



EcoSpark Volunteer Manual: Caterpillars Count!



What is Caterpillar's Count?

- Caterpillars Count! is a citizen science project for measuring the seasonal variation, also known as phenology, and abundance of arthropods like caterpillars, beetles, and spiders found on the foliage of trees and shrubs.
- Participants collect data by conducting surveys on trees and shrubs and recording all of the arthropods observed from sites such as parks, urban green spaces, or even spaces around buildings.
- The data you collect is used by researchers to observe trends in arthropod and bird populations in those same areas and to better understand how changes in climate and land use impact the plants and animals around us.

Why study caterpillars, and what are the goals of the project?

- Arthropods are an important food source for birds and other wildlife. They also have economic and environmental impacts on our forests and crops.
- Caterpillars, a type of arthropod, are one of the most important sources of food for many migratory birds and provide a tasty snack for growing nestlings.
- Climate change is affecting the timing of spring leaf out, insect activity, and bird migration and breeding. But are the plants, insects, and birds all responding to the same degree?
- If either insects or birds are not keeping up with the phenological shifts of the other organisms that they depend on, then further climate change may have negative consequences for their populations.
- This project aims to collect a variety of environmental data to help researchers answer questions about climate change's impact on organisms' phenology. This requires immense data, and that's where the project comes in!
- By collecting this data, you and researchers around the world can analyze trends and patterns in insect and plant phenology to help us mitigate the ecosystem-wide impacts of climate change.

How does EcoSpark fit in?

- EcoSpark, an environmental charity, aims to facilitate the citizen science project across the GTA. By helping regionalize the project, EcoSpark aims to collect vital data to help answer questions about our local environment and engage volunteers in learning about their urban environment through active participation!

What skills will you learn?

Arthropod ID, Tree ID, Fieldwork Skills, Data collection skills, Environmental monitoring.

Getting Started

Selecting a Site

- The first step is to select a site for your data collection. You can either select an existing EcoSpark site or choose a new site that is easily accessible to you.
- For new sites, you want at least 30 trees and the ability to sample the site at least six times over the spring and summer.

Setting Up the Site – Virtual

After you have a site that you are interested in, you can set it up on the Caterpillars Count Web Page.

[First, register for an account.](#) You'll need to supply an email address and create a password.

Once you are logged in, go to the Create New Site page to register your own Caterpillars Count! site. You'll need to enter the following information:

- Site name
- Short description (140 characters or fewer)
- Site location. Drag and drop the marker for your survey site onto the map.
- Number of survey locations you expect to support (should be a multiple of 5)
- Site password (You will give this out to participants/volunteers so they can submit surveys for your site. It should be different than your secret Caterpillars Count! account password; you want to give participants access to submit surveys at your site, not access to your whole Caterpillars Count! account!)

You will receive an email once you have created your site with a link to print your branch survey codes. You can simply click that link, or you can manually retrieve and print your branch survey codes from the Manage My Sites page.

Additionally, once your site is set up, add Dana from EcoSpark as a Site Manager (dana@ecospark.ca).

Setting up the site – Physical

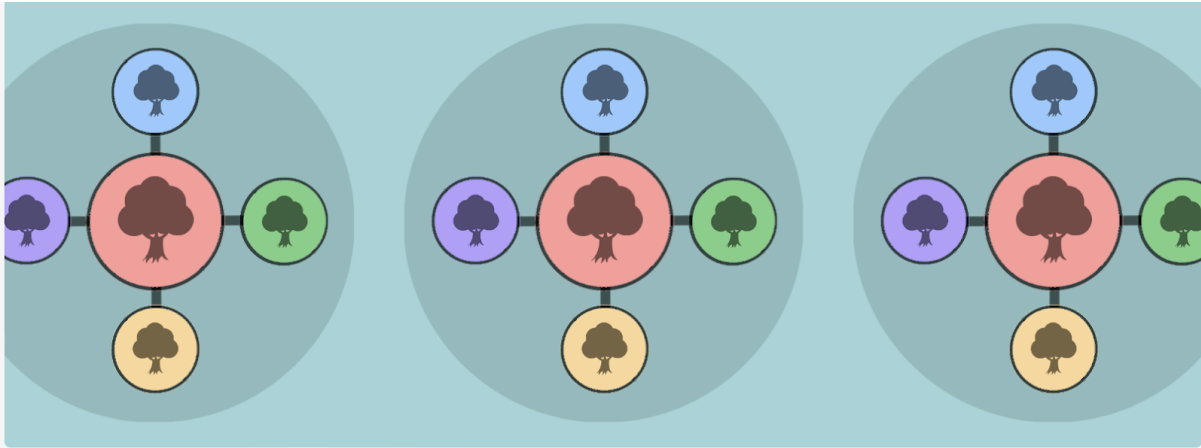
Now that you have virtually set up the site, you can start your fieldwork! Before you head out, you might want to bring these materials:

- Compass (to find cardinal directions)
- An Internet-connected smartphone or tablet can use a Tree ID app like Seek.

Select Your Survey Trees

In your site, you will create 6 circles of trees. Each circle will contain 5 trees, for a total of 30 trees per site. Each circle will have a center tree and 4 trees surrounding it located in the direction of the four cardinal directions. (Assuming the center tree is in the middle of the compass)

- Select the center survey tree (red).
 - When selecting the center tree, it is important to choose a tree that can be easily surveyed. You are in search of a tree that has at least 50 leaves that measure 5cm (~2in.) in length ([see these separate requirements for surveying conifers](#)). Therefore, choose a tree that has a relatively high abundance of leaves.
 - If finding 50 leaves to survey proves challenging, you are probably better off choosing another tree. It is also important that the leaves are at a height that is easily accessible.
- Identify the 4 satellite survey trees.
 - Once you have selected the center (red) survey, walk 5 yards (approximately 6-7 steps) in one of the cardinal directions. The first plant with 50 leaves that are at least 5cm (~2in.) in length is the plant that you should survey. If there is not a plant directly in front of you, then you can use a plant that sits within 10 feet of your transect line. If there is no suitable vegetation at 5 yards and within 10 feet, continue walking along your transect line away from the center point until you find a tree with 50 leaves.
 - Repeat this process until you have picked out all 4 satellite trees (blue, green, yellow, purple). The colors of the 4 satellite trees can be arranged in any order, and depending on the availability of suitable branches, your actual survey circle layout may look quite different from the ideal cartoon pictured above, which is fine!
- Identify survey trees.
 - See the [Identification Skills](#) page for resources to help identify your survey trees to species. You can also use the Seek app to help with identification.
 - Species names can be entered through the Manage My Sites (Edit Survey Plants) page of the website or app.
- Mark survey trees.
 - After creating a site, you'll receive an email with a link to print survey tags for that site. If you cannot find that email, retrieve and print the tags from the Manage My Sites page. One cheap method of weather-proofing tags is to "laminates" them with packing tape. Hang tags on the relevant survey branches in a visible location.
- Repeat these steps for each survey circle.



Now that you have established your survey trees and decided on a survey method, your site is ready to be surveyed!

How to make a beat sheet

- Cross the 2 cuts of wood in the middle to form an “X” and tape them together with duct tape.
- Cut an approximate 2ft by 2ft square piece of fabric.
- Staple or tape the fabric to the corners of the crossed pieces of wood.
- Alternatively, you can also get a Caterpillar Count Kit from EcoSpark, which has a beat sheet and several other pieces of equipment to help you with your sampling.

How to conduct a beat sheet survey

Now that you have your beat sheet and equipment, you can begin surveying your site!

1. First, approximate the number of leaves on the branch that will be surveyed.
2. Hold the beat sheet under the survey branch.
3. Hit the survey branch 10 times with a stick within 4-5 seconds.
4. Arthropods (> 2mm in length) that fall in the beat sheet are observed and used for data collection (photographs can be taken if needed – especially of caterpillars)
5. Arthropods are returned back to the tree or shaken off the beat sheet onto the ground.
6. Repeat this method for each survey branch per satellite and center tree.

How to record your data

The best way to collect your data is through the *Caterpillars Count!* App. Below, we have detailed what each button does when you enter the app.

Survey Code Password

To conduct a survey, you first need to enter the unique 3-letter code specifying the survey branch you are at. Confirm that the site name, circle, and tree species is correct. The first time at a new site, you will need to enter the site password which should have been provided to you by the local site coordinator. You only need to enter the password one time for a site and from then on, the app will remember that you have permissions.

Date and Time.

Date and Time will autofill with the current time and date, and unless you are entering data that was collected on some other occasion, you will not need to adjust them.

Survey Type

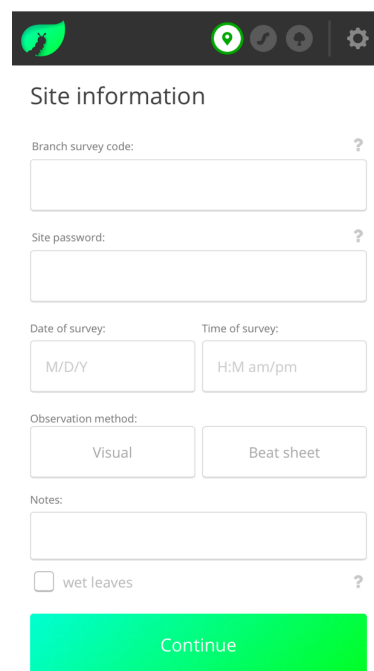
Specify whether you will conduct a Visual Survey (in which you inspect a set of 50 leaves and associated petioles and twigs), or a Beat Sheet Survey (which requires that you beat a branch over a "beat sheet" [assembly instructions available on the website]). This is a space to enter notes about potentially relevant observations that might apply to the entire survey as a whole. For example, perhaps the branch was bent or disturbed since the last time it was surveyed, or there was an unusual weather event.

Notes

This is a space to enter notes about potentially relevant observations that might apply to the entire survey as a whole. For example, perhaps the branch was bent or disturbed since the last time it was surveyed, or there was an unusual weather event.

Wet Leaves

Tick this box if the foliage you are surveying is wet from dew or recent rain, which might impact arthropod activity.



The screenshot shows the 'Site information' form in the app. At the top is a dark navigation bar with a green leaf icon, a location pin, a back arrow, a forward arrow, and a settings gear. The form fields are: 'Branch survey code:' with a text input and a question mark; 'Site password:' with a text input and a question mark; 'Date of survey:' with an 'M/D/Y' input; 'Time of survey:' with an 'H:M am/pm' input; 'Observation method:' with two buttons labeled 'Visual' and 'Beat sheet'; 'Notes:' with a text input; and a checkbox labeled 'wet leaves' with a question mark. A large green 'Continue' button is at the bottom.

Arthropod Information Page

The image displays two screenshots of the 'Arthropod Information Page' from a mobile application. Both screenshots feature a dark header with a green leaf icon, a location pin, a green checkmark, a grey trash can, and a gear settings icon.

The left screenshot shows the initial question: 'Did you find any arthropods?'. Below the question are two buttons: 'Yes' (white with black text) and 'No' (black with white text). A large green button labeled 'Continue' is positioned below these options.

The right screenshot shows the 'Arthropod information' form. It includes a dropdown menu for 'Arthropod group' with 'Not selected' and a downward arrow. Below this are two input fields: 'Length (mm)' with the text '1 mm - 300mm' and 'Quantity' with the value '1' and up/down arrows. An 'Optional photo:' section contains a text field with 'Upload a picture?' and a camera icon. A 'Notes:' text area is located below the photo field. At the bottom are two buttons: a red 'Cancel' button and a blue 'Save' button.

Specify whether you observed any arthropods during your survey, and then tap Continue.

If you selected Yes, then you can now select the arthropod you observed from the dropdown menu. If the arthropod type is not listed and you know what it is, you may select "Other" and describe/name it in the Arthropod Notes field. If you are not sure what type of arthropod you observed, you may select "Unidentified," and describe any relevant aspects of its appearance in the Notes. Also record the length of the arthropod(s) you observed in millimeters, and the number of arthropods observed of this type and size. You may optionally take a photo of the arthropod. Click Save to add this observation record to your survey, and you will see a record of this observation displayed in the Arthropod information section. For every new arthropod you see within this survey, fill out a new record by tapping Add more arthropods.

Note that if you conducted a survey and saw 5 ants, four of which were 3 mm and one of which was 10 mm, and 1 caterpillar of 35 mm, that would require 3 separate records to fill out: 1 for the ants of size 3 mm, 1 for the ant of size 10 mm, and 1 for the caterpillar.

You can optionally take a photo of any arthropod you observe. We highly encourage taking photos of caterpillars!

Plant Information

Plant Species

Plant species names should autofill assuming your site coordinator has entered them in the database. (Site coordinators do this by clicking Manage My Sites and then Edit Survey Plants.) If not, you can manually fill in this field.

Amount of Branch

Depending on whether the branch is broad-leaved or coniferous, you will characterize the amount of branch surveyed differently.

For broad-leaved branches you will be asked for:

- ***Leaf Count***

If you conduct a Visual Survey, this count will be 50 and cannot be edited. If you conduct a Beat Sheet Survey, please estimate the number of leaves that were hanging directly over the beat sheet when you beat the branch. For compound leaves like hickories and ashes, a survey "leaf" refers to an individual leaflet.

- ***Average Leaf Length***

Record the length of an average leaf from your survey branch from the tip to the base (not counting the petiole/stem) in centimeters (2 inches = 5 cm, 4 inches = 10 cm).

For coniferous branches, you will be asked to record:

- ***Average Needle Length***

Record the length of an average needle from your survey branch in centimeters.

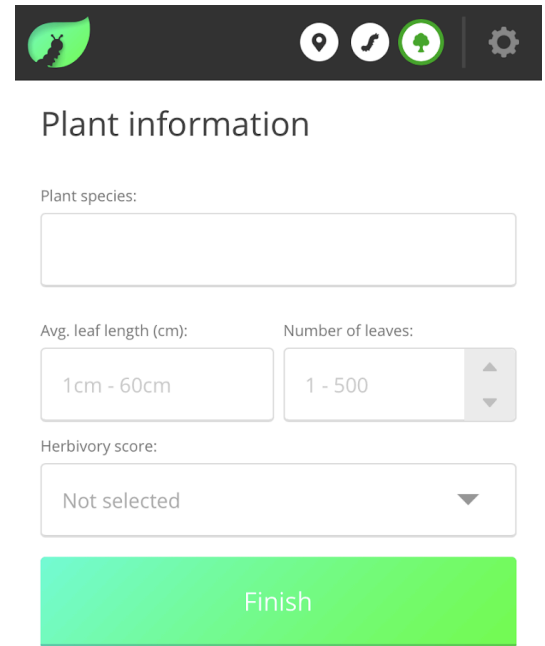
- ***Linear branch length***

The linear branch length sampled is the sum of the lengths of all the branches and twigs examined. For a visual survey, we suggest examining between 100 and 300 cm of branches and twigs, including all of the component needles. Whichever total length works well for you, we ask you to be consistent and use it for all of your visual surveys on conifers, if possible.

For a beat sheet survey, after beating the branch and entering your arthropod observations, you will estimate the sum of the linear branch length sampled as in the animated figure below. Read more about surveying conifers [here](#).

Herbivory

Give your survey branch an herbivory score based on how much leaf damage there is on average over the leaves you examined. 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 over a 50-leaf survey and were able to cover 5 average leaves, that would be 10%. If leaf holes collectively sum to about 2 average leaves worth, that would be 4%, etc.



The screenshot shows a mobile application interface for entering plant information. At the top, there is a dark navigation bar with icons for a leaf, location, a path, a tree, and settings. Below the navigation bar, the title "Plant information" is displayed. The form consists of several input fields: a text box for "Plant species:", a range selector for "Avg. leaf length (cm)" currently set to "1 cm - 60cm", a range selector for "Number of leaves" currently set to "1 - 500", and a dropdown menu for "Herbivory score" currently set to "Not selected". At the bottom of the form is a prominent green button labeled "Finish".

Other Functions in the App

Settings

Tapping the gear icon at the top right gives you the following options: Create New Site, Manage My Sites, Change Password, and Sign Out.

Create New Site

To create a new site, enter the site name and a brief description of the site. Use the map to zoom in and specify the precise location of your site. Enter the number of surveys that you will set up at your site, a number which must be a multiple of 5 and no fewer than 10. Finally, decide on a site password that you will share with participants to permit them to submit data for your site.

Manage My Sites

If you are a site manager, you can click Edit Site to modify any of the basic site information, including changing the site password.

Edit Survey Plants allows you to enter the plant species names for each of your survey locations, and to see the unique survey codes for each survey.

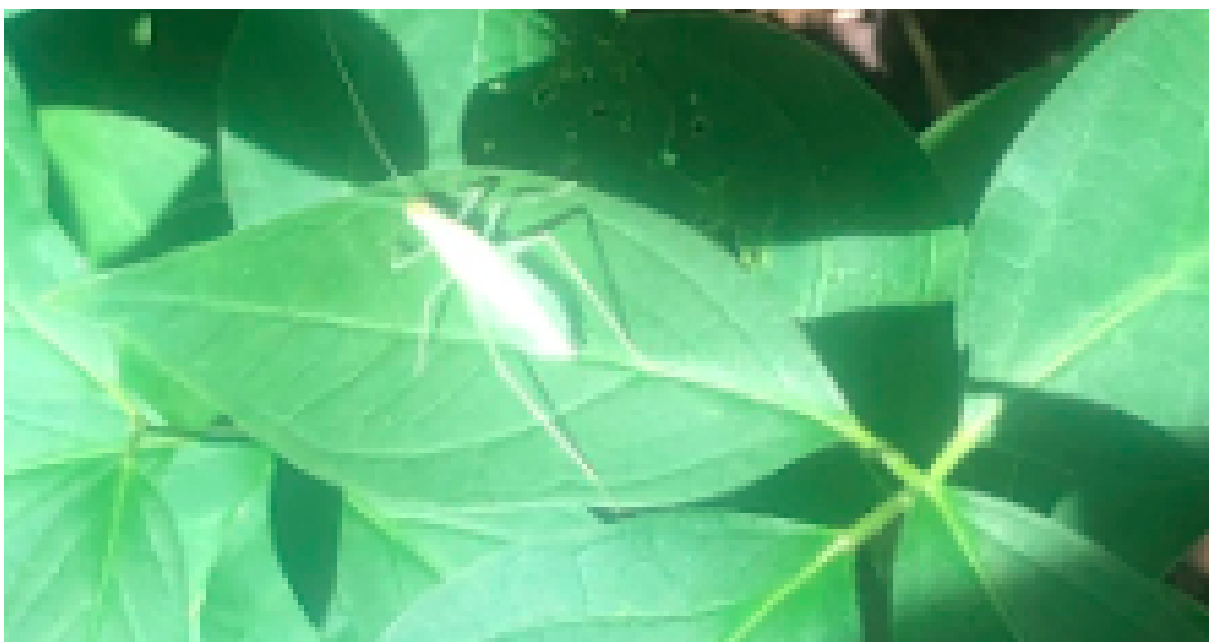
The Print Tags feature will email you a link to a webpage with the complete set of survey location codes/tags for printing, laminating (e.g., folding within a piece of packing tape), and hanging from survey branches.

Change Password

Allows you to change your personal Caterpillars Count! account password (not a site password; see Edit Site above).

Sign Out

Signs you out of the app.



Arthropod ID and Tree ID

Here are a few resources to help with Tree and Arthropod ID.

- [Common Arthropod ID Guide](#)
- [Arthropod Dichotomous Key](#)
- [Arthropod Quiz](#)
- You can also download the Seek app, which is great for tree IDs.

Sampling and Fieldwork Tips

These are a few tips and suggestions to make your fieldwork easier!

- Try to visit your site at a consistent time that is convenient for you. Collecting the data at the same time may help control the arthropods' daily behavior patterns.
- Remember to charge your phone if you plan on collecting data digitally. Also, take an adequate amount of water, especially during the hotter summer months.
- If your site is public, it might be better to visit during times of low public activity.
- It might be easier to enter all the information on the app's home page before collecting arthropods on the beat sheet.



