

Thank you for considering participation in **Caterpillars Count!** with your class. This document is designed to provide some tips and advice for incorporating the project into your class, and to help you ensure students understand the protocols and submit accurate data.

Setting up a **Caterpillars Count!** Site

If you are planning on students performing arthropod surveys, then presumably you will be setting up the **Caterpillars Count!** site on campus or in a nearby natural area. General instructions for setting up a site can be found [here](#).

How many survey branches?

Your first decision will be how many survey branches to create, and this will depend on your specific class situation. For example, a small middle school class where the teacher feels the need to provide oversight over each survey might set up only 10 survey branches (the bare minimum). At the opposite end of the spectrum, a large introductory college biology course with 500 students will require many more!

To decide exactly how many branches would be best, ask yourself the following questions:

- **Will students be working in groups for this exercise?** Groups of anywhere from 2-5 students are recommended, as students can help each other reach consensus on arthropod identifications, and it is more likely that someone will remember specific protocol details. How many groups will you have?
- **How many survey branches will a group be assigned to?** A group might be assigned to a single survey branch, or a “circle” of 5 survey branches, or some other number.
- **How many visits will the group make to its assigned survey branch(es)?** Small classes could potentially carry out repeat sampling of the same branches over several weeks if desired by the instructor. (Although the sampling window during which there are leaves on branches may be limited in either the fall or spring semester depending on latitude.) For very large classes, the instructor may simply be trying to figure out how to get every group to get a single survey opportunity.
- **How many times will the same branch be visited?** If the class is very large, you may need to assign multiple groups to each conduct a survey on the same branch with the understanding that each group should conduct their surveys during separate sampling windows.



College Example:

- At the University of North Carolina at Chapel Hill, *Caterpillars Count!* has been used in the Introductory Biology class (BIOL 101) which has a total of ~560 students across two lecture sections.
- Students were divided into 118 groups of 4-5 students each.
- 120 survey branches (24 “circles” of 5 branches each) were set up across campus.
- Each student group was responsible for conducting surveys at 5 branches (1 “circle”) on a single date.
- This meant that each survey circle was assigned to ~5 different student groups. If one group were to conduct surveys immediately after another group had just finished, the branch would have been disturbed and the second group would probably not see as much.
- For this reason, instructors split up the sampling window into two week-long periods, and assigned half of the groups to each period to hopefully minimize the odds of groups attempting to sample at the same time.
- Instructors were not explicit about assigning exact days for sampling to allow flexibility in students of a group finding a time when their schedules overlapped. However, this might have been more feasible if there were recitation or lab sections associated with the class.
- **Thoughts:** 120 is a LOT of branches to locate, and then print and hang tags for. However, if only 60 branches had been set up, then each branch would have been surveyed by ~10 different student groups. Over a relatively short sampling window, there is greater chance of students trying to survey at roughly the same time, or of a branch getting disturbed so frequently that it has few arthropods by the end of the window. Alternative ways to reduce this sampling overlap would be to assign fewer branches to each group, or to decrease the number of groups (by increasing group size), and those tradeoffs are left to the discretion of the instructor.



High School Example:

- A high school after school science club of 10 students chooses to set up a site with 30 marked branches (6 “circles”) along the edge of school grounds.
- Each week (during the part of the school year with green leaves on the trees), students conduct branch surveys in pairs using a beat sheet, with each pair surveying 6 branches.
- This takes the group approximately 1 hour to conduct all 30 surveys, including sharing cool finds, taking photos, etc.
- **Bonus:** If students become engaged in the project, see if you can get them to create a sign up sheet for conducting surveys on a few dates over the summer.



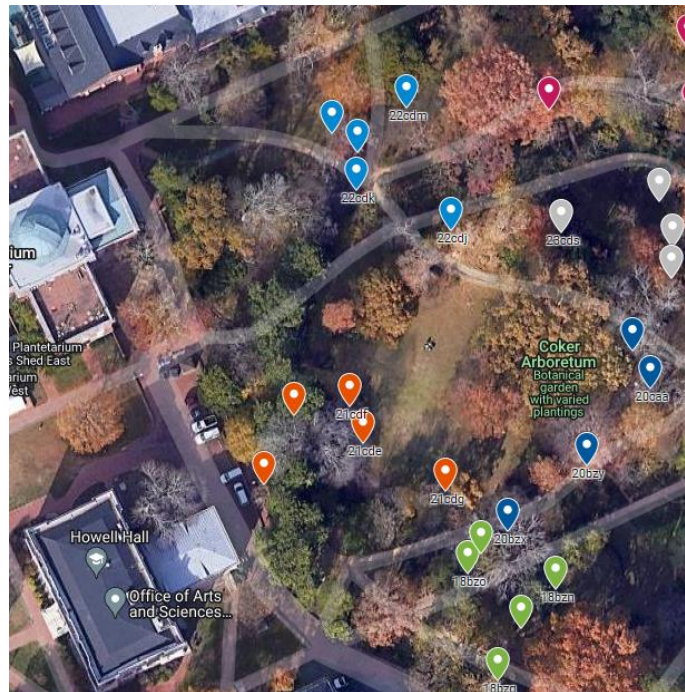
Here are more examples of the number of survey branches used at various schools:

Institution	Class type	Number of survey branches
University of North Carolina	Large mixed-majors lecture	120
NC State University	Large non-majors lecture	65
East Carolina University	Environmental biology lab sections for non-majors	40
Appalachian State University	Non-majors biology lab	105
Environmental Sciences Magnet School	Middle school science class	25

Selecting Survey Branches

You will need to select and tag your survey branches in advance before sending students out to do surveys. Here are some considerations for that process:

- Survey branches must be on trees or bushes (**woody plants only**, no garden plants, herbs or grasses). Branches must have sufficient foliage (e.g. at least 50 leaves if doing visual surveys) at eye level.
- Follow [these instructions](#) for **selecting survey branches in groups of 5**.
- **Print a campus map** and mark the rough locations of the trees you are selecting. You will need to find them again to hang the branch tags later.
- Although not required, the arthropod survey data will be far more valuable if the **survey branches are identified to species**. Consider asking a colleague to help with species identifications if you do not have botanical expertise. Apps like *iNaturalist* and *LeafSnap* may also be helpful in identifying your branches. Even an identification to genus (e.g., oak sp., maple sp., etc.) is helpful.
- **Tree species id's can be** entered directly into the mobile app as you walk around selecting branches by tapping the Settings gear icon in the top right, and then *Manage My Site > Edit Survey Plants*. Tap the relevant circle and branch to edit.
- By creating a site online, a **set of unique branch tags** will automatically be created. Access and print them from the website by logging in and going to *Manage My Site > Print Tags*. These can be laminated or folded up within a piece of clear packing tape and then hung by twist ties.
- **Consider making a map of survey branch locations** to share with students like [this one](#) (example at right). In this case, the pins are labeled with the circle # followed by the branch's unique 3-letter code.
- If necessary, seek permission from groundskeeping or other entities for hanging tags on branches. By giving them a heads up, they may be less likely to inadvertently prune survey branches, or at least they may be more likely to let you know when they do.



Okay, you've selected and tagged your branches, and your site is now ready for students to conduct surveys!

Introducing Students to the Project

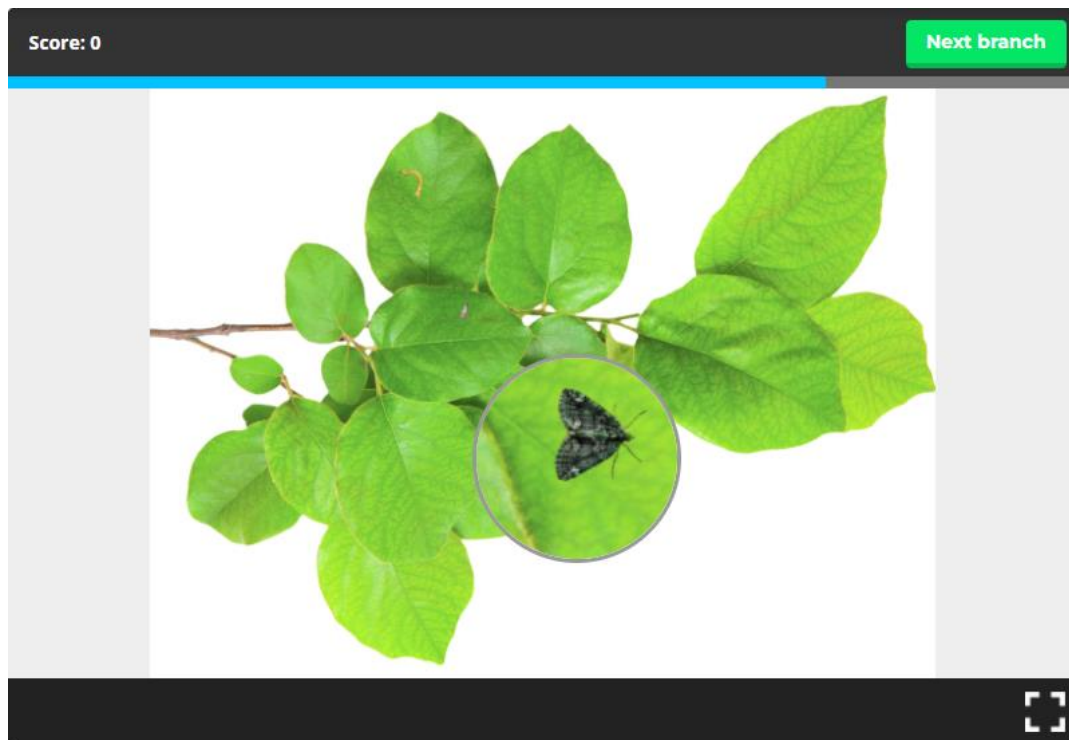
The specific context in which you are introducing this project will vary from class to class. It could be in the context of biodiversity, food webs, entomology, phenology, climate change, citizen science, or any number of other facets for which you presumably have content.

- To provide an overview of the rationale and goals of the *Caterpillars Count!* project, have them watch the short one and a half minute video linked on the [project homepage](#).
- Introduce students to the concept of “citizen science”, in which members of the public may contribute observations and data that can help scientists answer important research questions. There are great resources at [citizenscience.org](#) and [SciStarter.org](#).
- Data collected by students could potentially help answer a number of questions:
 - How does the density of arthropods vary...
 - geographically?
 - with urbanization?
 - by plant species?
 - seasonally?
 - Which arthropod types are most common on foliage and which are rare?
 - Are different arthropod groups more or less common than in the past?
 - Has climate change impacted the abundance or seasonal timing of arthropods?
 - And many more!
- Because they will contribute data to a real scientific database, it is important to follow directions exactly and to do their best.
- They shouldn't feel stressed about submitting low quality data because they will have the option to say if they're not sure of the type of bugs they find.



Preparing Students for Conducting Surveys

- Detailed written instructions are provided on the [website](#), and you can assign them to watch the video instructions for conducting either a [visual survey](#) or a [beatsheet survey](#).
 - Note that you should **pick just a single survey method** for the class. Beat sheet surveys may be less feasible for large classes because of equipment logistics, but more preferable for small classes and younger students because they make it easier to show and share bug finds and require less patience.
- Students should create a **Caterpillars Count!** account using their institutional email.
- Have them take this [Survey Protocol Quiz](#). Answers are provided at the end of the quiz.
- Introduce them to our [resources](#) for [arthropod identification](#), including this [Photo ID Quiz](#). Instructors at NC State asked students to keep trying the quiz (it shows different photos each time) until the student got 90% or better.
- Have them practice the full experience—finding bugs, identifying them, and estimating length—using our [Virtual Survey Game](#). The game will indicate which of those 3 tasks they need to work on most.



Screenshot of the virtual survey game, where students have to locate, identify, and measure bugs on branches.

Email to students

Here is some example text you could share with your students at the beginning of the project. Feel free to modify as needed for your purposes. I suggest sending this out in writing/email in addition to talking about it in class:

In class, we will be participating in a citizen science project called **Caterpillars Count!** The data we submit as a class will become part of an international database that will help researchers answer questions about the abundance and composition of arthropods and how they vary geographically, seasonally, and from year to year across North America.

As such, we want to ensure that the data we submit is as accurate as possible. Here are a few **DOs** and **DON'Ts** of data submission.

- **DO** select the “Unidentified” option if you are not confident about the type of arthropod you observed.
- **DO** provide some text describing the color and features of anything listed as “Unidentified”.
- **DO** take a photo of the bugs you encounter using the app (especially for caterpillars, or for any unidentified bugs you are unsure about). Make sure they are in focus!
- **DO** learn how many millimeters wide your pinky nail and thumbnail are. These “rulers” will always be with you!
- **DON'T** ever guess the type of arthropod if you are unsure. (Use “Unidentified”, see above.)
- **DON'T** make up data. Report only exactly what you find on your survey branch, even if that was “no bugs found”. Fabricated data will impact the research findings from your site.
- **DON'T** upload photos from the internet. Only submit photos taken of bugs on your survey branch at the time of the survey.
- **DON'T** count bugs that are outside of your visual survey area, or that are not on your beat sheet. This means you should not count bugs on the ground nearby, or on the tree trunk, etc.



Assessing Participation

Instructors may wish to verify that students actually conducted the assigned surveys. Here are some methods instructors have used:

- Check the total number of surveys conducted by week on the [Manage My Sites](#) page.
 - From this page you can also click on a link to your site's photo observations on iNaturalist. (But note that even if students were instructed to photograph all bugs found, not all survey branches will necessarily have bugs to photograph.)
- Scan the [Manage My Surveys](#) page to see exactly which survey branches have been surveyed, and by which students.
- Have students take and submit a selfie of themselves at one of their survey branches. Have them tag us on Twitter [@CaterpillarsCt](#).

Resources

We provide all types of training and learning resources on the project website. Some of those resources are listed by category below.

Resource Type	Resources
Arthropod identification	<ul style="list-style-type: none"> • Dichotomous keys • Arthropod ID guide and slide deck • Online Arthropod ID Quiz • Virtual Survey Game
Learning survey protocols	<ul style="list-style-type: none"> • Video instructions for visual and beat sheet surveys • Mobile App Instructions • Survey Protocol Quiz • Virtual Survey Game
Data management	<ul style="list-style-type: none"> • How to view, edit, or delete survey data • How to explore and visualize data • Site Manager Guide
Learning activities	<ul style="list-style-type: none"> • Open-ended inquiry using data viz tools • Learning activities (click on <i>For Educators</i>) • Complementary project ideas