NEON USER GUIDE TO RIPARIAN VEGETATION PERCENT COVER (DP1.20191.001)

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CHANGE RECORD

REVISION	DATE	DESCRIPTION OF CHANGE
A	12/11/2017	Initial Release
B	07/16/2020	Included general statement about usage of neonUtilities R package and minor updates to spatial sampling design. Starting in 2020 riparian cover is collected at NEON rivers sites. Prior to that, this data product was only collected at wadeable stream sites.in
C	04/08/2022	Updated section 4.3 Data Revision with latest information regarding data release
D	04/17/2025	Added information about the new neonUtilities Python package.

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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 litter functional groups 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 Riparian Vegetation % Cover - 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 Riparian vegetation percent cover (DP1.20191.001) (AD[04]), 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 AOS Protocol and Procedure: Riparian Habitat Assessment (AD[06]). The raw data that are processed in this document are detailed in the file, NEON Raw Data Validation for riparian composition and cover (DP0.20275.001) (AD[03]), 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.002652	NEON Data Products Catalog
AD[03]	Available with data download	Validation csv
AD[04]	Available with data download	Variables csv
AD[05]	NEON.DOC.001152	Aquatic Sample Strategy
AD[06]	NEON.DOC.003826	AOS Protocol and Procedure: Riparian Habitat Assessment
AD[07]	NEON.DOC.000008	NEON Acronym List
AD[08]	NEON.DOC.000243	NEON Glossary of Terms
AD[09]	NEON.DOC.004825	NEON Algorithm Theoretical Basis Document: OS Generic Transitions
AD[10]	Available on NEON data portal	NEON Ingest Conversion Language Function Library
AD[11]	NEON.DOC.004842	AOS Commissioning Test Report: Riparian Habitat Assessment Process Quality
AD[12]	NEON.DOC.004848	AOS Commissioning Test Report: Riparian Habitat Assessment Data Quality
AD[13]	Available on NEON data portal	NEON Ingest Conversion Language
AD[14]	Available with data download	Categorical Codes csv

2.2 Acronyms

Acronym	Definition
EMAP	Environmental Monitoring and Assessment Program
EPA	U.S. Environmental Protection Agency
MODIS	Moderate Resolution Imaging Spectroradiometer
NDVI	Normalized Difference Vegetation Index

3 DATA PRODUCT DESCRIPTION

The riparian vegetation % cover product provides measurements of canopy cover over NEON wadeable streams and rivers. Cover is measured using a convex densiometer. The protocol is derived from methods developed by the U.S. Environmental Protection Agency (2008) and U.S. Fish and Wildlife Service (1997, 2009). The method follows Ode (2007), using the Strickler modification (17-point) of a convex spherical densiometer to correct for overestimation of canopy density (thickness and consistency of plant foliage) that occurs with unmodified readings (Strickler, 1959).

3.1 Spatial Sampling Design

The vegetation % cover component of the riparian habitat asessment protocol is executed at wadeable stream and river sites.

At wadeable stream sites, 10 stream transects are evenly distributed throughout the 1 kilometer biological sampling reach (Figure 1). At each transect, measurements are taken at 3 points: the center of the stream, 0.3 meters from the left bank and 0.3 meters from right bank. At the center stream sampling point, 4 densiometer readings are taken facing upstream, downstream, river right, and river left; at the left and right banks a single densiometer reading is taken, facing the bank.

At river sites measurements are collected at 5 of 10 plots, choosing the paired plot closest to the river thalweg. The measurement is collected 0.3 meters from the bank, or as close as the boat can be safely get to the bank.

As much as possible, sampling occurs in the same locations over the lifetime of the Observatory. However, over time some sampling locations may become impossible to sample, due to disturbance or other local changes. When this occurs, the location and its location ID are retired. A location may also shift to slightly different coordinates. Refer to the locations endpoint of the NEON API for details about locations that have been moved or retired: https://data.neonscience.org/data-api/endpoints/locations/

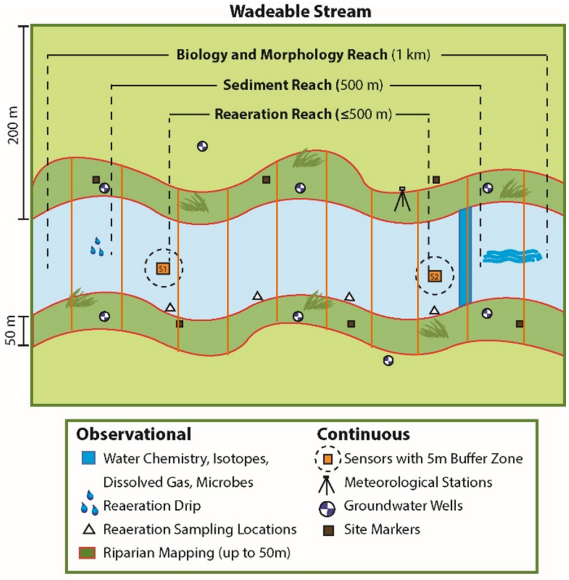

Figure 1: Riparian habitat assessment locations for wadeable streams

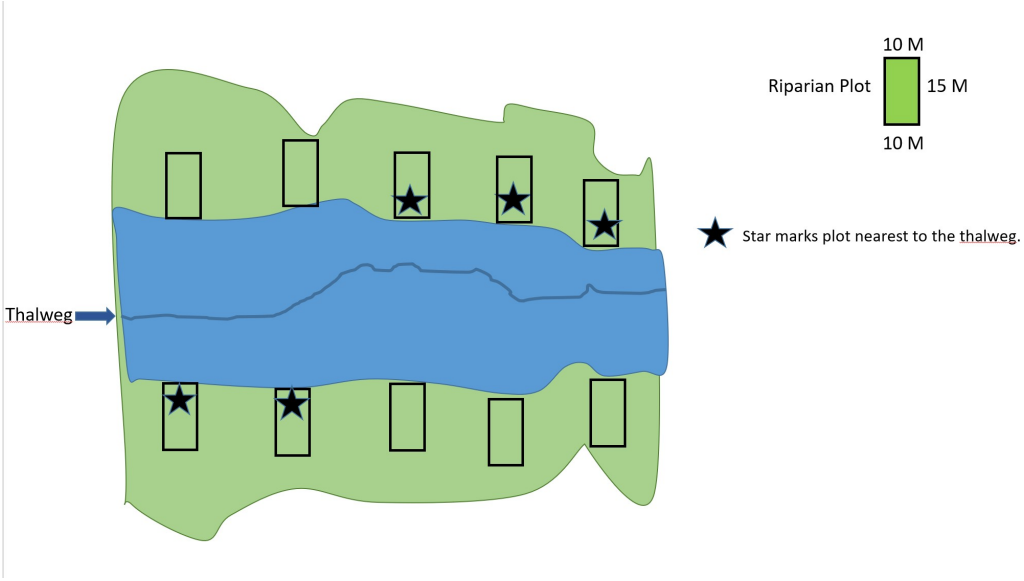

Figure 2: Riparian habitat assessment locations for rivers

3.2 Temporal Sampling Design

Riparian vegetation % cover measurements occur once per year, during periods of peak-greenness as determined by the range of historical dates when MODIS NDVI greenness is within 90% of site maximum.

3.3 Sampling Design Changes

Starting in 2020 riparian cover is collected at NEON rivers sites. Prior to that, this data product was only collected at wadeable stream sites.

3.4 Variables Reported

All variables reported from the field or laboratory technician (L0 data) are listed in the file, NEON Raw Data Validation for riparian composition and cover (DP0.20275.001) (AD[03]). All variables reported in the published data (L1 data) are also provided separately in the file, NEON Data Variables for Riparian vegetation percent cover (DP1.20191.001) (AD[04]).

Field names have been standardized with Darwin Core terms (http://rs.tdwg.org/dwc/; accessed 7 December 2017), the Global Biodiversity Information Facility vocabularies (http://rs.gbif.org/vocabulary/gbif/; accessed 7 December 2017), the VegCore data dictionary (https://projects.nceas.ucsb.edu/nceas/projects/bien/wiki/VegCore; accessed 7 December 2017), where applicable. NEON spatial data employs the World Geodetic System 1984 (WGS84) for its fundamental reference datum and Geoid12A geoid model for its vertical reference surface. Latitudes and longitudes are denoted in decimal notation to six 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.

3.5 Spatial Resolution and Extent

The basic spatial data included in the data downloaded include the latitude, longitude, and elevation of a fixed riparian transect where sampling occurred + associated uncertainty due to GPS error.

Each riparian cover observation occurs at a fixed transect and involves observations at the center of the stream, looking upstream, downstream and toward both banks, as well as at each bank looking toward the bank. The basic spatial data refers to the point along this transect at the thalweg.

Overall, this results in a spatial hierarchy of:

measurementLocation and measurement direction (center, left or right bank facing upsteam, downstream, or either bank) →**namedLocation** (unique ID given to the individual transect) → **siteID** (ID of NEON site) → **domainID** (ID of a NEON domain).

3.6 Temporal Resolution and Extent

The finest resolution at which temporal data are reported is the **startDate**, the date and time of day at which the assessment of a particular transect began. Usually all transects at a site will be done within a single day, however it is possible it may take more than one day.

3.7 Associated Data Streams

namedLocation and **startDate** are linking variables that tie specific observations and associated metadata to the Riparian composition and structure data product (DP1.20275.001).

3.8 Product Instances

At wadeable stream sites, each of 10 transects per site is expected to be surveyed once per year. Each transect contains 3 points, sampled in either 4 (center) or one (bank) directions, yielding 60 data product instances per site per calendar year.

At river sites, 5 plots per site per year is expected to be surveyed once per year. Each plot contains 1 point, sampled in 1 direction, yielding 5 data product instances per site per calender year.

3.9 Data Relationships

Data downloaded from the NEON Data Portal are provided in separate data files for each site and month requested. The neonUtilities package in R and the neonutilities package in Python contain functions to merge these files across sites and months into a single file for each table. The neonUtilities R package is available from the Comprehensive R Archive Network (CRAN; https://cran.r-project.org/web/packages/neonUtilities/index.html) and can be installed using the install.packages() function in R. The neonutilities package in Python is available on the Python Package Index (PyPi; https://pypi.org/project/neonutilities/) and can be installed using pip. For instructions on using the package in either language to merge NEON data files, see the Download and Explore NEON Data tutorial on the NEON website: https://www.neonscience.org/download-explore-neon-data.

4 DATA QUALITY

4.1 DATA ENTRY CONSTRAINT AND VALIDATION

Many quality control measures are implemented at the point of data entry within a mobile data entry application or web user interface (UI). For example, data formats are constrained and data values controlled through the provision of dropdown options, which reduces the number of processing steps necessary to prepare the raw data for publication. An additional 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 riparian composition and cover (DP0.20275.001), provided with every download of this data product. Contained within this file is a field named 'entryValidationRulesForm', which describes syntactically the validation rules for each field built into the data entry application. 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[10]).

A schematic of the data entry application design is depicted in Figure 3.

4.2 Automated Data Processing Steps

Following data entry into a mobile application or web user interface, 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[09]).

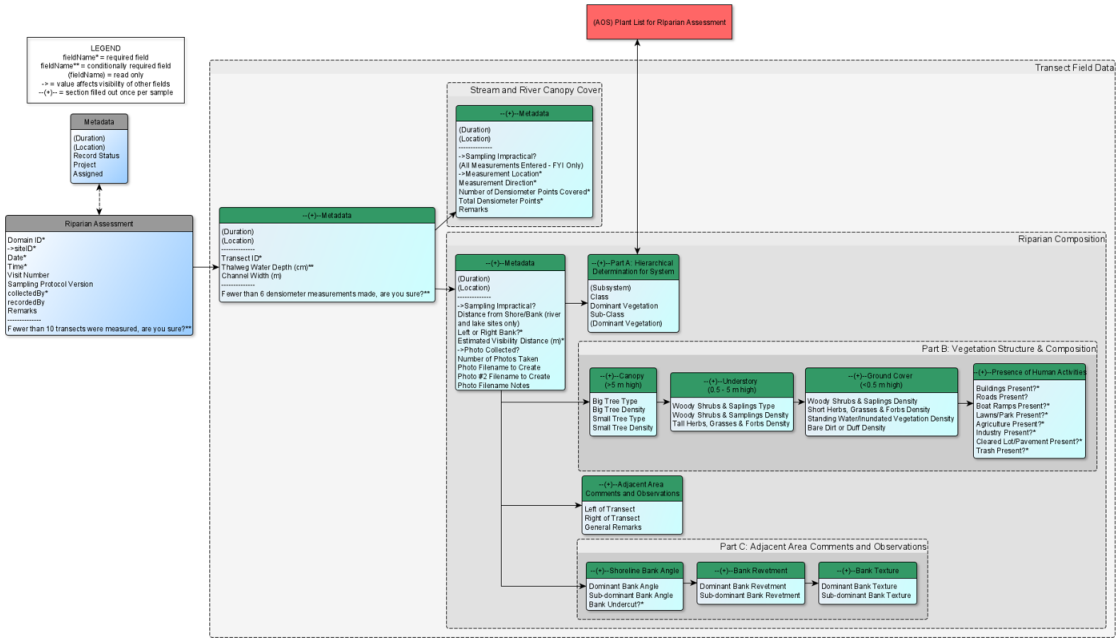

Figure 3: Schematic of the applications used by field technicians to enter riparian field data

4.3 Data Revision

All data are provisional until a numbered version is released. Annually, NEON releases a static version of all or almost all data products, annotated with digital object identifiers (DOIs). The first data Release was made in 2021. 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 Issue Log section of the data product landing page contains a history of major known errors and revisions.

4.4 Quality Flagging

The **dataQF** field in each record is a quality flag for known issues applying to the record, added by NEON Science upon data review. At this time, there are no known issues applying to the records in this data product

Records of land management activities, disturbances, and other incidents of ecological note that may have a potential impact are found in the Site Management and Event Reporting data product (DP1.10111.001)

5 REFERENCES

Ode, P. 2007 Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California. State Water Resources Control Board, Surface Water, Ambient Monitoring Program. 48pp.

Strickler, Gerald S. 1959. Use of the densiometer to estimate density of forest canopy on permanent sample plots. USDA Forest Service, Pacific Northwest Forest and Range Exp. Sta. Research Note 180,Portland, Oregon, 5 pp

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U.S. Fish and Wildlife Service. 1997. A system for mapping riparian areas in the western United States. U. S. Fish and Wildlife Service. Washington, DC. 15 pp.

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