Plant phenology observations (DP1.10055.001)

Measurement

In-situ observations of status and intensity of phenological stages. Phenophases measured vary by species growth form and include leaf and needle development senescence along with reproductive phenophases.

Collection methodology

Observations are made on no more than 100 individuals along a square 800-meter long primary transect, and no more than 9 individuals in a 200 by 200 meter square plot that overlaps with the site's tower phenocam. Each individual is assessed for each possible phenophase at each bout. Bouts may occur year round at a frequency of once per week, or be seasonal with dynamic scheduling based on phenological activity of interest. Bout scheduling aims to collect observations on each individual approximately 50 times per year. One additional bout per year assesses overall individual health or disease status, along with structural measurements such as height.

The spatial extent of plant phenology data collection was reduced as of 2026. Phenological observations are now made only at core sites. Data collected at gradient sites up until the end of 2025 will remain available on the NEON Data Portal for the lifetime of NEON.

For information about disturbances, land management activities, and other incidents that may impact data at NEON sites, see the Site management and event reporting (DP1.10111.001) data product.

Data package contents

phe_statusintensity: Plant phenophase status and intensity data
phe_perindividualperyear: Annual census of size and disease status on phenology plants
phe_perindividual: Geolocation and taxonomic identification for phenology plants
phe_identificationHistory: Phenology identification history for records where identifications have changed
variables: Description and units for each column of data in data tables
readme: Data product description, issue log, and other metadata about the data product
validation: Description of data validation applied at the points of collection and ingest

Data quality

Individuals that become unsuitable for monitoring (due to death, disease or infestation, or other factors) may be dropped from observation. A replacement of the same species is selected and given a new tag ID.

Please note that quality checks are comprehensive but not exhaustive; therefore, unknown data quality issues may exist. Users are advised to evaluate quality of the data as relevant to the scientific research

question being addressed, perform data review and post-processing prior to analysis, and use the data quality information and issue logs included in download packages to aid interpretation.

Standard calculations

For wrapper functions to download data from the API, and functions to merge tabular data files across sites and months, NEON provides the neonUtilities package in R and the neonutilities package in Python. See the Download and Explore NEON Data tutorial for introductory instructions in both programming languages.

Individual spatial information can be calculated from the provided information: the coordinates and elevation of the plot centroid, along with the known dimensions of the phenology transect and the transect meter of each individual. This can also be done automatically using the getLocTOS() function from the geoNEON package, available from https://github.com/NEONScience/NEON-geolocation

The phe_perindividual and phe_perindividualperyear tables contain an editedDate field, which is used to track new data records about an individual that has already been described (for example, to note an updated taxonomic identification). For the most up-to-date information about each monitored plant, use the record with the most recent editedDate for each individualID.

Table joining

Table 1	Table 2	Join by field(s)
phe_perindividual	phe_perindividualperyear	individualID
phe_perindividual	phe_statusintensity	individualID
phe_perindividualperyear	phe_statusintensity	Not fully automatable: join by individualID, then by year as calculated from the date in each table

Documentation

TOS Science Design for Plant Phenology
NEON.DOC.000907vC | 494 KiB | PDF

NEON Algorithm Theoretical Basis Document (ATBD): OS Data Quality Control
NEON.DOC.005424vA | 651.3 KiB | PDF

TOS Protocol and Procedure: PHE – Plant Phenology
NEON.DOC.014040vN | 3.6 MiB | PDF

NEON User Guide to Plant Phenology Observations (DP1.10055.001)
NEON_phenology_userGuide_vG | 427.8 KiB | PDF

For more information on data product documentation, see:
https://data.neonscience.org/data-products/DP1.10055.001

Citation

To cite data from value: "Plant phenology observations" (DP1.10055.001), see citation here:
https://data.neonscience.org/data-products/DP1.10055.001
For general guidance in citing NEON data and documentation, see the citation guidelines page:
https://www.neonscience.org/data-samples/guidelines-policies/citing

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NEON welcomes discussion with data users! Reach out with any questions or concerns about NEON data:
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