TOS SITE CHARACTERIZATION REPORT: DOMAIN 20

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CHANGE RECORD

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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 the one site in the Pacific Tropical Domain. For more information about the sampling methods, reference the TOS Site Characterization Methods Document (RD[05]). The geographic coordinates for all TOS sampling locations can be found in the Document Library 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.011085	TIS Site Characterization Report
RD[05]	NEON.DOC.003885	TOS Site Characterization Methods
RD[06]	NEON.DOC.000481	TOS Protocol and Procedure: Small Mammal Sampling
RD[07]	NEON.DOC.014041	TOS Protocol and Procedure: Breeding Landbird Abundance and Diversity
RD[08]	NEON.DOC.014042	TOS Protocol and Procedure: Plant Diversity Sampling
RD[09]	NEON.DOC.000987	TOS Protocol and Procedure: Measurement of Vegetation Structure
RD[10]	NEON.DOC.014040	TOS Protocol and Procedure: Plant Phenology
RD[11]	NEON.DOC.001709	TOS Protocol and Procedure: Bryophyte Productivity

2.3 Acronyms

Acronym	Definition
NLCD	National Land Cover Database

3 DOMAIN 20 OVERVIEW: PACIFIC TROPICAL DOMAIN

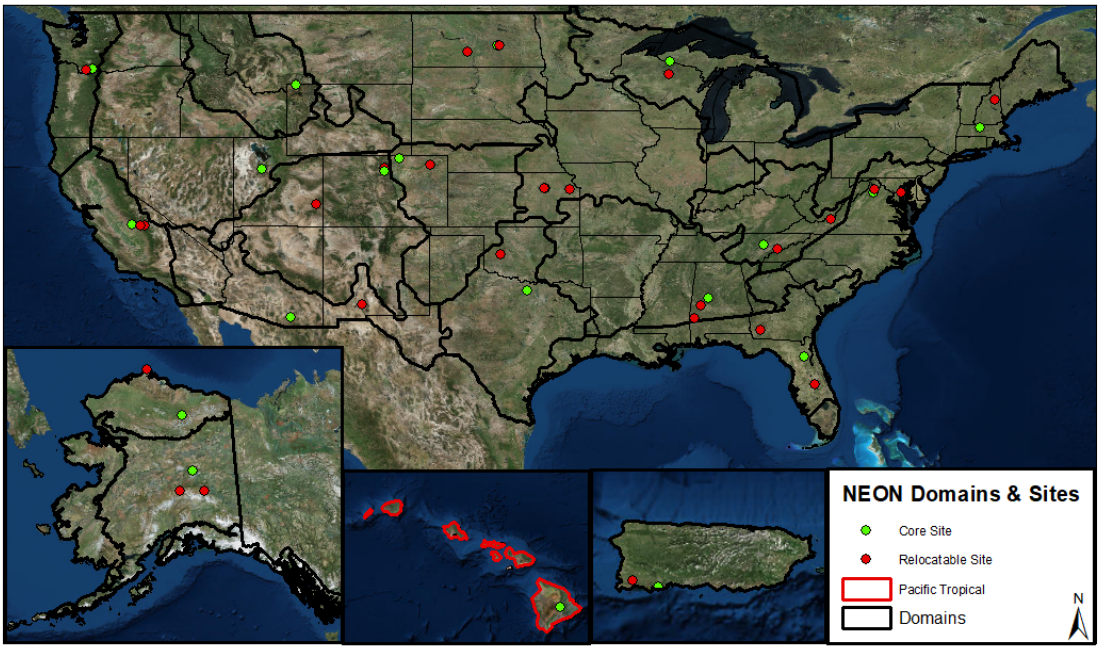

Figure 1: NEON project map with Domain 20 highlighted in red.

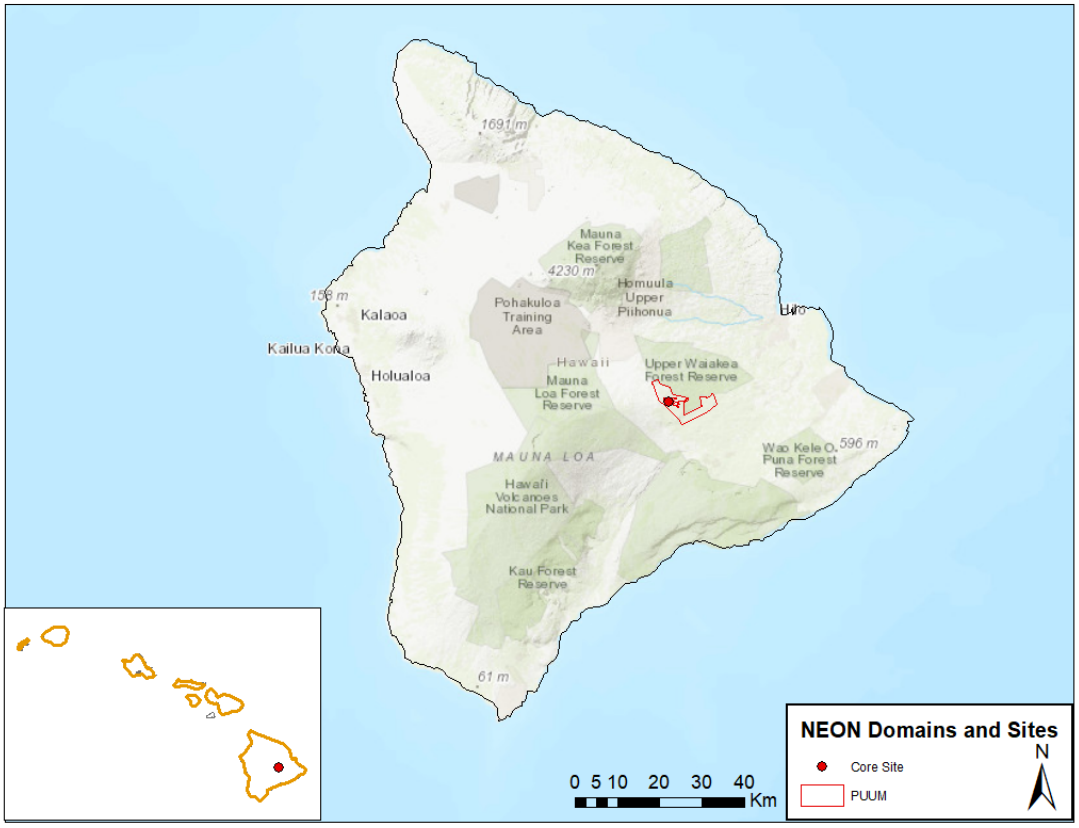

Figure 2: Site boundaries within Domain 20.

The Pacific Tropical Domain includes all of the Hawaiian Islands. The unique endemic diversity coupled with the threat from invasive species makes Domain 20 (D20) a compelling location to conduct long-term ecological research. The Hawaiian ecosystem also serves as a proxy model to extend comparative understandings to other tropical systems, particularly those in the Atlantic Neotropical Domain (D4).

- States included in the domain: Hawai'i
- Core site: Pu'u Maka'ala Natural Resource Area
- Science themes: Invasive Species

4 CORE SITE- PU'U MAKA'ALA NATURAL RESOURCE AREA (PUUM)

Pu'u Maka'ala Natural Resource Area is located in the South Hilo district on the island of Hawai'i. Located on the northeast side of Mauna Loa, the reserve receives an average rainfall of 2,000-4,000 mm per year. Lava flow substrate ages range from 1942 to flows from 10,000 years ago (DOFAW, 2013). Part of the reserve is fenced to reduce damage from feral ungulates making the area extremely important for the protection of native species.

Key Characteristics:

- Site host: Hawai'i State Forest Reserve System Department of Land and Natural Resources, Division of Forestry and Wildlife
- Located in: Hawai'i County, HI
- Area: 47.20 km^2
- Elevation: 1030- 1845m
- Dominant vegetation type: The ecosystem at PUUM is Hawai'i Montane Rainforest. The site transitions from lowland montane wet forest in the east to drier habitats in the west along the elevational gradient of Mauna Loa. The Ohi'a (*Metrosideros polymorpha*) forest has a dense understory compromised of hapu'u tree ferns (*Cibotium* sp.). In total over 150 endemic plant and fern species can be found in Pu'u Maka'ala (DOFAW, 2013).
- General management: Natural Area Reserves (NAR) are managed to protect the unique natural and culture resources of Hawaii. The Pu'u Maka'ala Reserve was created to protect a portion of the Big Island's native wet forest. Ongoing management and research is focused on habitat restoration, invasive weed removal, and removing ungulates from fenced management units (Hawai'i Island Natural Area Reserves, 2018).
- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research. See the "TOS Spatial Sampling Design" section for site specific deviations.

4.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at PUUM according to a spatially balanced and stratified-random design (RD[3]). The 2011 National Land Cover Database (NLCD) was selected for stratification because of the consistent and comparable data availability across the United States. On ground verification reported that the NLCD shrub scrub layer was actually open-canopy ohi'a tree stands. The shrub scrub areas were reclassified as evergreen forest for plot allocation.

No tick sampling occurs at PUUM following site host recommendations to avoid creating trails. In addition, no *Ixodes* or *Dermacentor* tick species occur at the site. No small mammal sampling occurs at PUUM since there are no natives species and mark-recapture sampling of invasive small mammals is not permitted. TOS Tower Plots were allocated according to a spatially balanced design in and around the NEON tower airshed (RD[03]). To avoid creating additional trails, the primary phenology transect is located north of the tower along the road. No additional phenocam plot will be established.

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.

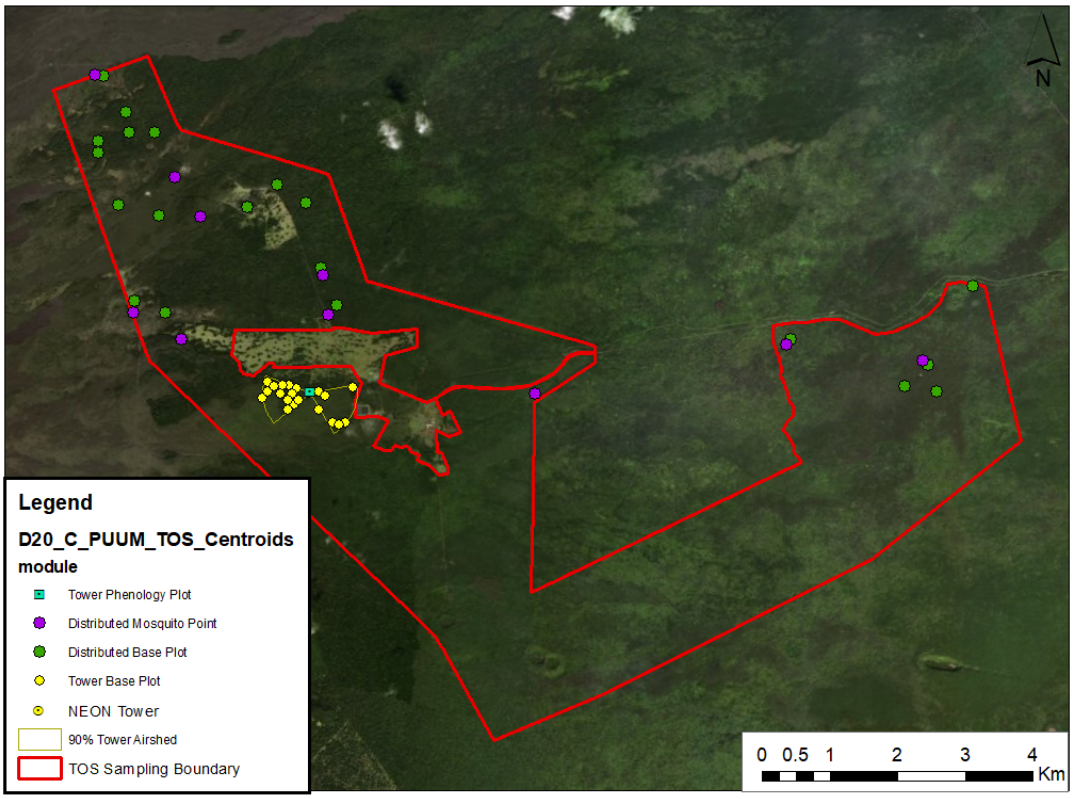

Figure 3: Map of TOS plot centroids within the NEON TOS sampling boundary at PUUM.

For a list of protocols associated with each plot see tables below; for additional spatial design information see RD[03]. Due to the dense forest, plots were constrained to areas near established roads and trails. Much of the southern part of the boundary is not logistically feasible to sample.

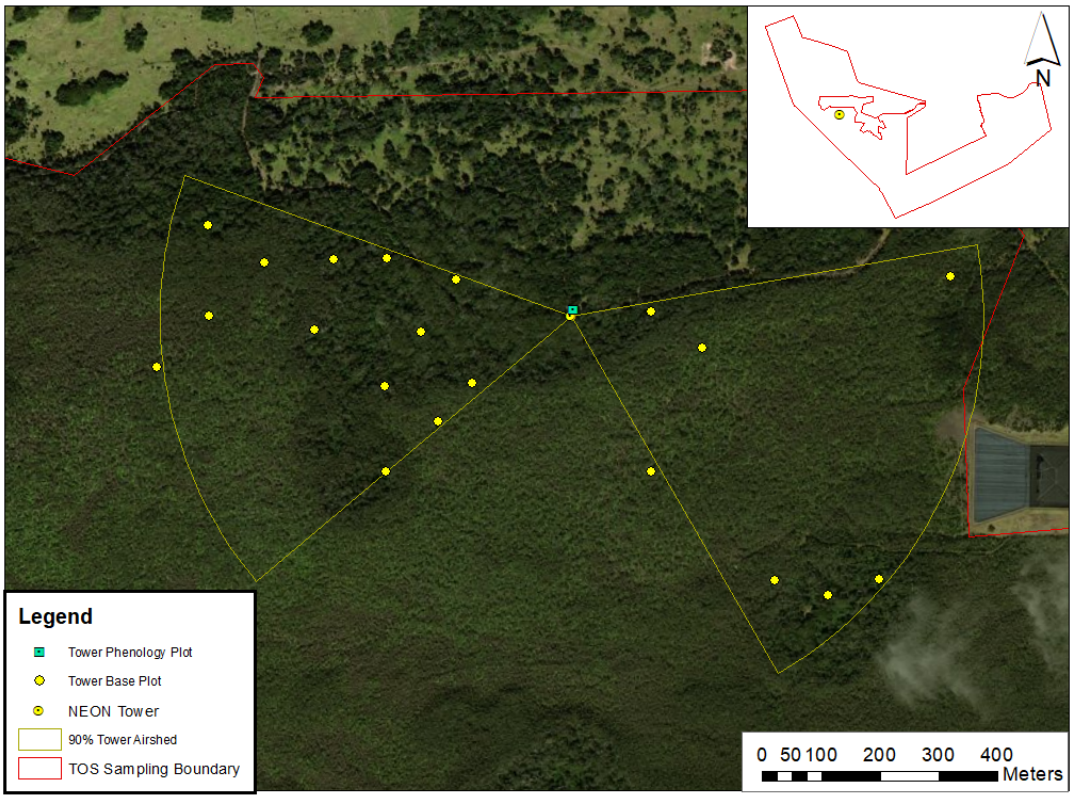

Figure 4: Map of the tower airshed and TOS plot centroids at PUUM.

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 PUUM.

NLCD Class	Site Area (km^2)	Percent (%)
Evergreen Forest	41.93	88.87
Shrub Scrub	3.79	8.03
Developed Open Space	0.88	1.87
Grassland Herbaceous	0.45	0.96
Developed Low Intensity	0.12	0.26

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 PUUM.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Evergreen Forest	20
Distributed	Mosquito Point	Evergreen Forest	10
Tower	Base Plot	NA	20
Tower	Phenology Plot	NA	1

Note: The shrub scrub areas were reclassified as evergreen forest for plot allocation, see "TOS Spatial Sampling Design" for more information. 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 PUUM.

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Evergreen Forest	Beetles	10
Distributed	Base Plot	Evergreen Forest	Birds	15
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
Distributed	Base Plot	Evergreen Forest	Herbaceous Biomass	20
Distributed	Base Plot	Evergreen Forest	Plant Diversity	20
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 PUUM.

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

Plot Type	Plot Subtype	Protocols	Number of Plots
Tower	Base Plot	Plant Belowground Biomass	20
Tower	Base Plot	Plant Diversity	3
Tower	Base Plot	Soil Biogeochemistry	4
Tower	Base Plot	Soil Microbes	4
Tower	Base Plot	Vegetation Structure	20
Tower	Phenology	Plant Phenology	1

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: PUUM

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 PUUM (see Figure 5 below). Using data from nearby weather stations and knowledge from on site collaborators and NEON staff it was determined to use precipitation data (see Figure 6) as the primary driver in guiding temporal aspects of TOS sampling at PUUM. Precipitation data spanning 1949-2000 was analyzed from four stations near the town of Hilo (approximately 30 kilometers from PUUM).In general, TOS sampling at PUUM is timed to avoid the wettest parts of the year, and to avoid sampling during periods that are critical for nesting native birds.

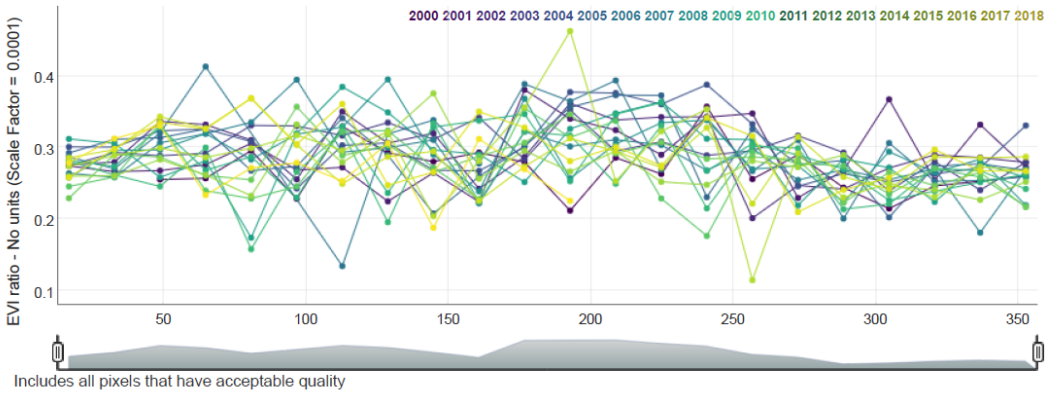

Figure 5: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2001-2018 at the NEON PUUM site.

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: 2001-2018
- User selected area: 10.25 km x 10.25 km box, Centroid Latitude: 19.55309, Longitude: -155.31731 (WGS84 datum)

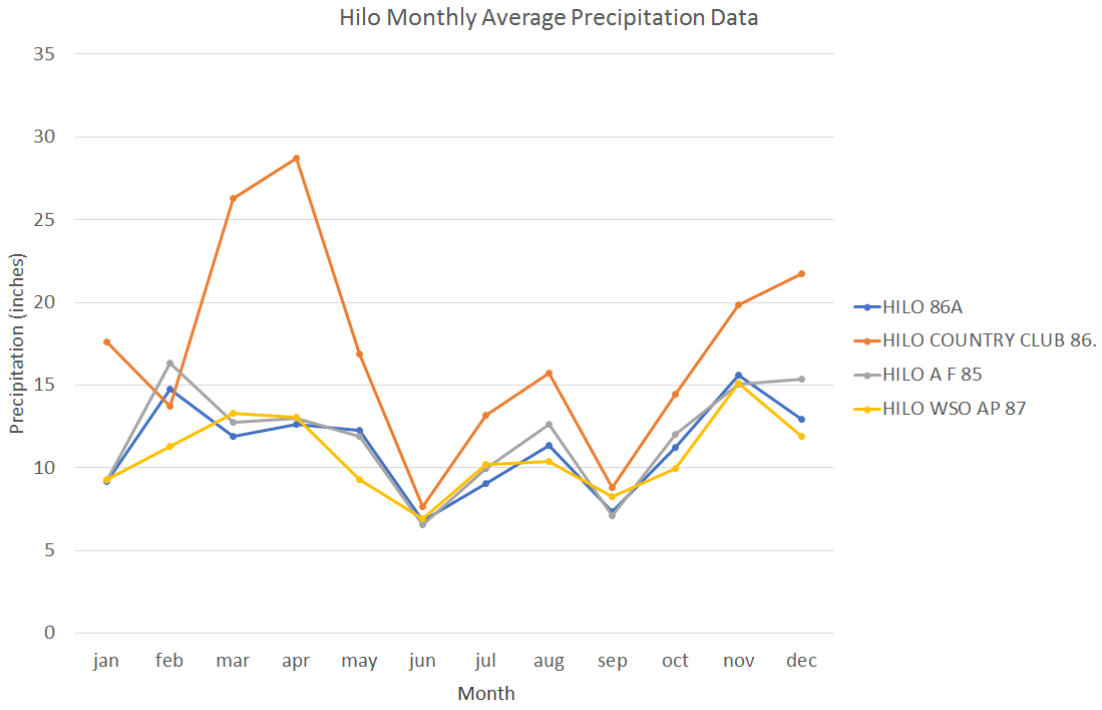

Figure 6: Precipitation Data for four weather stations in Hilo, HI. Data downloaded from the Hawai'i State Climate Office (http://www.soest.hawaii.edu/MET/Hsco/ppt.htm#ave-ppt)

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4.3 Belowground Biomass

Due to shallow soil no mega pit below ground biomass sampling was conducted at PUUM.

4.4 Plant Characterization and Phenology Species Selection

4.4.1 Site-Specific Methods

Plant characterization data were collected by NEON staff. Vegetation structure measurements were collected March- August 2018 and plant diversity data were collected March-May 2018. Plant characterization data informs sampling procedures for plant phenology and plant productivity protocols.

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

1. Mean percent cover values were calculated based on species specific cover estimation for all plant species under 3m tall in eight 1m by 1m subplots per plot; see the TOS Protocol and Procedure: Plant Diversity Sampling (RD[08]) 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[9]) 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[9]) for more information.

The standard field methods and ranking calculations are further outlined in TOS Site Characterization Methods (RD[4]). For more information on this protocol and data product numbers see Appendix A.

4.4.2 Results

Table 5: Site plant characterization and phenology species summary at PUUM.

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
MEPO5	*Metrosideros polymorpha* Gaudich.	1	2	<1	22
CIGL	*Cibotium glaucum* (Sm.) Hook. & Arn.	3	2	<1	15.46
STTA	*Styphelia tameiameiae* (Cham. & Schltdl.) F. Muell.	4	1	0.1	<1
ACKO	*Acacia koa* A. Gray	5	<1	<1	9.28
DILI	*Dicranopteris linearis* (Burm.) Underw.	6	6	<1	<1
RUHA	*Rubus hawaiensis* A. Gray	7	<1	0.02	<1
ILAN	*Ilex anomala* Hook. & Arn.	8	<1	<1	1.7
VACA8	*Vaccinium calycinum* Sm.	9	<1	0.01	<1
CIME8	*Cibotium menziesii* Hook.	10	<1	<1	1.31
DRWA	*Dryopteris wallichiana* (Spreng.) Hyl.	11	2	<1	<1
HYDRAN	Hydrangeaceae sp.	12	<1	0.01	<1
MYLE2	*Myrsine lessertiana* A. DC.	13	<1	<1	0.99

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
CHTR2	*Cheirodendron trigynum* (Gaudich.) A. Heller	14	<1	<1	0.98
LYCE2	*Lycopodiella cernua* (L.) Pic. Serm.	15	1	<1	<1
COER3	*Coprosma ernodeoides* A. Gray	16	<1	<1	<1
SADLE	*Sadleria* sp.	17	1	<1	<1
CLMO5	*Clermontia montis-loa* Rock	18	<1	<1	0.03
VARE	*Vaccinium reticulatum* Sm.	19	<1	<1	<1
MEVO	*Melicope volcanica* (A. Gray) T.G. Hartley & B.C. Stone	20	<1	<1	<1
DILI	*Dicranopteris linearis* (Burm.) Underw.	21	6	<1	<1
COPRO	*Coprosma* sp.	22	<1	<1	0.22
MYSA	*Myoporum sandwicense* (A. DC.) A. Gray	23	<1	<1	0.3
ELAPH	*Elaphoglossum* sp.	24	<1	<1	<1
SAPA11	*Sadleria pallida* Hook. & Arn.	25	<1	<1	0.01
DENU6	*Deschampsia nubigena* Hillebr.	26	<1	<1	<1
ASME4	*Astelia menziesiana* Sm.	27	<1	<1	<1
CAREX	*Carex* sp.	28	<1	<1	<1
ALST11	*Alyxia stellata* (J.R. Forst. & G. Forst.) Roem. & Schult.	29	<1	<1	<1
COOC3	*Coprosma ochracea* W.R.B. Oliv.	30	<1	<1	0.1
ASPLE	*Asplenium* sp.	31	<1	<1	<1
MYSA2	*Myrsine sandwicensis* A. DC.	32	<1	<1	0.08
SACY3	*Sadleria cyatheoides* Kaulf.	33	<1	<1	0.12
MIST	*Microlaena stipoides* (Labill.) R. Br.	34	<1	<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)
DISA3	*Diplazium sandwichianum* (C. Presl) Diels	35	<1	<1	<1
SASO2	*Sadleria souleyetiana* (Gaudich.) T. Moore	37	<1	<1	<1
ATMI	*Athyrium microphyllum* (J. Sm.) Alston	38	<1	<1	<1
DUSC	*Dubautia scabra* (DC.) D.D. Keck	39	<1	<1	<1
MELIC3	*Melicope* sp.	40	<1	<1	<1
PNSA	*Pneumatopteris sandwicensis* (Brack.) Holttum	41	<1	<1	<1
ELHI3	*Elaphoglossum hirtum* (Sw.) C. Chr.	42	<1	<1	<1
MERA2	*Melicope radiata* (H. St. John) T.G. Hartley & B.C. Stone	43	<1	<1	0.03
BRAR6	*Broussaisia arguta* Gaudich.	44	<1	<1	<1
CYPERA	Cyperaceae sp.	45	<1	<1	<1
MAAN	*Machaerina angustifolia* (Gaudich.) T. Koyama	45	<1	<1	<1
CAAL12	*Carex alligata* Boott	47	<1	<1	<1
VACCI	*Vaccinium* sp.	48	<1	<1	<1
PASPA2	*Paspalum* sp.	49	<1	<1	<1
ADTR2	*Adenophorus tripinnatifidus* Gaudich.	50	<1	<1	<1
GRHO2	*Grammitis hookeri* (Brack.) Copeland	50	<1	<1	<1
ADENO3	*Adenophorus* sp.	52	<1	<1	<1
HYLA2	*Hymenophyllum lanceolatum* Hook. & Arn.	52	<1	<1	<1
LUHA2	*Luzula hawaiiensis* Buchenau	52	<1	<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)
MECL	*Melicope clusiifolia* (A. Gray) T.G. Hartley & B.C. Stone	55	<1	<1	<1
ANOD	*Anthoxanthum odoratum* L.	56	<1	<1	<1
CAWA	*Carex wahuensis* C.A. Mey.	56	<1	<1	<1
DIPLA2SPP	*Diplazium* sp.	56	<1	<1	<1
FRUH	*Fraxinus uhdei* (Wenzig) Lingelsh.	56	<1	<1	<1
ORFU2	*Oreobolus furcatus* H. Mann	56	<1	<1	<1
PLANT	*Plantago* sp.	56	<1	<1	<1
PSHA3	*Psychotria hawaiiensis* (A. Gray) Fosberg	56	<1	<1	<1
HETE21	*Hedyotis terminalis* (Hook. & Arn.) W.L. Wagner & D.R. Herbst	63	<1	<1	<1

Note:Taxon IDs and scientific names are based on the USDA Plants database (plants.usda.gov). Moss was the number two ranked group and removed from the list of possible species for phenology sampling.

Table 6: Per plot breakdown of species richness, diversity, and herbaceous cover at PUUM.

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
PUUM_031	10	1.59	29	13.1
PUUM_032	12	1.25	90	2.5
PUUM_033	13	1.61	112	47.56
PUUM_034	18	2.04	48	16.38
PUUM_035	14	1.76	130	20.75
PUUM_036	18	2.1	87	12.62
PUUM_037	22	1.99	202	48.5
PUUM_038	16	1.57	178	41.88
PUUM_039	15	1.87	95	25.86
PUUM_040	17	1.8	103	23.56

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
PUUM_041	18	1.29	192	61.25
PUUM_042	17	1.57	57	32
PUUM_043	11	1.78	146	26.29
PUUM_044	18	1.88	125	53.38
PUUM_045	18	1.92	94	22.79
PUUM_046	19	2.13	108	28.62
PUUM_047	18	1.91	63	25.62
PUUM_048	20	1.65	102	61.25
PUUM_049	17	2.05	85	29.93
PUUM_050	16	1.38	41	28.12
Bryophyte				31.1

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 are used to determine which sites qualify for implementation of the Bryophyte Productivity protocol. According to AD[07], sites qualify for bryophyte productivity sampling when average bryophyte cover is $\geq$ 20% across all Tower plots. However, bryophyte productivity sampling was discontinued in 2018 and NEON no longer implements this protocol.

4.5 Beetles

4.5.1 Site-Specific Methods

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

4.6 Mosquitoes

4.6.1 Site-Specific Methods

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

4.7 Ticks

4.7.1 Site-Specific Methods

No tick site characterization was conducted at PUUM. 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[06], RD[07]).

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6 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 7: 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

Name	Description	Identification Code
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