

# Let's Do Science

Grade Six

## Trees and Forests



## Science Alberta Programs for Your Classroom



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# Trees and Forests Before You Begin

The Trees and Forests unit focuses on ecological areas in our province that are both environmentally and economically crucial to our future. Students examine and identify local species of trees and recognize the characteristics of different types of trees. They develop skills in describing and interpreting the structural features of trees. Students also develop an understanding that forests serve as a habitat for a variety of living things, and study the role of trees in an ecosystem.

This unit strives to raise students' awareness of issues regarding forest use. Many people view our forests as an inexhaustible source capable of supplying our needs indefinitely, rather than seeing forests as a finite resource that needs to be managed wisely. Students identify issues regarding forest use, study different perspectives on those issues and discuss responsible actions that might be taken to address them.

## Topic E: Trees and Forests

(Suggested time: 6-8 weeks)

Spring or early fall usually provide optimal opportunities for studying trees and forests as the weather is more cooperative for outside activities. This unit will take approximately 6-8 weeks, depending on how extensively you study issues regarding forest use.

For this unit you will need to order or make tree cookies (tree cross-sections), order tree seedlings (if you are including planting in your unit), gather forestry posters and information and arrange for speakers. Tent caterpillar egg rings, if you are using them, will need to be collected in the fall. Arrange your field trips to a nearby forested area and begin collecting information from different sources regarding issues in forestry and the various perspectives that pertain to these issues. Preview any films, filmstrips and videos you have available to be sure you are familiar with the issues and perspectives being presented.

## Background Information

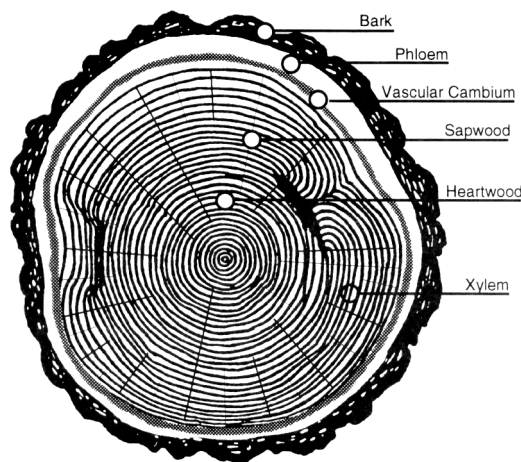
### The Tree

Have you ever wondered what makes a tree a tree? Why do we call the towering lilac over by the fence a bush and refer to the somewhat smaller plant growing next to it as an apple tree? In this unit we will define what constitutes a tree and look at how a tree grows. We'll also explore several tree varieties typically found in Alberta and examine the important roles trees play in our environment.

In general, a plant must satisfy three criteria to count as a tree: it must be a *perennial* (a plant that survives to put forth new growth each year), it must have a self-supporting trunk (usually just one) that forms the dominant plant structure, and this trunk must consist of a woody material. What about height? Some people say a plant must reach five to seven metres at adulthood to qualify as a tree, but this is an arbitrary measurement. Just consider the modest size of many ornamental fruit trees and the miniature stature of the bonsai.

Trees can take on a wide variety of forms. There are three basic categories according to branching patterns. *Excurrent* trees have a trunk that is well defined and forms a dominant, main axis from which lateral branches of smaller proportion grow. This usually creates a conical form (e.g., firs, spruces, larches and most pines). The main trunk of *decurrent* trees goes up part way then branching begins. This can result in forms such as the crowns, globular heads and ovals of oaks, elms and maples. At the opposite extreme, *columnar* trees display a prominent, long trunk with foliage growing out the top. Palm trees fall into this category.

Figure 1.  
Tree trunk cross-section.



A cross-section of tree trunk shows several concentric zones of dead and living plant material (see Fig. 1). The outermost zone is the *bark*. It consists of an exterior layer of dead cells and an interior layer of living bark called the *phloem*.

Nutrients manufactured in the tree's leaves travel down the phloem to nourish the whole tree. (If the phloem layer of bark is damaged, the tree can eventually die of starvation.)

Working inward, the next zone is a single-cell-thick layer where all the trunk's growing takes place. It's called the *vascular cambium*. (In addition to the vascular cambium layer, there are two other places where growth takes place on a tree: at the root tips and at the nodes on branch stems.) Some of the cells generated in the vascular cambium become phloem cells, but

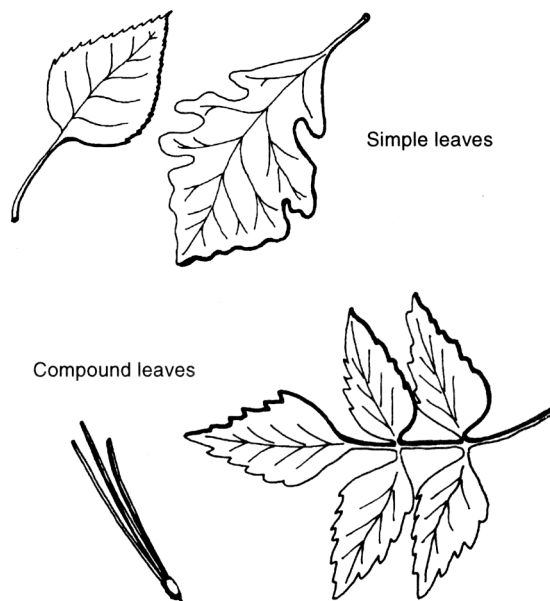
the vast majority go toward building up the next zone inward, the *xylem*, or *sapwood*. Xylem consists of cylindrical, hollow cells with tiny holes in their sides. These cells transport water and dissolved minerals from the root tips up to the leaves for use in photosynthesis. Xylem cells are made of *cellulose*, a resilient carbohydrate material, and an even stronger material called *lignin*. As the tree ages, the innermost, active xylem cells become clogged with waste products (resin, gums and tannins) generated by the tree at the sapwood-cambium interface. These waste products are transported to the inner layers of specialized cellular structures called *vascular rays* that radiate out to the sapwood like spokes. When the clogged xylem cells can no longer function, they die, building up a core of *heartwood*. Each season the new xylem forms visible growth layers, or rings. In a limited number of tree species, the width of each ring corresponds directly to the amount of local annual precipitation and other growing conditions, so tree ring patterns can be used as a means of dating wooden items in the same vicinity. This dating technique is called *dendrochronology*.

In addition to trunk and branch structure, foliage is a highly distinctive and important feature of trees. Leaves serve as energy collection, conversion and storage units and also function as the respiratory organ of trees. Each leaf is riddled with tiny holes called *stomata* (single stoma), usually on the underside of the leaf. Evaporation of water out of these stomata (*transpiration*) literally sucks water and dissolved minerals up from the root system to the leaf much like water moving up a capillary tube. In the food-producing area of the leaf's interior, *chloroplasts* (special cells that contain chlorophyll) combine the energy of the sun with this water, and carbon dioxide from the air. This process, called *photosynthesis*, creates carbohydrates (energy-packed organic molecules) and generates oxygen as a by-product. The carbohydrates are used for tree growth (leaves, stems, roots, woody tissue, fruits and nuts). The oxygen is released back into the environment through the stomata.

Leaves come in many shapes and sizes. For convenience, they are sorted into two basic categories: *simple* leaves that consist of a single blade, and *compound* leaves that have two or more blades (see Fig. 2).

Trees themselves are also sorted into two groups depending on whether or not they drop their leaves on an annual basis: *deciduous* trees do, *conifers* (or evergreens) do not. Evergreens in Alberta are commonly conifers with needle-shaped leaves (pines, firs and spruces). In tropical regions, evergreens are primarily broad-leafed, flowering plants. Conifer needles can form simple leaves—single short needles growing directly out of the branch—or compound leaves of two to five long needles grouped in a bundle and attached to the branch by a short, scaly structure. These trees bear seeds in woody, thick-scaled (female) cones and produce pollen grains in smaller, thin-scaled (male) cones on the same tree. Evergreens appear to hold onto their leaves forever, but this is not the case. The

Figure 2.  
Simple and compound leaves.



leaves usually last somewhere between two and 20 years. They can hold out through a winter or a drought because they are coated with a thick, waxy film that inhibits water loss due to transpiration.

Deciduous tree leaves lose so much water that the tree has to drop them in the fall as a survival tactic to avoid drying out during the winter. For the most part, these leaves are flat, green blades

attached to the branch via a slender stalk called the *petiole*.

The following is a list of several tree varieties found in Alberta, along with notes indicating features of each variety to aid in species identification.

- *Lodgepole pine*: This is one of the most common trees in the Canadian Rockies. It can be identified by its compound leaves consisting of two relatively long needles. It is Alberta's provincial tree.
- *Fir*: These trees have soft, flat, short needles of the simple leaf variety. Don't confuse true alpine firs with Douglas firs, which belong to a different group. They have similar leaf formations but the cones of a true fir grow upright on the branches instead of hanging down.
- *Larch*: Although a conifer, the larch is not an evergreen. In the fall, its compound leaves (made of several soft, pale-green needles) turn golden and drop off.
- *Spruce*: Needles are 1 to 2 cm long, prickly and square in cross-section, as opposed to flat fir needles and rounder, longer pine needles.
- *Poplars*: These trees have heart-shaped simple leaves that are a glossy, dark green on the upper surface and a lighter green underneath. The leaf edges are so fine-toothed they may appear to be smooth. The poplar tree produces hairy seeds in greenish-brown capsules in July.
- *Birch*: These trees are similar to the poplar, but the seeds are winged, not hairy. Birch trees have peeling bark and simple leaves that exhibit irregularly toothed edges.
- *Elm*: The dark-green leaves of elms are roughly 5 cm long and have jagged edges running down each side of their elliptical shape. Look for a corky projection (wing) at the base of each petiole.

## The Forest

- *Crabapple*: The sharply toothed elliptical leaves are 7.5-10 cm long, dark green above and pale green underneath. Depending on variety, its five-petal flowers can be white or pink.

Trees constitute more than four-fifths of all plant matter. En masse, they can exert pronounced effects on the environment. Forests alter the *microclimate* (conditions in the immediate vicinity), remove carbon dioxide from the air, contribute significant amounts of oxygen to the atmosphere, act as a vital link in nutrient cycling, anchor topsoil in place and provide shelter, shade, homes, raw building materials and food for a host of plants and animals.

A microclimate is affected by the number of trees in the area. The moisture unleashed into surrounding air through transpiration, combined with the deep shade cast by dense leaf growth, cools a forested area considerably. Widespread tree growth also reduces wind speed: the denser and higher the growth, the greater the contrast between wind speed at ground level and wind speed above the tree-tops.

Forests make significant contributions to three major ecological cycles.

- *The water cycle*: ground water passes through trees and is evaporated into the atmosphere through transpiration.
- *The cycle of oxygen and carbon dioxide exchange*: green plants take in the carbon dioxide exhaled by animals and generated through the burning of fossil fuels, use it in the process of photosynthesis, and give off oxygen in return.
- *Nutrient cycling*: water-borne nutrients from the soil are taken in by tree roots and incorporated into the carbohydrates manufactured by photosynthesis. The resulting leaves, fruits and nuts are eaten by animals that eventually die. Their bodies, as well as fallen leaves and dead tree matter, are decomposed by small animal life forms, fungi and microbes, and the nutrients return to the soil where they are reused by the trees.

Another well documented effect of forest growth is the prevention of soil erosion. The extensive root systems of trees provide a natural matrix that helps trap soil in place while the canopy of tree growth above protects the ground from driving rains and strong winds.

Of course, forests also shelter plants and animals from these elements, providing a reasonable habitat. Birds and squirrels nest in the branches and hollows. A host of insects live in the cracks and crannies of bark. Parasitic plants cling to trunks and branches. And snails, slugs, worms, nematodes (round worms), fungi and other microbes populate the forest floor in and around the root system.

Many of these animals unintentionally return the favour. For example, some bird species feed on the harmful insects inhabiting the bark, and

## Elementary Science Program of Studies

### General and Specific Learner Expectations

special nitrogen-fixing micro-organisms convert nitrogen in the soil into a soluble form trees can use.

We humans depend on the forest to supply us with an abundance of products that goes well beyond the raw material to build our homes. Historically, trees have furnished us with fuel, food (fruits, nuts, syrup and spices), furniture, medicines, rubber, dyes and tanning materials. More recently, we have turned to trees for plywood, rosin, turpentine, creosote, cork, kapok fibre, newsprint, cardboard and many other paper products.

Forestry management works on the principle of sustained yield: you harvest and replant only a portion of your “crop” every year, depending on the maturity rate of the tree variety you are managing. Pines typically take from 20 to 50 years to mature, while oaks can require up to 200 years to reach an economic size. With such long time spans involved, responsible management techniques are imperative.

The following general and specific learner expectations have been taken directly from the 1996 Elementary Science Program of Studies. The specific learner expectations (SLEs) are referred to by number in the second column of the activities table.

#### General Learner Expectation

Students will be able to:

Describe characteristics of trees and the interaction of trees with other living things in the local environment.

#### Specific Learner Expectations

Students will be able to:

1. Identify reasons why trees and forests are valued. Students meeting this expectation should be aware that forests serve as habitat for a variety of living things, and are important to human needs for recreation and raw materials and for a life-supporting environment.
2. Describe the kinds of plants and animals found living on, under and among trees, and identify how trees may affect and are affected by those living things.
3. Describe the role of trees in nutrient cycles and in the production of oxygen.
4. Identify general characteristics that distinguish trees from other plants, and characteristics that distinguish deciduous from coniferous trees.

5. Identify characteristics of at least four trees found in the local environment. Students should be familiar with at least two deciduous trees and two coniferous trees. Examples should include native species, such as spruce, birch, poplar and pine, and cultivated species, such as elm and crabapple.
6. Describe and classify leaf shapes, leaf arrangements, branching patterns and the overall form of a tree.
7. Interpret the growth pattern of a young tree, distinguishing this year's growth from that of the previous year, and from the year before that. Students meeting this expectation should recognize differences in colour and texture of new growth and old growth, and locate scars that separate old and new growth.
8. Identify human uses of forests and compare modern and historical patterns of use.
9. Identify human actions that enhance or threaten the existence of forests.
10. Identify an issue regarding forest use. Identify different perspectives on that issue, and identify actions that might be taken.

## Cross-curricular Connections

### Mathematics

- Graphing.
- Estimate the circumference of trees or the number of leaves on a tree.
- Work with percentages.
- Measure the diameter and circumference of trees.
- Solve word problems.
- Conduct surveys.

### Reading and Language Arts

- Interviews and reports.
- Research and presentations.
- Debates.
- Compose stories, poetry, playwriting and choral reading.

### Art

- Create leaf collages as murals and displays.
- Use recyclable objects in art, e.g., rags for weaving or making paper.
- Make bark rubbings and compare the textures of tree trunks.

## Children's Alternative Frameworks

### Music

- Create musical instruments from waste.
- Learn songs from lumber camps (Canadian folklore).

### Drama

- Participate in readers' theatre and plays.

### Health

- Compare basic needs of living things (e.g., compare the needs of a healthy tree with that of a healthy human).
- Learn the effects of air pollution, clear cutting, etc. on living things.

### Social Studies

- Learn where Canadians live, how they make their living and how they relate to their environment.
- Look at local government and its responsibility to deal with issues and concerns of the community, introduce the idea that citizens in a democracy have rights and responsibilities.
- Create timelines by comparing tree rings with historical events.

### Decay

Some students may have the naïve view that matter just disappears in the process of decay. Older students have the idea that some matter goes into the soil, which shows a partial recycling of matter.

### Soil and Plants

- Soil is the plant's food.
- People put food (fertilizer) in the soil for plants to eat.
- The soil loses weight as the plant grows.
- Roots absorb the soil.
- Soil has nothing to do with growth.

### Leaves

- Rain goes in the holes in the leaves.
- Leaves drink in the dew.
- The leaf's main job is to trap water vapour from the air.
- The leaf's main job is to capture the Sun's warmth.
- Leaves turn colour because they can't breathe.
- Students sometimes do not understand that needles on coniferous trees are a type of leaf.

## Activities

### Miscellaneous

- Plants mainly give off carbon dioxide.
- Trees sleep in the winter.
- Plants grow to a giant size in the dark.

Classroom teachers have identified the following activities that may be done to address the Specific Learner Expectations (SLEs) in the Program of Studies. The list is not prescriptive and teachers may select activities that are most appropriate for their students.

Activities have been listed under two headings: Key Activities and Extension Activities. Key activities are supported by authorized resources and identify “powerful and practical” means for achieving learner expectations. Extension activities represent alternative ways of achieving or supporting learner expectations.

### Key Activities

Key Activity	SLE	Print Resources	Essential Materials	Comments
Group discussion and brainstorming to identify student ideas and questions about trees		<i>Explorations in Science, Level 6, A Walk in the Woods (Seeing the Forest and the Trees)</i> , p. 10	a class walk in the forest or a film to simulate a walk in the forest, chart paper, felt pen (check field trip requirements in your school jurisdiction)	You could also have a guest speaker show slides and discuss forests.
Drawing a tree of choice without any visual aids and then going outside to draw another from observation	4, 5, 6	<i>Explorations in Science, Level 6, Branching Out (A Close-up on Trees)</i> , p. 10	drawing materials, trees, clipboards	Language Arts Extension: develop a tree dictionary with words and diagrams.
Observing and identifying different types of trees	4, 5, 6	<i>Explorations in Science, Level 6, A Walk in the Woods (Tree Types)</i> , p. 11  <i>Alberta’s Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>School Yard Trees, Activity 1.3</i> , p. 35	outdoor venue, cameras (optional), paper, coloured pens, student journals  logbooks, <i>Activity Guide</i> (Unit 1, p. 37), <i>Alberta Tree and Shrub Identification Guide</i> (optional)	Extension: related activity <i>The Great Tree Scavenger Hunt</i> , (Activity 4.1, p. 19)  Note: SLEs will vary depending on the activities chosen.

Key Activity	SLE	Print Resources	Essential Materials	Comments
Interpreting tree growth	6	<i>Alberta's Focus on Forests, 7, 8, 9 Junior High</i> (Alberta Forestry Association), <i>How Trees Grow, Activity 27</i> , p. 63	3 or 4 freshly cut twigs, sugar, jar, plastic bag	This activity is best done in winter or spring, before leaf buds have emerged.
Examining and measuring tree trunks to enable students to make inferences about the tree's growth	4, 5, 6, 7	<i>Explorations in Science, Level 6, Branching Out (Barking Up the Right Trunk)</i> , p. 15  <i>Explorations in Science, Level 6, A Walk in the Woods (Barking Up the Right Tree)</i> , p. 15  <i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Stored in the Rings, Activity 2.1</i> , p. 9	tape measures, string, cross-sections of trees (tree cookies*), hand lenses  *good sources for these are discarded Christmas trees, firewood, logs, etc. prepared at home  outdoor venue, hand lenses, Plasticine or crayons, paper for rubbings, camera  30 wood disc samples or dendro disc student pages, hand lens, chart paper (one per group), sandpaper, felt pens	The class can discuss how rings reveal the tree's age and types of growing seasons the tree may have had. They can also examine tree trunks for animal life.  Extensions:  Art: use bark rubbings to compare textures of tree trunks  Math: diameter of circles, estimate and measure circumference and diameter of trees, construct timelines
Classifying leaves and developing a dichotomous key for leaf identification	4, 5, 6	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Leaf Match, Activity 1.7</i> , p. 49  <i>Explorations in Science, Level 6, A Walk in the Woods (Leafing Through!)</i> , p. 13  <i>Alberta's Focus on Forests: 7, 8, 9 Junior High</i> (Alberta Forestry Association), <i>Difference in Design, Activity 2.4</i> , p. 31, <i>Tree Keys, Activity 2.5</i> , p. 39	laminated leaf samples, <i>Identifying Plants by Their Leaves</i> student information sheet (Unit 1, p. 54), dichotomous key for Alberta trees and shrubs  large leaf collection, books on leaf shapes and arrangements, copies of <i>Explorations</i> line masters 16 and 17, chart paper	See "Teacher Preparation" for tips on how to get ready for this lesson.
Examining food chains and nutrient cycles	3	<i>Explorations in Science, Level 6, A Walk in the Woods (Cycles Around)</i> , p. 19  <i>Innovations in Science, Level 6, Earth Team (Foraging in Forests)</i> , p. 190	chart paper, coloured pencils	

Key Activity	SLE	Print Resources	Essential Materials	Comments
Examining and observing the forest as an ecosystem through a field study (verify specific regulations for taking students' outside the school territory)	1, 2, 3, 4, 5, 6, 7	<p><i>Explorations in Science, Level 6, A Walk in the Woods (In the Field)</i>, p. 22</p> <p><i>Alberta's Focus on Forests, 7, 8, 9 Junior High (Alberta Forestry Association) Activity 1.1, Field Trip to a Forest</i>, p. 3</p> <p><i>Alberta's Focus on Forests, 7, 8, 9 Junior High (Alberta Forestry Association) Activity 1.2 Forest Habitat</i>, p. 25</p>	hand lenses, binoculars, thermometers, wind gauges, copies of <i>Explorations</i> line masters 3-5, notepads, pencils, collection containers, cameras, field guides, question lists	Students refer back to the questions they formulated in the introductory activity and complete the ones they can now answer. They may also add on any new questions they may have. <i>A Little More About Forests</i> , p. 24, could be done to gather further information. Check field trip regulations for your school district.
Examining food webs and the interdependence of living things in a forest ecosystem	1, 2, 3, 8, 9	<p><i>Alberta's Focus on Forests, 4, 5, 6 Elementary (Alberta Forestry Association), Survival in the Forest—A Game, Activity 2.2</i>, p. 15</p> <p><i>Innovations in Science, Level 6, Student's Book, Earth Team (Foraging in Forests)</i>, p. 190</p> <p><i>Innovations in Science, Level 6, Student's Book, Earth Team</i>, p. 179, 182</p>	<p>pylons, coloured pinnies or tags, 6 coffee cans (or other suitable containers), numbered green paper tags for plants, black tags for decomposition</p> <p>blackline master 2, resource books on North American animals, plants and insects</p>	This game could be played in Phys. Ed.
Examining different forest uses	1, 8, 9, 10	<p><i>Explorations in Science, Level 6, A Walk in the Woods (Forests in Use)</i>, p. 27</p> <p><i>Alberta's Focus on Forests 4, 5, 6 Elementary (Alberta Forestry Association) Activity 5.5 (Caring for the Forest—Forest Management)</i>, p. 41</p>	resources with pertinent information, chart paper, coloured pencils	
Identifying events and actions that can threaten a forest	9, 10  1, 2, 9	<p><i>Explorations in Science, Level 6, A Walk in the Woods (Forest Problems)</i>, p. 29</p> <p><i>Alberta's Focus on Forests 4, 5, 6 Elementary (Alberta Forestry Association), Forests on Fire, Activity 3.6</i>, p. 35</p>	<p>chart paper, felt pens</p> <p>colouring tools, pencils, copies of student activity sheets, blank paper for posters (size optional)</p>	A good resource person for this is a biologist from Banff National Park because of their controlled burn policies.

Key Activity	SLE	Print Resources	Essential Materials	Comments
Researching a forestry-related issue	1, 9, 10	<p><i>Alberta's Focus on Forests</i> 4, 5, 6  <i>Elementary</i> (Alberta Forestry Association), <i>Decisions, Decisions, Decisions, Activity 5.3</i>, p. 19</p> <p><i>Innovations in Science, Level 6, Earth Team (Introduction)</i>, p. 184</p> <p><i>Innovations in Science, Level 6, Earth Team (Foraging in Forests)</i>, p. 190</p> <p><i>Innovations in Science, Level 6, Earth Team (Did You Know?)</i>, p. 208</p> <p><i>Innovations in Science, Level 6, Earth Team (Eco-Ills)</i>, p. 212</p> <p><i>Innovations in Science, Level 6, Earth Team (More to Explore)</i>, p. 215</p> <p><i>Innovations in Science, Level 6, Earth Team (Eco-Protectors)</i>, p. 216</p>	catalogues, newspaper advertisements and flyers from hardware stores and lumber yards, copies of decision-making framework (p. 25)	

## Extension Activities

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Reporting on a vision for an area, from different forest-use perspectives	1, 8, 9, 10	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Integrated Resource Planning—More Decisions</i> , Activity 5.4, p. 27	copies of the <i>Carcajou River Planning Area</i> description (p. 31) and map (including 2 enlarged maps) and the description of each group's task	The most challenging task is that of the Integrated Resource Planner.
Constructing one model of a forested valley which will display all the resources and how they are used, protected and cared for	1, 2, 3, 7, 8, 9, 10	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Caring for the Forest—Forest Management</i> , Activity 5.5, p. 41	plywood (1.2 x 1.2 m), tissue paper (green, yellow, brown, red, orange, blue), modelling clay or play dough, sand, soil, pebbles, twigs, paper mâché, pencils, crayons, felt pens	<b>Note:</b> This would be a good culminating activity as it covers many of the Specific Learner Expectations. Be prepared for this activity to take up a lot of class time. (More than the suggested 45-60 minutes for modelling will be necessary if your students are using paper mâché.)
Developing a plan to save trees by using the three R's and learning to make recycled paper	1, 8, 9, 10	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>The Three R's</i> , Activity 5.6, p. 73	student information and activity sheets (p. 77), newspapers, scrap paper, blender, mixing bowl, leaves, flower petals, nylon screening, 2 wooden frames (15 cm x 20 cm), kitchen towel, sponges, iron, large plastic carrying tray	You'll need access to water. This is a messy, wet activity. Not to be done in winter or when it is really cold.
Investigating forest uses	1, 8	<i>Explorations in Science, Level 6 (Forests in Use)</i> , p. 27 <i>Teaching About Trees: A Resources Kit, Booklet 2 (Tree Products)</i> , p. 18 <i>Alberta's Focus on Forests: 7, 8, 9 Junior High</i> (Alberta Forestry Association), <i>Products from Canada's Forests</i> , Activity 4.2, p. 21	chart paper, reference books on trees, examples of tree products	An investigation of forest uses should include forest products, uses for recreation and as habitat for a wide variety of living things.

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Investigating the effects of trees on the immediate environment	1, 5, 6	<i>Explorations in Science, Level 6, Branching Out (Crowns on Top)</i> , p. 17	thermometers, paper and pencils, clipboards	Specifically, students measure the difference in temperature in the sunshine and in a tree's shade and also the difference in rainfall under and away from the tree.
Constructing a key for classifying shoes	4, 5, 6	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Playing with Keys</i> , Activity 1.6, p. 47	shoes	<b>Note:</b> Although this activity does not directly address SLEs 4, 5 and 6, it is a very good introduction to tree classifying activities.
Investigating the effects of spacing on plant growth	1, 2, 9	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>The Space Race</i> , Activity 3.3, p. 21	potting soil, 35 mm film containers or pill bottles (3 per student), radish, bean or marigold seeds, flat trays with a lip, pencils, nails, masking tape, commercial plant fertilizer	This activity helps develop the concept of natural selection.
Planning for balanced forest use	1, 8, 9	<i>Explorations in Science, Level 6, A Walk in the Woods (The Ideal Forest)</i> , p. 30	large sheets of graph paper or mural paper, art materials	It gives students a chance to infer that a forest's growth and ability to support other species is affected by the amount of available space. Check for allergies (plants and open dirt).
Creating a field guide for a nearby forest, trees in the neighbourhood or a local conservation area	1, 2, 4, 5, 6, 8	<i>Explorations in Science, Level 6, A Walk in the Woods (Forest Field Guide)</i> , p. 31	file cards, art materials, sources of information about plants and animals in the local area	Could be published in the newsletter, good for article writing.

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Creating a map or collage showing Alberta's forestry resources and examining the importance of forestry to Alberta communities	1, 8	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>What Is Alberta?</i> , Activity 5.1, p. 11	roll of newsprint or craft paper, an atlas of Alberta showing natural resources and their location in the province, glue, magazines that contain pictures of resources (e.g., forests, wildlife, coal mines, and people), small outline map of Alberta, and copies of brochures, booklets and posters that describe Alberta's forestry resources	<b>Note:</b> Send a letter home with students requesting relevant magazines.
Brainstorming about the role of trees in the natural environment	1, 8, 9	<i>Explorations in Science, Level 6, Branching Out (The Productive Tree)</i> , p. 22	clipboards, paper, pencils, stickers	Art: students can design the tree product logo to use for labelling wood products.
Monitoring the amount of paper used by the school and making plans to reduce paper consumption	1, 8, 9, 10	<i>Explorations in Science, Level 6, Branching Out (Paper, Paper, Everywhere)</i> , p. 24	chart paper	Extension: students make their own paper by reusing classroom scraps (see activity on p. 12).
Preparing an area for planting tree seedlings and taking part in their ongoing care	1, 5, 9	<i>Explorations in Science, Level 6, Branching Out (Planting a Seedling—Growing a Tree)</i> , p. 27	tree seedlings	Students can write and illustrate a care guide for the seedling they planted.
Describing the traits of a tree students would like as an official symbol, sharing their partner's tree with the class and using the resulting list of traits to discuss how trees are adapted for survival	4	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>A Tree for Me</i> , Activity 1.2, p. 33	chart paper, felt pens, drawing paper, logbooks	Extension: students can imagine and draw their tree to use as a cover for their logbook. They can write a description of it or a shape poem inside the front cover.

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Making rubbings of an assortment of leaves	4, 5, 6	<i>Explorations in Science, Level 6, Branching Out (Leafing Through the Leaves)</i> , p. 18	art paper, crayons, charcoal or pastels, hard surfaces for rubbings (e.g., clipboards), aquarium, small file cards	Extension: set up a school composting project.
Observing the differences between trees and other plants	4, 5, 6, 7	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Are Trees Plants?</i> , Activity 4.4, p. 25	<i>Are Trees Plants?</i> activity sheet (p. 29), pencil, large drawing paper, clipboards or 20 cm x 30 cm heavy cardboard, elastics	This is one of a few activities that address the general characteristics that distinguish trees from other plants.
Investigating different locations on a tree to find "mini beasts"	1, 2, 3	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>Where the Mini Beasts Are</i> , Activity 4.7, p. 37	hand lenses or bug boxes, yogurt containers, masking tape, pantyhose, <i>Mini Beast Homes</i> activity sheet	
Observing isopods or tent caterpillars to see if they have a preference for one environment over another	1, 2	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>The Behaviour of Forest Animals</i> , Activity 3.4, p. 25	1-L milk cartons, cereal boxes, light sources (e.g., gooseneck lamps), coloured construction paper, thermometers, ice cubes, aluminum foil, leaves (assorted, live and dead), terrarium or large glass jars, isopods or tent caterpillars	<b>Important:</b> Read <i>Info Stop</i> (Unit 3, p. 26) for information about how and when to collect tent caterpillar egg rings in the fall. Isopod ordering information is provided on p. 29, Unit 3. Check your local guidelines.
Choosing one or more projects from the <i>Projects Guide, Focus on Forests</i>	1, 7, 8, 9, 10	<i>Alberta's Focus on Forests: 4, 5, 6 Elementary</i> (Alberta Forestry Association), <i>About Ecosystems</i> , Activity 2.4, p. 25	See <i>Activity Information</i> for a detailed list. This activity has several options that depend on the availability of print resources which include <i>The Lorax</i> , <i>Gone with the Wind and Water</i> , <i>The Game of the Environment</i> and <i>The Giving Tree</i> .	This activity will require 10-25 hours (reading, discussion, project work).  After completing several of the suggested readings about the effect of humans on the environment and working through the accompanying reader's guides, students will be prepared to select a project.

## Assessment

For a broader discussion of science classroom assessment techniques see *Assessing Student Learning* in the introduction of this publication on p. 15. Good places to begin looking for the unit-related ideas are *Explorations in Science* assessment handbooks, *Innovations in Science* teaching notes, Unit tests and Portfolio ideas, Alberta Education sample tests at [www.education.gov.ab.ca](http://www.education.gov.ab.ca) and Alberta Assessment Consortium at [www.aac.ab.ca](http://www.aac.ab.ca)

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