

“Solutions-Oriented 5 Forest Ecosystem Benefits Learning” Storyline



5-Forests: Forest Ecosystem Benefits

Storyline introduction and overview:

The goal of the fifth grade Forests: Forest Ecosystem Benefits storyline is to build on students' previous knowledge of plant/animal needs, ecosystems, and protection of Earth's resources. In this storyline students develop an understanding of forest ecosystems, tree benefits including carbon sequestration, and what trees need to grow/gain mass.

Forests NGSS Learning Progression: The 5th grade storyline is part of a larger learning progression that includes students mastering standards pre-K to 12th grade. Take a look at how the 5th grade performance expectations fit in a continuum of learning for your students.

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| <p>Placemaking:</p> <p>Humans have a relationship with trees. Gather from students all the ways that we interact with trees (e.g. sit under them for shade, hide and seek, for lumber, gum rubber, burning for warmth, food, fireplaces for aesthetics, etc.).</p> | <p>Anchoring phenomena:</p> <p>Show a piece of wood (ideally several types of pieces of wood, a piece of firewood, a fallen branch, a piece of dimensional lumber, a piece of plywood, etc.).</p> <p>Trees gain mass.</p> | <p>Drawdown:</p> <p>Temperate Forests Restoration Indigenous Peoples' Forest Tenure</p> |
| <p>Indigenous and other relevant cultural connections:</p> <ul style="list-style-type: none">● Worldview of trees as living beings● Giving respect to the sovereignty of living beings● Take only what you need | <p>NGSS PEs:</p> <p>5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.</p> <p>5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</p> <p>5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.</p> | |

Estimated time required to implement this storyline: 2-3 weeks

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NGSS PEs:

5-LS1-1 From Molecules to Organisms: Structures and Processes: Support an argument that plants get the materials they need for growth chiefly from air and water.

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

5-ESS3-1 Earth and Human Activity: Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

| Science & Engineering Practice (SEP) | Disciplinary Core Idea (DCI) | Cross Cutting Concept (CCC) |
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| <p>Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> Support an argument with evidence, data, or a model. (5-LS1-1) | <p>For 5-LS1-1 LS1.C: Organization for Matter and Energy Flow in Organisms Plants acquire their material for growth chiefly from air and water. (5-LS1-1)</p> | <p>Energy and Matter Matter is transported into, out of, and within systems. (5-LS1-1)</p> |
| <p>Developing and Using Models Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> Develop a model to describe phenomena. (5-LS2-1) <p>----- Connections to the Nature of Science</p> <p>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</p> <ul style="list-style-type: none"> Science explanations describe the mechanisms for natural events. (5-LS2-1) | <p>For 5-LS2-1 LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) <p>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</p> <ul style="list-style-type: none"> Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5- | <p>Systems and System Models A system can be described in terms of its components and their interactions. (5-LS2-1)</p> |

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| | LS2-1) | |
| Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. <ul style="list-style-type: none"> Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1) | For 5-ESS3-1 ESS3.C: Human Impacts on Earth Systems Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. (5-ESS3-1) | Systems and System Models A system can be described in terms of its components and their interactions. (5-ESS3-1) Connections to Nature of Science Science Addresses Questions About the Natural and Material World. Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1) |

Learning Sessions

| Materials List | |
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| Learning session | Materials |
| Grounding Native Ways of Knowing | Regional tribal stories and information |
| 1. | Activity and video |
| 2. | Chunk of wood, science notebook page |
| 3. | Pre-assessment and rubric |
| 4. | 1 set per four kids (6 plastic baggies, handful of beans, tape, Sharpie marker, paper towel, stapler), copies of science notebook page |
| 5. | five pieces of string attached to five 5x8 note cards(to create necklaces) |
| 6. | copies of student pages, copies of timeline cards, coat hangers(for placing on the timeline) |
| 7. | copies of student pages (option B), measuring tape, calculator(as a scaffold for specific students) |
| 8. | print out of ecosystem cards for either Western or Eastern Washington |

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| 9. | local guides to identifying trees or use of smart devices to identify trees, copies of tree cards from Forests of Washington guide, measuring tapes, copies of data recording sheets |
| 10. | access to an online brochure template or white computer paper for a handmade template. |
| 11. | Dependent on teacher choice |
| 12 | Post assessment and rubric |

Youtube channel for this storyline: [The Forest Service and Climate Change](#)

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| Grounding Native Ways of Knowing | |
| <p>Throughout the learning sessions there are opportunities for partnerships with local tribes. Find local tribal connections here: Partnering with Tribes-OSPI resource</p> <p>In addition to connecting with a local tribe in your area, these books or videos have connection to trees and Indigenous peoples:</p> <ul style="list-style-type: none"> ● Grandmother Cedar Tree - A Samish Story as told by Roger Fernandes, Lower Elwha S’Klallam Storyteller <ul style="list-style-type: none"> ○ Cedar Box Teaching Toolkit- page 23 ● Western Red Cedar poem- “Prayer of the Woods,” a Portuguese forest preservation prayer that has been used for more than 1,000 years. Author unknown, adapted by Elise Krohn <ul style="list-style-type: none"> ○ Cedar Box Teaching Toolkit- page 30 ● The Elders are Watching by David Bouchard ● The Story of Cedar documentary | |

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| 1. Pre-lesson on photosynthesis | Estimated time: 30 minutes |
| <p>Students may need a refresher before this storyline on photosynthesis. Here are some suggested resources:</p> <ul style="list-style-type: none"> ● Forest Fact Breaks-Photosynthesis ● Nature of Trees- Structure and Function (Photosynthesis) This lesson includes the photosynthesis “equation” but also includes a nice graphic organizer to describe the process. | |

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| 2. | Examine phenomena: Trees gain mass. | Estimated time: 45 minutes |
| <p>Pass a chunk of wood or several pieces of wood around and show the video Acorn to Oak . Have students brainstorm answers to the question: <i>What gives the tree its mass?</i></p> <p>Use science notebook page-learning session 2 to examine phenomena and connect back to prior knowledge on what trees/plants need to grow.</p> <p><i>Expected answers: soil, minerals, water, sun/light, air, carbon. Ask students to remember the inputs and outputs of photosynthesis: CO₂ + water and the addition of sunlight produces glucose + oxygen</i></p> | | |

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| 3. | Pre Assessment: | Estimated time: 30 minutes |
| <p>5 Forests: Forest Ecosystem Benefits Pre-Assessment 5 -Forests: Forest Ecosystem Benefits Assessment Rubric</p> | | |

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| 4. | Guiding question: What do trees need to grow? | Estimated time: 45 minutes for investigation set-up 10 minutes every three days 30 minutes for CER on day 9 |
| <p>Native ways of knowing connection: check with your local tribe to see if there are any shareable stories related to growth(plant or otherwise that would make a connection for all students)</p> <p>Brainstorm and discuss: <i>What do trees need to grow?</i></p> <p>In this investigation, students create models of growing environments with or without soil to determine what plants need to grow.</p> <p>FEB- Investigation Set Up- Learning Session 3</p> <p>Have students use this science notebook page-learning session 3 to guide them through setting up the investigation and recording their observations (try to observe every three days). <u>Supplies needed are listed at the beginning of the lesson sessions.</u></p> | | |

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| | <p>TT: Some students or classes may need more guidance in designing their investigation depending on their past experiences with investigations.</p> <p>After students finish their observations complete a class Claim, Evidence, Reasoning (CER) poster chart (see CER example).</p> |
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| 5. | Guiding question: Why is carbon important to trees? | Estimated time: 45 minutes |
| | <p>Brainstorm and discuss: <i>What do trees need to grow? Why do you think that?</i> Be sure to follow the intro sequence to set up the activity and engage students in the thinking around what the trees are “racing” for.</p> <p>Race for the Sun game directions</p> <p>Another option: Every Tree for Itself from PLT</p> <p>Review basic photosynthesis using a video or article (Carbon article from ReadWorks). Be sure that the review doesn’t interrupt or halt the exploration of session 3.</p> <p>Discuss: Why is carbon important to trees?</p> | |

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| 6. | Guiding question: How is carbon impacting the Earth? | Estimated time: One 45 minute session One 30 minute session |
| | <p>Overview: Students create a timeline of climate science over the past 200 years and gather information about climate mitigation and strategies for forests.</p> <p>Southeastern Forests and Climate Change: Lesson 1-Stepping Through Climate Science lesson on page 27</p> <p>Lesson 1- Activity 1: Student pages (you will need to create a login but it’s free!)</p> <p>TT: You can modify this lesson by picking the dates that you want to focus on or choosing just science or policy dates.</p> <p>Forest Service and Climate Change video</p> <p>TT: Rather than the questions after the video, it might be more beneficial to have a discussion</p> | |

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| | <p>and answer the questions together.</p> <p>Reminder: Have students go back to their original explanation of the phenomena on science notebook page- learning session 2 and make a revised explanation.</p> |
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| 7. | Guiding question: How much carbon is in a tree? | Estimated time: 45 minutes |
| | <p>Overview: Students measure trees near their school to find the trees’ carbon capacity.</p> <p>Southeastern Forests and Climate Change- Lesson 8 (Option B)</p> <p>TT: This would be a good opportunity to have kids partner up or work in small groups.</p> | |

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| 8. | Guiding question: How do living and nonliving things interact with each other in a forest? | Estimated time: 60 minutes |
| | <p>Overview: Students find connections between living and nonliving things in Washington forests. There are separate ecosystem cards for Eastern and Western Washington.</p> <p>Forests of Washington- Washington Forest Eco-Connections- Lesson 6- page 73-81</p> <p>Grounding in Native Ways of Knowing: After learning about connections between living and nonliving things in forests, follow proper procedure (see Partnering with Tribes-OSPI resource) and reach out to a local tribe or do independent research to find if there are stories or current work being done by the tribe around the interconnectedness of life or forest ecosystems. Here are some examples (if one is not present for your region, please find a resource that is local to you and your students):</p> <ul style="list-style-type: none"> • Washington LASER: Native American Story Connections <ul style="list-style-type: none"> ○ (several tribes represented in this source) • Spirit of the Trees: People of the Cedar (Northwest Tribes) <ul style="list-style-type: none"> ○ Yakama and Quinault Nations | |

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| 9. | Guiding question: How do trees benefit the climate, humans and ecosystems? | Estimated time: 60+ minutes |
| | <p>Overview: Take students out to the schoolyard and have them measure the circumference (inches) of several trees. Then have students access the i-Tree website (below) to put in the school’s address, location/type of trees and the circumference of the trees. Here is a data sheet you might want students to use Tree Measurement Data Sheet</p> | |

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| | <p>Forests of Washington- Tree ID Cards- page 27-32</p> <p>i-Tree gives calculations of carbon dioxide, stormwater runoff, energy and air quality.</p> <p>More information on tree benefits: The Power of Trees (Data is available for Seattle, Spokane, Yakima)</p> <p>Teachers can also extend this lesson using Carbon Cycle lesson from LearnForests.org. This lesson details more about the carbon cycle and carbon footprint.</p> <p>Career connections: What kind of jobs work support healthy forests? Using the resources below, explore possible forest related careers with students:</p> <ul style="list-style-type: none"> • PEI Career Card: Assistant Forester • PEI Career Card: Land Steward • PEI Career Card: Senior Resource Information Forester • PEI Career Card: Silviculture Forester • Natural Inquirer: Forest and Plants Scientist Cards |
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| 10. | <p>Guiding question: Why is it a problem if there are fewer living trees?</p> | <p>Estimated time: 70+ minutes</p> |
| | <p>Brainstorm and discuss: What are some benefits that trees provide?</p> <p>Watch video: Forest Fast Break: Carbon Capture</p> <p>Discuss video and reaffirm benefits that trees provide.</p> <p>Reminder: Have students go back to their original explanation of the phenomena on science notebook page- learning session 2 and make a revised explanation, model and key vocabulary.</p> <p>Overview: Students create a brochure about forest ecosystem benefits including information about the impacts of having fewer living trees using the data they collected in Session 8 and the information in their science notebook.</p> <p>Sample brochure outline: Learning Session 9- Brochure Sample</p> <p>The brochure sample has guiding questions and color coded NGSS connections.</p> <p>TT: This brochure activity can be scaffolded by having students work in pairs. Students can</p> | |

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| | do the brochure on paper or with an online template. The sample brochure has suggested headings and information that could be included in each section. This learning session might need to be broken up into smaller time periods. After students complete their brochures it would be a great opportunity to share their work with each other, another grade level or their parents/community members. |
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| 11 | Possible next steps/off-ramps/actions: | |
| | <ul style="list-style-type: none"> ● Tree diversity- afforestation ● Visit forests managed for different purposes - tribal/first foods, wood harvest, Christmas tree, etc. ● Design a tree management plan for your school campus or community to increase the amount of trees in the area ● Connect with local land trusts to bring in guest speakers about forest conservation ● 5th grade Food Waste Storyline- connect to how food waste contributes to greenhouse gases ● Working with native plants through Good Grub- Tend, Gather and Grow ● Family connection with i-tree Family i-tree connection | |

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| 12 | Post Assessment: | Estimated time: 30 minutes |
| | 5- Forests: Forest Ecosystem Benefits Post Assessment Assessment Rubric- 5 Forest Ecosystem Benefits | |

[OER Tracker - 5-Forests: Forest Ecosystem Benefits](#)

Pacific Education Institute would like to acknowledge and thank the writing team for their work. The team included Chad Mullen and Hattie Osborne. In you have comments or questions please contact info@pacificeducationinstitute.org

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