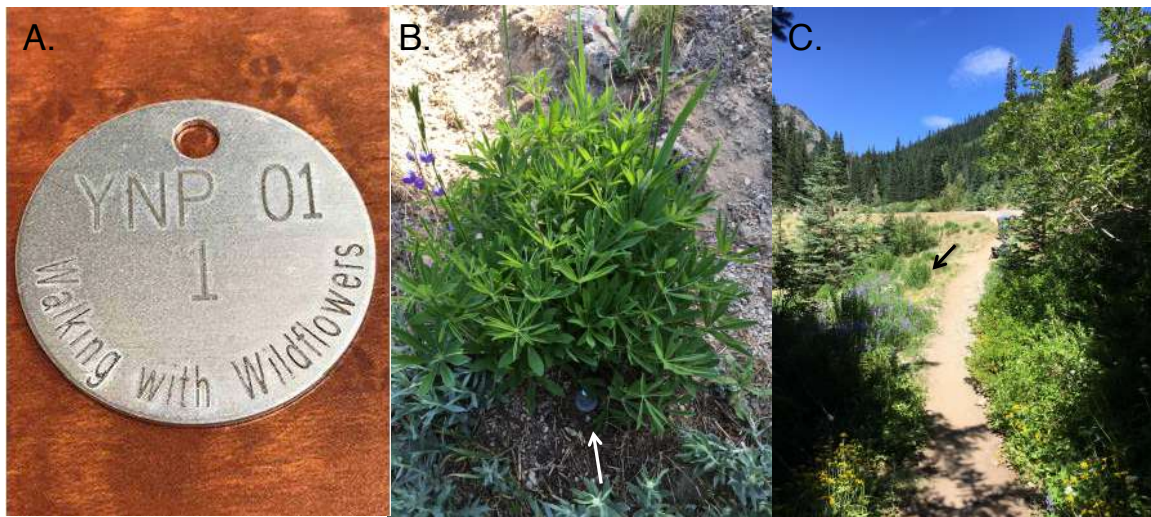


## **Walking with Wildflowers – Making Phenology Observations**

So you decided to be a citizen scientist with Walking with Wildflowers, and have downloaded the *Nature's Notebook* App, the Halfmile App, and the Hiker's companion guide for the section of the PCT that you are hiking through. Let's make some phenology observations!

### **Step 1:** Find the phenology site on the PCT.

Possibly the most challenging part of making phenology observations is actually finding the phenology site on the PCT. To find these sites, we recommend using the maps provided in the hiker companion guide, the GPS coordinates and PCT mileage of the site that are provided in the hiker guide, and the Halfmile App. While we tried to provide natural landmarks at each phenology site to aid in finding the site, there is no signage for each site. First, before you leave, take a look at the larger map on the first page of the hiker guide to provide context for where each site is located. For each site, we provide GPS coordinates as well the mileage along on the PCT. Keep an eye on the PCT mile markers on Halfmile App as you hike. When you get to a location near the site, check out the site map (in the companion guide), and look at the GPS coordinates to identify the exact site.



**Fig. 1** –Most plants are tagged with small round aluminum tags.

### **Step 2:** Find plants within each site.

To find a plant within a site, refer to the individual site within the hiker companion guide. There is a table for each site that details the species name and position along the trail of each plant within the site. The location along the trail is relative to the starting position within the site. The start position is at the southern end of the site, and the picture of the site is taken from this position. From this position, the table gives a position going northbound along the trail (e.g. 5 ft) and a lateral position for each plant (e.g. L 2ft indicates a plant on the left side of the trail 2 ft from the edge of the trail). **Tagging method for each plant depends on which agency governs the area that you are hiking through.** In North Cascades National Park, every plant has been tagged with a tag with the specific site and plant number (Fig. 1). Within

Yosemite National Park, all herbaceous plants (i.e. all wildflowers, but not trees or scrubs) are tagged. At Inyo National Forest, none of the plants are tagged. Tags are typically nailed into the ground directly next to the focal plant. For some woody species in North Cascades National Park, tags are suspended from branches.

**Step 3:** Make a phenology observation

Login to the *Natures Notebook* App. In the 'Choose Network' box, go to Walking with Wildflowers; in the 'Choose Site' box, go to the current site you are at. Click 'add plant observation' at the bottom of the page. Select the plant that you are going to observe. *Nature's Notebook* has many more phenophases than we are interested in for this project. For wildflowers and shrubs, we only record five phenophases (leaves, flowers or flower buds, open flowers, fruits, and recent fruit or seed drop). Once you select "Yes" or "No" for a phenophase, a box will pop up that asks how many of a given structure do you see (e.g. how many buds, open flowers, or fruits?) We describe the phenophases and the data we use below.

*Leaves* – One or more live, fully unfolded leaves are visible on the plant. For seedlings, consider only true leaves and do not count the one or two small, round or elongated leaves (cotyledons) that are found on the stem almost immediately after the seedling germinates. Do not include fully dried or dead leaves. Reporting on the number of leaves is optional for this project.

*Flowers or flower buds* – One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds or inflorescences that are swelling or expanding, but do not include those that are tightly closed and not actively growing (dormant). Also do not include wilted or dried flowers. How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.

*Open flowers* – One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers. What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open. Note that if you report a "Yes" for open flowers, you should also still report a "Yes" for Flowers or flower buds.

*Fruits* – One or more fruits are visible on the plant. How many fruits are present?

*Ripe fruits* -- One or more ripe fruits are visible on the plant.

The phenophases for the pine trees (lodgepole and ponderosa pine) in our dataset are slightly different as these plants do not produce flowers. The important

phenophases for these plants are young needles, pollen cones, open pollen cones, unripe seed cones, and ripe seed cones. There is no need to count numbers for any of these phenophases.

*Young needles* – One or more young, unfolded needles are visible on the plant. A needle is considered "young" and "unfolded" once it begins to spread away at an angle from other needles in the bundle (and is no longer pressed flat against them), but before it has reached full size or turned the darker green color or tougher texture of mature needles on the plant.

*Pollen cones* – One or more fresh, male pollen cones (strobili) are visible on the plant. Cones have overlapping scales that are initially tightly closed, then spread apart to open the cone and release pollen. Include cones that are unopened or open, but do not include wilted or dried cones that have already released all of their pollen.

*Open pollen cones* – One or more open, fresh, male pollen cones (strobili) are visible on the plant. Cones are considered "open" when the scales have spread apart to release pollen. Do not include wilted or dried cones that have already released all of their pollen.

*Unripe seed cones* – One or more unripe, female seed cones are visible on the plant. For our species, an unripe seed cone is green or brown with scales closed together.

*Ripe seed cones* – One or more ripe, female seed cones are visible on the plant. For our species, a seed cone is considered ripe when it has turned brown and the scales have begun to spread apart to expose the seeds inside. Do not include empty cones that have already dropped all of their seeds.

As you probably do not know what these different phenophases look like for a given species, we provide a phenophase guide as the second page in the hiker companion guide that you initially downloaded. Importantly, if you are not sure about a particular phenophase, you can use the "?" option, or just skip the question entirely.

Congratulations, after your first observation, you are officially a citizen scientist!