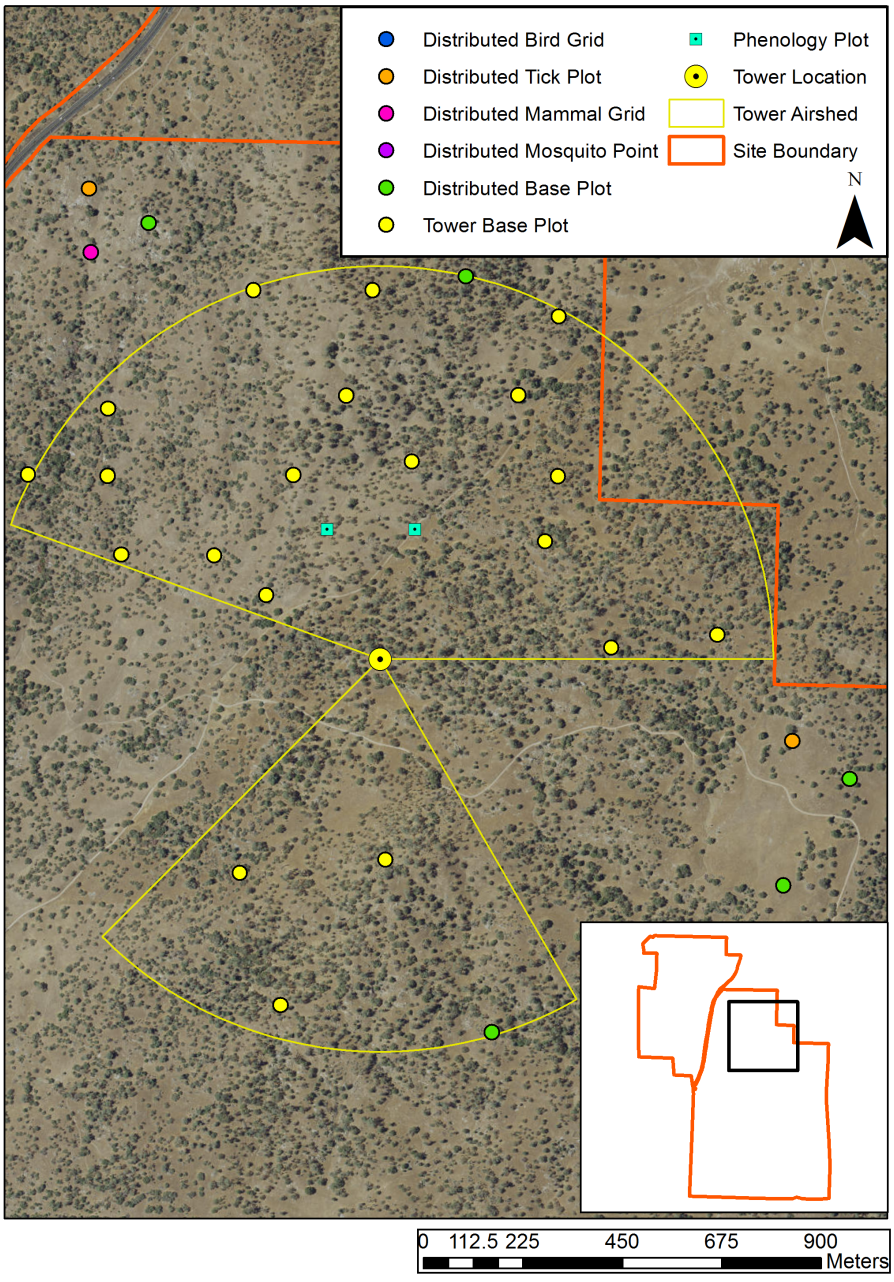

Figure 4: Map of the tower airshed and TOS plot centroids at SJER.

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 SJER.

NLCD Class	Site Area (km^2)	Percent (%)
Grassland Herbaceous	13.51	74.14
Evergreen Forest	2.72	14.93
Shrub Scrub	1.68	9.24
Developed Open Space	0.18	0.97
Deciduous Forest	0.13	0.72

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 SJER.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Evergreen Forest	7
Distributed	Base Plot	Grassland Herbaceous	17
Distributed	Base Plot	Shrub Scrub	6
Distributed	Bird Grid	Evergreen Forest	1
Distributed	Bird Grid	Grassland Herbaceous	7
Distributed	Mammal Grid	Evergreen Forest	1
Distributed	Mammal Grid	Grassland Herbaceous	7
Distributed	Mosquito Point	Evergreen Forest	2
Distributed	Mosquito Point	Grassland Herbaceous	8
Distributed	Tick Plot	Evergreen Forest	1
Distributed	Tick Plot	Grassland Herbaceous	4
Distributed	Tick Plot	Shrub Scrub	1
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 types within the airshed are evergreen forest and grassland herbaceous.

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

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Beetles	1
Distributed	Base Plot	Grassland Herbaceous	Beetles	8
Distributed	Base Plot	Shrub Scrub	Beetles	1
Distributed	Base Plot	Evergreen Forest	Canopy Foliage Chemistry	2
Distributed	Base Plot	Grassland Herbaceous	Canopy Foliage Chemistry	12
Distributed	Base Plot	Shrub Scrub	Canopy Foliage Chemistry	2
Distributed	Base Plot	Evergreen Forest	Coarse Downed Wood	3
Distributed	Base Plot	Grassland Herbaceous	Coarse Downed Wood	15
Distributed	Base Plot	Shrub Scrub	Coarse Downed Wood	2
Distributed	Base Plot	Evergreen Forest	Digital Hemispherical Photos for Leaf Area Index	3
Distributed	Base Plot	Grassland Herbaceous	Digital Hemispherical Photos for Leaf Area Index	15
Distributed	Base Plot	Shrub Scrub	Digital Hemispherical Photos for Leaf Area Index	2
Distributed	Base Plot	Evergreen Forest	Herbaceous Biomass	3
Distributed	Base Plot	Grassland Herbaceous	Herbaceous Biomass	15
Distributed	Base Plot	Shrub Scrub	Herbaceous Biomass	2
Distributed	Base Plot	Evergreen Forest	Plant Diversity	7
Distributed	Base Plot	Grassland Herbaceous	Plant Diversity	17
Distributed	Base Plot	Shrub Scrub	Plant Diversity	6
Distributed	Base Plot	Evergreen Forest	Soil Biogeochemistry	1
Distributed	Base Plot	Grassland Herbaceous	Soil Biogeochemistry	4
Distributed	Base Plot	Shrub Scrub	Soil Biogeochemistry	1
Distributed	Base Plot	Evergreen Forest	Soil Microbes	1
Distributed	Base Plot	Grassland Herbaceous	Soil Microbes	4
Distributed	Base Plot	Shrub Scrub	Soil Microbes	1
Distributed	Base Plot	Evergreen Forest	Vegetation Structure	3
Distributed	Base Plot	Grassland Herbaceous	Vegetation Structure	15
Distributed	Base Plot	Shrub Scrub	Vegetation Structure	2

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 SJER.

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: SJER

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.

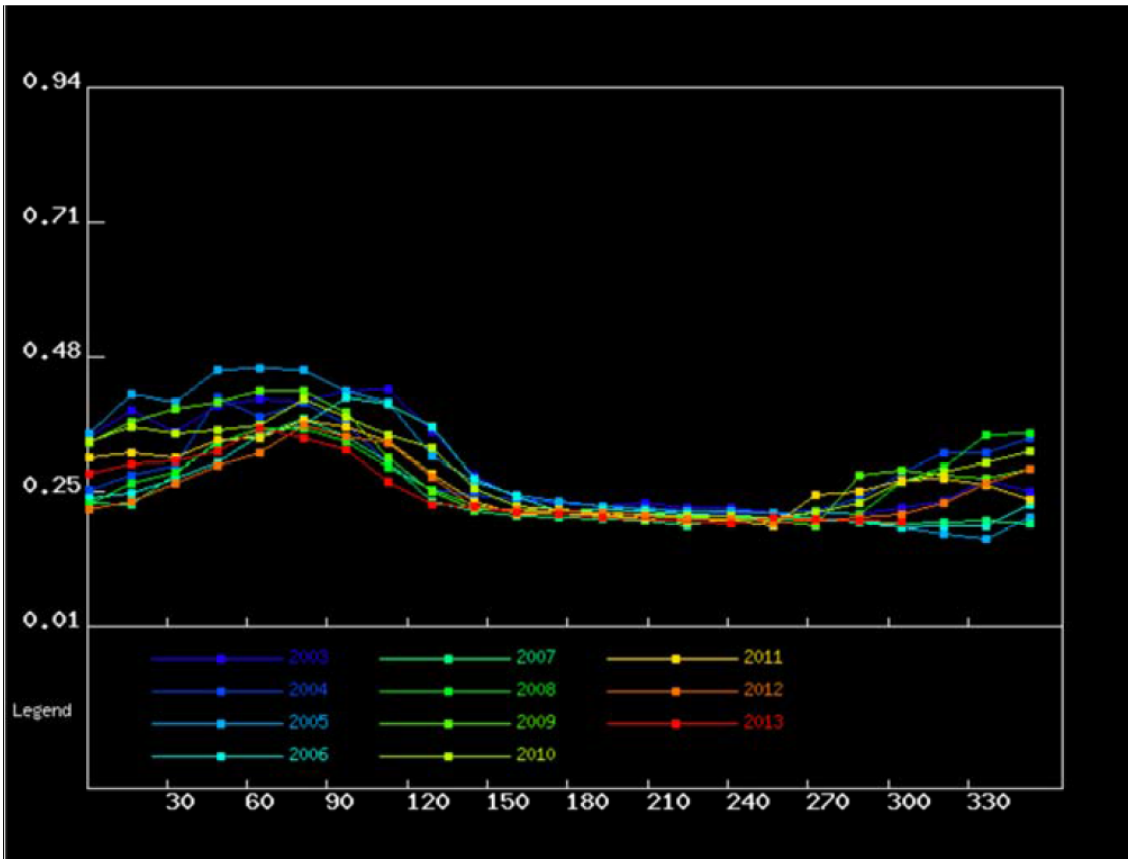

Figure 5: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON SJER site.

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

Average Increase	Average Maximum	Average Decrease	Average Minimum
270 (09/28)	65 (03/07)	95 (04/06)	155 (06/05)

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: 12.25 km x 12.25 km box, centroid lat: 37.10878, centroid long: -119.73228 (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 November 2016. 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 SJER.

Latitude	Longitude	Soil Family	Soil Order
37.107117	-119.733	Sandy, mixed, thermic Entic Haploxeroll	Mollisol

The soil family and order is a tentative description until final lab results are available. The soil profile was described by Natural Resource Conservation Service (NRCS).

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

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	1.72	0.14
10	20	0.5	0.23
20	30	0.23	0.14
30	40	0.15	0.21
40	50	0.15	0.06
50	60	0.1	0.1
60	70	0.12	0.04
70	80	0.1	0.14
80	90	0.19	0.18
90	100	0.11	0.03
100	120	0.04	0.03
120	140	1.44	2.3

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
140	160	0.1	0.04
160	180	0.09	0.11
180	200	0	0

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

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	172	14.19
10	20	222.3	14.67
20	30	245.5	16.72
30	40	260.93	24.63
40	50	275.6	19.86
50	60	285.9	13.42
60	70	298.3	16.54
70	80	308.1	30.53
80	90	326.8	27.58
90	100	337.37	30.71
100	120	345.43	33.97
120	140	496.72	228.33
140	160	516.02	236.58
160	180	533.98	230.06
180	200	533.98	230.06

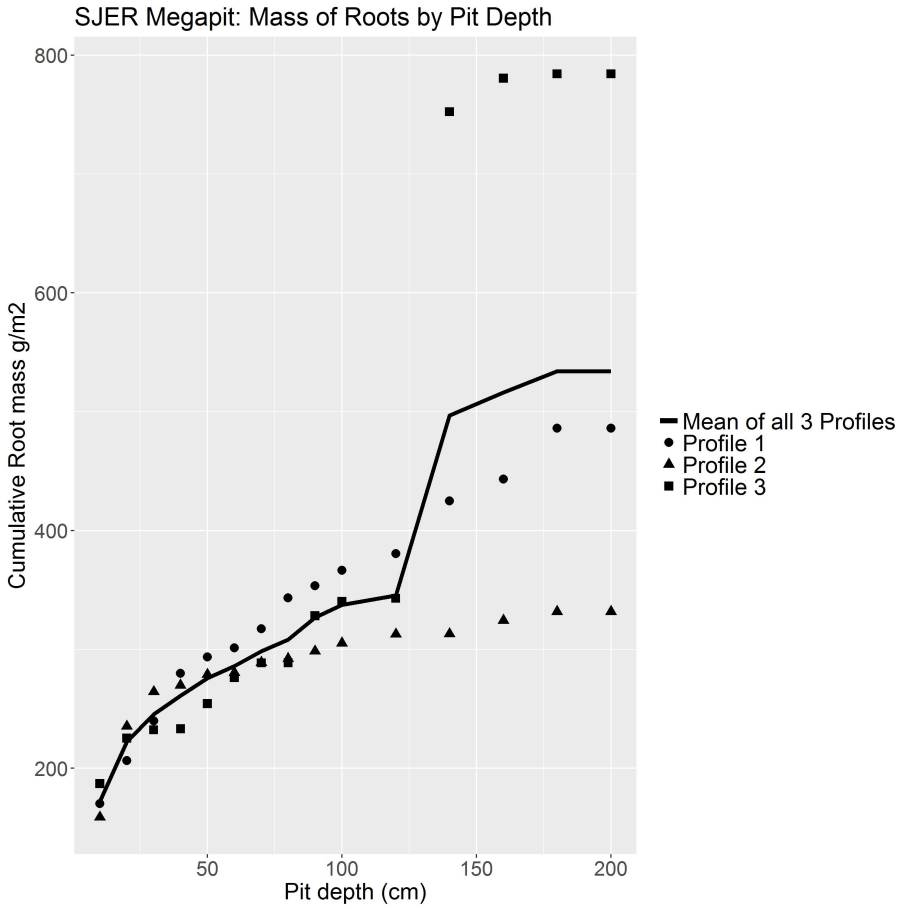

Figure 6: Cumulative root mass by pit depth at SJER.

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

Total Pit Depth (cm)	200
Total Mean Cumulative Mass at 30cm (g per m^2)	245.5
Total Mean Cumulative Mass at 100cm (g per m^2)	337.37
Total Mean Cumulative Mass (g per m^2)	533.98

4.4 Plant Characterization and Phenology Species Selection

4.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff during May of 2015. Plant characterization data inform the 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 SJER.

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
QUDO	*Quercus douglasii* Hook. & Arn.	1	NA	<1	2.92
ERBO	*Erodium botrys* (Cav.) Bertol.	2	14	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)
BRDI3	*Bromus diandrus* Roth	3	11	NA	NA
PISA2	*Pinus sabiniana* Douglas ex Douglas	4	<1	NA	1.39
RHIL	*Rhamnus ilicifolia* Kellogg	5	NA	0.02	0.02
QUWI2	*Quercus wislizeni* A. DC.	6	<1	<1	1.29
CELE2	*Ceanothus leucodermis* Greene	7	<1	0.02	0.01
CECU	*Ceanothus cuneatus* (Hook.) Nutt.	8	<1	0.01	NA
BRHO2	*Bromus hordeaceus* L.	9	5	NA	NA
TODI	*Toxicodendron diversilobum* (Torr. & A. Gray) Greene	10	<1	<1	NA
VULPI	*Vulpia* sp.	11	2	NA	NA
HOMUL	*Hordeum murinum* L. ssp. *leporinum* (Link) Arcang.	12	2	NA	NA
HYGL2	*Hypochaeris glabra* L.	13	2	NA	NA
AVBA	*Avena barbata* Pott ex Link	14	2	NA	NA
FRCAC7	*Frangula californica* (Eschsch.) A. Gray ssp. *cuspidata* (Greene) Kartesz & Gandhi	15	NA	<1	NA
CECU	*Ceanothus cuneatus* (Hook.) Nutt.	16	<1	<1	NA
ARVIM	*Arctostaphylos viscida* Parry ssp. *mariposa* (Dudley) P.V. Wells	17	NA	<1	0.02
BRRU2	*Bromus rubens* L.	18	<1	NA	NA
PTDR	*Pterostegia drymarioides* Fisch. & C.A. Mey.	18	<1	NA	NA
PHCI	*Phacelia cicutaria* Greene	20	<1	NA	NA
AMME	*Amsinckia menziesii* (Lehm.) A. Nelson & J.F. Macbr.	21	<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)
CIOCC4	*Cirsium occidentale* (Nutt.) Jeps. var. *californicum* (A. Gray) Keil & C. Turner	22	<1	NA	NA
SIGA	*Silene gallica* L.	23	<1	NA	NA
TRCI	*Trifolium ciliolatum* Benth.	24	<1	NA	NA
GERAN	*Geranium molle* Geranium molle	25	<1	NA	NA
TRMI4	*Trifolium microcephalum* Pursh	26	<1	NA	NA
PLNO	*Plagiobothrys nothofulvus* (A. Gray) A. Gray	27	<1	NA	NA
OXRA	*Oxalis radicosa* A. Rich.	28	<1	NA	NA
LUBI	*Lupinus bicolor* Lindl.	30	<1	NA	NA
GITR2	*Gilia tricolor* Benth.	31	<1	NA	NA
LUBE	*Lupinus benthamii* A. Heller	32	<1	NA	NA
STME2	*Stellaria media* (L.) Vill.	33	<1	NA	NA
PETR7	*Pentagramma triangularis* (Kaulf.) Yatsk., Windham & E. Wollenw.	34	<1	NA	NA
QUDE	*Quercus douglasii* Quercus douglasii	35	NA	NA	0.01
BRTE	*Bromus tectorum* L.	36	<1	NA	NA
BRAR3	*Bromus arenarius* Labill.	37	<1	NA	NA
GAAP2	*Galium aparine* L.	38	<1	NA	NA
DICAC5	*Dichelostemma capitatum* (Benth.) Alph. Wood ssp. *capitatum*	39	<1	NA	NA
DAPU3	*Daucus pusillus* Michx.	40	<1	NA	NA
LECI18	*Leptosiphon ciliatus* (Benth.) Jeps.	40	<1	NA	NA
ERODI	*Erodium* sp.	42	<1	NA	NA
CLDU	*Clarkia dudleyana* (Abrams) J.F. Macbr.	43	<1	NA	NA
CLPEP	*Claytonia perfoliata*	44	<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)
THCU	*Thysanocarpus curvipes* Hook.	45	<1	NA	NA
ERCI6	*Erodium cicutarium* (L.) L'Hér. ex Aiton	46	<1	NA	NA
GICA5	*Gilia capitata* Sims	46	<1	NA	NA
AICA	*Aira caryophyllea* L.	48	<1	NA	NA
CLPU2	*Clarkia purpurea* (W. Curtis) A. Nelson & J.F. Macbr.	48	<1	NA	NA
CRCOC	*Crassula connata (Ruiz* & Pav.) A. Berger var. *connata*	50	<1	NA	NA
MICA	*Micropus californicus* Fisch. & C.A. Mey.	50	<1	NA	NA
HIIN3	*Hirschfeldia incana* (L.) Lagr.-Foss.	52	<1	NA	NA
LOTUS	*Lotus* sp.	52	<1	NA	NA
TRWI3	*Trifolium willdenovii* Spreng.	52	<1	NA	NA
LUPIN	*Lupinus* sp.	55	<1	NA	NA
BRMI2	*Briza minor* L.	56	<1	NA	NA
CALI20	*Castilleja lineariiloba* (Benth.) T.I. Chuang & Heckard	56	<1	NA	NA
CEME2	*Centaurea melitensis* L.	56	<1	NA	NA
CHME2	*Chorizanthe membranacea* Benth.	56	<1	NA	NA
CLARK	*Clarkia* sp.	56	<1	NA	NA
GERANSPP	*Geranium* sp.	56	<1	NA	NA
LAPE	*Layia pentachaeta* A. Gray	56	<1	NA	NA
LOUNU	*Lotus unifoliolatus* (Hook.) Benth. var. *unifoliolatus*	56	<1	NA	NA
CLUN	*Clarkia unguiculata* Lindl.	64	<1	NA	NA
TRIFO	*Trifolium* sp.	64	<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)
BRCO3	*Brodiaea coronaria* (Salisb.) Engl.	66	<1	NA	NA
CEGL2	*Cerastium glomeratum* Thuill.	66	<1	NA	NA
CLARKSPP	*Clarkia* sp.	66	<1	NA	NA
CRYPT	*Cryptantha* sp.	66	<1	NA	NA
ERODISPP	*Erodium* sp.	66	<1	NA	NA
FABACE	Fabaceae sp.	66	<1	NA	NA
LOGA2	*Logfia gallica* (L.) Coss. & Germ.	66	<1	NA	NA
POSE	*Poa secunda* J. Presl	66	<1	NA	NA
SATU	*Sanicula tuberosa* Torr.	66	<1	NA	NA

Note:Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov). *Vulpia microstachys* and *V. myuros* are lumped within *Vulpia*. Similarly, *Erodium* spp. includes *Erodium mosch*.

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

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
SJER_045	28	2.43	46	1.31
SJER_046	22	1.72	94	0
SJER_047	26	2.36	62	12.5
SJER_048	30	2.74	51	0.94
SJER_049	17	1.65	55	0
SJER_050	27	2.09	58	3
SJER_051	27	2.06	80	0.38
SJER_052	22	1.81	81	4.25
SJER_053	11	1.02	40	0
SJER_054	32	2.39	107	0.08
SJER_055	22	2.06	157	0.1
SJER_056	19	1.82	51	0.4
SJER_057	21	1.86	118	0.62
SJER_058	27	2.34	109	0
SJER_059	27	2.5	63	0

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
SJER_060	18	1.75	58	0
SJER_061	25	2.33	44	2
SJER_062	17	1.84	33	0
SJER_063	19	1.8	50	0
SJER_064	23	2.23	76	1.56
Bryophyte Mean				1.36

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 not conducted at SJER. 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 not conducted at SJER. For more information on this protocol and data product numbers see Appendix A.

4.7 Ticks

4.7.1 Site-Specific Methods

Tick site chacterization was not conducted at SJER. 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]).

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

Crampton, Beecher. Grasses in California. 1974. University of California Press, Berkeley.

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.

Greenhouse, J., Markos, S., Moe, R., Simono, S., Wetherwax, M., & Vorobik, L. 2012. The Digital Jepson Manual: Vascular Plants of California, Second Edition, Thoroughly Revised and Expanded (Baldwin B., Goldman D., Keil D., Patterson R., Rosatti T., & Wilken D., Eds.). University of California Press. Retrieved from http://www.jstor.org/stable/10.1525/j.ctt1pn9sv

Larson, J.H., J. Stebbins, and W.L. Porter. 1985. A Revised Checklist of the Plants of the San Joaquin Experimental Range. California Agricultural Technology Institute. California State University, Fresno. Fresno, CA. 41 pp.

Purcell, K. L., D. A. Drynan, and K. M. Mazzocco. 2007. Vertebrate Fauna of the San Joaquin Experimental Range, California: An Annotated Checklist Based on 70 Years of Observations. U.S. Forest Service, Pacific Southwest Research Station.

Thomson, R.C, A.N. Wright, and H.B. Shaffer. 2016. California Amphibian and Reptile Species of Special Concern. University of California Press Books.

5 RELOCATABLE SITE 1- SOAPROOT SADDLE (SOAP)

Soaproot Saddle is a mixed conifer forest, ranging in elevation from 1,000-1,400m. The terrain is relatively complex, with coarse hills, steep slopes, and narrow drainages.

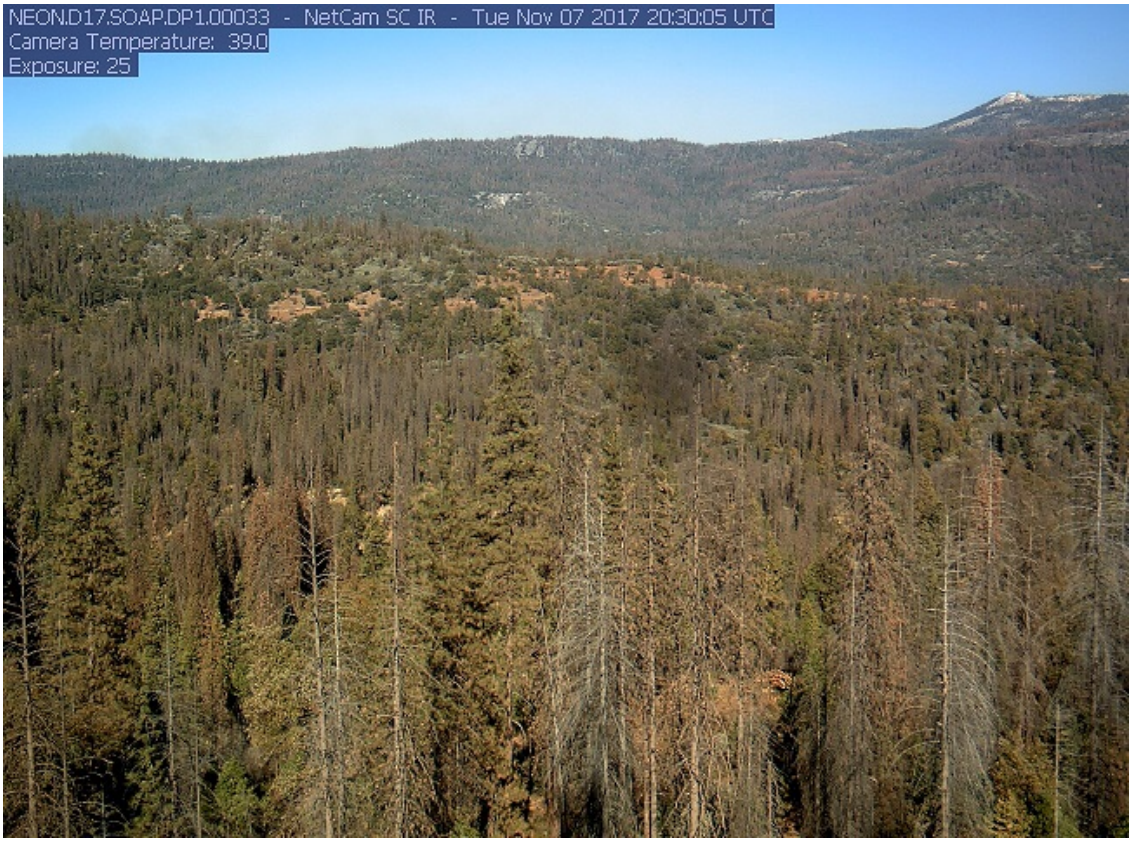

Figure 7: Phenocamera image for SOAP. The phenocamera is located at the top of the NEON tower and faces north. Phenocamera images are available at https://phenocam.sr.unh.edu/webcam/network/table/.

Key Characteristics:

- Site host: U.S. Forest Service
- Located in: Fresno County, CA
- Sampling Area: 5.82 km^2
- Plot Elevation: 1,040-1,375m
- Dominant vegetation type: Ponderosa pine (*Pinus ponderosa*) and incense cedar (*Calocedrus decurrens*) dominate the overstory, with co-dominant canyon live oak (*Quercus chrysolepis*) and California black oak (*Quercus kelloggii*). However, the interaction of long-term drought and warming has exacerbated the outbreak of pine bark beetles, leading to high Ponderosa pine mortality and a potential shift in the forest community. Mariposa manzanita (*Arctostaphylos viscida* ssp. *Mariposa*) are interspersed throughout the understory and often form dense thickets in open areas, whereas deerbrush (*Ceanothus integerrimus*) and poi-

son oak (*Toxicodendron diversilobum*) are common in the shaded understory. Mountain misery (*Chamaebatia foliolosa*) provides dense groundcover throughout much of the site.

- General management: Soaproot Saddle is part of the Sierra National Forest. Wildland fire is of particular concern at SOAP, where foresters use a combination of prescribed fire and mechanical fuel treatment to minimize damage while maintaining a healthy fire regime.
- Upper Big Creek is located north of Soaproot, 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.

5.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at SOAP 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.

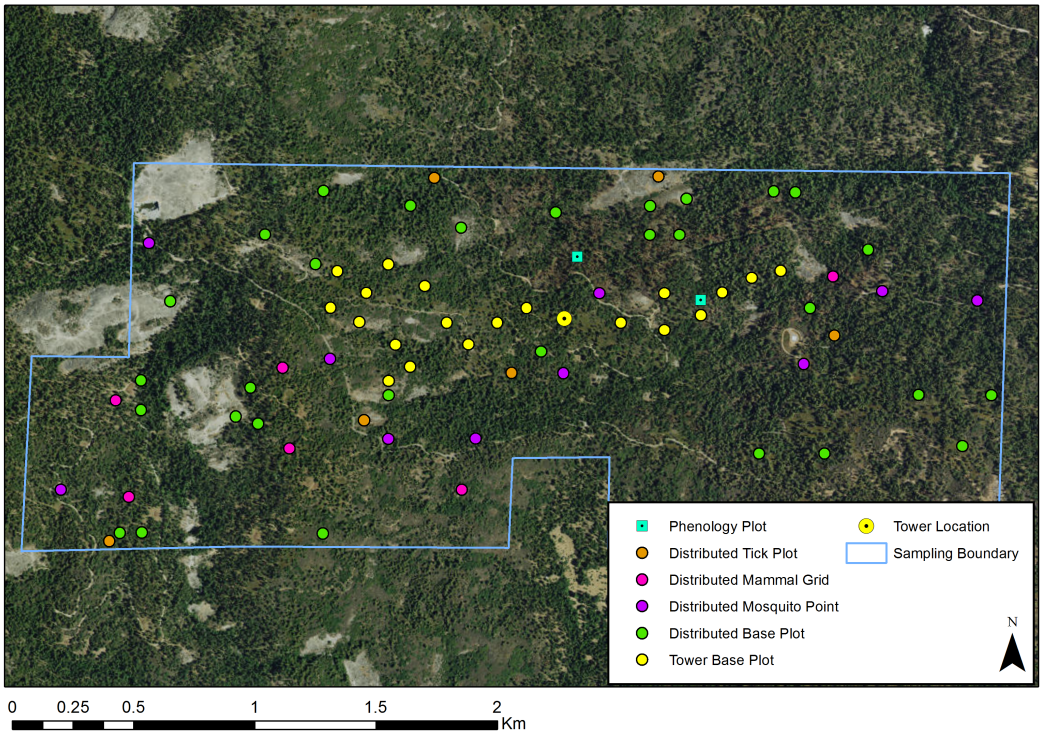

Figure 8: Map of TOS plot centroids within the NEON TOS sampling boundary at SOAP.

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

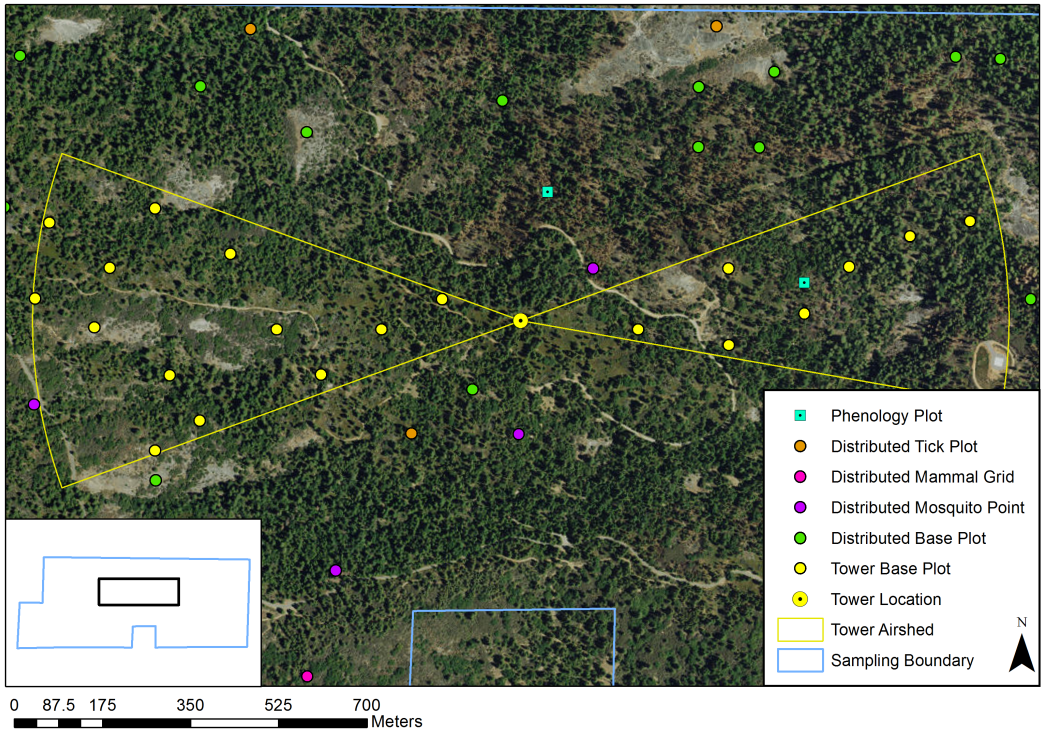

Figure 9: Map of the tower airshed and TOS plot centroids at SOAP.

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 SOAP.

NLCD Class	Site Area (km^2)	Percent (%)
Evergreen Forest	5.17	88.77
Shrub Scrub	0.62	10.65
Grassland Herbaceous	0.03	0.49

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 SOAP.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Evergreen Forest	22

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Shrub Scrub	8
Distributed	Mammal Grid	Evergreen Forest	4
Distributed	Mammal Grid	Shrub Scrub	1
Distributed	Mosquito Point	Evergreen Forest	9
Distributed	Mosquito Point	Shrub Scrub	1
Distributed	Tick Plot	Evergreen Forest	4
Distributed	Tick Plot	Shrub Scrub	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 types within the airshed are evergreen forest and shrub scrub.

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

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Beetles	9
Distributed	Base Plot	Shrub Scrub	Beetles	1
Distributed	Base Plot	Evergreen Forest	Birds	14
Distributed	Base Plot	Shrub Scrub	Birds	2
Distributed	Base Plot	Evergreen Forest	Canopy Foliage Chemistry	9
Distributed	Base Plot	Shrub Scrub	Canopy Foliage Chemistry	1
Distributed	Base Plot	Evergreen Forest	Coarse Downed Wood	18
Distributed	Base Plot	Shrub Scrub	Coarse Downed Wood	2
Distributed	Base Plot	Evergreen Forest	Digital Hemispherical Photos for Leaf Area Index	18
Distributed	Base Plot	Shrub Scrub	Digital Hemispherical Photos for Leaf Area Index	2
Distributed	Base Plot	Evergreen Forest	Herbaceous Biomass	18
Distributed	Base Plot	Shrub Scrub	Herbaceous Biomass	2
Distributed	Base Plot	Evergreen Forest	Plant Diversity	22
Distributed	Base Plot	Shrub Scrub	Plant Diversity	8
Distributed	Base Plot	Evergreen Forest	Soil Biogeochemistry	5
Distributed	Base Plot	Shrub Scrub	Soil Biogeochemistry	1
Distributed	Base Plot	Evergreen Forest	Soil Microbes	5
Distributed	Base Plot	Shrub Scrub	Soil Microbes	1

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Vegetation Structure	18
Distributed	Base Plot	Shrub Scrub	Vegetation Structure	2

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 SOAP.

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 total TOS Tower Base Plot number.

5.2 Sampling Season Characterization: SOAP

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.

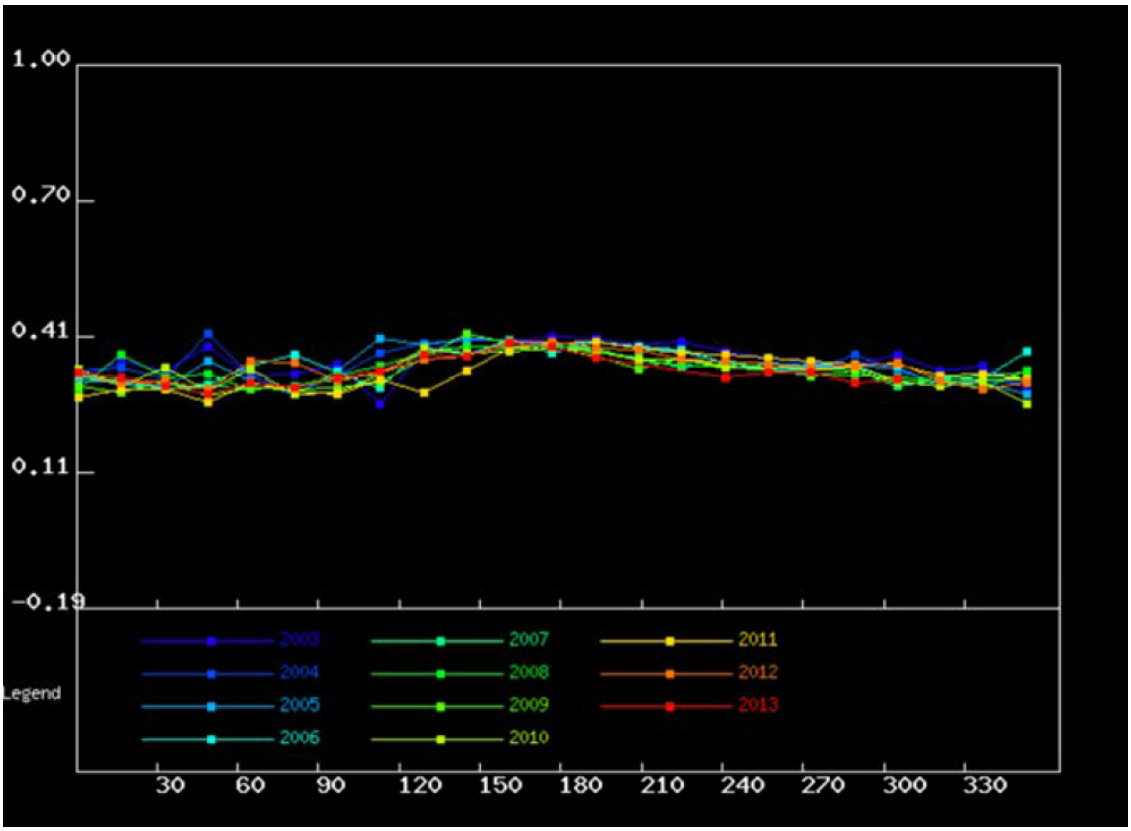

Figure 10: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON SOAP site.

Table 16: Average MODIS-EVI greenness dates for the NEON SOAP site, based on data from 2003-2013 (DOY, with MM/DD in parentheses).

Average Increase	Average Maximum	Average Decrease	Average Minimum
90 (04/01)	155 (06/05)	185 (07/05)	290 (10/18)

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 lat: 37.03337, centroid long: -119.26219 (WGS84 datum)

5.3 Belowground Biomass

5.3.1 Site-Specific Methods

Belowground biomass characterization data were collected down to a depth of 200 cm by NEON staff in August 2016. 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.

5.3.2 Results

Table 17: Soil Pit Information at SOAP.

Latitude	Longitude	Soil Family	Soil Order
37.03269	-119.2621	Fine-loamy - mixed - semiactive - mesic Ultic Haploxeralfs	Alfisol

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

Table 18: Fine root mass per depth increment (cm) at SOAP.

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	18.4	7.43
10	20	8.73	4.78
20	30	7.59	2.36
30	40	10.99	4.72
40	50	4.62	0.43
50	60	4.56	2.01
60	70	7.31	3.55
70	80	2.32	1.77
80	90	2.46	2.48
90	100	1.34	0.79
100	120	1.94	0.89
120	140	0.98	0.3
140	160	0.78	0.64

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
160	180	0.67	0.9
180	200	1.51	2.4

Table 19: Cumulative fine root mass as a function of depth (cm) at SOAP.

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	1839.77	743.13
10	20	2712.53	1221.02
20	30	3471.7	1369.89
30	40	4571.2	1022.58
40	50	5033.3	1047.84
50	60	5489.13	1111.27
60	70	6220.17	975.01
70	80	6452.27	1132.58
80	90	6698.47	1231.98
90	100	6832.9	1264.59
100	120	7221.9	1390.49
120	140	7418.23	1366.66
140	160	7574.33	1410.07
160	180	7709	1459.8
180	200	8010.3	1691.02

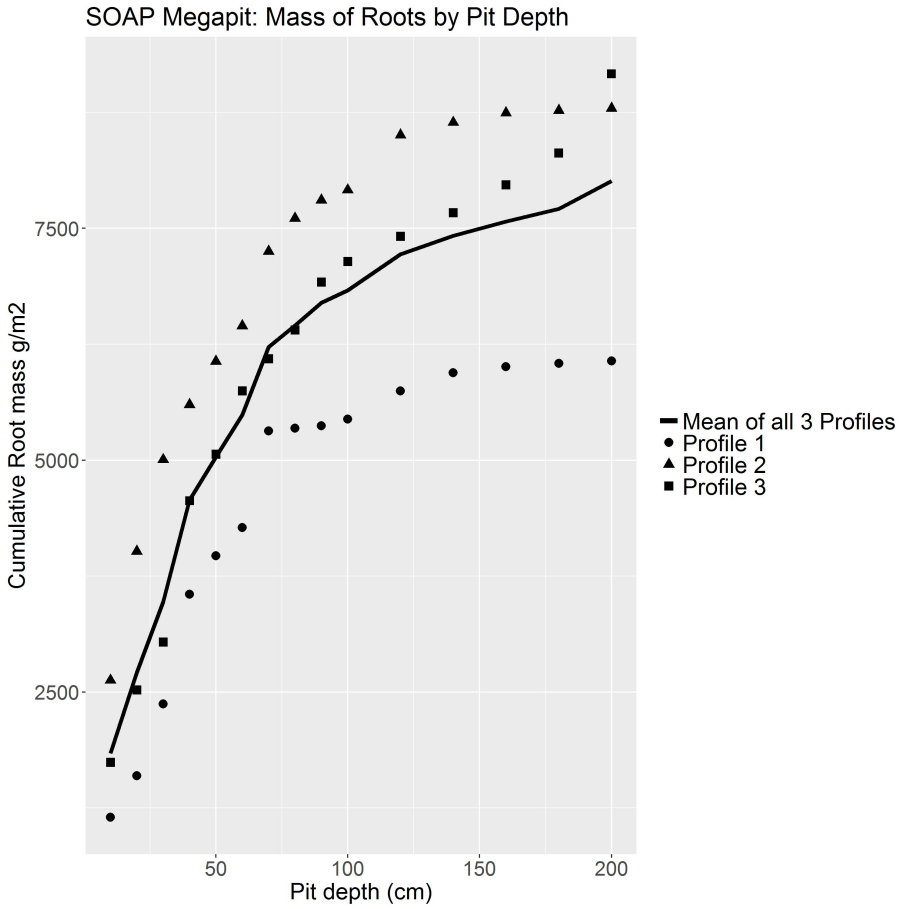

Figure 11: Cumulative root mass by pit depth at SOAP.

Table 20: Fine root biomass sampling summary data at SOAP.

Total Pit Depth (cm)	200
Total Mean Cumulative Mass at 30cm (g per m^2)	3471.7
Total Mean Cumulative Mass at 100cm (g per m^2)	6832.9
Total Mean Cumulative Mass (g per m^2)	8010.3

5.4 Plant Characterization and Phenology Species Selection

5.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff during July of 2015. Plant characterization data inform the 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 21: Site plant characterization and phenology species summary at SOAP.

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
ARVIM	*Arctostaphylos viscida* Parry ssp. *mariposa* (Dudley) P.V. Wells	1	1	0.06	0.44
CHFO	*Chamaebatia foliolosa* Benth.	2	16	NA	NA
QUCH2	*Quercus chrysolepis* Liebm.	3	<1	0.04	2.23
CADE27	*Calocedrus decurrens* (Torr.) Florin	4	<1	NA	4.22
PIPO	*Pinus ponderosa* Lawson & C. Lawson	5	<1	<1	5.73
QUKE	*Quercus kelloggii* Newberry	6	<1	<1	4.32
CECU	*Ceanothus cuneatus* (Hook.) Nutt.	7	<1	0.01	NA
CEMOG	*Cercocarpus montanus* Raf. var. *glaber* (S. Watson) F.L. Martin	8	<1	0.01	0.02

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
PILA	*Pinus lambertiana* Douglas	9	NA	NA	0.5
VULPI	*Vulpia* sp.	10	1	NA	NA
TODI	*Toxicodendron diversilobum* (Torr. & A. Gray) Greene	11	<1	<1	<1
CEIN3	*Ceanothus integerrimus* Hook. & Arn.	12	<1	<1	<1
FRCA6	*Fremontodendron californicum* (Torr.) Coville	13	NA	<1	<1
RIRO	*Ribes roezlii* Regel	15	<1	<1	NA
AECA	*Aesculus californica* (Spach) Nutt.	16	NA	<1	NA
CLPA5	*Claytonia parviflora* Claytonia parviflora	17	<1	NA	NA
GAAP2	*Galium aparine* L.	18	<1	NA	NA
TOAR	*Torilis arevensis* Torilis arevensis	19	<1	NA	NA
LOIN4	*Lonicera interrupta* Benth.	20	<1	<1	NA
RHIL	*Rhamnus ilicifolia* Kellogg	21	NA	<1	NA
ROBR3	*Rosa bridgesii* Crép.	22	<1	NA	NA
BRTE	*Bromus tectorum* L.	23	<1	NA	NA
BRCA5	*Bromus carinatus* Hook. & Arn.	24	<1	NA	NA
CEDI2	*Ceanothus diversifolius* Kellogg	24	<1	NA	NA
DEDA	*Deschampsia danthonioides* (Trin.) Munro	24	<1	NA	NA
LOUNU	*Lotus unifoliolatus* (Hook.) Benth. var. *unifoliolatus*	24	<1	NA	NA
ONAGRA	Onagraceae sp.	28	<1	NA	NA
HYGL2	*Hypochaeris glabra* L.	29	<1	NA	NA
BRELE	*Brodiaea elegans* Hoover ssp. *elegans*	30	<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)
BRHO2	*Bromus hordeaceus* L.	30	<1	NA	NA
CAMU5	*Carex multicaulis* L.H. Bailey	30	<1	NA	NA
CHPO3	*Chlorogalum pomeridianum* (DC.) Kunth	30	<1	NA	NA
POSE	*Poa secunda* J. Presl	34	<1	NA	NA
BRDI3	*Bromus diandrus* Roth	35	<1	NA	NA
MIMUL	*Mimulus* sp.	35	<1	NA	NA
COTI	*Collinsia tinctoria* Hartw. ex Benth.	37	<1	NA	NA
COUMC	*Comandra umbellata* (L.) Nutt. ssp. *californica* (Eastw. ex Rydb.) Piehl	37	<1	NA	NA
FEOC	*Festuca occidentalis* Hook.	37	<1	NA	NA
LANEN	*Lathyrus nevadensis* S. Watson ssp. *nevadensis*	37	<1	NA	NA
TRIXS	*Triteleia ixioides* (W.T. Aiton) Greene ssp. *scabra* (Greene) Lenz	37	<1	NA	NA
AMSIN	*Amsinckia* sp.	42	<1	NA	NA
ELGLG	*Elymus glaucus* Buckley ssp. *glaucus*	42	<1	NA	NA
LENE3	*Lessingia nemaclada* Greene	42	<1	NA	NA
PEMUM	*Pellaea mucronata* (D.C. Eaton) D.C. Eaton ssp. *mucronata*	42	<1	NA	NA
TRMI4	*Trifolium microcephalum* Pursh	42	<1	NA	NA
CLUN	*Clarkia unguiculata* Lindl.	47	<1	NA	NA
POACEA	Poaceae sp.	47	<1	NA	NA
STVIP	*Stephanomeria virgata* Benth. ssp. *pleurocarpa* (Greene) Gottlieb	47	<1	NA	NA
CECU	*Ceanothus cuneatus* (Hook.) Nutt.	50	<1	<1	NA

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
CLPUQ	*Clarkia purpurea* (W. Curtis) A. Nelson & J.F. Macbr. ssp. *quadrivulnera* (Douglas ex Lindl.) F.H. Lewis & M.E. Lewis	51	<1	NA	NA
GILIA	*Gilia* sp.	51	<1	NA	NA
LATHY	*Lathyrus* sp.	51	<1	NA	NA
LOTUS	*Lotus* sp.	51	<1	NA	NA
PETR7	*Pentagramma triangularis* (Kaulf.) Yatsk., Windham & E. Wollenw.	51	<1	NA	NA
PHACE	*Phacelia* sp.	51	<1	NA	NA
TRWI3	*Trifolium willdenovii* Spreng.	51	<1	NA	NA
UMCA	*Umbellularia californica* (Hook. & Arn.) Nutt.	51	<1	NA	NA
APIACE	Apiaceae sp.	59	<1	NA	NA
AVBA	*Avena barbata* Pott ex Link	59	<1	NA	NA
CASTI2	*Castilleja* sp.	59	<1	NA	NA
CLDU	*Clarkia dudleyana* (Abrams) J.F. Macbr.	59	<1	NA	NA
DICAC5	*Dichelostemma capitatum* (Benth.) Alph. Wood ssp. *capitatum*	59	<1	NA	NA
GALIU	*Galium* sp.	59	<1	NA	NA
LECI18	*Leptosiphon ciliatus* (Benth.) Jeps.	59	<1	NA	NA
LOGFI2	*Logfia* sp.	59	<1	NA	NA
LUPIN	*Lupinus* sp.	59	<1	NA	NA
POGLR3	*Potentilla glandulosa* Lindl. ssp. *reflexa* (Greene) D.D. Keck	59	<1	NA	NA
PTDR	*Pterostegia drymarioides* Fisch. & C.A. Mey.	59	<1	NA	NA
SILE2	*Silene lemmonii* S. Watson	59	<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)
STME2	*Stellaria media* (L.) Vill.	59	<1	NA	NA
TRCI	*Trifolium ciliolatum* Benth.	59	<1	NA	NA

Note: Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov). *Vulpia microstachys* and *V. myuros* are lumped within *Vulpia*. Similary, Onagraceae sp. includes *Epilobium foliosum*, *Clarkia* spp., and *Gayophytum* sp..

Table 22: Per plot breakdown of species richness, diversity, and herbaceous cover at SOAP.

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
SOAP_031	15	1.85	40	4.25
SOAP_043	13	1.52	40	0.12
SOAP_044	9	1.01	18	5.56
SOAP_045	12	1.42	52	0.12
SOAP_046	11	1.17	49	0.38
SOAP_047	16	1.31	33	0.12
SOAP_048	14	1.34	69	0.06
SOAP_049	15	1.56	44	0.5
SOAP_050	11	1.36	18	7.62
SOAP_051	26	2	93	1.44
SOAP_052	8	0.92	29	0.12
SOAP_053	13	1.82	31	0.12
SOAP_054	10	1.33	32	0.31
SOAP_055	10	1.34	26	0.31
SOAP_056	10	1.17	25	1.5
SOAP_057	9	1	24	0
SOAP_058	8	0.53	28	0
SOAP_059	19	1.76	106	0
SOAP_060	28	2.29	63	10.69
SOAP_061	13	1.58	46	0.06
Bryophyte Mean				1.66

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 not conducted at SOAP. 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 not conducted at SOAP. For more information on this protocol and data product numbers see Appendix A.

5.7 Ticks

5.7.1 Site-Specific Methods

Tick site chacterization was not conducted at SOAP. 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 SJER species reference list section.

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 RELOCATABLE SITE 2- LOWER TEAKETTLE (TEAK)

Lower Teakettle is a mixed conifer forest, ranging in elevation from 1,990 to 2,807 m. The varied terrain is typical of the Sierra Nevada, with rugged mountains, meadows, and prominent granite outcrops.

Key Characteristics:

- Site host: U.S. Forest Service
- Located in: Fresno County, CA
- Sampling Area: 51.4 km^2
- Plot Elevation: 2,085- 2,735m
- Dominant vegetation type: Dominant tree species include red and white fir (*Abies magnifica* and *Abies concolor*), Jeffrey pine (*Pinus jeffreyi*) and lodgepole pine (*Pinus contorta*). Stand structure is diverse, with active recruitment and extensive coarse downed wood. Although dense tree cover limits understory shrubs, bush chinquapin (*Chrysolepis sempervirens*) often grows on forested slopes. Exposed rock and shallow soils support other shrub species, such as mountain whitethorn (*Ceanothus cordulatus*), greenleaf manzanita (*Arctostaphylos patula*) and pinemat manzanita (*A.nevadensis*). Pine and fir forests provide habitat for more shade-tolerant herbaceous plants, whereas meadows, streams and patches of shallow soil accommodate a greater diversity of native grasses, graminoids, and forbs (Teakettle Experimental Forest, 2016).
- General management: Lower Teakettle is part of the Sierra National Forest. The southernmost portion of TEAK overlaps with the Teakettle Experimental Forest, managed by the Pacific Southwest Research Station. The USFS manages the forest for grazing.
- Teakettle 2 Creek is located south of the TOS site. 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.

6.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at TEAK 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.

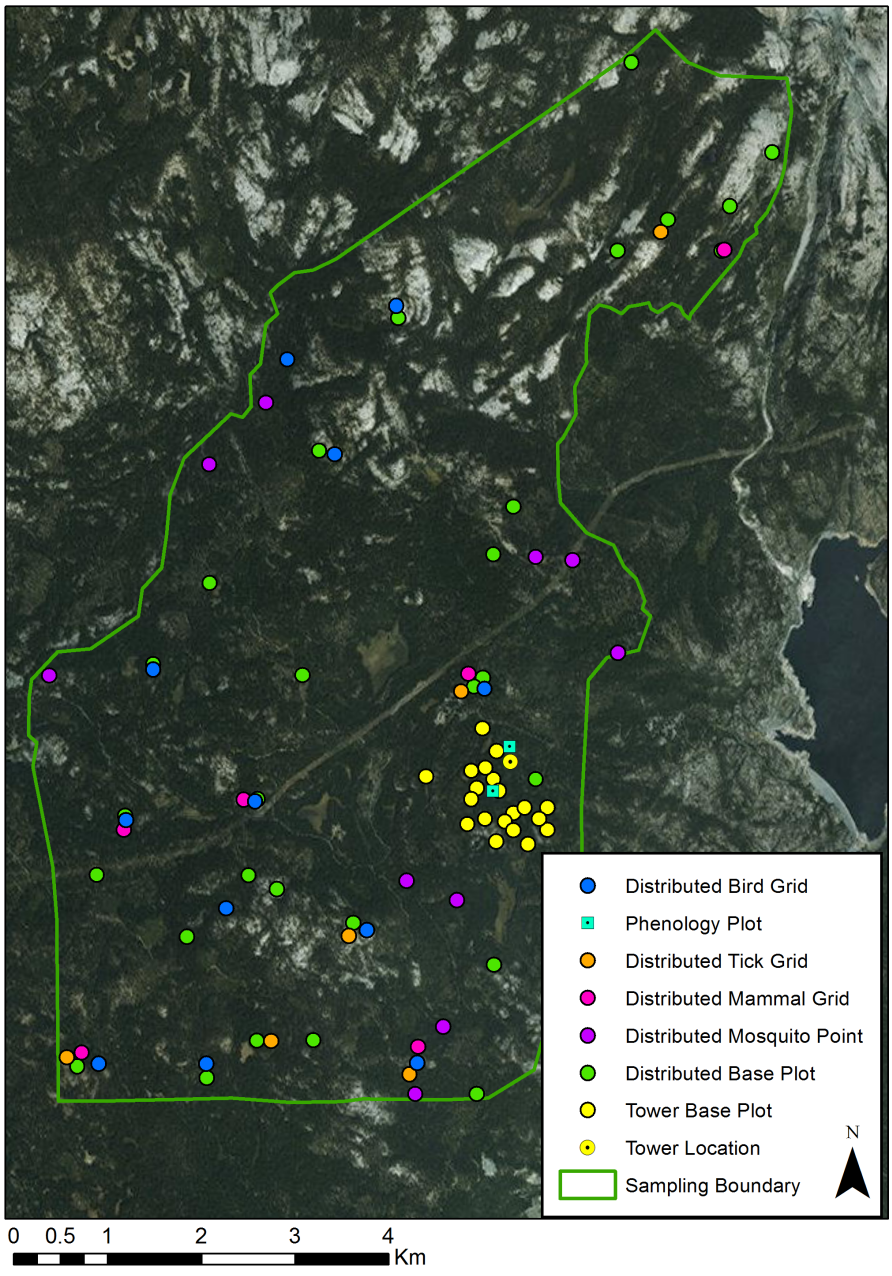

Figure 12: Map of TOS plot centroids within the NEON TOS sampling boundary at TEAK.

For a list of protocols associated with each plot see tables below; for additional spatial design information see

RD[03].

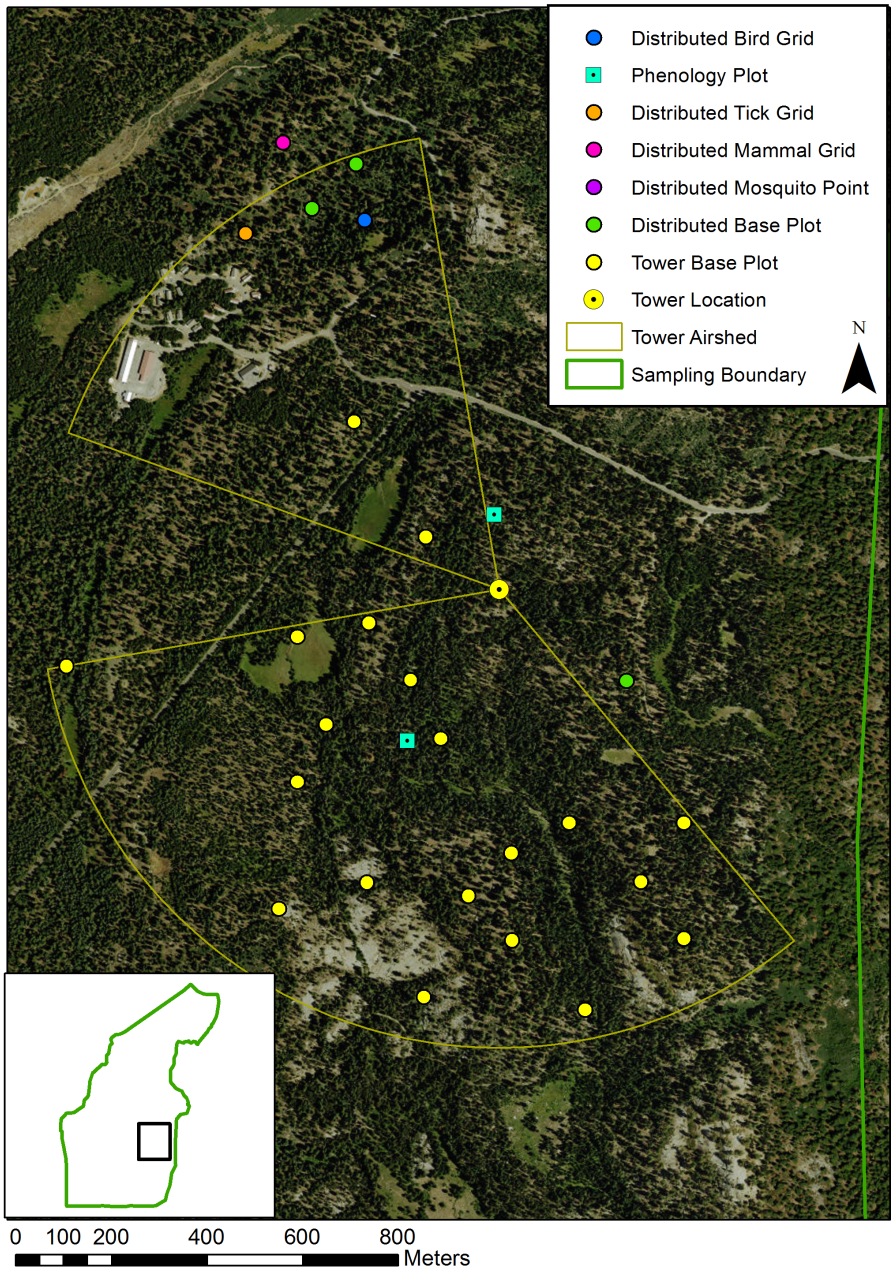

Figure 13: Map of the tower airshed and TOS plot centroids at TEAK.

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

Table 23: NLCD land cover classes and area within the TOS site boundary at TEAK.

NLCD Class	Site Area (km^2)	Percent (%)
Evergreen Forest	43.77	85.3
Shrub Scrub	5.98	11.66
Barren Land	1.02	1.98
Emergent Herbaceous Wetlands	0.37	0.72
Grassland Herbaceous	0.16	0.32
Open Water	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 24: NLCD land cover classes and TOS plot numbers at TEAK.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Evergreen Forest	22
Distributed	Base Plot	Shrub Scrub	8
Distributed	Bird Grid	Evergreen Forest	9
Distributed	Bird Grid	Shrub Scrub	1
Distributed	Mammal Grid	Evergreen Forest	5
Distributed	Mammal Grid	Shrub Scrub	1
Distributed	Mosquito Point	Evergreen Forest	9
Distributed	Mosquito Point	Shrub Scrub	1
Distributed	Tick Plot	Evergreen Forest	5
Distributed	Tick Plot	Shrub Scrub	1
Tower	Base Plot	NA	20
Tower	Phenology Plot	NA	2

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 25: Number of Distributed Base plots per NLCD land cover class per protocol at TEAK.

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Beetles	9

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Shrub Scrub	Beetles	1
Distributed	Base Plot	Evergreen Forest	Canopy Foliage Chemistry	9
Distributed	Base Plot	Shrub Scrub	Canopy Foliage Chemistry	1
Distributed	Base Plot	Evergreen Forest	Coarse Downed Wood	18
Distributed	Base Plot	Shrub Scrub	Coarse Downed Wood	2
Distributed	Base Plot	Evergreen Forest	Digital Hemispherical Photos for Leaf Area Index	18
Distributed	Base Plot	Shrub Scrub	Digital Hemispherical Photos for Leaf Area Index	2
Distributed	Base Plot	Evergreen Forest	Herbaceous Biomass	18
Distributed	Base Plot	Shrub Scrub	Herbaceous Biomass	2
Distributed	Base Plot	Evergreen Forest	Plant Diversity	22
Distributed	Base Plot	Shrub Scrub	Plant Diversity	8
Distributed	Base Plot	Evergreen Forest	Soil Biogeochemistry	5
Distributed	Base Plot	Shrub Scrub	Soil Biogeochemistry	1
Distributed	Base Plot	Evergreen Forest	Soil Microbes	5
Distributed	Base Plot	Shrub Scrub	Soil Microbes	1
Distributed	Base Plot	Evergreen Forest	Vegetation Structure	18
Distributed	Base Plot	Shrub Scrub	Vegetation Structure	2

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 26: Number of Tower Plots per protocol at TEAK.

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

Plot Type	Plot Subtype	Protocols	Number of Plots
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: TEAK

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.

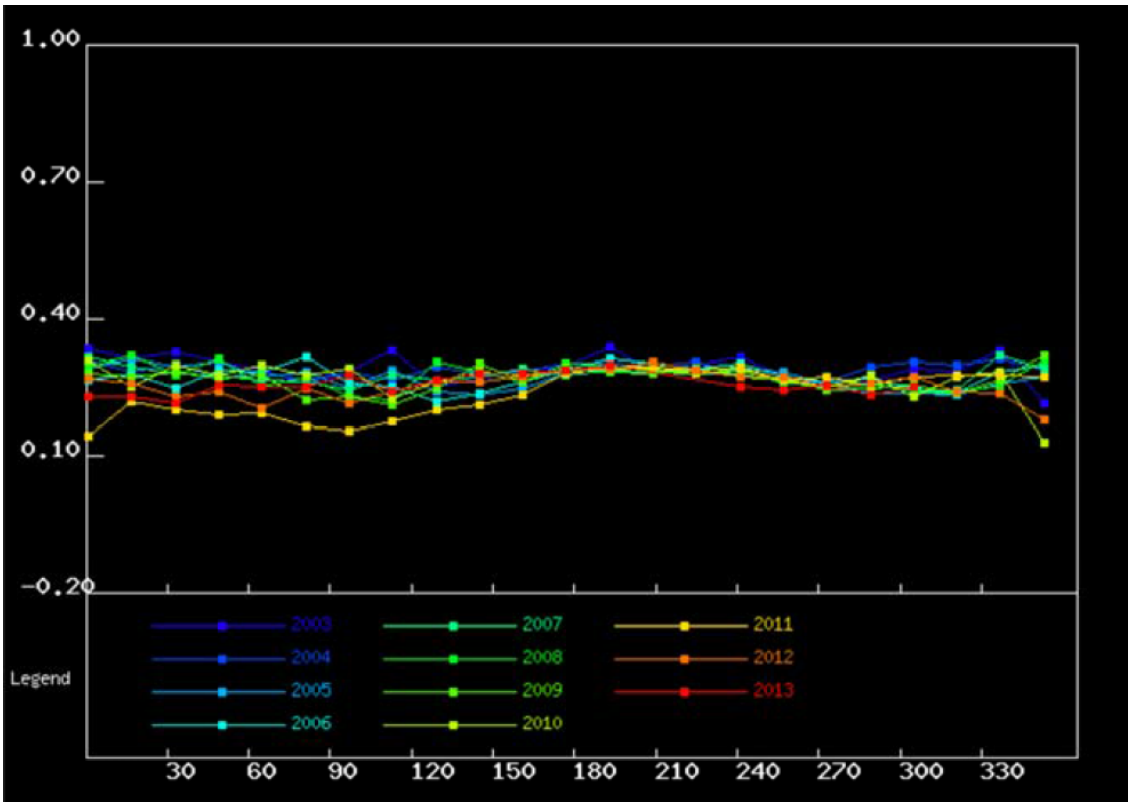

Figure 14: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON TEAK site.

Table 27: Average MODIS-EVI greenness dates for the NEON TEAK site, based on data from 2003-2013 (DOY, with MM/DD in parentheses).

Average Increase	Average Maximum	Average Decrease	Average Minimum
120 (05/01)	180 (06/30)	205 (07/25)	300 (10/28)

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: 12.25 km x 12.25 km box, centroid lat: 37.00583, centroid long: -119.00602 (WGS84 datum)

6.3 Belowground Biomass

6.3.1 Site-Specific Methods

Belowground biomass characterization data were collected down to a depth of 200 cm by NEON staff in August 2016. 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 28: Soil Pit Information at TEAK.

Latitude	Longitude	Soil Family	Soil Order
37.006472	-119.005758	Coarse-loamy - mixed - superactive - frigid Pachic Humixerepts	Inceptisol

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

Table 29: Fine root mass per depth increment (cm) at TEAK.

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	0.51	0.17
10	20	1.52	0.34
20	30	11.7	17.18
30	40	2.08	1.7
40	50	1.93	1.12
50	60	4.04	4.64
60	70	2.26	0.7
70	80	2.93	4.02
80	90	2.74	2.1
90	100	2.23	1.71
100	120	3.61	3.33
120	140	1.09	0.42
140	160	1.02	0.48
160	180	0.22	0.22
180	200	0.55	0.47

Table 30: Cumulative fine root mass as a function of depth (cm) at TEAK.

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	50.97	16.63
10	20	202.73	23.72
20	30	1372.77	1728.68
30	40	1580.27	1624.64
40	50	1773.3	1704.12
50	60	2177.47	1423.77
60	70	2403.13	1467.27
70	80	2695.97	1862.27
80	90	2969.53	1906.69
90	100	3192.5	1941.46
100	120	3913.8	2606.05
120	140	4132.5	2678.15
140	160	4335.87	2754.89
160	180	4379.83	2741.62

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
180	200	4489.63	2718.14

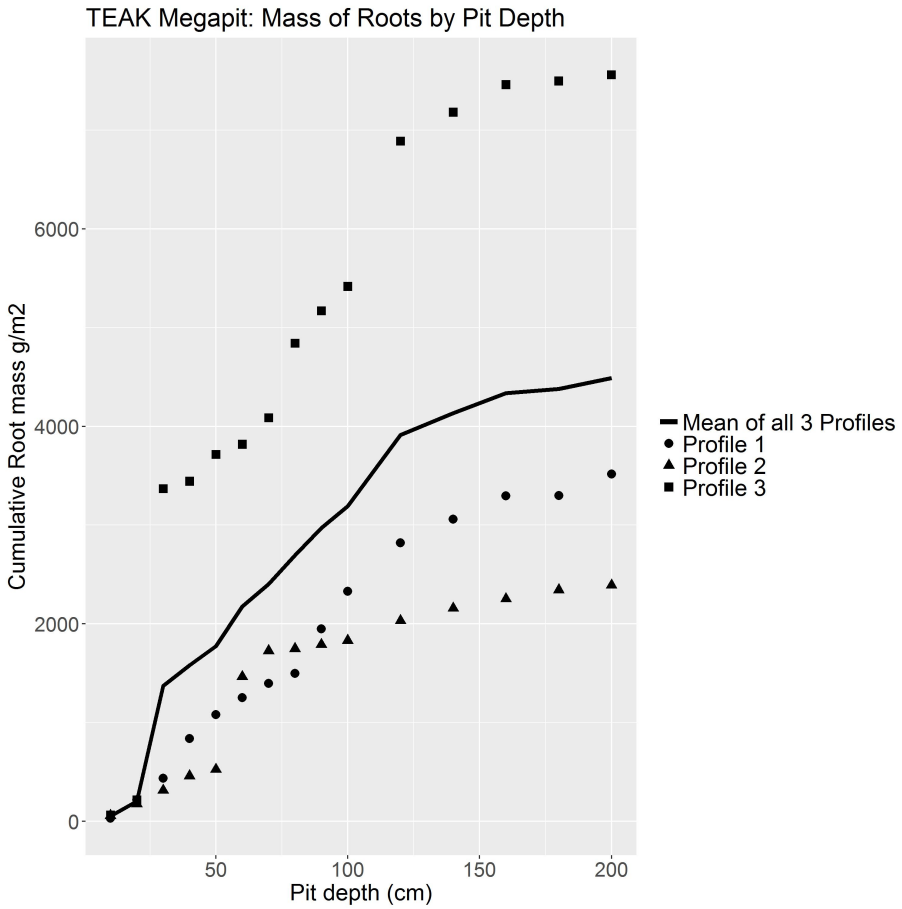

Figure 15: Cumulative root mass by pit depth at TEAK.

Table 31: Fine root biomass sampling summary data at TEAK.

Total Pit Depth (cm)	200
Total Mean Cumulative Mass at 30cm (g per m^2)	1372.77
Total Mean Cumulative Mass at 100cm (g per m^2)	3192.5
Total Mean Cumulative Mass (g per m^2)	4489.63

6.4 Plant Characterization and Phenology Species Selection

6.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff during June of 2015. Plant characterization data inform the 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 32: Site plant characterization and phenology species summary at TEAK.

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
ABMA	*Abies magnifica* A. Murray bis	1	1	<1	15.39
ABCO	*Abies concolor (Gord.* & Glend.) Lindl. ex Hildebr.	2	2	<1	14.21
PICO	*Pinus contorta* Douglas ex Loudon	3	<1	<1	12.56
PIJE	*Pinus jeffreyi* Balf.	4	<1	NA	6.93
ARPA6	*Arctostaphylos patula* Greene	5	NA	0.01	NA
CECO	*Ceanothus cordulatus* Kellogg	6	NA	0.01	NA
SALIX	*Salix* sp.	7	NA	<1	<1

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
RIBES	*Ribes* sp.	8	NA	<1	NA
CHSE11	*Chrysolepis sempervirens* (Kellogg) Hjelmqvist	9	<1	<1	NA
POSE	*Poa secunda* J. Presl	10	1	NA	NA
PREM	*Prunus emarginata* (Douglas ex Hook.) D. Dietr.	11	NA	<1	NA
TAOF	*Taraxacum officinale* F.H. Wigg.	12	<1	NA	NA
ASTERA	Asteraceae sp.	13	<1	NA	NA
DOJE	*Dodecatheon jeffreyi* Van Houtte	14	<1	NA	NA
CAREX	*Carex* sp.	15	<1	NA	NA
VIPU4	*Viola purpurea* Kellogg	16	<1	NA	NA
ERIOG	*Eriogonum* sp.	17	<1	NA	NA
AQUIL	*Aquilegia* sp.	18	<1	NA	NA
CAREXSPP	*Carex* sp.	19	<1	NA	NA
COTO	*Collinsia torreyi* A. Gray	20	<1	NA	NA
MOOD	*Monardella odoratissima* Benth.	21	<1	NA	NA
ACOCO	*Achnatherum occidentale* (Thurb.) Barkworth ssp. *occidentale*	22	<1	NA	NA
RIRO	*Ribes roezlii* Regel	23	NA	<1	NA
HIAL2	*Hieracium albiflorum* Hook.	24	<1	NA	NA
LILIAC	Liliaceae sp.	25	<1	NA	NA
VIMA2	*Viola macloskeyi* Lloyd	26	<1	NA	NA
PTAQ	*Pteridium aquilinum* (L.) Kuhn	27	<1	NA	NA
FRVI	*Fragaria virginiana* Duchesne	28	<1	NA	NA
POTEN	*Potentilla* sp.	29	<1	NA	NA
CADE27	*Calocedrus decurrens* (Torr.) Florin	31	NA	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)
PILA	*Pinus lambertiana* Douglas	32	NA	NA	0.04
DACA3	*Danthonia californica Bol.* Danthonia californica Bol.	33	<1	NA	NA
RUAC3	*Rumex acetosella* L.	34	<1	NA	NA
TRIFO	*Trifolium* sp.	35	<1	NA	NA
POBI6	*Polygonum bistortoides* Pursh	36	<1	NA	NA
DECE	*Deschampsia cespitosa* (L.) P. Beauv.	37	<1	NA	NA
HEMI20	*Hemizonella minima* (A. Gray) A. Gray	37	<1	NA	NA
MIMUL	*Mimulus* sp.	37	<1	NA	NA
RAUN	*Ranunculus uncinatus* D. Don ex G. Don	37	<1	NA	NA
GAER2	*Gayophytum eriospermum* Coville	41	<1	NA	NA
PESE2	*Pedicularis semibarbata* A. Gray	41	<1	NA	NA
GAYOP	*Gayophytum* sp.	43	<1	NA	NA
LUSU7	*Luzula subcongesta* (S. Watson) Jeps.	43	<1	NA	NA
VECA2	*Veratrum californicum* Durand	43	<1	NA	NA
APIACE	Apiaceae sp.	46	<1	NA	NA
CRYPT	*Cryptantha* sp.	46	<1	NA	NA
PINACE	Pinaceae sp.	46	<1	NA	NA
RUSAD	*Rumex salicifolius* Weinm. var. *denticulatus* Torr.	46	<1	NA	NA
STREP2	*Streptanthus* sp.	46	<1	NA	NA
ABIES	*Abies* sp.	51	<1	NA	<1
LAMIAC	Lamiaceae sp.	52	<1	NA	NA
LAMIAC	Lamiaceae sp.	53	<1	NA	NA
POACEA	Poaceae sp.	53	<1	NA	NA
SETR	*Senecio triangularis* Hook.	53	<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)
CIMO5	*Cistanthe monosperma* (Greene) Hershkovitz	56	<1	NA	NA
HOTRT	*Horkelia tridentata* Torr. ssp. *tridentata*	56	<1	NA	NA
SEAR4	*Senecio aronicoides* DC.	56	<1	NA	NA
STT03	*Streptanthus tortuosus Kellogg* Streptanthus tortuosus Kellogg	56	<1	NA	NA
BRMA4	*Bromus marginatus* Nees ex Steud.	60	<1	NA	NA
CAMI	*Calochortus minimus* Ownbey	60	<1	NA	NA
CLPE	*Claytonia perfoliata* Donn ex Willd.	60	<1	NA	NA
LECI18	*Leptosiphon ciliatus* (Benth.) Jeps.	60	<1	NA	NA
PIUN3	*Piperia unalascensis* (Spreng.) Rydb.	60	<1	NA	NA
SILE2	*Silene lemmonii* S. Watson	60	<1	NA	NA
ALLIU	*Allium* sp.	66	<1	NA	NA
ARHOR	*Arabis holboellii* Hornem. var. *retrofracta* (Graham) Rydb.	66	<1	NA	NA
LOUNU	*Lotus unifoliolatus* (Hook.) Benth. var. *unifoliolatus*	66	<1	NA	NA
PHQU	*Phacelia quickii* J.T. Howell	66	<1	NA	NA
ACOCC	*Achnatherum occidentale* (Thurb.) Barkworth ssp. *californicum* (Merr. & Burtt Davy) Barkworth	70	<1	NA	NA
CALE3	*Calochortus leichtlinii* Hook. f.	70	<1	NA	NA
CARYOP	Caryophyllaceae sp.	70	<1	NA	NA
GABI	*Galium bifolium* S. Watson	70	<1	NA	NA
PHACE	*Phacelia* sp.	70	<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)
THFE	*Thalictrum fendleri* Engelm. ex A. Gray	70	<1	NA	NA
TRIX	*Triteleia ixioides* (W.T. Aiton) Greene	70	<1	NA	NA
VIGL	*Viola glabella* Nutt.	70	<1	NA	NA
ALCA2	*Allium campanulatum* S. Watson	78	<1	NA	NA
APAN2	*Apocynum androsaemifolium* L.	78	<1	NA	NA
ARAM	*Arceuthobium americanum* Nutt. ex Engelm.	78	<1	NA	NA
CEGL2	*Cerastium glomeratum* Thuill.	78	<1	NA	NA
EQUIS	*Equisetum* sp.	78	<1	NA	NA
LOTO2	*Lomatium torreyi* (J.M. Coult. & Rose) J.M. Coult. & Rose	78	<1	NA	NA
LUPIN	*Lupinus* sp.	78	<1	NA	NA
LUZUL	*Luzula* sp.	78	<1	NA	NA
ONAGRA	Onagraceae sp.	78	<1	NA	NA
PENEN	*Penstemon newberryi* A. Gray ssp. *newberryi*	78	<1	NA	NA
PINUS	*Pinus* sp.	78	<1	NA	NA
PIPER2	*Piperia* sp.	78	<1	NA	NA
ROCU2	*Rorippa curvipes* Greene	78	<1	NA	NA
STOB	*Stellaria obtusa* Engelm.	78	<1	NA	NA

Note: Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov). *Ribes* sp. includes *R. roezlii*, *R. cereum* var. *cereum*, *R. nevadense*, and *R. viscosissium*. *Carex* sp. includes *C.rosii*. *Eriogonum* sp. includes *E. spergulinum*. *Potentilla* sp. includes *P. gracilis* var *fastigiata*. *Mimulus* sp. includes *M. floribundus*, *M. guttatus*, *M. leptaleus*,*M. moschatus*, *M. primuloide* var. *primuloides*, and *M. whitneyi*. Pinaceae sp. includes the seedlings of *Abies* spp. or *Pinus* spp while *Pinus* sp. includes the seedlings of *P. jeffreyi*, *P. contorta*, or *P. lambertiana* . Similarly, *Abies* sp. includes the seedlings of *A. concolor* or *A. magnifica*. *Lupinus* sp. includes *L. breweri* var. *breweri*.

Table 33: Per plot breakdown of species richness, diversity, and herbaceous cover at TEAK.

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
TEAK_043	22	2.29	23	0.25
TEAK_044	22	2.19	84	0.38
TEAK_045	11	1.88	17	0
TEAK_046	7	0.2	88	0.06
TEAK_047	10	2.05	8	0
TEAK_048	11	1.86	13	0
TEAK_049	8	1.95	4	0
TEAK_050	3	0.07	40	0.06
TEAK_051	14	1.4	44	0.12
TEAK_052	19	1.75	26	0.12
TEAK_053	30	2.48	100	0
TEAK_054	4	0.67	5	0
TEAK_055	11	0.85	37	0
TEAK_056	17	2.06	19	0
TEAK_057	15	2.08	24	5.75
TEAK_058	14	1.54	27	0.31
TEAK_059	4	0.74	64	0.06
TEAK_060	16	1.63	33	6.62
TEAK_061	15	1.91	48	0.69
TEAK_062	6	1.56	3	0.25
Bryophyte Mean				0.73

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

Beetle site characterization was not conducted at TEAK. For more information on this protocol and data product numbers see Appendix A.

6.6 Mosquitoes

6.6.1 Site-Specific Methods

Mosquito site characterization was not conducted at TEAK. For more information on this protocol and data product numbers see Appendix A.

6.7 Ticks

6.7.1 Site-Specific Methods

Tick site chacterization was not conducted at TEAK. 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]). For statewide references see the SJER species reference list section.

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

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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 34: 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

Name	Description	Identification Code
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
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