



Responsible Forest Management: How can we keep our forests healthy?

TEACHER'S GUIDE

Grades: 5-8

Subject: Science and Environmental Science

Purpose: Through the material in this guide, students will explore responsible forest management while learning about key science concepts related to ecosystems and environmental sustainability. They will examine the factors that create and maintain a healthy forest, including biodiversity, nutrient cycling, and ecological interactions. Additionally, students will discuss the detrimental effects of deforestation and other human activities on forest ecosystems, gaining insights into conservation and environmental stewardship.

Essential Question: What are ways in which people can protect and responsibly manage forests? How does forest management affect ecosystems, wildlife, and people?

Supporting Questions:

1. What is the importance of trees for ecosystems, wildlife, and humans?
2. How is tree health measured and how does their health affect forests?

Time Frame: These lessons are set to be completed within (5) 50-minute class periods.

Focus Topics:

Forest Management, Sustainability, Reforestation, Food Webs, Energy Transfer, Forest Habitats

Description:

There is enormous potential in decarbonizing with natural climate solutions, which are based on the conservation, restoration and improved management of forests, grasslands, and wetlands. Research conducted by The Nature Conservancy (TNC) and other institutions estimates these approaches could deliver around a third of the emission reductions needed by 2030. These lessons would educate students about responsible forestry and its critical role in ensuring forests are replenished for generations to come.

Forests represent a powerful opportunity to pull carbon dioxide out of the atmosphere, helping to cool our planet while also providing clean air, clean water, and habitat for wildlife. We are increasingly seeing reforestation commitments from nations, corporations and individuals that are united by a desire to create a better future. Responsibly managed forests provide many benefits, including wildlife habitat, provision of clean air and water, supporting livelihoods and the power to mitigate climate change. Of all habitats, forests have the greatest potential to increase carbon storage and avoid greenhouse gas emissions through improved forest management.

In this teacher's guide, we'll explore real-life examples from The Nature Conservancy's work in the United States and South America. We will discover the importance of reforestation in mitigating climate change, restoring ecosystems, and creating a sustainable future.



Objectives:

Students will...

1. Learn about photosynthesis to explain the importance of trees.
2. Investigate the ecological importance of cacao plants, which make chocolate.
3. Discover how the cultivation of chocolate from cacao trees has benefited farming practices for generations.
4. Observe and describe trees and their leaves in their community.
5. Create food webs and discuss energy cycling through an activity based on forest wildlife.
6. Define the layers of the forest and discuss the crucial role of each layer.
7. Investigate the factors that lead to healthy forests.
8. Demonstrate their understanding of forests, tree species, and wildlife by creating a diorama.

Standards:

Next Generation Science Standards - Middle School

- MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
- MS-ESS3 Earth and Human Activity

Crosscutting Concepts

- **Disciplinary Core Ideas:**
- LS2.A: Interdependent Relationships in Ecosystems
- LS2.B: Cycle of Matter and Energy Transfer in Ecosystems
- LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- LS4.D: Biodiversity and Humans
- ETS1.B: Developing Possible Solutions
- ESS3.A: Natural Resources

Science and Engineering Practices

- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Performance Expectation Middle School

Students who demonstrate understanding can:

- A. MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- B. MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- C. MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- D. MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.



Common Core Standards

6th-8th Grade Science and Technical Subjects

- CCSS.ELA-Literacy.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- CCSS.ELA-Literacy.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context.
- CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- CCSS.ELA-Literacy.SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- CCSS.ELA-Literacy.SL.8. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Common Core English and Language Arts Standards for Writing Grade 6-8

- CCSS.ELA-LITERACY.WHST.6-8.2. A Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- CCSS.ELA-LITERACY.WHST.6-8.2. B Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- CCSS.ELA-LITERACY.WHST.6-8.2. D Use precise language and domain-specific vocabulary to inform about or explain the topic.
- CCSS.ELA-LITERACY.WHST.6-8.6 - Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.



Vocabulary:

1. **Canopy:** The densest layer of forest made of overlapping leaves and branches of tall trees. This layer provides shade and shelter to the forest layers below it.
2. **Carnivore** - An animal that consumes other animals as a food source.
3. **Consumer** - A living organism that obtains its energy from eating other animals.
4. **Degradation:** The deterioration of the environment due to a decrease in resources such as air, water, and soil.
5. **Emergent Layer:** This is the highest layer of the forest and is made up of the tallest trees. These trees can be as tall as skyscrapers.
6. **Energy Transfer** - The process by which energy is converted from one source to another. In a food web, this refers to how energy flows from the Sun to producers to consumers.
7. **Forest Layers:** The four vertical sections of the forest, which each have their own unique role in an ecosystem.
8. **Forest Floor:** The first layer of the forest at the bottom. This layer is made up of mixed soil and decayed or decaying organic material common for a forested area.
9. **Forestry** - The theory and practice of sustainably growing and harvesting trees for human use.
10. **Keystone Species:** Living organisms, often animals, that play an important role in an ecosystem. Their roles and behavior can have a big effect on the ecosystem.
11. **Herbivore** - An animal that consumes plants as a food source.
12. **Omnivore** - An animal that consumes both animals and plants as food sources.
13. **Photosynthesis** – The process of how plants and photosynthetic organisms make their own energy. Plants do this by collecting sunlight, water, and carbon dioxide in their cells.
14. **Primary Consumer** - An animal that consumes herbivores.
15. **Producer** - A living organism that uses photosynthesis to make its own energy from the Sun.
16. **Responsible Forest Management:** Management of a forest that is mutually good for the environment and for people. These practices are socially just, sustainable, and can financially support people.
17. **Secondary Consumer** - An animal that can consume primary consumers and herbivores.
18. **Sustainability** - An environmentally healthy practice that can continue indefinitely.
19. **Tertiary Consumer** - An animal that can consume primary, secondary consumers and herbivores.
20. **Understory:** A layer of lush vegetation that is found below the canopy. This layer is where small trees and seedlings thrive.



Supplemental Resources:

Since this lesson plan has a focus on forests and ecosystems, students should have a prior understanding of the following topics: photosynthesis, carbon sequestration, and climate change. The following Nature Lab resources are suggested to provide an overview of the topics in this guide. We recommend sharing the resources below with your students prior to starting this guide.

[Climate Heroes: The Power of Trees](#)

[Understanding Climate Change - Nature's Role in Creating Resilience](#)

[Reforestation: Impact on Climate](#)

[The Search for "Lingering Trees" Offers Hope for Imperiled Species](#) (Related to the [TreeSnap](#) app)

Materials:

Notebook paper or journal

Pencil or pen

Blank Copy Paper

Chart paper

Index Cards

Plastic bags for students

Computer or laptop

Projector or Screen Casting Capability

Pictures or samples of various tree leaves (real or printed)

Tree identification guide (books, online resources, or posters) or [TreeSnap App](#)

Rulers

Measuring tape

Digital Resources (In order of use)

1. [Photosynthesis video \(PBS Learning Media\)](#)
2. [Photosynthesis PowerPoint Diagram \(Michigan.gov\)](#)
3. [Photosynthesis Digital Worksheet \(School Webmasters\)](#)
4. [Working Trees: Reforestation and Responsible Forestry](#)
5. [Kahoot Game](#)
6. [Planting the Future in the Amazon Rainforest \(TNC\)](#)
7. ["Forest Cocoa" \(Note- In Portuguese with English subtitles, pause frequently while watching to check for understanding\)](#)
8. [TNC Article – Trees in Peril](#)
9. [TNC Video – Trees in Peril](#)
10. [Tree Identification Key \(Arbor Foundation\)](#)
11. [Nature Lab - Forest Layer Worksheet \(Google Drive\)](#)
12. [The 4 layers of the forest \(YouTube\)](#)
13. [Forest layer diagram \(California Academy of Sciences\)](#)
14. [Food Webs and Energy Pyramids \(YouTube\)](#)
15. [Video Recap Worksheet \(Amoeba Sisters\)](#)
16. [Make your own Forest Diorama Worksheet \(Nature Lab\)](#)
17. [Habitat Diorama Packet \(Monroe Twp NJ Public Schools\)](#)



Lesson Overview:

Lesson 0 (*Optional if students have not learned about photosynthesis*)

Introduction: Importance of Trees – Photosynthesis lesson

Activity – Role of trees and importance of trees

Lesson 1

Virtual Field Trip: Working Trees

Activity 1 – Guided Viewing and Discussion

Activity 2- Understanding carbon sequestration.

Activity 3- Play Kahoot Game

Lesson 2

Topic: Brazil example: How is chocolate made?

Activity – The importance of sustainable chocolate and how it is made without damaging forests.

Lesson 3

Topic: Tree diversity and leaf identification

Activity 1 – What trees are found in my community?

Activity 2 – What are the layers of a forest?

Lesson 4

Topic: Understanding forest management (*This lesson was adapted from – [Project Learning Tree](#)*)

Activity – Every tree for itself

Lesson 5

Topic: Food Webs, Energy Transfer, Trophic levels

Activity - How can we make a forest food web?

Lesson 6

Topic: Project Based Learning - Forest Project and Presentation

Activity – Make your own forest diorama.



Lesson Plans

Lesson 0 (Optional)

Introduction: Importance of Trees – Photosynthesis lesson

Activity – Role of trees and importance of trees

1. Students will be introduced to the topic through a discussion about forests. Students can be asked the following questions:
 - **What do you know about forests?**
 - **Where have you seen them before?**
 - **What kind of plants and animals typically live in forests?**
2. Guide the discussion towards describing how there are different types of forests found all around the world. Explain that - *Not all forests are the same! There are evergreen forests, deciduous forests where trees lose their leaves, and there are rainforests to name a few.*
3. Ask students - *What do you know about trees? Why are they important?* Have students work with a partner or small group to develop a list of what they know about trees and their importance. This can be done on notebook paper, or an index card per group.
4. Have one student in each group share their lists and take note of the answers most related to *the air we breathe, make fruit, clean air, provide shade, etc.*
5. Review student answers and discuss the important role of trees in our environment.
6. Ask students – *How do you think trees eat? If they are living things, then they need food just like animals do.* Tell students that trees have a superpower that can be explained by science, trees can make their own food! The process of how they make their food is called – **Photosynthesis.**
7. Show students the [Photosynthesis video \(PBS Learning Media\)](#), which gives an overview of the process to students.
8. Share with students the [Photosynthesis PowerPoint Diagram \(Michigan.gov\)](#), which displays the process of photosynthesis and has the steps to the process as well. Walk students through the steps of the process and take breaks for further explanation as needed.
9. Have students work on the downloadable [Photosynthesis Digital Worksheet \(School Webmasters\)](#) and complete at least the first page of questions in class. The second page can be completed for homework.



Lesson 1

Virtual Field Trip: Working Trees: Reforestation and Responsible Forest Management

Activity 1 – Virtual Field Trip and Whole or Small Group Discussion

Lead a guided viewing of the virtual field trip, [Working Trees: Reforestation and Responsible Forest Management](#). Stop throughout video to lead whole-group discussions using the guided viewing questions below or create small groups and provide the questions below to each group to hold small-group discussions. You may also assign these questions as homework or give each small group 3-5 questions and have them share out their responses to the whole group after a short, small-group discussion. Sample answers are provided for your convenience.

1. How does the virtual field trip show us the impact our daily activities have on the environment, like buying a chocolate bar?
A: By showing how everyday activities, like buying a chocolate bar, contribute to carbon emissions through transportation and production processes.
2. Why are trees important in helping to reduce carbon dioxide emissions?
A: Trees absorb carbon dioxide during photosynthesis, helping to mitigate greenhouse gas emissions.
3. What does responsible forest management mean, and why is it necessary for the health of forests?
A: Responsible forest management involves sustainable practices to maintain forest health, prevent deforestation, and conserve biodiversity.
4. What are some of the reasons forests are being cut down?
A: Forests are cut down for agricultural expansion, logging, mining, and urban development.
5. How can planting cacao trees help both forests and people?
A: Planting cacao trees can provide income for farmers, promote biodiversity, and contribute to reforestation efforts.
6. What challenges do forests face in terms of having a diverse range of plants and animals?
A: Forests face challenges such as habitat loss, invasive species, and climate change impacts that affect plant and animal diversity.
7. How does the concept of succession help us understand how forests grow and change over time?
A: Succession shows how forests evolve over time, with different plant species replacing one another in stages.
8. What practices are recommended for making sure we use forests sustainably?
A: Sustainable forestry practices include selective logging, protecting wildlife habitats, and minimizing soil erosion.
9. Why should we choose products made from sustainably harvested wood?
A: Products made from sustainably harvested wood support forest conservation and biodiversity.



10. How can students like us help take care of forests and support responsible forest management?
A: Students can participate in tree planting initiatives, advocate for sustainable forestry policies, and reduce paper consumption.
11. How do trees absorb carbon dioxide, and why is this process important for the environment?
A: Trees absorb carbon dioxide through photosynthesis, helping to mitigate climate change by storing carbon.
12. What factors influence the growth of different tree species?
A: Factors like soil quality, climate, and sunlight influence the growth of different tree species.
13. How does biodiversity contribute to the health of forests?
A: Biodiversity in forests contributes to ecosystem resilience, nutrient cycling, and pest control.
14. What role does fire play in maintaining the health of certain forest ecosystems?
A: Fire plays a role in forest regeneration, clearing out underbrush, and promoting the growth of fire-adapted species.
15. How do forests help to regulate climate and maintain ecological balance?
A: Forests regulate climate by absorbing carbon dioxide, releasing oxygen, and influencing weather patterns, while maintaining ecological balance by providing habitats for diverse species.

Activity 2-- Carbon Sequestration

Objective: To help students understand the importance of trees in carbon sequestration and to learn how to identify different tree species.

Materials Needed:

- Pictures or samples of various tree leaves (real or printed)
- Tree identification guide (books, online resources, or posters)
- Paper
- Pencils
- Rulers
- Measuring tape

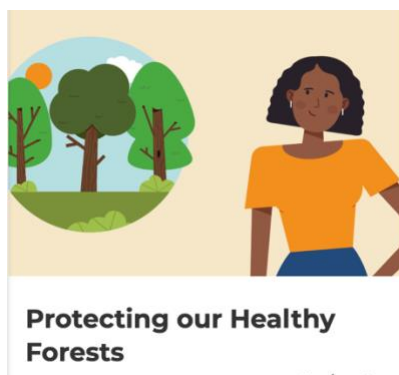
Instructions:

1. Begin by discussing with students the importance of trees in absorbing carbon dioxide and mitigating climate change, as well as the biodiversity they support.
2. Show students pictures or provide samples of different tree leaves and briefly discuss the characteristics of each species.
3. Divide students into small groups and provide each group with a tree identification guide and materials.
4. If possible, instruct students to go on a tree identification scavenger hunt around the schoolyard or nearby park. Encourage them to identify as many tree species as possible



- using the guide. If going outside is not possible or trees are not available, provide photos of various types of trees from your area either printed out or on a screen via slideshow.
5. Once students have identified several trees, have them measure the circumference of the trunk and estimate the height of each tree using rulers and measuring tape. If time allows, you may have students use a clinometer as is used in the virtual field trip. If working with photos of trees, simply provide these figures to students or have them research the averages for the types of trees shown.
 6. Back in the classroom, guide students in calculating the approximate carbon sequestration of each tree using the formula discussed in the video (height x circumference).
 7. Have students record their findings on paper, including the tree species, circumference, height, and estimated carbon sequestration.
 8. As a class, discuss the importance of maintaining healthy forests and the role of responsible forest management in carbon sequestration.
 9. Conclude the activity by emphasizing the significance of trees in mitigating climate change and the importance of conservation efforts.
 10. Encourage students to share their findings and newfound knowledge with their classmates, families, and communities.

Activity 3—Play a Kahoot Game to Check for Understanding



Explore responsible forest management practices by understanding the many factors that create healthy forests. Learn about forest layers and different forest types along the way.

Play Kahoot Game:

<https://create.kahoot.it/share/protecting-our-healthy-forests/d402b977-185b-44a0-92c3-b80beb7c7d>



Lesson 2

Topic: How is chocolate made?

Activity – The importance of chocolate and how it is made.

1. After students have worked on the photosynthesis worksheet, ask them - *what was the sweet treat that was discussed in the virtual field trip?* That's right! Chocolate comes from trees!
2. Have students watch the following two videos on chocolate production. First, explore in 360 degrees (click around as you watch the video to explore the image further) a powerful solution to deforestation alongside Rosely Dias, a Brazilian farmer using a game-changing agricultural approach called Agroforestry. Rosely plants and maintains native trees like cocoa that regenerate the land and keep more rainforest standing. Tour Rosely's food forest and see how she harvests cocoa and various fruits to earn an income while supporting forest health, biodiversity and our climate. [Planting the Future in the Amazon Rainforest \(TNC\)](#)
3. Then, watch ["Forest Cocoa"](#) (Note- In Portuguese with English subtitles, pause frequently while watching to check for understanding) to explore how small farmers growing cocoa are restoring the Amazon forest
4. Conclude this part of the lesson by letting students discuss what they learned about the chocolate production process in Brazil. Ask students - *What was something new that you learned? Why are cacao trees important for the environment?*



Lesson 3

Topic: Tree Diversity and Sampling

Activity 1 – What trees are found in my community?

1. Review with students what they learned yesterday have them turn and talk with a classmate and share one thing they learned.
2. Ask the class – Are all trees the same? What are some observations that make trees and other plants different?
3. Have students in groups verbally compare and contrast a field of wheat to a meadow. Give students a couple minutes to turn and talk and discuss. As students share their answers, please use the following concepts to guide the conversation. *A wheat field supports just one species of plant. A meadow has many different kinds of plants. Forests are similar. Natural forests have diverse species of trees. The woody trunks of trees have various properties, enabling them to be used for different products. The diversity also allows a forest (and a meadow) to withstand an attack (e.g., disease, insect) on any one species. Tree diversity is also important because a wider variety of trees support a greater range of wildlife.*
4. Ask students to brainstorm why this might be? Lead them to the idea that more species and a more varied habitat provide animals with more ways to find food and shelter.
5. Tell students that to learn more about trees, we will be investigating one part of trees that make them different, their leaves. In this outdoor activity, students will collect as many different leaves as they can in order to gauge the tree diversity of their area.
6. Before leaving, tell students that part of our jobs today will be to protect our neighborhood trees by being stewards of nature. This means we can make observations and collect leaves but should not disturb the trees in any other way. This also means that we should look out for any visual concerns of our neighborhood trees! We can do this by taking notes of anything that may look wrong with a tree.
7. Tell students that scientists and volunteers alike now can monitor tree health by using an app! Introduce students to monitoring tree health by watching the following video - [TNC Video – Trees in Peril](#).



8. Next, use the [TNC Article – Trees in Peril](#) to give students an overview of different signs of tree health and also to introduce the app – [TreeSnap](#). Teachers may download this app and use their phones as an example for students during their nature walk.
9. Take the class outside and have students collect leaves from the ground to ensure no harm to living trees. Students can do this activity anywhere trees or woody plants are growing. (An alternative to this lesson would be that the teacher can collect leaves before class if the activity cannot be performed outside).
10. Have students work individually to collect as many *different* leaves as they can from the natural area, placing them carefully in a plastic bag. Emphasize that each student should only collect one leaf for each different type they find. Limit the collection time to 20 minutes.
11. To make other observations of trees, students can use their notebook to record other characteristics of each tree type, such as features of the trunk, seeds, or fruit. Ideally students take a digital picture of the tree to match the leaves they collect.
12. Back in the classroom, students can use the [Tree Identification Key \(Arbor Foundation\)](#) to name each species they find. A booklet is also available on the site for a fee or students can download a tree identification app on a smartphone.
13. Students can work in groups to help each other with identification, but they should keep their leaf samples separate. Have students make a list of all the trees they identified.
14. Pool the lists of trees to get a comprehensive list of all the tree species in their study area.
15. Ask students what they noticed about the different kinds of trees. Were some trees more common than others? Were some trees represented only by one or two individuals? Compiling the class data will quantify the samples collected by the students and indicate how rare or common different kinds of trees are.
16. In the list of all trees, record how many students found a particular tree:

Type of tree	Number of students who found that tree



Activity 2 - What are the layers of a forest?

1. Tell students that now that we explored trees in our community, we are going to learn about how all these different species of trees live in forests and how forests develop overtime through creating separate layers.
2. Ask students to close their eyes and picture a forest and to think about what different kinds of plants and animals they can imagine. Ask them after, do all these animals live on the bottom of the forest? Picture animals that may fly, hop, or even nest on tall trees. Without tree diversity, animals would all be crowded on the bottom of a forest and may not have the shelter they need to survive.
3. Give students the [Nature Lab - Forest Layer Worksheet \(Google Drive\)](#) and explain that we will be watching a video about the different layers of the forest and that they will be making observations of the characteristics of each layer and of the animals and plants that they see.
4. Show students [The 4 layers of the forest \(YouTube\)](#) and pause between each layer of the forest. The video will start from the **forest floor** and make it way up high to the **emergent layer**.
5. After the video, as a second visual for students, share with the [Forest layer diagram \(California Academy of Sciences\)](#), which is another representation of forest layers in a jungle.
6. Review the worksheet with the class and if there is time, ask students to share *what their favorite forest layer is and why? What part of the forest would you live in if you were an animal?*



Lesson 4

Topic: Understanding forest health (*This lesson was adapted from – [Project Learning Tree](#))

Activity – Every tree for itself

Materials: 8" x 10" (20 cm x 25 cm) pieces of paper or white paper plates; 4–6 different colors of poker chips, or construction paper; large sheet of paper or other means for recording group results.

Activity Prep: Gather 4–6 different colors of math cubes, construction paper, or poker chips—such as blue, yellow, white, green, black, and red—with enough of each color so that each learner can have two cubes or chips. Keep the colors separate to start. As an alternative, cut 3" x 3" (7.6 cm x 7.6 cm) squares out of different colors of construction paper.

Introduction

Ask learners what they think trees need to grow. (They might mention water, sunlight, air, or nutrients. You may want to point out that most of a tree's mass is made of carbon, which comes from the air.)

Ask: *What do you think would happen if a tree doesn't get all the things it needs?*

1. To model what happens when a tree doesn't get everything it needs, have learners spread out about 3 feet (90 cm) apart and stand (or sit in chairs) on a piece of paper or paper plate. They each represent a tree whose goal is to get as many needs as possible. They must stay planted on their paper and cannot slide it along the floor or step off it.
2. Equally distribute the "tree resources" (colored poker chips, paper squares, etc.) around the learners so that the resources are about 1–2 feet (30–60 cm) apart. Explain that each represents a tree need. Assign each need a color (e.g., blue = water, yellow = sunlight, white = carbon from the air, and green = a nutrient such as nitrogen or phosphorus).
3. Give a signal to start. Have "trees" reach to gather the resources they need. Use the following quantity requirements to determine how many of the group's trees are growing



well or poorly: three or more of each resource means superior growth, two of each means average growth, and one or fewer of each means poor growth.

4. **Discuss:** What might happen to a real tree that can't meet one or more of its needs? (It might grow slowly or eventually die. Point out that different species of trees have different needs; some tree species might need more water than others, for example.)
5. Conduct additional rounds, using one or more of the following conditions:
 - Trees stand or sit closer together on their papers (representing more competition).
 - Fewer water resources (representing a drought).
 - Fewer sunlight resources (representing overcrowding for young trees).
 - Fewer nutrient resources (representing poor-quality soil).
 - Add a new colored resource to represent fire (red) or an insect infestation (black), such as bark beetles or gypsy moths. How might this new element affect the trees? Discuss that some trees may not be affected, for example, Loblolly pine, may be relatively unaffected by fire
6. Challenge learners to look for outside examples of the different scenarios they modeled in the activity. For example, they may see groups of trees growing close together (and not getting enough sunlight) or a tree planted close to the pavement (and not getting enough water or space).



Lesson 5

Topic: Food Webs and Energy Transfer

Activity: How can we make a forest food web?

1. For this next activity, explain that to learn more about the animals and plants that are found in forests, students will learn about food webs and how energy is transferred within an ecosystem.
2. Students will first be placed in groups of 2 - 4 and given chart paper. They will be asked to write down a few examples of animals and plants that live in forests. Small sketches may be drawn of these animals and plants as well.
3. Teacher will explain the concept of a food chain and food web. The following video can help guide the instruction: [Food Webs and Energy Pyramids \(YouTube\)](#).
4. This video explains the concepts of food chains, food webs, and energy transfer. The video may be paused at the end of each section for review.
5. As students are listening, the video can be paused for them to start drawing their food chain on the chart paper. The food chain should only take up about a third of the chart paper.
6. First instruct students to draw a food chain of one **autotroph (plant)** and **3 consumers**, one at each trophic level starting with a primary consumer. This will display one complete food chain.
7. Explain to students that as the video discussed, an animal usually does not eat just one thing, they often eat different types of plants and/or animals found in their ecosystem. This will assist in guiding the creation of a food web.
8. To display a food web, students can use the diagram displayed in the food web video as a guide to construct their own food web on chart paper or notebook paper.
9. The focus of the food web can be just of animals found in forests. Students can watch the videos from part 1 and use The Nature Conservancy's articles on the Emerald Edge (linked at the end of the lesson), to create their food web based on what animals can be found in
10. As students are working on their food web, ask them: *How do you think trees and forest health can affect animals and food webs?*



11. As a formative assessment and for students to learn more about food webs and energy transfer, students can complete the following worksheet which can be downloaded and printed: [Video Recap Worksheet \(Amoeba Sisters\)](#).

Extend:

As an extension, students can create a food web of a habitat of their choice. This habitat can be chosen by the teacher as well. Students can research a different habitat and create a full food web with organisms found at the different trophic levels, including **producers, omnivores, and decomposers**.



Lesson 6

PBL Project: Make your own forest diorama!

Purpose: Students will create a forest habitat diorama to demonstrate their knowledge about healthy forests and what animals live in a forest. Students may pick the type of forest to research then create their diorama. Students will present their diorama to the class.

1. Hand out the [Make your own Forest Diorama Worksheet \(Nature Lab\)](#) with instructions and a grading rubric included.
2. Each student will create a diorama (a scenic representation in which sculpted figures and lifelike details are displayed) showing their selected habitat.
3. To create the diorama project, a shoe box or other small box may be used as the space for the diorama. The box should not be bigger than an adult sized shoebox.
4. Students may use plastic figures or mold items from clay to represent animals, plants, and objects in their projects. Materials such as magazines (for photos), silk or plastic plants, popsicle sticks, toothpicks, glue, construction paper, and other craft items may be used. Creativity is encouraged!
5. You will be creating a diorama of forest habitat of your choice:
 - Rainforest
 - Evergreen or coniferous forest
 - Tropical forest
 - Deciduous forest
5. In your diorama, you should include all of the following: (Please check off all of the items as you complete your project)
 - You need to cover the inside of your box using paper. This should reflect the habitat that you chose. For example, a forest habitat would have a blue background to represent water.
 - Write your name and the habitat you chose on the back of the box.
 - At least two animals that live in this habitat.
 - At least two plants that live in this habitat.
 - Label the items in your habitat.



- On the back of the shoebox, using an index card, describe your habitat by answering the following questions: - Why did you choose this habitat? - What types of plants and animals live in this habitat? - What is the environment of this habitat like?
- After completing the project, you will present your project to the rest of the class. Be prepared to describe your habitat and explain your work.
- Please look at the attached examples to help you plan your project. [Habitat Diorama Packet \(Monroe Twp NJ Public Schools\)](#).



Nature Lab Related Resources: The following lesson plans and videos can be used to supplement this virtual field trip and teaching guide. **Students will learn more about controlled burns, the power of trees, and how healthy forests can be logged sustainably.**



Climate Heroes: The Power of Trees

Grade Levels: 5-8

Trees are our climate superheroes! From Louisville, Kentucky, in the United States to St. Vincent and the Grenadines in the Caribbean, trees are playing critical roles in cleaning our air and improving our resilience in the face of climate change.

<https://www.nature.org/en-us/about-us/who-we-are/how-we-work/youth-engagement/nature-lab/virtual-field-trips/>



Fighting Fire with Fire

Grade Levels: 5-8

Learn how controlled burns, also known as prescribed fires, are set by land managers and conservationists to mimic the effects of natural fires and the positive impacts of fire on ecosystems.

<https://www.nature.org/en-us/about-us/who-we-are/how-we-work/youth-engagement/nature-lab/middle-school-lesson-plans/>



Forests: The Stuff of Life

Grade Levels: 5-8

Explore how sustainably logged forests can provide us with a sustainable supply of wood products while also supporting rich biodiversity.

<https://www.nature.org/en-us/about-us/who-we-are/how-we-work/youth-engagement/nature-lab/middle-school-lesson-plans/>

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