

Model Lesson: Tree Identification and Growth Study at Outdoor School

Overview: Students will identify tree species, collect and analyze tree growth data from two different sites, discuss human impacts on the forest, and predict forest growth as the climate changes. As an extension, students will evaluate the forest as a forest manager to plan for the future. This lesson is designed to be used in mid-elevation coniferous forests in the Cascades of Oregon, dominated by mature Douglas-fir, Western Hemlock, Western Redcedar, and Pacific Yew. The measurements, analysis, discussion questions, and activities can be used in any forest, with modifications taking into account the tree species of the Outdoor School location.

General information: This particular lesson has been developed in cooperation with K-12 educators (science, language arts, social studies, math, and geography) in an effort to enhance 6th grade students' Outdoor School experience and increase their awareness of geography. When the connection a young person has with the natural world is fostered, the young person flourishes academically, mentally, and physically. A connection with our natural world, whether in an old-growth forest, or a city park, both grounds a person and sparks curiosity for the natural world. Being able to name and identify the trees of Oregon, will give students a connection or perhaps a feeling of ownership and thus will encourage stewardship of our natural resources.

National Geography Standards:

Standard 8 : The characteristics and spatial distribution of ecosystems and biomes on Earth's surface.

Standard 14 : How human actions modify the physical environment.

Oregon Geography Content Standards:

Standard 6.12 : Collect and analyze data to describe regions of the Western Hemisphere.

Oregon Science Content Standard:

Standard LS2.A: Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth.

Science Practices:

3. Planning and carrying out investigations
4. Analyzing and interpreting data
8. Obtaining, evaluating, and communicating information

Connections to Common Core:

Writing W.6.7 : Conduct short research projects to answer a question.

Objectives:

Students will be able to :

1. Correctly identify tree species
2. Measure the diameter of trees and determine the density of the trees in a given area (extension: compare diameter distribution between sites)
3. Analyze the differences and similarities between two sites
4. Observe and predict human influences on the forest

5. Make predictions of tree growth as the climate changes
6. (Extension) Make recommendations for future forest management

Grade Levels: 6th

Time:

- 1 class period (30-40 minutes) prior to Outdoor School
- 2 hours at Outdoor School

Materials:

1. Samples of trees species at Outdoor School (Douglas-fir, Western Hemlock, Western Redcedar, Pacific Yew)
2. Dichotomous Key (Common Trees of the Pacific Northwest or other tree identification publication)
3. Tools to measure tree growth (pencil, 100 foot tape measure, DBH [*diameter at breast height*] tape measure)
4. Clipboard (a hard surface to write on in the forest)
5. "Into the Forest" booklet, OFRI publication
6. Datasheets (see appendices)

Background:

Prior to Outdoor School, introduce students to the major tree species they will encounter in the Outdoor School setting. Students should have experience measuring with a tape measure and completing simple calculations. There are various methods of introducing students to trees and other vegetation. Google Earth is a great resource to show students the vegetation and physical geography of an Outdoor School site. The Student Atlas of Oregon is another resource that has both vegetative and physical geography maps.

Procedures:

Prior to Outdoor School: (30-40 minutes, approximately)

Introduction to trees and geography:

1. Show students the location and physical geography of the Outdoor School site, using satellite images within Google Earth or the Student Atlas of Oregon.
2. Using tree samples, work through a dichotomous key of the tree species to demonstrate how a key is used and to show the characteristics that will be used to determine tree species at Outdoor School (needles, cones, bark, size).

At Outdoor School:

Tree Identification:(30-45 minutes approximately) The duration will depend on the distance of the hike to be determined by the teacher. (Use the Observation Sheet from Appendix A.)

1. In small groups, lead students on a forest hike to observe and learn the major tree species. Stop periodically on the hike and show students the individual characteristics of the trees. *Needles and cones are very different between tree species.*
2. Make sure that each student has a chance to observe specific characteristics of tree needles, bark, and growth habit, of all tree species being studied. *The growth habit "droopy-top" of Western Hemlock is much different than that of a straight Douglas-fir tree. Western Hemlock is shade-tolerant and seedlings can grow in shade, Douglas-fir seedlings must have direct sun to grow successfully.*

3. During the hike, collect individual tree samples for each species. *Collect part of a branch to allow students to closely examine needles, and pick up cones that have fallen from the ground. Make sure that you are collecting the correct cones associated with the correct tree. In a forest, it is common for cones to be moved by wind or animals.*
4. Following the hike, allow students to use the tree samples, and record their observations on the sensory observation sheet (Appendix A).
5. Allow students to share observations with the group, and work through the discussion questions together. With this practice identifying trees, students will be ready to test their new knowledge as they measure trees.

Discussion Questions:

1. What do you notice about all the tree species? What is similar? What is different?
They all have green needles. The Western Hemlock needles are various lengths, but the Douglas-fir needles are all the same length.
2. Do the trees smell different?
Have students share what they have recorded. If students need help with this question, crush the needles in your hand to release an odor.
3. Sometimes there are tricks to remembering tree species, do you have any ideas about what is special about Douglas-fir or Western Redcedar?
Talk about the unique Douglas-fir cone, that looks like a mouse has run back into the cone and its tail and feet are showing. Western Redcedar bark looks stringy on the older trees.

Tree Measurement: (45 minutes at two locations, so a total of 90 minutes) Teachers that are not familiar with forest surveying (measuring trees) should read and watch the videos within the “*Virtual Cruiser Vest*” publication by Kevin Zobrist (see the resources section). An alternative to learning from Kevin Zobrist is to recruit your local forester to come work with the students during Outdoor School. Two different plots should be marked, prior to having students measuring trees (*The different plots could have different aged trees, have been partially logged or an old burn.*) Use the data collection sheet (Appendix B). (*If you have the benefit of a forester include the height measurement using a clinometer. Tree height is often the more difficult task to measure accurately.*)

1. Demonstrate how to use the tools and allow time for students to practice and ask questions. Provide equipment to each group of 3-4 students. Remind students the importance of careful observations and data collection.
2. Within each group have one student record tree growth data, and 2 to 3 other students take the actual measurements.
3. Spend 20-30 minutes collecting and recording data, then stop the students to allow them to explain the data they gathered with the group. As a group, discuss the questions and share ideas.

4. Extension: If there is a group that finishes early, you may have them record data using Appendix C (Looking at their diameters, have the students make a comparison between the sites. *Example: there are 3 DH that are between 16 and 20 inches in diameter*)

Discussion Questions:

1. What do you notice about the trees in this plot? Are the four species we learned earlier all growing here? What species are most of the seedlings? Why? *You could draw on their knowledge of which species are shade-tolerant, Pacific Yew and Western Hemlock are very shade-tolerant.*
2. What species has the largest diameter? Why do you think that is the case?
3. What are the challenges of collecting data in the forest? *If the trees are very large, it can be hard to measure with a DBH tape.*
4. Do you see evidence of human activity? *Stumps from logging, logging debris, fires.*
5. Do you see evidence of wildlife? *Elk can rub (rack) seedlings with antlers, elk and deer scat may be present.*

Following the discussion, take the group to the other site/plot and collect the same data on a new data sheet and ask the same questions.

After visiting both sites, discuss the following questions:

1. How are the 2 sites similar? How are they different?
2. Why are they similar/ different? *The 2 sites may be too close together to show any differences. Is there evidence of logging, fires, animal damage?*
3. What evidence did you observe of human influence on this forests? *There may be a path for recreation, stumps, or burned stumps.*
4. If more people use this forest, what do you predict will happen to the trees? *They could be protected if they are old-growth, or logged.*
5. What is missing from the sites that you expected to find? *It always surprises me what the students say. Maybe there are very few Pacific Yew trees.*
6. What are some other measurements that we could take to quantify the differences? *Temperature, soil water, slope of the land, soil nutrient, etc...*
7. With increased temperatures, as the climate changes, how will these sites change? *Students may talk about the lack of water.*

8. As the climate changes, how will the forest change on these two sites? *Different species may be introduced or perhaps there will be more insects.*
9. What does it mean when a forester says they “manage” the forest? *Discuss how a good manager is thinking about a sustainable resource, whether that is lumber or wildlife.*
10. What kinds of things do forest managers do?
11. What are some of the different reasons people manage forests? Should all forests be managed? *People may manage for wood products, wildlife habitat, or recreation.*

Assessment:

Formative assessment:

1. Using a dichotomous key to identify trees.
2. Datasheet for the tree growth (Appendix B)
3. Discussion questions

Summative assessment:

1. Sensory observation for tree identification (Appendix A)
2. *Extension* Activity: “Tree Diameter Comparison of Two Sites” (Appendix C)
3. *Extension* Activity: “Your Forest Plan” Worksheet (Appendix D)

Adaptations:

For the first part of the lesson, when students are writing their observations, students with limited writing abilities may draw pictures to communicate their observations. When dividing students into groups, partner ELD and SPED students with supportive and helpful peers. Check for understanding as the lesson is being implemented and guide students as needed. As the groups are working, check-in frequently with the ELD and SPED students.

Extensions:

1. “Tree Diameter Comparison of Two Sites” (Appendix C), this activity can be completed by groups that finish early, or the more advanced students that need a challenge.
2. “Your Forest Plan” (Appendix D), this is an activity to be done in small groups and will require small group discussion and take into account the previous activities and learning.
3. Other lessons for Outdoor School have been written by middle school teachers, that would enhance students educational experience. They include: *Tread Lightly (human impact)* by Anna Hart, *Teaching the Layers of the Forest through Poetry and Writing* (by Beth Chitwood).

Sources:

Bulman, Teresa. and Rice, Gwenda. *Student Atlas of Oregon*. (2015).

College of Forestry, Oregon State University. *Common Trees of the Pacific Northwest*. <http://www.orst.edu/trees/index.html> (2016)

Oregon Forest Resources Institute. *Into the Forest*, Student and Teacher Guide [Publication]. Portland, OR. (2015).

Zobrist, Kevin. *Virtual Cruiser Vest* (2008). Washington State University Extension and the National Learning Center for Private and Range Landowners. USDA Nondiscrimination Statement " A program of the Cooperative Extension Service funded by the Renewable Resources Extension Act".

http://forestandrange.org/Virtual%20Cruiser%20Vest/lessons/lesson_06/Lesson_6_PDF.pdf

Appendix A

Tree Identification Observation Sheet - use word phrases to describe how the tree specimen looks, smells and feels. Draw and label the tree sample.

Sights - describe what the tree looks like	Smell - describe how the needles smell
	
Touch- describe how the needles feel	Drawing of the tree sample
	

Rubric : Sensory Observation of Tree Species

CATEGORY	4	3	2	1
Sight	There are more than four distinct and specific observations recorded.	There are at least three distinct and specific observations recorded.	There are at least two specific observations recorded.	There is one observation recorded.
Touch and Smell	Combining these two boxes, there are more than six distinct and specific observations recorded.	Combining these two boxes, there are five distinct and specific observations recorded.	Combining these two boxes, there are four specific observations recorded.	Combining these two boxes, there are three observations recorded.
Drawing of tree species	Drawing includes 4 or more characteristics of the tree to include needles, bark and/or cones all clearly labeled.	Drawing of at least 3 characteristics of the tree (needles, bark or cones) are clearly labeled.	Drawing of at least 2 characteristics of the tree (needles, bark or cones) not labeled.	Drawing of 1 characteristic of the tree (needles, bark or cones) not labeled.

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Appendix B
Datasheet: Tree growth

Site Location _____ Date _____

Names of data collectors _____

Tree Species (Common Name)	Number of trees	Diameter (dbh)	Height of tallest tree	Density (number of trees per site)

Tree species list:

- Western Redcedar (WR)
- Western Hemlock (WH)
- Douglas-fir (DF)
- Pacific Yew (PY)

Appendix C

Extension Activity (Tree Diameter Comparison of Two Sites)

DBH (inches)	Tree Species from your plot whose DBH is found within this range	
	SITE _____	SITE _____
1-5		
6-10		
11-15		
16-20		
21-25		
26-30		
31-35		
36-40		
41-45		
46-50		
51+		

Tree species list:

- Western Redcedar (WR)
- Western Hemlock (WH)
- Douglas-fir (DF)
- Pacific Yew (PY)

Appendix D

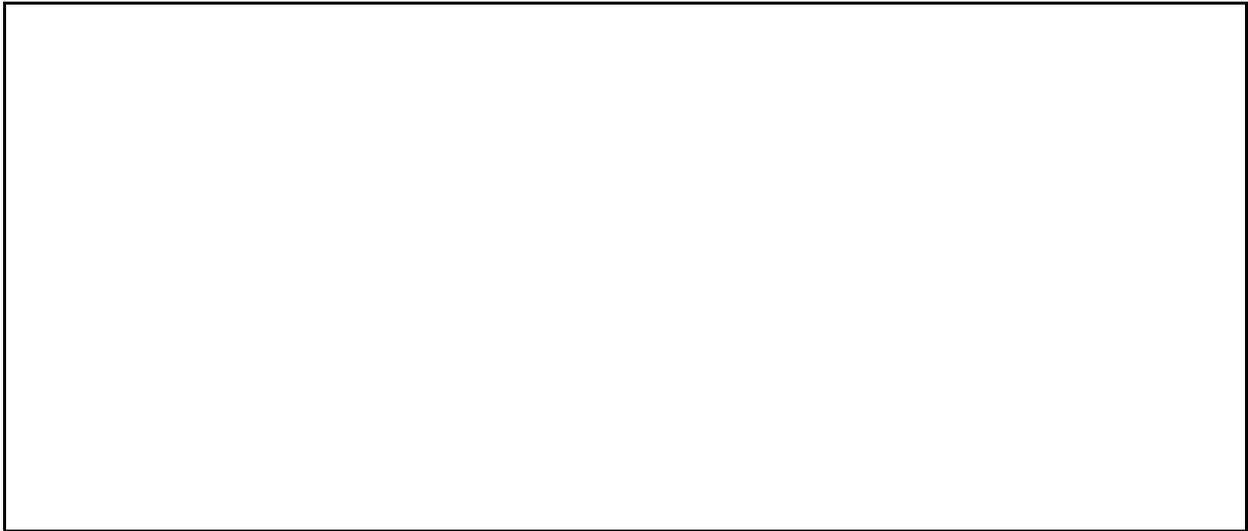
Your Forest Plan

Name _____

Imagine that your group owns and manages 100 acres of forest. This forest is made up of conifer trees that are all about the same age, and has a stream running through it.

What is your goal for this forest?

What would your forest look like if your goal is being met? Draw a picture of it.



Are there any natural benefits forests provide, such as storing carbon, that could help you achieve your goal? (Look through [Into the Forest](#) for ideas.)

What forest management activities would you do in the next year to move toward your goal?

What would you do in the following five years?

What would you do to ensure that your forest remains healthy for the next 25 years and more, while also meeting your goal? _____

RUBRIC: YOUR FOREST PLAN

CATEGORY	4	3	2	1
Goal	The goal of the forest plan is clearly identified and stated.	The goal of the forest plan is identified, but is stated in a somewhat unclear manner.	The goal of the forest plan is partially identified, and is stated in a somewhat unclear manner.	The goal of the forest plan is erroneous or irrelevant.
Drawings/Diagrams	Clear, accurate diagrams are included and make the future forest easier to understand. Diagrams are labeled neatly and accurately.	Diagrams are included and are labeled neatly and accurately.	Diagrams are included and are labeled.	Needed diagrams are missing OR are missing important labels.
Management Activities and Questions	Activities are listed in clear steps. Questions are answered in complete sentences.	Activities are listed in a logical order, but are not in complete sentences.	Activities listed but are not in a logical order or are difficult to follow.	Activities not accurately listed.