



LEAF: Learning About Forests

BASELINE AUDIT, GRADES 9-12

Consider contacting local, regional or state non-profits, state Forest Service, or tree and forestry non-profits for assistance conducting your audit. Their involvement is a great way to connect to the community, inspire students, demonstrate career possibilities and share resource expertise.

Invite parents and community members to participate in the auditing process. Students can take on the role of educator by working with volunteers on citizen science projects. This experience is a great way to build community.

Before starting the LEAF audit or going further, survey your students. Record the average response.

On a scale from 1-10, 10 being the most important and 1 being the least important,

- How important are trees to plants and animals? _____
- How important are trees to the national economy? _____
- How important are forest systems to communities? _____
- How important are a school's actions to forest conservation and stewardship? _____



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TABLE 1. DEFINING THE STUDY SITE

<p>1. What are the GPS coordinates for your study site? Use your smartphone's GPS or go to: https://www.whatsmygps.com to find the coordinates.</p>	<p>Latitude N _____ Longitude W _____</p>
<p>2. In what watershed is the study site located? https://cfpub.epa.gov/surf/locate/index.cfm</p>	
<p>3. What type of treed area is the team/class auditing? Check all that apply.</p>	<p>() school grounds () community forest () state or national forest () urban () suburban () rural</p>
<p>4. Is the study site being actively managed? If yes, for what? Check all that apply.</p>	<p>() Yes () No () Timber () Firewood () Wildlife Habitat</p>
<p>5. How many trees are in the forest study site?</p>	<p>() A few (less than 5) () Some (between 6 and 12) () Many (more than 12) () Exact number if known _____</p>
<p>6. If there are dead trees on the study site, count the number of standing fallen dead trees.</p>	<p>_____ N/A _____ Standing dead trees (snags) _____ Fallen dead trees (logs)</p>
<p>7. What types of trees are found in the study site?</p>	<p>() Deciduous () Evergreen () Mixed</p>
<p>8. How is land used surrounding the study site? Check all that apply.</p>	<p>() Residential () Park or Public Green Space () Commercial () Undeveloped Land</p>



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CHART 1. TREE SPECIES DATA

Refer to the Forest Study Site Measurement Guide. Choose 5-10 trees and complete Chart 1.

Data in Chart 1 will be used in Table 6.

Tree Species	Deciduous (D) or Evergreen (E)	Age Sprout, Seedling, Mature, or Snag	Tree Height in Feet	Tree Diameter (DBH) in Inches
Example: Sugar Maple	D	Mature	17	28
#1				
#2				
#3				
#4				
#5				
#6				
#7				
#8				
#9				
#10				

Think about the following questions as you summarize the information in Table and Chart 1.

1. Summarize the study site based on the site definition data collected.
2. Is it better to have trees of one type or trees of many types? Explain.
3. What actions can the team/class take to improve biodiversity?



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TABLE 2. WEATHER

<p>1. Identify the season during which data is being collected.</p>	<p>() Summer () Fall () Winter () Spring</p>
<p>2. What is the average annual rainfall? https://www.usclimatedata.com</p>	<p>_____ in. _____ cm</p>
<p>3. From 2000 to now, list the number of years the study site's county shows <i>D2 Severe Drought</i> to <i>D4 Exceptional Drought</i>. https://droughtmonitor.unl.edu/Data/Timeseries.aspx</p> <ul style="list-style-type: none"> • Area Type – Choose county. • Area – Choose your county. • Index – Leave as is. • Fill Area – Leave checked. • Show – Uncheck D0 and D1. 	<p>_____</p>
<p>4. Surface Ozone Use ozone test strips for this measurement.</p>	<p>_____ parts per billion (ppb)</p>

Think about the following question as you summarize the data in Table 2.

1. How do weather conditions impact trees and/or forest systems? What is the relationship? What patterns can be observed?
2. What type of weather is expected when the post-audit is conducted?
3. In the last year, has there been a fire, flood, drought or other extreme weather event in or around the forest study site? If yes, elaborate.



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TABLE 3. WATER QUALITY

1. Is there a water source within 50 yards of the study site? If yes, conduct the following water quality tests.		() Yes () No
2. pH Test 1 _____ pH Level Test 2 _____ pH Level Test 3 _____ pH Level () Acidic () Neutral () Basic		3. Temperature Test 1 _____ °F _____ °C Test 2 _____ °F _____ °C Test 3 _____ °F _____ °C
4. Conductivity Test 1 _____ μS/cm Test 2 _____ μS/cm Test 3 _____ μS/cm	5. Alkalinity Test 1 _____ CaCO ₃ mg/L Test 2 _____ CaCO ₃ mg/L Test 3 _____ CaCO ₃ mg/L	6. Dissolved Oxygen Test 1 _____ mg/L Test 2 _____ mg/L Test 3 _____ mg/L
7. Transparency – Choose method A or B. A1. Secchi disk – distance from observer to: Test 1 _____ m water surface _____ m where disk disappears _____ m where disk reappears Test 2 _____ m water surface _____ m where disk disappears _____ m where disk reappears Test 3 _____ m water surface _____ m where disk disappears _____ m where disk reappears A2. Secchi disk reaches the bottom and does not disappear – distance from observer to: Test 1 _____ m to water surface _____ m depth to the bottom of the water site Test 2 _____ m to water surface _____ m depth to the bottom of the water site Test 3 _____ m to water surface _____ m depth to the bottom of the water site B. Transparency Tube Tube test 1 _____ cm or _____ greater than depth of transparency tube. Tube test 2 _____ cm or _____ greater than depth of transparency tube. Tube test 3 _____ cm or _____ greater than depth of transparency tube.		

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Think about the following questions as you summarize the data in Table 3.

1. Why is it important to observe and test water quality near tree systems?
2. What is the relationship between water quality and tree system health?
3. What impacts are associated with water quality after a forest fire or extreme weather events?



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TABLE 4. SOIL QUALITY

1. Soil Temperature <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">At 5 cm</td> <td style="width: 50%; border: none;">At 10 cm</td> </tr> <tr> <td style="border: none;">_____ ° F _____ ° C</td> <td style="border: none;">_____ ° F _____ ° C</td> </tr> <tr> <td style="border: none;">_____ ° F _____ ° C</td> <td style="border: none;">_____ ° F _____ ° C</td> </tr> <tr> <td style="border: none;">_____ ° F _____ ° C</td> <td style="border: none;">_____ ° F _____ ° C</td> </tr> </table>		At 5 cm	At 10 cm	_____ ° F _____ ° C	_____ ° F _____ ° C	_____ ° F _____ ° C	_____ ° F _____ ° C	_____ ° F _____ ° C	_____ ° F _____ ° C	2. Soil pH Test 1 _____ pH Level Test 2 _____ pH Level Test 3 _____ pH Level () Acidic () Neutral () Basic	
At 5 cm	At 10 cm										
_____ ° F _____ ° C	_____ ° F _____ ° C										
_____ ° F _____ ° C	_____ ° F _____ ° C										
_____ ° F _____ ° C	_____ ° F _____ ° C										
3. Nitrogen (N) Test 1 () Low () Medium () High Test 2 () Low () Medium () High Test 3 () Low () Medium () High		4. Phosphorus (P) Test 1 () Low () Medium () High Test 2 () Low () Medium () High Test 3 () Low () Medium () High									
6. Soil Texture () Sandy () Clay () Silt () Loam		7. Soil Consistence () hard () loose () firm () plastic and sticky									
		5. Potassium (K) Test 1 () Low () Medium () High Test 2 () Low () Medium () High Test 3 () Low () Medium () High									
		8. Soil Color A. () dark () light B. () brown with yellow hues () brown with grey hues () brown with green hues () brown with blue hues									

Think about the following questions as you summarize the data in Table 4.

1. Why is it important to observe and test soil quality in tree systems?
2. What is the relationship between soil quality and tree system health?
3. What impacts are associated with soil quality after a forest fire or extreme weather events?



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Consider contacting a local non-profit, business, government agency, college or university. Their involvement is a great way to connect to the community, inspire students, demonstrate career possibilities and share resource expertise. If you cannot conduct a study in the field please determine the best way to gather data, i.e. a phone call, an email or ideally a virtual conferencing tool with someone who works as a forester, forest ecologist, landscape architect, park planner, volunteer, etc. Contact your state forest service office for resource specialist contacts, resources or recommendations.

Invite parents and community members to participate in the auditing process. Students can take on the role of educator by working with volunteers on citizen science. This experience is a great way to build community.

TABLE 5. WILDLIFE - GENERAL

1. Are there animals present at the forest study site?	() Yes () No
2. Did students see animals in the following families? Check all that apply, then fill in Chart 2. Wildlife-Animal Observations.	<input type="checkbox"/> mammals <input type="checkbox"/> birds <input type="checkbox"/> insects <input type="checkbox"/> reptiles <input type="checkbox"/> amphibians
3. Did you observe other plant types at the study site?	() Yes () No
4. Did students see plants from the following groups? Check all that apply, then fill in Chart 3. Wildlife-Plant Observations.	<input type="checkbox"/> bushes <input type="checkbox"/> grasses <input type="checkbox"/> wildflowers <input type="checkbox"/> ferns <input type="checkbox"/> mosses <input type="checkbox"/> other (fungi)

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CHART 2. WILDLIFE – ANIMAL OBSERVATIONS

Allow students opportunities to practice identifying what wildlife species they are observing. For example, is the bird a Robin or a Black-throated blue warbler? Is the squirrel a red or a gray squirrel? Often the type of wildlife you find in the study site will help to define the health and the type of forest.

Birds, Mammals, Insects, Reptiles, Amphibians	# of Animals Observed	Animal Evidence (tracks, burrows, nests, droppings, etc.)	Other Notes
Example: Birds	5	One nest	Nest had a broken egg, made up of pine needles, feathers and leaf litter

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CHART 3. WILDLIFE – PLANT OBSERVATIONS

Ground Cover (plant life on the ground)	Species or Description	Estimate the Amount Found at the Study Site (a lot, some, a little)
Bushes	Example: Blackberries	a lot
Grasses	Example: Woodland Sedge	some
Wildflowers	Example: White Trillium	a little

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CHART 3. WILDLIFE – PLANT OBSERVATIONS, CONTINUED

Ground Cover (plant life on the ground)	Species or Description	Estimate the Amount Found at the Study Site (a lot, some, a little)
Ferns	Example: Maidenhair	some
Mosses	Example: White-Tipped Moss	a lot
Other (Fungi)	Example: Oyster Mushroom	some

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Think about the following questions as you summarize the information in Table 5 and Charts 2 and 3.

1. How do forests support wildlife?
2. Are there any protected plant or animal species in or around the study site?
3. What are some actions the team/class can take to improve or support wildlife habitat at the study site?



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TABLE 6. TREE WORTH

Use the *National Tree Benefit Calculator*, <http://www.treebenefits.com/calculator>, to collect the data below. Some data will be used as metrics for your school's Eco-Schools USA Dashboard.

Use the information from Chart 1 to begin populating the table below. Next input the requested data into the online calculator at *National Tree Benefit Calculator*. If you would like to provide data for more trees or you would like to calculate multiple trees for a species, please enter the information into an Excel spreadsheet or other document and submit as evidence when applying for an Eco-Schools award.

Tree Species	Tree Diameter in Inches (in.)	Land Use	Stormwater Runoff in Gallons (gal.)	Energy Saved in Kilowatt Hours (kWh)	CO ₂ Captured in Pounds (lbs.)	Annual Overall Tree Benefit in Dollars (\$)
Example: American Beech	25	Park/Vacant	4,191	171	854	\$212
TOTALS						

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Think about the following questions as you summarize the information in Table 6.

1. Did students have prior understanding of true tree value?
2. Worth is not always defined by numbers or monetarily. What value do trees have throughout history, specifically to indigenous communities?
3. How does tree worth impact sustainable development? Keep in mind the three dimensions, social, economic and environmental.
4. What are some of the actions students can take to support local, state or national tree campaigns?

Review of All Data

1. Based on what is known and has been learned, what claims can be made based on the data and other evidence?
2. Be prepared in the post-audit to explain the role **systems and system models** play in understanding forest systems.
3. Be prepared in the post-audit to provide evidence of **stability and change** within a forest system.
4. Be prepared in the post-audit to explain **patterns** students have identified through their investigations.
5. Be prepared in the post-audit to explain any **relationships** students identified between wildlife and data sets collected.