

H.J. Andrews Experimental Forest Tea Party



Author: Molly Charnes
Time: 1 50 minute class period
Grade Level: 6-10

The Andrews, which...is the most studied primal forest ecosystem on this continent, and perhaps the planet. That does not mean that scientists here have found every cog and wheel, much less every relationship between them. But here they have discovered a host of species previously unknown to science, and interactions in the forest ecosystem that no one previously imagined. Here, in the shadows of this woods, in its rivulets and streams, under its soil, and high overhead, they have discovered a hidden forest.
(Luoma, 2006)

Background

The H.J. Andrews Experimental Forest: Where Ecosystems Are Revealed

The HJ Andrews Experimental Forest is located in the Cascades Mountains of Oregon on the Willamette National Forest. Ecosystem scientists have explored basic and applied questions about forests and watersheds there for more than 60 years. By studying old-growth and managed forests at this site for decades, scientists have identified the critical role of large old trees and downed wood in the fundamental forest processes of decomposition, nutrient cycling, and landscape connectivity. In collaboration with colleagues in the humanities, education and natural resource management, their work has transformed the way old-growth forests are conserved and managed today.

Introduction to the Lesson

A “tea party” is a literacy strategy that can be used to introduce students to the characters and concepts in a novel or story or to the people and interests involved in historical events. Students generally familiarize themselves with a character or key idea, and adopt a prescribed persona as they mingle with others to determine how their interests conflict, support each other, or illuminate concepts they will be learning.

This tea party is recommended as an initial lesson in a unit on ecology. It adapts the tea party strategy to help teachers introduce the biotic components of an old growth forest. By talking to other students from the perspectives of forest organisms, they will begin to understand the types of relationships essential in this and other ecosystems. Some of the concepts introduced include trophic interactions, nutrient cycling, and symbiotic relationships.

Students will be assigned one of the roles included in the activity. After learning their roles, they will mingle with the rest of the class and through their conversations uncover the connections among the residents of the forest. To enhance the party-like atmosphere, you may choose to serve drinks and snacks as students interact in the persona of their organisms.

Because this activity is a tea party, and the organisms are described with human characters, students are being asked to relate their human experience to other organisms as described in their role cards. It may be beneficial during or after this lesson to point out that interactions in an ecosystem don’t happen because different organisms (or humans!) are “looking out for each other,” “don’t like each other,” are friends or enemies, or for other anthropomorphic reasons. As your ecology unit continues, hopefully your students become more comfortable describing the principles behind what is happening in ecosystems and less likely to

see processes and events occurring through a human perspective. This lesson was designed to engage them in seeing some of the parts of an ecosystem and how they work as part of the whole.

Instructional Goals

- Students will recognize the existence of a variety of different forest organisms, including decomposers
- Students will discuss the role of an organism in a forest
- Students will identify and model ways that forest organisms interact with each other

Vocabulary

Ecosystem-a system composed of the living and nonliving parts that interact and influence each other

Biotic-the living components of an ecosystem such as plants, animals, and bacteria

Abiotic-the nonliving components of an ecosystem, such as soil, air, and water

Symbiotic- a close association between two organisms of different species in which at least one member benefits

Decomposer- an organism that breaks down dead materials

Nitrogen- a vital element for living organisms. Composes 78% of the atmosphere, but bacteria are required to convert it from air into a form useable by plants

Herbivore- an organism that gains energy by eating plants

Framework for K-12 Science Education Standards

LS2.A Interdependent Relationships in Ecosystems

LS2.B Cycles of Matter and Energy Transfer in Ecosystems

LS2.D Social Interactions and Group Behavior

Materials

Copies of organism role cards*

Copies of student worksheet

Name tags

[*Additional organism role cards](#)

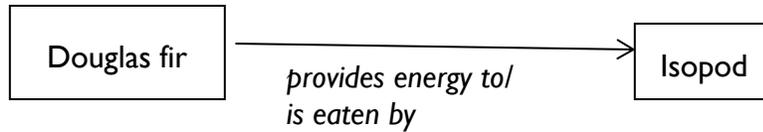
Poster paper

Optional: Tea, punch, cookies, or other party snacks

Lesson Procedure

1. Assign each student one of the organism role cards. Have students read their card to themselves until they have identified the unique traits, behaviors and interactions of their organism and are prepared to talk about them with other students.
2. Provide each student a name tag on which to write the name of their organism. You may choose to have them use either the common or scientific names of the organisms. Have students put their name tags on themselves (they may need a reminder to wear it somewhere visible.)
3. Explain to students how the tea party works: during the given time (15-20 minutes), they will interact with others in the room in the persona of their organisms. Students should move around the room and introduce themselves to the other organisms they meet, engaging in one-on-one conversations to learn more about the role each other plays in the forest. They should not be gathering in large groups or reading off their role card during these conversations.
4. Review the directions for the student worksheet. As students meet other organisms, they should record their names and any important details about them in the appropriate square.
5. Have students stand up and mingle, recording on their worksheet as they go. Provide 15-20 minutes for this part of the activity.
6. After the tea party, have students individually diagram the relationships they have discovered or can infer about the organisms they met. There is space for this on their worksheet. If students are

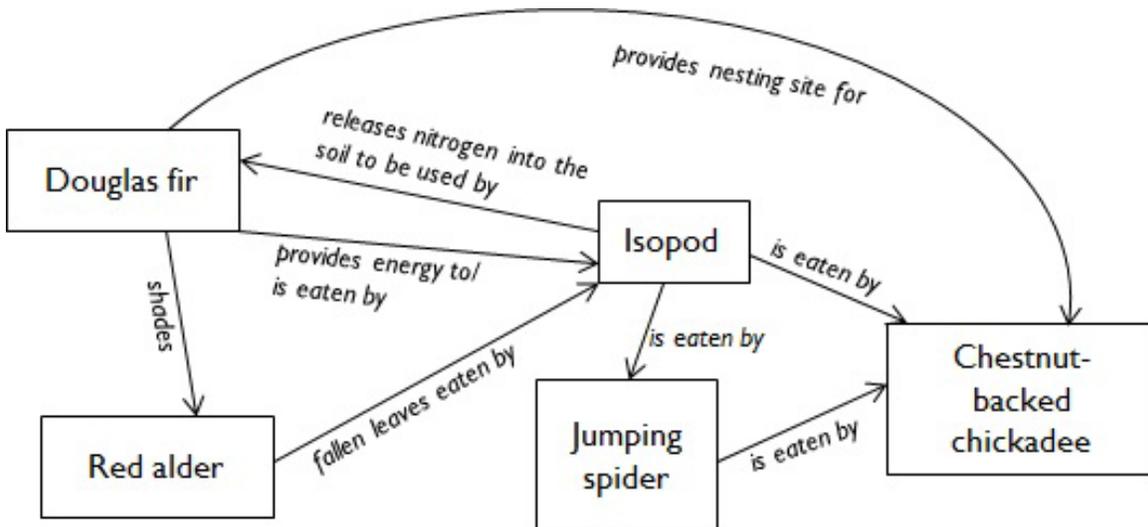
unfamiliar with drawing models or interaction web diagrams, you may want to help this process by asking a student to share an example of a connection they discovered between themselves and another organism (e.g. isopods shred and eat the wood from dead Douglas fir trees.) Draw an example of this interaction by putting the organisms in a box and drawing and labeling an arrow to show the relationship:



Notes

- I generally have students draw arrows representing the movement of matter and energy (from the fir to the isopod) to support the understanding of food webs in future lessons, though you may choose to allow students to determine how to draw and describe their arrows. Some relationships may not transfer matter and energy, so the students will need to determine how to direct those arrows.
- Organisms' descriptions may only include general terms describing their connections to other organisms (e.g. plants, insects), so encourage students to make inferences if necessary to complete their models.
- Not all organisms can/need to be connected to each other, but encourage students to make as many arrows as they can.

An example of a model including a few more organisms:



7. As a closing activity, the class can combine what they know on a class version of the diagram, making sure that all organisms are represented.

Assessment Ideas

Ask students to write about one or more of the following questions. These questions may also be used later in the unit to connect new learning with this activity.

- How do you think the forest would be affected if the species you represented went extinct? Give as many examples as you can.

- What values could humans find in this forest? In other words, what ecosystem services does it support?
- Which of these organisms are in a symbiotic relationship with each other? Explain how this relationship is significant to each member of the interaction.
- Which of these organisms are decomposers? How do they play an important role in this ecosystem?
- Describe how the organisms in this ecosystem contribute to the cycling of nitrogen or carbon.
- What are some ways in which these organisms change the abiotic environment? Give examples.
- Why do you think there are multiple kinds of predators, herbivores, and decomposers in the forest instead of one best kind of each?

Extension activities

- After studying trophic levels, students may be asked to sort the cards into feeding groups (producers, decomposers, herbivores, omnivores, carnivores.)
- Groups of students may be given a set of the role cards and asked to diagram how nitrogen or carbon cycle through the system.
- After studying a local or other ecosystem (including their own schoolyard), students may each be required to adopt an organism from the ecosystem and create a new class set of role cards about a different ecosystem.

References

Spies, T.A. and S.L. Duncan, eds. 2009. *Old growth in a new world: A Pacific Northwest icon reexamined*. Island Press. 344 p.

Science expertise provided by the following Oregon State University faculty: Dr. Judith Li (Department of Fisheries & Wildlife); Dr. Kari O'Connell (Oregon Natural Resources Education Program, College of Forestry); Dr. Mark Schulze (Department of Forest Ecosystems and Society).

For further information:

H.J. Andrews Experimental Forest Website: <http://andrewsforest.oregonstate.edu/>

H.J. Andrews Experimental Forest Children's Book: Li, Judith. 2013. *Ellie's Log, Exploring the Forest Where the Great Tree Fell*. Oregon State University Press.

Teacher's Guide: <http://ellieslog.osupress.oregonstate.edu/>

Luoma, J.R. 2006. *The Hidden Forest: Biography of an Ecosystem*. Oregon State University Press. 248 p.

Pyle, Robert Michael. 2004. The long haul. *Orion*. September/October: 70-71.
<http://andrewsforest.oregonstate.edu/research/related/writers/wir/pyle3.pdf>

Acknowledgements

This lesson was created using information learned in the Oregon Natural Resources Education Program's Teachers as Watershed Researchers workshops as well as a Research Experience for Teachers experience at the H.J. Andrews Experimental Forest (HJA). Research and educational opportunities at the HJA were supported by the National Science Foundation's Long-Term Ecological Research Program (DEB 08-23380), US Forest Service Pacific Northwest Research Station and Oregon State University.

HJ Andrews Experimental Forest Tea Party Student Worksheet

Directions

1. Read your role to yourself. Read it again. You will be interacting as if you were the organism on the card you received and telling the other guests about yourself, so be prepared to discuss the big ideas you learned about your organism. As you meet with other students you should be talking about your organism, not reading off your role card.
2. When directed to, walk around the room and meet as many other members of the forest ecosystem as you can. You should be having one-on-one conversations with other forest residents (students) and talking about your organism. Find out who the other organisms are and what role they play in the ecosystem. Consider how they influence your survival in this ecosystem.
3. As you meet other organisms, fill in the grid on the back of this page using what you learned about them.
4. After the party, use the space below to draw a diagram that shows the connections between yourself and the other organisms that you met today.

Diagram: Interactions between Old Growth Forest Organisms

Find an organism who: (Fill in the spaces below with the names of organisms and what you learned about them.)

| | | |
|-------------------------------------|--|--|
| Gets energy by eating other animals | Uses sunlight to make food | Is endangered |
| Lives underground | Loses their leaves once a year | Exchanges materials with another organism |
| Is microscopic | May spend their entire life in the forest canopy | Gets energy by eating plants |
| Gets energy from dead organisms | Does not lose their leaves | Is in a mutually beneficial relationship with another organism |

Organism Role Cards

Rindge's Moth Caterpillar

Pero mizon



I am a young caterpillar that some call an inchworm. I'm often not even noticed as I sit on the branch of my favorite foods, but sometimes you can see me inching along to a new leaf. I'm not a picky eater: I like the leaves and flowers of plants like alder, Douglas-fir, oak.

I spend months eating and growing until I am ready to change into a moth. Some moth species stay caterpillars for years, if they can avoid being eaten!

Image Source: I, Brocken Inaglory [GFDL (<http://www.gnu.org/copyleft/fdl.html>), CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>) or CC-BY-SA-2.5-2.0-1.0 (<http://creativecommons.org/licenses/by-sa/2.5-2.0-1.0/>)], via Wikimedia Commons



Rindge's Pero Moth

Pero mizon

I am a medium-sized moth. My wingspan is about 4 cm (1 5/8th inches.) We adults hatch out of our cocoons in the middle or end of the summer. During the night I travel from flower to flower seeking food.

My species is common in wet conifer forests. During the day I try to blend in to the bark of trees and avoid predators. My wings are covered with stripes, and I think I do a pretty good job of hiding.

Image by willapalens, "156 Pero mizon - Rindge's Pero Moth 6757," via Flickr.



Douglas-Fir

Pseudotsuga menziesii

I am a Douglas-fir tree. Instead of eating food, my needles capture sunlight that I use to make my own food. I belong to one of the largest tree species in the world. I am a conifer tree, which means my seeds are stored in cones and that I have needles instead of leaves.

My species dominates this old growth forest where I've been growing for the past 500 years, and I still expect to live for a couple hundred more years.

Image sources:

(Left) By U.S. Forest Service [Public domain], via Wikimedia Commons

(Right) By Walter Siegmund (Own work) [GFDL

(<http://www.gnu.org/copyleft/fdl.html>), CC-BY-SA-3.0

(<http://creativecommons.org/licenses/by-sa/3.0/>), via Wikimedia Commons



Red Tree Vole

Arborimus longicaudus

I am a red tree vole, a small mouse-like rodent. I stand out from other species of voles because I live my entire life up in the Douglas trees. I eat the needles for food and lick moisture off the needles when I need to drink. The needles are pretty hard to digest, but when I am young I find some bacteria that can assist the process. By eating the excrement (poop) of my parents, a colony of these bacteria is passed on and starts to live in my stomach.

Generations ago, my ancestors built the nest that I'm living in today. It is hundreds of feet off the ground and has a dining area, a bathroom, and an escape tunnel.

Image by Altig, Ron; photo by BLM (Roseburg, Oregon Field District) [Public domain], via Wikimedia Commons



Image from [US Bureau of Land Management](#), via [Wikimedia Commons](#)

Red Alder

Alnus rubra

I am a deciduous tree called red alder. Because I am a deciduous tree, my leaves fall off each fall and start to regrow each spring. I capture sunlight to make my own food. Sometimes this is challenging because I'm not as tall as a lot of the trees found in the forest and it can be pretty shady where I grow.

I don't live as long as the conifer trees, but a lot of animals use me as food. There are always insects crawling all over me and even more jump on my leaves the moment I drop them to the forest floor.

My leaves carry a lot of nutrients, including nitrogen. To help me get the nitrogen I need, I have teamed up with a special kind of bacteria that live in my roots that are able to capture nitrogen from the air and transform it to a form that I can use.



Image by Bot dk (Own work) [CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via [Wikimedia Commons](#)

Lichen

Lobaria oregana

I am a type of lichen called Lobaria that lives on the trunks and branches of Douglas-firs. I am actually three kinds of organisms in one: the team is made up of a fungus, an algae, and a cyanobacteria (a type of bacteria that can do photosynthesis). The fungus builds most of my structures, protecting the algae and cyanobacteria living inside me. The algae and cyanobacteria participate by gathering water and carbon dioxide from the air and using them to create food that the fungus can use.

I also can transform nitrogen in the atmosphere into a kind of nitrogen that plants can use. When I get knocked out of trees during winter storms, I fall to the ground and get decomposed, and the nitrogen stored in me is released and becomes available for Douglas-firs and other plants to use.



Images by Franco Folini (San Francisco, California) [GFDL (<http://www.gnu.org/copyleft/fdl.html>), CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>), via Wikimedia Commons

Isopod

Armadillidium vulgare

I am also known to some as a sow bug, potato bug, a pill bug, or a roly poly. I am a crustacean, meaning that lobsters, crabs and shrimp are some of the kinds of organisms that I am most similar to. I live in moist places like under logs and fallen leaves because I breathe using gills.

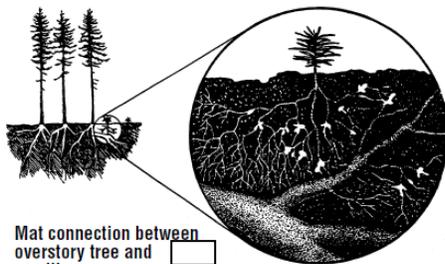
When dead trees and leaves fall to the forest floor, I move in to shred them into smaller pieces so that I can eat them. By doing this I return nutrients to the soil—you could call me a master recycler in the forest!



Mycorrhiza

I am a network created when fungi connect with the plant roots in the ground and can also grow into rotting logs. Fungi are not able to create their own food, but millions of years ago worked out a good deal with plants.

Plants can make their own food and are willing to share, in turn the fungus help provide plants with some of the nutrients they need.



Mat connection between overstory tree and seedling

Image sources: Top: Biomed Central, via Wikimedia Commons, Bottom: *Mycorrhizal Fungal Mats: Role in Forest Productivity* publication by Cascade Center for Ecosystem Management



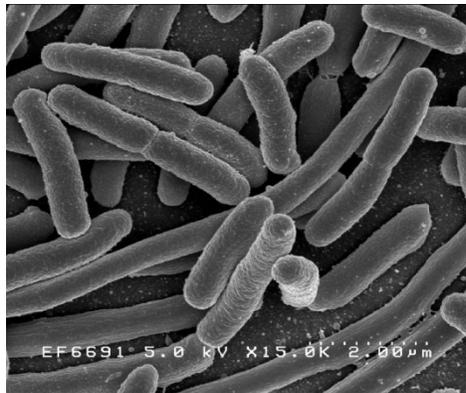
Oribatid Mite

I might be incredibly tiny, but I am hugely important to this forest! If you pick up a handful of dirt, you won't see me, but I'm there along with thousands of other mites.

We're no good at digging, though; we have to wait for worms and other organisms to make a path that we can follow.

To survive, we get energy by breaking down dead material on the forest floor. This process returns nutrients to the soil for plants to use. I also eat bacteria and facilitate the release of the nutrients they have been busy modifying.

Image by S.E. Thorpe, via Wikimedia Commons



Bacteria

We are not visible to the naked eye, but we are an important part of the forest. We can live on our own in the soil, but are also found in the stomachs of arthropods (bugs) that live there—we're that small!

When organisms die, we swoop in to break them down (dead organisms have lots of energy-rich molecules!), which releases the nutrients they held back into the soil.

Image source: Rocky Mountain Laboratories, NIAID, NIH, via Wikimedia Commons



Jumping Spider

Metaphidippus aeneolus

I am a jumping spider. I have a special hydraulic system that allows me to jump more than 30 times farther than my body is long. Along with my great eyesight, this makes hunting a piece of cake. This is important because unlike most spiders, I don't spin a web to catch my prey. I really do hunt it down.

I'm not very picky about what I eat. Dinner is often one of the many kinds of insects that eat the leaves or sap of plants. Along with other species of spiders, we manage to eat 99% of the caterpillars found in the forest--I wouldn't want to see what this forest looked like if those insects were around to keep eating all the time!

Image by Kaldari (Own work) [CC0], via
Wikimedia Commons



Oregon Grape

Berberis nervosa

I am known as Oregon grape. I am Oregon's state flower and grow in shady areas like this forest as well as in sunny areas.

I capture sunlight to create my own food.

It's hard to tell where I begin and end because even though I look like several different copies of the same kind of plant, each one is connected with the same roots. As my roots grow through the ground they connect with a fungus. The fungus shares nutrients with me in exchange for the food I provide it.

Image by EncMstr (Own work) [CC-BY-SA-3.0
(<http://creativecommons.org/licenses/by-sa/3.0>), via
Wikimedia Commons



Vine Maple *Acer circinatum*

I am vine maple, a common understory tree in the old growth forest. My leaves are a popular snack for many insects, which makes my branches a great place to find birds.

Fortunately I have no problem living in the shade since the Douglas-firs growing around me prevent much light from reaching the understory. You can find me in the riparian zone—in other words, next to streams. I am a pretty thirsty plant: even though I don't require a lot of sunlight, I use 10 times as much water as the Douglas-firs (per leaf area).

Image by Angilbas at the English language Wikipedia [GFDL (<http://www.gnu.org/copyleft/fdl.html>) or CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons



Chestnut-backed Chickadee *Poecile rufescens*

I am a small song who lives year-round in many Douglas-fir forests in the Pacific Northwest. I am an insectivore so most of my diet is made up of insects and other invertebrates, but sometimes I also eat seeds. I tend to spend my days moving around the forest with my flock in search of food.

The trees around the forest provide food for the insects that I eat, and provide me structure for my home. I am a cavity nester, which means that I build my nest in holes in trees. I also search the forest for fur to line the cavity and keep it warm while I am raising my young.

Image by Minette Layne (Flickr: [1]) [CC-BY-SA-2.0 (<http://creativecommons.org/licenses/by-sa/2.0/>)], via Wikimedia Commons



Big Brown Bat

Eptesicus fuscus

I am a big brown bat. I am nocturnal and spend my nights hunting for flying insects like moths and mosquitoes.

I use echolocation as I fly to help me locate food and to avoid running into trees. In echolocation, I send out a burst of sound and wait for the echo to return to me.

During the day I roost in holes in trees, caves, and along rock ledges.

Image by Matt Reinbold from Bismarck, ND, USA
(Bilateral Symmetry) [CC-BY-SA-2.0
(<http://creativecommons.org/licenses/by-sa/2.0>)], via
Wikimedia Commons



Millipede

On each of my many many segments (except the first one that is my head), I have 2 pairs of legs. To protect myself I can curl into a tight spiral or sometimes emit a foul smell, but I am not poisonous and I don't bite! I'm one of the bigger invertebrates on the forest floor – some millipedes are almost 1 foot long.

I live in moist environments (and especially like soft wood in rotting logs or nurse trees). Most of my kind are either scavengers or herbivores.

Image by Ken Hammond (H. J. Andrews photograph)



Oregon slender salamander

Batrachoseps wrighti

I am a small salamander. I live only in the Pacific Northwest, where I like moist forests – like Douglas- fir, maple or red cedar woodlands. Because of my diminutive size, I fit easily in small crevices of down wood, and in the leaf litter.

I eat insects that I find on the forest floor.

Like many other amphibians, I am very vulnerable to habitat loss. I have been listed as threatened by the International Union for the Conservation of Nature.

Image by From USDA Forest service,
<http://www.fs.fed.us/r6/centraloregon/wildlife/species/reptiles-amphibians/salamanders.shtml>



Long-horned beetle

Cerambycidae

I am one of many kinds of bark beetles in the forest. As a larva I feed on dead, dying or decaying wood. These activities are important for wood decomposition.

I spend most of my 1-3 years as a larva. After pupating I emerge as an adult (my photo shown here) when I feed on flowers or other plant parts for a few days to months.

Image by Jeff Miller. H. J. Andrews photograph.