

# The Plant Phenology Ontology: Term Definitions and Documentation

This documentation corresponds with the October 20, 2017 release of the PPO (<https://raw.githubusercontent.com/PlantPhenoOntology/ppo/master/releases/2017-10-20/ppo.owl>) and is supplementary material for: Stucky et al. (2018) The Plant Phenology Ontology: A new informatics resource for large-scale integration of plant phenology data. *Frontiers in Plant Science*. doi: 10.3389/fpls.2018.00517. The most recent version of this documentation is available at <https://raw.githubusercontent.com/PlantPhenoOntology/ppo/master/documentation/ppo.pdf>.

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## Introduction

The PPO's model of plant phenology data is based on observations of "phenological traits". Phenological traits are observable features of a plant that provide phenologically relevant information, such as whether a plant has leaves, how many ripe fruits are on a plant, or whether a plant's leaves are senescing. Definitions of phenological traits therefore depend on classes for particular plant structures. The PPO defines a large suite of phenological trait classes for representing information about plant phenology.

The PPO also provides four data properties that are used to record quantitative information about phenological traits. The PPO's trait classes, data properties, and supporting classes from other key ontologies work together to describe the phenology of a particular plant or plant community at some place and time.

## Phenological traits: top-level trait classes

Note that each phenological trait "presence" class documented in this section also has two convenience subclasses, one for the case where a particular feature of a plant is present and one for when it is absent. So, for example, 'mature leaf presence' has subclasses 'mature

leaves present' and 'mature leaves absent'. For ease of readability, these present/absent classes are not included in this section. Instead, they are documented in the sections "Phenological traits: "present" trait classes" and "Phenological traits: "absent" trait classes".

### **plant structure presence**

OBO ID: PPO:0002001

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002001](http://purl.obolibrary.org/obo/PPO_0002001)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of some 'plant structure' (PO:0009011) that are part of a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **breaking leaf bud presence**

OBO ID: PPO:0002013

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002013](http://purl.obolibrary.org/obo/PPO_0002013)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of breaking leaf buds (PPO:0001012) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **cone presence**

OBO ID: PPO:0002048

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002048](http://purl.obolibrary.org/obo/PPO_0002048)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of cones (strobili) (PO:0025083) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **dormant leaf bud presence**

OBO ID: PPO:0002010

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002010](http://purl.obolibrary.org/obo/PPO_0002010)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of dormant leaf buds (PPO:0001009) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **expanded immature true leaf presence**

OBO ID: PPO:0002023

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002023](http://purl.obolibrary.org/obo/PPO_0002023)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of expanded immature true leaves (PPO:0001021) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **expanding true leaf presence**

OBO ID: PPO:0002024

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002024](http://purl.obolibrary.org/obo/PPO_0002024)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of expanding true leaves (PPO:0001022) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **expanding unfolded true leaf presence**

OBO ID: PPO:0002022

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002022](http://purl.obolibrary.org/obo/PPO_0002022)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of expanding unfolded true leaves (PPO:0001020) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **floral structure presence**

OBO ID: PPO:0002026

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002026](http://purl.obolibrary.org/obo/PPO_0002026)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of floral structures (PPO:0001025) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **flower head presence**

OBO ID: PPO:0002038

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002038](http://purl.obolibrary.org/obo/PPO_0002038)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of inflorescences (PO:0009049) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **flower presence**

OBO ID: PPO:0002032

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002032](http://purl.obolibrary.org/obo/PPO_0002032)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of flowers (PO:0009046) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **fresh pollen cone presence**

OBO ID: PPO:0002050

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002050](http://purl.obolibrary.org/obo/PPO_0002050)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of fresh pollen cones (PPO:0001046) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **fresh seed cone presence**

OBO ID: PPO:0002054

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002054](http://purl.obolibrary.org/obo/PPO_0002054)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of fresh seed cones (PPO:0001049) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **fruit presence**

OBO ID: PPO:0002044

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002044](http://purl.obolibrary.org/obo/PPO_0002044)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of simple fruit or compound fruits (PPO:0001042) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **immature unfolded true leaf presence**

OBO ID: PPO:0002020

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002020](http://purl.obolibrary.org/obo/PPO_0002020)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of immature unfolded true leaves (PPO:0001018) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **leaf bud presence**

OBO ID: PPO:0002009

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002009](http://purl.obolibrary.org/obo/PPO_0002009)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of vegetative buds (PO:0000058) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **mature true leaf presence**

OBO ID: PPO:0002021

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002021](http://purl.obolibrary.org/obo/PPO_0002021)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of mature true leaves (PPO:0001019) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

### **new above-ground shoot-borne shoot system presence**

OBO ID: PPO:0002004

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002004](http://purl.obolibrary.org/obo/PPO_0002004)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of new above-ground shoot-borne shoot systems (PPO:0001004) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**new shoot system emerging from ground in first growth cycle presence**

OBO ID: PPO:0002006

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002006](http://purl.obolibrary.org/obo/PPO_0002006)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of new shoot systems emerging from ground in first growth cycle (PPO:0001006) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**new shoot system emerging from ground in later growth cycle presence**

OBO ID: PPO:0002008

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002008](http://purl.obolibrary.org/obo/PPO_0002008)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of new shoot systems emerging from ground in later growth cycle (PPO:0001008) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**new shoot system emerging from ground presence**

OBO ID: PPO:0002005

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002005](http://purl.obolibrary.org/obo/PPO_0002005)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of new shoot systems emerging from ground (PPO:0001005) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**new shoot system presence**

OBO ID: PPO:0002003

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002003](http://purl.obolibrary.org/obo/PPO_0002003)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of new shoot systems (PPO:0001003) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**non-dormant leaf bud presence**

OBO ID: PPO:0002011

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002011](http://purl.obolibrary.org/obo/PPO_0002011)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of non-dormant leaf buds (PPO:0001010) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**non-senesced floral structure presence**

OBO ID: PPO:0002027

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002027](http://purl.obolibrary.org/obo/PPO_0002027)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of non-senesced floral structures (PPO:0001026) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**non-senesced flower head presence**

OBO ID: PPO:0002039

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002039](http://purl.obolibrary.org/obo/PPO_0002039)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of non-senesced flower heads (PPO:0001036) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**non-senesced flower presence**

OBO ID: PPO:0002033

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002033](http://purl.obolibrary.org/obo/PPO_0002033)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of non-senesced flowers (PPO:0001031) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**non-senescing unfolded true leaf presence**

OBO ID: PPO:0002018

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002018](http://purl.obolibrary.org/obo/PPO_0002018)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of non-senescing unfolded true leaves (PPO:0001016) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**open floral structure presence**

OBO ID: PPO:0002029

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002029](http://purl.obolibrary.org/obo/PPO_0002029)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of open floral structures (PPO:0001028) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**open flower head presence**

OBO ID: PPO:0002041

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002041](http://purl.obolibrary.org/obo/PPO_0002041)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of open flower heads (PPO:0001038) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**open flower presence**

OBO ID: PPO:0002035

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002035](http://purl.obolibrary.org/obo/PPO_0002035)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of open flowers (PPO:0001033) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**open pollen cone presence**

OBO ID: PPO:0002051

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002051](http://purl.obolibrary.org/obo/PPO_0002051)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of open pollen cones (PPO:0001047) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**pollen cone presence**

OBO ID: PPO:0002049

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002049](http://purl.obolibrary.org/obo/PPO_0002049)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of pollen cones (PO:0005031) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**pollen-releasing floral structure presence**

OBO ID: PPO:0002030

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002030](http://purl.obolibrary.org/obo/PPO_0002030)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of pollen-releasing floral structures (PPO:0001029) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**pollen-releasing flower head presence**

OBO ID: PPO:0002042

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002042](http://purl.obolibrary.org/obo/PPO_0002042)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of pollen-releasing flower heads (PPO:0001039) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**pollen-releasing flower presence**

OBO ID: PPO:0002036

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002036](http://purl.obolibrary.org/obo/PPO_0002036)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of pollen-releasing flowers (PPO:0001034) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**pollen-releasing pollen cone presence**

OBO ID: PPO:0002052

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002052](http://purl.obolibrary.org/obo/PPO_0002052)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of pollen-releasing pollen cones (PPO:0001048) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**reproductive structure presence**

OBO ID: PPO:0002025

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002025](http://purl.obolibrary.org/obo/PPO_0002025)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of reproductive structures (PPO:0001023) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**ripe fruit presence**

OBO ID: PPO:0002047

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002047](http://purl.obolibrary.org/obo/PPO_0002047)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of ripe fruits (PPO:0001045) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**ripe seed cone presence**

OBO ID: PPO:0002057

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002057](http://purl.obolibrary.org/obo/PPO_0002057)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of ripe seed cones (PPO:0001052) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**ripening fruit presence**

OBO ID: PPO:0002045

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002045](http://purl.obolibrary.org/obo/PPO_0002045)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of ripening fruits (PPO:0001043) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.



**ripening seed cone presence**

OBO ID: PPO:0002055

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002055](http://purl.obolibrary.org/obo/PPO_0002055)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of ripening seed cones (PPO:0001050) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**seed cone presence**

OBO ID: PPO:0002053

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002053](http://purl.obolibrary.org/obo/PPO_0002053)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of seed cones (PO:0005032) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**seedling presence**

OBO ID: PPO:0002007

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002007](http://purl.obolibrary.org/obo/PPO_0002007)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by whether or not a 'whole plant' (PO:0000003) is a 'seedling' (PPO:0001007).

Comment: For consistency with other trait measurements, 'seedling presence' is also measured with a count, which must be a binary value: 0 if the plant is a seedling, 1 if it is not.

**senesced floral structure presence**

OBO ID: PPO:0002031

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002031](http://purl.obolibrary.org/obo/PPO_0002031)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of senesced floral structures (PPO:0001030) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**senesced flower head presence**

OBO ID: PPO:0002043

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002043](http://purl.obolibrary.org/obo/PPO_0002043)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of senesced flower heads (PPO:0001040) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**senesced flower presence**

OBO ID: PPO:0002037

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002037](http://purl.obolibrary.org/obo/PPO_0002037)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of senesced flowers (PPO:0001035) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**senescing true leaf presence**

OBO ID: PPO:0002019

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002019](http://purl.obolibrary.org/obo/PPO_0002019)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of senescing true leaves (PPO:0001017) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**swelling leaf bud presence**

OBO ID: PPO:0002012

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002012](http://purl.obolibrary.org/obo/PPO_0002012)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of swelling leaf buds (PPO:0001011) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**true leaf presence**

OBO ID: PPO:0002015

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002015](http://purl.obolibrary.org/obo/PPO_0002015)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of true leaves (PPO:0001013) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unfolded true leaf presence**

OBO ID: PPO:0002017

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002017](http://purl.obolibrary.org/obo/PPO_0002017)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unfolded true leaves (PPO:0001015) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unfolding true leaf presence**

OBO ID: PPO:0002016

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002016](http://purl.obolibrary.org/obo/PPO_0002016)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unfolding true leaves (PPO:0001014) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unopened floral structure presence**

OBO ID: PPO:0002028

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002028](http://purl.obolibrary.org/obo/PPO_0002028)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unopened floral structures (PPO:0001027) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unopened flower head presence**

OBO ID: PPO:0002040

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002040](http://purl.obolibrary.org/obo/PPO_0002040)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unopened flower heads (PPO:0001037) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unopened flower presence**

OBO ID: PPO:0002034

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002034](http://purl.obolibrary.org/obo/PPO_0002034)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unopened flowers (PPO:0001032) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unripe fruit presence**

OBO ID: PPO:0002046

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002046](http://purl.obolibrary.org/obo/PPO_0002046)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unripe fruits (PPO:0001044) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**unripe seed cone presence**

OBO ID: PPO:0002056

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002056](http://purl.obolibrary.org/obo/PPO_0002056)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of unripe seed cones (PPO:0001051) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**vascular leaf presence**

OBO ID: PPO:0002014

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002014](http://purl.obolibrary.org/obo/PPO_0002014)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of vascular leaves (PO:0009025) on a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**abscised plant structure presence**

OBO ID: PPO:0002002

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002002](http://purl.obolibrary.org/obo/PPO_0002002)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of some 'plant structure' (PO:0009011) that a 'whole plant' (PO:0000003) has abscised or that have been removed from a 'whole plant' (PO:0000003).

Comment: The number can be 0 or more.

**abscised cone or seed presence**

OBO ID: PPO:0002060

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002060](http://purl.obolibrary.org/obo/PPO_0002060)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of a whole plant's ripe seed cones (PPO:0001052) that have been abscised or removed by an herbivore and/or the number of ripe seed cones on a 'whole plant' (PO:0000003) that have abscised at least one 'mature seed' (PPO:0001024).

Comment: The number can be 0 or more and only includes the most recent cone crop.

**abscised fruit or seed presence**

OBO ID: PPO:0002059

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002059](http://purl.obolibrary.org/obo/PPO_0002059)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of a whole plant's ripe fruits (PPO:0001045) that have been abscised or removed by an herbivore and/or the number of ripe fruits on a 'whole plant' (PO:0000003) that have abscised at least one 'mature seed' (PPO:0001024).

Comment: The number can be 0 or more.

**abscised leaf presence**

OBO ID: PPO:0002058

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002058](http://purl.obolibrary.org/obo/PPO_0002058)

Definition: A 'plant phenological trait' (PPO:0002000) that is measured by the number of true leaves (PPO:0001013) that a 'whole plant' (PO:0000003) has abscised.

Comment: The number can be 0 or more.

**Phenological traits: "present" trait classes**

**new shoot system present**

OBO ID: PPO:0002301

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002301](http://purl.obolibrary.org/obo/PPO_0002301)

Definition: An 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'new shoot system' (PPO:0001003).

**new above-ground shoot-borne shoot systems present**

OBO ID: PPO:0002302

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002302](http://purl.obolibrary.org/obo/PPO_0002302)

Definition: A 'new above-ground shoot-borne shoot system presence' (PPO:0002004) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'new above-ground shoot-borne shoot system' (PPO:0001004).

**breaking leaf buds present**

OBO ID: PPO:0002311

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002311](http://purl.obolibrary.org/obo/PPO_0002311)

Definition: A 'breaking leaf bud presence' (PPO:0002013) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'breaking leaf bud' (PPO:0001012).

**new shoot systems emerging from ground present**

OBO ID: PPO:0002303

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002303](http://purl.obolibrary.org/obo/PPO_0002303)

Definition: A 'new shoot system emerging from ground presence' (PPO:0002005) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'new shoot system emerging from ground' (PPO:0001005).

**new shoot systems emerging from ground in first growth cycle present**

OBO ID: PPO:0002304

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002304](http://purl.obolibrary.org/obo/PPO_0002304)

Definition: A 'new shoot system emerging from ground in first growth cycle presence' (PPO:0002006) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'new shoot system emerging from ground in first growth cycle' (PPO:0001006).

**seedling present**

OBO ID: PPO:0002305

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002305](http://purl.obolibrary.org/obo/PPO_0002305)

Definition: A 'seedling presence' (PPO:0002007) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that is a 'seedling' (PPO:0001007).

**new shoot systems emerging from ground in later growth cycle present**

OBO ID: PPO:0002306

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002306](http://purl.obolibrary.org/obo/PPO_0002306)

Definition: A 'new shoot system emerging from ground in later growth cycle presence' (PPO:0002008) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'new shoot system emerging from ground in later growth cycle' (PPO:0001008).

### **leaf buds present**

OBO ID: PPO:0002307

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002307](http://purl.obolibrary.org/obo/PPO_0002307)

Definition: A 'leaf bud presence' (PPO:0002009) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one PO:'vegetative bud' (PO:0000058).

### **dormant leaf buds present**

OBO ID: PPO:0002308

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002308](http://purl.obolibrary.org/obo/PPO_0002308)

Definition: A 'dormant leaf bud presence' (PPO:0002010) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'dormant leaf bud' (PPO:0001009).

### **non-dormant leaf buds present**

OBO ID: PPO:0002309

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002309](http://purl.obolibrary.org/obo/PPO_0002309)

Definition: A 'non-dormant leaf bud presence' (PPO:0002011) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'non-dormant leaf bud' (PPO:0001010).

### **breaking leaf buds present**

OBO ID: PPO:0002311

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002311](http://purl.obolibrary.org/obo/PPO_0002311)

Definition: A 'breaking leaf bud presence' (PPO:0002013) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'breaking leaf bud' (PPO:0001012).

### **swelling leaf buds present**

OBO ID: PPO:0002310

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002310](http://purl.obolibrary.org/obo/PPO_0002310)

Definition: A 'swelling leaf bud presence' (PPO:0002012) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'swelling leaf bud' (PPO:0001011).

### **vascular leaves present**

OBO ID: PPO:0002312

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002312](http://purl.obolibrary.org/obo/PPO_0002312)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'vascular leaf' (PO:0009025).

### **true leaves present**

OBO ID: PPO:0002313

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002313](http://purl.obolibrary.org/obo/PPO_0002313)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'true leaf' (PPO:0001013).

### **expanding true leaves present**

OBO ID: PPO:0002322

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002322](http://purl.obolibrary.org/obo/PPO_0002322)

Definition: An 'expanding true leaf presence' (PPO:0002024) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'expanding true leaf' (PPO:0001022).

### **expanding unfolded true leaves present**

OBO ID: PPO:0002320

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002320](http://purl.obolibrary.org/obo/PPO_0002320)

Definition: An 'expanding unfolded true leaf presence' (PPO:0002022) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'expanding unfolded true leaf' (PPO:0001020).

### **unfolding true leaves present**

OBO ID: PPO:0002314

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002314](http://purl.obolibrary.org/obo/PPO_0002314)

Definition: An 'unfolding true leaf presence' (PPO:0002016) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unfolding true leaf' (PPO:0001014).

### **breaking leaf buds present**

OBO ID: PPO:0002311

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002311](http://purl.obolibrary.org/obo/PPO_0002311)

Definition: A 'breaking leaf bud presence' (PPO:0002013) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'breaking leaf bud' (PPO:0001012).

### **unfolded true leaves present**

OBO ID: PPO:0002315

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002315](http://purl.obolibrary.org/obo/PPO_0002315)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unfolded true leaf' (PPO:0001015).

**non-senescing unfolded true leaves present**

OBO ID: PPO:0002316

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002316](http://purl.obolibrary.org/obo/PPO_0002316)

Definition: A 'non-senescing unfolded true leaf presence' (PPO:0002018) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'non-senescing unfolded true leaf' (PPO:0001016).

**immature unfolded true leaves present**

OBO ID: PPO:0002318

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002318](http://purl.obolibrary.org/obo/PPO_0002318)

Definition: An 'immature unfolded true leaf presence' (PPO:0002020) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'immature unfolded true leaf' (PPO:0001018).

**expanded immature true leaves present**

OBO ID: PPO:0002321

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002321](http://purl.obolibrary.org/obo/PPO_0002321)

Definition: An 'expanded immature true leaf presence' (PPO:0002023) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'expanded immature true leaf' (PPO:0001021).

**expanding unfolded true leaves present**

OBO ID: PPO:0002320

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002320](http://purl.obolibrary.org/obo/PPO_0002320)

Definition: An 'expanding unfolded true leaf presence' (PPO:0002022) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'expanding unfolded true leaf' (PPO:0001020).

**mature true leaves present**

OBO ID: PPO:0002319

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002319](http://purl.obolibrary.org/obo/PPO_0002319)



Definition: An 'mature true leaf presence' (PPO:0002021) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'mature true leaf' (PPO:0001019).

**senescing true leaves present**

OBO ID: PPO:0002317

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002317](http://purl.obolibrary.org/obo/PPO_0002317)

Definition: A 'senescing true leaf presence' (PPO:0002019) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'senescing true leaf' (PPO:0001017).

**reproductive structures present**

OBO ID: PPO:0002323

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002323](http://purl.obolibrary.org/obo/PPO_0002323)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'reproductive structure' (PPO:0001023).

**cones present**

OBO ID: PPO:0002346

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002346](http://purl.obolibrary.org/obo/PPO_0002346)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one cone (PO:0025083).

**pollen cones present**

OBO ID: PPO:0002347

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002347](http://purl.obolibrary.org/obo/PPO_0002347)

Definition: A 'pollen cone presence' (PPO:0002049) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one pollen cone (PO:0005031).

**fresh pollen cones present**

OBO ID: PPO:0002348

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002348](http://purl.obolibrary.org/obo/PPO_0002348)

Definition: A 'fresh pollen cone presence' (PPO:0002050) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'fresh pollen cone' (PPO:0001046).

**open pollen cones present**

OBO ID: PPO:0002349

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002349](http://purl.obolibrary.org/obo/PPO_0002349)

Definition: An 'open pollen cone presence' (PPO:0002051) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'open pollen cone' (PPO:0001047).

**pollen-releasing pollen cones present**

OBO ID: PPO:0002350

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002350](http://purl.obolibrary.org/obo/PPO_0002350)

Definition: A 'pollen-releasing pollen cone presence' (PPO:0002052) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing pollen cone' (PPO:0001048).

**seed cones present**

OBO ID: PPO:0002351

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002351](http://purl.obolibrary.org/obo/PPO_0002351)

Definition: A 'seed cone presence' (PPO:0002053) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one PO:'megasporangiate strobilus' (PO:0005032).

**fresh seed cones present**

OBO ID: PPO:0002352

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002352](http://purl.obolibrary.org/obo/PPO_0002352)

Definition: A 'fresh seed cone presence' (PPO:0002054) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'fresh seed cone' (PPO:0001049).

**ripening seed cones present**

OBO ID: PPO:0002353

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002353](http://purl.obolibrary.org/obo/PPO_0002353)

Definition: A 'ripening seed cone presence' (PPO:0002055) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'ripening seed cone' (PPO:0001050).

**ripe seed cones present**

OBO ID: PPO:0002355

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002355](http://purl.obolibrary.org/obo/PPO_0002355)

Definition: A 'ripe seed cone presence' (PPO:0002057) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'ripe seed cone' (PPO:0001052).

**unripe seed cones present**

OBO ID: PPO:0002354

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002354](http://purl.obolibrary.org/obo/PPO_0002354)

Definition: An 'unripe seed cone presence' (PPO:0002056) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unripe seed cone' (PPO:0001051).

**floral structures present**

OBO ID: PPO:0002324

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002324](http://purl.obolibrary.org/obo/PPO_0002324)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'floral structure' (PPO:0001025).

**flower heads present**

OBO ID: PPO:0002336

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002336](http://purl.obolibrary.org/obo/PPO_0002336)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one PO:'inflorescence' (PO:0009049).

**non-senesced flower heads present**

OBO ID: PPO:0002337

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002337](http://purl.obolibrary.org/obo/PPO_0002337)

Definition: A 'non-senesced flower head presence' (PPO:0002039) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'non-senesced flower head' (PPO:0001036).

**open flower heads present**

OBO ID: PPO:0002339

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002339](http://purl.obolibrary.org/obo/PPO_0002339)

Definition: An 'open flower head presence' (PPO:0002041) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'open flower head' (PPO:0001038).

**pollen-releasing flower heads present**

OBO ID: PPO:0002340

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002340](http://purl.obolibrary.org/obo/PPO_0002340)

Definition: A 'pollen-releasing flower head presence' (PPO:0002042) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing flower head' (PPO:0001039).

**unopened flower heads present**

OBO ID: PPO:0002338

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002338](http://purl.obolibrary.org/obo/PPO_0002338)

Definition: An 'unopened flower head presence' (PPO:0002040) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unopened flower head' (PPO:0001037).

**senesced flower heads present**

OBO ID: PPO:0002341

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002341](http://purl.obolibrary.org/obo/PPO_0002341)

Definition: A 'senesced flower head presence' (PPO:0002043) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'senesced flower head' (PPO:0001040).

**flowers present**

OBO ID: PPO:0002330

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002330](http://purl.obolibrary.org/obo/PPO_0002330)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one PO:'flower' (PO:0009046).

**non-senesced flowers present**

OBO ID: PPO:0002331

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002331](http://purl.obolibrary.org/obo/PPO_0002331)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'non-senesced flower' (PPO:0001031).

**open flowers present**

OBO ID: PPO:0002333

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002333](http://purl.obolibrary.org/obo/PPO_0002333)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'open flower' (PPO:0001033).

**open flower heads present**

OBO ID: PPO:0002339

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002339](http://purl.obolibrary.org/obo/PPO_0002339)

Definition: An 'open flower head presence' (PPO:0002041) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'open flower head' (PPO:0001038).

**pollen-releasing flower heads present**

OBO ID: PPO:0002340

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0002340](http://purl.obolibrary.org/obo/PPO_0002340)

Definition: A 'pollen-releasing flower head presence' (PPO:0002042) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing flower head' (PPO:0001039).

**pollen-releasing flowers present**

OBO ID: PPO:0002334

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002334](http://purl.obolibrary.org/obo/PPO_0002334)

Definition: A 'pollen-releasing flower presence' (PPO:0002036) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing flower' (PPO:0001034).

**pollen-releasing floral structures present**

OBO ID: PPO:0002328

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0002328](http://purl.obolibrary.org/obo/PPO_0002328)

Definition: A 'pollen-releasing floral structure presence' (PPO:0002030) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing floral structure' (PPO:0001029).

**pollen-releasing flower heads present**

OBO ID: PPO:0002340

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0002340](http://purl.obolibrary.org/obo/PPO_0002340)

Definition: A 'pollen-releasing flower head presence' (PPO:0002042) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing flower head' (PPO:0001039).

### **unopened flowers present**

OBO ID: PPO:0002332

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002332](http://purl.obolibrary.org/obo/PPO_0002332)

Definition: An 'unopened flower presence' (PPO:0002034) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unopened flower' (PPO:0001032).

### **open floral structures present**

OBO ID: PPO:0002327

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002327](http://purl.obolibrary.org/obo/PPO_0002327)

Definition: An 'open floral structure presence' (PPO:0002029) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'open floral structure' (PPO:0001028).

### **pollen-releasing floral structures present**

OBO ID: PPO:0002328

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002328](http://purl.obolibrary.org/obo/PPO_0002328)

Definition: A 'pollen-releasing floral structure presence' (PPO:0002030) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing floral structure' (PPO:0001029).

### **senesced flowers present**

OBO ID: PPO:0002335

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002335](http://purl.obolibrary.org/obo/PPO_0002335)

Definition: A 'senesced flower presence' (PPO:0002037) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'senesced flower' (PPO:0001035).

### **senesced floral structures present**

OBO ID: PPO:0002329

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002329](http://purl.obolibrary.org/obo/PPO_0002329)

Definition: A 'senesced floral structure presence' (PPO:0002031) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'senesced floral structure' (PPO:0001030).

**non-senesced floral structures present**

OBO ID: PPO:0002325

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002325](http://purl.obolibrary.org/obo/PPO_0002325)

Definition: A 'non-senesced floral structure presence' (PPO:0002027) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'non-senesced floral structure' (PPO:0001026).

**open floral structures present**

OBO ID: PPO:0002327

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002327](http://purl.obolibrary.org/obo/PPO_0002327)

Definition: An 'open floral structure presence' (PPO:0002029) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'open floral structure' (PPO:0001028).

**pollen-releasing floral structures present**

OBO ID: PPO:0002328

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002328](http://purl.obolibrary.org/obo/PPO_0002328)

Definition: A 'pollen-releasing floral structure presence' (PPO:0002030) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'pollen-releasing floral structure' (PPO:0001029).

**unopened floral structures present**

OBO ID: PPO:0002326

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002326](http://purl.obolibrary.org/obo/PPO_0002326)

Definition: An 'unopened floral structure presence' (PPO:0002028) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unopened floral structure' (PPO:0001027).

**fruits present**

OBO ID: PPO:0002342

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002342](http://purl.obolibrary.org/obo/PPO_0002342)

Definition: A 'fruit presence' (PPO:0002044) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'simple fruit or compound fruit' (PPO:0001042).

**ripening fruits present**

OBO ID: PPO:0002343

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002343](http://purl.obolibrary.org/obo/PPO_0002343)

Definition: A 'ripening fruit presence' (PPO:0002045) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'ripening fruit' (PPO:0001043).

**ripe fruits present**

OBO ID: PPO:0002345

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002345](http://purl.obolibrary.org/obo/PPO_0002345)

Definition: A 'ripe fruit presence' (PPO:0002047) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'ripe fruit' (PPO:0001045).

**unripe fruits present**

OBO ID: PPO:0002344

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002344](http://purl.obolibrary.org/obo/PPO_0002344)

Definition: An 'unripe fruit presence' (PPO:0002046) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that has at least one 'unripe fruit' (PPO:0001044).

**abscised plant structures present**

OBO ID: PPO:0002356

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002356](http://purl.obolibrary.org/obo/PPO_0002356)

Definition: An 'abscised plant structure presence' (PPO:0002002) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which at least one of some 'plant structure' (PO:0009011) has been abscised or removed.

**abscised cones or seeds present**

OBO ID: PPO:0002359

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002359](http://purl.obolibrary.org/obo/PPO_0002359)

Definition: An 'abscised cone or seed presence' (PPO:0002060) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which at least one 'ripe seed cone' (PPO:0001052) has been abscised or removed by an herbivore or that has at least one ripe seed cone that has 'abscised' (PPO:0000005) at least one 'mature seed' (PPO:0001024).

**abscised fruits or seeds present**

OBO ID: PPO:0002358

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002358](http://purl.obolibrary.org/obo/PPO_0002358)

Definition: An 'abscised fruit or seed presence' (PPO:0002059) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which at least one 'ripe fruit' (PPO:0001045) has been abscised or removed by an herbivore or that has at least one 'ripe fruit' (PPO:0001045) that has abscised at least one 'mature seed' (PPO:0001024).



### **abscised leaves present**

OBO ID: PPO:0002357

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002357](http://purl.obolibrary.org/obo/PPO_0002357)

Definition: An 'abscised leaf presence' (PPO:0002058) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which at least one 'true leaf' (PPO:0001013) has been 'abscised' (PPO:0000005).

## **Phenological traits: "absent" trait classes**

### **breaking leaf buds absent**

OBO ID: PPO:0002610

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002610](http://purl.obolibrary.org/obo/PPO_0002610)

Definition: A 'breaking leaf bud presence' (PPO:0002013) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any breaking leaf buds (PPO:0001012).

### **new above-ground shoot-borne shoot systems absent**

OBO ID: PPO:0002601

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002601](http://purl.obolibrary.org/obo/PPO_0002601)

Definition: A 'new above-ground shoot-borne shoot system presence' (PPO:0002004) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new above-ground shoot-borne shoot systems (PPO:0001004).

### **new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

### **non-dormant leaf buds absent**

OBO ID: PPO:0002608

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002608](http://purl.obolibrary.org/obo/PPO_0002608)

Definition: A 'non-dormant leaf bud presence' (PPO:0002011) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-dormant leaf buds (PPO:0001010).

### **leaf buds absent**

OBO ID: PPO:0002606

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002606](http://purl.obolibrary.org/obo/PPO_0002606)

Definition: A 'leaf bud presence' (PPO:0002009) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vegetative buds (PO:0000058).

**unfolding true leaves absent**

OBO ID: PPO:0002613

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002613](http://purl.obolibrary.org/obo/PPO_0002613)

Definition: An 'unfolding true leaf presence' (PPO:0002016) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolding true leaves (PPO:0001014).

**expanding true leaves absent**

OBO ID: PPO:0002621

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002621](http://purl.obolibrary.org/obo/PPO_0002621)

Definition: An 'expanding true leaf presence' (PPO:0002024) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any expanding true leaves (PPO:0001022).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**dormant leaf buds absent**

OBO ID: PPO:0002607

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002607](http://purl.obolibrary.org/obo/PPO_0002607)

Definition: A 'dormant leaf bud presence' (PPO:0002010) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any dormant leaf buds (PPO:0001009).

**leaf buds absent**

OBO ID: PPO:0002606

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002606](http://purl.obolibrary.org/obo/PPO_0002606)

Definition: A 'leaf bud presence' (PPO:0002009) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vegetative buds (PO:0000058).

**expanded immature true leaves absent**

OBO ID: PPO:0002620

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002620](http://purl.obolibrary.org/obo/PPO_0002620)

Definition: An 'expanded immature true leaf presence' (PPO:0002023) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any expanded immature true leaves (PPO:0001021).

**immature unfolded true leaves absent**

OBO ID: PPO:0002617

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002617](http://purl.obolibrary.org/obo/PPO_0002617)

Definition: An 'immature unfolded true leaf presence' (PPO:0002020) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any immature unfolded true leaves (PPO:0001018).

**non-senescing unfolded true leaves absent**

OBO ID: PPO:0002615

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002615](http://purl.obolibrary.org/obo/PPO_0002615)

Definition: A 'non-senescing unfolded true leaf presence' (PPO:0002018) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senescing unfolded true leaves (PPO:0001016).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**expanding true leaves absent**

OBO ID: PPO:0002621

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002621](http://purl.obolibrary.org/obo/PPO_0002621)

Definition: An 'expanding true leaf presence' (PPO:0002024) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any expanding true leaves (PPO:0001022).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**expanding unfolded true leaves absent**

OBO ID: PPO:0002619

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002619](http://purl.obolibrary.org/obo/PPO_0002619)

Definition: An 'expanding unfolded true leaf presence' (PPO:0002022) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any expanding unfolded true leaves (PPO:0001020).

**expanding true leaves absent**

OBO ID: PPO:0002621

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002621](http://purl.obolibrary.org/obo/PPO_0002621)

Definition: An 'expanding true leaf presence' (PPO:0002024) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any expanding true leaves (PPO:0001022).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**immature unfolded true leaves absent**

OBO ID: PPO:0002617

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002617](http://purl.obolibrary.org/obo/PPO_0002617)

Definition: An 'immature unfolded true leaf presence' (PPO:0002020) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any immature unfolded true leaves (PPO:0001018).

**non-senescing unfolded true leaves absent**

OBO ID: PPO:0002615

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002615](http://purl.obolibrary.org/obo/PPO_0002615)

Definition: A 'non-senescing unfolded true leaf presence' (PPO:0002018) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senescing unfolded true leaves (PPO:0001016).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**flower heads absent**

OBO ID: PPO:0002635

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002635](http://purl.obolibrary.org/obo/PPO_0002635)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:inflorescences (PO:0009049).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**fresh pollen cones absent**

OBO ID: PPO:0002647

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002647](http://purl.obolibrary.org/obo/PPO_0002647)

Definition: A 'fresh pollen cone presence' (PPO:0002050) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh pollen cones (PPO:0001046).

**pollen cones absent**

OBO ID: PPO:0002646

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002646](http://purl.obolibrary.org/obo/PPO_0002646)

Definition: A 'pollen cone presence' (PPO:0002049) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen cones (PO:0005031).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**fresh seed cones absent**

OBO ID: PPO:0002651

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002651](http://purl.obolibrary.org/obo/PPO_0002651)

Definition: A 'fresh seed cone presence' (PPO:0002054) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh seed cones (PPO:0001049).

**seed cones absent**

OBO ID: PPO:0002650

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002650](http://purl.obolibrary.org/obo/PPO_0002650)

Definition: A 'seed cone presence' (PPO:0002053) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any seed cones (PO:0005032).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)



Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**fruits absent**

OBO ID: PPO:0002641

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002641](http://purl.obolibrary.org/obo/PPO_0002641)

Definition: A 'fruit presence' (PPO:0002044) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any simple fruits or compound fruits (PPO:0001042).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**immature unfolded true leaves absent**

OBO ID: PPO:0002617

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002617](http://purl.obolibrary.org/obo/PPO_0002617)

Definition: An 'immature unfolded true leaf presence' (PPO:0002020) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any immature unfolded true leaves (PPO:0001018).

**non-senescing unfolded true leaves absent**

OBO ID: PPO:0002615

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002615](http://purl.obolibrary.org/obo/PPO_0002615)

Definition: A 'non-senescing unfolded true leaf presence' (PPO:0002018) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senescing unfolded true leaves (PPO:0001016).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**leaf buds absent**

OBO ID: PPO:0002606

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002606](http://purl.obolibrary.org/obo/PPO_0002606)

Definition: A 'leaf bud presence' (PPO:0002009) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vegetative buds (PO:0000058).

**mature true leaves absent**

OBO ID: PPO:0002618

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002618](http://purl.obolibrary.org/obo/PPO_0002618)

Definition: A 'mature true leaf presence' (PPO:0002021) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any mature true leaves (PPO:0001019).

**non-senescing unfolded true leaves absent**

OBO ID: PPO:0002615

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002615](http://purl.obolibrary.org/obo/PPO_0002615)

Definition: A 'non-senescing unfolded true leaf presence' (PPO:0002018) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senescing unfolded true leaves (PPO:0001016).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**new above-ground shoot-borne shoot systems absent**

OBO ID: PPO:0002601

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002601](http://purl.obolibrary.org/obo/PPO_0002601)

Definition: A 'new above-ground shoot-borne shoot system presence' (PPO:0002004) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new above-ground shoot-borne shoot systems (PPO:0001004).

**new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

**new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

**new shoot systems emerging from ground absent**

OBO ID: PPO:0002602

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002602](http://purl.obolibrary.org/obo/PPO_0002602)

Definition: A 'new shoot system emerging from ground presence' (PPO:0002005) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground (PPO:0001005).

**new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

**new shoot systems emerging from ground in first growth cycle absent**

OBO ID: PPO:0002603

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002603](http://purl.obolibrary.org/obo/PPO_0002603)

Definition: A 'new shoot system emerging from ground in first growth cycle presence' (PPO:0002006) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground in first growth cycle (PPO:0001006).

**new shoot systems emerging from ground absent**

OBO ID: PPO:0002602

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002602](http://purl.obolibrary.org/obo/PPO_0002602)

Definition: A 'new shoot system emerging from ground presence' (PPO:0002005) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground (PPO:0001005).

**new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

**new shoot systems emerging from ground in later growth cycle absent**

OBO ID: PPO:0002605

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002605](http://purl.obolibrary.org/obo/PPO_0002605)

Definition: A 'new shoot system emerging from ground in later growth cycle presence' (PPO:0002008) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground in later growth cycle (PPO:0001008).

**new shoot systems emerging from ground absent**

OBO ID: PPO:0002602

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002602](http://purl.obolibrary.org/obo/PPO_0002602)

Definition: A 'new shoot system emerging from ground presence' (PPO:0002005) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground (PPO:0001005).

**new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

### **non-dormant leaf buds absent**

OBO ID: PPO:0002608

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002608](http://purl.obolibrary.org/obo/PPO_0002608)

Definition: A 'non-dormant leaf bud presence' (PPO:0002011) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-dormant leaf buds (PPO:0001010).

### **leaf buds absent**

OBO ID: PPO:0002606

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002606](http://purl.obolibrary.org/obo/PPO_0002606)

Definition: A 'leaf bud presence' (PPO:0002009) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vegetative buds (PO:0000058).

### **non-senesced floral structures absent**

OBO ID: PPO:0002624

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002624](http://purl.obolibrary.org/obo/PPO_0002624)

Definition: A 'non-senesced floral structure presence' (PPO:0002027) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced floral structures (PPO:0001026).

### **floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

### **reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

### **non-senesced flower heads absent**

OBO ID: PPO:0002636

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002636](http://purl.obolibrary.org/obo/PPO_0002636)

Definition: A 'non-senesced flower head presence' (PPO:0002039) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flower heads (PPO:0001036).

**flower heads absent**

OBO ID: PPO:0002635

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002635](http://purl.obolibrary.org/obo/PPO_0002635)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:inflorescences (PO:0009049).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**non-senescing unfolded true leaves absent**

OBO ID: PPO:0002615

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002615](http://purl.obolibrary.org/obo/PPO_0002615)

Definition: A 'non-senescing unfolded true leaf presence' (PPO:0002018) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senescing unfolded true leaves (PPO:0001016).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**open floral structures absent**

OBO ID: PPO:0002626

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002626](http://purl.obolibrary.org/obo/PPO_0002626)

Definition: An 'open floral structure presence' (PPO:0002029) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open floral structures (PPO:0001028).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**non-senesced floral structures absent**

OBO ID: PPO:0002624

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002624](http://purl.obolibrary.org/obo/PPO_0002624)

Definition: A 'non-senesced floral structure presence' (PPO:0002027) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced floral structures (PPO:0001026).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)



Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**open flower heads absent**

OBO ID: PPO:0002638

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002638](http://purl.obolibrary.org/obo/PPO_0002638)

Definition: An 'open flower head presence' (PPO:0002041) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flower heads (PPO:0001038).

**non-senesced flower heads absent**

OBO ID: PPO:0002636

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002636](http://purl.obolibrary.org/obo/PPO_0002636)

Definition: A 'non-senesced flower head presence' (PPO:0002039) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flower heads (PPO:0001036).

**flower heads absent**

OBO ID: PPO:0002635

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002635](http://purl.obolibrary.org/obo/PPO_0002635)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:inflorescences (PO:0009049).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**open flowers absent**

OBO ID: PPO:0002632

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002632](http://purl.obolibrary.org/obo/PPO_0002632)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flowers (PPO:0001033).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**open flowers absent**

OBO ID: PPO:0002632

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002632](http://purl.obolibrary.org/obo/PPO_0002632)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flowers (PPO:0001033).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**open pollen cones absent**

OBO ID: PPO:0002648

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002648](http://purl.obolibrary.org/obo/PPO_0002648)

Definition: An 'open pollen cone presence' (PPO:0002051) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open pollen cones (PPO:0001047).

**fresh pollen cones absent**

OBO ID: PPO:0002647

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002647](http://purl.obolibrary.org/obo/PPO_0002647)

Definition: A 'fresh pollen cone presence' (PPO:0002050) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh pollen cones (PPO:0001046).

**pollen cones absent**

OBO ID: PPO:0002646

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002646](http://purl.obolibrary.org/obo/PPO_0002646)

Definition: A 'pollen cone presence' (PPO:0002049) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen cones (PO:0005031).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen cones absent**

OBO ID: PPO:0002646

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002646](http://purl.obolibrary.org/obo/PPO_0002646)

Definition: A 'pollen cone presence' (PPO:0002049) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen cones (PO:0005031).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen-releasing floral structures absent**

OBO ID: PPO:0002627

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002627](http://purl.obolibrary.org/obo/PPO_0002627)

Definition: A 'pollen-releasing floral structure presence' (PPO:0002030) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen-releasing floral structures (PPO:0001029).

**open floral structures absent**

OBO ID: PPO:0002626

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002626](http://purl.obolibrary.org/obo/PPO_0002626)

Definition: An 'open floral structure presence' (PPO:0002029) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open floral structures (PPO:0001028).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**non-senesced floral structures absent**

OBO ID: PPO:0002624

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002624](http://purl.obolibrary.org/obo/PPO_0002624)

Definition: A 'non-senesced floral structure presence' (PPO:0002027) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced floral structures (PPO:0001026).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen-releasing flowers absent**

OBO ID: PPO:0002633

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002633](http://purl.obolibrary.org/obo/PPO_0002633)

Definition: A 'pollen-releasing flower presence' (PPO:0002036) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen-releasing flowers (PPO:0001034).

**open flowers absent**

OBO ID: PPO:0002632

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002632](http://purl.obolibrary.org/obo/PPO_0002632)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flowers (PPO:0001033).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen-releasing flower heads absent**

OBO ID: PPO:0002639

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002639](http://purl.obolibrary.org/obo/PPO_0002639)

Definition: A 'pollen-releasing flower head presence' (PPO:0002042) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen-releasing flower heads (PPO:0001039).

**open flower heads absent**

OBO ID: PPO:0002638

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002638](http://purl.obolibrary.org/obo/PPO_0002638)

Definition: An 'open flower head presence' (PPO:0002041) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flower heads (PPO:0001038).

**non-senesced flower heads absent**

OBO ID: PPO:0002636

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002636](http://purl.obolibrary.org/obo/PPO_0002636)

Definition: A 'non-senesced flower head presence' (PPO:0002039) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flower heads (PPO:0001036).

**flower heads absent**

OBO ID: PPO:0002635

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002635](http://purl.obolibrary.org/obo/PPO_0002635)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:inflorescences (PO:0009049).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**open flowers absent**

OBO ID: PPO:0002632

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002632](http://purl.obolibrary.org/obo/PPO_0002632)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flowers (PPO:0001033).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)



Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen-releasing flowers absent**

OBO ID: PPO:0002633

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002633](http://purl.obolibrary.org/obo/PPO_0002633)

Definition: A 'pollen-releasing flower presence' (PPO:0002036) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen-releasing flowers (PPO:0001034).

**open flowers absent**

OBO ID: PPO:0002632

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002632](http://purl.obolibrary.org/obo/PPO_0002632)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flowers (PPO:0001033).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen-releasing flowers absent**

OBO ID: PPO:0002633

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002633](http://purl.obolibrary.org/obo/PPO_0002633)

Definition: A 'pollen-releasing flower presence' (PPO:0002036) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen-releasing flowers (PPO:0001034).

**open flowers absent**

OBO ID: PPO:0002632

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002632](http://purl.obolibrary.org/obo/PPO_0002632)

Definition: An 'open flower presence' (PPO:0002035) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open flowers (PPO:0001033).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**pollen-releasing pollen cones absent**

OBO ID: PPO:0002649

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002649](http://purl.obolibrary.org/obo/PPO_0002649)

Definition: A 'pollen-releasing pollen cone presence' (PPO:0002052) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen-releasing pollen cones (PPO:0001048).

**open pollen cones absent**

OBO ID: PPO:0002648

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002648](http://purl.obolibrary.org/obo/PPO_0002648)

Definition: An 'open pollen cone presence' (PPO:0002051) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any open pollen cones (PPO:0001047).

**fresh pollen cones absent**

OBO ID: PPO:0002647

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002647](http://purl.obolibrary.org/obo/PPO_0002647)

Definition: A 'fresh pollen cone presence' (PPO:0002050) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh pollen cones (PPO:0001046).

**pollen cones absent**

OBO ID: PPO:0002646

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002646](http://purl.obolibrary.org/obo/PPO_0002646)

Definition: A 'pollen cone presence' (PPO:0002049) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any pollen cones (PO:0005031).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**ripe fruits absent**

OBO ID: PPO:0002644

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002644](http://purl.obolibrary.org/obo/PPO_0002644)

Definition: A 'ripe fruit presence' (PPO:0002047) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripe fruits (PPO:0001045).

**ripening fruits absent**

OBO ID: PPO:0002642

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002642](http://purl.obolibrary.org/obo/PPO_0002642)

Definition: A 'ripening fruit presence' (PPO:0002045) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripening fruits (PPO:0001043).

**fruits absent**

OBO ID: PPO:0002641

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002641](http://purl.obolibrary.org/obo/PPO_0002641)

Definition: A 'fruit presence' (PPO:0002044) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any simple fruits or compound fruits (PPO:0001042).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**ripe seed cones absent**

OBO ID: PPO:0002654

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002654](http://purl.obolibrary.org/obo/PPO_0002654)

Definition: A 'ripe seed cone presence' (PPO:0002057) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripe seed cones (PPO:0001052).

**ripening seed cones absent**

OBO ID: PPO:0002652

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002652](http://purl.obolibrary.org/obo/PPO_0002652)

Definition: A 'ripening seed cone presence' (PPO:0002055) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripening seed cones (PPO:0001050).

**fresh seed cones absent**

OBO ID: PPO:0002651

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002651](http://purl.obolibrary.org/obo/PPO_0002651)

Definition: A 'fresh seed cone presence' (PPO:0002054) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh seed cones (PPO:0001049).

**seed cones absent**

OBO ID: PPO:0002650

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002650](http://purl.obolibrary.org/obo/PPO_0002650)

Definition: A 'seed cone presence' (PPO:0002053) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any seed cones (PO:0005032).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**ripening fruits absent**

OBO ID: PPO:0002642

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002642](http://purl.obolibrary.org/obo/PPO_0002642)

Definition: A 'ripening fruit presence' (PPO:0002045) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripening fruits (PPO:0001043).

**fruits absent**

OBO ID: PPO:0002641

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002641](http://purl.obolibrary.org/obo/PPO_0002641)

Definition: A 'fruit presence' (PPO:0002044) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any simple fruits or compound fruits (PPO:0001042).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**ripening seed cones absent**

OBO ID: PPO:0002652

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002652](http://purl.obolibrary.org/obo/PPO_0002652)

Definition: A 'ripening seed cone presence' (PPO:0002055) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripening seed cones (PPO:0001050).

**fresh seed cones absent**

OBO ID: PPO:0002651

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002651](http://purl.obolibrary.org/obo/PPO_0002651)

Definition: A 'fresh seed cone presence' (PPO:0002054) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh seed cones (PPO:0001049).

**seed cones absent**

OBO ID: PPO:0002650

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002650](http://purl.obolibrary.org/obo/PPO_0002650)

Definition: A 'seed cone presence' (PPO:0002053) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any seed cones (PO:0005032).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**seed cones absent**

OBO ID: PPO:0002650

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002650](http://purl.obolibrary.org/obo/PPO_0002650)

Definition: A 'seed cone presence' (PPO:0002053) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any seed cones (PO:0005032).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**seedling absent**

OBO ID: PPO:0002604

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002604](http://purl.obolibrary.org/obo/PPO_0002604)

Definition: An 'seedling presence' (PPO:0002007) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that is not a 'seedling' (PPO:0001007).

**new shoot systems emerging from ground in first growth cycle absent**

OBO ID: PPO:0002603

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002603](http://purl.obolibrary.org/obo/PPO_0002603)

Definition: A 'new shoot system emerging from ground in first growth cycle presence' (PPO:0002006) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground in first growth cycle (PPO:0001006).

**new shoot systems emerging from ground absent**

OBO ID: PPO:0002602

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002602](http://purl.obolibrary.org/obo/PPO_0002602)

Definition: A 'new shoot system emerging from ground presence' (PPO:0002005) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems emerging from ground (PPO:0001005).

**new shoot system absent**

OBO ID: PPO:0002600

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002600](http://purl.obolibrary.org/obo/PPO_0002600)

Definition: A 'new shoot system presence' (PPO:0002003) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any new shoot systems (PPO:0001003).

**senesced floral structures absent**

OBO ID: PPO:0002628

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002628](http://purl.obolibrary.org/obo/PPO_0002628)

Definition: A 'senesced floral structure presence' (PPO:0002031) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any senesced floral structures (PPO:0001030).

**senesced flowers absent**

OBO ID: PPO:0002634



IRI: [http://purl.obolibrary.org/obo/PPO\\_0002634](http://purl.obolibrary.org/obo/PPO_0002634)

Definition: A 'senesced flower presence' (PPO:0002037) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any senesced flowers (PPO:0001035).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**senesced flower heads absent**

OBO ID: PPO:0002640

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002640](http://purl.obolibrary.org/obo/PPO_0002640)

Definition: A 'senesced flower head presence' (PPO:0002043) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any senesced flower heads (PPO:0001040).

**flower heads absent**

OBO ID: PPO:0002635

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002635](http://purl.obolibrary.org/obo/PPO_0002635)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:inflorescences (PO:0009049).

**floral structures absent**

OBO ID: PPO:0002623

## PPO: Definitions and Documentation

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

### reproductive structures absent

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

### senesced flowers absent

OBO ID: PPO:0002634

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002634](http://purl.obolibrary.org/obo/PPO_0002634)

Definition: A 'senesced flower presence' (PPO:0002037) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any senesced flowers (PPO:0001035).

### flowers absent

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

### floral structures absent

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

### reproductive structures absent

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

### senescing true leaves absent

OBO ID: PPO:0002616

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002616](http://purl.obolibrary.org/obo/PPO_0002616)

Definition: A 'senescing true leaf presence' (PPO:0002019) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any senescing true leaves (PPO:0001017).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**swelling leaf buds absent**

OBO ID: PPO:0002609

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002609](http://purl.obolibrary.org/obo/PPO_0002609)

Definition: A 'swelling leaf bud presence' (PPO:0002012) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any swelling leaf buds (PPO:0001011).

**non-dormant leaf buds absent**

OBO ID: PPO:0002608

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002608](http://purl.obolibrary.org/obo/PPO_0002608)

Definition: A 'non-dormant leaf bud presence' (PPO:0002011) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-dormant leaf buds (PPO:0001010).

**leaf buds absent**

OBO ID: PPO:0002606

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002606](http://purl.obolibrary.org/obo/PPO_0002606)

Definition: A 'leaf bud presence' (PPO:0002009) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vegetative buds (PO:0000058).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**unfolded true leaves absent**

OBO ID: PPO:0002614

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002614](http://purl.obolibrary.org/obo/PPO_0002614)

Definition: An 'unfolded true leaf presence' (PPO:0002017) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolded true leaves (PPO:0001015).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**unfolding true leaves absent**

OBO ID: PPO:0002613

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002613](http://purl.obolibrary.org/obo/PPO_0002613)

Definition: An 'unfolding true leaf presence' (PPO:0002016) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unfolding true leaves (PPO:0001014).

**expanding true leaves absent**

OBO ID: PPO:0002621

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002621](http://purl.obolibrary.org/obo/PPO_0002621)

Definition: An 'expanding true leaf presence' (PPO:0002024) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any expanding true leaves (PPO:0001022).

**true leaves absent**

OBO ID: PPO:0002612

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002612](http://purl.obolibrary.org/obo/PPO_0002612)

Definition: A 'true leaf presence' (PPO:0002015) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any true leaves (PPO:0001013).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**unopened floral structures absent**

OBO ID: PPO:0002625

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002625](http://purl.obolibrary.org/obo/PPO_0002625)

Definition: An 'unopened floral structure presence' (PPO:0002028) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unopened floral structures (PPO:0001027).

**non-senesced floral structures absent**

OBO ID: PPO:0002624

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002624](http://purl.obolibrary.org/obo/PPO_0002624)

Definition: A 'non-senesced floral structure presence' (PPO:0002027) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced floral structures (PPO:0001026).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**unopened flower heads absent**

OBO ID: PPO:0002637

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002637](http://purl.obolibrary.org/obo/PPO_0002637)

Definition: An 'unopened flower head presence' (PPO:0002040) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unopened flower heads (PPO:0001037).

**non-senesced flower heads absent**

OBO ID: PPO:0002636

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002636](http://purl.obolibrary.org/obo/PPO_0002636)

Definition: A 'non-senesced flower head presence' (PPO:0002039) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flower heads (PPO:0001036).

**flower heads absent**

OBO ID: PPO:0002635

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002635](http://purl.obolibrary.org/obo/PPO_0002635)

Definition: A 'flower head presence' (PPO:0002038) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:inflorescences (PO:0009049).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**unopened flowers absent**

OBO ID: PPO:0002631

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002631](http://purl.obolibrary.org/obo/PPO_0002631)

Definition: An 'unopened flower presence' (PPO:0002034) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unopened flowers (PPO:0001032).

**non-senesced flowers absent**

OBO ID: PPO:0002630

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002630](http://purl.obolibrary.org/obo/PPO_0002630)

Definition: A 'non-senesced flower presence' (PPO:0002033) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any non-senesced flowers (PPO:0001031).

**flowers absent**

OBO ID: PPO:0002629

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002629](http://purl.obolibrary.org/obo/PPO_0002629)

Definition: A 'flower presence' (PPO:0002032) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any PO:flowers (PO:0009046).

**floral structures absent**

OBO ID: PPO:0002623

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002623](http://purl.obolibrary.org/obo/PPO_0002623)

Definition: A 'floral structure presence' (PPO:0002026) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any floral structures (PPO:0001025).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**unripe fruits absent**

OBO ID: PPO:0002643

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002643](http://purl.obolibrary.org/obo/PPO_0002643)

Definition: An 'unripe fruit presence' (PPO:0002046) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unripe fruits (PPO:0001044).

**ripening fruits absent**

OBO ID: PPO:0002642

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002642](http://purl.obolibrary.org/obo/PPO_0002642)

Definition: A 'ripening fruit presence' (PPO:0002045) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripening fruits (PPO:0001043).

**fruits absent**

OBO ID: PPO:0002641

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002641](http://purl.obolibrary.org/obo/PPO_0002641)

Definition: A 'fruit presence' (PPO:0002044) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any simple fruits or compound fruits (PPO:0001042).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**unripe seed cones absent**

OBO ID: PPO:0002653

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002653](http://purl.obolibrary.org/obo/PPO_0002653)

Definition: An 'unripe seed cone presence' (PPO:0002056) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any unripe seed cones (PPO:0001051).

**ripening seed cones absent**

OBO ID: PPO:0002652

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002652](http://purl.obolibrary.org/obo/PPO_0002652)

Definition: A 'ripening seed cone presence' (PPO:0002055) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any ripening seed cones (PPO:0001050).

**fresh seed cones absent**

OBO ID: PPO:0002651

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002651](http://purl.obolibrary.org/obo/PPO_0002651)



Definition: A 'fresh seed cone presence' (PPO:0002054) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any fresh seed cones (PPO:0001049).

**seed cones absent**

OBO ID: PPO:0002650

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002650](http://purl.obolibrary.org/obo/PPO_0002650)

Definition: A 'seed cone presence' (PPO:0002053) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any seed cones (PO:0005032).

**cones absent**

OBO ID: PPO:0002645

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002645](http://purl.obolibrary.org/obo/PPO_0002645)

Definition: A 'cone presence' (PPO:0002048) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any cones (PO:0025083).

**reproductive structures absent**

OBO ID: PPO:0002622

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002622](http://purl.obolibrary.org/obo/PPO_0002622)

Definition: A 'reproductive structure presence' (PPO:0002025) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any reproductive structures (PPO:0001023).

**vascular leaves absent**

OBO ID: PPO:0002611

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002611](http://purl.obolibrary.org/obo/PPO_0002611)

Definition: A 'vascular leaf presence' (PPO:0002014) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) that does not have any vascular leaves (PO:0009025).

**abscised cones or seeds absent**

OBO ID: PPO:0002658

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002658](http://purl.obolibrary.org/obo/PPO_0002658)

Definition: An 'abscised cone or seed presence' (PPO:0002060) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which no ripe seed cones (PPO:0001052) have been abscised or removed by herbivores and that does not have any ripe seed cones that have 'abscised' (PPO:0000005) any mature seeds (PPO:0001024).

**abscised plant structures absent**

OBO ID: PPO:0002655

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002655](http://purl.obolibrary.org/obo/PPO_0002655)

Definition: An 'abscised plant structure presence' (PPO:0002002) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which none of some 'plant structure' (PO:0009011) have been abscised or removed.

### **abscised fruits or seeds absent**

OBO ID: PPO:0002657

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002657](http://purl.obolibrary.org/obo/PPO_0002657)

Definition: An 'abscised fruit or seed presence' (PPO:0002059) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which no ripe fruits (PPO:0001045) have been abscised or removed by herbivores and that does not have any ripe fruits that have 'abscised' (PPO:0000005) any mature seeds (PPO:0001024).

### **abscised plant structures absent**

OBO ID: PPO:0002655

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002655](http://purl.obolibrary.org/obo/PPO_0002655)

Definition: An 'abscised plant structure presence' (PPO:0002002) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which none of some 'plant structure' (PO:0009011) have been abscised or removed.

### **abscised leaves absent**

OBO ID: PPO:0002656

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002656](http://purl.obolibrary.org/obo/PPO_0002656)

Definition: An 'abscised leaf presence' (PPO:0002058) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which no true leaves (PPO:0001013) have been 'abscised' (PPO:0000005).

### **abscised plant structures absent**

OBO ID: PPO:0002655

IRI: [http://purl.obolibrary.org/obo/PPO\\_0002655](http://purl.obolibrary.org/obo/PPO_0002655)

Definition: An 'abscised plant structure presence' (PPO:0002002) trait that is a 'quality of' (RO:0000080) a 'whole plant' (PO:0000003) from which none of some 'plant structure' (PO:0009011) have been abscised or removed.

## **Plant structures**

In the PPO, plant structures are used primarily to provide precise definitions of phenological traits. Most users will probably not need to use the plant structure classes directly, but they are included here for reference. Many of the plant structures used in the PPO are defined in the Plant Ontology (PO), which includes many more plant structures that are not used by the PPO. Here, we only include the PO plant structures that are most relevant to users of the PPO.

### **plant structure**

OBO ID: PO:0009011

IRI: [http://purl.obolibrary.org/obo/PO\\_0009011](http://purl.obolibrary.org/obo/PO_0009011)

Definition: An anatomical structure that is or was part of a plant, or was derived from a part of a plant.

Comment: 'Part' includes both proper parts and the whole plant. CARO:0000003 anatomical structure is defined as: Material anatomical entity that has inherent 3D shape and is generated by coordinated expression of the organism's own genome.

### **reproductive structure**

OBO ID: PPO:0001023

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001023](http://purl.obolibrary.org/obo/PPO_0001023)

Definition: A 'plant structure' (PO:0009011) that is either a 'reproductive shoot system' (PO:0025082) or a 'fruit' (PO:0009001).

### **reproductive shoot system**

OBO ID: PO:0025082

IRI: [http://purl.obolibrary.org/obo/PO\\_0025082](http://purl.obolibrary.org/obo/PO_0025082)

Definition: A shoot system (PO:0009006) in the sporophytic phase that has as part at least one sporangium (PO:0025094).

### **floral structure**

OBO ID: PPO:0001025

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001025](http://purl.obolibrary.org/obo/PPO_0001025)

### **flower**

OBO ID: PO:0009046

IRI: [http://purl.obolibrary.org/obo/PO\\_0009046](http://purl.obolibrary.org/obo/PO_0009046)

Definition: A determinate reproductive shoot system (PO:0025082) that has as part at least one carpel (PO:0009030) or at least one stamen (PO:0009029) and does not contain any other determinate shoot system (PO:0009006) as a part.

Comment: The characteristic reproductive structure of angiosperms. May have as part one or more petals, sepals or tepals. May contain one or more pistillode (PO:0009078), staminode (PO:0009077) or other aborted organs that don't show up in mature form.

### **non-senesced flower**

OBO ID: PPO:0001031

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001031](http://purl.obolibrary.org/obo/PPO_0001031)

Definition: A 'flower' (PO:0009046) in which all the petaloid floral organs (PO:0025395) have not completed 'floral organ senescence' (GO:0080187). Petaloid floral organs generally are the petals, sepal, or tepals, but may also be floral bracts or petaloid anthers (PO:0009066). For scoring phenology in grasses, petaloid floral organs can include 'lemma' (PO:0009037), 'palea' (PO:0009038) or 'glume' (PO:0009039), even though a 'glume' (PO:0009039) is not strictly a 'floral organ' (PO:0025395), because it encloses an 'inflorescence' (PO:0009049).

**open flower**

OBO ID: PPO:0001033

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001033](http://purl.obolibrary.org/obo/PPO_0001033)

Definition: A 'non-senesced flower' (PPO:0001031) that is in the 'open flower stage' (PPO:0007010).

**pollen-releasing flower**

OBO ID: PPO:0001034

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001034](http://purl.obolibrary.org/obo/PPO_0001034)

Definition: An 'open flower' (PPO:0001033) that is in the 'pollen-releasing flower stage' (PPO:0007011).

**unopened flower**

OBO ID: PPO:0001032

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001032](http://purl.obolibrary.org/obo/PPO_0001032)

Definition: A 'non-senesced flower' (PPO:0001031) that is in the 'unopened flower stage' (PPO:0007009).

**senesced flower**

OBO ID: PPO:0001035

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001035](http://purl.obolibrary.org/obo/PPO_0001035)

Definition: A 'flower' (PO:0009046) in which all of the petaloid floral organs (PO:0025395) have completed 'floral organ senescence' (GO:0080187). Petaloid floral organs generally

are the petals, sepal, or tepals, but may also be floral bracts or petaloid anthers (PO:0009066). For scoring phenology in grasses, petaloid floral organs can include 'lemma' (PO:0009037), 'palea' (PO:0009038) or 'glume' (PO:0009039), even though a 'glume' (PO:0009039) is not strictly a 'floral organ' (PO:0025395), because it encloses an 'inflorescence' (PO:0009049).

**spikelet floret**

OBO ID: PO:0009082

IRI: [http://purl.obolibrary.org/obo/PO\\_0009082](http://purl.obolibrary.org/obo/PO_0009082)

Definition: A small flower (PO:0009046) that is part of a spikelet (PO:0009051).

Comment: A spikelet floret (PO:0009082) is enclosed by one or both the flower bracts (PO:0009034); lemma (PO:0009037) and palea (PO:0009038) and also includes a lodicule (PO:0009036). To describe a floret of the Asteraceae, use ray flower (PO:0025331) or disk flower (PO:0025332). Found in Poaceae, Cyperaceae and other Poales.

**inflorescence**

OBO ID: PO:0009049

IRI: [http://purl.obolibrary.org/obo/PO\\_0009049](http://purl.obolibrary.org/obo/PO_0009049)

Definition: A reproductive shoot system (PO:0025082) that has as parts all of the shoot axes (PO:0025029) distal to the most distal foliage leaf (PO:0009025) of a shoot axis and all of the flowers (PO:0009046) borne by those axes. Must have two or more flowers as parts.

Comment: Some plants have only solitary flowers, e.g. *Magnolia*.

**non-senesced flower head**

OBO ID: PPO:0001036

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001036](http://purl.obolibrary.org/obo/PPO_0001036)

Definition: An 'inflorescence' (PO:0009049) with at least one 'non-senesced flower' (PPO:0001031). In the case of an 'unopened flower head' (PPO:0001037), the non-senesced flower(s) might not be visible.

**open flower head**

OBO ID: PPO:0001038

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001038](http://purl.obolibrary.org/obo/PPO_0001038)

Definition: A 'non-senesced flower head' (PPO:0001036) with at least one 'open flower' (PPO:0001033).

**pollen-releasing flower head**

OBO ID: PPO:0001039

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001039](http://purl.obolibrary.org/obo/PPO_0001039)

Definition: An 'open flower head' (PPO:0001038) with at least one 'pollen-releasing flower' (PPO:0001034).

**unopened flower head**

OBO ID: PPO:0001037

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001037](http://purl.obolibrary.org/obo/PPO_0001037)

Definition: A 'non-senesced flower head' (PPO:0001036) in which all flowers are unopened flowers (PPO:0001032). The unopened flowers might not yet be visible.

**senesced flower head**

OBO ID: PPO:0001040

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001040](http://purl.obolibrary.org/obo/PPO_0001040)

Definition: An 'inflorescence' (PO:0009049) on which there are no remaining non-senesced flowers (PPO:0001031).

**non-senesced floral structure**

OBO ID: PPO:0001026

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001026](http://purl.obolibrary.org/obo/PPO_0001026)

**open floral structure**

OBO ID: PPO:0001028

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001028](http://purl.obolibrary.org/obo/PPO_0001028)

**pollen-releasing floral structure**

OBO ID: PPO:0001029

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001029](http://purl.obolibrary.org/obo/PPO_0001029)

**unopened floral structure**

OBO ID: PPO:0001027

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001027](http://purl.obolibrary.org/obo/PPO_0001027)

**senesced floral structure**

OBO ID: PPO:0001030

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001030](http://purl.obolibrary.org/obo/PPO_0001030)

Definition: A 'floral structure' (PPO:0001025) that has completed 'floral organ senescence' (GO:0080187).

**flower**

OBO ID: PO:0009046

IRI: [http://purl.obolibrary.org/obo/PO\\_0009046](http://purl.obolibrary.org/obo/PO_0009046)

Definition: A determinate reproductive shoot system (PO:0025082) that has as part at least one carpel (PO:0009030) or at least one stamen (PO:0009029) and does not contain any other determinate shoot system (PO:0009006) as a part.

Comment: The characteristic reproductive structure of angiosperms. May have as part one or more petals, sepals or tepals. May contain one or more pistillode (PO:0009078), staminode (PO:0009077) or other aborted organs that don't show up in mature form.

**non-senesced flower**

OBO ID: PPO:0001031

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001031](http://purl.obolibrary.org/obo/PPO_0001031)

Definition: A 'flower' (PO:0009046) in which all the petaloid floral organs (PO:0025395) have not completed 'floral organ senescence' (GO:0080187). Petaloid floral organs generally are the petals, sepal, or tepals, but may also be floral bracts or petaloid anthers (PO:0009066). For scoring phenology in grasses, petaloid floral organs can include 'lemma' (PO:0009037), 'palea' (PO:0009038) or 'glume' (PO:0009039), even though a 'glume' (PO:0009039) is not strictly a 'floral organ' (PO:0025395), because it encloses an 'inflorescence' (PO:0009049).

**open flower**

OBO ID: PPO:0001033

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001033](http://purl.obolibrary.org/obo/PPO_0001033)

Definition: A 'non-senesced flower' (PPO:0001031) that is in the 'open flower stage' (PPO:0007010).

**pollen-releasing flower**

OBO ID: PPO:0001034

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001034](http://purl.obolibrary.org/obo/PPO_0001034)

Definition: An 'open flower' (PPO:0001033) that is in the 'pollen-releasing flower stage' (PPO:0007011).

**unopened flower**

OBO ID: PPO:0001032

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001032](http://purl.obolibrary.org/obo/PPO_0001032)

Definition: A 'non-senesced flower' (PPO:0001031) that is in the 'unopened flower stage' (PPO:0007009).

**senesced flower**

OBO ID: PPO:0001035

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001035](http://purl.obolibrary.org/obo/PPO_0001035)

Definition: A 'flower' (PO:0009046) in which all of the petaloid floral organs (PO:0025395) have completed 'floral organ senescence' (GO:0080187). Petaloid floral organs generally are the petals, sepal, or tepals, but may also be floral bracts or petaloid anthers (PO:0009066). For scoring phenology in grasses, petaloid floral organs can include 'lemma' (PO:0009037), 'palea' (PO:0009038) or 'glume' (PO:0009039), even though a 'glume' (PO:0009039) is not strictly a 'floral organ' (PO:0025395), because it encloses an 'inflorescence' (PO:0009049).

**spikelet floret**

OBO ID: PO:0009082

IRI: [http://purl.obolibrary.org/obo/PO\\_0009082](http://purl.obolibrary.org/obo/PO_0009082)

Definition: A small flower (PO:0009046) that is part of a spikelet (PO:0009051).

Comment: A spikelet floret (PO:0009082) is enclosed by one or both the flower bracts (PO:0009034); lemma (PO:0009037) and palea (PO:0009038) and also includes a lodicule (PO:0009036). To describe a floret of the Asteraceae, use ray flower (PO:0025331) or disk flower (PO:0025332). Found in Poaceae, Cyperaceae and other Poales.



**inflorescence**

OBO ID: PO:0009049

IRI: [http://purl.obolibrary.org/obo/PO\\_0009049](http://purl.obolibrary.org/obo/PO_0009049)

Definition: A reproductive shoot system (PO:0025082) that has as parts all of the shoot axes (PO:0025029) distal to the most distal foliage leaf (PO:0009025) of a shoot axis and all of the flowers (PO:0009046) borne by those axes. Must have two or more flowers as parts.

Comment: Some plants have only solitary flowers, e.g. *Magnolia*.

**non-senesced flower head**

OBO ID: PPO:0001036

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001036](http://purl.obolibrary.org/obo/PPO_0001036)

Definition: An 'inflorescence' (PO:0009049) with at least one 'non-senesced flower' (PPO:0001031). In the case of an 'unopened flower head' (PPO:0001037), the non-senesced flower(s) might not be visible.

**open flower head**

OBO ID: PPO:0001038

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001038](http://purl.obolibrary.org/obo/PPO_0001038)

Definition: A 'non-senesced flower head' (PPO:0001036) with at least one 'open flower' (PPO:0001033).

**pollen-releasing flower head**

OBO ID: PPO:0001039

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001039](http://purl.obolibrary.org/obo/PPO_0001039)

Definition: An 'open flower head' (PPO:0001038) with at least one 'pollen-releasing flower' (PPO:0001034).

**unopened flower head**

OBO ID: PPO:0001037

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001037](http://purl.obolibrary.org/obo/PPO_0001037)

Definition: A 'non-senesced flower head' (PPO:0001036) in which all flowers are unopened flowers (PPO:0001032). The unopened flowers might not yet be visible.

**senesced flower head**

OBO ID: PPO:0001040

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001040](http://purl.obolibrary.org/obo/PPO_0001040)

Definition: An 'inflorescence' (PO:0009049) on which there are no remaining non-senesced flowers (PPO:0001031).

**reproductive bud**

OBO ID: PO:0025084

IRI: [http://purl.obolibrary.org/obo/PO\\_0025084](http://purl.obolibrary.org/obo/PO_0025084)

Definition: A bud that develops into a reproductive shoot system.

**flower bud**

OBO ID: PO:0000056

IRI: [http://purl.obolibrary.org/obo/PO\\_0000056](http://purl.obolibrary.org/obo/PO_0000056)

Definition: A bud that develops into a flower.

**inflorescence bud**

OBO ID: PO:0000057

IRI: [http://purl.obolibrary.org/obo/PO\\_0000057](http://purl.obolibrary.org/obo/PO_0000057)

Definition: A bud that develops into an inflorescence.

**spikelet**

OBO ID: PO:0009051

IRI: [http://purl.obolibrary.org/obo/PO\\_0009051](http://purl.obolibrary.org/obo/PO_0009051)

Definition: A reproductive shoot system (PO:0025082) that is the ultimate and congested inflorescence branch (PO:0009081) of the grasses.

Comment: It consists of one to many closely-packed flowers and associated glumes etc.

**strobilus**

OBO ID: PO:0025083

IRI: [http://purl.obolibrary.org/obo/PO\\_0025083](http://purl.obolibrary.org/obo/PO_0025083)

Definition: A reproductive shoot system (PO:0025082) consisting of a number of sporophylls (PO:0009026) or plant ovule (PO:0020003)-bearing modified leaves (PO:0025034) grouped terminally on a stem (PO:0009047).

Comment: May be simple or compound. Found in lycophytes such as Selaginella and Lycopodium, sphenophytes such as Equisetum, gymnosperms such as cycad, conifers, gnetophytes and the pollen producing structures of Ginkgo. The term cone is often used for strobili that are woody. Flowers are sometimes

considered bisexual strobili. Some flowering plants such as *Alnus* have inflorescences called catkins that resemble strobili, but are not.

**megasporangiate strobilus**

OBO ID: PO:0005032

IRI: [http://purl.obolibrary.org/obo/PO\\_0005032](http://purl.obolibrary.org/obo/PO_0005032)

Definition: A strobilus (PO:0025083) that bears only plant ovules (PO:0020003).

**fresh seed cone**

OBO ID: PPO:0001049

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001049](http://purl.obolibrary.org/obo/PPO_0001049)

Definition: A 'megasporangiate strobilus' (PO:0005032) that has not yet been abscised and has not yet releases all of its seeds.

**ripening seed cone**

OBO ID: PPO:0001050

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001050](http://purl.obolibrary.org/obo/PPO_0001050)

Definition: A 'fresh seed cone' (PPO:0001049) that is in the 'megasporangiate strobilus ripening stage' (PPO:0007017).

**ripe seed cone**

OBO ID: PPO:0001052

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001052](http://purl.obolibrary.org/obo/PPO_0001052)

Definition: A 'ripening seed cone' (PPO:0001050) that is in the 'megasporangiate strobilus ripe stage' (PPO:0007019).

**unripe seed cone**

OBO ID: PPO:0001051

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001051](http://purl.obolibrary.org/obo/PPO_0001051)

Definition: A 'ripening seed cone' (PPO:0001050) that is in the 'megasporangiate strobilus unripe stage' (PPO:0007018).

**microsporangiate strobilus**

OBO ID: PO:0005031

IRI: [http://purl.obolibrary.org/obo/PO\\_0005031](http://purl.obolibrary.org/obo/PO_0005031)

Definition: A strobilus (PO:0025083) that bears only pollen (PO:0025281).

**fresh pollen cone**

OBO ID: PPO:0001046

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001046](http://purl.obolibrary.org/obo/PPO_0001046)

Definition: A 'microsporangiate strobilus' (PO:0005031) that has not yet completed the 'pollen-releasing strobilus stage' (PPO:0007016).

**open pollen cone**

OBO ID: PPO:0001047

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001047](http://purl.obolibrary.org/obo/PPO_0001047)

Definition: A 'fresh pollen cone' (PPO:0001046) that is in the 'open microsporangiate strobilus stage' (PPO:0007015).

**pollen-releasing pollen cone**

OBO ID: PPO:0001048

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001048](http://purl.obolibrary.org/obo/PPO_0001048)

Definition: A 'open pollen cone' (PPO:0001047) that is in the 'pollen-releasing strobilus stage' (PPO:0007016).

**simple fruit or compound fruit**

OBO ID: PPO:0001042

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001042](http://purl.obolibrary.org/obo/PPO_0001042)

**compound fruit**

OBO ID: PPO:0001041

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001041](http://purl.obolibrary.org/obo/PPO_0001041)

**fruit**

OBO ID: PO:0009001

IRI: [http://purl.obolibrary.org/obo/PO\\_0009001](http://purl.obolibrary.org/obo/PO_0009001)

Definition: A multi-tissue plant structure (PO:0025496) that develops from a gynoecium (PO:0009062), or a single carpel (PO:0009030), and at maturity may have as parts one or more seeds (PO:0009010).

Comment: A fruit (PO:0009001) may contain additional plant structures (PO:0009011) that were part of a flower (PO:0009046) and mature along with the gynoecium, such as a receptacle (PO:0009064). A fruit may develop without fertilization in cases of parthenocarpy, apomixis, or other hormone-induced conditions and may not always contain seeds (PO:0009010). When annotating to fruit (PO:0009001) that are referred to as 'aggregate', 'multiple', or 'compound', please annotate directly to the appropriate plant structure, such as receptacle, hypanthium (PO:0009065) or infructescence (PO:0006342). Fruits only occur in angiosperms.

**ripening fruit**

OBO ID: PPO:0001043

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001043](http://purl.obolibrary.org/obo/PPO_0001043)

Definition: A 'simple fruit or compound fruit' (PPO:0001042) that is in the PO:'fruit ripening stage' (PO:0025502).

**ripe fruit**

OBO ID: PPO:0001045

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001045](http://purl.obolibrary.org/obo/PPO_0001045)

Definition: A 'ripening fruit' (PPO:0001043) that is in the 'fruit ripe stage' (PPO:0007013).

**unripe fruit**

OBO ID: PPO:0001044

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001044](http://purl.obolibrary.org/obo/PPO_0001044)

Definition: A 'ripening fruit' (PPO:0001043) that is in the 'fruit unripe stage' (PPO:0007012).

**bud**

OBO ID: PO:0000055

IRI: [http://purl.obolibrary.org/obo/PO\\_0000055](http://purl.obolibrary.org/obo/PO_0000055)

Definition: An undeveloped shoot system (PO:0009006).

**reproductive bud**

OBO ID: PO:0025084

IRI: [http://purl.obolibrary.org/obo/PO\\_0025084](http://purl.obolibrary.org/obo/PO_0025084)

Definition: A bud that develops into a reproductive shoot system.

**flower bud**

OBO ID: PO:0000056

IRI: [http://purl.obolibrary.org/obo/PO\\_0000056](http://purl.obolibrary.org/obo/PO_0000056)

Definition: A bud that develops into a flower.

**inflorescence bud**

OBO ID: PO:0000057

IRI: [http://purl.obolibrary.org/obo/PO\\_0000057](http://purl.obolibrary.org/obo/PO_0000057)

Definition: A bud that develops into an inflorescence.

**vegetative bud**

OBO ID: PO:0000058

IRI: [http://purl.obolibrary.org/obo/PO\\_0000058](http://purl.obolibrary.org/obo/PO_0000058)

Definition: A bud (PO:0000055) that develops into a vegetative shoot system (PO:0025607).

**dormant leaf bud**

OBO ID: PPO:0001009

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001009](http://purl.obolibrary.org/obo/PPO_0001009)

Definition: A PO:'vegetative bud' (PO:0000058) that is participating in a GO:'bud dormancy process' (GO:0097207).

**non-dormant leaf bud**

OBO ID: PPO:0001010

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001010](http://purl.obolibrary.org/obo/PPO_0001010)

Definition: A PO:'vegetative bud' (PO:0000058) that is not participating in a GO:'bud dormancy process' (GO:0097207).

**breaking leaf bud**

OBO ID: PPO:0001012

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001012](http://purl.obolibrary.org/obo/PPO_0001012)

Definition: A 'non-dormant leaf bud' (PPO:0001010) that is in the 'bud burst stage' (PO:0025532).

Comment: If a breaking leaf bud is present, it implies that a new shoot system and unfolding true leaf are also present and observable, hence the "subclass of" axiom.

**swelling leaf bud**

OBO ID: PPO:0001011

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001011](http://purl.obolibrary.org/obo/PPO_0001011)

Definition: A 'non-dormant leaf bud' (PPO:0001010) that is in the 'bud swell stage' (PO:0025531).

**new shoot system**

OBO ID: PPO:0001003

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001003](http://purl.obolibrary.org/obo/PPO_0001003)

Definition: A 'vegetative shoot system' (PO:0025607) that does not yet have any unfolded true leaves (PPO:0001015).

**new above-ground shoot-borne shoot system**

OBO ID: PPO:0001004

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001004](http://purl.obolibrary.org/obo/PPO_0001004)

**new shoot system emerging from ground**

OBO ID: PPO:0001005

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001005](http://purl.obolibrary.org/obo/PPO_0001005)

**new shoot system emerging from ground in first growth cycle**

OBO ID: PPO:0001006

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001006](http://purl.obolibrary.org/obo/PPO_0001006)

**new shoot system emerging from ground in later growth cycle**

OBO ID: PPO:0001008

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001008](http://purl.obolibrary.org/obo/PPO_0001008)

**vascular leaf**

OBO ID: PO:0009025

IRI: [http://purl.obolibrary.org/obo/PO\\_0009025](http://purl.obolibrary.org/obo/PO_0009025)

Definition: A leaf (PO:0025034) in a vascular plant.

Comment: Has vascular tissue. From APweb Glossary: In angiosperms, commonly thought of as one of the three basic parts of the seed plant body, a structure usually of determinate growth, without secondary thickening, and of superficial origin, often flattened and photosynthetic in part, and in the axil of which is found a bud. Occurs in the sporophytic phase of a plant life cycle.

**cotyledon**

OBO ID: PO:0020030

IRI: [http://purl.obolibrary.org/obo/PO\\_0020030](http://purl.obolibrary.org/obo/PO_0020030)

Definition: A vascular leaf (PO:0009025) formed at the first shoot node (PO:0005004) of a plant embryo (PO:0009009) or a seedling (PO:0000003).

**true leaf**

OBO ID: PPO:0001013

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001013](http://purl.obolibrary.org/obo/PPO_0001013)

Definition: A 'vascular leaf' (PO:0009025) that is not a 'cotyledon' (PO:0020030).

**expanding true leaf**

OBO ID: PPO:0001022

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001022](http://purl.obolibrary.org/obo/PPO_0001022)

Definition: A 'true leaf' (PPO:0001013) that is in the 'vascular leaf expansion stage' (PO:0001052).

**expanding unfolded true leaf**

OBO ID: PPO:0001020

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001020](http://purl.obolibrary.org/obo/PPO_0001020)

Definition: A 'expanding true leaf' (PPO:0001022) that is in the 'vascular leaf expanding unfolded stage' (PPO:0007006).

**unfolding true leaf**

OBO ID: PPO:0001014

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001014](http://purl.obolibrary.org/obo/PPO_0001014)

Definition: A 'expanding true leaf' (PPO:0001022) that is in the 'vascular leaf unfolding stage' (PPO:0007005).

**unfolded true leaf**

OBO ID: PPO:0001015

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001015](http://purl.obolibrary.org/obo/PPO_0001015)

Definition: A 'true leaf' (PPO:0001013) that is in the 'vascular leaf expanding unfolded stage' (PPO:0007006) or 'vascular leaf post-expansion stage' (PO:0001053) or 'vascular leaf senescent stage' (PO:0001054).

**non-senescing unfolded true leaf**

OBO ID: PPO:0001016

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001016](http://purl.obolibrary.org/obo/PPO_0001016)

Definition: A 'unfolded true leaf' (PPO:0001015) that is in the 'vascular leaf expanding unfolded stage' (PPO:0007006) or 'vascular leaf post-expansion stage' (PO:0001053).

**immature unfolded true leaf**

OBO ID: PPO:0001018

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001018](http://purl.obolibrary.org/obo/PPO_0001018)



Definition: A 'non-senescing unfolded true leaf' (PPO:0001016) that is in the 'vascular leaf expanding unfolded stage' (PPO:0007006) or 'vascular leaf expanded immature stage' (PPO:0007007).

**expanded immature true leaf**

OBO ID: PPO:0001021

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001021](http://purl.obolibrary.org/obo/PPO_0001021)

Definition: A 'immature unfolded true leaf' (PPO:0001018) that is in the 'vascular leaf expanded immature stage' (PPO:0007007).

**expanding unfolded true leaf**

OBO ID: PPO:0001020

IRI:

[http://purl.obolibrary.org/obo/PPO\\_0001020](http://purl.obolibrary.org/obo/PPO_0001020)

Definition: A 'expanding true leaf' (PPO:0001022) that is in the 'vascular leaf expanding unfolded stage' (PPO:0007006).

**mature true leaf**

OBO ID: PPO:0001019

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001019](http://purl.obolibrary.org/obo/PPO_0001019)

Definition: A 'non-senescing unfolded true leaf' (PPO:0001016) that is in the 'vascular leaf mature stage' (PPO:0007008).

**senescing true leaf**

OBO ID: PPO:0001017

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001017](http://purl.obolibrary.org/obo/PPO_0001017)

Definition: A 'unfolded true leaf' (PPO:0001015) that is in the 'vascular leaf senescent stage' (PO:0001054).

**seed**

OBO ID: PO:0009010

IRI: [http://purl.obolibrary.org/obo/PO\\_0009010](http://purl.obolibrary.org/obo/PO_0009010)

Definition: A multi-tissue plant structure (PO:0025496) that develops from a plant ovule (PO:0020003) and has as parts a plant embryo (PO:0009009) enclosed in a seed coat (PO:0009088).

Comment: A seed generally develops from an ovule (PO:0020003) after fertilization, but may develop without fertilization in the case of apogamy (e.g., adventitious embryos or somatic embryos). A seed is a reproductive unit of seed plants (gymnosperms, angiosperms, and fossil pteridosperms).

**mature seed**

OBO ID: PPO:0001024

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001024](http://purl.obolibrary.org/obo/PPO_0001024)

Definition: A 'seed' (PO:0009010) that has participated in a 'seed maturation stage' (PO:0007632).

**whole plant**

OBO ID: PO:0000003

IRI: [http://purl.obolibrary.org/obo/PO\\_0000003](http://purl.obolibrary.org/obo/PO_0000003)

Definition: A plant structure (PO:0005679) which is a whole organism.

Comment: Examples include plant embryo (PO:0009009), megagametophyte (PO:0025279) and microgametophyte (PO:0025280).

**herbaceous plant**

OBO ID: PPO:0001000

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001000](http://purl.obolibrary.org/obo/PPO_0001000)

**perennial plant**

OBO ID: PPO:0001002

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001002](http://purl.obolibrary.org/obo/PPO_0001002)

**plant embryo**

OBO ID: PO:0009009

IRI: [http://purl.obolibrary.org/obo/PO\\_0009009](http://purl.obolibrary.org/obo/PO_0009009)

Definition: A whole plant (PO:0000003) that participates in the plant embryo stage (PO:0007631).

Comment: A plant embryo is generally formed after the first division of a plant zygote (PO:0000423), but in the case of a nucellar (adventitious) plant embryo (PO:0004537), somatic plant embryo (PO:0025302), microspore-derived cultured plant embryo (PO:0025305), and other embryos that arise through apogamy, it begins after the division of a single cell that is not a zygote. The end of the embryo stage varies among taxa; the beginning of a seed germination stage (PO:0007057) in seed plants, formation of the first vascular leaf (PO:0009025) in pteridophytes, the beginning of development of a sporangium (PO:0025094) in bryophytes, or the beginning of the formation of a plant organ (PO:0009008) such as a root (PO:0009005), shoot axis (PO:0025029), or vascular leaf (PO:0009025) in a cultured plant embryo (PO:0000010).

**seedling**

OBO ID: PPO:0001007

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001007](http://purl.obolibrary.org/obo/PPO_0001007)

**woody plant**

OBO ID: PPO:0001001

IRI: [http://purl.obolibrary.org/obo/PPO\\_0001001](http://purl.obolibrary.org/obo/PPO_0001001)

## Data properties

The PPO defines four data properties that are used to record quantitative information about trait observations, such as the number of open flowers on a plant or the percent of leaves that are senescing. These data properties offer a great deal of flexibility in that they allow for numeric ranges, including open-ended ranges (e.g., "at least 10 fruits").

**lower count**

OBO ID: PPO:0000001

IRI: [http://purl.obolibrary.org/obo/PPO\\_0000001](http://purl.obolibrary.org/obo/PPO_0000001)

Definition: A relationship between a 'measurement datum' (IAO:0000109) and the inclusive lower endpoint of a non-negative integer range that contains the datum's value.

**upper count**

OBO ID: PPO:0000002

IRI: [http://purl.obolibrary.org/obo/PPO\\_0000002](http://purl.obolibrary.org/obo/PPO_0000002)

Definition: A relationship between a 'measurement datum' (IAO:0000109) and the inclusive upper endpoint of a non-negative integer range that contains the datum's value.

**lower percent**

OBO ID: PPO:0000003

IRI: [http://purl.obolibrary.org/obo/PPO\\_0000003](http://purl.obolibrary.org/obo/PPO_0000003)

Definition: A relationship between a 'measurement datum' (IAO:0000109) and the inclusive lower endpoint of a real number range within [0.0,100.0] that contains the datum's value.

**upper percent**

OBO ID: PPO:0000004

IRI: [http://purl.obolibrary.org/obo/PPO\\_0000004](http://purl.obolibrary.org/obo/PPO_0000004)

Definition: A relationship between a 'measurement datum' (IAO:0000109) and the inclusive upper endpoint of a real number range within [0.0,100.0] that contains the datum's value.