

Show and Tell Lab

Subject(s): Science

Grade Level: 7th-12th

Activity authors: John Fisher, Lewiston H.S.;
Ann Gehring and Rick Alm, Priest River
Lamanna H.S.

Lesson Objectives:

The purpose of this activity is to integrate various subject areas and provide hands-on cooperative experiences to introduce or (usually) to culminate learning units.

Time Required: Three days

Background (by John Fisher):

“Show & Tell” Lab activities are the result of a 25 year evolutionary process, the idea originating perhaps in a college zoology lab. At least 5 or 6 teachers have used this type of activity at Lewiston H.S. and J. Fisher has at least 8 or 10 different labs. They are stored in cardboard boxes.

Creating:

The items used usually require almost no money and are available from home, stores, resource agencies, industry and students. Put out a wish list. While little cost is involved, creation and writing is labor intensive. The satisfaction is watching near 100% student participation and interaction. J. Fisher has found that 3 days is the maximum time for motivated high school students.

Writing these lab cards calls for creative thinking (How can I use this object?) and very careful wording. It takes several rewrites and revisions before and after use. A mix of simple, easy factual questions in addition to complex analytical/value questions allows success for lower achieving students and tough challenges for higher achievers and a chance for all to learn from their collective knowledge.

Grading: This can be very time consuming. Consider the following:

- A good key with a complete set of answers can usually be graded by a student aide.
- Grade one station at a time. The answers and order will be memorized and graded consistently.
- Grade only one paper from each group but make sure each person turns in a set.

Logistics: I suggest you consider the following format as you develop your personalized lab:

-Organize lab stations according to subject areas and it will be easier to add/delete items without having to totally rewrite keys or cards. By organizing the lab into stations, everyone can start at a different point at the same time. The students organize their answers numerically within a station area and collate them (alphabetically) before turning in. Be sure each station is labeled on their paper with station #, title, and point value.

-Students should be work in groups of 2 to 4, with a mix of males and females to take advantage of their diversity of knowledge and experiences. I generally answer questions only to direct their thought process, suggest sources, and reinterpret the questions. Because some of the questions can be very difficult, I allow them to use any source for answers, except me. This often forces them to consult with resource experts, and even their parents, in addition to traditional sources and their notes. Students should have their own set of answers. Some of these questions could be used as introductory material, but I generally use them as a culminating activity. As you can see, they combine some of the elements of a lab, worksheets, text material, and a test.

What follows are some questions that were created as a result of the *Ecology, Economics and the Environment Forest Tour* and some that have been used for over 15 years by J. Fisher. The material may need wording revision, answer additions or corrections. We suggest the information be transferred to index cards. We include suggested station areas, suggested alphabetical/numerical system, titles, questions, possible answers (abbreviated) and where not obvious, a description of the item and possible sources.

Learning from the Forest

Procedure:

Examine the objects provided and answer the questions.

Biotic Factors

- B-1 Fruticose lichen/Old man's beard/Goat's beard
Review the definitions of Symbiosis, Mutualism and Commensalism.
 1. What are the 2 organisms that make up the lichen? (*Algae and Fungi*)
 2. What is the relationship between the two? (*Fungi hold moisture and provide a home, the algae provide a food source via photosynthesis.*)
 3. What do you suppose is the relationship between the two? (*Commensal or probably symbiotic.*)
 4. What endangered animal in north Idaho is heavily dependant on this lichen? (*Caribou*) recycling, 4. may inhibit growth of new seedlings)
- B-2 Blister Rust (*White pine's infected branch*)
 1. Outline the life cycle of this organism.
 2. Describe the infected site on this tree.
- B-3 Conch Fungus (Creeping Crud) (*Cross cut conch with a bandsaw*)
 1. If this is the fruiting body of this organism, where is the rest of the body? (*In the heartwood*)
 2. How can we tell the age of the fruiting body? (*Growth rings*)
- B-4 Bark beetles (*Bark with beetle galleries*)
 1. How do bark beetles kill a tree? (*They eat the cambium and phloem layer under the bark and girdle the tree.*)
 2. How can a healthy tree resist attack? (*It uses resinous pitch to block or force out the beetle.*)
- B-5 Blue stain (*Fire wood chunk*)
 1. What causes blue stain in timber? (*Fungi*)
 2. What effect does it have on timber value? (*Reduces the value by half, stains the sap wood blue/gray but doesn't affect structure or strength*)
- B-6 Duff/Humus
 How is this material important in the forest ecosystem? (*1. holds moisture, 2. prevents erosion, 3. fungi and decay cause nutrient*)
- B-7 Wood boring insects
These various species fill many roles in the ecosystem. Describe three different ones.
 1. The good - (*speeds up decay, food for insectivores, allow entrance of bacteria, thin the forest, food for natives*)
 2. The bad - (*kill trees, damage valuable commercial timber*)
 3. The ugly - (*devalues lumber, larvae are ugly with large jaws*)
- B-8 Gall
 What happened to these limbs?
- B-9 Mistletoe (*Branch with mistletoe*)
Mistletoe causes more damage to western forests than any other organism.
 1. How does it injure trees? (*Creates witches broom, stunts the tree's growth*)
 2. How can it be controlled on commercial forest lands? (*Cut down infected areas*)

Fire & History

- F-1 Fire Fighting & History
Name these tools
 1. Used by firefighters (*Pulaski*)
 2. Used by loggers up to about 50 years ago (*double-bitted axe*)
- F-2 History in a Tree
 This larch was cut down about 4 years ago in the Orogrande area. As it was split for firewood a telephone line insulator was found embedded in the tree. **Do not use your pen to touch the tree, use the paper clip to point.**
 1. Age when it was nailed
 2. Age when it died
 3. Birth year for the tree. Who was the president?
- F-3 Fire Resistant Bark
 Identify these tree species with thick bark.
 1. Larch. Ponderosa Pine. Douglas-fir. Redwood
- F-4 Fire & Soils
 1. How do cool fires help soils? (*Add nutrients*)
 2. How do hot fires damage soils? (*1. Heat destroys soils organisms, 2. Volatilizes soil, nutrients are lost*)
- F-5 Lebanon (*extra credit*) *1 Kings 5 Verse 6, 8, 9, 10; II Kings 19 Verse 23
 1. How long ago did the cedars and firs cover the hills and mountains of Lebanon?
2. What has happened to the land since then?
 3. How long might it take for the land to recover even if humans helped it?
- F-6 Tinder (*extra credit*) Cedar bark
 This bark is always dry in older trees no matter how long it has been raining. It was important as tinder for Indians and early white settlers.
 1. What species of tree? 2. What is tinder?
- F-7 Aerial photo (from Forest Service or Industry)
Analyze this Aerial Photo:
 1. What evidence do you see that fire has occurred? What quadrants show evidence of fires?
 2. How can you tell a clear cut from a fire? (*1. Straight or square borders – logging, 2. Puzzle-like, irregular shapes – fire; 3. Stripes up mountain side – fire; 4. Snags – probably fire, but might be wildlife trees left on purpose during logging*) **NOTE: Modern clearcuts are often designed with irregular borders to mimic nature's "clearcuts."**
- F-8 Fire Kill Log
 1. Why do these logs have to be harvested quickly if they are to have any value?

Mammals & Birds

- M-1 Rubs (marks from elk antlers)
 1. Why do male *Cervidae* rub their antlers on trees and shrubs? (*To clean off velvet, announce its presence, and intimidate rivals*)
 2. What impact does this have on forest health? (Usually no impact)
- M-2 Snowshoe Rabbits (Study skin or chewed shrubs/trees)
 How do these animals impact trees and shrubs? (*May girdle some plants, especially during population peaks*)
- M-3 Beaver (Study skin or chewed stem)
 Describe the successional impacts of these creatures in mountain valleys. (*1. Flooded, forest killed; 2. adjacent trees (harvested); pond abandoned to succession...to Forest Products*)
- M-4 Gophers
 1. Positive impact (*Churns and aerates soils which allows easy water absorption*)
 2. Negative impact (*Eats roots & stems of young seedlings on commercial timber lands, nuisance in yards*)
- M-5 Pine (Red) Squirrel
 1. Why is this rodent important to forests? (*1. It helps forest regeneration by planting seeds; 2. creates seed caches collected and used by foresters.*)
- M-6 Spruce Grouse (Study skins, droppings or picture)
 1. Why does this grouse have this name? (1. Lives in spruce forests; 2. Eats spruce bark)
- M-7 Snags (Logs with woodpecker hole) Why do foresters leave dead snags standing in forests? (*To provide homes for a variety of birds and animals*)
- M-8 Cows & Sheep (Skull)
 1. What are the benefits of grazing cattle on forest lands? (*1. Increase income; 2. reduce competition by non-tree species*)
- M-9 Dead Tree (Killed by porcupine)
 1. What killed this tree? (*Porcupine*)
 2. How exactly did the tree die? (*Tree was girdled*)

Learning from the Forest

Other Plants

- O-1 Mosses
1. What part do these play in the ecosystem? (1. *Pioneer plants*; 2. *moisture retention*; 3. *break down rocks*)
- O-2 Bunch Grasses
1. What characteristics do Ponderosa Pine and bunch grasses share? (1. *Fire resistance*; 2. *wide spacing due to inadequate rainfall*; 3. *wide root systems*)
- O-3 Club Mosses, Ferns, Mushrooms
1. Why are permits required to commercially harvest these organisms? (1. *Prevent over-harvesting*; 2. *prevent fighting*)
- O-4 Ceanothus Species
1. How do some new species of plants suddenly appear after a fire? (1. *Seeds blow in*; 2. *carried by birds or animals like bears*; 3. *seeds lie in the ground for hundreds of years until a fire clears the land*)
- O-5 Bear Grass
Larch is not an evergreen. Bear grass is not a grass.
1. What makes each of these statements true? (1. *Larch loses its leaves*; 2. *Bear grass is in the lily family and has a big white flower*)
- O-6 Pioneer Species (Invaders, any weed)
1. Why are these plants called Pioneer?
- O-7 Saprophytes (Fungi on tree limbs, bark, etc.)
1. What would happen if there were no saprophytes in the forest? In the world?
- O-8 Shrub Species
Collect a variety of specimens and write questions related to how birds, big game rely on them for cover, nesting, food, winter range, browse, etc.

Timber Harvesting & Planting

- T-1 Board foot (Board 1 inch x 1 foot x 1 foot)
If you have a prime 32-foot log that is 15 inches in diameter...
1. How many board feet are in this log? Deduct 10% for waste.
2. If an average house needs about 15,000 board feet of lumber, how many logs of the same size need to be cut from the forest to build this home?
- T-2 DBH
1. Use a tape measure and calculator to determine the DBH of the spruce outside the door.
- T-3 Crown Height
1. Use a clinometer and tape measure to calculate the height of the sycamore tree across the street and the tallest locust tree in the auto shop parking lot.
- T-4 Loggers' Gear (Caulked boots, hard hat, glasses, wedges)
1. Make a list of some of the safety equipment a sawyer has.
- T-5 Saws (Cross cut, chain, piece of band saw, circular saw) A hundred years of technology separates these blades and yet all 4 are still used today.
1. Where and how is each used today?
a. Crosscut (*Felling trees and cutting boards, found in 3rd world*)
b. Circular (*Shaping, trimming lumber*)
c. Band (*Cutting dimension lumber*)
d. Chain (*Felling trees, shaping logs, cutting lumber in the back country, sculpture*)
- T-6 Tree Planting
1. Why do tree planters usually plant a variety of species? (*Insure survivability of the stand due to diversity of species*)
2. What may kill a large percentage of the seedlings the first year? (1. *Heat*; 2. *competition from grasses and other plants*. 3. *drought*; 3. *browsing*; 4. *rodents*)
- T-7 Road Closures ("Shot up" road closure sign from F&G or F.S.)
1. Why do timber companies and the Forest Service close roads after logging operations? (1. *Reduce erosion*; 2. *reduce big game disturbance*; 3. *reduce weed distribution*)

Learning from the Forest

Wood Products

- W-0 Wood & Uses *Gather samples at a lumberyard or woodshop. Cut or shape so their uses are not readily apparent. With the addition of unusual characteristics (bark, cones/seed, needles/leaves, etc.) this could become a 1 hr. activity.*
1. Identify each species of tree/wood and one of its most important uses.
 2. Answers too numerous to list.
- W-1 Fire Starter
1. What 2 substances were mixed together to make this fire starter?
- W-2 Cedar
1. What are the most popular uses of this wood? (*Paneling & external uses, shakes, siding, and decking*)
 2. What are two characteristics that make this wood so valuable? (*Beautiful, insect resistant, rot resistant*)
 3. What other U.S. species have similar characteristics? (*Cypress and Redwood Sequoia*)
- W-3 Plywood & OSB (Oriented Strand Board)
1. Compare the size and characteristics of logs needed to make these products:
 - a. Plywood (*1. large diameter; 2. few knots*)
 - b. OSB (*1. varying diameter/wood waste; 2. varying species*)
 2. Speculate on the advantages and disadvantages of each.
 - a. Plywood (*1. known technology; 2. more expensive; 3. voids from knots*)
 - b. OSB (*1. cheaper; 2. no voids*)
- W-4 Engineered Wood (Solid beam joist OS Beam/glue lams/finger jointed molding)
1. What has happened in the timber industry to encourage the development of engineered wood? (*Reduced availability and increased price of large old growth lumber*)
 2. What are the advantages and disadvantages of these new products? (*Advantages: may be cheaper than a solid beam; 2. doesn't twist or warp; 3. consistent quality; 4. often lighter and stronger. Disadvantages: 1. uneven quality; 2. longevity of products unknown; 3. may be more expensive*)
- W-5 Hardibacker (see tile installer)
1. What materials make up this product? (*Wood fiber, cement, fine sand*)
 2. A similar product is made into exterior siding. Under what (climatic) conditions would this be a popular product? (*1. High precipitation; 2. high humidity; 3. tropical wetness; 4. presence of termites*)
- W-6 Turpentine
1. What is this derived from? (*Southeastern pine tree sap*)
 2. What is it used for? (*Paint thinners & solvents*)
- W-7 Pine Cleaner
1. What characteristic of this product makes this so popular (in the U.S. and Latin America)? (*Pine odor, cleaning solvents*)
- W-8 Pine Nuts
1. Although these pine nuts were collected and packaged in China from a similar tree species, what species of pine produces commercial quantities of pine nuts in this country? (*Pinyon pine*)
- W-9 Bark
1. What are some of the commercial uses of bark? (*Landscaping, hog fuel/electricity & heat production*)
- W-10 Charcoal
1. How is charcoal produced? (*Burning wood in low oxygen conditions to burn off the volatile components and leave the pure carbon*)
- W-11 Oak (Flooring)
1. What species of wood is this? (Hint: It grows in the eastern deciduous forest) (*Oak*)
 2. What clue does the finish give you as to the use of the strip? (*Varnish to protect a floor*)
 3. How do the strips fit together and why would this be important? (*Very tightly by tongue in groove. Important so that dirt does not lodge in between the strips*)
 4. What does deciduous mean? (*Loses all its leaves every year in the fall*)
 5. What needle tree, native to the Northwest, is also deciduous? (*Larch "Tamarack"*)

Learning from the Forest

Other suggested questions

Cedar Shakes (one old and one new)

1. Describe evidence of use and weathering of this cedar shake. (*Gray to black color, moss, deterioration of the wood, staple hole where shake attached to roof*)
2. Compare and contrast the new shake. (*Shake is golden, (cedar) color, no deterioration, no sign of attachment to roof*)
3. What are advantages and disadvantages of cedar shakes? (*Advantages: attractive, Disadvantages: costly, fire hazard*)
4. Describe a possible use for this cedar and an advantage. (*Paneling... ..most likely indoor due to shape. Advantage: attractive*)

Engineered Wood

1. Describe how these would be stronger than a regular stud. How might they be weaker? (*Stronger vertically because the wood fibers are shorter and will twist and warp less. Very weak horizontally, hold very little weight.*)
2. Describe the use of this engineered wood. (*Molding*)
3. How is it manufactured? (*Thin strips are glued together and then a router rounds the edges for a finished look.*)

Cement Wood (Hardi-Trex)

1. Why is such a product being produced? (*To recycle waste products*)
2. What makes up this product? (*Sawdust, cement*)
3. Why do you suppose that these products cost more than conventional wood?

Bark (With Beetle Evidence)

1. What evidence is there that an animal established its home in this bark? (*Various grooves with "sawdust" in them indicate the presence of an insect. Extra: Slime trail of slug is evidence that he/she was here!*)
2. This is the bark of what species native to the Northwest? (*Ponderosa pine*)
3. What are the advantages of the thick bark? (*Protection from fire*)

Soil Samples, Basalt and Granite, Tub with Sod

1. Which soil absorbs water better? (*Basalt*)
2. How does sod affect runoff? (*Lessens erosion*)
3. What happens to sand and small gravel from forest roads? (*It washes off and causes erosion, can also fill streams*)
4. How do fallen trees affect stream quality? (*Can be helpful by creating pools for fish*)
5. How does a riparian area protect a stream? (*Creates shade, keeps cattle from getting into the stream and polluting it*)