



neon
Operated by Battelle

A visual guide to accessing NEON data

Please view included slide notes throughout the presentation for additional details

Updated 6 February 2020

Slideshow Sections

Discover NEON Data

Explore and Download NEON Data from Data Portal

Special Cases for Downloading NEON Data

Understand Downloaded Data Structure

Additional Important Pages & Information

Discover NEON Data

- NEONScience.org
- NEONScience.org/data

NEONScience.org

- Overview of data collection
- Field site maps
- Information for researchers
- Using NEON Infrastructure
- Access to the NEON Data Portal

The image shows two screenshots of the NEONScience.org website. The top screenshot is the homepage, featuring the NEON logo and a banner with the text "Good science is built on good data". A blue arrow points from the "Data & Samples" link in the top navigation bar to the second screenshot. The second screenshot is the "Data & Samples" page, which has a dark blue header with the same navigation links. A green oval highlights the "Explore Data Products" link under the main menu.

View Edit Delete Revisions

About Us Data & Samples Field Sites Impact Resources Get Involved

Good science is built on good data

The National Ecological Observatory Network, or NEON, offers expert ecological data from sites across the continent to power the most important science being done today.

WATCH The Future of Science is Open

About Us Data & Samples Field Sites Impact Resources Get Involved

X Data & Samples

Data Portal >

Samples & Specimens >

Collection Methods >

Data Policies & Citation Guidelines

Data Notifications

Data Management >

Explore Data Products

Spatial Data & Maps

Document Library

API & GraphQL

Prototype Data

– Prototype Data Ingest

External Lab Data Ingest (restricted)

NEONscience.org/data

- Explore and download data
- Information on programmatic access to NEON data
 - API
 - Code packages
- Access data product user guides, detailed protocols, and other important documents
- News on product updates and versions

The screenshot shows the NEON Data Portal homepage. At the top, there's a navigation bar with links for About Us, Data & Samples, Field Sites, Impact, Resources, Get Involved, and a search icon. The main header is "Data Portal". Below the header is a collage of four images: a tall metal tower in a forest, a person working in a field, another tall tower at sunset, and two people working with equipment in a field. A descriptive text block below the images reads: "The National Ecological Observatory Network provides open data to understand changing ecosystems. Explore our data products and related resources." There are six main sections arranged in a grid: 1. "Explore and Download Data Products" (with a "GET DATA" button), 2. "API and GraphQL" (with a "USE THE API" button), 3. "Prototype Data" (with a "EXPLORE PROTOTYPE DATA" button), 4. "Working with NEON Data" (with a "GET DATA" button), 5. "Data Availability" (with a "GET DATA" button), and 6. "Data Notifications" (with a "GET DATA" button).

Explore & Download Data From Portal

- Explore Data Page
 - Download Tabular Data Including:
 - Instrumented Sampling
 - Observational Sampling

Explore data

Step 1

Data Portal



The National Ecological Observatory Network provides open data to understand changing ecosystems. Explore our data products and related resources.

Explore and Download Data Products
All of NEON's data products are free and open. Explore all of our available and pending data products.

GET DATA >

API and GraphQL
Work more efficiently - query and download NEON data programmatically or from the command line.

USE THE API >

Prototype Data
Find datasets collected during the testing of new products, especially during the construction of NEON.

EXPLORE PROTOTYPE DATA >

Filter

RESET ALL FILTERS

Search

Utah, "snow depth", 2020, etc...

Use several terms to match products having any term (term OR term). Quote terms to match phrases (e.g. "wind speed"). [Browse keywords](#) for ideas.

Release

Latest and Provisional

Data in the latest release in addition to provisional data (not yet in any release)
181 data products

Available Dates

Show products that have any data available between two dates.

FILTER ON AVAILABLE DATES...

Data Status

Available (163)
 Coming Soon (18)

Visualizations

Time Series Viewer (34)
 AOP Data Viewer (2)

Science Team

Airborne Observation Platform (AOP) (29)
 Aquatic Instrument System (AIS) (22)
 Aquatic Observation System (AOS) (37)

Step 2

Home / Data & Samples / Data Portal / Explore Data Products

Explore Data Products

All Products
181 products from 81 sites Data available Dec 2010 – Mar 2021
Download Full Catalog: CSV JSON PDF

Filtered Products
no filters currently applied

Sort
"Available" data products will always show above "Coming Soon" data products, except when sorting by search relevance.

by Product Name ▾

Showing first 10 of 181 total products

2D wind speed and direction
DP1.0001.001
Two-dimensional wind speed and direction, available as two- and thirty-minute aggregations of 1 Hz observations. Observations are made by 2-D sonic anemometer sensors located at multiple heights on the tower infrastructure and by 2-D sonic anemometer sensors located on the aquatic meteorological station.

Available Dates 2013-09 through 2021-02

Data Themes

Visualize Data TIME SERIES VIEWER

View By: SUMMARY SITE STATE DOMAIN

3D wind attitude and motion reference
DP1.00010.001
Measurement of 3D anemometer attitude and motion.

Available Dates

This data product is bundled into [Bundled data products - eddy covariance \(DP4.00200.001\)](#)
It is not available as a standalone download. Data availability shown below reflects availability of the entire bundle.

DATA DOWNLOAD

PRODUCT DETAILS

Explore data: Filter to find data products of interest

Remove all filters

Filter by keyword

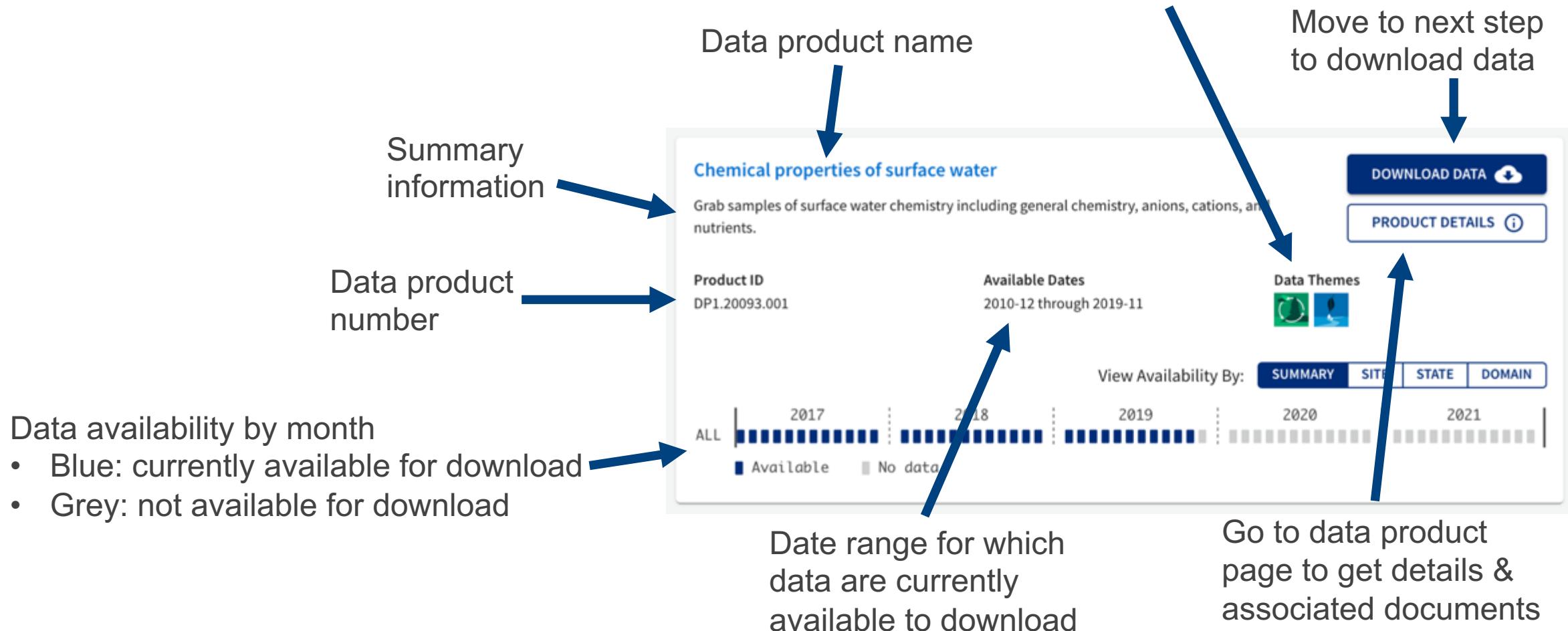
Filter by category

- Data status
- Themes
- States
- Domains
- Sites
- Data teams

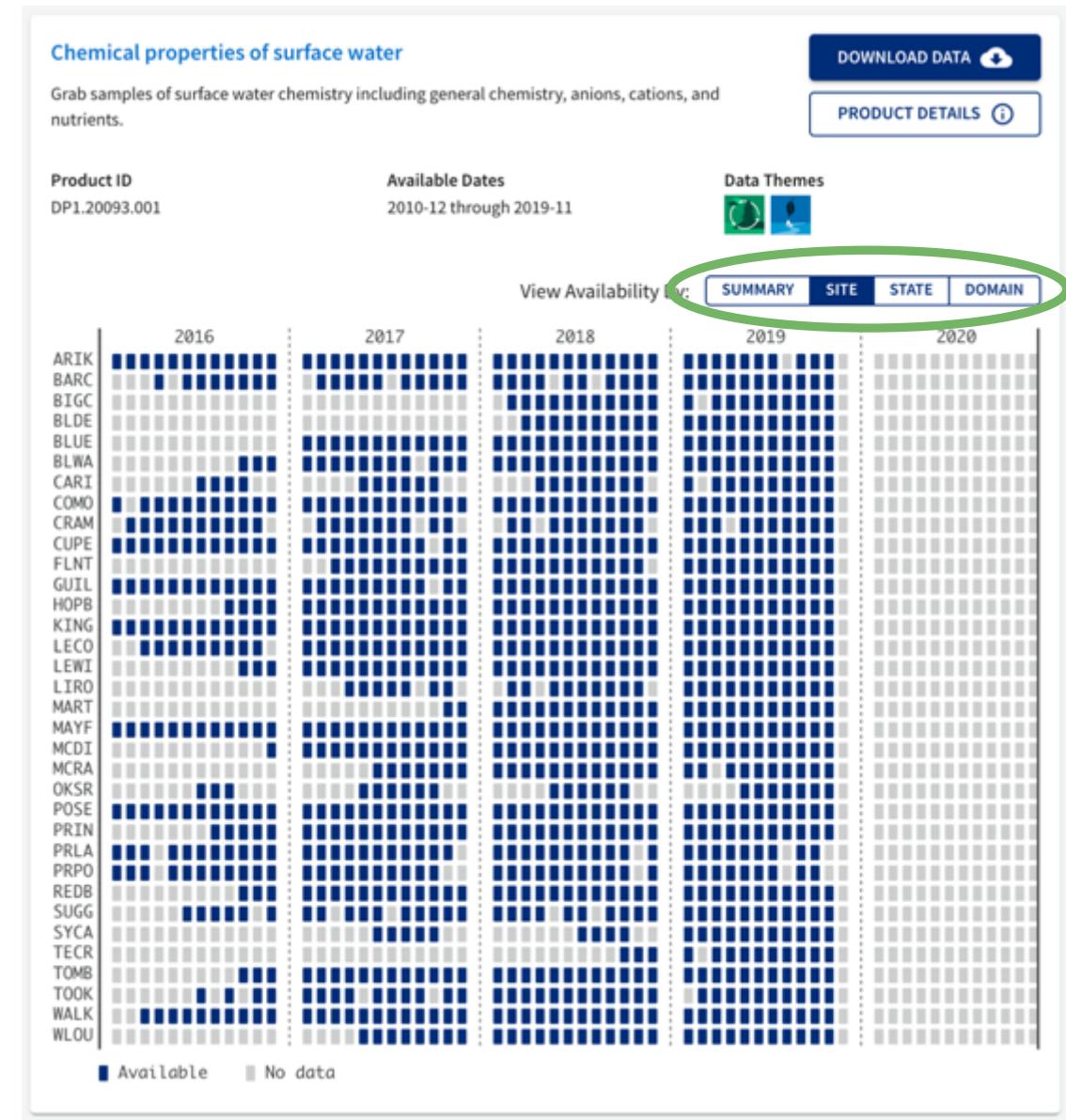
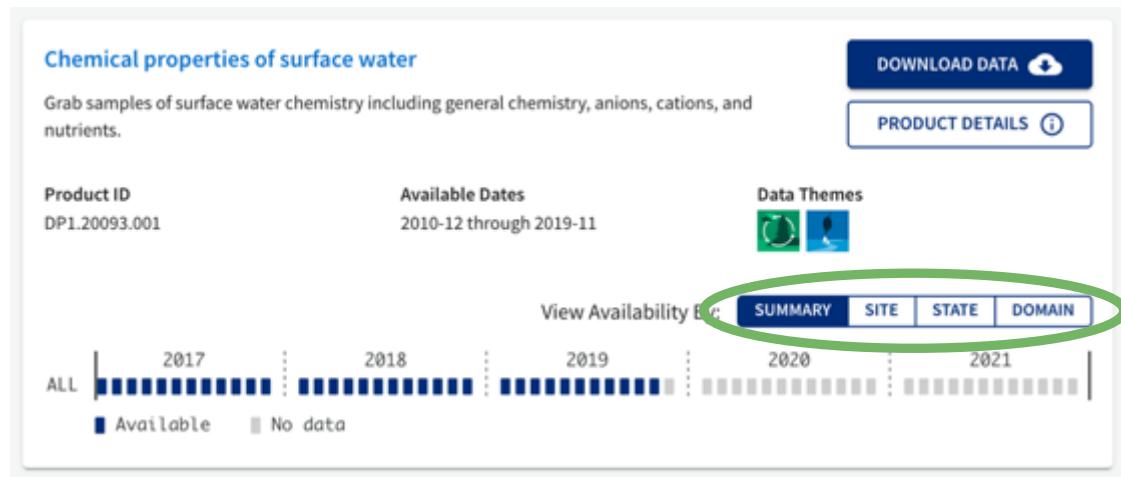
The screenshot shows the NEON Data Portal's 'Explore Data Products' page. At the top left, there is a 'Filter' sidebar with sections for 'Search' (containing a search bar with 'carbon'), 'Release' (set to 'Latest and Provisional'), 'Available Dates' (with a 'FILTER ON AVAILABLE DATES...' button), 'Data Status' (checkboxes for 'Available' and 'Coming Soon'), 'Visualizations' (checkboxes for 'Time Series Viewer' and 'AOP Data Viewer'), 'Science Team' (checkboxes for 'Airborne Observation Platform (AOP)', 'Aquatic Instrument System (AIS)', 'Aquatic Observation System (AOS)', and 'Terrestrial Instrument System (TIS)'). The main content area has two tabs: 'All Products' (181 products from 81 sites) and 'Filtered Products' (35 products from 81 sites). Below these are two data product cards: 'Sediment chemical properties' (DP1.20194.001) and 'Root stable isotopes' (DP1.10099.001). The 'Root stable isotopes' card includes a note about being split and bundled into multiple parent products and states it is not available as a standalone download.

Results of searching
for “carbon”

Explore data: Key information

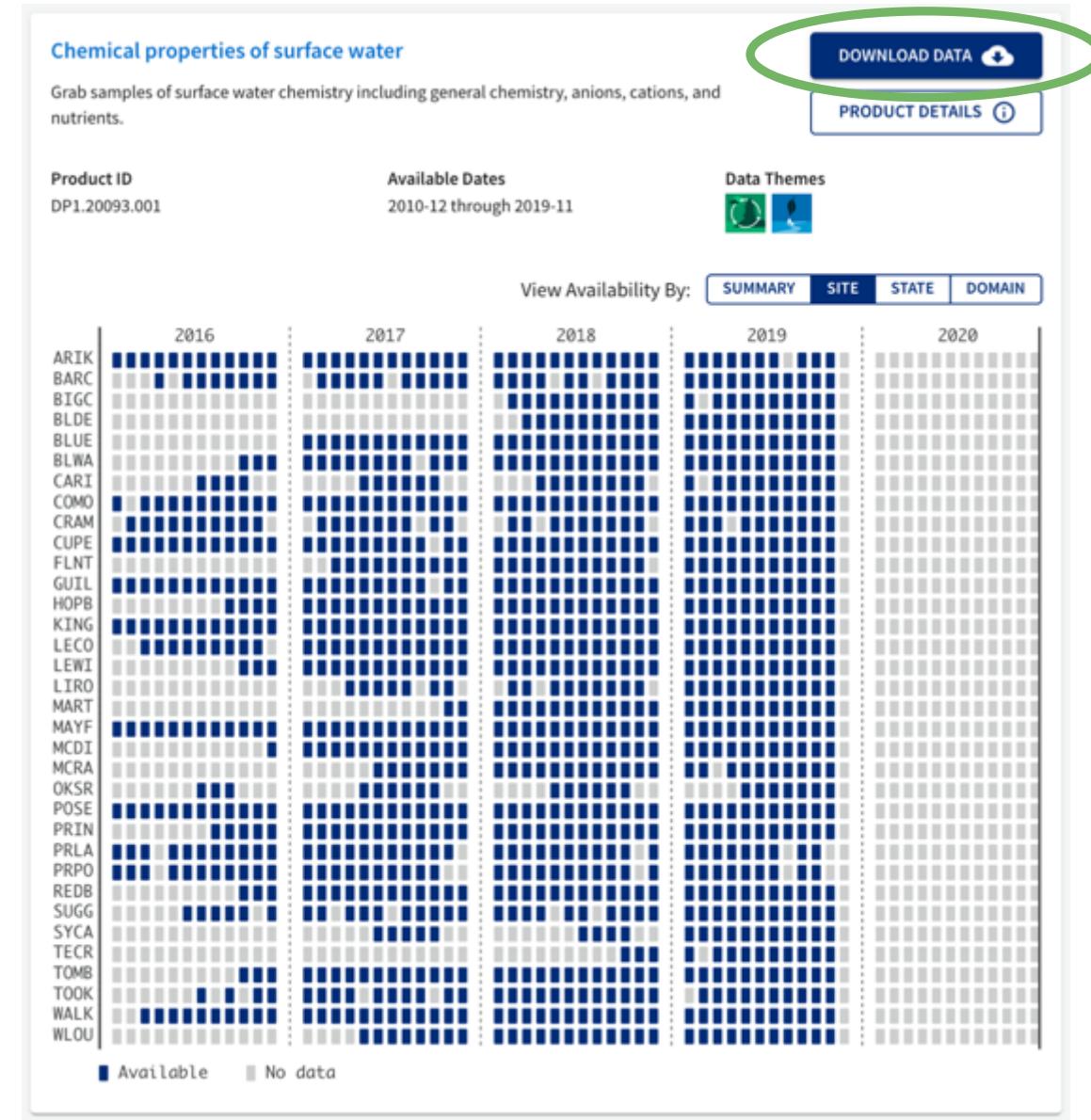


Explore data: View data availability



Configure data download - Part 1

Select Download Data when you are ready to configure a data download



Configure data download - Part 2

1.1 Select date range of interest

1.2 Select area(s) of interest by
clicking on appropriate line(s)

1.3 Click the ‘Next’ button.

NEON | Explore Data Products X NEON | Chemical properties of surface water X +

data.neonscience.org/data-products/explore

Configure Data for Download

Chemical properties of surface water

DP1.20093.001

CANCEL DOWNLOAD DATA

Estimated size 11.0 MB

Complete all steps to enable download

File Type: ZIP (Compressed Text)

Sites and Date Range Documentation Package Type Policies Summary

What sites and dates do you want?

Sites

3 sites

Date Range

Start December 2018 End November 2019

View Availability By

SUMMARY SITE STATE DOMAIN

2013 2014 2015 2016 2017 2018 2019 2020 2021

ARIK BART BGC BLD E BLD E BILW CARL COMO CRAM CUPE FLNT GUIL HOPP KING LECO LEWT LTRD MARR MAYT MC01 MCRA OKSR POSF PRIN PRLA PROPO REDB SUGG SYCA TCR TOMB TOOK WALK WLOU

Available All sites selected No data Some sites selected

Click on rows in the grid above to select individual sites or states
Click and drag the grid to zoom in/out

NEXT >

Configure data download - Part 3

2. Select inclusion of documents
3. Select document package type
4. Agree to NEON policies

Chemical properties of surface water
DPI.20093.001

CANCEL DOWNLOAD DATA Complete all steps to enable download File Type: ZIP (Compressed Text)

Sites and Date Range Documentation Package Type Policies Summary

2 Do you want to include documentation?

Include
Include relevant documents for this Data Product

Exclude
Data only, no relevant documents for this Data Product

EML files for this Data Product are included in all downloads. Learn more about EML files in the [NEON FAQ](#) and at [KNB](#).

Chemical properties of surface water
DPI.20093.001

CANCEL DOWNLOAD DATA Complete all steps to enable download File Type: ZIP (Compressed Text)

Sites and Date Range Documentation Package Type Policies Summary

3 Which package type do you want?

Basic
The basic download package includes the primary measurements.

Expanded
The expanded package for this data product contain metadata associated with the in-house alkalinity and ANC titrations, and method detection limits from the analytical laboratory.

Chemical properties of surface water
DPI.20093.001

CANCEL DOWNLOAD DATA Complete all steps to enable download File Type: ZIP (Compressed Text)

Sites and Date Range Documentation Package Type Policies Summary

4 Agree to Policies

In order to proceed to download NEON data you must agree to the [Data Usage and Citation Policies](#).

I agree to the NEON Data Usage and Citation Policies.

Configure data download - Part 4

5. Check file size

6. Click Download Data

7. Use the recommended citation!

Estimated size
13.1 MB

CANCEL DOWNLOAD DATA

File Type: ZIP (Compressed Text)

Chemical properties of surface water
DP1.20093.001

Sites and Date Range Documentation Policies Summary

Summary of Data Download Configuration

2 sites — Dec 2010 - Nov 2019

Documentation
Include

Package Type
Expanded

DOWNLOAD DATA

Tip: Check out our [Download and Explore NEON Data tutorial](#). This tutorial will explain how our `neon/utilities` package can be used to unzip and join data tables with just a few lines of code.

Files in this download will follow NEON File Naming Conventions.

Please use this citation in your publications. See [Data Usage and Citation Policies](#) for more info.

National Ecological Observatory Network. 2020. Data Product DP1.20093.001, Chemical properties of surface water. Provisional data downloaded from <http://data.neonscience.org> on January 3, 2020. Battelle, Boulder, CO, USA NEON. 2020.

Please use this citation in your publications. See [Data Usage and Citation Policies](#) for more info.

National Ecological Observatory Network. 2020. Data Product DP1.20093.001, Chemical properties of surface water. Provisional data downloaded from <http://data.neonscience.org> on January 3, 2020. Battelle, Boulder, CO, USA NEON. 2020.

Special Cases for Downloading Data

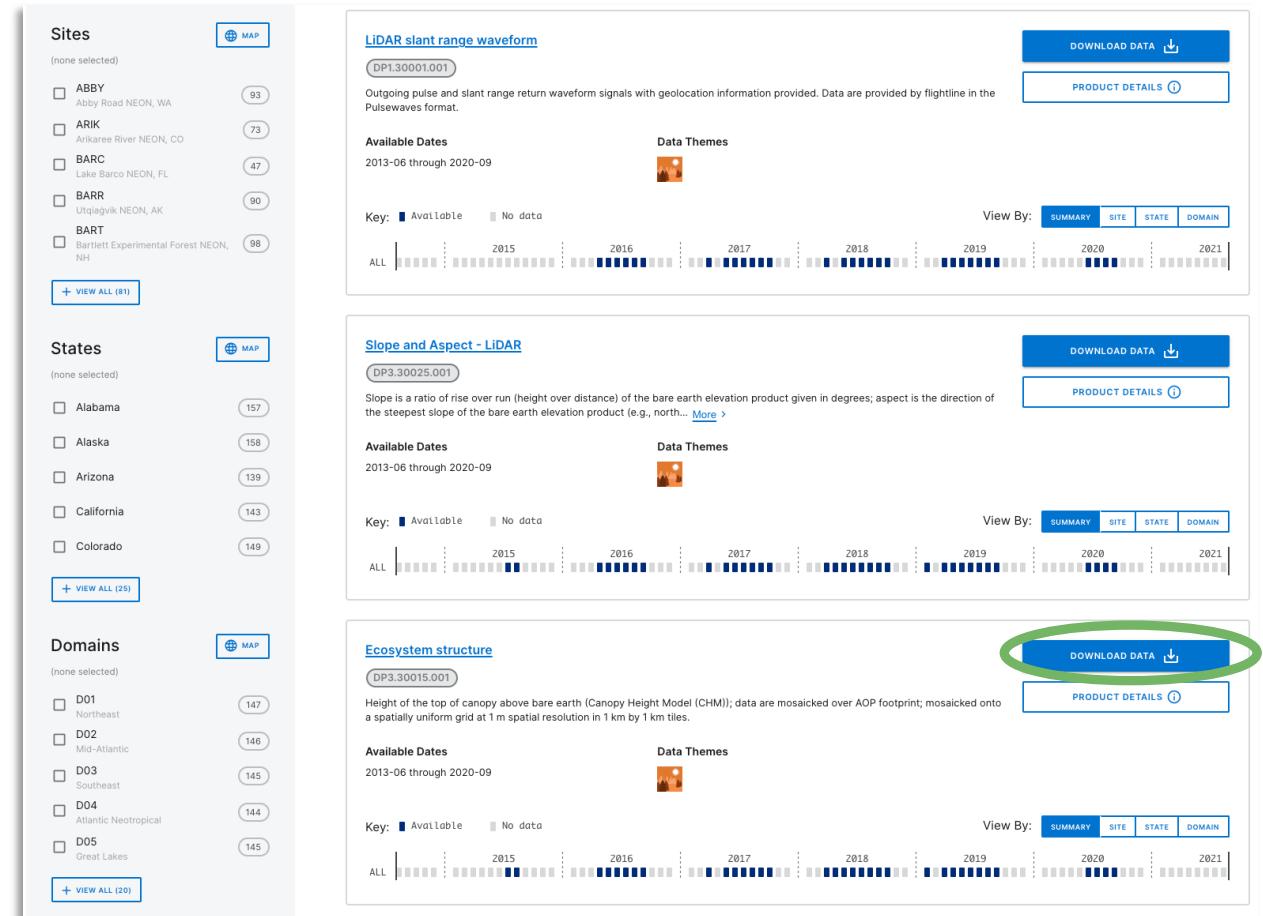
- Aerial Observation Platform (AOP) Data:
 - LiDAR
 - Hyperspectral
 - Aerial Imagery
- Phenocam & Genomics Data from Partner Organizations

Aerial Observation Platform (AOP) Data

NEON's remotely sensed data, such as lidar, hyperspectral, and aerial imagery data, are very large files. NEON delivers them as 1km² tiles or flightlines.

To download this data, in addition to data product, site, and date range, you have to select which files you want to download.

You can also explore some types of AOP data through a visual browser.

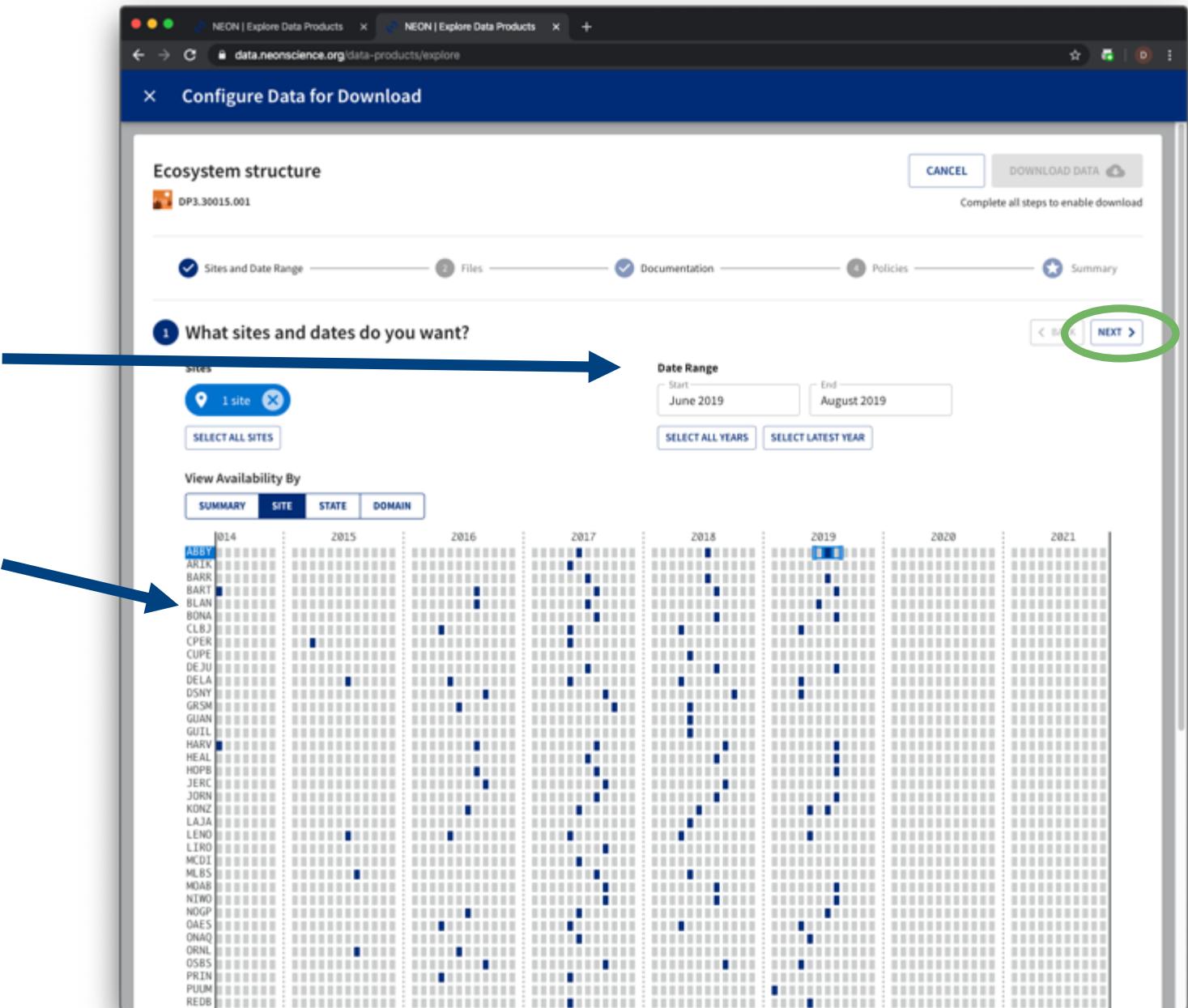


Configure data download - Part 1

1.1 Select date range of interest

1.2 Select area(s) of interest by
clicking on appropriate line(s)

1.3 Click the ‘Next’ button.



Configure data download - Part 2

2.1 Select all files in package, or subset by Site, Date, Visit #, Name, or file Type

2.2 Check the estimated file size!

2.3 Click Next when ready

The screenshot shows the 'Configure Data for Download' interface for a specific ecosystem structure (DP3.30015.001). The interface includes tabs for 'Sites and Date Range', 'Files' (which is selected), 'Documentation', 'Policies', and 'Summary'. Step 2, 'Select Files to Include in Download', is active. It shows a table with columns: Site, Date, Visit, Name, and Type. A green circle highlights the 'Name' column header. Below the table, it says '92 files selected (348 MB uncompressed)'. At the bottom, there are navigation buttons: 'BACK', 'NEXT >', and 'Complete all steps to enable download'.

Site	Date	Visit	Name	Type	Size
ABBY	2019-01		NEON_D16_ABBY_DP3_556000_5067000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_551000_5064000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_554000_5071000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_556000_5062000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_555000_5068000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_555000_5063000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_555000_5067000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_552000_5068000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_552000_5070000_CHM	tif	3.82 MB
ABBY	2019-07	3	NEON_D16_ABBY_DP3_550000_5063000_CHM	tif	3.82 MB

Configure data download - Part 3

3. Select inclusion of documents

4. Agree to NEON policies

5. Ready to download

The image displays three sequential screenshots of the NEON Data Download Configuration interface:

- Screenshot 1 (Step 3):** Shows the "Ecosystem structure" page for Data Product DP3.30015.001. It includes tabs for "Sites and Date Range" (checked), "Files" (checked), "Documentation" (checked), "Policies" (unchecked), and "Summary". A sub-section titled "3 Do you want to include documentation?" offers two options: "Include" (selected) and "Exclude". A tooltip explains that EML files are included in all downloads and provides links to the NEON FAQ and KNB. Navigation buttons "< BACK" and "NEXT >" are at the bottom.
- Screenshot 2 (Step 4):** Shows the "Ecosystem structure" page with the "Policies" tab now checked. A sub-section titled "4 Agree to Policies" contains a checkbox for "I agree to the NEON Data Usage and Citation Policies." A tooltip states that agreement is required to proceed. Navigation buttons "< BACK" and "NEXT >" are at the bottom.
- Screenshot 3 (Step 5):** Shows the "Summary of Data Download Configuration" page. It lists the configuration: 1 site (May 2019 - Sep 2019), 92 files (348 MB uncompressed), and Documentation set to "Include". It features a "DOWNLOAD DATA" button and a "Tip" box about using neonUtilities. Another box states that files follow NEON File Naming Conventions. A third box provides citation information and a "COPY" button. The page ends with a footer note about the data source.

Explore through visual browser

- Explore mosaicked camera and hyperspectral imagery
- Available on the Data Product Detail Page
- Current download options: only can download .png or binary files
- Partnership with University of Utah's ViSUS team – availability of data product that this is for will be expanding
- Two products available to browse:
- High-resolution Imagery:
 - <https://data.neonscience.org/data-products/DP3.30010.001>
- Vegetation indices:
 - <https://data.neonscience.org/data-products/DP3.30026.001>

Visualizations

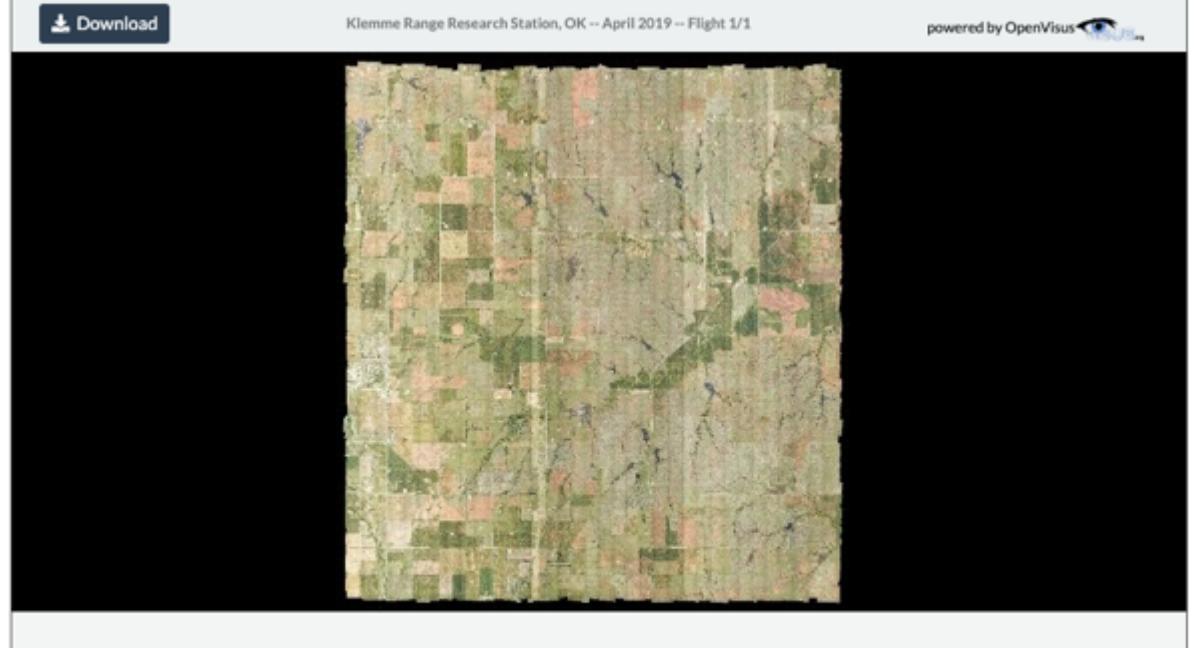
AOP Data Viewer

This viewer allows for interactive exploration of remotely sensed data from the Airborne Observation Platform (AOP). Change the field site and flight for this data product using the tools below to stream different data into view. Pan and zoom in the view to stream higher resolution imagery. This pilot data viewer is provided through a collaboration with the [ViSUS Project at the University of Utah](#) and more updates are planned for the future.

Site ⓘ Year ⓘ Flight ⓘ

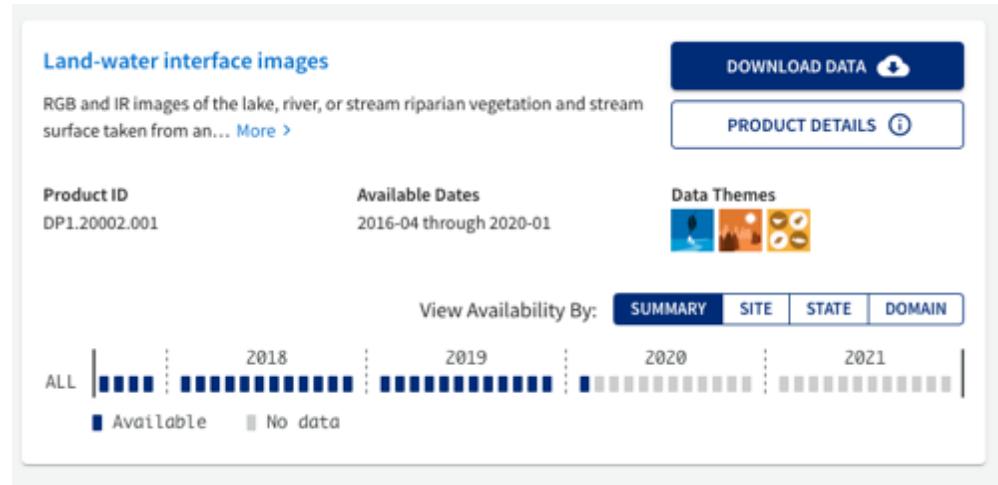
OAES < 2017 2018 2019 > 1/1 (April) ▾

[Download](#) Klemme Range Research Station, OK -- April 2019 -- Flight 1/1 powered by OpenVisus



Download Phenocam Data

1. Select your dataset of interest
2. Follow the links provided



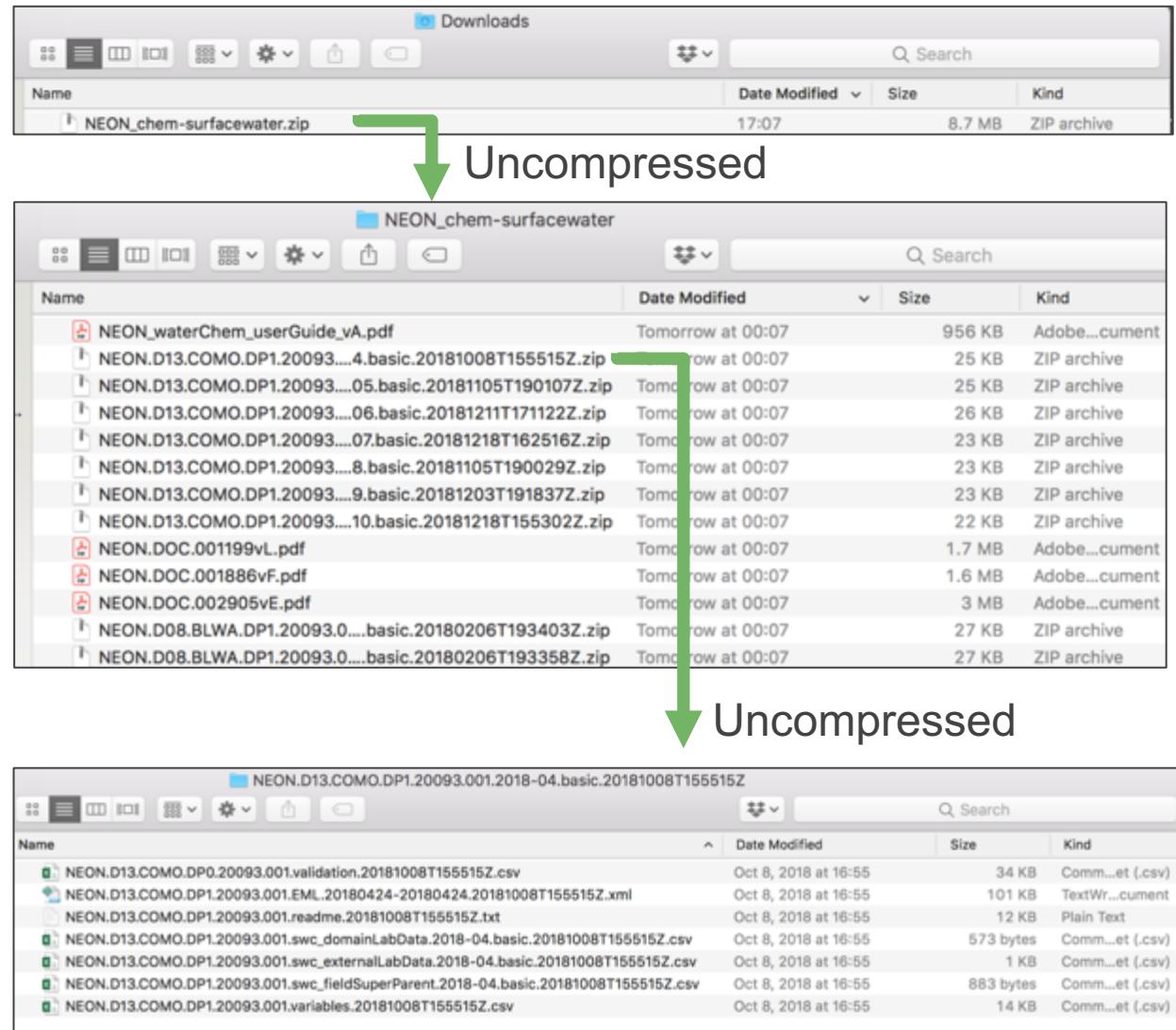
This screenshot shows the 'Download Data from External Host' page for the 'Land-water interface images' dataset. It includes:

- Product ID:** DP1.20002.001
- Information Box:** A box stating: "Data for this product is not currently available for download through the NEON Data Portal. Please use the links below to access data for this product for a particular site from the [PhenoCam Project](#)."
- State Lists:** A grid of state lists, each with a bulleted list of research sites.
 - Alabama:** BLWA - Black Warrior River, DELA - Dead Lake, LENO - Lenoir Landing, MAYF - Mayfield Creek, TALL - Talladega National Forest, TOMB - Tombigbee River
 - Alaska:** BARR - Barrow Environmental Observatory, BONA - Caribou-Poker Creeks Research Watershed, CARI - Caribou Creek at Caribou-Poker Creeks Research Watershed, DEJU - Delta Junction, HEAL - Healy, OKSR - Oksrukuyik Creek, TOOK - Toolik Lake, TOOL - Toolik
 - Arizona:** SRER - Santa Rita Experimental Range, SYCA - Sycamore Creek
 - California:** BIGC - Upper Big Creek, SJER - San Joaquin, SOAP - Soaproot Saddle, TEAK - Lower Teakettle, TECR - Teakettle 2 Creek
 - Colorado:** ARIK - Arikaree River, COMO - Como Creek, CPER - Central Plains Experimental Range, NIWO - Niwot Ridge Mountain Research Station, RMNP - Rocky Mountain National Park, STER - Sterling, WLOU - West St Louis Creek
 - Florida:** BARC - Barco Lake, DSNY - Disney Wilderness Preserve, OSBS - Ordway-Swisher Biological Station, SUGG - Suggs Lake
 - Georgia:** FLNT - Flint River, JERC - Jones Ecological Research Center
 - Hawaii:** PUUM - Pu-u Maka-ala Natural Area Reserve
 - Kansas:** KING - Kings Creek, KONA - Konza Prairie Biological Station - Relocatable, KONZ - Konza Prairie Biological Station, MCDI - McDiffett Creek, UKFS - The University of Kansas Field Station
 - Maryland:** SERC - Smithsonian Environmental Research Center
 - Massachusetts:** HARV - Harvard Forest, HOPB - Hop Brook
 - Michigan:** UNDE - UNDERC
 - New Hampshire:** BART - Bartlett Experimental Forest
 - New Mexico:** JORN - Jornada LTER
 - North Dakota:** DCFS - Dakota Coteau Field School, NOGP - Northern Great Plains Research Laboratory, PRLA - Prairie Lake at Dakota Coteau Field School
 - Oklahoma:** BLUE - Blue River, OAES - Klemme Range Research Station

Understand Downloaded Data Structure

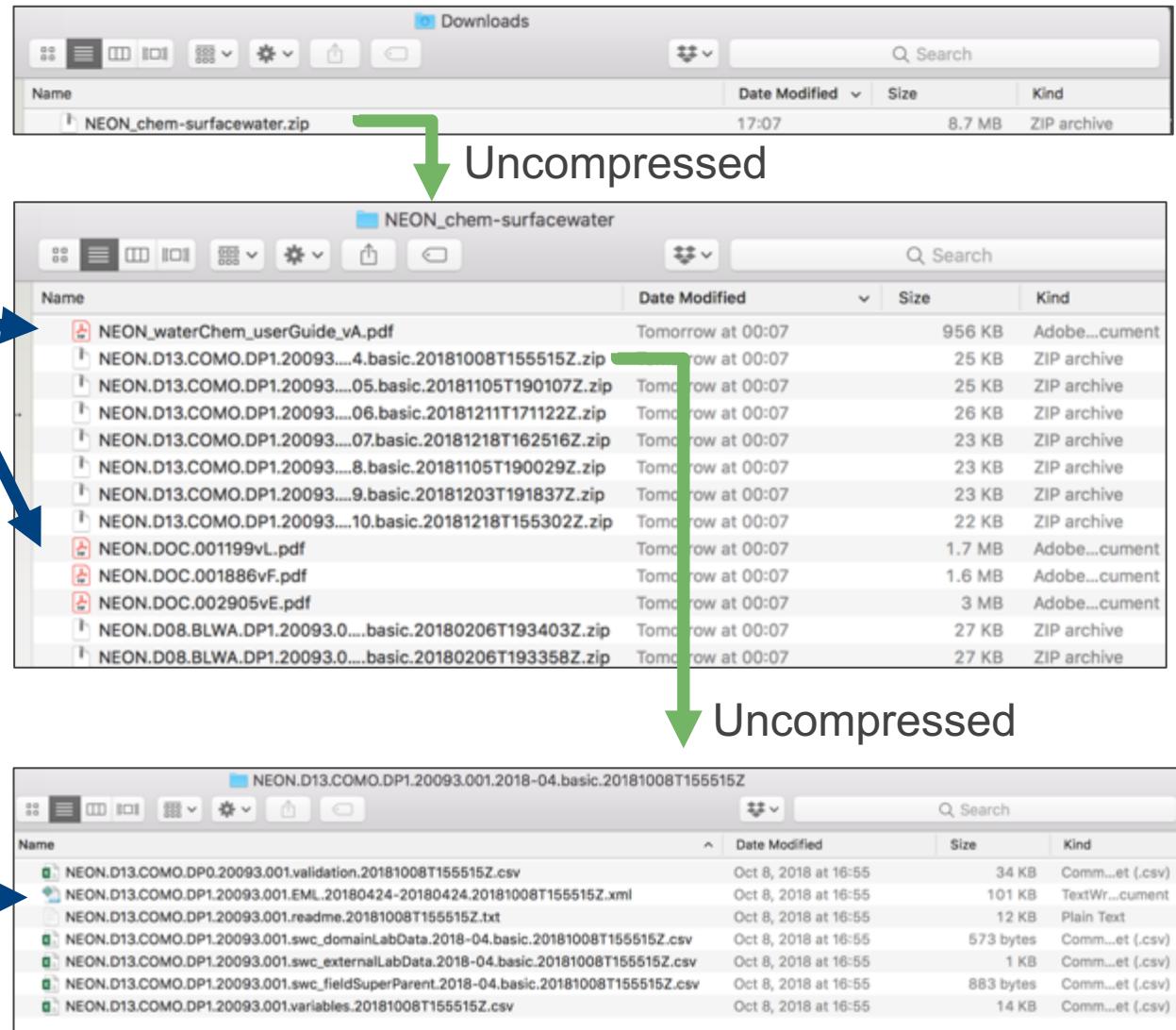
Use downloaded data: Structure

- Most NEON data products are delivered as compressed (zipped) .csv files.
 - Other formats include .hdf5 and .tif
- Uncompress to view the contents
- Data in compressed site by month files
- For each site by month, there may be multiple related data tables per data product.



Use downloaded data: Key files

- Included documentation (if selected)
 - User Guide, Protocol, etc.
- Validation file
 - Contains the data processing rules
- EML (.xml) file
 - Machine readable metadata file
- Readme file
 - Important information on the download
- Data table(s)
 - One or more related .csv files
- Variables file
 - Lists which variables are found in which data table



Use downloaded data: Stack data

- Use neonUtilities R package to combine all site by month files.
- Tools to help (see notes)
 - Super simple script for beginners
 - Using neonUtilites with Python
 - Data tutorial on neonUtilites

Name	Date Modified	Size	Kind
NEON_waterChem_userGuide_vA.pdf	Tomorrow at 00:07	956 KB	Adobe...cument
NEON.D13.COMO.DP1.20093....4.basic.20181008T155515Z.zip	Tomorrow at 00:07	25 KB	ZIP archive
NEON.D13.COMO.DP1.20093....05.basic.20181105T190107Z.zip	Tomorrow at 00:07	25 KB	ZIP archive
NEON.D13.COMO.DP1.20093....06.basic.20181211T171122Z.zip	Tomorrow at 00:07	26 KB	ZIP archive
NEON.D13.COMO.DP1.20093....07.basic.20181218T162516Z.zip	Tomorrow at 00:07	23 KB	ZIP archive
NEON.D13.COMO.DP1.20093....08.basic.20181105T190029Z.zip	Tomorrow at 00:07	23 KB	ZIP archive
NEON.D13.COMO.DP1.20093....09.basic.20181203T191837Z.zip	Tomorrow at 00:07	23 KB	ZIP archive
NEON.D13.COMO.DP1.20093....10.basic.20181218T155302Z.zip	Tomorrow at 00:07	22 KB	ZIP archive
NEON.DOC.001199vL.pdf	Tomorrow at 00:07	1.7 MB	Adobe...cument
NEON.DOC.001886vF.pdf	Tomorrow at 00:07	1.6 MB	Adobe...cument
NEON.DOC.002905vE.pdf	Tomorrow at 00:07	3 MB	Adobe...cument
NEON.D08.BLWA.DP1.20093.0....basic.20180206T193403Z.zip	Tomorrow at 00:07	27 KB	ZIP archive
NEON.D08.BLWA.DP1.20093.0....basic.20180206T193358Z.zip	Tomorrow at 00:07	27 KB	ZIP archive

neonUtilities::stackByTable()

Name	Date Modified	Size	Kind
NEON_waterChem_userGuide_vA.pdf	Today at 17:43	956 KB	Adobe...cument
NEON.DOC.001199vL.pdf	Today at 17:43	1.7 MB	Adobe...cument
NEON.DOC.001886vF.pdf	Today at 17:43	1.6 MB	Adobe...cument
NEON.DOC.002905vE.pdf	Today at 17:43	3 MB	Adobe...cument
stackedFiles	Today at 17:43	--	Folder
swc_domainLabData.csv	Today at 17:43	65 KB	Comm...et (.csv)
swc_externalLabData.csv	Today at 17:43	35 KB	Comm...et (.csv)
swc_fieldData.csv	Today at 17:43	24 KB	Comm...et (.csv)
swc_fieldSuperParent.csv	Today at 17:43	70 KB	Comm...et (.csv)
validation.csv	Today at 17:43	32 KB	Comm...et (.csv)
variables.csv	Today at 17:43	14 KB	Comm...et (.csv)

Additional Important Pages

- Accessing NEON Data Programmatically
- Making the Most of your NEON Account
- NEON Data Policies – How to Cite
- Data Product Detail Pages
- File Name Conventions Page
- Data Quality Pages

Programmatic access to NEON data

- Use the NEON API
 - Learn More: <https://data.neonscience.org/data-api/>
- Use the neonUtilities R package
 - Functions to directly access NEON data (not just stack downloaded files)
 - Available on CRAN
 - Data tutorial: www.neonscience.org/neonDataStackR
- Additional tools
 - github.com/NEONScience
 - [Code Hub](#)

Code Hub



NEON's data are often complex; working with data can be greatly simplified using software or code. We provide some code to get you started, like with our 'neonUtilities' package for R, and also post links to code contributed by members of the community. The NEON-related code resources listed below are designed to make working with all NEON data easier, to perform common algorithms on select data products, and to share the code used to generate select data products.

Most code resources that were created by and are managed by NEON can be found in the [NEONScience GitHub organization](#). The code is free and open access to download and utilize. The code found in the NEONScience GitHub organization is published and maintained by NEON project scientists.

Other code resources listed below are created by data users interested in sharing their code. If you have requests for coding resources, challenges with NEON data or ideas for creating NEON data-related code, we encourage you to learn more about [how we categorize NEON-related code resources](#), and how you can [submit your own code resources](#).

Code resources are provided at three tiers, differing in level of review by NEON:

TIER 1: COMMUNITY CONTRIBUTED CODE	Community contributed code is reviewed to determine that it is publicly available, generally comprehensible, and involves NEON data. Code functionality is not evaluated.
TIER 2: NEON CERTIFIED CODE	Certified code goes through a code review, to ensure it performs as described and without error.
TIER 3: NEON PRODUCTION CODE	Production code is used in NEON data processing pipelines, to generate NEON data products. It is the end product of a very long and careful development process.

Search the table below to find code that might be useful for your project.

NEON Data Account

Take advantage of optional account features while helping NEON achieve our mission.

- Review your download history to easily update your research with the latest data, and forward your queries to collaborators around the world
- Help NEON track data usage for **anonymized** reporting to our funding agency, the National Science Foundation
- Your data are yours! Retrieve your data or delete your account any time
- To read more about how we secure and respect your information, please visit:
<https://www.neonscience.org/about/user-accounts>

The screenshot shows the 'My Account' page of the NEON Data Portal. At the top, there's a navigation bar with links for NEON SCIENCE, DATA PORTAL, and BIOREPOSITORY, along with sign-in options. The main content area has a header 'HOME - MY ACCOUNT'. On the left, there's a profile section with a large orange circle containing 'DA', labeled 'Data Staff', and a blue button. Below it are sections for 'Identity Provider' (auth0) and 'Last Login' (August 30th, 2019, 3:23:52 PM). To the right, there are three main sections: 'Account Information' (with fields for First Name, Middle Name, Last Name, Organization, Title, Country, and ORCID), 'Products of Interest' (a list of checkboxes for various data products like '2D wind speed and direction'), and 'Sites of Interest' (a list of checkboxes for sites like 'Abby Road', 'Arikaree River', etc.). At the bottom, there are buttons for 'SAVE' (with a cloud icon), 'DOWNLOAD ACCOUNT DATA' (with a cloud icon), and 'DELETE ACCOUNT' (with a trash icon).

NEON Data Policies

By using NEON data, you agree to appropriately cite these products.

Please see our detailed citation, acknowledgement, copyright, and table styles at:

<https://www.neonscience.org/data-samples/data-policies-citation>

The screenshot shows the NEON website's "Data & Samples" section. At the top, there's a navigation bar with links for About Us, Data & Samples, Field Sites, Impact, Resources, Get Involved, and a search icon. Below the navigation is a sidebar with links for Data Portal, Samples & Specimens, Collection Methods, Data Policies & Citation Guidelines (which is underlined), Data Notifications, and Data Management. A "JUMP TO:" section lists various citation-related topics like Data Usage Policy, Sample Usage Policy, Acknowledging NEON, Citing NEON, Citing Data, Citing Samples & Specimens, Citing Documents, Citing Code Packages, Citing Educational Resources, and Citing Media. The main content area is titled "Data Policies & Citation Guidelines". It discusses NEON's commitment to FAIR data principles and provides a COPDESS signatory link. It also encourages practices for enabling FAIR data and mentions the Creative Commons CC0 1.0 license. Below this are sections for Data Usage Policy, Sample Usage Policy, and Acknowledging NEON, each with its own descriptive text and links to external policies.

Data Policies & Citation Guidelines

NEON is committed to providing data of high value to the ecological research community by meeting the [FAIR data principles](#). These principles recommend that data be:

- **Findable**, through globally unique persistent identifiers and rich metadata which is indexed in a searchable resource.
- **Accessible**, through standardized communication protocols. Metadata should be preserved even when data are no longer available.
- **Interoperable**, through the use of broadly accessible language with shared vocabularies and qualified references to other metadata.
- **Reusable**, through prescribed data usage criteria, documentation of provenance, and defined domain-relevant community standards.

To show our commitment to FAIR, we are a [COPDESS signatory for the Enabling FAIR Data project](#), as a data repository and research infrastructure.

We highly encourage practices that continue the enablement of FAIR, including acknowledging and citing sources of data, samples, and documentation as well as preserving and openly publishing research inputs, workflows, and outputs so that they may be discovered and used by others.

Data Usage Policy

All data collected by NEON and provided as data products, with the exception of data related to rare, threatened, or endangered (RTE) species, are released to the "public domain" under Creative Commons CC0 1.0 "No Rights Reserved" (<https://creativecommons.org/publicdomain/zero/1/0/>). No copyright has been applied to NEON data; any person may copy, modify, or distribute the data, for commercial or non-commercial purposes, without asking for permission. NEON data may still be subject to other laws or rights such as for privacy, and NEON makes no warranties about the data and disclaims all liability. When using or citing NEON data, no implication should be made about endorsement by NEON.

In most countries, data and facts are not copyrightable. By putting NEON data into the public domain, we encourage broad use, particularly in scientific analyses and data aggregations. However, **please be mindful of the following scholarly norms**:

- NEON data should be used in a way that is mindful of the limitations of the data, using the documentation associated with the data packages as a guide.
- Unlike most scientific data, NEON data is not associated with individual authors; rather, the 'author' of data produced by the Observatory is NEON itself. Attributions and citations should be made to NEON for any use of the data.

Sample Usage Policy

The majority of NEON samples are archived in the Biorepository at Arizona State University. To learn more about ASU-specific guidelines, please visit the [Biorepository Portal](#).

Across all repositories that NEON partners with, [NEON's Sample Use Policy](#) balances the need to provide researchers with access to NEON samples for a wide-variety of purposes while preserving the future research potential of those samples. This is a living document that is subject to change over time.

Acknowledging NEON

In publications, the following statements may be used in the Acknowledgement section, or a combined statement if more than one type of support was obtained from NEON.

General Support and Data Product Use

'The National Ecological Observatory Network is a program sponsored by the National Science Foundation and operated under cooperative agreement by Battelle Memorial Institute. This material is based in part upon work supported by the National Science Foundation through the NEON Program.'

Assignable Asset Program

'The National Ecological Observatory Network is a program sponsored by the National Science Foundation and operated under cooperative agreement by Battelle Memorial Institute. Data collected/used in this research were obtained through the NEON Assignable Assets program.'

Data product details

These pages provide you with information regarding any NEON data product.

Contents:

- About: Overview information including product ID, data themes, keywords, a brief description, Abstract, additional remarks, and the data citation
- Collection and Processing: details about the observatory-wide collection, including relevant documentation and instrumentation types
- Availability and Download: similar to the interface shown in the previous slides

HOME > DATA PRODUCTS > DP1.20093.001

Chemical properties of surface water

About

Product ID DP1.20093.001

Data Themes 

Responsible Science Team Aquatic Observation System (AOS)

Date Range December 2010 - ongoing

Scientific Keywords acid neutralizing capacity (ANC), anions, chemical properties, grab samples, nutrients, surface water, analytes, cations, chemistry, nitrogen (N), carbon (C), phosphorous (P), total carbon (TC), water quality, alkalinity

Description

Grab samples of surface water chemistry including general chemistry, anions, cations, and nutrients.

Abstract

This data product contains the quality-controlled, native sampling resolution data from NEON's surface water chemistry sampling protocol. Subsamples are analyzed at NEON domain headquarters for alkalinity and acid neutralizing capacity (ANC); other subsamples are sent to external facilities for a broad suite of analytes, including dissolved and total nutrients and carbon, cations and anions, and general chemistry. For additional details on NEON field and laboratory protocols, see the AOS Protocol and Procedure: Water Chemistry Sampling in Surface Waters and Groundwater (NEON.DOC.002905).

Latency: The expected time from data and/or sample collection in the field to data publication is as follows, for each of the data tables (in days) in the downloaded data package. See the Data Product User Guide for more information.

swc_domainLabData: 60
swc_externalLabData: 150
swc_fieldData: 30
swc_fieldSuperParent: 30
swc_externalLabSummaryData: 14

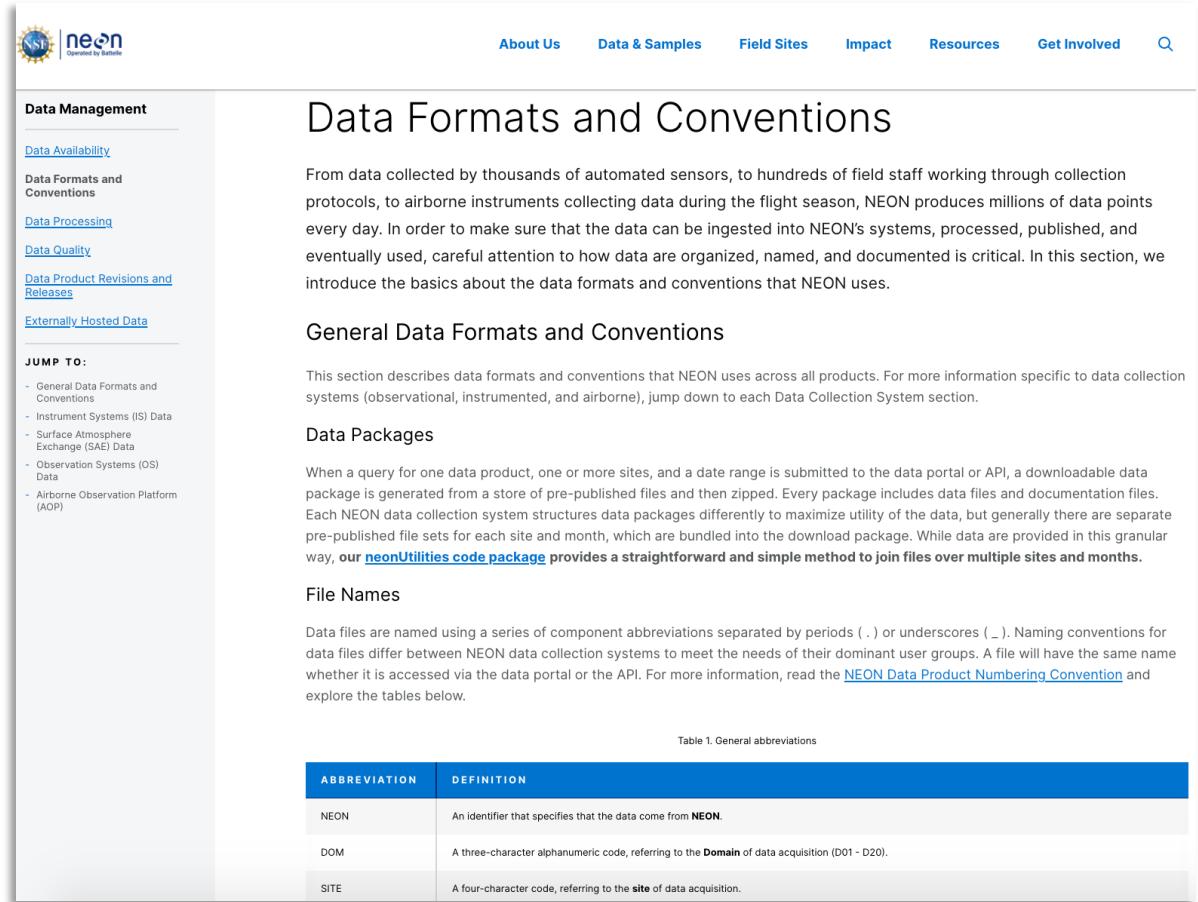
Remarks

Contents

ABOUT
COLLECTION AND PROCESSING
AVAILABILITY AND DOWNLOAD

File name conventions

- Provides details on standardized names of the data files.
- <https://www.neonscience.org/data-samples/data-management/data-formats-conventions>



The screenshot shows the NEON website's Data Management page. The header includes the NEON logo and navigation links for About Us, Data & Samples, Field Sites, Impact, Resources, and Get Involved. The main content area is titled "Data Formats and Conventions". It features a paragraph about the variety of data collected and the importance of standardization. Below this is a section titled "General Data Formats and Conventions" with a brief description and a link to more information. Further down are sections for "Data Packages" and "File Names", each with its own descriptive text and links. At the bottom is a table titled "Table 1. General abbreviations" with three rows: NEON, DOM, and SITE, each with a definition.

Data Management

[Data Availability](#)
[Data Formats and Conventions](#)
[Data Processing](#)
[Data Quality](#)
[Data Product Revisions and Releases](#)
[Externally Hosted Data](#)

JUMP TO:

- General Data Formats and Conventions
- Instrument Systems (IS) Data
- Surface Atmosphere Exchange (SAE) Data
- Observation Systems (OS) Data
- Airborne Observation Platform (AOP)

Data Formats and Conventions

From data collected by thousands of automated sensors, to hundreds of field staff working through collection protocols, to airborne instruments collecting data during the flight season, NEON produces millions of data points every day. In order to make sure that the data can be ingested into NEON's systems, processed, published, and eventually used, careful attention to how data are organized, named, and documented is critical. In this section, we introduce the basics about the data formats and conventions that NEON uses.

General Data Formats and Conventions

This section describes data formats and conventions that NEON uses across all products. For more information specific to data collection systems (observational, instrumented, and airborne), jump down to each Data Collection System section.

Data Packages

When a query for one data product, one or more sites, and a date range is submitted to the data portal or API, a downloadable data package is generated from a store of pre-published files and then zipped. Every package includes data files and documentation files. Each NEON data collection system structures data packages differently to maximize utility of the data, but generally there are separate pre-published file sets for each site and month, which are bundled into the download package. While data are provided in this granular way, our [neonUtilities code package](#) provides a straightforward and simple method to join files over multiple sites and months.

File Names

Data files are named using a series of component abbreviations separated by periods (.) or underscores (_). Naming conventions for data files differ between NEON data collection systems to meet the needs of their dominant user groups. A file will have the same name whether it is accessed via the data portal or the API. For more information, read the [NEON Data Product Numbering Convention](#) and explore the tables below.

Table 1. General abbreviations

ABBREVIATION	DEFINITION
NEON	An identifier that specifies that the data come from NEON.
DOM	A three-character alphanumeric code, referring to the Domain of data acquisition (D01 - D20).
SITE	A four-character code, referring to the site of data acquisition.

Data quality

- Learn how NEON ensures quality, reliable data.
- <https://www.neonscience.org/data-samples/data-management/data-quality-program>

The screenshot shows the NEON website's Data Management page. At the top, there's a navigation bar with links for About Us, Data & Samples, Field Sites, Impact, and Resources. Below the navigation is a breadcrumb trail: Home / Data & Samples / Data Management / Data Quality. The main content area has a title "Data Quality". Below the title is a text block: "In order to test ideas about how ecosystems function or change over time, it is essential to obtain and use data that are fit for the intended analyses. Using good methodologies or well-designed instruments is important, but other measures must also be taken to ensure that data are fit for research." Underneath this text, there's a section titled "This may include assuring (*quality assurance*) that:" followed by a bulleted list of quality assurance measures. Another section follows with "It is also important to check data after collection (*quality control*) for issues such as:" followed by a bulleted list of quality control issues. At the bottom of the page, there's a section titled "About NEON's data quality program" with a descriptive paragraph.

Data Management

[Data Availability](#)
[Data Formats and Conventions](#)
[Data Processing](#)
[Data Quality](#)
[Data Product Revisions and Releases](#)
[Externally Hosted Data](#)

JUMP TO:

- About NEON's data quality program
- Quality Program for Observation System Data Products
- Quality Program for Instrument System Data Products
- Quality Program for Airborne Remote Sensing Data Products

This may include assuring (*quality assurance*) that:

- Sensors are correctly installed, collecting values in the correct range, and transmitting data correctly;
- Data entry is free of typographical errors or incorrect values; and
- Labs and technicians are using protocols or methods correctly and reporting errors.

It is also important to check data after collection (*quality control*) for issues such as:

- Unexpected gaps, such as can happen when a sensor isn't functioning or transmitting data properly;
- Values that are outside of a possible range;
- Processing errors, such as can happen when an incorrect calibration value or algorithm is applied to the data or a malfunction occurs with the processing system;
- Publication errors, such as writing the processed data into an incorrect format.

About NEON's data quality program

NEON is committed to delivering high-quality, research-grade data products to the ecological community. Our data quality program seeks to build and continuously improve quality assurance and control (QA/QC) methods throughout the entire lifecycle of our data. Quality assurance methods check data quality early on, during collection and ingest into our data system. Quality control methods are inserted at several points along our processing and publication chains (for more information about these, read the Data Processing & Publication page).



| **neon**
Operated by Battelle

720.746.4844 | neonscience@battelleecology.org | neonscience.org