



FOREST ECOLOGY & MANAGEMENT

Students will learn about forest ecology and management. They will use a Tree ID book to identify species and use their sense of touch during a blindfold tree bark game. Lastly, they will conduct a town hall debate about managing the Pisgah Forest using role-play.

LESSON LENGTH:

- Part 1: 1 hour
- Part 2: 2-2.5+ hours

GOALS:

- Students will learn the basics of forest systems and ecological succession as well as forestry practices and sustainable resource management through short lessons, interactive activities, and games as well as a role-play mock town hall debate.

OBJECTIVES:

Students will:

- Learn how to use a dichotomous key and identify trees to the genus level.
- Use reasoning to solve a problem.
- Learn about forest management plans and the relative benefits and weaknesses of different strategies.
- Practice group discussion skills, effective communication within a group, and compromise.
- Gain experience synthesizing information from literature and practice developing and presenting persuasive arguments.

NATIONAL, STATE, LOCAL STANDARDS

NC Essential Science Standards

- Bio.2.2.1: Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction, and introduction of nonnative species) may impact the environment.
- Bio.2.2.2: Explain how the use, protection, and conservation of natural resources by humans impact the environment from one generation to the next.
- EEn.2.2.1: Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.
- EEn.2.4.2: Evaluate human influences on water quality in North Carolina's river basins, wetlands, and tidal environments.
- EEn.2.8.1: Evaluate alternative energy technologies for use in North Carolina.

STUDENT TAKEAWAYS FROM LESSON:

- **Essential question / theme**
 - Forest Ecology and Sustainable management
 - How are forests managed? Who makes the decision about use of the forest?
- **Key concepts and vocabulary**
 - **Sustainable forestry:** The art and science of managing forests to produce various products and benefits including timber, wildlife habitat, clean water, biodiversity, and recreation indefinitely.
 - **Silviculture:** The art, science, and practice of establishing, tending, and reproducing forest stands of desired characteristics. It is based on knowledge of species' characteristics and environmental requirements.
 - **Forest management:** Caring for a forest so that it stays healthy and vigorous and provides the products and values the landowner desires.
 - **Forest management plan:** A written document listing activities that enhance or improve forest resources (wildlife, timber, soil, water, recreation and aesthetics) on private land over a five-year period.
 - **Clearcut:** A harvesting and regeneration method that removes all trees within a given area. It is most commonly used in pine and hardwood forests that require full sunlight to regenerate and grow efficiently.

- **Selective harvest:** The periodic removal of individual trees or groups of trees to improve or regenerate a stand.
- **Seed tree harvest:** A harvesting method in which a few scattered trees are left in the area to provide seeds for a new forest stand. Selection of seed trees is based on growth rate, form, seeding ability, wind firmness, and future marketability.
- **Diameter at breast height (DBH):** Tree diameter measured at 4.5 feet above ground level.
- **Timber:** The solid interior of a tree that is processed into beams and planks.
- **Board foot:** A unit of volume equal to a board that is 1 inch thick, 12 inches long, and 12 inches wide, or 144 cubic inches.
- **Renewable resource:** A naturally occurring raw material or form of energy that has the capacity to replenish itself through ecological cycles and sound management practices.
- **Habitat:** An area in which a specific plant or animal naturally lives, grows and reproduces; the area that provides a plant or animal with adequate food, water, shelter and living space.
- **Natural Disturbance:** Impacts on forests resulting from fire, drought, introduced species, insect and pathogen outbreaks, hurricanes, windstorms, ice storms, and landslides.
- **Erosion:** The wearing away or removal of land or soil by the action of wind, water, ice, or gravity.
- **Sedimentation:** The deposition or settling of soil particles suspended in water.
- **Land owner:** A person who owns the land, holds the deed or title and is the ultimate decision maker for the treatment of the land.
- **Contract forester:** Provides services to the land owner including making recommendations on how to manage a forest and carrying out management activities.
- **Best management practices:** Procedures employed during harvesting and/or timber stand improvement activities that reduce erosion and prevent or control water pollution.
- **Prescribed burning:** The practice of using regulated fires to reduce or eliminate material on the forest floor, for seedbed preparation or to control competing vegetation. Prescribed burning simulates one of the most common natural disturbances. Also called controlled burning.
- **Reforestation:** Reestablishing a forest by planting or seeding an area from which forest vegetation has been removed.
- **Plant succession:** The progression of plants from bare ground to mature forest.

ASSESSMENTS:

- Formative
 - Describe the trees using qualitative observations
 - Using the Tree ID book accurately
- Summative
 - Identifying the trees without using the Tree ID book
 - Synthesize information into a debate

DIVERSITY (REACHING STUDENTS OF ALL LEVELS/ABILITIES):

- The students can work in groups.
- The students can write their observations in their notebooks.
- Identifying trees is a kinesthetic learning style.



MATERIALS & EQUIPMENT:

- Tree Finder: A Manual for Identification of Trees by their Leaves
- Bandana (one for every two students)
- Paper
- Pen
- Marker

LOCATION:

- A space where students can be safely guided to a tree

RISK MANAGEMENT & SAFETY CONCERNS:

- During the blind-fold bark game, the students are asked walk with blind folds on. This could pose a tripping hazard.
- A student may also have a fear of being blind-folded, a fear of the dark, or feel claustrophobic. Ensure every student has a pair they feel safe and comfortable with and that this is a challenge-by-choice activity.

BAD WEATHER ALTERNATIVE:

- If the weather does not allow for the *Explore* section, begin with the town hall debate instead.
- If short on time, combine the tree ID exercise with the blind-fold bark game by identifying the tree that the students touched using the Tree ID book.

PRE-LESSON PREPARATION:

- Have enough blindfolds for the number of pairs you have in your group.
- Cut out each of the role descriptions.



LESSON:

	Activity	Length	Materials
<u>Lesson 1</u> Tree Basics	Tree ID exercise	15-30 minutes	Tree ID book
	Blind-fold bark game	15-30 minutes	Blindfolds
<u>Lesson 2</u> Town Hall Debate	Group work for debate prep	1+ hours	Handouts (attached)
	Debate activity and follow-up discussion	1-1.5 hrs	

EXPLORE

- **Tree Basics**
 - **Tree ID exercise (15 minutes)**
 - Explain how to use the dichotomous tree ID key book: Start at the first question on the first page. There will be a page number below the answer corresponding to your tree. Go to that next page and answer the next question. Keep answering the questions and following the ‘Go to page ##’ prompts until you’ve arrived at a tree species!
 - Students may work in groups and identify the tree to the genus level (species level if there is time).
 - **Blind-folded bark game (15 minutes)**
 - Students pair up in groups of two. Student A leads Student B, blindfolded, to a tree. Student B is allowed to feel the bark and the size of the trunk. Then Student B is walked back away, spun around and un-blindfolded.
 - After all pairs are back, Student B should attempt to guess which tree they felt, using prior knowledge and the tree ID book.
 - Have the students switch roles, where Student B leads Student A to a different tree. Student A should then attempt to guess which tree they felt.
 - The instructor can ask these follow-up questions:
 - Describe what clues they used to determine their tree?
 - Can you reason out why some trees have smooth bark, and some have rough bark?
 - How old do you think your tree is? How are you determining the age of the tree?
 - The instructor should tell the students to count all the different “things” they see.
 - Use the ID books to determine as many species names as possible. Those that they can’t identify, they should describe in detail
 - They should write down their identification and/or detailed description in their field notebooks.



- If there is a tree corer, have them core the trees to determine the age. The age of a tree can be determined by counting the number of rings. Also, the larger the distance between rings, the more the tree grew that year.

EXTEND

Town Hall Debate

- The instructor should tell the students that they will be doing a town hall debate in which each student (or group of students) will have a role.
- The instructor explains the scenario:
 - *The Pisgah National Forest has been under federal protection since 1916. The current presidential administration has loosened federal jurisdictions that protect the forest from development and extractive industries and is giving the power to manage these lands back to the states. The governor of NC has called a town hall meeting for those interested in the future of the land to voice their opinions and come up with a working draft of a land management plan.*
 - *The forest currently has 512,758 acres of mixed hardwood forest with whitewater rivers and hundreds of miles of trails. The state has administered the land for recreational use only, but now, under the new federal jurisdiction, the Governor is considering reopening the forest to other uses and hoping to generate revenue and stimulate the state's economy.*
- The instructor should first have a discussion about managing forests. Ask the students:
 - What is a forest management plan?
 - Caring for a forest so that it stays healthy and vigorous and provides the products and values the landowner desires.
 - Based on the scenario, who decided the original plan? (The federal government.) Currently who has the ability to decide the use of the forest? (The state government.)
- Each student will be assigned a role (or roles can be assigned to pairs or small groups depending on the number of students), given a description of their character's backstory, and also given a short article to analyze for evidence that will support their interests.
- *Before* handing out the roles, descriptions, and short article, have a discussion with the students about the activity. Write the answers to the following questions in a space that the students will be able to see the entire time:
 - Ask the students to define what they think a successful outcome of this activity might look like.
 - Ask the students about their expectations for group discourse, and lay some ground rules about how the discussion will be conducted (the instructor can start off with base rules, then ask students for more input).
- Now assign each student (or groups of students) their role, the character description, and the short article. Provide students with enough preparation time to work through their character's scenario and formulate their arguments. The instructor should be periodically checking in on each student or group to ensure they are making progress and if they have any questions.
- Once the students are feeling ready to be a part of the town hall meeting, the instructor should read the scenario again and open the town hall meeting for comments.



- Each participant/group introduces themselves with a short opening statement to the group explaining their point of view.
- The instructor, acting as the Governor of NC, facilitates a dialogue between all participants.
- Students are encouraged to design a forest management plan that is agreeable to everyone.
- After 30 minutes of open discussion, the Governor should direct the group toward writing the management plan or at least outlining the key criteria that have been agreed on.

ELABORATE

- Since the early 1990s, the United States Forest Service has emphasized an ecosystem approach to management of the National Forests. Forest environments of the Southern Appalachian Mountains and their characteristic plant communities are among the most varied in the Eastern United States.
- Substantial acreage of forested land has been purchased by the federal and state governments for forests and parks during this century.
- The major types of conversion threats for the ecoregion are timber and mineral extraction, conversion to developed lands, fire suppression, air pollution, acid precipitation, high densities of deer, and the introduction of exotic pests and diseases.

EVALUATE

- **Reflection (students are no longer in character)**
 - Bring it back to the big picture or to the start. Relate it back to their lives. Make sure they know why it matters, and who it matters to (hopefully to them and to the environment).
 - Have students discuss the plan they came up with.
 - Are they satisfied? Do they think it would work?
 - What was challenging about their roles?
 - Give students a chance to voice their personal opinions about forest management.
 - What was difficult about pretending to support a different point of view?
 - Ask the students to comment about the effectiveness of the group discussion. Did everyone feel like their voices were heard? What could have been done better?

REFERENCEMATERIALS/RESOURCES

- <https://www.ncforestry.org/teachers/glossary-of-forestry-terms/>
- <https://www.worldwildlife.org/ecoregions/na0403>
- Eastern Hellbender
 - http://www.ncwildlife.org/Portals/0/Conserving/documents/FactSheets/Eastern_Hellbender_fact_sheet_lores.pdf
- Water Quality:
 - <https://nyti.ms/2jRSmqf>
- Housing development:
 - <http://www.cbsnews.com/news/national-parks-landscape-changing-as-private-land-developed/>
- Prescribed burning:



- <http://www.citizen-times.com/story/news/local/2017/02/10/prescribed-burns-begin-pisgah-national-forest/97738264/>
- <https://www.fs.usda.gov/detail/sierra/landmanagement/?cid=stelprdb5442511>
- Park management
 - <http://carolinapublicpress.org/17231/enviro-groups-forest-service-to-meet-about-national-forest-timber-harvest-appeal/>
- Wilderness protection
 - <http://wilderness.org/blog/saving-north-carolina-forests>
 - <http://www.ctnc.org/protect/land-conservation-benefits-everyone/>
- Forestry
 - <http://oregonforests.org/content/clearcutting>
 - <http://www.futureforestinc.com/six-benefits-of-logging-forests/>
 - <https://www.ncforestry.org/>
- Hunting:
 - <http://www.ncwildlife.org/portals/0/hunting/documents/benefits%20of%20hunting-hunting%20matters!.pdf>







Sue Casa
Real Estate Developer
No Place like Home L.C.C.

You see Pisgah National Forest as the ultimate development opportunity. There is money to be made here, and it's going to be yours when you convince the governor to let you turn the park into deluxe housing. You know you can get the timber corporations on board because they could turn a profit by clearing the land for you; however, you want some of the forest maintained to preserve the value of these homes. Stunning views are essential for high retail value!



Bab Linbrook
Town Council-Woman
Brevard, NC

You have been a resident of Brevard, NC, all your life. You are deeply passionate about the town and about Pisgah National Forest, which you consider to be an extension of your own back yard. You are here on behalf of your constituents who are concerned that the loss of protection of the forest will impact the quality of the town's water supply. You are worried that if logging, housing projects, or other industry are allowed, you will have to raise Brevard's taxes in order to improve town water treatment.



Sally Mander
Wildlife Biologist
UNC Asheville

You have literally made a career out of studying the eastern hellbender, and your greatest mission in life is to prevent this magnificent creature from going extinct. You have been studying threats to the salamander's range, which include impaired water quality. You would like to raise awareness about the protection of this animal and are hopeful that revitalizing the hellbender population will improve visitor rates and boost the local tourism economy.

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Maura McBurney
Fire control specialist
Pisgah National Forest

You worked in the Sierra Nevada Mountains for 20 years and are an expert of fire control. After the terrible wildfires in NC last fall, the Forest Service brought you in to manage Pisgah for prevention of a major, destructive fire in the future. You have worked closely with the forest administration on several prescribed burns this year. You believe establishing a regime of fire based control is necessary for the safety of nearby communities, but you are also open to the idea that selective harvest may be a promising fire prevention strategy, especially if it provides revenue for further park protection.



Hilda Klyme
Forest Supervisor
National Forests of NC

You have been overseeing forest operations for 28 years, and you love everything about Pisgah. Your highest aim is to protect the forest fully from anyone who seeks to detract from its beauty, its wildlife or its pristine natural conditions. However, you are willing to compromise on park policies if you believe that changes will improve tourism by bringing positive attention to the park or raising awareness about the importance of protecting these lands. You are no stranger to these debates and have brokered negotiations over forest management plans before, but, for the first time, the decision is out of your control!



Anita Forrest
CEO
Decimation Lumber Inc.

When you look at Pisgah, you only see a bank of opportunity in the way of trees. Your goal is to have the governor approve logging within the National Forest with as few restrictions as possible. The quicker you can get at those trees, the quicker you can turn a profit. It's all about the money for you, but you recognize that others may stand to gain too from this boost to the local economy. Hopefully this will help convince the governor to let you do your thing!







Aroya Cooper
Governor of NC

You love the great state of North Carolina, but the area of forest management is new to you. You care about the environment and know the value of natural lands as a state resource but, you know that the loss of federal funding for Pisgah will make it impossible to continue current management of the Forest. You want to avoid raising taxes at all costs because your highest priority is making your constituents happy. You hope this public forum will spark ideas for new ways forward for Pisgah.



Marsha Lott
Volunteer
The Wilderness Society

You consider yourself to be an avid environmental activist, willing to do whatever it takes in the name of protecting nature. Like the Lorax, you believe it is your job to speak for the trees and bring the voice of all wildlife to this meeting. You are not afraid to chain yourself to a tree if you need to in order to protect Pisgah from being logged.



Avita Lotto-Venson
Second Home Owner

You own a beautiful cottage near the National Forest where you spend your summers. You enjoy visiting this area during your vacations, hiking and rafting in the forest. You are also an avid hunter and fisher. You came to this meeting to ensure future protection of Pisgah to protect your favorite hobbies, but you also see a benefit in selectively clearing land, because this would be favorable to the local deer population.



Sandy Wood
Sawmill operator
(Currently unemployed)

You would really like to see the timber industry revived in this area. Your family has been suffering from the lack of employment opportunities given the ever-growing plots of federally protected land. You believe that stimulating the economy through timber production is necessary for revitalizing your community and for you to be able to provide for your family. Lately, you have taken an interest in alternative forestry techniques and are hopeful that they may be implemented in the forest.

