Instructions on How to do a Bumble Bee/Carpenter Bee Floral Survey

What will I be doing?

In this survey you will walk around an area of your choosing and record all the flower species you see, *regardless of if bees are using them*, while observing which flowers bumble bees and carpenter bees are on.

Why do this?

By determining which flowers bumble bees/carpenter bees are observed on, we gain an understanding of the plants that they tend to use. This allows us to manage the environment to cater to them.

Requirements:

- Ability to identify bumble bees and carpenter bees. Example photos can be found by scanning the first QR code under "Bee Identification Resources" on page 4 of this document.
    - Identification of bumble bee species and sex is useful, but not required. There are two versions of the datasheet available: one for people who can identify bumble bee species (labelled "Use this datasheet if you *can* identify bumble bees to species"), and one for those who cannot (labelled "Use this datasheet if you *cannot* identify bumble bees to species").
- "Seek by iNaturalist" app. This app identifies plant species in the field. It does not need Wi-Fi or cell service for identifications.
- Temperature is above 60° F and not raining. Time is 9:00 am – 4:00 pm.

Using "Seek by iNaturalist":

- Download the 'Seek by iNaturalist" app to identify the blooming plants. Open the app and hit the green camera button at the bottom of the screen to begin identifying flowers.
- If Seek gives you an ID that you disagree with, record the ID that Seek has given you in the data collection table and record the species you believe it is in the "Notes:" box (e.g. "I think Sp. 3 was White Clover")

Choosing a Survey Area:

- All locations containing flowers are viable (urban/suburban/wild are all important). The entire area should be roughly the same habitat type.
- Choose an area you could cover in approximately 30 minutes.
- Size and shape of the area surveyed are up to you.

Completing the datasheet:

Top header section:

- Determine latitude and longitude using a maps app on your phone, and report to at least 4 decimal places.
    - In Apple Maps, simply click on your location (blue circle) and scroll down.
    - In Google Maps, click close to your location (may need to click and hold), without hitting the blue circle to drop a pin within your survey area. Click on that pin (red logo) and scroll up to view the latitude and longitude.
- Percent clouds should be estimated, and temperature can be estimated or found online.
- If using the datasheet for people who *can* ID bumble bees to species, the "Notes:" box contains spaces to record up to 5 *Bombus/Xylocopa* species. Fill these species in as you

survey and identify them. If you encounter more than 5 species write results for the additional species in the notes section. For example, write "B. *fervidus* on flower 8".

Conducting the survey:

- Prior to starting, scout out your survey area to get a rough idea of what flowers are around and their relative abundance. Consider practicing using Seek if you're unfamiliar.
- There should be 30 minutes of bee observational time, not including time spent filling out the top header section of the form or recording plant species. Write flowers as you survey and ***extend the survey time to accommodate the time spent writing***.
- Walk around the area, recording each flower species that you come across. Use Seek to ID the plants and take a photo of each flower species, then record the species under "Plant Species/Description" and the time the photo was taken under "Photo time".
  - Seek automatically saves photos to your camera roll. Use your camera roll to check the photo time and to access the photos when submitting data, as Seek does not store multiple photos of a single species.
  - If Seek is unable to determine the species, record the classification that Seek gave you along with a description of the flower (e.g., small yellow).
  - Make sure your photo is in focus and includes important characters. An expert will use the photos to confirm floral IDs. For Goldenrod, capture the flower head, base of stem, and underside of a leaf. For American Asters, capture the flower head, flower bract (underside of head), and basal leaves (leaves just above the ground). Record photo time as a range from the earliest to latest photo.
- There is no need to walk in any specific pattern or along a transect, simply roam wherever you see flowers, and record any flowers within a 10-foot radius of you.
- ***Include all flowers whether bees used them or not***. ***Don't forget to record small flowers on the ground and species with just one or two flowers.***

Floral Quantification:

- As you survey, take note of the abundance of each flower species. We use two measures of abundance: "# Lots" and "Floral Rank"
  - # Lots is a measure of floral distribution that explains if flowers are clumped together or dispersed across your survey area. For # Lots, imagine your survey path as a suburban road lined with 25 property lots. For each flower species estimate how many of the 25 lots contain a blooming flower of that species. It doesn't matter how much of each lot is covered by the flower species, only that the species occurs in the lot. Only consider area that is viable for plants (do not count area occupied by buildings, roads, lakes, etc.).
    - This is a ***rough estimation*** of how spread out each flower species is, so don't spend much time determining a precise value.
    - For uncommon flowers it will likely be easiest to tally patches as you pass them. For very common flowers it is often easiest to estimate the number of lots after the survey is complete.
    - Only count flowers that are ***currently in bloom*** (no buds or dead flowers)
  - Floral rank is a measure of sheer abundance of blooms. For floral rank, rank which flowers are most abundant relative to each other. This measure should factor in both the size of flowers and the quantity of them (e.g., hundreds of tiny

flowers may be equally abundant to ten larger flowers). Consider how much area each species could cover if you flattened out all the flowers to a flat surface. Remember to only consider blooms, not other plant parts like stems and leaves.

- Let **1 be the most abundant species**, and your highest number be the least abundant.
- Multiple species can be tied for a single rank.

- ***Keep both measures of floral abundance in mind while surveying to help yourself remember. If you forget to look out for abundance during your survey, consider retracing your steps afterwards to recall how abundant each flower was.***

Bee Counting:

- Use tallies to record bumble bees and carpenter bees as you see them. If you are identifying bumble bees to species, use the box corresponding to the appropriate sex and species (including sex and species unknown) as described below. If you are using the form for people who cannot identify bumble bees to species, disregard this step.
  - Below the sex headings (e.g. # Females), there are numbers 1-6. These numbers correspond to the species you recorded in the "Notes:" section.
  - For example, if you wrote "Sp. 1: B. *bimaculatus*" in the notes, and you see a B. *bimaculatus* female*,* record a line in the column below "1" and "# Females" and in the row of the plant species you saw the bee on.-
  - Use the unknown column unless you are 100% sure about your species ID.
  - If there are an overwhelming number of bees on a single species do not spend a long time identifying them all, just ID a few to estimate diversity and record the rest as unknown.

Instructions on how to upload datasheet and photos from surveys:

Method 1: **Uploading Directly into Shared Drive (recommended):**

1. Contact bumblebeecount@gmail.com to be added to the drive.
2. Download the Google Drive app.
3. Open the Google Drive app and select the "Shared" tab at the bottom of the screen.
4. There will be a folder named after you (i.e. folder name is your full name). Click on that folder to enter it and click the plus sign in the bottom right corner.
5. Select "Folder" to create a new folder with the following format: "Location name – Date" (e.g. Bee Lab – 06/14/2021)
6. Click on that folder to enter it, then click the plus sign in the bottom right corner and select "Upload"
7. Allow Drive to access your camera roll, and select all photos you took in a single survey ***(including a photo of your datasheet!),*** then hit "UPLOAD".
   a. You will be able to upload all photos at once, there is no need to do small batches.
8. The uploading will pause if you leave the app or stop using your phone, but the upload will not cancel (i.e. you can still reopen the app and it will finish uploading).

Method 2: **Emailing Photos to be uploaded:**

1. The email bumblebeecount@gmail.com is prepared to receive photos, however, emails typically limit the size of a message to contain a maximum of 6 photos.
2. If you can compress your images into a ZIP file, do so for all your photos (including your data sheet) and send them to bumblebeecount@gmail.com in a single email. If not, send the images to bumblebeecount@gmail.com in groups of 6 photos or less.

Bee Identification Resources:

Bumble Bee vs Carpenter Bee vs Honey Bee

This PDF is intended for people who cannot identify bumble bees and carpenter bees. It contains pictures of bumble bees, honey bees, and carpenter bees and a brief description of how to differentiate between each genus.

https://www.xerces.org/sites/default/files/2018-05/12-052_01_Eastern_Bumble_Bee.pdf

This PDF is a guide to the bumble bees of the Eastern US. Beginning on page 14, there are sections on each common Bombus species within the Eastern US. The guide includes information on ID characteristics, range, phenology, and more.

https://www.bumblebeewatch.org/app/ - /species/profile

This site provides identifying characters, lookalikes, seasonal patterns, ranges, and more for most Bombus species. This link goes to Bombus *affinis*, use the search bar to look up your local species.

https://www.inaturalist.org/taxa/52775-Bombus

This site provides photos of each bee species in the field. The link goes directly to the Bombus genus, use the search bar to look up your local species.