



# Looking at the Layers

## LESSON

### GRADE LEVEL:

K-9

### CATEGORY:

Earth, Ecosystems and Ecology

### TOPIC:

Forest ecosystem habitats and the layers of a forest

### TIME:

- 45 minutes visit to forest
- Variable time for classroom work

### MATERIALS:

- Drawings of forest showing the layers – one is provided on page 4.
- A collection of forest wildlife photos or cards showing a plant or animal and the layer they most often use.
- Art materials (appropriate to grade), sketching pencils, and paper (consider rite in rain or watercolour paper).
- Hula hoops or rope circles, or cardboard frames to hold up to help students focus on a forest layer if desired.

### SETTING:

Outdoors and indoors

### GROUP SIZE:

Small groups

### SKILLS:

Communication, drawing, group work, interpreting, observation, research

### SUBJECT AREAS:

Science, Arts, and Numeracy

### KEYWORDS:

Canopy, understory, forest floor, soil, habitat

## Overview

Students examine forest layers and habitats through their senses to produce a mural of a forest while gaining an understanding of the diversity of life within and between the different forest layers.

## Objectives

Students will be able to:

1. Understand that forests have differing vertical structures made up of different habitat elements; and,
2. Recognize different forest dwellers that are found in the various layers of a forest ecosystem and how the layers are used to meet their habitat needs.

## Method

In small groups, students investigate the different layers of the forest through drawing, painting and mapping. The artwork is used to produce a vertical mural of the forest layers and how animals and plants live in and/or move between the layers.

## Background

Healthy forests have a complex structure that can be described by their vertical layers such as canopy, understory and forest floor. A forest with a diversity of plants (including trees) and a complex structure allows for many kinds of habitats (combination of food, water, shelter and space) that, in turn, support a wide variety of living things. Depending on geography, forest structure will vary; however most follow a similar pattern and be described by the most dominant vegetation. In B.C.'s western forests dominated by trees (over 40% of the layer), Cottonwood and Douglas Fir have deep roots in the soil of the forest floor and tall trunks that branch near the top to give the leaves and needles the best exposure to sunlight. The tallest trees in a western forest such as Cottonwood and Douglas Fir have roots deep in the

soil of the forest floor and tall trunks branching near the top to give the leaves and needles the best exposure to sunlight. This layer, called the canopy, is like an umbrella and creates shade for layers below. Other sun lovers like Maples need not grow as tall because they have large leaves to capture the sunlight that filters through the canopy. Moving downward, Western Hemlocks and Cedars may reach the canopy layer, but are most often found in the understory because they tolerate shade from the canopy above. Finally, smaller trees like Pacific Ninebark, Vine Maple, shrubs, young trees and ferns of the lowest levels (understory and forest floor) make good use of any filtered or low light conditions in various ways. Plants like licorice fern can be found high up on Maple trees or on a fallen tree on the forest floor while some animals like rabbits use the forest floor for all its habitat needs.

Some plants and many animals can be found across multiple layers, like licorice fern that can be high up in the crook of a Maple tree branch or on a fallen tree on the forest floor. Some animals like rabbits use the forest floor to meet most of its habitat needs while others utilize all layers, such as Owls that may hunt on the forest floor for small mammals, nest and raise offspring in an understory tree cavity, or roost in the canopy.

### Forest layers and their inhabitants

The following are a few examples of the layers you can find in the forest. Included are just a few of the species you may find there.

- **Canopy:** Typically, the uppermost continuous layer of branches and foliage in a stand of trees or shrubs; but can also refer to middle and lower layers in multiple story stands. Some examples of canopy species include Aspen, Cottonwood, Douglas fir, Osprey, Bald Eagle, flycatchers, Waxwings, and certain butterflies of Garry Oak forests.
- **Understory:** Younger trees and other woody growth growing under the canopies of larger adjacent trees include hemlock, cascara, hawthorn, elderberry and huckleberry. Some understory species include Screech Owl, Pacific Treefrog, Chickadee and Bushtit.
- **Forest floor:** Plants, living and dead, on the forest floor includes herbs, ferns, mosses, fallen trees, leaves and branches. Animals include shrews and mice, rabbits, squirrels along with bugs and soil arthropods.

The forest floor can be broken down into three levels: litter, humus and mineral soil.

**The litter layer** is on top. It includes under-decomposed organic material from animal poop, dead animals or decaying

logs, twigs, branches and leaves that have fallen from the layers above. Other contributions are dead roots and bodies of soil dwelling animals like centipedes. The decomposers such as snails, slugs, earthworms, fungi and bacteria work the litter layer until it becomes humus.

**Humus** is the layer where the components of litter layer have decomposed to a point where it is unrecognizable as to what it was, be it feather, leaf or twig. There is a lot of activity at this level for plants and animals because the decomposing layers release nutrients that plants use to grow, and animals such as rabbits eat young plant growth. Some humus dependent animals include: shrews, western red-backed salamander, ruffed grouse, rabbits, humans, and deer.

**Mineral soil**, while part of the forest floor is worthy of special attention because of the diversity of life in this layer. This may seem counterintuitive because they are hard to see, but the top layer of the Earth's surface is teeming with life. This layer consists of unconsolidated mineral or organic materials derived from geological material and dead, organic matter. These components are modified by biological, chemical, and physical processes such as weathering and floods. In combination with these climatic factors and the actions of the organisms this layer supports most of the plant, animal and fungi life in a forest. Some soil inhabitants include worms, ants, nematodes and springtails, fungi and slime molds, moles, overwintering honey bees, spiders, and other microscopic organisms.

### Mural and Material options

1. Complete the drawings on graph paper so students can convert the drawings into larger scale mural at school. If available, you could also use Rite in Rain graph paper if rain or dampness is an issue on the day you visit the forest.
2. Use art supplies to make the drawings or paintings while visiting the forest and then join the paintings or drawings to create a mural at school to represent the way each student saw the layers.
3. You may wish to allow the students to draw what they see from where they are or as their skills improve introduce the class to the idea of how they position themselves can create different paintings. For example, the canopy group may wish to draw this area from the side and therefore need to be in area so they can see that layer. You could also allow them to draw this layer by looking up or the forest floor looking down. This change in perspective can be done for each layer.

## Procedure

1. During a pre-trip to a local forest or with a variety of images try to identify layers they can see in the forest. How might this look different when they are in the forest. What is the perspective (top down, bottom looking up or a sideways) of the photo or image?
  2. Use forest wildlife cards to think about where living things might reside in the different layers of a forest. Wonder about and make predictions about which living things they are likely to hear or see on their visit.
  3. Split students into groups of about 6 and make these small groups responsible for investigating and drawing each of the three layers (forest floor, understory and canopy). Assign or ask each group to pick a perspective to draw while in the forest. Discuss with the students what challenges exist with picking top down or different viewpoints for the different layers? Depending on the site, you may have access to position groups at different levels if there is a lookout, otherwise select bottom up or sideways views.
- Identify and record questions or wonderings to investigate about the forest or the layer that they drew.
  - Free write in journals after the drawing/mapping.
  - Draw any animals that were seen during the visit.

### On returning to class:

- Assemble the mural from the drawings or use the graph paper drawings to transfer the drawings to a larger mural for each group. Grids can be laid over the drawings to help convert into a larger mural if they wish. Sketches made of the entire area can be used to join the drawings into one large mural.
- Colour the mural based on the colour map created during the visit.
- Use the forest web cards and the sound map to place the living things on the mural or complete further research on forest animals and other plants likely to live there.

### During the visit:

At the location, mix up the groups so that students assigned to each layer are spread out horizontally through the forest along a trail. E.g. the canopy group should be spread out at different places along the trail. Use frames or hula hoops to help focus the students on their layer if needed. Ask students to look for the layer they selected to draw and have them work together or individually to illustrate the layer. Pick one side of the trail to draw from or draw both sides.

Teachers should consider sketching the outline of the entire site to aid in lining up or positioning the parts when the sections of drawings are brought together at school or when translating the drawings to a larger mural. Record the location of each student on this outline sketch of entire site.

### Additional ideas while visiting:

- Use sound mapping to record the sounds in each layer by using a different symbol for each different sound as appropriate for the class.
- Create a colour map the area by having students select colours (crayons work well to quickly decide or use other art supplies, such as chalk pastels as appropriate for the group) needed for each layer. Use the colour map to add colours they observed to the mural or their drawings when they return to class.

## Assessment

1. Describe the layers of a forest and what is there. Identify why some things grow or live in different layers of the forest.
2. Start an adjective list for the forest layers, or for the colours found.
3. Create poems or stories from the free write or adjective lists about the forest visit and the animals and plants that live there.

## Extensions

1. Investigate the wonders recorded during the visit. For example, some might wonder why there are no branches in the understory on some trees, while other might wonder about the colors or arrangement of leaf litter or humus layer. Work as a class to determine which questions are similar and either investigate as a class or as groups of students. Add any new information to the mural if appropriate.
2. Visit another kind of forest and repeat the exercise or work with another class from the school or another school to compare forest layers from different places.

3. Write plays and act out stories about their forest mural and the inhabitants of each layer using the mural as a backdrop or source of inspiration.
4. Compare local forests that have all layers with those missing some of their layers (managed forests or forests that have had floods or fires). How does the loss of a layer affect the diversity of a forest? Or does it improve it? How and why were any of the layers removed?

References: Dunster, J. and K. Dunster. 1996  
*The Dictionary of Resource Management*

### Drawing of Forest Layers

