COMPLETING THE SURVEY

EQUIPMENT NEEDED

- Smartphone with Caterpillars Count! app
- Sheet of paper with a scale box

OR

- Clipboard
- Visual leaf survey datasheet
- Digital Camera
- Post-it notes
- Sheet of paper with scale box
- Pen/Pencil

OPTIONAL: Beat sheet (see instructions in the back), and stick

SURVEY TYPE

You may choose to conduct either of two types of surveys of foliage arthropods: a visual survey, or a beat sheet survey. In either case, the goal is to quantify the number of arthropods observed over some known area of leaves searched. A ***beat sheet survey*** is a little bit quicker, and some might say a little more fun, and involves holding a white sheet under a branch and then whacking that branch with a stick. You can then count all of the bugs that have fallen off the branch onto your sheet. Using this survey technique requires that you make a beat sheet (see instructions in the "Other Resources" section). A ***visual survey*** takes slightly more time and patience, and involves carefully inspecting by hand a set of 50 leaves on a branch. To conduct this type of survey, all you need is a datasheet or smartphone to record your data.

Whichever type of survey you choose to use, we ask that you be consistent and conduct all surveys with the same method whenever possible.

Notes

- The leaves you survey should be no more than 6.6 ft. off of the ground, although the plant you survey may be much taller.
- If you realize that the plant you are surveying has a dwindling leaf-supply, you can also survey plants *of the same plant species* in the general vicinity.

- When surveying, you should make a point to survey the same section of leaves every time. An easy way to keep track of this is to survey the leaves closest to the flagging.
- For our purposes, each individual leaflet within a compound leaf (e.g. hickory, buckeye, ash, etc.) will be counted as one leaf.
- It is vital to keep count of how many leaves you have surveyed as you are recording your findings on your datasheet. Some people find it helpful to make a tally for every 5 or 10 leaves they count, while others simply keep track in their heads.

VISUAL SURVEYS

The video below gives an accurate depiction of how to perform a visual survey, but the main idea is to look at the top, underside, and petiole of 50 leaves (this requires turning the leaf over). **This process should take at least ~3 seconds per leaf.** In order to get a proper estimate of the arthropods present on the plant, it is important to disturb the plant as little as possible.

See here for a video demonstrating how to conduct visual foliage surveys:

http://www.youtube.com/watch?v=XXWEwbRk9jU

Note that the layout of surveys in the video differs; use the site layout specified here.

Paper Datasheet

If you have a smartphone, you can download the free Caterpillars Count! app and submit data according to the instructions in the "Submitting Data with Smartphone App" section. Otherwise, you will need a paper survey datasheet, available on the project website, and in the Appendix of these materials.

1. **Begin a survey sheet**: Fill out the top of the datasheet (location, surveyor, date, time, temperature, etc.).

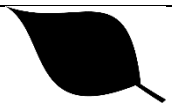
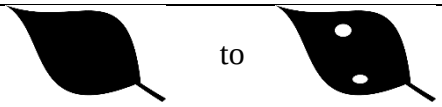
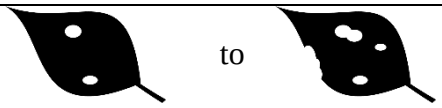
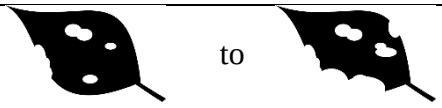
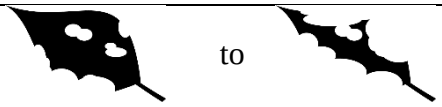
2. **Record the time** that you start each new survey

3. **Record the survey letter and number indicated on your flagging**

4. **Determine and record the species**: Record the species of your survey tree if known. If you are unable to identify it, label the tree as “Unidentified.”

5. Give your 50-leaf sample an **herbivory score** based on how much leaf damage there is (Table 1). Herbivory scores are as follows: 0 - none, 1 - trace (<5%), 2 - light (5-10%), 3 - moderate (10-25%), 4 - heavy (>25%). If you summed all of the observed leaf holes together and were able to cover 5 average leaves, that would be 10%. If leaf holes only sum to about 2 average leaves worth, that would be 4%, etc.

Table 2. Herbivory scores based on the average leaf examined.

0 - None	
1 – Trace, less than 5%	
2 – Light, 5-10%	
3 – Moderate, 10-25%	
4 – Heavy, > 25%	

Recording Your Arthropod Findings

1. When you find an arthropod, record the Order it belongs to (e.g., Beetle, Caterpillar, Spider, Fly, etc). If you are not sure what order it belongs to or if you are deciding between 2 orders, enter it as "unidentified" and describe it as best you can in the notes section. Make sure to include key features, so that it may be identified later. We are particularly interested in the focal arthropods listed in the Arthropod Identification Guide, which can be found in the "Resources" section.
2. **Estimate the body length of the arthropod to the nearest millimeter, not counting antennae or legs that extend out in front or behind**. Therefore, a daddy longlegs is going to be ~7mm, not ~40mm because we are not including the length of the legs. Note that the diameter of your classic Bic ballpoint pen or wooden pencil is ~8 mm. The diameter of a standard Sharpie marker is ~11 mm.
3. Note how many arthropods you saw of a given size in the Count (or #) field. See example data entered in the smarthphone app at right, and a sample datasheet at the back of this packet for examples.
4. **If you searched 50 leaves and did not find a single arthropod, we still want you to record that a survey was done!** Write "NONE" under Order. Otherwise, we will never know the difference between a survey that was never conducted, versus a survey with 0 abundance. Write 0 for the Length and Count as well.

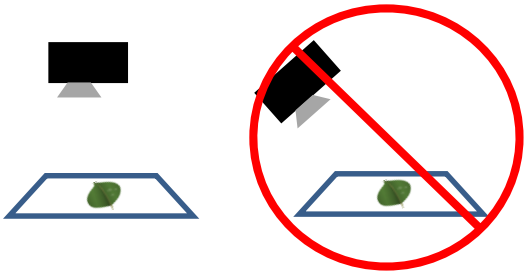
BEAT SHEET SURVEYS

Beat sheet surveys can be done instead of visual surveys, as long as you have a proper beat sheet (see "Other Resources" for how to make one).

1. Hold the beat sheet directly under a branch that has ~20-80 leaves on it.
2. Using a stick ½ - 1" in diameter, beat the branch so that any arthropods on the branch fall down onto the sheet. Give the branch 10 strong beats with the stick, but not so hard that you damage the branch or break any twigs or leaves off.
3. Try to identify and count any arthropods that might fly away first (e.g., flies, moths, beetles) before counting the more sedentary ones.
4. After recording all of the arthropods that have fallen onto the sheet, **count the number of leaves on the branch *that were directly above your beat sheet when you were beating***. Record this number where appropriate.
5. Record tree species, survey location, herbivory score, etc. as in the Visual Survey.

Photo Instructions

1. We need to know how much total leaf area you surveyed, so once you have completed your survey, you will photograph a leaf that is about the average size of leaves you just examined. (When we multiply the area of that representative leaf by the number of leaves in your survey, it should be a reasonable approximation to the total area you just searched.) **Take a photo of the leaf against a white background** (i.e., blank sheet of paper) making sure to:
    a. Write on a post-it note the Site name (e.g., “Prairie Ridge”) and survey location (e.g., 1A, 5E, etc), date, and tree species. Write dark and legibly, and make sure the post-it is in the photo. This can be switched out for each photo.
    b. Make sure the photo also includes a box of known area for scale. If you don't have a copy of the scale box sheet at the end of this document, you can create a scale box by tracing the outline of a post-it note with sharpie on the white piece of paper.
    c. Make sure the leaf is framed entirely within the white background if possible, and that both the entire leaf and entire scale box appear in the photo.
    d. NOTE: Photo angle is very important! To get an accurate estimate of leaf area, **the photo must be taken from directly above the leaf looking straight down**. Neither the leaf nor the scale box should be closer to the camera lens than the other.



e. Photos can be uploaded via the Caterpillars Count! website or the smartphone app (see below).

Notes

- An alternative to using Post-it notes requires laminate, a blank scale sheet, and a dry-erase marker. Simply laminate the scale sheet and write on it with the dry-erase marker. This allows you to change the data between each survey without wasting Post-it notes.
- Try to pick a leaf that has no holes in it.
- If you cannot easily identify the leaf by the picture, make sure to include the species along with the other data (site, date, etc.).

Example Photo: