

NEON USER GUIDE TO ROOT SAMPLING (MEGAPIT) (NEON.DP1.10066)

PREPARED BY	ORGANIZATION	DATE
Sam Simkin	FSU	01/16/2018
Courtney Meier	FSU	01/16/2018
Cody Flagg	FSU	01/16/2018

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CHANGE RECORD

REVISION	DATE	DESCRIPTION OF CHANGE
A	07/05/2017	Initial Release

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1 DESCRIPTION

1.1 Purpose

This document provides an overview of the data included in this NEON Level 1 data product, the quality controlled product generated from raw Level 0 data, and associated metadata. In the NEON data products framework, the raw data collected in the field, for example the dry weights of root samples from a single collection event, are considered the lowest level (Level 0). Raw data that have been quality checked via the steps detailed herein, as well as simple metrics that emerge from the raw data are considered Level 1 data products.

The text herein provides a discussion of measurement theory and implementation, data product provenance, quality assurance and control methods used, and approximations and/or assumptions made during L1 data creation.

1.2 Scope

This document describes the steps needed to generate the L1 data product, Root sampling (Megapit), and associated metadata from input data. This document also provides details relevant to the publication of the data products via the NEON data portal, with additional detail available in the file, NEON Data Variables for Root sampling (Megapit) (NEON.DP1.10066.001) (AD[05]), provided in the download package for this data product.

This document describes the process for ingesting and performing automated quality assurance and control procedures on the data collected in the field pertaining to TOS Protocol and Procedure: Soil Pit Sampling for Plant Belowground Biomass (AD[06]). The raw data that are processed in this document are detailed in the file, NEON Raw Data Validation for Root sampling (Megapit) (NEON.DP0.10066.001) (AD[04]), provided in the download package for this data product. Please note that raw data products (denoted by 'DP0') may not always have the same numbers (e.g., '10033') as the corresponding L1 data product.

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Associated Documents

AD[01]	NEON.DOC.000001	NEON Observatory Design (NOD) Requirements
AD[02]	NEON.DOC.000913	TOS Science Design for Spatial Sampling
AD[03]	NEON.DOC.000914	TOS Science Design for Plant Biomass, Productivity, and Leaf Area Index
AD[04]	NEON.DOC.003691	NEON Raw Data Validation for Root sampling (Megapit) (NEON.DP0.10066.001)
AD[05]	NEON.DOC.003692	NEON Data Variables for Root sampling (Megapit) (NEON.DP1.10066.001)
AD[06]	NEON.DOC.001708vA	TOS Protocol and Procedure: Soil Pit Sampling for Plant Belowground Biomass
AD[07]	NEON.DOC.000008	NEON Acronym List
AD[08]	NEON.DOC.000243	NEON Glossary of Terms
AD[09]	NEON.DOC.002652	NEON Level 1, Level 2 and Level 3 Data Products Catalog
AD[10]	OS_Generic_Transitions.pdf	NEON Algorithm Theoretical Basis Document: OS Generic Transitions
AD[11]	Nicl Language.pdf	NEON's Ingest Conversion Language (NICL) specifications

2.2 Acronyms

Acronym	Definition
TOS	Terrestrial Observation System
TIS	Terrestrial Instrument System
CRB	Coarse root biomass
FRB	Fine root biomass

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3 DATA PRODUCT DESCRIPTION

Belowground plant biomass properties shall be measured at each NEON core and relocatable terrestrial site once prior to full observatory operations. Soil samples shall be collected incrementally from the soil surface to the bottom of a soil pit, typically 2 m in depth, across three vertical sampling profiles. Coarse root biomass (CRB) and fine root biomass (FRB) samples are collected and separated into living and dead fractions. Additional belowground plant biomass samples collected from the same soil pit are archived in the NEON Megapit Soil Archive and are available upon request. The parent soil pit is at a location expected to be representative of NEON sensor-based soil plots. For additional details on the sampling protocol, see the TOS Protocol and Procedure: Soil Pit Sampling for Plant Belowground Biomass (AD[06]). Products resulting from this sampling include root biomass by size class and status.

3.1 Spatial Sampling Design

The Root sampling (Megapit) data product is available at each terrestrial site. The soil pit location was chosen to be representative of the sensor-based soil plots based on soil type, vegetation and topography, as well as being accessible by a backhoe and outside the main measurement zone of other sensors. The soil pit is usually within a few hundred meters of the sensor-based soil plots and NEON tower. Within each soil pit there are three profiles, with the orientation of the pit profiles as follows:

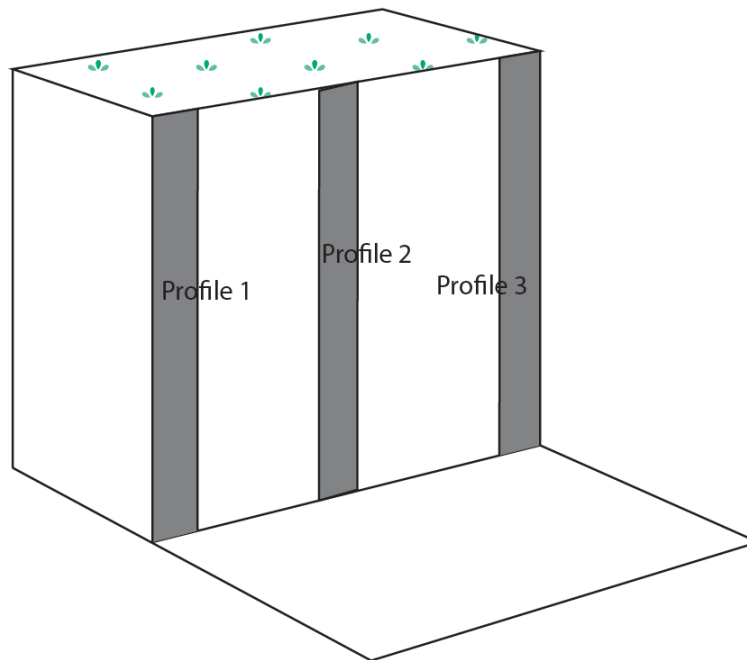


Figure 1: Representation of a NEON megapit with three pit profiles

Soil samples were collected at 10 cm depth increments to the first 100 cm below the surface, then 20 cm depth increments thereafter to 200 cm.

3.2 Temporal Sampling Design

Soil pits are sampled once during construction, including at future locations of relocatable sites, representing a point in time.

3.3 Variables Reported

All variables reported from the field or laboratory technician (L0 data) are listed in the file, NEON Raw Data Validation for Root sampling (Megapit) (NEON.DP0.10066.001) (AD[04]). All variables reported in the published data (L1 data) are also provided separately in the file, NEON Data Variables for Root sampling (Megapit) (NEON.DP1.10066.001) (AD[05]).

NEON TOS spatial data employs the World Geodetic System 1984 (WGS84) for its fundamental reference datum and GEOID09 for its reference gravitational ellipsoid. Latitudes and longitudes are denoted in decimal notation to five decimal places, with longitudes indicated as negative west of the Greenwich meridian.

Some variables described in this document may be for NEON internal use only and will not appear in downloaded data.

3.4 Spatial Resolution and Extent

The finest spatial resolution at which Root sampling (Megapit) will be tracked is per sampling depth increment within a pit profile (three per pit) within the soil pit (one megapit soil pit per NEON terrestrial core and relocatable site). The Root sampling (Megapit) will be generated for a single horizontal location at each NEON terrestrial core and relocatable site (i.e., the location of the megapit). Separate data tables will be generated for per pit profile and per sampling depth increment. There are up to up to 15 depth increments (10 within the top 100 cm and 5 within the 100-200 cm depth).

spatial hierarchy → domainID → siteID → pitID (ID of pit within a site) → pitProfileID (ID of the profile within a pit) → depthIncrementID (ID of the depth increment within a profile) → sampleID (ID of the sizeCategory and sampleStatus per depthIncrementID)

3.5 Temporal Resolution and Extent

The finest temporal resolution that Root sampling (Megapit) data will be tracked is at the level of a day. The Root sampling (Megapit) data products will be generated once for each soil pit profile and each sampling depth increment at each NEON core and relocatable site. They represent a point in time. The NEON Data Portal currently provides data in monthly files for query and download efficiency.

3.6 Associated Data Streams

Root sampling (Megapit) data products are directly linked by variable **pitID** to the TIS Soil chemical properties (Megapit) (NEON.DP1.00097) and Soil physical properties (Megapit) (NEON.DP1.00096) data products, as these samples are collected from the same soil pit over the same time period. While all megapit samples are derived from

the same parent material, sub-sampling for soil chemical and physical properties is carried out per soil horizon rather than at fixed depth intervals. Root sampling (Megapit) data products are also directly linked to the Root chemical properties (NEON.DP1.10102) data product by the variable **sampleID**. Finally, this data product is also related to belowground plant biomass data derived from the Root sampling tower plots (NEON.DP1.10067) data product. Archive samples, where there is sufficient sample material, are linked to this product by variable **archiveID**.

3.7 Product Instances

There is one megapit at each NEON terrestrial core and relocatable site. The number of depth increments at each pit will be 15 unless it is impossible to dig to the full prescribed depth of 200 cm. As relocatable TIS sites are moved, new megapit data will be generated.

3.8 Data Relationships

The Root sampling (Megapit) data product is comprised of samples collected within the same soil pits utilized for the TIS Soil chemical properties (Megapit) (NEON.DP1.00097), the TIS Soil physical properties (Megapit) (NEON.DP1.00096) data products, and other data generated from samples collected from the same soil pit, such as the soil water content sensor calibration equation and data generated from analysis of Megapit Soil Archive samples by archive users. The same samples collected for the Root sampling (Megapit) data product are submitted for external laboratory analyses as a portion of the Root chemical properties (NEON.DP1.10102) data product.

mpr_perpitprofile.csv - > Three records expected per **pitID**

mpr_perdepthincrement.csv - > Fifteen records expected per **pitID** per **pitProfileID** combination.

mpr_perrootssample.csv - > Up to four records expected per **perDepthIncrementID**, since there are two different root status values (live or dead) and two different size classes (nominally LTE 2mm and > 2mm).

Sample IDs will be generated for each collection event and functional group within a sample (**sampleID**), and submitted for external laboratory analyses for the Root chemical properties (NEON.DP1.10102) data product. If any sample material remains after laboratory analyses, it is retained for the archive (***archiveID**).

4 DATA QUALITY

4.1 Data Entry Constraint and Validation

A set of constraints are implemented during the process of ingest into the NEON database. The product-specific data constraint and validation requirements built into data entry applications and database ingest are described in the document NEON Raw Data Validation for Root sampling (Megapit) (NEON.DP0.10066.001), provided with every download of this data product. Data entry constraints are described in NiCl syntax in the validation file provided with every data download, and the NiCl language is described in NEON's Ingest Conversion Language (NICL) specifications ([AD[11]).

4.2 Automated Data Processing Steps

Following data entry the steps used to process the data through to publication on the NEON Data Portal are detailed in the NEON Algorithm Theoretical Basis Document: OS Generic Transitions (AD[10]).

4.3 Data Revision

All data are provisional until a numbered version is released; the first release of a static version of NEON data, annotated with a globally unique identifier, is planned to take place in 2020. During the provisional period, QA/QC is an active process, as opposed to a discrete activity performed once, and records are updated on a rolling basis as a result of scheduled tests or feedback from data users. The Change Log section of the data product readme, provided with every data download, contains a history of major known errors and revisions.

4.4 Quality Flagging

The **dataQF** field in each data record is a quality flag for known errors applying to the record. There are currently no dataQF codes in use in this data product.

5 REFERENCES