



# FOREST FIELD TRIP TOOLKIT

*TEACHERS GUIDE*



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# FOREST FIELD TRIP TOOLKIT

## TEACHERS GUIDE

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## WELCOME TO YOUR FOREST FIELD TRIP TOOLKIT!

Getting outside and experiencing forests is a valuable way for students to learn about the forest ecosystems and to develop a stewardship mindset. We are excited for you to take these tools, activities and lessons adapted from Inside Education forest programs to create amazing forest education experiences for your students.

This guide is split into **5 sections**, each exploring an aspect of forests, forestry and wildlife in Alberta. The activities connect directly to the Alberta Program of Studies, with learning outcomes listed on the Curriculum Connections page.

The tools required for each activity are in your backpack toolkit, and we have provided you instructions on how to use them. Where possible, instructions for adapting the activities without the toolkit have been provided. This will allow for all of your students to stay engaged during the activities, and will allow you to share this resource with your colleagues.

***We look forward to helping  
you and your students  
explore the forests in and  
around your community!***



*The Forest Toolkit Teachers Guide was produced by **Inside Education** to provide teachers with information and ready-to-use lessons related to forests in Alberta (Grades 4-9). The activities contained in this guide are linked to the Forest Toolkit.*

# CURRICULUM CONNECTIONS

## FOREST REPORT

Grades 4-6: General Learning Expectations, Science Inquiry Specific Learning Expectations  
 Grades 7-9: Developing a Nature of Science Emphasis  
 Grade 4 Unit E: Plant Growth and Changes  
 Grade 6 Unit D: Evidence and Investigations SLE 1, 4  
 Grade 6 Unit E: Trees and Forests SLE 8, 9, 10  
 Grade 7 Unit A: Interactions and Ecosystems STS 1  
 Grade 7 Unit B: Plants for Food and Fibre STS 1  
 Outdoor Education - Environmental Core (1, 2a, 3, 4), Environmental Investigations (1a)

## PLANT IDENTIFICATION

Grade 6 Science Unit E: Trees and Forests SLE 1, 4, 5, 6, 8  
 Grade 6 Math Number SO 6, Patterns and Relations SO 1, Statistics and Probability SO 3  
 Outdoor Education - Environmental Core (1, 3)  
 Grade 7 Unit A: Interactions and Ecosystems STS 1,3

## TREE MEASUREMENTS

Grade 6 Science Unit E: Trees and Forests SLE 1, 4, 5, 6, 8, 9,10  
 Grade 6 Math Number SO 1,2,8; Patterns & Relations SO 2, 3, 4  
 Grade 7 Math Number SO 2, Shape & Space SO 1  
 Outdoor Education - Environmental Core (1, 2a, 3)  
 Grade 7 Unit A: Interactions and Ecosystems STS 1, 3  
 Grade 7 Unit B: Plants for Food and Fibre STS 1

## WILDLIFE HABITAT ASSESSMENT

Grade 6 Science Unit D: Evidence and Investigations SLE 1,4  
 Grade 6 Science Unit E: Trees and Forests SLE 1, 2, 9, 10  
 Grade 7 Unit A: Interactions and Ecosystems STS 1, 3, 4  
 Grade 7 Unit B: Plants for Food and Fibre STS 4  
 Outdoor Education - Outdoor Core (1c), Environmental Core (1, 2a, 3, 4), Environmental Investigations (1, 2d)

## SOIL SAMPLING





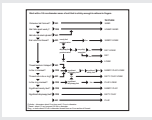




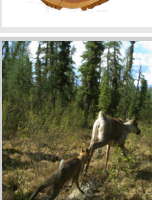
Grade 6 Unit D: Evidence and Investigations SLE 1, 4  
 Grade 6 Unit E: Trees and Forests SLE 8, 9, 10  
 Grade 7 Unit A: Interactions and Ecosystems STS 1, 3, 4  
 Grade 7 Unit B: Plants for Food and Fibre STS 2, 3, 4  
 Outdoor Education - Outdoor Core (1c), Environmental Core (1, 2a, 3, 4), Environmental Investigations (1)

**This kit is designed to meet environmental stewardship and forestry CTF/CTS Outcomes**

## 2 MATERIALS LIST

Photo of tool	Name of tool	Brief description	Which activities it is part of
	<b>Alberta Nature Guide</b>	Guide to common animals and plants found in Alberta.	Wildlife Habitat
	<b>Anemometer</b>	Anemometers measure temperature and wind conditions. This information can be helpful for gathering either data, or to determine the safety of working in the forest.	Forest Report
	<b>Animal Tracks:</b> <i>A Folding Pocket Guide to the Tracks &amp; Signs of Familiar North American Species</i>	Guide for identifying animals through footprints and scat.	Wildlife Habitat
	<b>Bird Bands</b>	Bird bands are used in studying bird species, such as by tracking migration of birds over long distances ( <i>as shown in the included bird migration map</i> ).	Wildlife Habitat
	<b>Diameter Tape</b>	Used to determine the diameter of a tree trunk from its circumference.	Tree Measurements
	<b>Flagging Tape</b>	Flagging tape is used to mark out areas that are to be harvested, study areas or hazards in the forest.	All Activities
	<b>Fur Samples</b>	Samples of mink, badger, muskrat, beaver, coyote and lynx which demonstrate animal adaptations and are commonly used in traditional clothing.	Wildlife Habitat
	<b>Guide to the Common Native Trees and Shrubs of Alberta</b>	Includes a dichotomous key used to identify common Alberta plant species.	Tree Measurements Plant Identification
	<b>Magnifying Glass</b>	Used to help study small organisms.	Wildlife Habitat Forest Report

# MATERIALS LIST 3

Photo of tool	Name of tool	Brief description of what it's used for	Which activities it is part of.
	<b>Mountain Pine Beetle kit</b>	Examples of larval and adult mountain pine beetle, as well as the larval galleries made in bark.	Wildlife Habitat
	<b>Owl Pellets</b>	Owl pellets are the undigested fur, bones, teeth, feathers, and insect shells from owl prey.	Wildlife Habitat
	<b>Soil Auger</b>	Used to take soil cores from the ground, allowing for further testing.	Soil Sampling
	<b>Soil Test Kit</b>	Measures the nitrogen, phosphorous, potassium and pH of the soil.	Soil Sampling
	<b>Soil Texturing Chart</b>	Helps determine the composition of sand, clay and silt particles in a soil sample.	Soil Sampling
	<b>Surveyor's Rope</b>	Used to measure distance in a forest. Like a measuring tape, but lighter weight and more rugged.	Tree Measurements
	<b>Tally Counter</b>	Tally counters are helpful in keeping track of large numbers of items, such as saplings, trees of a specific species or nests.	Plant Identification
	<b>Tangent Height Gauge</b>	The tangent height gauge is a simple tool used to measure the height of a tree.	Tree Measurements
	<b>Tree Cookies</b>	Tree cookies are cross sections of trees that allow us to study tree rings. This kit includes both a deciduous and coniferous tree cookie.	Tree Measurements
	<b>Wildlife Camera Photos</b>	Wildlife cameras are used by biologists to track and monitor animals without disturbing them. These photos are examples of wildlife camera captures from Alberta.	Wildlife Habitat

All of the items on this list are available for purchase from various vendors. If you need a hand sourcing tools for your classroom, do not hesitate to reach out — we are happy to help! [info@insideeducation.ca](mailto:info@insideeducation.ca)





# FOREST REPORT

## INTRODUCTION

Examining a forest and the goods and services it provides allows us to understand and appreciate all the reasons we value forests. With this, we can consider all the ways in which we can be stewards of the environment and our natural resources.

### PART 1

## SITE REPORT

This forest field study encourage students to think about what kinds of plants might grow in the area, what might live on or around trees, ways that humans and animals use trees and plants, and the resources trees and plants need to survive.

This is also an opportunity opportunity to consider forest stewardship. Encourage discussions about how we can be respectfu while we are learning outside (*not littering, not breaking branches, staying on trails, etc.*), as well as how we can be good stewards of forests in our everyday lives (*recycling, using both sides of a sheet of paper, sharing knowledge of the forest with friends/family, etc.*)

After identifying the study site and setting boundaries for exploration use the **Site Report worksheet** and **Scavenger Hunt worksheet** to guide the start of your field day.

### GUIDING QUESTION

Why are forests considered valuable?

- *How do humans use forests?*
- *How do animals use forests?*
- *How do forests contribute to a healthy environment?*
- *Has the way we use forests changed over time? How?*
- *Why are forests important to you?*

### MATERIALS FROM TOOLKIT

- Anemometer

### OTHER MATERIALS

- Site Report worksheet
- Forest Scavenger Hunt worksheet





## FOREST REPORT

## PART 2

## SCAVENGER HUNT

Here are some hints, guiding questions and background information that will help you and your students during the scavenger hunt.

Item	Critical Thinking	Context
<p><b>A tree that would be a good place for a bird to nest in</b></p>	<p>Why is this a good nesting spot?</p> <p>What other animals might use the tree for a nest or home?</p>	<p>Trees provide habitat for birds, bats, squirrels, insects and other forest species.</p>
<p><b>A tree or shrub that has fruit or berries</b></p> 	<p>Are all berries edible?</p> <p>What are some other ways berries might be used, other than for food for humans?</p>	<p>Did you know rose hips are a fruit? They are also a source of vitamin C and have been used traditionally to treat infections.</p> <p>Berries and fruits also have been used in soaps, dyes, teas and other medicines.</p>
<p><b>Leaf Litter</b></p> 	<p>What happens to leaf litter over time?</p> <p>How does leaf litter benefit the soil and other animals?</p>	<p>Leaf litter is not garbage! It is actually a valuable source of nutrients for plants, protects the ground from drying out and provides food for decomposers and habitat for a variety of animals.</p>
<p><b>A bench or picnic table</b></p>	<p>Why is it important for people to have access to forests and natural areas?</p> <p>Why is it important to protect forest ecosystems?</p>	<p>Alberta's forests have different designations, some forests are protected for wildlife habitat, some are designated for recreation while others are used for natural resource development.</p> <p>Many forest areas are multi-use and can support a variety of activities in the same place.</p>
<p><b>A body of water</b> <i>(i.e. a stream, creek, river, lake)</i></p>	<p>Is there vegetation around the water — how is the water and forest connected?</p> <p>What other role does this water body play in the forest ecosystem?</p>	<p>Riparian vegetation can help improve the quality of the water in these areas by trapping sediment and reducing erosion.</p> <p>Vegetation also provides important wildlife habitat, contributing to increased biodiversity and ecosystem health.</p>
<p><b>A tree that has moss or lichen growing on or near it</b></p>	<p>What type of symbiotic relationship exists between a tree with moss/lichen growing on it?</p> <p>What might moss or lichen be used for in the forest?</p>	<p>Moss or lichen growing on trees is an example of commensalism — the moss or lichen has a place to grow, but the tree is not harmed.</p> <p>Lichen itself is an example of mutualism between algae and fungus — both benefit from the relationship. Lichen is the primary food source for woodland caribou.</p>

<p><b>A squirrel midden</b></p> 	<p>Why is it important for squirrels to cache food?</p> <p>What benefit could food caches provide to the forest ecosystem at large?</p>	<p>A squirrel midden is a messy pile of leftover spruce cones from a squirrel eating the seeds inside. Middens can also act as a cache of food for squirrels in winter months.</p>
<p><b>Fungus</b></p> 	<p>What makes fungus different from trees and other plants?</p> <p>What conditions does fungi need to grow? What are the different uses of fungi?</p>	<p>Fungi play a variety of roles in forest ecosystems including: forming beneficial relationships with plant root systems, acting as pathogens, and some species of fungi can be a source of food for humans and wildlife.</p>
<p><b>An insect on the forest floor</b></p>	<p>What do you think these insects eat?</p> <p>Where else would you expect to find similar insects?</p>	<p>Decomposers return the nutrients from dead plants and animals, and return them to the soil, making them an essential part of the forest ecosystem.</p>
<p><b>A trail wide enough for a vehicle to drive on</b></p>	<p>How would this trail impact the forest around it?</p> <p>How can people work together to minimize the impact of roads?</p>	<p>Wide trails provide easy access into forested areas. This is good news for recreation, hunting, camping and natural resource industries, but can pose a problem to plants, wildlife and waterbodies if the area becomes too disturbed.</p>
<p><b>A tree stump</b></p>	<p>Who or what created this stump? How can you tell?</p> <p>Why are stumps important in forest ecosystems?</p>	<p>Stumps can be a result of many events, including people cutting down trees, an aging tree falling, a lightning strike or even beavers. Stumps help hold the soil in place, preventing erosion.</p>
<p><b>A fallen or dead tree</b></p>	<p>What caused this tree to fall/die?</p> <p>How is a fallen or dead tree valuable in the forest?</p>	<p>Dead and dying trees can be a result of disease, insect pests or natural events such as fire or wind. They provide important habitat for many small mammals, insects, birds and decomposers, therefore contributing to the biodiversity of forests.</p>
<p><b>A plant that has traditional uses</b> (<i>ie. sage, willow, birch bark</i>)</p> 	<p>How might this plant have helped indigenous people survive in this area?</p> <p>Have you used this plant in your day-to-day life?</p>	<p>Though traditional uses of plants have developed over thousands of years of indigenous people living in close relationship with the land, many are still important in modern indigenous (<i>and non-indigenous</i>) societies.</p>
<p><b>A tree that you could use in building a home</b></p>	<p>What features would make a tree suitable for building?</p> <p>How has human use of trees in homes changed over the millennia?</p>	<p>Certain species are better used for building materials than others.</p> <p><i>*See the <b>Tree Measurements</b> Activity for more context</i></p>
<p><b>Your favourite spot in the forest</b></p>	<p>How does this spot make you feel?</p> <p>Do you think humans belong as a part of the forest?</p>	<p>Consider how people are connected with their local forest environments, including through being out in the forest, the products they use and the ecosystem services forests provide.</p>

## FOREST REPORT

## FOREST SCAVENGER HUNT | WORKSHEET

Item	Forest Value					
	<i>*check how the item found would be used in the forest</i>					
	Habitat for Animals	Food	Recreation	Shelter	Medicine	Other <i>(Please describe)</i>
A tree that would be a good place for a bird to nest in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A tree or shrub that has fruit or berries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Leaf litter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A bench or picnic table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A body of water <i>(ie. a stream, creek, river, lake)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A tree that has moss or lichen growing on or near it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A squirrel midden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Item	Forest Value					
	<i>*check how the item found would be used in the forest</i>					
	Habitat for Animals	Food	Recreation	Shelter	Medicine	Other <i>(Please describe)</i>
Fungus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
An insect on the forest floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A trail wide enough for a vehicle to drive on	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A tree stump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A fallen or dead tree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A plant that has traditional uses <i>(ie. sage, willow, birch bark)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A tree that you could use in building a home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Your favourite spot in the forest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## FOREST REPORT

## SITE REPORT | WORKSHEET

Welcome field scientists! Today we will be assessing the trees and forests that exist in your community, around your school! As **field scientists**, we will...

## MAKE OBSERVATIONS

Date: \_\_\_\_\_

Community (*City/town*): \_\_\_\_\_

**Weather Conditions** (*circle any*):

Sunny / Partly Cloudy / Cloudy / Rainy / Snowy / Windy

Temperature: \_\_\_\_\_ Wind speed: \_\_\_\_\_

*\*use the **anemometer** from your tool kit*

**Season** (*circle one*): Spring / Summer / Fall / Winter

**Natural Region** (*circle one*):

Canadian Shield / Boreal Forest / Aspen Parkland / Grasslands  
Foothills / Rocky Mountains

## RECORD FINDINGS

Take some time to record what you hear, feel, and see — think about who or what is using this area, for example wildlife, people exercising or relaxing, indigenous people, or farmers

I hear...	I feel...	I see...

## ASK QUESTIONS

I'm wondering...

I want to learn more about...

I'm excited to...

What are some ways we can help take care of the trees and forests ?

# PLANT IDENTIFICATION

## INTRODUCTION

Alberta has many different species of native trees and shrubs as well as many introduced species. Identifying and classifying trees is a skill that allows you to become familiar with your natural surroundings and gain a better understanding of biodiversity in your community as well as what different species need in order to grow.

Identifying tree species is also important for foresters, because different species of tree are better suited for different products. This is explored more in the **Tree Measurements** activities.

Trees and shrubs are commonly identified by their leaf characteristics in addition to other obvious features such as bark colour and texture. Learning to identify these characteristics is an important skill for identifying plants.

As an introduction to plant identification use the *Guide to the Common Native Trees & Shrubs of Alberta* to explain different plant characteristics and how a dichotomous key is used.

**Note:** Many plants found in communities and schoolyards are non-native species, so you may not be able to identify your trees correctly.

### GUIDING QUESTION

Are Alberta's common forest species present in our community?

- What characteristics make a tree different from other plants?
- What other characteristics do the trees in our community have?
- What characteristics do native tree species in Alberta have?
- What kind of forest do we have in our community?

### MATERIALS FROM TOOLKIT

- Guide to the Common Native Trees and Shrubs of Alberta
- Tally Counter

### OTHER MATERIALS

- What Tree Could I Be worksheet
- Graph Paper
- Coloured Pencils



## PLANT IDENTIFICATION

### PART 1

## WHAT TREE COULD I BE?

This activity uses the **What Tree Could I Be** worksheet and can be used in addition to **Part 2** or as a stand-alone activity when the tree species in your community are uncertain or a mix of native and non-native. This activity can be done without any tools from the Forest Field Trip Toolkit.

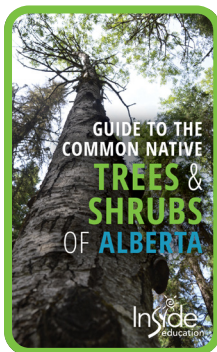
Give each student one or more copies of the **What Tree Could I Be** worksheet (*one for each plant you want them to characterize*).

### The worksheet has 5 parts:

1. Drawing your plant
2. Confirming that your plant is a tree
3. Determining if your tree is coniferous or deciduous
4. Recording leaf shape and growth patterns
5. Identifying which tree your plant is most like

### PART 2

## USING A DICHOTOMOUS KEY



You may use this activity if you are certain that you have trees and/or shrubs in your community which are native and within the **Guide to the Common Native Trees & Shrubs of Alberta**. PDF copies can be found on the Inside Education website. — [www.insideeducation.ca](http://www.insideeducation.ca)

Using the *Guide to the Common Native Trees & Shrubs of Alberta* ask your students to identify and record a number of species in your chosen area.



## PART 3

## COMMUNITY FOREST INVENTORY

This activity can be done with or without tools from the Forest Field Trip Toolkit.



One way that forests can be classified is based on the number of **coniferous** and **deciduous** trees relative to each other. An area of forest which is dominated (>75%) by deciduous trees is called a Deciduous Stand, while an area of forest which is dominated (>75%) by coniferous trees is called a Coniferous Stand. An area of forest which has a mix of both coniferous and deciduous trees is called a Mixedwood Stand. A stand is considered mixedwood when 26%-75% of the trees are deciduous, or in other words when neither type of tree makes up more than 75% of the forest.

Using the **tally counter** included in the Forest Field Trip Toolkit, or using pencil and paper students should record the number of coniferous and deciduous trees in a designated area (eg. your schoolyard, a number of blocks in your community, within an area marked with flagging tape in a forest).

With their collected data students should create a percentage bar graph of their community forest, and determine if the forest is a deciduous stand, coniferous stand, or mixedwood stand.

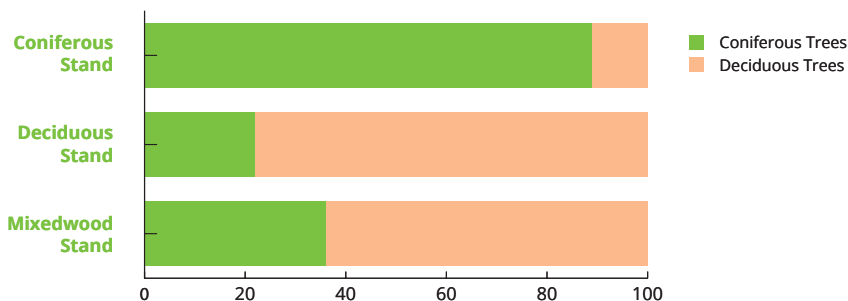
### Deciduous

Trees have leaves that fall off every autumn — examples include the aspen poplar, balsam poplar, and American elm. In Alberta they usually (*but not always!*) have broad, flat leaves.

### Coniferous

Trees have cones -the word “conifer” is latin and translates to “cone-bearing.” Examples include the lodgepole pine and Colorado spruce. In Alberta they usually (*but not always!*) have needle-shaped leaves that stay on the tree all year.

Types of Forest



WHAT TREE COULD I BE

WORKSHEET

Draw your plants

AM I A TREE AT ALL?

Does your plant have these three characteristics?

- Trunk:** A large single stem
- Bark:** A hard outer layer
- Wood:** A solid inside

If yes, congratulations, it's a tree!

Coniferous OR Deciduous

(Circle ONE)



















Cones  
Needleleaf  
Evergreen



Loses Leaves,  
Broadleaf,  
Flowers, Catkins,  
or Fruit

LEAF SHAPES & PATTERNS


































Different types of leaves and how they grow are often the best way to tell trees apart. Check all of the characteristics that apply to your tree.

<input type="checkbox"/> Needleleaf 	<input type="checkbox"/> Single Needles 	<input type="checkbox"/> Clustered Needles 	<input type="checkbox"/> Needle Pairs (Sheathed) 
<input type="checkbox"/> Square Needles 	<input type="checkbox"/> Flat Needles 	<input type="checkbox"/> Broadleaf 	<input type="checkbox"/> Alternate 
<input type="checkbox"/> Opposite 	<input type="checkbox"/> Compound 	<input type="checkbox"/> Teeth (coarse or fine) 	<input type="checkbox"/> Lobed 
<input type="checkbox"/> Oblong 	<input type="checkbox"/> Oval/Ovate 	<input type="checkbox"/> Triangular/Heart 	<input type="checkbox"/> Round 

**COMMON ALBERTA TREE SPECIES**

Which common Alberta species is most like yours?

Check next to the species with the most similar characteristics. If you think it's an exact match circle your checkmark.

<input type="checkbox"/> <b>Black Spruce</b> <input type="checkbox"/> or <b>White Spruce</b>		 Cones	 Needleleaf	 Single Needles	 Square Needles
<input type="checkbox"/> <b>Lodgepole Pine</b> <input type="checkbox"/> or <b>Jack Pine</b>		 Cones	 Needleleaf	 Needle Pairs	
<input type="checkbox"/> <b>Balsam Fir</b>		 Cones	 Needleleaf	 Single Needles	 Flat Needles
<input type="checkbox"/> <b>Tamarack Larch</b>		 Cones	 Needleleaf	 Clustered Needles	
<input type="checkbox"/> <b>Balsam Poplar</b>		 Broadleaf	 Alternate	 Fine Curved Teeth	 Oval Shape
<input type="checkbox"/> <b>Aspen Poplar</b>		 Broadleaf	 Alternate	 Fine Curved Teeth	 Ovate Shape
<input type="checkbox"/> <b>White Birch</b>		 Broadleaf	 Alternate	 Coarse Teeth	 Ovate Shape



# TREE MEASUREMENTS

## INTRODUCTION

When foresters are doing a forest inventory, they are usually interested in two measurements: tree height and tree diameter. These measurements are used to estimate the volume of timber in the forest, tree growth, and the quality of the growing conditions.

It is also important for foresters to determine the species of the trees they are harvesting, because different species are better suited for different products. Wood from spruce and pine are used to make lumber and wood panels like plywood, while aspen poplar is often used to make pulp, which makes products like oriented strand board, newsprint, toilet paper and other papers.

We can do an inventory of the forests in our community to determine how much timber we have in our community's trees, and what kinds of products could be made with them! Follow the steps below on several trees to do your own Community Forest Inventory.

### GUIDING QUESTION

What could be made with the trees in our community?

- *What forestry products are made using the tree species found in our community?*
- *How do foresters determine which trees should be harvested?*
- *What other values do trees and forests provide?*

### MATERIALS FROM TOOLKIT

- Guide to the Common Native Trees and Shrubs of Alberta
- Diameter Tape
- Surveyor's Rope
- Tangent Height Gauge
- Tree Cookies

### OTHER MATERIALS

- String/measuring tape
- Metre stick
- Calculator
- Tree Measurements worksheet



## TREE MEASUREMENTS

### PART 1

## DETERMINE YOUR TREE SPECIES

In order to determine what could be made with your tree, first you must determine what kind of tree it is. This can be as simple as deciding if your tree is deciduous or coniferous, or you can identify the tree species. If the tree you are measuring is a species native to the forests of Alberta, you may be able to determine the species using the *Guide to the Common Native Trees and Shrubs of Alberta* in your kit! However, it may be an introduced or ornamental tree, such as a Schubert Chokecherry, American Elm, or Colorado Spruce, in which case just determining if it is deciduous or coniferous is enough.

1. Give each of your students a copy of the **Tree Measurements worksheet**
2. In an your study area, have each student choose a tree
3. Fill in **Part 1** of the worksheet, using the *Guide to Common Native Trees and Shrubs of Alberta* to determine species

*\*Note, pdf copies of the guide can be found at [www.insideeducation.ca/forest\\_field\\_trip\\_toolkit](http://www.insideeducation.ca/forest_field_trip_toolkit)*



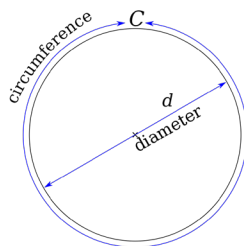
### Did you know...

That there is a native tree in Alberta that is both deciduous and coniferous? The tamarack or American larch is a cone-bearing tree with **needle** leaves that fall off each autumn!

## PART 2

## MEASURING DIAMETER

If we imagine the trunk of a tree cut horizontally through the middle as a flat circle, the diameter of a tree trunk is the distance across that circle. This is hard to measure on a living tree, so instead we can measure the circumference of the tree, and use a mathematical formula to calculate the diameter. Or, we can use a tool called a **diameter tape**, which eliminates the need to do mathematical calculations in the field. One side of the tape shows regular centimeters, and the other side shows a scale that has already converted circumference to diameter using  $\pi$ . The diameter of the tree can be read directly off the tape!



$$C=2\pi r \quad d=C\div\pi$$

In order to be consistent, foresters always make their diameter measurements at 1.3 metres above the ground. You can have your students measure how high 1.3 metres is on their bodies using a tape measure, metre stick, or **surveyor's rope**, and this is how high they will make their measurements.

**Method 1** Diameter tape

1. Using the diameter tape, hook the metal clasp into the bark at 1.3 m above the ground.
2. Wrap the tape around the tree.
3. Keep the tape level around the tree, and make sure you are reading the numbers in black (*this is the diameter measurement in cm*).
4. Read the number once it overlaps with the 0 mark.

*Note: The diameter tape can be used as a demonstration, or to verify that students calculated their diameter correctly.*

**Method 2** Measuring tape or string

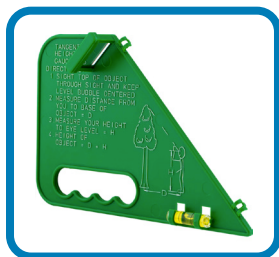
1. Give each of your students/groups a flexible measuring tape or string
2. Wrap the tool around the tree to measure the circumference at 1.3 metres above the ground.
3. If using string, use a metre stick to measure the circumference in cm
4. Record in **part 2** of worksheet
5. Use the formula to calculate the diameter

We can use the formula  $C=2\pi r$  to determine the circumference of a circle from the radius, but in the case we already know the circumference and want to know the diameter (*which equals two times the radius*). So we can rearrange this formula and use  $d=C\div\pi$  to calculate the diameter of your tree trunk.

## TREE MEASUREMENTS

### PART 3

## MEASURING HEIGHT



Most trees are very tall, so measuring the height without a special tool or a gigantic ladder can be tricky. Tree height can be estimated by using a person or an object as a reference, or can be measured more accurately using tools such as a clinometer or a **tangent height gauge**.

### Method 1 Tangent height gauge

1. Start standing in front of the tree.
2. Hold the gauge up to your eye and slowly move away from the tree until you can see the top through the sight while holding the gauge level (*you can have a second person watch the level on the side of the gauge to make sure you are keeping it straight — the bubble should be between the lines!*) Make sure you are checking behind you so that you don't trip!
3. Once you can see the top of the tree through the sight, stop moving.
4. Use a tape measure or surveyor's rope to measure the distance from you to the tree ( $d$ ) and the height of your eye from the ground ( $h$ ), and add them together - this is the height of your tree!

$$\text{Tree height} = d + h$$

### Method 2 Estimation with a person or object

1. Measure the height of the person or object
2. Stand at the bottom of your tree.
3. Stand far enough from the tree so that you can easily see it from top to bottom and then estimate how many times your helper or your object would fit into the height of the tree.
4. Record in **Part 3** of the **Tree Measurement worksheet**



## PART 4

## DETERMINING VOLUME

If we want to know how much of a product we can make from a tree (*or a forest of trees*), we need to know how much wood is in each tree, or the volume of wood. This can be tricky to calculate because trees are generally wider at the base and narrower near the top, and different tree species are different shapes! To solve this problem, foresters use special tables that give them an estimation of the amount of wood in a tree based on its height and diameter.

*\*This activity can be done indoors, as the measurements have already been taken*

1. Have students select the table for their tree (deciduous or coniferous)
2. Using the diameter and height measurements from **Part 2** and **3**, estimate the volume of wood in the tree
3. Record in **Part 4** of the **Tree Measurement Worksheet**

### CASE STUDY | HOW OLD IS MY TREE?

You probably know that we can tell the age of a tree by counting the rings that appear on the cross section of the trunk — usually from a tree stump. One growing season has both a light ring (*early-spring growth*) and a dark ring (*late-summer growth*), so we can count each set together to figure out the age of a tree.

**We can determine a few other things from looking at the cross section of a tree:**

1. Count the rings on the **tree cookies** in your kit to determine the age of the trees at the time they were cut down.
2. You will notice there is one coniferous and one deciduous cookie. What similarities and differences do you notice about the bark, wood and rings?
3. See if you can find evidence of any of the following:
  - a. Years with poor growing conditions (*narrow rings*)
  - b. Years with favourable growing conditions (*wide rings*)
  - c. Tree growing on a slant (*rings off-centered*)
  - d. Evidence of damage, disease, insects, fire can show up as discolourations, or warped rings, also called scars



In order to determine the age of a living tree without cutting it down, foresters use a tool called an increment borer. This device uses a hollow bit to drill into a tree, and then a long skinny “spoon” is inserted to draw out a cross-section sample so that the rings can be counted. This does only a minimal amount of damage to the tree, as tree sap means it is able to heal again easily.

## TREE MEASUREMENTS



### Individual Tree Volume in m<sup>3</sup> *Aspen Poplar (Deciduous)*

		DBH(cm)							
		1.1 - 11.0	11.1 - 21.0	21.1 - 31.0	31.1 - 41.0	41.1 - 51.0	51.1 - 61.0	61.1 - 71.0	71.1 - 81.0
Total Tree Height (m)	3.1 - 5.0	0.0047	0.0315	0.0785	0.1435	0.2254	0.3247	0.4422	0.5794
	5.1 - 7.0	0.0071	0.0491	0.1230	0.2240	0.3490	0.496	0.6639	0.8525
	7.1 - 9.0	0.0096	0.0667	0.1679	0.3060	0.4755	0.6723	0.8935	0.1368
	9.1 - 11.0	0.0121	0.0844	0.2131	0.3889	0.6042	0.8527	1.1297	1.4312
	11.1 - 13.0	0.0146	0.1021	0.2584	0.4724	0.7342	1.0358	1.3704	1.7326
	13.1 - 15.0	0.0171	0.1198	0.3039	0.5563	0.8652	1.2206	1.6142	2.0389
	15.1 - 17.0	0.0196	0.1375	0.3495	0.6405	0.9968	1.4068	1.8603	2.3487
	17.1 - 19.0	0.0221	0.1553	0.3952	0.7249	1.1290	1.5938	2.108	2.6612
	19.1 - 21.0	0.0246	0.1730	0.4408	0.8094	1.2615	1.7818	2.3570	2.9756
	21.1 - 23.0	0.0270	0.1908	0.4866	0.8940	1.3942	1.9702	2.6069	3.2915
	23.1 - 25.0	0.0295	0.2085	0.5323	0.9788	1.5272	2.1590	2.8576	3.6087
	25.1 - 27.0	0.0320	0.2263	0.5781	1.0636	1.6604	2.3482	3.1090	3.9269
	27.1 - 29.0	0.0345	0.2441	0.6239	1.1485	1.7937	2.5377	3.3608	4.2459
	29.1 - 31.0	0.0370	0.2619	0.6697	1.2334	1.9272	2.7274	3.6131	4.5656
	31.1 - 33.0	0.0395	0.2796	0.7156	1.3184	2.0607	2.9173	3.8657	4.8858
	33.1 - 35.0	0.0420	0.2974	0.7614	1.4034	2.1944	3.1074	4.1187	5.2066
	35.1 - 37.0	0.0445	0.3152	0.8073	1.4885	2.3281	3.2977	4.3718	5.5277
37.1 - 39.0	0.0470	0.3330	0.8531	1.5736	2.4619	3.4881	4.6253	5.8492	



Individual Tree Volume in m<sup>3</sup>  
**White Spruce** (*Coniferous*)

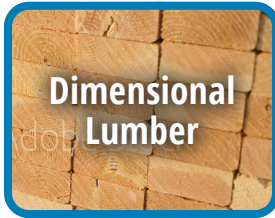
		DBH(cm)							
		1.1 - 11.0	11.1 - 21.0	21.1 - 31.0	31.1 - 41.0	41.1 - 51.0	51.1 - 61.0	61.1 - 71.0	71.1 - 81.0
Total Tree Height (m)	3.1 - 5.0	0.0048	0.0306	0.0772	0.1470	0.2453	0.3799	0.5609	0.8009
	5.1 - 7.0	0.0074	0.0479	0.1193	0.2212	0.3563	0.5295	0.7476	1.0189
	7.1 - 9.0	0.1000	0.0654	0.1625	0.2982	0.4725	0.6879	0.9482	1.2588
	9.1 - 11.0	0.0126	0.0831	0.2066	0.3774	0.5935	0.8548	1.1631	1.5214
	11.1 - 13.0	0.0152	0.1009	0.2512	0.4583	0.7178	1.0279	1.3883	1.8000
	13.1 - 15.0	0.0178	0.1188	0.2962	0.5402	0.8446	1.2055	1.6209	2.0902
	15.1 - 17.0	0.0205	0.1368	0.3415	0.623	0.9731	1.3863	1.8589	2.3887
	17.1 - 19.0	0.0231	0.1548	0.3870	0.7063	1.1030	1.5696	2.1011	2.6937
	19.1 - 21.0	0.0257	0.1728	0.4326	0.7901	1.2338	1.7549	2.3465	3.0037
	21.1 - 23.0	0.0284	0.1908	0.4784	0.8743	1.3655	1.9416	2.5944	3.3177
	23.1 - 25.0	0.0310	0.2089	0.5243	0.9588	1.4978	2.1296	2.8445	3.6348
	25.1 - 27.0	0.0337	0.2270	0.5702	1.0435	1.6307	2.3186	3.0962	3.9547
	27.1 - 29.0	0.0363	0.2451	0.6163	1.1284	1.7640	2.5084	3.3494	4.2768
	29.1 - 31.0	0.0389	0.2633	0.6624	1.2135	1.8977	2.6990	3.6038	4.6007
	31.1 - 33.0	0.0416	0.2814	0.7086	1.2988	2.0318	2.8901	3.8592	4.9263
	33.1 - 35.0	0.0442	0.2996	0.7548	1.3842	2.1661	3.0818	4.1155	5.2532
35.1 - 37.0	0.0469	0.3178	0.8010	1.4697	2.3007	3.2740	4.3726	5.5814	
37.1 - 39.0	0.0495	0.3359	0.8473	1.5553	2.4355	3.4666	4.6303	5.9107	

## TREE MEASUREMENTS

### PART 5

## FOREST PRODUCTS

There are many different products that might be made with a tree!  
Below are some of the most common types of products that are made with trees from Alberta.



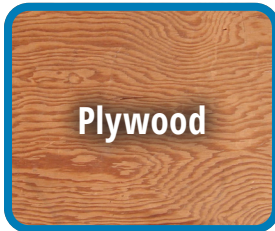
Lumber that is cut to standardized dimensions, such as a two-by-four, and is largely used in the construction of single-family homes.

In Alberta lumber is generally made of spruce, pine, and fir trees. If you go to your local lumber store you will see a stamp that says “SPF”, which stands for spruce, pine or fir.



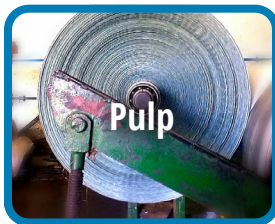
Stands for Oriented Strand Board, and is created by compressing adhesives and strands of wood into a board

This creates a strong and durable product which is used in construction, flooring, and furniture production, and is usually made with balsam or aspen poplar



Tree logs are peeled on a large spindle creating thin layers of wood that are stacked and bonded together with an adhesive plus heat and pressure. It creates a board that can be of varying thickness, and is often used in construction or in the production of furniture.

In Alberta, plywood is mainly made from spruce and pine trees.



Wood chips are treated with chemicals and/or heat to separate the cellulose fibres from each other, creating pulp.

Pulp is the basis of a wide variety of paper products, from computer paper to cardboard to toilet paper! Spruce, pine, and aspen poplar are all used to make pulp in Alberta.

Generally, in Alberta, we only have three species of trees that are used on a large scale to make forest products — lodgepole pine, white spruce, and aspen poplar. The others generally occur in smaller numbers, and are usually only harvested incidentally.

## TREE MEASUREMENTS

\*This activity can be done indoors, as the measurements have already been taken

- Use the chart below to determine what kind of product you might be able to make from your tree.
- If you just know that your tree is deciduous or coniferous, you can choose any of the products that fall into your tree type (*blue is coniferous, orange is deciduous*)

		Forest Products			
		Dimensional Lumber	OSB	Plywood	Pulp
Native Boreal Forest Trees	White Spruce	×		×	×
	Black Spruce	×			×
	Jack Pine	×			×
	Lodgepole Pine	×			×
	Balsam Fir	×			
	Tamarack				×
	Aspen Poplar		×		×
	Balsam Poplar		×		
	White Birch	×		×	×

- Now, use the following chart to determine what can be made with your forest product, and how much wood is required.
- Divide the volume of your tree by the amount of wood required to determine how many of your forest product can be made by your tree!

$$\text{Number of items} = \text{Volume of tree} \div \text{Amount of wood per item}$$

Forest Product	What can I make?	Amount of wood per item
Dimensional Lumber	Picnic Table	0.51m <sup>3</sup>
OSB	Dog House	0.12 m <sup>3</sup>
Plywood	Dresser	0.25 m <sup>3</sup>
Pulp	One roll of Toilet Paper	0.0007 m <sup>3</sup>

- Record in **Part 5** of the **Tree Measurements Worksheet**

## TREE MEASUREMENTS

# TREE MEASUREMENTS | WORKSHEET

### PART 1 | TREE SPECIES

My tree is (*check one*):

Deciduous       Coniferous

If your tree is a native species found in the boreal forest, what species is it? (*check one*):

Aspen Poplar       Balsam Poplar       White Birch  
 Jack Pine       Lodgepole Pine       Tamarack  
 White Spruce       Black Spruce       Balsam Fir

### PART 2 | DIAMETER OF THE TREE

Circumference of my tree (cm): \_\_\_\_\_ cm

Diameter of my tree = Circumference  $\div$   $\pi$  (3.14) = \_\_\_\_\_ cm

### PART 3 | TREE HEIGHT

Height of my partner: \_\_\_\_\_ m

Number of times partner fits into the height of the tree: \_\_\_\_\_

Tree Height = Height of helper  $\times$  Number  
of times they fit into the height of the tree = \_\_\_\_\_ m

### PART 4 | VOLUME OF WOOD

Volume of wood in my tree: \_\_\_\_\_ m<sup>3</sup>

### PART 5 | WHAT WOOD I MAKE?

Type of forest product I can make with my tree \_\_\_\_\_

Number of items I can make \_\_\_\_\_

*Number of items = Volume of tree  $\div$  Amount of wood per item*

# WILDLIFE HABITAT ASSESSMENT

## INTRODUCTION

Trees and forests provide essential habitat for many different species of wildlife. If you're lucky you may see wildlife in your community, or on a visit to the forest. However, if you don't see them there is almost always evidence that they are there, you just have to know what to look for!

Each animal is adapted to and plays a specific role in their habitat. When an animal species experiences a dramatic change in population or goes extinct there will be ripple effects in the rest of the ecosystem. Therefore it is very important to have an understanding of forest wildlife and their habitat so that we can help each species thrive. When native species thrive we protect biodiversity and the overall health of our forest ecosystems.

Through these activities we will identify wildlife species native to Alberta's forests, understand some of their adaptations and needs, and explore how our use of the forest might impact those species.

### GUIDING QUESTION

What animals use the trees and forests in our community?

- *What evidence of wildlife species can be found in Alberta's forests?*
- *How are Alberta species adapted to life in the forest? How are their needs met by the forest?*
- *How can human use of the forest affect the animals that live there?*

### MATERIALS FROM TOOLKIT

- Animal Tracks Pocket Guide
- Alberta Nature Guide
- Animal Artifacts (*Bird Bands, Owl Pellet, Fur Samples*)
- Caribou Poster
- Trout Poster
- Mountain Pine Beetle Kit

### OTHER MATERIALS

- Animal Evidence Worksheet



## WILDLIFE HABITAT

## PART 1

**SEARCHING FOR ANIMAL EVIDENCE**

For this activity students will explore your community to look for evidence of animals living in your community forest. Animal

1. Print a copy of the **Animal Evidence Worksheet** for each student
2. Instruct students to search for and record any animal evidence they find on the front of the worksheet



## PART 2

**IDENTIFYING SPECIES & HABITATS**

1. Explore the **animal artifacts** with your students.
2. Have students choose one piece of evidence they collected in part one or one of the animal artifacts. Using the **Animal Tracks pocket guide**, the **Alberta Nature Guide** or other sources, students will identify the species the evidence or artifact represents.
3. Once the species has been identified students will answer **questions 1-4** in **Part 2** of the **Animal Evidence Worksheet**
4. Using the **caribou poster** and **trout poster**, lead a discussion on how human activity is impacting these wildlife species as well as the work being done to protect them. It can be easy to focus on only positive or only negative impacts, so challenge your students to consider both!
5. Use the **mountain pine beetle kit** and **“Case Study | Mountain Pine Beetle”** to discuss how human activity has led to a population outbreak. How could this impact other species?
6. Going back to the species the students identified earlier, ask students to consider how human activity may impact that species. Students can record this in **question 5** of **Part 2** of the **Animal Evidence Worksheet**.



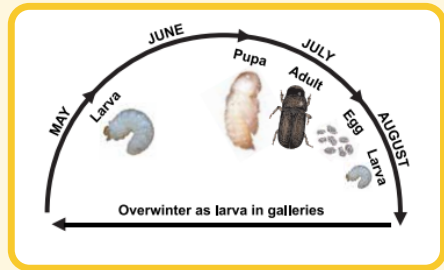
## CASE STUDY | MOUNTAIN PINE BEETLE

The mountain pine beetle (*MPB*) is a forest insect naturally found in the southern Rocky Mountains. Until 2006 it had not occurred in the northeastern slopes of the Rocky Mountains or west-central Alberta.

As a bark beetle the mountain pine beetle spends most of its life under the bark of older pine trees (*80+ years old*). Adult females bore into the bark and create galleries where they lay their eggs. The eggs develop into larvae which tunnel further under the bark over winter. As spring arrives they develop into pupae and then emerge as adults in summer. The adult beetles exit the tree and fly away to find a new tree host.

Mountain Pine beetle plays an important role in forest succession. They very quickly kill older pine trees, which then provide food and shelter for other species, eventually decomposing and returning their nutrients to the soil.

Recently mountain pine beetles have seen a sharp increase in population, and they have also spread eastwards into Alberta's boreal forest. While populations of animals move and fluctuate with time naturally, there are a few human-connected reasons that this specific species is experiencing a population boom.



First of all, mountain pine beetle populations are usually kept small by periods of extreme cold weather. While the beetle larvae are adapted to winter and can survive freezing temperatures, many larvae die during extended periods of extreme cold. Due to climate change, winters in Alberta are generally not as cold as they used to be, which means that mountain pine beetle larvae survive in greater numbers each year.

Another significant change to the forests of Alberta which has allowed pine beetle populations to thrive is how humans limit or prevent forest fires. Forest fire is an important part of the forest ecosystem and it also plays a significant role in succession. When we suppress fires, large areas of forest become overmature containing large numbers of pine trees which are over 80 years old, providing ideal habitat for mountain pine beetle.

Even though mountain pine beetle is a native species, growing beetle populations can cause a number of negative effects. When large areas of forest are killed by mountain pine beetle there is an increased risk of large wildfires due to larger than normal amounts of fuel in the forest. These large fires can result in destabilization of soils, which in turn can cause poor water quality due to run-off. Additionally, the forest areas killed by large pine beetle populations will take many years to regenerate to a suitable habitat for the species that lived there before. This can pose a threat to the native biodiversity.

## ANIMAL EVIDENCE | WORKSHEET

## PART 1

Take a look around your community. What kinds of evidence can you find for the animals that live here? Put a checkmark next to the types of evidence you find, sketch and or explain what you saw.

Type of Evidence		Sketch & Explain
<input type="checkbox"/>	<p><b>Live animal</b></p> <p><i>If you're lucky you might just see an animal instead of only seeing what it leaves behind!</i></p>	
<input type="checkbox"/>	<p><b>Tracks</b></p> <p><i>If the ground is soft animals can leave behind footprints. Look in mud, sand, or snow.</i></p>	
<input type="checkbox"/>	<p><b>Scat (Poop)</b></p> <p><i>Everybody poops! Animal scat is a great way to figure out which animals live in your area.</i></p>	
<input type="checkbox"/>	<p><b>Nest, Burrow, or Lodge</b></p> <p><i>Animals need a place to hide and raise their young. Look in trees, underground, or at the edge of water.</i></p>	
<input type="checkbox"/>	<p><b>Food Scraps</b></p> <p><i>Look around for things that have been chewed on! Twigs, cones, nuts, or even bones.</i></p>	
<input type="checkbox"/>	<p><b>Other</b></p> <p><i>Did you find something else an animal left behind? Sketch and describe it</i></p>	





# SOIL SAMPLING

## INTRODUCTION

The composition of the soil can provide foresters, researchers and others working in the forest with useful information about the site. The texture of the soil (*how much clay, silt and sand the soil is composed of*) can help determine the amount of water that a soil can retain, and therefore tell us about the movement of nutrients and minerals through the soil. Levels of phosphorus, potassium and nitrogen as well as pH can determine what types of plants will grow best on the site.

Different types of human activity on the site can change the composition of the soil through effects such as compaction, erosion and nutrient addition/depletion.

This activity will help you guide your students through inquiry and discovery of the soil at a site of your choice, and relate it back to human uses and the forest that grows there.

### GUIDING QUESTION

How has soil been impacted by humans in your community?

- *What do you think the soil will look like in your community?*
- *What human actions do you see in your community that could impact soil?*
- *What does the soil actually look like?*
- *What does this mean for what could grow here?*

### MATERIALS FROM TOOLKIT

- Soil auger
- Soil testing kit  
(*in the classroom*)
- Soil Texture Chart

### OTHER MATERIALS

- Soil Sampling Worksheet
- Water
- Ziplock bag or container  
(*for soil*)



## PART 1

## SOIL INVESTIGATION

Lead your students through the Soil Investigation part of the handout. Students will make observations and then come to a hypothesis about soil quality based on these observations.

### Human usage

As people walk or drive across soil, it can become compacted. This means that plant roots have a harder time growing through the soil, and the soil absorbs less water as well.

### Moisture

Very dry or very wet soil are both detrimental to soil health, especially as it relates to healthy plant communities. Generally, healthier soil retains some water, but also allows excess to filter through into the groundwater system.

### Plant diversity

In general, a more diverse array of plants can indicate a healthier soil ecosystem. Plant diversity can be affected by many other factors, such as temperature, ecozone and grazing activity. However, a poor soil is likely to see less types of plants because there are fewer plants that can tolerate poor soil quality (*or health*).

### Organic material

Dead plant material in the top layer of soil is an indication that there are nutrients returning to the soil through decomposition.

### Colour

Darker soil colour generally indicates higher organic matter and nutrient content. There are exceptions to this that can be explained by some of the intricacies of soil science, but for our purposes this is a good rule of thumb. A very pale soil generally means that the nutrients in the soil have leached out, meaning it is of poorer health.

Based on the above variables, students should be able to come up with a hypothesis and prediction about the soil health on their study site.

## PART 2

## TAKING A SOIL CORE

Using the **soil auger**, a soil core will be taken from a location at the site of your field study. Students will fill in the Soil Sampling portion of the handout during this activity.

### Soil sampling protocol

1. Find a location that is not very compacted and is likely to not have rocks or roots
2. Push the soil auger down into the ground using only your hands. If you are having a hard time pushing it down, rotate the auger back and forth slightly.  
**PLEASE DO NOT USE YOUR FEET** - the soil augers are made of soft metal and will bend
3. Once the handle of the soil auger is level with the top of the ground, gently pull the auger out.
4. Have your students draw the soil core and compare to the the soil horizon diagram.
5. Take a handful of the A horizon and wet it with a little bit of water so that it is malleable but not dripping wet.
6. Follow the **Soil Texturing Chart** to figure out the soil texture of this horizon.
7. Repeat steps 5 & 6 for the B horizon if it is present as well.
8. Replace the soil in the hole made by the auger.
9. Take another soil sample using the auger. This soil will be used in the Soil Testing activity back in the classroom.  
*\*Note: touching soil with hands can influence the soil tests that will be performed*
10. Using a small container or a bag, take approximately 1 cup of soil for use in the soil testing.

## SOIL SAMPLING

### PART 3

## SOIL TESTING

There are 4 separate tests in the soil testing kit.  
The tests are colour coded for easy usage:

**GREEN** - pH test

**PURPLE** - Nitrogen (**N**) test

**BLUE** - Phosphorous (**P**) test

**ORANGE** - Potassium (**K**) test

### step 1 From the 1 cup of soil you collected

1. Use approximately  $\frac{1}{4}$  tsp to fill to the soil line on the **pH test chamber** (*skinnier chamber - see Figure*) — If you want to conduct more than 1 pH test, reserve soil for these
2. With the rest of the soil, create a solution of **1 part soil : 5 parts distilled water** in a clean container (*the amount of soil does not matter as long as the ratio is correct*). This solution will be used in Step 2 for the N,P and K tests.

### step 2 N, P and K Tests

1. Stir/shake the soil and distilled water solution for at least **1 minute**
2. Allow the mixture to sit undisturbed until it settles. This can take anywhere from **30 minutes to 24 hours** depending on the particle size of your soil sample (*more clay means longer settling time*)
3. Once the solution has settled (*the solution may still be cloudy and that's ok*), select the soil test that you want to conduct
4. With the dropper provided, fill the test and reference chambers with the water from the solution - avoid disturbing the sediment at the bottom
  - The reference chamber is filled so that any discolourations in your water can be taken into account in the colour chart
5. Take a test capsule of the **same colour** as your test container. Holding the capsule horizontally above the test chamber, separate the two halves. If the capsule will not open, use scissors to cut a small hole in one end and pour powder out.
6. Put the lid back on the test container, make sure it is sealed. Shake thoroughly
7. Set a timer for **10 minutes** - the colour in the solution should not be allowed to develop for any longer.
8. If flakes of the **BLUE** colour have settled to the bottom of the **phosphorous test container**, shake the container to suspend in the solution
9. If flakes of the **ORANGE/brown** accumulate at the top of the solution in the potassium test, **DO NOT** reshake the container. Just read the colour of the solution as is.
10. Compare the colour of the solution to the colour chart. For best results, do this in daylight (not direct sunlight) to illuminate the solution in both chambers.
11. Follow the above steps for each of the nutrient tests



### step 3 pH test (GREEN)

1. Fill test chamber to soil fill line
2. Take a **GREEN** test capsule. Holding the capsule horizontally above the test chamber, separate the two halves. If the capsule will not open, use scissors to cut a small hole in one end and pour powder out.
3. Using the dropper provided, add distilled water to the water fill line of both chambers.
4. Cap the container and ensure it is sealed. Shake thoroughly
5. Allow the soil to settle and the colour to develop for about a **minute**
6. Compare the colour of the solution to the colour chart. For best results, do this in daylight (*not direct sunlight*) to illuminate the solution in both chambers

The soil tests will give an idea of how depleted the nutrients in the soil are, and what the pH is. Ideal pH for most plants is around 6.5, and most plants will do well in sufficient or higher levels of nutrients.

Using these observations, help your students compare their results with the prediction they made earlier. Discuss how soil health could be improved at your site.



**SOIL SAMPLING****SOIL SAMPLING | WORKSHEET****PART 1 | SOIL INVESTIGATION**

Walk around your site and observe the soil.  
Mark your observations on the following scales:

\_\_\_\_\_

High human usage Low human usage

\_\_\_\_\_

Very wet OR Very dry Moist

\_\_\_\_\_

Low plant diversity High plant diversity

\_\_\_\_\_

Little organic material Lots of organic material

\_\_\_\_\_

Light in colour Dark in colour

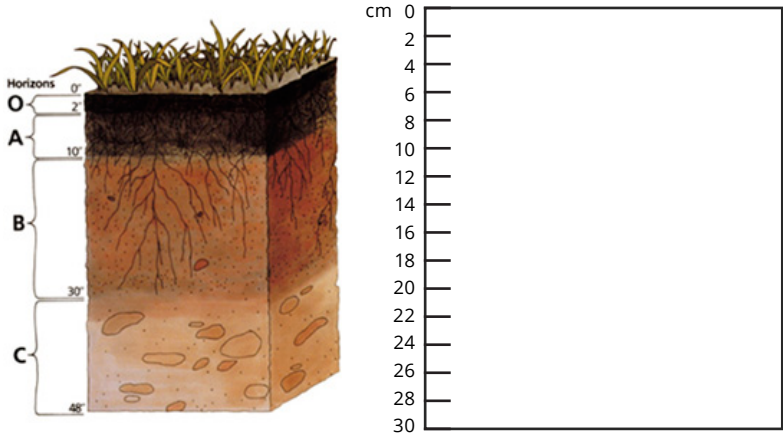
Other observations:

The left side of the above scales typically indicate poor soil health, and the right side indicates high soil health. Based on your observations, write a hypothesis of the soil health at your site:

## SOIL SAMPLING

## PART 2 | SOIL SAMPLING

Draw your soil sample in the box below, labeling the different horizons.



Use the soil texturing chart to figure out what texture of soil you have:

A horizon: \_\_\_\_\_

B horizon (if present): \_\_\_\_\_

## PART 3 | SOIL TESTING

Using the **soil testing kit**, write down the measurements of your soil in the table below:

Variable	Test result
pH	
Nitrogen (N)	
Phosphorous (P)	
Potassium (K)	

Based on the observations you have made in the Soil Sampling and Soil Testing sections, what do you think the health of your soil is? Why do you think so?

## REFERENCES





[www.InsideEducation.ca](http://www.InsideEducation.ca)