TOS SITE CHARACTERIZATION REPORT: DOMAIN 06

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CHANGE RECORD

REVISION	DATE	ECO#	DESCRIPTION OF CHANGE
A	10/13/2017	ECO-05038	Initial Release
B	11/19/2018	ECO-05656	• 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 Prairie Peninsula 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.011079	TIS Site Characterization Report
RD[05]	NEON.DOC.001858	AIS Site Characterization Report
RD[06]	NEON.DOC.003885	TOS Site Characterization Methods
RD[07]	NEON.DOC.000481	TOS Protocol and Procedure: Small Mammal Sampling
RD[08]	NEON.DOC.014041	TOS Protocol and Procedure: Breeding Landbird Abundance and Diversity
RD[09]	NEON.DOC.014042	TOS Protocol and Procedure: Plant Diversity Sampling
RD[10]	NEON.DOC.000987	TOS Protocol and Procedure: Measurement of Vegetation Structure
RD[11]	NEON.DOC.014040	TOS Protocol and Procedure: Plant Phenology
RD[12]	NEON.DOC.001709	TOS Protocol and Procedure: Bryophyte Productivity

2.3 Acronyms

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

3 DOMAIN 06 OVERVIEW: PRAIRIE PENINSULA DOMAIN

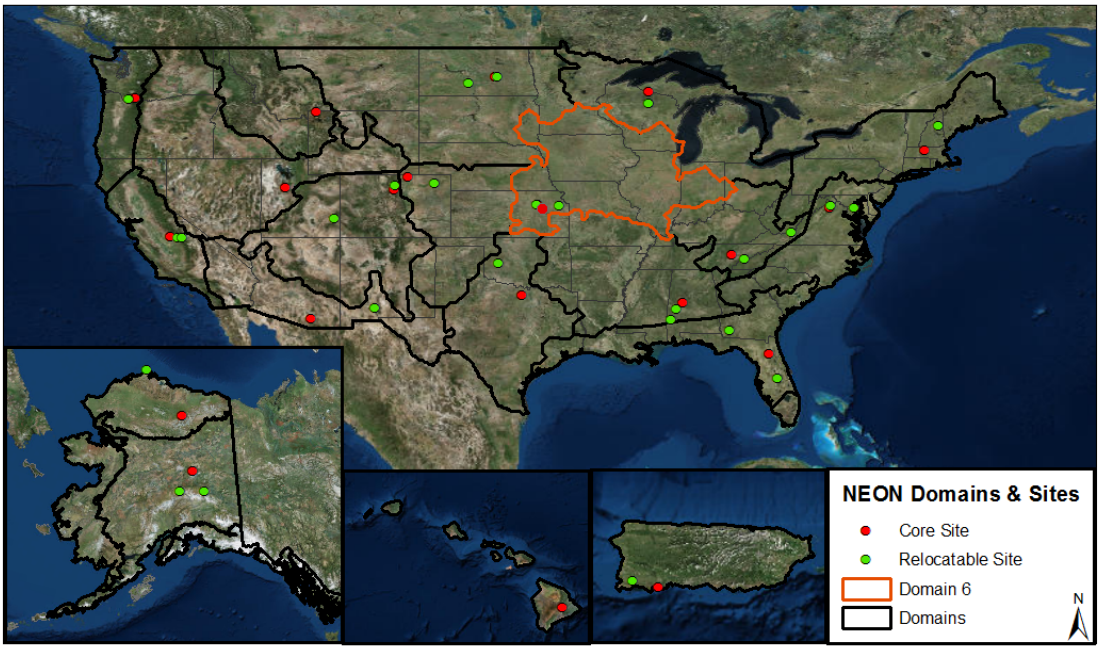

Figure 1: NEON project map with Domain 06 highlighted in red.

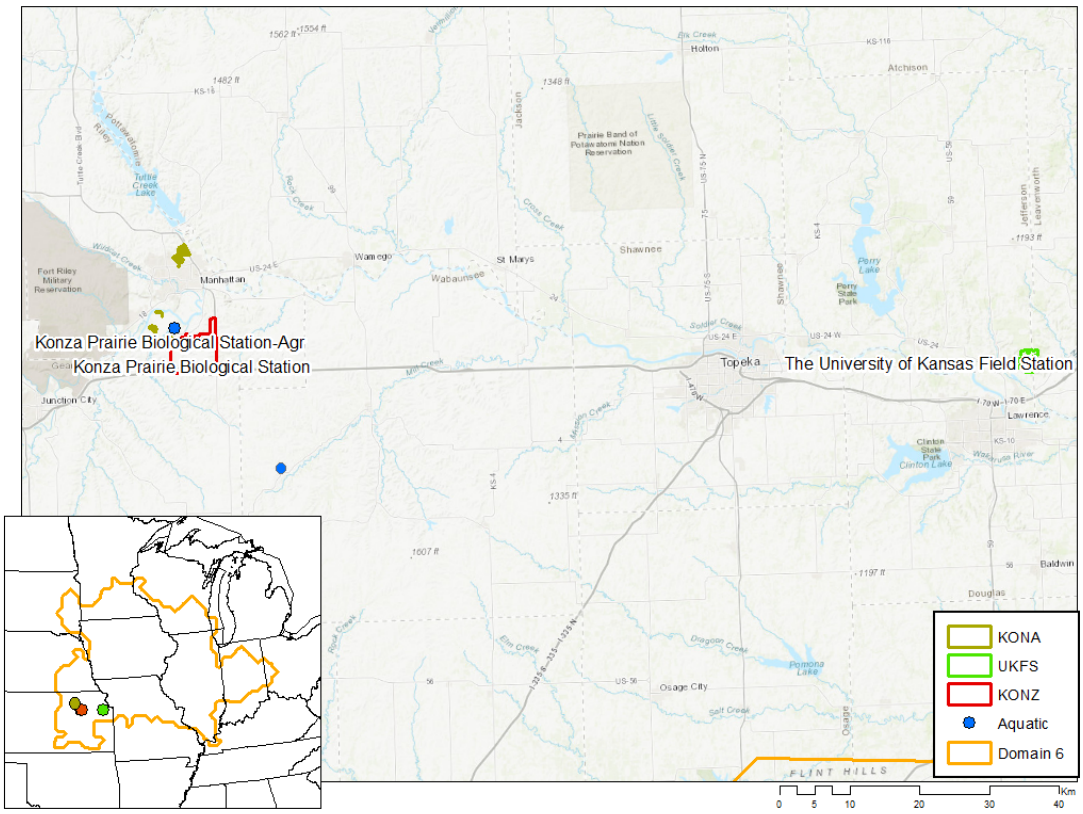

Figure 2: Site boundaries within Domain 06.

The Prairie Peninsula Domain is a patchwork of grassland, forest, and agricultural cover types. Land use and land management are key grand challenge themes in Domain 06. In addition, all TOS sampling boundaries overlap other research networks allowing opportunities for larger datasets and longer time series.

- States included in the domain: Illiinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin
- Core site: Konza Prairie Biological Station
- Relocatable 1: The University of Kansas Field Station
- Relocatable 2: Konza Prairie Biological Station- Agriculture
- Science themes: Agriculture, Land management

4 CORE SITE- KONZA PRAIRIE BIOLOGICAL STATION (KONZ)

Konza Prairie Biological Station is a tallgrass prairie preserve dedicated to long-term ecological research, education, and prairie conservation. Located 10km south of Manhattan, KS, Konza Prairie and the surrounding landscape is one of the largest remaining areas of unplowed tallgrass prairie in North America (Konza Prairie Biological Station, 2017).

Figure 3: Phenocamera image for KONZ. 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: The Nature Conservancy, Kansas State University, LTER
- Located in: Geary and Riley counties, Kansas
- Sampling Area: 34.6 km^2
- Plot Elevation: 330-445m
- Dominant vegetation type: The flora of Konza Prairie includes more than 600 species. The prairie is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). Woody buckbrush (*Symphoricarpos orbiculatus*) and smooth sumac (*Rhus glabra*) are common as well. Along the creek, deciduous forests are domainated by hackberry (*Celtis occidentalis*), bur oak (*Quercus macrocarpa*), and chinquapin oak (*Quercus muehlenbergii*) (Konza Prairie Biological Station: Location and Habitats, 2017).
- General management: Konza Prairie is operated as a field research station by Kansas State University and since 1971 over 1,600 scientific papers have been published from local studies. Konza Prairie utilizes replicated watershed-level experimental manipulations to study how ecological processes are affected by fire and grazing (cattle and bison) (Konza Prairie Biological Station: Current Research, 2017).

- King's Creek is located within Konza Prairie approximately 5 km west of the NEON tower. McDiffett Creek is located approximately 25 km southeast of the KONZ 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.

4.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at KONZ 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.

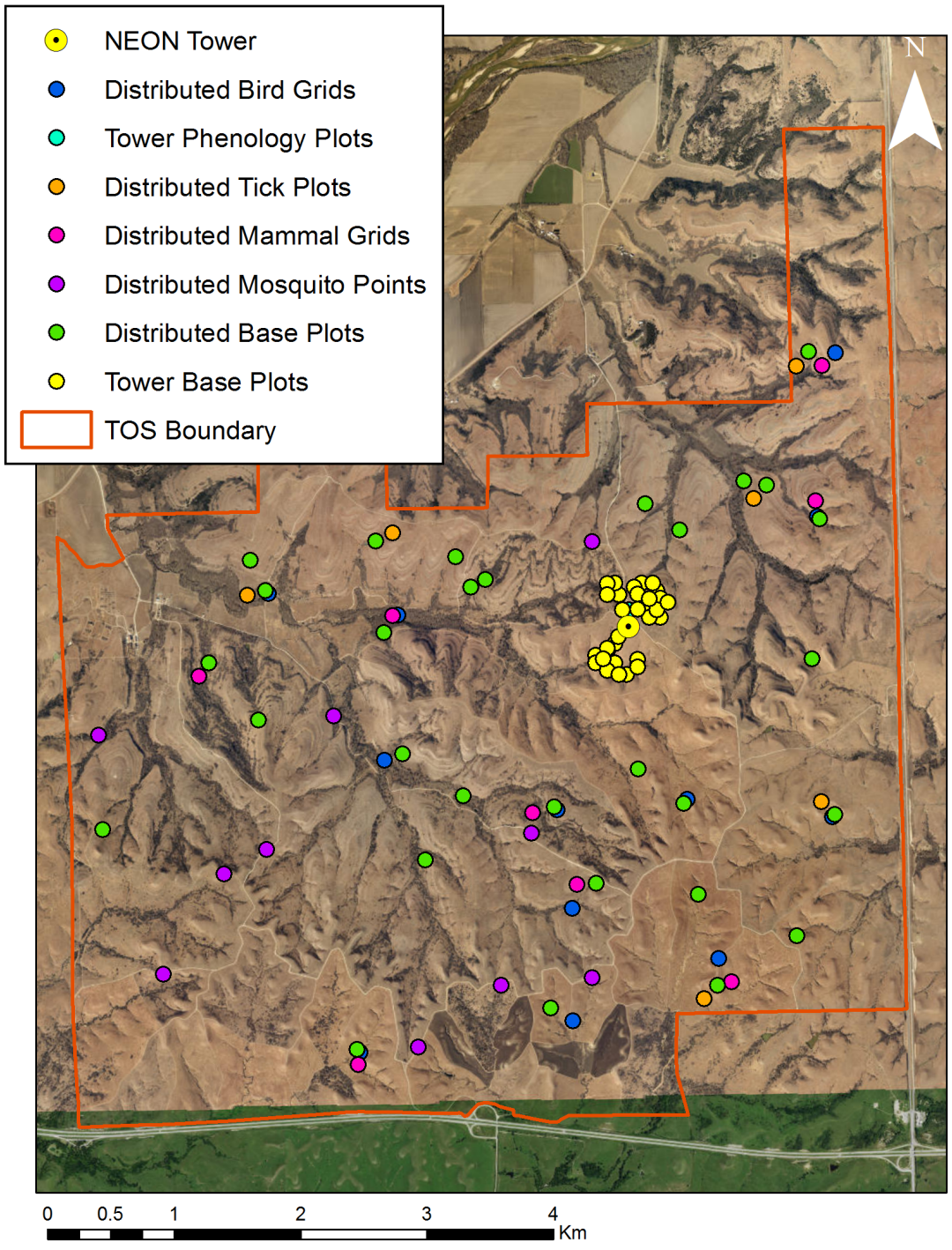

Figure 4: Map of TOS plot centroids within the NEON TOS sampling boundary at KONZ.

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

RD[03].

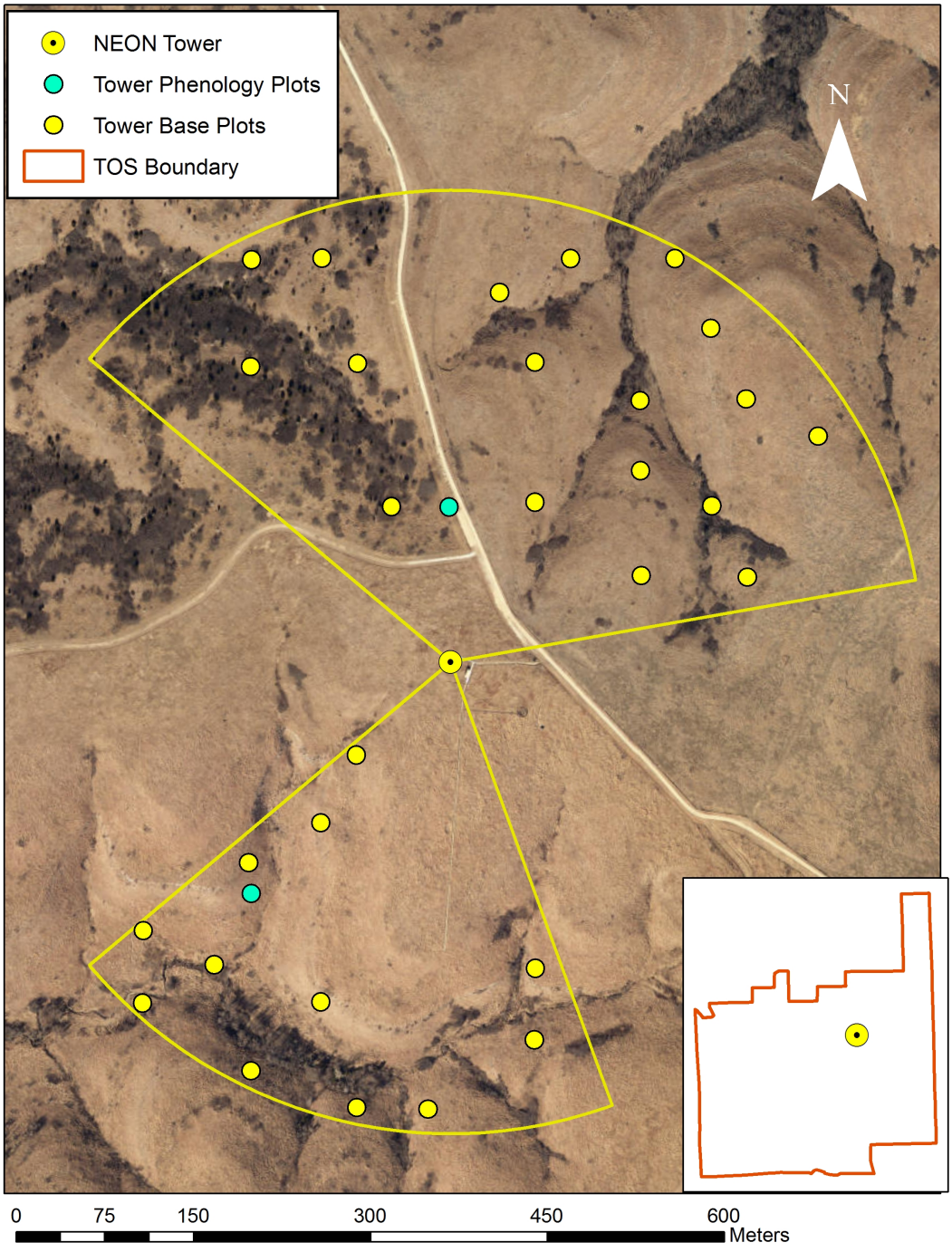

Figure 5: Map of the tower airshed and TOS plot centroids at KONZ.

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 KONZ.

NLCD Class	Site Area (km^2)	Percent (%)
Grassland Herbaceous	29.71	86.17
Deciduous Forest	3.27	9.48
Developed Open Space	0.78	2.26
Cultivated Crops	0.28	0.81
Woody Wetlands	0.18	0.53
Emergent Herbaceous Wetlands	0.14	0.4
Mixed Forest	0.06	0.17
Developed Low Intensity	0.05	0.13
Developed Medium Intensity	0.01	0.04

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 KONZ.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Deciduous Forest	7
Distributed	Base Plot	Grassland Herbaceous	23
Distributed	Bird Grid	Deciduous Forest	1
Distributed	Bird Grid	Grassland Herbaceous	9
Distributed	Mammal Grid	Deciduous Forest	1
Distributed	Mammal Grid	Grassland Herbaceous	5
Distributed	Mosquito Point	Deciduous Forest	1
Distributed	Mosquito Point	Grassland Herbaceous	9
Distributed	Tick Plot	Deciduous Forest	1
Distributed	Tick Plot	Grassland Herbaceous	5
Tower	Base Plot	NA	30
Tower	Phenology Plot	NA	2

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

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

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Deciduous Forest	Beetles	1
Distributed	Base Plot	Grassland Herbaceous	Beetles	9
Distributed	Base Plot	Deciduous Forest	Canopy Foliage Chemistry	2
Distributed	Base Plot	Grassland Herbaceous	Canopy Foliage Chemistry	14
Distributed	Base Plot	Deciduous Forest	Coarse Downed Wood	2
Distributed	Base Plot	Grassland Herbaceous	Coarse Downed Wood	18
Distributed	Base Plot	Deciduous Forest	Digital Hemispherical Photos for Leaf Area Index	2
Distributed	Base Plot	Grassland Herbaceous	Digital Hemispherical Photos for Leaf Area Index	18
Distributed	Base Plot	Deciduous Forest	Herbaceous Biomass	2
Distributed	Base Plot	Grassland Herbaceous	Herbaceous Biomass	18
Distributed	Base Plot	Deciduous Forest	Plant Diversity	7
Distributed	Base Plot	Grassland Herbaceous	Plant Diversity	23
Distributed	Base Plot	Deciduous Forest	Soil Biogeochemistry	1
Distributed	Base Plot	Grassland Herbaceous	Soil Biogeochemistry	5
Distributed	Base Plot	Deciduous Forest	Soil Microbes	1
Distributed	Base Plot	Grassland Herbaceous	Soil Microbes	5
Distributed	Base Plot	Deciduous Forest	Vegetation Structure	2
Distributed	Base Plot	Grassland Herbaceous	Vegetation Structure	18

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 KONZ.

Plot Type	Plot Subtype	Protocols	Number of Plots
Tower	Base Plot	Canopy Foliage Chemistry	4
Tower	Base Plot	Coarse Downed Wood	30
Tower	Base Plot	Digital Hemispherical Photos for Leaf Area Index	3
Tower	Base Plot	Herbaceous Biomass	30
Tower	Base Plot	Litterfall and Fine Woody Debris	30
Tower	Base Plot	Plant Belowground Biomass	30
Tower	Base Plot	Plant Diversity	3

Plot Type	Plot Subtype	Protocols	Number of Plots
Tower	Base Plot	Soil Biogeochemistry	4
Tower	Base Plot	Soil Microbes	4
Tower	Base Plot	Vegetation Structure	30
Tower	Phenology	Plant Phenology	2

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

4.2 Sampling Season Characterization: KONZ

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

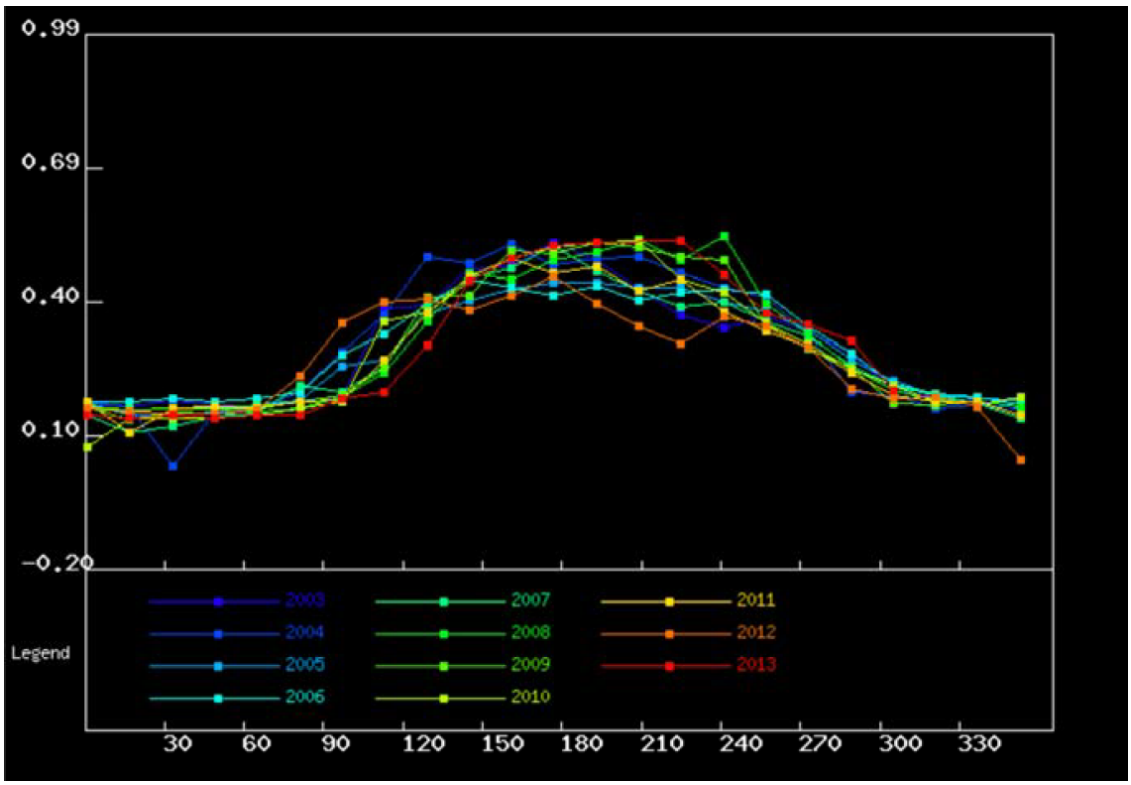

Figure 6: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON KONZ site.

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

Average Increase	Average Maximum	Average Decrease	Average Minimum
90 (04/01)	160 (06/10)	210 (07/30)	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: 10.25 km x 10.25 km box, centroid lat: 39.100906, centroid long: -96.562977 (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 June 2014. Since the NEON protocol for long-term, operational sampling of belowground biomass only collects data to a depth of 30 cm, the belowground biomass site characterization data are critical for scaling belowground biomass measurements to greater depths; see the TOS Science Design for Plant Biomass, Productivity, and Leaf Area Index (AD[7]) for more information. Samples were collected following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Roots were sorted to two diameter size categories ($\leq$ 4 mm and 4-30 mm) and by root status (live or dead). The tables below summarize all the belowground biomass less than or equal to 30 mm diameter; size class data and more information can be found by searching the NEON data portal for the data product numbers in Appendix A.

4.3.2 Results

Table 6: Soil Pit Information at KONZ.

Latitude	Longitude	Soil Family	Soil Order
39.1007	-96.56227	Fine - smectitic - mesic Pachic Udertic Argiustolls	Mollisol

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

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

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	8.4	2.76
10	20	2.08	0.53
20	30	0.61	0.23
30	40	0.61	0.37
40	50	1.2	1.64
50	60	0.4	0.15
60	70	0.28	0.13
70	80	0.45	0.19
80	90	0.71	0.13
90	100	0.15	0.15
100	120	0.01	0.01
120	140	0	0
140	160	0	0
160	180	0	0
180	200	0	0

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

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	840.05	275.83
10	20	1048.28	321.35
20	30	1109.57	330.57
30	40	1170.58	328.81
40	50	1290.26	322.52
50	60	1330.52	332.04
60	70	1358.76	319.19
70	80	1404.03	300.79
80	90	1474.91	295.54
90	100	1490.39	305.75
100	120	1492.15	305.36
120	140	1492.96	305.42
140	160	1493.2	305.17
160	180	1493.27	305.24

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
180	200	1493.27	305.24

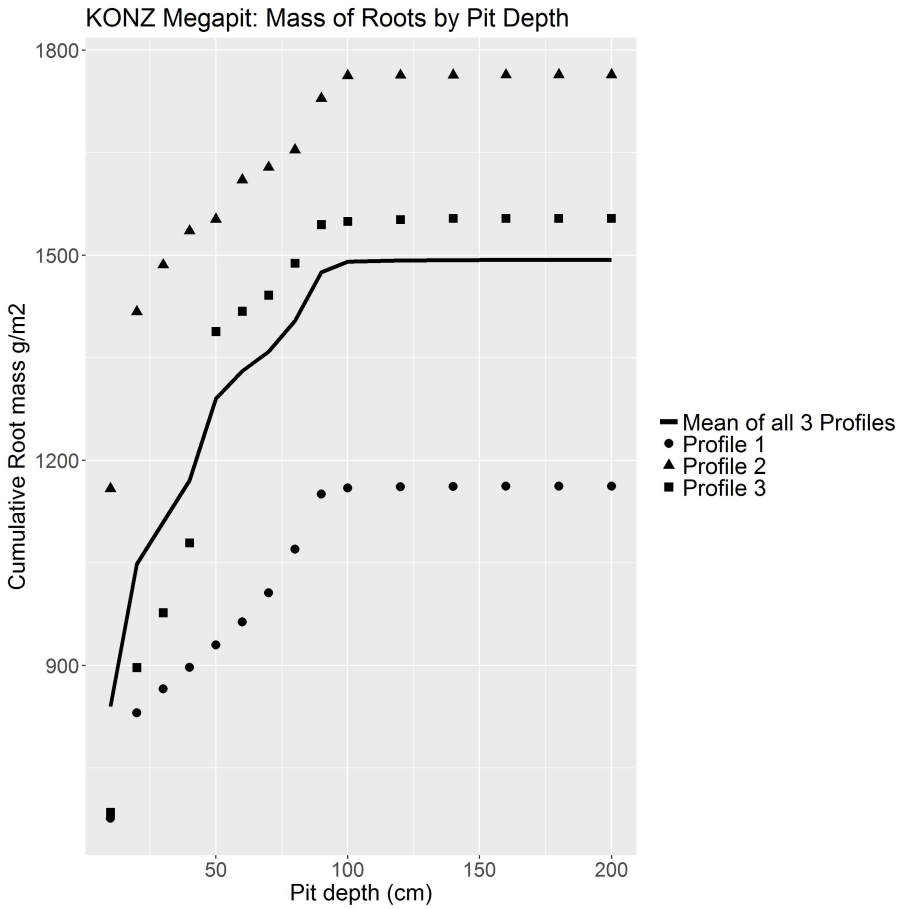

Figure 7: Cumulative root mass by pit depth at KONZ.

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

Total Pit Depth (cm)	200
Total Mean Cumulative Mass at 30cm (g per m^2)	1109.57
Total Mean Cumulative Mass at 100cm (g per m^2)	1490.39
Total Mean Cumulative Mass (g per m^2)	1493.27

4.4 Plant Characterization and Phenology Species Selection

4.4.1 Site-Specific Methods

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

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

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

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

4.4.2 Results

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

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
CODR	*Cornus drummondii* C.A. Mey.	1	7	0.06	0.39
SCSC	*Schizachyrium scoparium* (Michx.) Nash	2	7	NA	NA
ANGE	*Andropogon gerardii* Vitman	3	7	NA	NA
ULMUS	*Ulmus* sp.	4	<1	0.01	0.1
ZAAM	*Zanthoxylum americanum* Mill.	5	<1	<1	0.03
RHAR4	*Rhus aromatica* Aiton	6	1	0.02	0.02
SONU2	*Sorghastrum nutans* (L.) Nash	7	4	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)
RHGL	*Rhus glabra* L.	8	1	<1	NA
GLTR	*Gleditsia triacanthos* L.	9	<1	0.01	0.04
CEHE	*Ceanothus herbaceus* Raf.	10	3	<1	NA
LEFR5	*Lespedeza frutescens* (L.) Hornem.	11	2	NA	NA
PRUNU	*Prunus* sp.	12	<1	<1	0.03
SYOR	*Symphoricarpos orbiculatus* Moench	13	2	<1	NA
ULPU	*Ulmus pumila* L.	14	NA	NA	0.06
SYOB	*Symphyotrichum oblongifolium* (Nutt.) G.L. Nesom	15	2	NA	NA
BOCU	*Bouteloua curtipendula* (Michx.) Torr.	16	2	NA	NA
QUMU	*Quercus muehlenbergii* Engelm.	17	<1	NA	0.05
SYER	*Symphyotrichum ericoides* (L.) G.L. Nesom	18	1	NA	NA
PAVI2	*Panicum virgatum* L.	19	1	NA	NA
AMCA6	*Amorpha canescens* Pursh	20	1	NA	NA
CYPERA	Cyperaceae sp.	21	1	NA	NA
AMPS	*Ambrosia psilostachya* DC.	22	1	NA	NA
CECA4	*Cercis canadensis* L.	23	<1	<1	0.03
ROAR3	*Rosa arkansana* Porter	24	<1	<1	NA
JUVI	*Juniperus virginiana* L.	25	<1	NA	0.03
ARLU	*Artemisia ludoviciana* Nutt.	26	<1	NA	NA
SOCA6	*Solidago canadensis* L.	28	<1	NA	NA
DIOL	*Dichanthelium oligosanthes* (Schult.) Gould	29	<1	NA	NA
SOMI2	*Solidago missouriensis* Nutt.	30	<1	NA	NA
VEBA	*Vernonia baldwinii* Torr.	31	<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)
BREU	*Brickellia eupatorioides* (L.) Shinners	32	<1	NA	NA
OLRI	*Oligoneuron rigidum* (L.) Small	33	<1	NA	NA
SOLID	*Solidago* sp.	34	<1	NA	NA
RUOC	*Rubus occidentalis* L.	35	<1	<1	NA
LISU4	*Linum sulcatum* Riddell	36	<1	NA	NA
LECA8	*Lespedeza capitata* Michx.	37	<1	NA	NA
TORA2	*Toxicodendron radicans* (L.) Kuntze	38	<1	NA	NA
SPPE	*Spartina pectinata* Bosc ex Link	39	<1	NA	NA
MINU6	*Mimosa nuttallii* (DC. ex Britton & Rose) B.L. Turner	41	<1	NA	NA
TECA3	*Teucrium canadense* L.	42	<1	NA	NA
CEOC	*Celtis occidentalis* L.	43	NA	NA	0.01
GECA7	*Geum canadense* Jacq.	44	<1	NA	NA
PHYSA	*Physalis* sp.	45	<1	NA	NA
SYLA3	*Symphyotrichum laeve* (L.) Á. Löve & D. Löve	46	<1	NA	NA
EUAL3	*Eupatorium altissimum* L.	47	<1	NA	NA
DEIL2	*Desmodium illinoense* A. Gray	48	<1	NA	NA
SPHE	*Sporobolus heterolepis* (A. Gray) A. Gray	49	<1	NA	NA
MUHLE	*Muhlenbergia* sp.	51	<1	NA	NA
RIMI	*Ribes missouriense* Nutt.	52	<1	NA	NA
POACEA	Poaceae sp.	53	<1	NA	NA
DAMU	*Dalea multiflora* (Nutt.) Shinners	54	<1	NA	NA
SONU	*Sophora nuttalliana* B.L. Turner	56	<1	NA	NA
SPORO	*Sporobolus* sp.	57	<1	NA	NA
SAAZ	*Salvia azurea* Michx. ex Lam.	58	<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)
SPCR	*Sporobolus cryptandrus* (Torr.) A. Gray	58	<1	NA	NA
VITIS	*Vitis* sp.	60	<1	<1	<1
CRMO6	*Croton monanthogynus* Michx.	61	<1	NA	NA
ASVE	*Asclepias verticillata* L.	62	<1	NA	NA
GACI2	*Galium circaezans* Michx.	63	<1	NA	NA
ACALY	*Acalypha* sp.	64	<1	NA	NA
CEAM	*Ceanothus americanus* L.	64	<1	NA	NA
ARTEM	*Artemisia* sp.	66	<1	NA	NA
ASTU	*Asclepias tuberosa* L.	67	<1	NA	NA
COUM	*Comandra umbellata* (L.) Nutt.	68	<1	NA	NA
DAPU5	*Dalea purpurea* Vent.	69	<1	NA	NA
AGAL5	*Ageratina altissima* (L.) R.M. King & H. Rob.	70	<1	NA	NA
BAAU	*Baptisia australis* (L.) R. Br.	70	<1	NA	NA
PSTE5	*Psoralidium tenuiflorum* (Pursh) Rydb.	72	<1	NA	NA
CHNU9	*Chamaesyce nutans* (Lag.) Small	73	<1	NA	NA
DEIL	*Desmanthus illinoensis* (Michx.) MacMill. ex B.L. Rob. & Fernald	74	<1	NA	NA
ECHIN	*Echinacea* sp.	74	<1	NA	NA
PHPU7	*Physalis pubescens* L.	76	<1	NA	NA
CALLI3	*Callirhoe* sp.	77	<1	NA	NA
SPCO16	*Sporobolus compositus* (Poir.) Merr.	77	<1	NA	NA
OXALI	*Oxalis* sp.	79	<1	NA	NA
SALVI	*Salvia* sp.	80	<1	NA	NA
TRAGI	*Tragia* sp.	81	<1	NA	NA
APCA	*Apocynum cannabinum* L.	82	<1	NA	NA
ERSP	*Eragrostis spectabilis* (Pursh) Steud.	83	<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)
LIATR	*Liatris* sp.	83	<1	NA	NA
LIPU	*Liatris punctata* Hook.	83	<1	NA	NA
SYMPH4	*Symphyotrichum* sp.	86	<1	NA	NA
CIAL2	*Cirsium altissimum* (L.) Hill	87	<1	NA	NA
COCA5	*Conyza canadensis* (L.) Cronquist	87	<1	NA	NA
STNIN	*Stenaria nigricans* (Lam.) Terrell var. *nigricans*	87	<1	NA	NA
SYSE2	*Symphyotrichum sericeum* (Vent.) G.L. Nesom	90	<1	NA	NA
ELVI3	*Elymus virginicus* L.	91	<1	NA	NA
ONBE	*Onosmodium bejariense* DC. ex A. DC.	91	<1	NA	NA
SACA15	*Sanicula canadensis* L.	93	<1	NA	NA
AMAR2	*Ambrosia artemisiifolia* L.	94	<1	NA	NA
EUMA8	*Euphorbia marginata* Pursh	94	<1	NA	NA
EUDA5	*Euphorbia davidii* Subils	96	<1	NA	NA
TEUCR	*Teucrium* sp.	96	<1	NA	NA
TRPE4	*Triodanis perfoliata* (L.) Nieuwl.	96	<1	NA	NA
BOHI2	*Bouteloua hirsuta* Lag.	99	<1	NA	NA
KOMA	*Koeleria macrantha* (Ledeb.) Schult.	99	<1	NA	NA
LIIN2	*Lithospermum incisum* Lehm.	99	<1	NA	NA
LYAL4	*Lythrum alatum* Pursh	99	<1	NA	NA
ALPE4	*Alliaria petiolata* (M. Bieb.) Cavara & Grande	103	<1	NA	NA
ASVI	*Asclepias viridiflora* Raf.	103	<1	NA	NA
DACA7	*Dalea candida* Michx. ex Willd.	103	<1	NA	NA
SOLAN	*Solanum* sp.	103	<1	NA	NA
VIOLA	*Viola* sp.	103	<1	NA	NA
DIARR	*Diarrhena* sp.	108	<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)
OEBI	*Oenothera biennis* L.	108	<1	NA	NA
OESP2	*Oenothera speciosa* Nutt.	108	<1	NA	NA
SOCA3	*Solanum carolinense* L.	108	<1	NA	NA
SOLANA	Solanaceae sp.	108	<1	NA	NA
TRPE5	*Triosteum perfoliatum* L.	108	<1	NA	NA
ACMI2	*Achillea millefolium* L.	114	<1	NA	NA
AGAS2	*Agalinis aspera* (Douglas ex Benth.) Britton	114	<1	NA	NA
LACTU	*Lactuca* sp.	114	<1	NA	NA
CESC	*Celastrus scandens* L.	117	<1	NA	NA
DALEA	*Dalea* sp.	117	<1	NA	NA
POVE	*Polygala verticillata* L.	117	<1	NA	NA
TRAGISPP	*Tragia* sp.	117	<1	NA	NA
HYPE	*Hypericum perforatum* L.	121	<1	NA	NA
OLIGO3	*Oligoneuron* sp.	121	<1	NA	NA
PENST	*Penstemon* sp.	121	<1	NA	NA
ANNE	*Antennaria neglecta* Greene	124	<1	NA	NA
ANTEN	*Antennaria* sp.	124	<1	NA	NA
ASCLE	*Asclepias* sp.	124	<1	NA	NA
DICHA2	*Dichanthelium* sp.	124	<1	NA	NA
LIAS	*Liatris aspera* Michx.	124	<1	NA	NA
RUELL	*Ruellia* sp.	124	<1	NA	NA
STLI2	*Stenosiphon linifolius* (Nutt. ex James) Heynh.	124	<1	NA	NA
LEERS	*Leersia* sp.	131	<1	NA	NA
MEOF	*Melilotus officinalis* (L.) Lam.	131	<1	NA	NA
RACO3	*Ratibida columnifera* (Nutt.) Woot. & Standl.	131	<1	NA	NA
ACVI	*Acalypha virginica* L.	134	<1	NA	NA
ASST	*Asclepias stenophylla* A. Gray	134	<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)
BOVI	*Botrychium virginianum* (L.) Sw.	134	<1	NA	NA
CAAL	*Callirhoe alcaeoides* (Michx.) A. Gray	134	<1	NA	NA
CABL	*Carex blanda* Dewey	134	<1	NA	NA
CHMI8	*Chamaesyce missurica* (Raf.) Shinners	134	<1	NA	NA
CROTO	*Croton* sp.	134	<1	NA	NA
DALE3	*Dalea leporina* (Aiton) Bullock	134	<1	NA	NA
DESE	*Desmodium sessilifolium* (Torr.) Torr. & A. Gray	134	<1	NA	NA
ELCA4	*Elymus canadensis* L.	134	<1	NA	NA
ELYMU	*Elymus* sp.	134	<1	NA	NA
ERIGE2	*Erigeron* sp.	134	<1	NA	NA
EUPHOR	Euphorbiaceae sp.	134	<1	NA	NA
FABACE	Fabaceae sp.	134	<1	NA	NA
GLLE3	*Glycyrrhiza lepidota* Pursh	134	<1	NA	NA
HEAN3	*Helianthus annuus* L.	134	<1	NA	NA
OENOT	*Oenothera* sp.	134	<1	NA	NA
ONAGRA	Onagraceae sp.	134	<1	NA	NA
ORUM	*Ornithogalum umbellatum* L.	134	<1	NA	NA
POPR	*Poa pratensis* L.	134	<1	NA	NA
RAPI	*Ratibida pinnata* (Vent.) Barnhart	134	<1	NA	NA
RATIB	*Ratibida* sp.	134	<1	NA	NA
SICA9	*Sisyrinchium campestre* E.P. Bicknell	134	<1	NA	NA
SYDR	*Symphyotrichum drummondii* (Lindl.) G.L. Nesom	134	<1	NA	NA
SYLA6	*Symphyotrichum lanceolatum* (Willd.) G.L. Nesom	134	<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)
VEST	*Verbena stricta* Vent.	134	<1	NA	NA
ARLUM2	*Artemisia ludoviciana* Nutt. ssp. *mexicana* (Willd. ex Spreng.) D.D. Keck	160	<1	NA	NA
ASSU3	*Asclepias sullivantii* Engelm. ex A. Gray	160	<1	NA	NA
BOGR2	*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths	160	<1	NA	NA
BOUTE	*Bouteloua* sp.	160	<1	NA	NA
CAIN2	*Callirhoe involucrata* (Torr. & A. Gray) A. Gray	160	<1	NA	NA
CHENO	*Chenopodium* sp.	160	<1	NA	NA
DEGL5	*Desmodium glutinosum* (Muhl. ex Willd.) Alph. Wood	160	<1	NA	NA
DESMO	*Desmodium* sp.	160	<1	NA	NA
GAAP2	*Galium aparine* L.	160	<1	NA	NA
GALIU	*Galium* sp.	160	<1	NA	NA
HYPER	*Hypericum* sp.	160	<1	NA	NA
JUNCU	*Juncus* sp.	160	<1	NA	NA
LESPE	*Lespedeza* sp.	160	<1	NA	NA
LINUM	*Linum* sp.	160	<1	NA	NA
PEAR6	*Pediomelum argophyllum* (Pursh) J. Grimes	160	<1	NA	NA
PECO4	*Penstemon cobaea* Nutt.	160	<1	NA	NA
ROSA5	*Rosa* sp.	160	<1	NA	NA
SCUTE	*Scutellaria* sp.	160	<1	NA	NA
SEMA11	*Senna marilandica* (L.) Link	160	<1	NA	NA
SEVI4	*Setaria viridis* (L.) P. Beauv.	160	<1	NA	NA
VIOLAC	Violaceae sp.	160	<1	NA	NA

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

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

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
KONZ_042	41	2.47	210	0.11
KONZ_043	41	3.33	126	0.6
KONZ_044	41	2.76	124	0
KONZ_045	40	3.24	135	0
KONZ_046	42	3.08	190	0
KONZ_047	46	3.37	85	0.25
KONZ_048	45	3.26	115	0.06
KONZ_049	49	3.29	147	0
KONZ_050	37	2.91	146	0.06
KONZ_051	41	2.88	115	0
KONZ_052	39	2.98	83	0.38
KONZ_053	48	3.08	194	0
KONZ_054	58	3.33	166	0
KONZ_055	34	2.88	89	0.06
KONZ_056	43	3.4	77	0.44
KONZ_057	40	3.22	101	0
KONZ_058	39	3.28	76	0.25
KONZ_059	53	3.43	155	0.56
KONZ_060	44	3.28	98	0.11
KONZ_061	49	3.19	130	0.31
KONZ_062	34	2.94	95	0
KONZ_063	49	3.18	209	0.69
KONZ_064	58	3.08	186	0.31
KONZ_065	41	2.76	192	0.25
KONZ_066	47	3.01	135	0.12
KONZ_067	47	3.24	146	0.44
KONZ_068	35	2.85	109	0
KONZ_069	47	2.79	163	0.19
KONZ_070	50	3.23	117	0.12
KONZ_071	38	2.84	94	0
Bryophyte Mean				0.18

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

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

4.5 Beetles

4.5.1 Site-Specific Methods

Beetle site characterization was conducted in July 2014 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Beetle site characterization data was collected to start site level teaching collections. For DNA sequence data generated as a result of these efforts, visit the Barcode of Life Data-systems (BOLD) at http://www.boldsystems.org. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

4.5.2 Results

Table 12: Beetle identification results at KONZ.

Sample ID	Scientific Name	Sex
NEONcarabid8198	*Pasimachus californicus*	M
NEONcarabid8205	*Pasimachus californicus*	F
NEONcarabid8200	*Pasimachus californicus*	F
NEONcarabid8201	*Pasimachus californicus*	M
NEONcarabid8207	*Pasimachus californicus*	M
NEONcarabid8197	*Pasimachus californicus*	M
NEONcarabid8202	*Pasimachus californicus*	M
NEONcarabid8212	*Pasimachus californicus*	F
NEONcarabid8196	*Pasimachus californicus*	F
NEONcarabid8203	*Pasimachus californicus*	M
NEONcarabid8204	*Pasimachus californicus*	F
NEONcarabid8206	*Pasimachus californicus*	M
NEONcarabid8211	*Pasimachus californicus*	F
NEONcarabid8199	*Pasimachus californicus*	M
NEONcarabid8210	*Pasimachus elongatus*	M
NEONcarabid8209	*Pasimachus californicus*	F

4.6 Mosquitoes

4.6.1 Site-Specific Methods

Mosquito site characterization was conducted in July 2014 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]) to test protocol methods and start site level species lists. No pathogen testing was performed. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

4.6.2 Results

Table 13: Mosquito identification results at KONZ.

Sample ID	Scientific Name	Sex	Count
KONZ.July2014.SC.1	*Culex tarsalis*	female	16
KONZ.July2014.SC.1	*Psorophora horrida*	female	2
KONZ.July2014.SC.1	*Psorophora discolor*	female	62
KONZ.July2014.SC.1	*Aedes trivittatus*	female	60
KONZ.July2014.SC.1	*Aedes vexans*	female	147
KONZ.July2014.SC.1	Unidentified		372
KONZ.July2014.SC.1	*Aedes sollicitans*	female	1
KONZ.July2014.SC.1	*Psorophora columbiae*	female	2

4.7 Ticks

4.7.1 Site-Specific Methods

Tick drags were conducted at KONZ in July 2014 to test protocol methods and calculate capture rates. No pathogen testing was performed. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

4.7.2 Results

Table 14: Tick identification results at KONZ.

Sample ID	Scientific Name	Count: Adult Male	Count: Adult Female	Count: Nymph
KONZ.000.20140624.SC.1	*Dermacentor variabilis*	0	1	0
KONZ.000.20140624.SC.1	*Amblyomma americanum*	4	4	2

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]).

Amphibians of the Konza Prairie. (2015). Kansas State University. Retrieved from https://www.k-state.edu/herplab/amphibians/

Anderson, K. and C.E. Owensby. 1969. Common names of a selected list of plants. KSU Agricultural Experiment Station Technical Bulletin no. 117, Manhattan. 62 pp.

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

Collins, J.T. 1993. Amphibians and reptiles in Kansas. University Press of Kansas, Lawrence. 397 pp.

Collins, J. T., S. L. Collins, and T. W. Taggart, 2010. Amphibians, Reptiles and Turtles in Kansas, 3rdEdition, revised. University of Kansas, Eagle Mountain publishing, Eagle Mountain, Utah.

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.

Flora and Fauna: Reptiles. (2017). Konza Prairie LTER. Retrieved from http://lter.konza.ksu.edu/flora-and-fauna/reptiles

Flora and Fauna: Vascular Plants. (2017). Konza Prairie LTER. Retrieved from http://lter.konza.ksu.edu/flora-and-fauna/vascular-plants

Freeman, C. C. 2014. Coefficients of conservatism for Kansas vascular plants and selected life history attributes. Kansas Biological Survey and R. L. McGregor Herbarium, University of Kansas

Freeman C. C., W. Kettle, K. Kindscher, R.E. Brooks, V.C. Varner, C.M. Pitcher. 1991. Vascular plants of the Kansas Ecological Reserves. Ecology and Hydrogeology of the Kansas Ecological Reserves and Baker University Wetlands: Open-file Report 91-35 Edition. Lawrence, KS: Kansas Geological Survey, p. 23-45.

Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas, Lawrence. 1392 pp.

Heinrich, M.L., and D.W. Kaufman. 1985. Herpetofauna of the Konza Prairie Biological Station, Kansas. Prairie Naturalist 17(2):101-112.

Towne, E.G. 2002. Vascular plants of Konza Prairie Biological Station: an annotated checklist of species in a Kansas tallgrass prairie. Sida 20:269-294

5 RELOCATABLE SITE 1- THE UNIVERSITY OF KANSAS FIELD STATION (UKFS)

The University of Kansas Field Station is located approximately 9 km north of Lawrence, KS, along an eastern deciduous forest and tallgrass prairie transition zone.

Figure 8: Phenocamera image for UKFS. At UKFS only the mid-tower camera is currently operational. The camera is located halfway up the NEON tower and faces north. Phenocamera images are available at https://phenocam.sr.unh.edu/webcam/network/table/.

Key Characteristics:

- Site host: University of Kansas
- Located in: Douglas, Jefferson, and Leavenworth counties, Kansas
- Sampling Area: 6.2 km^2
- Plot Elevation: 270-330m
- Dominant vegetation type: The ecosystem around the tower is a mixed hardwood forest dominated by white ash (*Fraxinus americana*) and hackberry (*Celtis occidentalis*). Tallgrass prairie tracts support perennial, warm-season grasses.
- General management: Established in 1947, KU field station's mission is to foster scholarly research, environmental education, and science-based stewardship of natural resources. The field station contains a

wide variety of ecosystems and management styles (Kansas Biological Survey: Ecological Setting, 2017).

- Plot Selection: NEON TOS Plots were allocated across the site following NEON standard criteria and avoiding existing research.

5.1 TOS Spatial Sampling Design

TOS Distributed Plots were allocated at UKFS 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. To limit disturbance to existing research, no TOS plots were allocated to Pasture Hay areas. TOS Tower Plots were allocated according to a spatially balanced design in and around the NEON tower airshed (RD[03]). The maps below depict the plot locations for the first year of NEON sampling. Some plot locations may change over time due to logistics, safety, and science requirements. Please visit the NEON website (http://www.neonscience.org) for updated plot locations at each site.

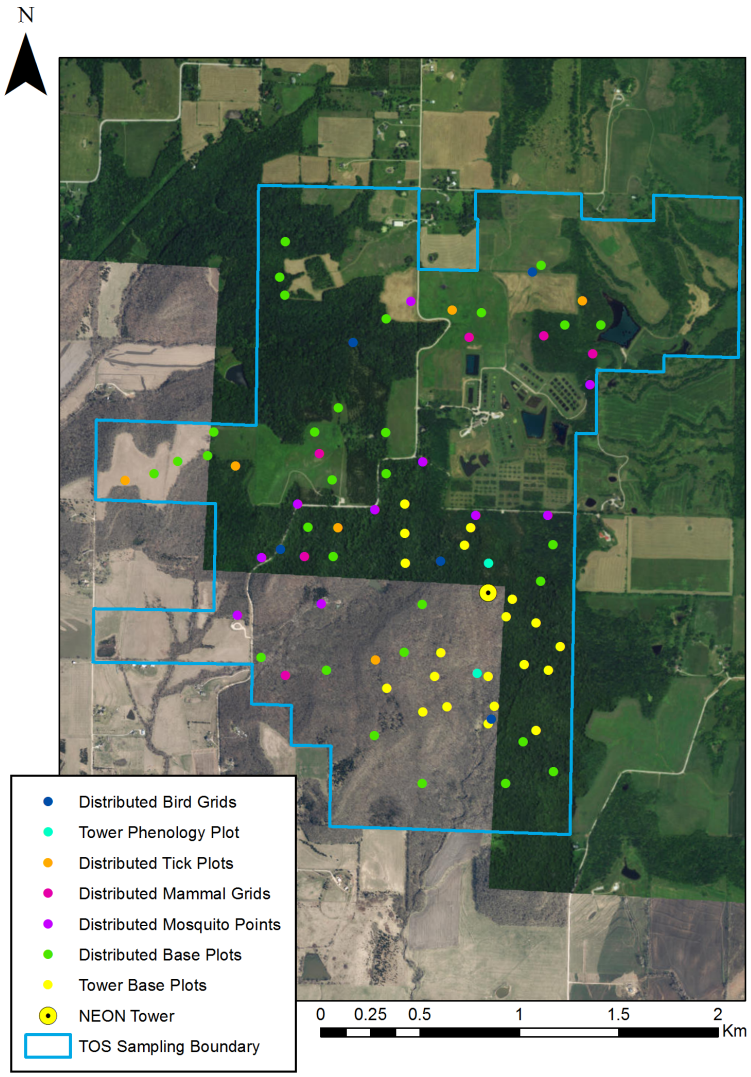

Figure 9: Map of TOS plot centroids within the NEON TOS sampling boundary at UKFS.

For a list of protocols associated with each plot see tables below; for additional spatial design information see RD[03]. The color transition in background of this map is the difference between winter and summer imagery and not differences in vegetation.

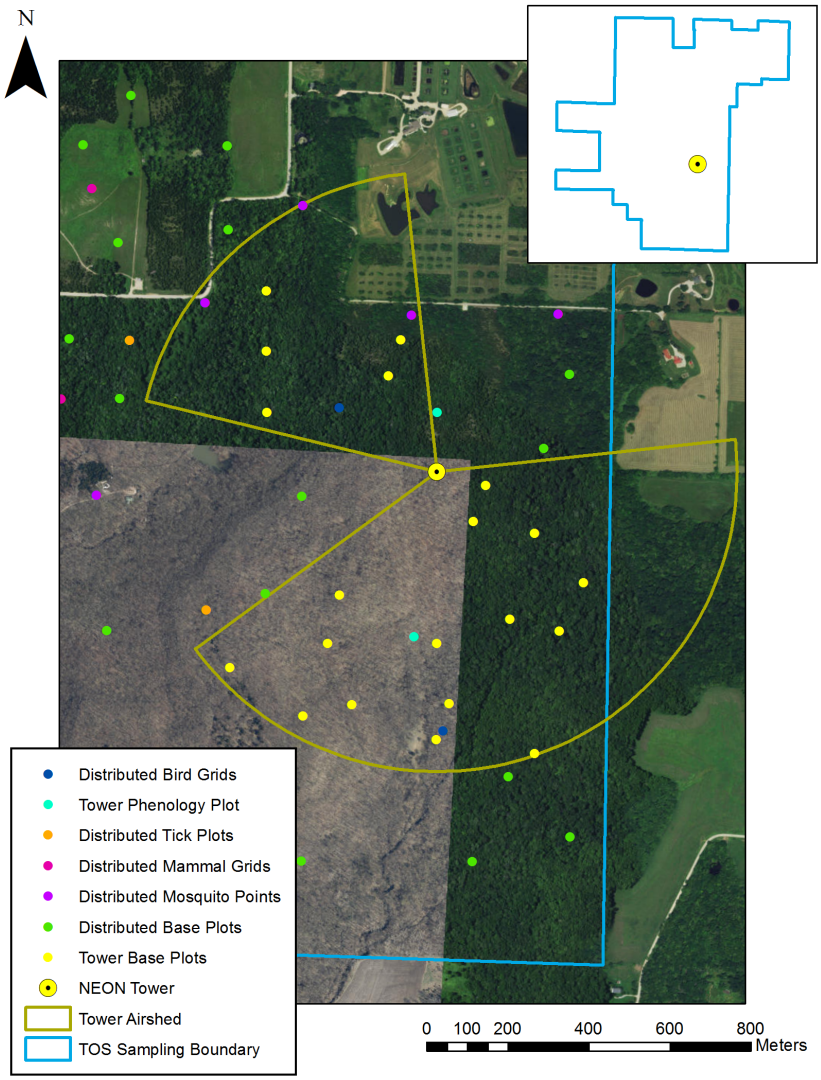

Figure 10: Map of the tower airshed and TOS plot centroids at UKFS.

More information about the tower airshed can be found in the FIU site characterization report (RD[04]). The color transition in background of this map is the difference between winter and summer imagery and not differences in vegetation.

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

NLCD Class	Site Area (km^2)	Percent (%)
Deciduous Forest	3.99	64.68
Pasture Hay	1.24	20.11
Grassland Herbaceous	0.62	10.1
Developed Open Space	0.17	2.71
Shrub Scrub	0.08	1.24
Open Water	0.07	1.06
Mixed Forest	0.01	0.09

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

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

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Deciduous Forest	22
Distributed	Base Plot	Grassland Herbaceous	8
Distributed	Bird Grid	Deciduous Forest	4
Distributed	Bird Grid	Grassland Herbaceous	1
Distributed	Mammal Grid	Deciduous Forest	4
Distributed	Mammal Grid	Grassland Herbaceous	2
Distributed	Mosquito Point	Deciduous Forest	9
Distributed	Mosquito Point	Grassland Herbaceous	1
Distributed	Tick Plot	Deciduous Forest	4
Distributed	Tick Plot	Grassland Herbaceous	2
Tower	Base Plot	NA	20
Tower	Phenology Plot	NA	2

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

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

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Deciduous Forest	Beetles	9
Distributed	Base Plot	Grassland Herbaceous	Beetles	1
Distributed	Base Plot	Deciduous Forest	Canopy Foliage Chemistry	9
Distributed	Base Plot	Grassland Herbaceous	Canopy Foliage Chemistry	1
Distributed	Base Plot	Deciduous Forest	Coarse Downed Wood	17
Distributed	Base Plot	Grassland Herbaceous	Coarse Downed Wood	3
Distributed	Base Plot	Deciduous Forest	Digital Hemispherical Photos for Leaf Area Index	17
Distributed	Base Plot	Grassland Herbaceous	Digital Hemispherical Photos for Leaf Area Index	3
Distributed	Base Plot	Deciduous Forest	Herbaceous Biomass	17
Distributed	Base Plot	Grassland Herbaceous	Herbaceous Biomass	3
Distributed	Base Plot	Deciduous Forest	Plant Diversity	22
Distributed	Base Plot	Grassland Herbaceous	Plant Diversity	8
Distributed	Base Plot	Deciduous Forest	Soil Biogeochemistry	5
Distributed	Base Plot	Grassland Herbaceous	Soil Biogeochemistry	1
Distributed	Base Plot	Deciduous Forest	Soil Microbes	5
Distributed	Base Plot	Grassland Herbaceous	Soil Microbes	1
Distributed	Base Plot	Deciduous Forest	Vegetation Structure	17
Distributed	Base Plot	Grassland Herbaceous	Vegetation Structure	3

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

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

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

Plot Type	Plot Subtype	Protocols	Number of Plots
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: UKFS

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

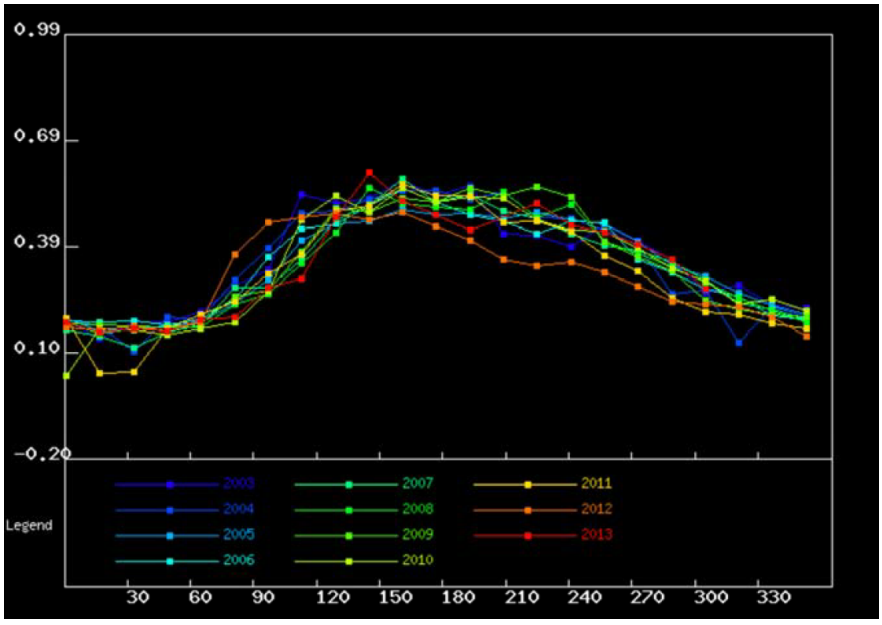

Figure 11: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON UKFS site.

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

Average Increase	Average Maximum	Average Decrease	Average Minimum
75 (03/17)	160 (06/10)	210 (07/30)	330 (11/27)

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: 6.25 km x 6.25 km box, centroid lat: 39.040562„ centroid long: -95.192043 (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 July 2014. Since the NEON protocol for long-term, operational sampling of belowground biomass only collects data to a depth of 30 cm, the belowground biomass site characterization data are critical for scaling belowground biomass measurements to greater depths; see the TOS Science Design for Plant Biomass, Productivity, and Leaf Area Index (AD[7]) for more information. Samples were collected following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Roots were sorted to two diameter size categories ($\leq$ 4 mm and 4-30 mm) and by root status (live or dead). The tables below summarize all the belowground biomass less than or equal to 30 mm diameter; size class data and more information can be found by searching the NEON data portal for the data product numbers in Appendix A.

5.3.2 Results

Table 20: Soil Pit Information at UKFS.

Latitude	Longitude	Soil Family	Soil Order
39.04168	-95.20495	Fine - smectitic - mesic Pachic Argiudolls	Mollisol

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

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

Upper Depth	Lower Depth	Mean (mg per cm^3)	Std Dev
0	10	3.29	2.22
10	20	2.2	0.9
20	30	8.23	8.85
30	40	0.47	0.24
40	50	0.5	0.44
50	60	0.49	0.35
60	70	0.16	0.09
70	80	0.85	0.08
80	90	0.54	0.47
90	100	0.25	0.13
100	120	0.48	0.34
120	140	0.85	1.06
140	160	0.31	0.17
160	180	0.23	0.15
180	200	0.22	0.25

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

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
0	10	328.81	221.9
10	20	548.4	222.61
20	30	1371.53	687.68
30	40	1418.05	674.57
40	50	1468.11	672.56
50	60	1517.42	655.82
60	70	1533.89	647.68
70	80	1619.37	654.92
80	90	1673.74	632.59
90	100	1699.13	638.09
100	120	1796.03	686.22
120	140	1965.74	878.56
140	160	2027.9	860.04
160	180	2073.87	862.67

Upper Depth	Lower Depth	Mean Cumulative (g per m^2)	Cumulative Std Dev
180	200	2117.7	844.62

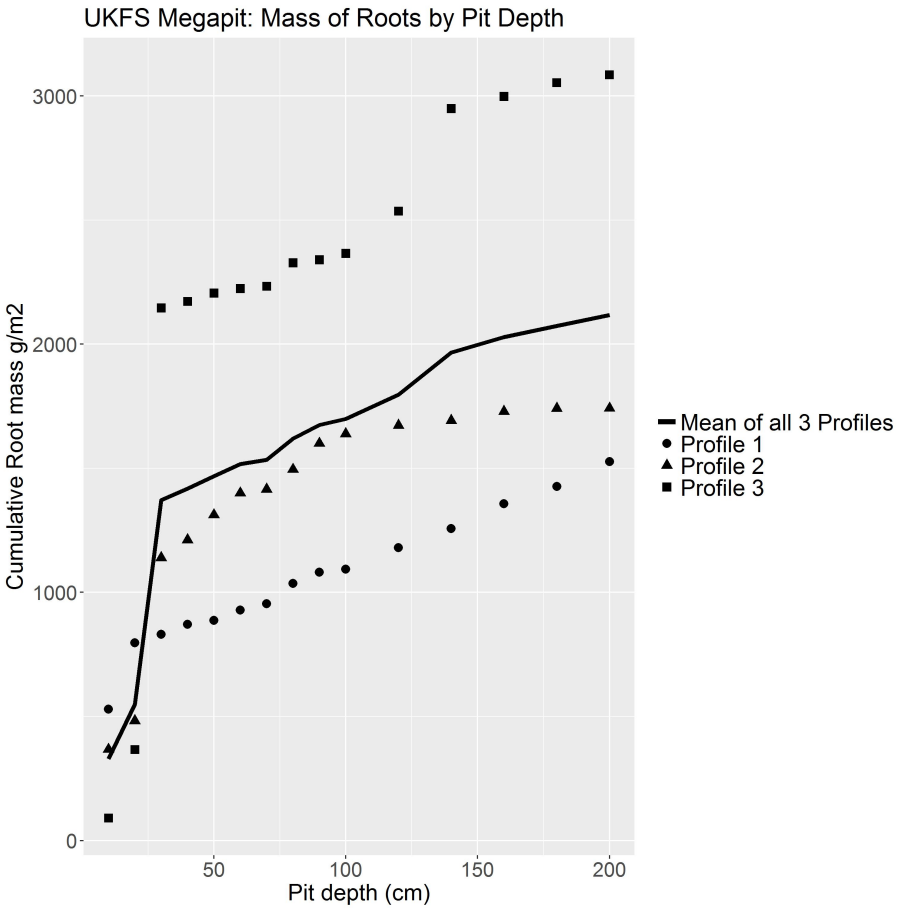

Figure 12: Cumulative root mass by pit depth at UKFS.

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

Total Pit Depth (cm)	200
Total Mean Cumulative Mass at 30cm (g per m^2)	1371.53
Total Mean Cumulative Mass at 100cm (g per m^2)	1699.13
Total Mean Cumulative Mass (g per m^2)	2117.7

5.4 Plant Characterization and Phenology Species Selection

5.4.1 Site-Specific Methods

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

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

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

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

5.4.2 Results

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

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
FRAM2	*Fraxinus americana* L.	1	<1	0.01	3.62
SYOR	*Symphoricarpos orbiculatus* Moench	2	13	<1	NA
CEOC	*Celtis occidentalis* L.	3	2	NA	2.79
JUVI	*Juniperus virginiana* L.	4	<1	<1	1.49
CAOV2	*Carya ovata* (Mill.) K. Koch	5	<1	NA	1.93
ULAM	*Ulmus americana* L.	6	<1	NA	1.57
MAPO	*Maclura pomifera* (Raf.) C.K. Schneid.	7	<1	NA	1.73
QUMU	*Quercus muehlenbergii* Engelm.	8	<1	<1	1.41

Taxon ID	Scientific Name	Rank	Mean Percent Cover	Mean Canopy Area (m^2 per m^2)	Mean ABH (cm^2 per m^2)
SAOD	*Sanicula odorata* (Raf.) K.M. Pryer & L.R. Phillippe	9	9	NA	NA
JUNI	*Juglans nigra* L.	10	<1	NA	1.18
ROMU	*Rosa multiflora* Thunb.	11	1	0.02	NA
GLTR	*Gleditsia triacanthos* L.	12	<1	NA	0.98
QUVE	*Quercus velutina* Lam.	13	<1	NA	1.05
PAQU2	*Parthenocissus quinquefolia* (L.) Planch.	15	3	NA	0.01
MORUS	*Morus* sp.	16	<1	NA	0.43
DEGL5	*Desmodium glutinosum* (Muhl. ex Willd.) Alph. Wood	17	3	NA	NA
LACA3	*Laportea canadensis* (L.) Weddell	18	2	NA	NA
CAJA2	*Carex jamesii* Schwein.	19	2	NA	NA
ULMUS	*Ulmus* sp.	20	1	NA	0.01
RIMI	*Ribes missouriense* Nutt.	21	1	NA	NA
CODR	*Cornus drummondii* C.A. Mey.	22	<1	<1	0.04
ALPE4	*Alliaria petiolata* (M. Bieb.) Cavara & Grande	23	1	NA	NA
CECA4	*Cercis canadensis* L.	24	<1	NA	0.11
DIOB3	*Diarrhena obovata* (Gleason) Brandenburg	25	1	NA	NA
MORU2	*Morus rubra* L.	26	NA	NA	0.18
FESU3	*Festuca subverticillata* (Pers.) Alexeev	27	1	NA	NA
SMTA2	*Smilax tamnoides* L.	28	<1	NA	NA
MOAL	*Morus alba* L.	29	<1	NA	0.11
GYDI2	*Gymnocarpium disjunctum* (Rupr.) Ching	30	NA	NA	0.15
CABL	*Carex blanda* Dewey	32	<1	NA	NA
BRPU6	*Bromus pubescens* Muhl. ex Willd.	33	<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)
HAVI2	*Hackelia virginiana* (L.) I.M. Johnst.	34	<1	NA	NA
VITIS	*Vitis* sp.	35	<1	NA	0.1
POVI2	*Polygonum virginianum* L.	36	<1	NA	NA
AGAL5	*Ageratina altissima* (L.) R.M. King & H. Rob.	37	<1	NA	NA
AMBR2	*Amphicarpaea bracteata* (L.) Fernald	38	<1	NA	NA
DESMO	*Desmodium* sp.	39	<1	NA	NA
POLYG4	*Polygonum* sp.	40	<1	NA	NA
GECA7	*Geum canadense* Jacq.	41	<1	NA	NA
MECA3	*Menispermum canadense* L.	42	<1	NA	NA
CARYA	*Carya* sp.	43	<1	NA	NA
CADA	*Carex davisii* Schwein. & Torr.	44	<1	NA	NA
GACI2	*Galium circaezans* Michx.	45	<1	NA	NA
GALIU	*Galium* sp.	46	<1	NA	NA
RUBUS	*Rubus* sp.	47	<1	NA	NA
CYPERA	Cyperaceae sp.	48	<1	NA	NA
AGRIM	*Agrimonia* sp.	49	<1	NA	NA
FRAXI	*Fraxinus* sp.	50	<1	NA	NA
POACEA	Poaceae sp.	51	<1	NA	NA
TORA2	*Toxicodendron radicans* (L.) Kuntze	52	<1	NA	<1
LEERS	*Leersia* sp.	53	<1	NA	NA
POLYG	*Polygala* sp.	53	<1	NA	NA
URDI	*Urtica dioica* L.	55	<1	NA	NA
RUST2	*Ruellia strepens* L.	56	<1	NA	NA
VIOLA	*Viola* sp.	57	<1	NA	NA
AMBRO	*Ambrosia* sp.	58	<1	NA	NA
CAMO11	*Carex molesta* Mack. ex Bright	58	<1	NA	NA
SACA15	*Sanicula canadensis* L.	58	<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)
SYOB	*Symphyotrichum oblongifolium* (Nutt.) G.L. Nesom	58	<1	NA	NA
VEAL	*Verbesina alternifolia* (L.) Britton ex Kearney	62	<1	NA	NA
CILU	*Circaea lutetiana* L.	63	<1	NA	NA
EUPU21	*Eutrochium purpureum* (L.) E.E. Lamont	64	<1	NA	NA
PRSE2	*Prunus serotina* Ehrh.	65	NA	NA	0.02
ELYMU	*Elymus* sp.	66	<1	NA	NA
SAOF4	*Saponaria officinalis* L.	67	<1	NA	NA
PHLE5	*Phryma leptostachya* L.	68	<1	NA	NA
GEUM	*Geum* sp.	69	<1	NA	NA
BOVI	*Botrychium virginianum* (L.) Sw.	70	<1	NA	NA
GAAP2	*Galium aparine* L.	72	<1	NA	NA
AMARAN	Amaranthaceae sp.	73	<1	NA	NA
CORNU	*Cornus* sp.	74	<1	NA	<1
CRCA9	*Cryptotaenia canadensis* (L.) DC.	75	<1	NA	NA
ELVI	*Elymus villosus* Muhl. ex Willd.	75	<1	NA	NA
ROSA5	*Rosa* sp.	77	<1	NA	NA
ASTR	*Asimina triloba* (L.) Dunal	78	NA	NA	0.01
ARTR	*Arisaema triphyllum* (L.) Schott	79	<1	NA	NA
PHLOX	*Phlox* sp.	80	<1	NA	NA
PIPU2	*Pilea pumila* (L.) A. Gray	80	<1	NA	NA
ULRU	*Ulmus rubra* Muhl.	82	<1	NA	NA
CAREX	*Carex* sp.	84	<1	NA	NA
MONAR	*Monarda* sp.	84	<1	NA	NA
POPE	*Podophyllum peltatum* L.	84	<1	NA	NA
ALPE2	*Allium perdulce* S.V. Fraser	87	<1	NA	NA
SOLID	*Solidago* sp.	87	<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)
SALIX	*Salix* sp.	89	NA	NA	NA
ALLIA	*Alliaria* sp.	90	<1	NA	NA
DAMA	*Dasistoma macrophylla* (Nutt.) Raf.	90	<1	NA	NA
ELVIV	*Elymus virginicus* L. var. *virginicus*	90	<1	NA	NA
LEOR	*Leersia oryzoides* (L.) Sw.	93	<1	NA	NA
POTEN	*Potentilla* sp.	93	<1	NA	NA
SYDR	*Symphyotrichum drummondii* (Lindl.) G.L. Nesom	93	<1	NA	NA
ELCA4	*Elymus canadensis* L.	96	<1	NA	NA
LACA	*Lactuca canadensis* L.	96	<1	NA	NA
VEAR3	*Vernonia arkansana* DC.	96	<1	NA	NA
VIRI	*Vitis riparia* Michx.	96	<1	NA	NA
PHDI5	*Phlox divaricata* L.	100	<1	NA	NA
VIMI2	*Vinca minor* L.	100	<1	NA	NA
GYDI	*Gymnocladus dioicus* (L.) K. Koch	102	NA	NA	NA
BIBI7	*Bidens bipinnata* L.	103	<1	NA	NA
CAAM18	*Campanulastrum americanum* (L.) Small	103	<1	NA	NA
CALE6	*Carex leavenworthii* Dewey	103	<1	NA	NA
CYPER	*Cyperus* sp.	103	<1	NA	NA
FABACE	Fabaceae sp.	103	<1	NA	NA
JUGLA	*Juglans* sp.	103	<1	NA	NA
LAFL	*Lactuca floridana* (L.) Gaertn.	103	<1	NA	NA
RHAR4	*Rhus aromatica* Aiton	103	<1	NA	NA
AMPS	*Ambrosia psilostachya* DC.	111	<1	NA	NA
OXALI	*Oxalis* sp.	111	<1	NA	NA
VEUR	*Verbena urticifolia* L.	111	<1	NA	NA
CESC	*Celastrus scandens* L.	114	<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)
OSLO	*Osmorhiza longistylis* (Torr.) DC.	114	<1	NA	NA
VIPU3	*Viola pubescens* Aiton	114	<1	NA	NA
QUERC	*Quercus* sp.	117	<1	NA	NA
ANPA9	*Antennaria parlinii* Fernald	118	<1	NA	NA
CHENO	*Chenopodium* sp.	118	<1	NA	NA
CIAL2	*Cirsium altissimum* (L.) Hill	118	<1	NA	NA
COMME	*Commelina* sp.	118	<1	NA	NA
DICHA2	*Dichanthelium* sp.	118	<1	NA	NA
DICU	*Dicentra cucullaria* (L.) Bernh.	118	<1	NA	NA
ERIGE2	*Erigeron* sp.	118	<1	NA	NA
OLRIR	*Oligoneuron rigidum* (L.) Small var. *rigidum*	118	<1	NA	NA
PHYSA	*Physalis* sp.	118	<1	NA	NA
POBI2	*Polygonatum biflorum* (Walter) Elliott	118	<1	NA	NA
POLYG2	*Polygonatum* sp.	118	<1	NA	NA
ROPS	*Robinia pseudoacacia* L.	118	<1	NA	NA
TARAX	*Taraxacum* sp.	118	<1	NA	NA
TOAR	*Torilis arvensis* (Huds.) Link	118	<1	NA	NA
AGERA2	*Ageratina* sp.	133	<1	NA	NA
AMBRB	*Amphicarpaea bracteata* (L.) Fernald var. *bracteata*	133	<1	NA	NA
APOCYN	Apocynaceae sp.	133	<1	NA	NA
BODI2	*Botrychium dissectum* Spreng.	133	<1	NA	NA
CHAL7	*Chenopodium album* L.	133	<1	NA	NA
COCA5	*Conyza canadensis* (L.) Cronquist	133	<1	NA	NA
DICL	*Dichanthelium clandestinum* (L.) Gould	133	<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)
FRVIV	*Fragaria virginiana* Duchesne ssp. *virginiana*	133	<1	NA	NA
KUMME	*Kummerowia* sp.	133	<1	NA	NA
LAPOR	*Laportea* sp.	133	<1	NA	NA
LEFR5	*Lespedeza frutescens* (L.) Hornem.	133	<1	NA	NA
ROSACE	Rosaceae sp.	133	<1	NA	NA

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

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

Plot ID	Species Richness	Shannon Diversity Index	Percent Total Herbaceous Cover	Bryophyte Percent Cover
UKFS_032	35	2.97	155	0.11
UKFS_043	32	2.86	137	0
UKFS_044	50	3.34	190	0.62
UKFS_045	30	2.82	142	0.06
UKFS_046	36	2.75	124	1.44
UKFS_047	37	2.83	154	0.5
UKFS_048	46	3.02	130	1.38
UKFS_049	32	2.36	199	0.19
UKFS_050	27	2.55	82	1.31
UKFS_051	29	3.05	31	3.94
UKFS_052	38	2.66	176	0.31
UKFS_053	33	2.64	128	0.06
UKFS_054	39	2.92	188	0
UKFS_055	44	3.07	163	1
UKFS_056	40	3.15	123	0.06
UKFS_057	48	3.24	102	0
UKFS_058	31	2.98	158	0.5
UKFS_059	38	2.94	180	0.25
UKFS_060	38	2.86	144	1.25
Bryophyte Mean				0.68

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

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

5.5 Beetles

5.5.1 Site-Specific Methods

Beetle site characterization was conducted in July 2014 by NEON staff following the standard methods outlined in TOS Site Characterization Methods (RD[6]). Beetle site characterization data was collected to start site level teaching collections. For DNA sequence data generated as a result of these efforts, visit the Barcode of Life Data-systems (BOLD) at http://www.boldsystems.org. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

5.5.2 Results

Table 26: Beetle identification results at UKFS.

Sample ID	Scientific Name	Sex
NEONcarabid8319	*Brachinus alternans*	M
NEONcarabid8321	*Brachinus alternans*	F
NEONcarabid8324	*Brachinus alternans*	F
NEONcarabid8325	*Brachinus alternans*	F
NEONcarabid8326	*Brachinus alternans*	F
NEONcarabid8328	*Brachinus alternans*	F
NEONcarabid8332	*Brachinus alternans*	M
NEONcarabid8336	*Brachinus alternans*	M
NEONcarabid8339	*Brachinus alternans*	F
NEONcarabid8340	*Brachinus alternans*	F
NEONcarabid8341	*Brachinus alternans*	M
NEONcarabid8343	*Brachinus alternans*	F
NEONcarabid8344	*Brachinus alternans*	F
NEONcarabid8296	*Semiardistomis puncticollis*	U
NEONcarabid8301	*Semiardistomis puncticollis*	U
NEONcarabid8302	*Agonum striatopunctatum*	F
NEONcarabid8303	*Loxandrus* sp.	F

Sample ID	Scientific Name	Sex
NEONcarabid8310	*Brachinus alternans*	M
NEONcarabid8314	*Brachinus alternans*	F
NEONcarabid8316	*Brachinus alternans*	F
NEONcarabid8348	*Dicaelus furvus*	F
NEONcarabid8349	*Chlaenius erythropus*	F
NEONcarabid8300	*Semiardistomis puncticollis*	U
NEONcarabid8305	*Brachinus alternans*	M
NEONcarabid8307	*Brachinus alternans*	M
NEONcarabid8312	*Brachinus alternans*	M
NEONcarabid8313	*Brachinus alternans*	M
NEONcarabid8315	*Brachinus alternans*	M
NEONcarabid8318	*Brachinus alternans*	F
NEONcarabid8320	*Brachinus alternans*	M
NEONcarabid8322	*Brachinus alternans*	F
NEONcarabid8327	*Brachinus alternans*	F
NEONcarabid8333	*Brachinus alternans*	F
NEONcarabid8337	*Brachinus alternans*	F
NEONcarabid8342	*Brachinus alternans*	F
NEONcarabid8346	*Brachinus alternans*	F
NEONcarabid8354	*Chlaenius erythropus*	F
NEONcarabid8295	*Semiardistomis puncticollis*	U
NEONcarabid8309	*Brachinus alternans*	M
NEONcarabid8317	*Brachinus alternans*	M
NEONcarabid8335	*Brachinus alternans*	F
NEONcarabid8345	*Brachinus alternans*	F
NEONcarabid8352	*Chlaenius erythropus*	F
NEONcarabid8299	*Semiardistomis puncticollis*	U
NEONcarabid8351	*Chlaenius erythropus*	M
NEONcarabid8297	*Semiardistomis puncticollis*	U
NEONcarabid8308	*Brachinus alternans*	M
NEONcarabid8330	*Brachinus alternans*	M
NEONcarabid8338	*Brachinus alternans*	F
NEONcarabid8353	*Chlaenius erythropus*	M
NEONcarabid8306	*Brachinus alternans*	M

Sample ID	Scientific Name	Sex
NEONcarabid8298	*Semiardistomis puncticollis*	U
NEONcarabid8347	*Brachinus alternans*	F
NEONcarabid8334	*Brachinus alternans*	M
NEONcarabid8350	*Chlaenius erythropus*	F
NEONcarabid8304	*Brachinus alternans*	M
NEONcarabid8311	*Brachinus alternans*	M
NEONcarabid8329	*Brachinus alternans*	F
NEONcarabid8331	*Brachinus alternans*	M
NEONcarabid8323	*Brachinus alternans*	M

5.6 Mosquitoes

5.6.1 Site-Specific Methods

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

5.7 Ticks

5.7.1 Site-Specific Methods

Tick drags were conducted at UKFS in July 2014 to test protocol methods and calculate capture rates. No pathogen testing was performed. All samples were pooled before identification. For more information on this protocol and data product numbers see Appendix A.

5.7.2 Results

Table 27: Tick identification results at UKFS.

Sample ID	Scientific Name	Count: Adult Male	Count: Adult Female	Count: Nymph	Count: Larvae
UKFS.000.20140723.SC.1	*Amblyomma* spp.	0	0	0	2
UKFS.000.20140723.SC.1	*Amblyomma americanum*	4	1	10	0

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]).

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.

Fitch, H.S. 1991. Reptiles and amphibians of the Kansas Ecological Reserves. In W.D. Kettle and D.O. Whittemore (eds.), Ecology and Hydrology of the Kansas Ecological Reserves and the Baker University Wetlands. KGS Open-File Report 91-35, pp. 71-74.

Kindscher, K., L.M. Martin, E M. Staab, and J.M. Delisle. 2016. A Natural Areas Inventory of Douglas County in Northeast Kansas. Open-File Report No. 184. Kansas Biological Survey. Lawrence, KS. 53 pp.

Liechti, P., D. Huggins. 1991. Selected aquatic insects of the Kansas Ecological Reserves. Kansas Academy of Science Multidisciplinary Guidebook 4. Lawrence, KS:Kansas Geological Survey.

Martinko, E.A. and S.G. Reyes. 1991. Insects of the Kansas Biotic Succession Facility. In Ecology and Hydrology of the Kansas Ecological Reserves and the Baker University Wetlands, W.D. Kettle and D.O. Whittemore (eds.), KGS Open-File Report 91-35, pp. 84-90.

Vascular plants of the KU Field Station. 2014. The University of Kansas. Retrieved from: https://biosurvey.ku.edu/vascular-plants-ku-field-station

6 RELOCATABLE SITE 2- KONZA PRAIRIE BIOLOGICAL STATION- AGRICULTURE (KONA)

Located approximately 5 km west of the KONZ tower, the KONA site is focused on sampling within agricultural systems. TOS distributed sampling occurs in non-adjacent in non-adjancent cultivated crop fields located 3-14 km from the tower. Due to KONA's close distance to the KONZ site and the continual landcover change of experimental crops no site characterization activities were conducted.

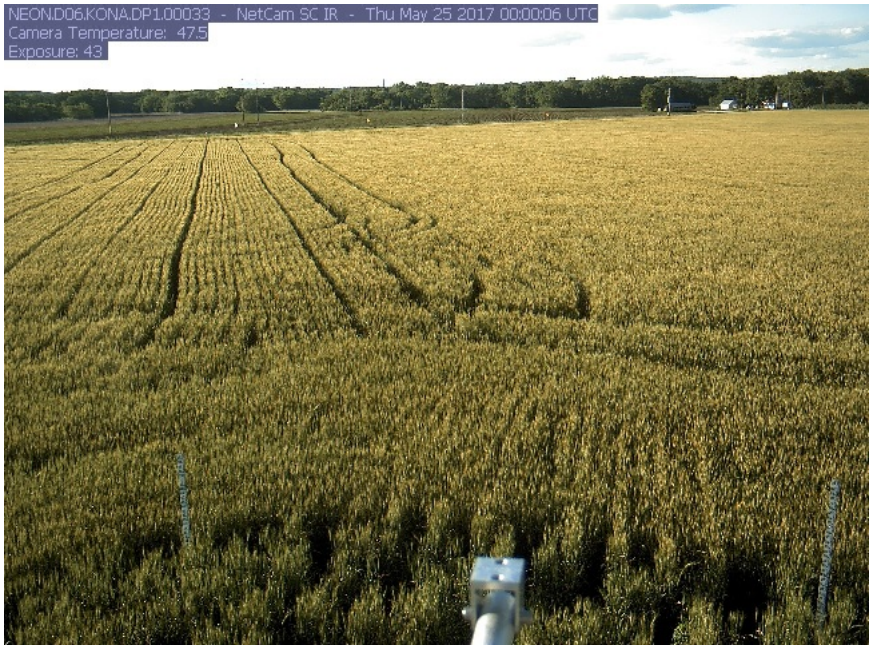

Figure 13: Phenocamera image for KONA. The phenocamera is located at the top of the NEON tower and faces north. Phenocamera images are available at https://phenocam.sr.unh.edu/webcam/network/table/.

Key Characteristics:

- Site host: The Nature Conservancy, Kansas State University, KSU Real Estate Fund, LLC (KSUREF)
- Located in: Riley county, Kansas
- Sampling Area: 3.65 km^2
- Plot Elevation: 300-355m
- Dominant vegetation type and general management: Crop types will rotate depending on existing research priorities. Experimental management techniques may include prescribed burns and grazing.
- King's Creek is located within Konza Prairie south east of the KONA NEON tower. McDiffett Creek is located approximately 30 km southeast of the KONA 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 KONA 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. TOS Tower Plots were allocated according to a spatially balanced design in and around the NEON tower airshed (RD[03]). The maps below depict the plot locations for the first year of NEON sampling. Some plot locations may change over time due to logistics, safety, and science requirements. Please visit the NEON website (http://www.neonscience.org) for updated plot locations at each site.

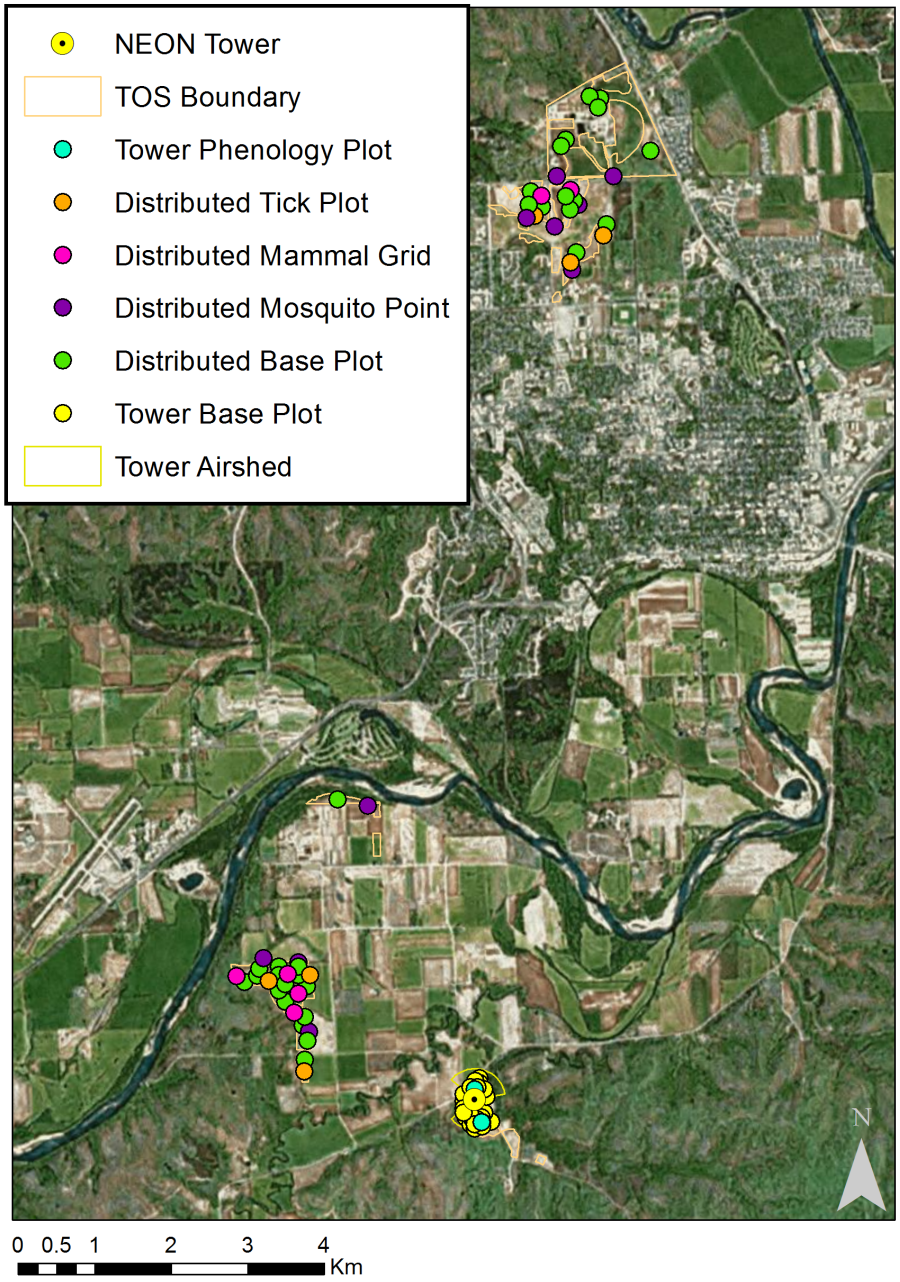

Figure 14: Map of TOS plot centroids within the NEON TOS sampling boundary at KONA.

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

RD[03].

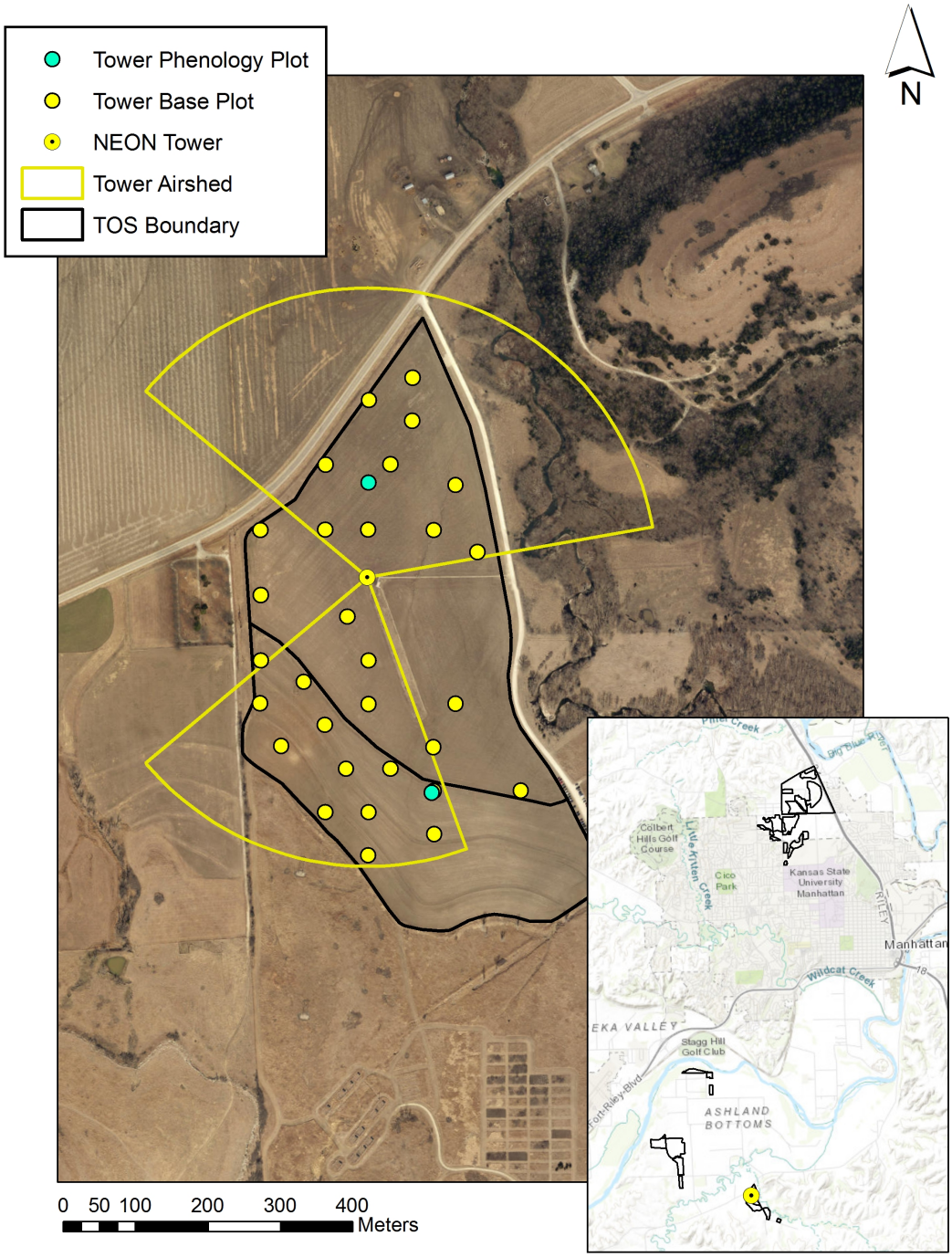

Figure 15: Map of the tower airshed and TOS plot centroids at KONA.

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

Table 28: NLCD land cover classes and area within the TOS site boundary at KONA.

NLCD Class	Site Area (km^2)	Percent (%)
Cultivated Crops	2.74	100

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 29: NLCD land cover classes and TOS plot numbers at KONA.

Plot Type	Plot Subtype	NLCD Class	Number of Plots Established
Distributed	Base Plot	Cultivated Crops	30
Distributed	Mammal Grid	Cultivated Crops	6
Distributed	Mosquito Point	Cultivated Crops	10
Distributed	Tick Plot	Cultivated Crops	6
Tower	Base Plot	NA	30
Tower	Phenology Plot	NA	2

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

Table 30: Number of Distributed Base plots per NLCD land cover class per protocol at KONA.

Plot Type	Plot Subtype	NLCD Class	Protocols	Number of Plots
Distributed	Base Plot	Cultivated Crops	Beetles	10
Distributed	Base Plot	Cultivated Crops	Birds	15
Distributed	Base Plot	Cultivated Crops	Canopy Foliage Chemistry	16
Distributed	Base Plot	Cultivated Crops	Coarse Downed Wood	20
Distributed	Base Plot	Cultivated Crops	Digital Hemispherical Photos for Leaf Area Index	20
Distributed	Base Plot	Cultivated Crops	Herbaceous Biomass	20
Distributed	Base Plot	Cultivated Crops	Plant Diversity	30
Distributed	Base Plot	Cultivated Crops	Soil Biogeochemistry	6
Distributed	Base Plot	Cultivated Crops	Soil Microbes	6
Distributed	Base Plot	Cultivated Crops	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 31: Number of Tower Plots per protocol at KONA.

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

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

6.2 Sampling Season Characterization: KONA

Due to KONA's proximity to KONZ the same MODIS data were used to calculate greenness transitions.

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. Because of the continuous crop cover at KONA, anticipated harvest dates also inform TOS sampling activities.

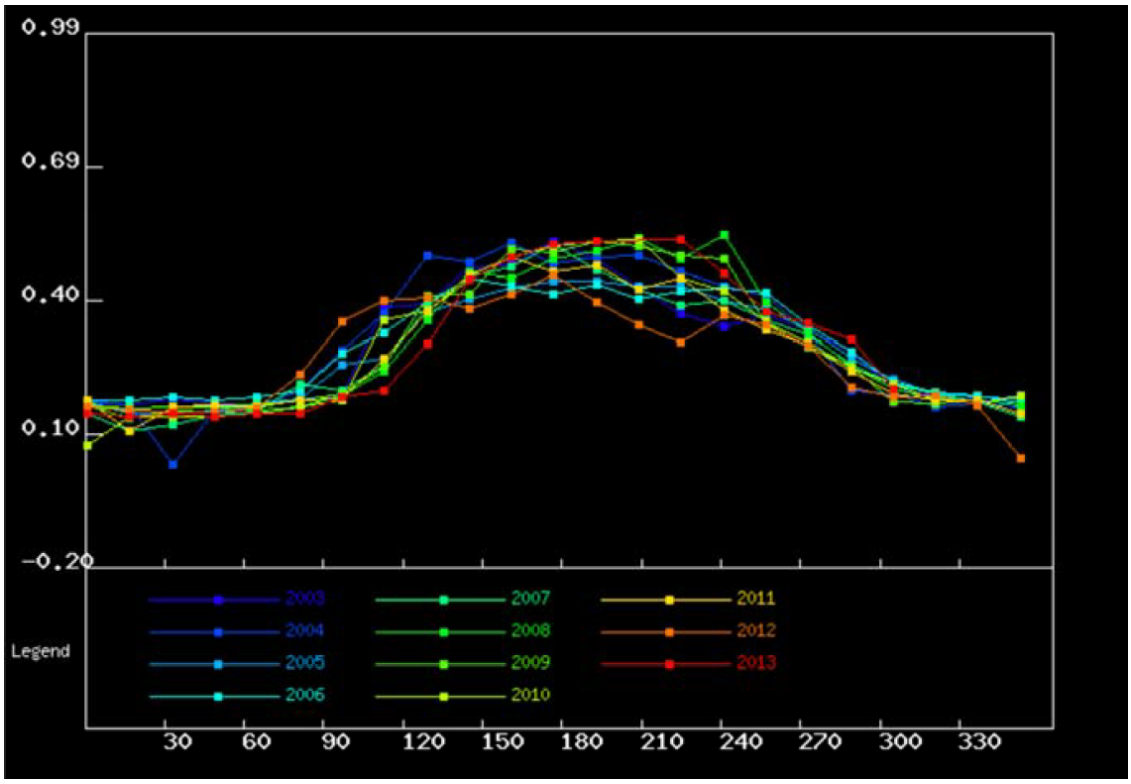

Figure 16: MODIS-EVI greenness (y-axis = EVI ratio) as a function of time (x-axis = DOY) for the years 2003-2013 at the NEON KONA site.

Table 32: Average MODIS-EVI greenness dates for the NEON KONA site, based on data from 2003-2013 (DOY, with MM/DD in parentheses).

Average Increase	Average Maximum	Average Decrease	Average Minimum
90 (04/01)	160 (06/10)	210 (07/30)	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: 10.25 km x 10.25 km box, centroid lat: 39.100906, centroid long: -96.562977 (WGS84 datum)

6.3 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]). Additional references for KONA overlap with the KONZ species references list.

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.

7 REFERENCES

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

Kansas Biological Survey: Ecological setting. 2015. Kansas State Univeristy. Retrieved from http://kpbs.konza.k-state.edu/location/.

Konza Prairie Biological Station: Current Research. 2017. The University of Kansas. Retrieved from https://biosurvey.ku.edu/conservation.

Konza Prairie Biological Station: Locations and Habitats. 2017. Kansas State Univeristy. Retrieved from http://kpbs.konza.k-state.edu/location/.

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

8 APPENDIX A: DATA PRODUCT NUMBERS

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

Table 33: 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

Name	Description	Identification Code
Soil physical properties (Megapit)	Soil taxonomy, horizon names, horizon depths, as well as soil bulk density, porosity, texture (sand, silt, and clay content) in the <= 2 mm soil fraction for each soil horizon. Data were derived from a sampling location expected to be representative of the area where the Instrumented Soil Plots per site are located and were collected once during site construction. Also see distributed soil data products.	NEON.DOM.SITE.DP1.00096
Soil chemical properties (Megapit)	Total content of a range of chemical elements, pH, and electrical conductivity in the <= 2 mm soil fraction for each soil horizon. Data were derived from a sampling location expected to be representative of the area where the Instrumented Soil Plots per site are located and were collected once during site construction. Also see distributed soil data products.	NEON.DOM.SITE.DP1.00097
Woody plant vegetation structure	Structure measurements, including height, canopy diameter, and stem diameter, as well as mapped position of individual woody plants	NEON.DOM.SITE.DP1.10098
Plant presence and percent cover	Plant species presence as observed in multi-scale plots: species and associated percent cover at 1-m2 and plant species presence at 10-m2, 100-m2 and 400-m2	NEON.DOM.SITE.DP1.10058
Plant phenology observations	Phenophase status and intensity of tagged plants	NEON.DOM.SITE.DP1.10055
Plant foliar stable isotopes	Field collection metadata describing the sampling of sun-lit canopy foliar tissues for stable isotope compositions. Also includes raw data returned from the laboratory.	NEON.DOM.SITE.DP1.10053
Plant foliar physical and chemical properties	Plant sun-lit canopy foliar physical (e.g., leaf mass per area) and chemical properties reported at the level of the individual.	NEON.DOM.SITE.DP1.10026
Non-herbaceous perennial vegetation structure	Field measurements of individual non-herbaceous perennial plants (e.g. cacti, ferns)	NEON.DOM.SITE.DP1.10045.
Ground beetles sampled from pitfall traps	Taxonomically identified ground beetles and the plots and times from which they were collected.	NEON.DOM.SITE.DP1.10022
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

Name	Description	Identification Code
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