

(<https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/>)

BIO 181 Hybrid Lab

Unit 4.2: Urban Ecology -Field Sampling Methods

Ecological Methods – Unit 4.2: Field Sampling Techniques

You get to go explore! Enjoy your time outdoors, but be safe!

Urban Ecology Methods

In preparation for data collection, be sure to read and view the videos in all points raised under **Benchmark #1** “Before going out in the field to collect data” on the Urban Ecology main webpage (<https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/lab-unit-4-scale-insect-online-blended/>). .

We highly suggest you enlist the help of a friend, lab partner or family member to help you collect data. They can be your scribe and/or help hold things while you collect data and take pictures. If you work with a lab partner, you cannot sample the same trees for your data collection. You can sample the same species, if you are sampling different actual trees. We want to increase sample size for our data to more easily see trends.

Materials you need on the field:

- Urban Ecology Data Collection Handout (https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/wp-content/uploads/sites/351/2024/02/Urban-Ecology-Data-Collection-Sheet-Spring_FinalB.docx).  (Sp2025)
- measuring tape or string at least 1 meter in length
- clear grid transparency with 1 x 1 cm² marks (provided in lab – 1 per student)
- a magnifier app for your phone: *Magnifying Glass* for iPhones (<https://apps.apple.com/us/app/magnifying-glass-flashlight/id908717824>) or Android

(https://play.google.com/store/apps/details?id=com.rvappstudios.magnifyingglass&hl=en_US) (look for free apps)

- > a compass app for your phone: *Compass* for iPhones or Android (look for free apps to determine North, South, East, West directions)
- > pen or pencil
- > phone camera/regular camera

Safety: Please be mindful of traffic, wildlife, standing water, any sort of brush or vines that may be hazardous. Wear closed-toed shoes and socks to cover your ankles. You may want other protective items like a hat, sunscreen, long-sleeved shirt and long pants. **Field Work Safety Guidelines**

(<https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/wp-content/uploads/sites/351/2023/08/Field-Work-Safety-in-BIO-181-labs-F23.pdf>).  – Important reminders.

Expanded Directions for Data Collection Beyond the Lab Unit 4.2 Lab Handout:

Complete Methods, # 1-4 below –Follow additional information below for Methods

Search for two locations near to you, one that is urban with nearby impervious surfaces (Area “A”), i.e., asphalt, concrete, and one that is a more natural/rural area (Area “B”) without impervious surfaces. You will need to find a tree in each area on which to collect data. These trees must have a DBH (Diameter at Breast Height – see Method #3 below) of at least 10 cm .

Methods #1 – Making observations:

Find a tree that has a DBH (see Method 3 below) of at least 10 cm. (ideally of the same species) in the two different locations (Area “A” and Area “B”), make observations (items #1 a-f) and record on the data collection sheets for each location. Note: many trees will not have leaves at this time, but you may be able to observe other features of the tree. Identify your tree. Try to make as many observations as possible and take pictures (add GPS location/geotag, if possible).

- > Assess the Relative health of each of your trees. Use 13 Steps for evaluating tree health (<https://www.deeproot.com/blog/blog-entries/13-simple-steps-to-evaluate-trees>).  . Rank the trees rank as *Healthy (H)*, *Unhealthy (UH)*, or *Unsafe (US)*.
- > View the list of **Resources** at the end of this page that includes tree identification guides/apps, information on organisms that live on or around a tree, and characteristics of tree health.
- > You may want to get ideas from the background material in Unit 4.1. and refer to the webpage for Identifying Herbivory, Fungal Incidence, and other Associations (<https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/unit-4-leaf-herbivory-examples/>).  for clues to what other organisms may be living in or around the tree.
- > Images of leaf herbivory, fungal infection and other tree associations (Unit 4.1 Leaf Herbivory Examples (<https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/unit-4-leaf-herbivory-examples/>)).  under Laboratory Units) may be helpful as evidence for the presence of various herbivores and other associations.

Search for two locations near to you, one that is urban with impervious surfaces (Area “A”), i.e., asphalt, concrete, and one that is a more natural area (Area “B”).

Methods #2 – Plant-to-Pace:

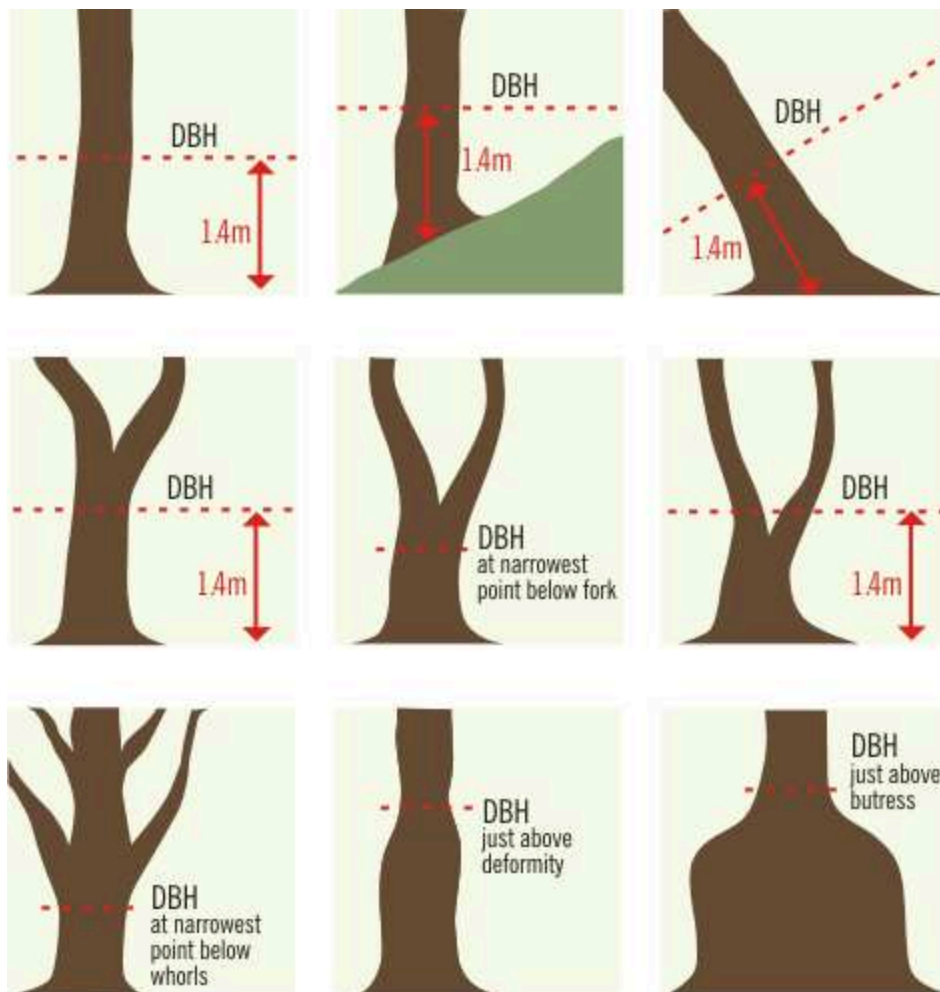


- Pace to plant technique (<https://content.ces.ncsu.edu/measuring-impervious-surface-cover-with-the-pace-to-plant-technique/>) follow steps 1-5
- Complete Method #2 a-d in the Lab Handout for the two trees you selected, one at each location (Area "A" and Area "B").
- Record your data in Table 4.2-1 (Area "A") and Table 4.2-4 (Area "B"). See the following for additional

Methods #3 – Diameter at Breast Height (DBH):

Record this measurement for each tree, and enter in Table 4.2-2 (Area "A") and Table 4.2-5 (Area "B").

- You will need a measuring tape to measure the circumference of your tree (or use a string, ribbon, or anything you can wrap around the tree and later use to measure with a measuring stick or ruler). Report your data in metric units.
- You will need a measuring tape to measure the circumference of your tree (or use a string, ribbon, or anything you can wrap around the tree and later use to measure with a measuring stick or ruler).
- You will also need to take similar measurements at 2 feet above the soil line.
- Video – How to take DBH measurements (<https://forestry.ces.ncsu.edu/forestry-videos/>).



Methods #4 – Determining % Surface Area Cover of Lichen at the 4 Cardinal Direction Points (N, S, E, W Compass Points) and at 2 Heights:

Review the short [Introduction to Lichens video \(https://www.youtube.com/watch?v=XQ_ZY57MY64\)](https://www.youtube.com/watch?v=XQ_ZY57MY64) to clearly differentiate between and identify the 3 growth forms of commonly found Lichens: crustose, foliose and fruticose.

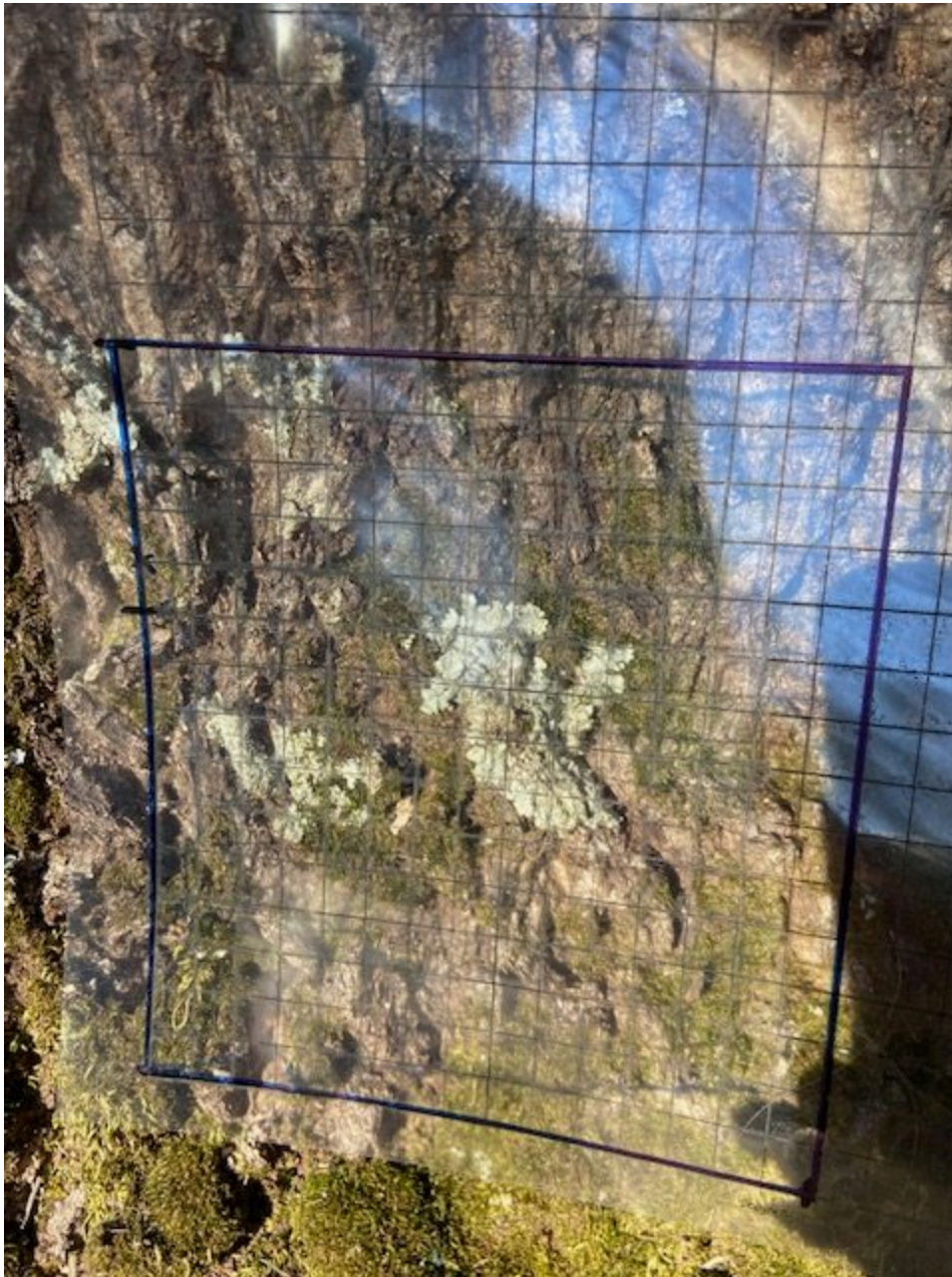
Use your phone to locate a free Compass App to determine the North, South, East and West sides of your tree.

We will use the DBH measurement to assess the % of lichen coverage on the north, south, east and west sides of each tree using a provided clear transparency grid with 1 cm² squares. An area of 15 x 15 cm² has been outlined as the sampling area to determine % cover in each direction.

We will also determine the % lichen coverage at the 2 foot height from the ground sampling on the north, south, east and west sides of the tree. The process is the same, just at a different height.

To determine % coverage using the clear grid, we will use a similar method used in determining leaf surface area (a method used for the Fall Ecology Projects when leaves are out on trees and shrubs).

1. Start your lichen measurements by centering the outlined 15 x 15 cm² grid at the DBH height on the **north** compass point side of the tree. Without removing the grid, calculate approximate surface area that overlies lichen on the tree. You can do this visually or you may take a picture of the grid over the lichens *if you can clearly see the lichens and bark underneath* while maintaining a clear view of the grid lines themselves. See below for how to estimate lichen coverage in each grid square. -> *Be sure to practice this method before taking your surface area measurements out in the field.*



From this example, the lichens are light gray green and **foliose** in growth form. Crustose and fruticose lichen are not present in this sample area. The darker green organisms are moss (do not measure the moss).

Moving across each row of 1 cm² squares, assess if each square is:

- 1 cm square is less than 1/2 full with lichen (= 0 cm²)
- 1/2 full with lichen (= 0.5 cm²)
- more than 1/2 full with lichen (= 1 cm²)
- Write down each # counted per square on scrap paper and add them up.
- Also record all growth forms of lichens present within the whole 15 x 15 cm² sampling area.

Record the **overall** lichen surface area cm² found in the 15 x 15 cm² grid sampling area.

Then calculate the % lichen coverage in the 15 x 15 cm² sampling.

Record what lichen growth forms are present (crustose, foliose, fruticose).

In this pictures, the overall surface area adds up to 17.5 cm² in each 15 x 15 cm² sampling area and the % Lichen coverage calculates to 7.8%.

An example of how to count the surface area in the 1 cm² square grids can be found in this [video](https://ncsu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=a48f8d08-eca3-4166-8b46-acb600a55117) (<https://ncsu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=a48f8d08-eca3-4166-8b46-acb600a55117>). . The method is the same, but here the video is measuring surface area of a whole leaf on a tree, and the area missing due to herbivory. You should follow this same method to determine the lichen surface area in a 15 x 15 cm² area.

2. After sampling the north side of the tree at DBH, go ahead and sample the south, east and north sides of the tree in the same manner at the same height. Remember to record the types of lichen growth forms seen in each sampling area.

3. Repeat this data collection process at the 2 feet height on the north, south, east and west sides of the tree.

Record all data (surface area of lichen and types of lichen) for both Tree A and Tree B in the Urban [Ecology Data Collections Handout](https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/wp-content/uploads/sites/351/2024/02/Urban-Ecology-Data-Collection-Sheet-Spring_FinalB.docx) (https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/wp-content/uploads/sites/351/2024/02/Urban-Ecology-Data-Collection-Sheet-Spring_FinalB.docx). . – Table 4.2-3 and 4.2-6. (same form provided at the top of this webpage).

[Click to return to main Unit 4.2 Webpage \(https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/lab-unit-4-scale-insect-online-blended/\)](https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/lab-unit-4-scale-insect-online-blended/)



Resources:

Tree Health and Urban Ecology:

13 Steps for evaluating tree health:

<https://www.deepproot.com/blog/blog-entries/13-simple-steps-to-evaluate-trees> (<https://www.deepproot.com/blog/blog-entries/13-simple-steps-to-evaluate-trees>).

Storm damage to landscape trees from NC State's Extension program:

<https://gardening.ces.ncsu.edu/weather-2/storm-damaged-landscape-trees/> (<https://gardening.ces.ncsu.edu/weather-2/storm-damaged-landscape-trees/>).

What Tree Should be Planted from NC State's Extension program:

<https://lenoir.ces.ncsu.edu/2019/02/what-tree-should-be-planted/> (<https://lenoir.ces.ncsu.edu/2019/02/what-tree-should-be-planted/>).

Resources for Tree and Organism Identification: Here are some resources in the form of links and applications (some of these apps are not free, but you can search for your own online too):

Winter Tree Identification

Winter Tree ID Key (<https://www.uwsp.edu/cnr-ap/leaf/Documents/LEAFWinterTreeIDKey.pdf>)  – nice handout with diagrams for twig tip anatomy and terminology

NC Tree Identification from NC State's Extension program:

<https://gardening.ces.ncsu.edu/2015/08/nc-tree-identification/> (<https://gardening.ces.ncsu.edu/2015/08/nc-tree-identification/>).

Trees – NC State Resources Extension Program:

<https://gardening.ces.ncsu.edu/gardening-plants/trees-3/> (<https://gardening.ces.ncsu.edu/gardening-plants/trees-3/>).

ChopDoc – list of apps for tree identification by leaves and bark: -website is currently down.

[ChopDoc – list of apps for tree identification by leaves and bark](#) ([opens in new window](#)) (<https://chopdoc.com/how-to-identify-tree-by-leaves>). 

Seek by iNaturalist – app that helps you identify organisms: (includes plants, animals and fungi)

https://www.inaturalist.org/pages/seek_app (https://www.inaturalist.org/pages/seek_app).

MyNature Tree Guide:

Android: <https://www.amazon.com/MyNature-Inc-Tree-Guide/dp/B00CJ10YV4>
(<https://www.amazon.com/MyNature-Inc-Tree-Guide/dp/B00CJ10YV4>). 

iPhone <http://www.mynatureapps.com/mynature-tree-guide/>
(<http://www.mynatureapps.com/mynature-tree-guide/>). 

iBird: <http://ibird.com/#> (<http://ibird.com/>) – website is currently down.

Peterson's Bird Guide: <http://petersonguides.com/apps/apps.php>
(<http://petersonguides.com/apps/apps.php>).

Merlin Bird ID: <https://merlin.allaboutbirds.org/> (<https://merlin.allaboutbirds.org/>).

Audubon Bird Guide App: <https://www.audubon.org/app> (<https://www.audubon.org/app>).

Butterfly Collection – app for identifying butterflies and other insects:

<http://hunter.pairsite.com/butterfly/> (<http://hunter.pairsite.com/butterfly/>).

[Return to Lab 4.2 Main Webpage](https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/lab-unit-4-scale-insect-online-blended/) (<https://wordpress-projects.wolfware.ncsu.edu/bio-181-hybrid-lab/laboratory-units/lab-unit-4-scale-insect-online-blended/>)



