

Alaska Berry Phenology Monitoring Protocol



Goal: This protocol is designed to help you track the timing of berry lifecycles to determine if the timing of flowering and fruiting is changing through time. You can use this alongside other methods to determine if the timing is shifting in relation to other parts of the ecosystem, such as the timing of weather events, pollinators, animals, or harvesting activities by your community. You will collect repeat observations of the same individual plants over a summer, and document the reproductive phenology (timing of flowering and fruiting). This protocol is aligned with the USA National Phenology Network (USA-NPN) protocols and other major phenology tracking programs such as NEON.

Acknowledgements: This protocol was developed by Dr. Katie Spellman (University of Alaska Fairbanks International Arctic Research Center) and Dr. Christa Mulder (UAF Institute of Arctic Biology) during their Melibee Project funded through the USDA NIFA grant (ALKR-2009-04931). Additional support for the development of this is provided by the Alaska Berry Futures Project the Alaska Climate Adaptation Science Center (USGS award G17ACOO213), NSF Arctic Harvest- Public Participation in Scientific Research project (NSF Award AISL-1713156) and the Bonanza Creek Long Term Ecological Research program (NSF Award DEB-163476 and USDA USFS award RJVA-PNW-01-JV-1161952-231).

Overview of berry phenology monitoring steps:

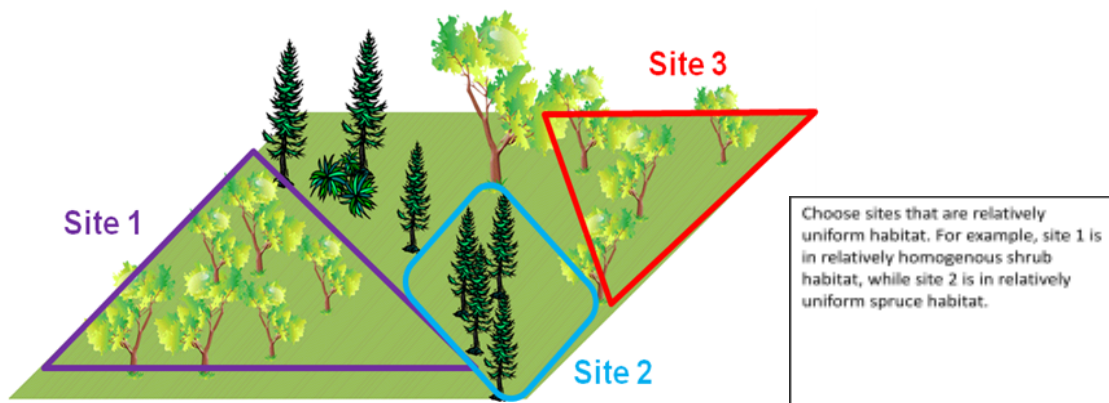
1. Select a site
2. Select plant species to investigate
3. Select individual focal plants
4. Mark your site and plants
5. Record your observations of plants
6. Report your data

1. Select a site

A **site** is the area which encompasses any plants you plan to observe.

Select sites that are

- convenient for you to get to
- relatively uniform habitat
- at least 4 m² in area, but not larger than 100m².



Remember, if the land is not publicly owned, be sure to secure permission from the landowner to observe plants on the property.

Try to avoid:

- Steep slopes
- Very windy sites
- Areas prone to snow drifts
- Watered or fertilized sites

The size of your site will depend on how sparse the species you are observing are on the landscape. If the plants are dense, a small site will work, if the plants are sparse, a larger site will be necessary.

When you've selected your site, fill out the site description form so you can have the relevant data about your site. You'll need to record the latitude, longitude, and elevation of your site. You can do this with a GPS unit or GPS app on a smartphone or tablet, if you have access to one, or you can use Google Earth to locate the exact location of your site and find these numbers.

2. Select berry species to investigate

You can monitor any berry species using this protocol. We have developed phenophase photo guides for *Vaccinium vitis-idaea* (lowbush cranberry or lingonberry) and *Vaccinium uliginosum* (lowbush blueberry or bog blueberry). Locate one or more berry species in a convenient location for you to monitor on at least a weekly basis. If you are unsure of the species that you have at your site, you can

3. Select individual focal plants

Observing multiple individuals helps to give scientists an idea of the variation in phenology among individuals at your site. You will select and monitor FIVE individuals of the same species at your site. You can select more plants if you want a higher level of precision in your data. Do not select plants that are direct neighbors.

Choose 5 or more plants that are:

- healthy and REPRODUCTIVE
- relatively undamaged
- At least 20 cm away from other plants you are observing if you are monitoring berries.
At least 1 meter away from other plants you are observing if you are monitoring sweetclover.
- For clonal plants, try to choose individual stems from different clumps

Try to avoid:

- plants that are close to buildings

What if the plant I am observing dies?

- Select a new individual to monitor
- Note the death in the comments section of the datasheet
- Give the replacement plant a new, unique label (for example, plant #6)

4. Marking sites and focal plants

You will make your observations repeatedly at the same site or sites over time. You will want to somehow mark your site so that you can find it again in the future. For most sites, it is probably easiest to mark an easy entry point or nearby tree or shrub with colorful flagging, which is a colored non-adhesive tape often made of PVC or vinyl, scrap cloth, or something similar. You can also use natural or human-made landmarks, like the edge of a yard, large rocks, a bend in a trail, a road, or something similar to remember your site location.

Because plant monitoring requires that you observe *the same individual plants* repeatedly, you will also need to mark each plant so that you can find it on each visit. Mark each individual plant with a unique label. You can label the flagging tape on each plant with permanent marker, or purchase metal forestry tree tags and engrave them with a pen to resist the weather. For example, you could mark the pieces of flagging tape or metal plant tags with “blueberry 1”, “blueberry 2”, etc. or give them unique and fun names like “Pie,” “Jam,” “Bob,” whatever! Then, tie them to each of the berry plants you are observing. For berry plants that are large and bushy, like high bush cranberry or raspberry, you can tag a single branch and just track the flowers and fruits above the tag or flagging tape.

Be sure to replace the labels if they get damaged by the weather or animals, so you can be sure to continue marking the correct data for the correct plant.

5. Recording Observations

At least once a week, you will record the phenophase of each focal plant by counting the number of buds, flowers and fruits. You will record these observations on a datasheet. You will record the data for each plant in the column on the data sheet with the same number or label as on the plant. There are different datasheets for sweetclover (*Melilotus albus*) and for the berries (*Vaccinium uliginosum* and *V. vitis-idaea*). Be sure you are using the correct data sheet.

Phenophases:

Leaf Unfurling/ Emergence

New growth of the plant is visible, either from above-ground buds with green tips, or new green or white shoots breaking through the soil surface. Growth is considered "initial" on each bud or shoot until the first leaf has fully unfolded. Record "yes" or "no" if the plant has begun to unfurl leaves. This phase will only need to be recorded at the beginning of the season in May or early June. You do not need to keep recording this phenophase when the leaves have fully emerged.

Flower Buds

Count the number of flower buds that have not yet opened on the plant. For *Vaccinium uliginosum* (blueberry) the flower buds droop like tiny pink earrings. For *Vaccinium vitis-idaea* (lowbush cranberry), the flower buds look a bit similar to leaf buds at first, as they are both pink in appearance and come straight from the end of the stem. Look for the pinker buds with hardly any green on them.

Flowers

Count the number of open, fresh flowers that are visible on the plant. Do not include wilted or dried flowers that remain on the plant.

Petal Drop

Count the number of flowers that have dropped their petals, but have not yet started to have their ovaries swell. In all species, the little green ovaries will not yet look like they are starting to get spherical, and there will be a pointy stigma protruding quite visibly now that the petals are gone.

Unripe Fruits

Count the number of unripe fruits on the plant. For an unripe fruit, the ovary is swollen and obviously has been fertilized. Count all the fruits that are green or beginning to color.

Ripe fruits

Count the number of ripe fruits that are visible on the plant. These are the berries that are more than half the color that they are supposed to be (red for cranberry, black for crowberry, blue for blueberry, etc.). The color change indicates that the fruit is mature enough to be consumed by an animal. We consider this ripe, even though it may not be the state that you would start picking the berries for harvesting. You can add a category for tracking when the berries are ready for picking (for some species, like lowbush cranberry and rosehips, this is after the first frost).

Frequency of observations:

- As often as possible, especially during the spring
- At least once a week
- All observations are valuable even if you miss a week or two!

Photographic data:

You can take photos of your plants to help you remember the phenology and identity of the plants. Make sure your plant labels are visible in the photo. You can put the site name, plant number, and date on a slip of paper or whiteboard and put this in the photo so you can better keep track of your photos. An example is pictured to the right.

**6. Reporting your data.**

There are several methods for keeping your phenology data organized and archived. Choose from one of these options, or come up with your own. Consider how the data will be archived and shared, and who should and should not have access to the berry locations and data.

- Make a spreadsheet database and enter your data for use by your agency, family or community.
- Create a project and data entry using the Indigenous Sentinels Network.
<https://www.sentinelsnetwork.com/>
- Post photos of each of your plants each week using iNaturalist, and record the counts in the comments. <https://www.inaturalist.org/>
- Post your data using the National Phenology Network's app, Nature's Notebook.
<https://www.usanpn.org/nn>

Berry Site Description Form



Please fill one out for each site you are making observations in.

Name of Observer(s) _____

Site Location:

Town (or nearest town) _____

Site name (give the site a unique descriptive name) _____

Site location description (describe where your site is located using landmarks)

Site GPS coordinates (in NAD84, decimal degrees)

Latitude _____ °N Longitude _____ °W

GPS precision _____ m Site Elevation _____ m

Site descriptive variables:

Dominant vegetation cover (circle one):

moss/lichen herbaceous shrub tundra tall shrub
deciduous trees coniferous trees

Slope (circle one): flat 0-5% grade 6-10% grade

Aspect (What direction does the site slant toward? Circle one) N NE E SE S SW W NW flat

Berry species for data collection at this site (list all that apply):

Additional notes or comments about the site:

Berry Phenology Monitoring Observation Datasheet



Please fill out the following datasheet once a week for each site. A different sheet must be used for each site. If you are monitoring more than one species at your site, use a new sheet for each species.

Observer name _____

Site Name _____

Date _____ Time of observation _____

Temperature _____ Weather (circle one) sunny partly cloudy cloudy rain

Plant phenology data:

Species _____

		Focal plant 1	Focal plant 2	Focal plant 3	Focal plant 4	Focal plant 5
Plant label						
Photo number (optional)						
Phenophase	Leaf unfurling / Emergence	Y N	Y N	Y N	Y N	Y N
	Flower buds					
	Open flowers					
	Petal Drop					
	Unripe fruit					
	Ripe fruit					
Additional notes about the plant						

General notes: