



The Tree-mendous Benefits of Trees:
An introduction to trees and scientific observations

Mentor's Guide

The **purpose of this tip sheet** is to help you as a scientist mentor **anticipate and respond** to students as they post online about their plant pathology-related investigations. Initial guided inquiries, in which students will be encouraged to get out and look at their surroundings, include conducting a tree/plant survey and making observations of nearby trees and plants. They may measure and observe plants and trees, observe interactions of flora with the local fauna (including humans), measure trees (circumference/height), count lesions, galls, cankers, or fungi, determine whether a tree is healthy or diseased. Students will discuss – in the classroom and outside the classroom – the importance and value of trees, how to tell whether they are healthy or diseased, what they contribute to landscapes and our atmosphere. After these guided inquiries, students will need to develop research questions to address their knowledge of trees, tree health, and how they connect to humans and human activities – and vice versa. Students may then work in teams to measure tree height, diameter, and even tree benefits using the [National Tree Benefits Calculator](#).

Expect teachers to adapt the module for their students:

School facilities or resources may make some experimental designs challenging. The equipment available and class experience with inquiry learning will influence the direction investigations take. Student motivation also plays a role in these investigations.

Connect with your teams' teacher via the **Classroom Group** for details about the students and teacher's goals and schedule.

Please see the **Tree-mendous Benefits of Trees Teacher's Guide** for learning goals, suggested sequence of activities, and schedule planner.

Juicy Questions for student investigations:

- How do humans use trees?
- How do other animals use trees?
- What can happen when trees get sick?
- How can we calculate the value of trees in a landscape?



Video Resource:

- **Portland Parks and Recreation**, How to Measure Trees: <https://youtu.be/R9eQ9qFrSVs>
- USDA Animal and Plant Health Inspection Service, Hungry Pests website: www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/ - Meet Vin Vasiv: a series of 30-second videos that illustrate how invasive species can be moved by humans.

What are students thinking when it comes to trees in our landscape?

As students blog about their investigations, they reveal their ideas. It is common for students to have a...

- Lack of awareness that plants can get sick or wounded
- Lack of knowledge about the wide range of benefits associated with trees

Attending to students' ideas and thinking

By attending to students' thinking, attention shifts from a right-answer orientation to uncovering student ideas and reasoning. As experts, we often make assumptions about what a student is meaning and connect concepts in ways novice learners cannot. Assumptions are often turned on their heads when probed. Also, responding as a naïve mind opens up possibilities in the discussion. Although students often learn by rote that food comes from farmers – in an abstract way, they have little experience with the concept of plant stress or disease/pest management.

What do arborists do when plants “get sick”? Can they protect plants from pests? This process of armchair inquiry, or **digging into juicy questions**, is a highly valued process in science.

Resources and References

- **National Tree Benefits Calculator website:** www.treebenefits.com/calculator/
- **City of Portland**, How to Measure a Tree www.portlandoregon.gov/trees/article/424017
- Forest Health Detectives, an Inquiry and Investigation by Tara L. Bal, published in the American Biology Teacher (Vol. 76, Oct. 2014) has good diagrams and photos, as well as ideas for research investigations and data collection.
- Diagnosing Sick Plants, Ohio State University Extension, by S.D. Williams, M.J. Boehm, J. Chatfield, J. Boggs and E. Draper. <https://ohioline.osu.edu/factsheet/plpath-gen-2>
- USDA Animal and Plant Health Inspection Service, Hungry Pests website: www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/
- “Getting to the root of urban health” by Erik Ness. <https://dl.sciencesocieties.org/story/2015/dec/thu/getting-to-the-root-of-urban-tree-health>
- iNaturalist is a great app to help identify local flora and fauna simply by sharing images, and fellow naturalists will help confirm or adjust your identifications. <https://www.inaturalist.org/>
- The Seek by iNaturalist identification app is an excellent resource to help identify plants, animals and fungi. https://www.inaturalist.org/pages/seek_app
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Teachers say it is hard to find accessible, scientifically accurate background information for students. Are there resources you recommend?

Possible prompts for open inquiry projects that students may tackle:

Possible questions and inquiries	Comments; suggestions for data collection, reporting and evaluation
What kind of trees in the study area offer the most and/or least landscape benefits?	Students can research the landscape benefits of the different tree species (e.g. shade, size, leaf color, blossoms, insect and disease resistance, adapted to your climate, tolerates road salt, etc.
How do trees in the study area contribute to local biodiversity?	Students can list and describe any organisms on or around the trees that were found and research (internet, books) to learn more about the types of wildlife, birds, fungi and insects associated with your tree species (it may be impossible to observe birds, squirrels etc. depending on the time of year). Information can be presented in an infographic or chart.
What are observable indications of healthy trees compared to unhealthy trees in the study site?	Create an infographic, drawings or photo collage of observations.
What is the percentage of healthy trees compared to unhealthy trees?	Calculate percentages and graph data and comment on any patterns in tree health within the study area.
Is there a relationship between tree size and tree type? E.g. Storm Water (gallons of stormwater runoff intercepted), Property Value, Energy, Air Quality, Atmospheric Carbon, and Tree Value (\$)	Data can be presented in a graph or table. Students can discuss the costs-benefits of trees in a landscape.
What can be done to improve the management of trees? What should be done with sick or dying trees?	Students can research tree care options, including the cost of pruning or cutting down trees. Depending on the location/ownership of the trees, investigations comparing treatments could be done.
Taking into account costs, benefits, and location constraints, what trees would you recommend planting if you were managing the landscape of the study area?	Students can search local nurseries on the internet to determine the cost of purchasing a tree. Students can also try to estimate how many years until the stand is established. How can this information be used by the school to make decisions on whether to purchase and plant more trees?