Question, Investigate, Discover!

A CLOSER LOOK:

Let's Explore Trees

SCIENCE PRIMARY–6

A CURRICULUM RESOURCE

NOVA SCOTIA

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Contents

Introduction

This resource has been developed in co-operation between the Department of Education and Early Childhood Development and the Department of Natural Resources. It is intended to be used with the Pack to Nature activity backpacks provided by the Department of Natural Resources to encourage investigations in an outdoor setting and to foster a greater understanding of the natural world. These investigations are designed to develop the scientific literacy and skills of students from grades primary to 6.

The intent of this resource is to allow participants to choose and to adapt those investigations that are appropriate for their purposes. The investigations allow plenty of time for exploration and evaluation. Each investigation can stand alone or may be incorporated with others.

⚠ Many of the investigations in this resource involve using the senses to identify various characteristics of trees and other objects. To ensure the safety of students, tasting should not happen.

Aim

The aim of science education in the Atlantic provinces is to develop scientific literacy. Scientific literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to develop inquiry, problem-solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them. To develop scientific literacy, students require diverse learning experiences that provide opportunities to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment.

To engage families in the exploration of trees and connecting with nature, see "Family Investigations—Let's Go Outside" on page 113.

Three Processes of Scientific Literacy

An individual can be considered scientifically literate when he or she is familiar with, and able to engage in, three processes: inquiry, problem solving, and decision making.

INQUIRY

Scientific inquiry involves posing questions and developing explanations for phenomena. While there is general agreement that there is no such thing as the scientific method, students require certain skills to participate in the activities of science. Skills such as questioning, observing, inferring, predicting, measuring, hypothesizing, classifying, designing experiments, collecting data, analyzing data, and interpreting data are fundamental to engaging in science. These activities provide students with opportunities to understand and practise the process of theory development in science and the nature of science.

PROBLEM SOLVING

The process of problem solving involves seeking solutions to human problems. It consists of proposing, creating, and testing prototypes, products, and techniques to determine the best solution to a given problem.

DECISION MAKING

The process of decision making involves determining what we should do in a particular context or in response to a given situation. Decision-making situations provide a relevant context for engaging in scientific inquiry and/or problem solving.

Science Skills

INTRODUCTION

The skill of observing is important because almost all other science skills are based upon it. Scientists make observations and construct several inferences about each observation. In many cases, it is possible to make more than one inference to explain an observation or set of observations.

An **observation** is an experience that is obtained through one of the senses. An **inference** is an explanation of an observation.

Observing items closely provides opportunities to describe objects in greater detail. Tools such as hand-held magnifiers, box magnifiers, microscopes, and optical microscopes allow a variety of extensions of the sense of sight. These instruments allow observations that extend the senses, in this case, the naked eye.

OBSERVING

Observation involves using all the senses. Observations of different qualities or properties of matter should be taught. This is extensive in grade primary and grade 1 science. The development of the skill of observation is sequential (as are most skills) and requires regular reinforcement.

Some science activities are specifically designed to teach a skill. Other activities teach valuable information about the object or event being observed. Language development used to describe what is seen helps clarify the observations.

Qualitative observations are the ones most frequently considered by students. These describe the objects using the senses. **Quantitative observations** tell how much or how many by giving an amount with the description.

Observations involving changes are useful and should be included in reporting whenever possible. Changes such as plant and animal observations help identify and explain what is happening in science.

Planning for and accurately recording observations increases their reliability. Recording in one or more of the following representations is part of the science reporting that students should do. These representations include symbolic, contextual, concrete, pictorial, and verbal (any written or oral language).

INFERRING

Distinguishing between observations and inferences needs to be done continually. The thought process used in constructing an inference may take place quickly. This process is often conditioned by past experiences.

In many cases, it is possible to make more than one inference to explain an observation or set of observations. Scientists make observations and construct several inferences about each. Then, they can make new observations to see if the inferences are acceptable explanations of the old and new observations.

QUESTIONING

Teachers should use operational questions that allow students to continue to explain and support their observations and inferences. Questions to consider:

1. What questions do you have?
2. What do you see?
3. What is happening?
4. What happened?
5. What did you know about the problem before you began your study?
6. What sense did you use to make that observation?
7. That is an interesting inference. What observation(s) did you use to support your inference?
8. What observation(s) did you make that allow you to say that?
9. What evidence do you have for saying _____?
10. What evidence do you have to support your inference?
11. Have you considered all the evidence?
12. What further information do you need?
13. What new ideas did you discover?

COMMUNICATING

Observation experiences enable students to become involved in their learning. Describing objects and changes in objects after making observations, identifying the sense(s) used, and using quantitative observations can lead to inferences. Many times the inferences are uncertain and tentative. These can become a basis for further investigation of the objects or changes in objects.

Students may use a variety of methods for communicating their findings. Different groups might report their findings in different ways appropriate to their understandings and learning styles.

Contents of Pack to Nature Activity Backpack

- folding loupe magnifiers (six per pack)
- folding shovel (u-dig-it) with case
- hula hoop, segmented (one per pack)
- large magnifier
- measuring tapes (12 per pack)
- mesh bag for hoop
- non-latex gloves (six pair per pack)
- protractors (two per pack)
- stethoscope
- tree cookies (six different species)
  - hardwoods (deciduous): red maple, white birch
  - softwoods (coniferous): white pine, red spruce, eastern hemlock, balsam fir

Using a Magnifier

For many of the investigations in this resource, young scientists are expected to use hand-held magnifiers. The proper manner in which to use these magnifiers is a skill that should be taught to them. The following are guidelines on how to use them.

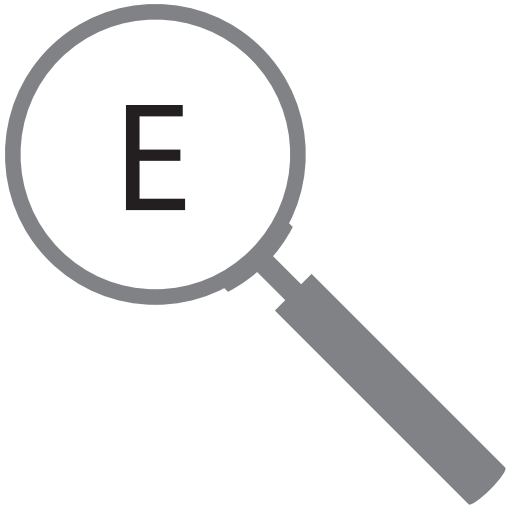
- The hand-held magnifier should be held parallel to the object being viewed. This will need to be demonstrated to young students as they may not know what parallel means.
- The distance the hand-held magnifier is held from the object should be at the correct focal length. (Focal length is the distance a lens is held away from an object providing the maximum field of view while the object remains in focus).
- The hand-held magnifier should be moved back and forth to bring the object in focus, not the student's head or body.

Invite young scientists to experiment with the use of the hand-held magnifiers prior to using these during investigations. One example would be to have them look at letters in a book and draw the difference in the size of the letters. Young scientists may draw what the viewed object looked like prior to looking at it under the magnifier and then after they have viewed it with the magnifier.

Without a hand-held magnifier

E

With a hand-held magnifier



Tripod Magnifier

When using a tripod magnifier, young scientists place the object to be viewed under the lens and move the object toward or away from the lens until the object is in focus.

Introduction to Trees—Information for Teachers

Introduce students to the concept that trees have life and experience the seasons, years, and events that happen around them. Some of these things can make a tree stronger and some of these things can make a tree weaker.

Suggested Experience 1

Have students look at pictures or diagrams of trees and discuss the jobs of the parts of the trees: buds, seeds, leaves, needles, branches, trunks, roots, and root hairs.

Ask students to use describing words for the properties of trees. Some of the properties may include colour, size, shape, texture, and scent.

Have students look at a tree cookie and identify the following and discuss

- heartwood: keeps the tree strong so it can stand up against storms
- sapwood: pumps the water from the roots up the tree trunk to the leaves
- cambium/phloem: made up of tubes that carry food from the leaves down to the roots
- bark: protects the tree from dangers such as insects, fire, and wildlife
  (See page 51 for a related diagram.)

Suggested Experience 2

To begin, have students form a circle holding hands. Ask students to move closer to each other until their shoulders are touching. Select two students to come into the middle to become the heartwood. They must stand strong for the tree. Ask students to say, “Stand tall and strong.”

Select four students to come and form a circle facing inwards, making the sapwood and holding hands around the heartwood students. Ask students to practise saying, “splash” to represent the water going up the tree.

Select six students to be the cambium, who form a circle facing outward around the sapwood. When the teacher says, “Leaves bring the food down,” the students raise their arms, cross their wrists, and shake their hands. Have them practise doing this.

Select eight to twelve students to be the bark forming a circle facing outwards. When the teacher says,” Have all the remaining students become the roots,” they should sit down with their backs against the bark. These students need to “slurp” to represent the roots drinking water.

GRADES PRIMARY–2

Introduction

Careful observation of the natural world reveals patterns of growth—how plants grow and respond to their natural environment. Everyone's awareness of plants begins with a variety of informal encounters within the environment; however, deeper understanding grows best from experience in planting, nurturing, and observing over time.

This section aims to develop young scientists' abilities to question, observe, infer, and predict patterns of growth in the natural world.

Focus and Context

In grades primary–2, young scientists will investigate and observe how trees grow and change throughout the year. They will also observe similarities and differences between and among types of trees, as well as observing how trees provide habitat for other organisms.

Investigation 1: Nature Scavenger Hunt

Outcomes:

Science Primary

Students will be expected to

100-1 develop vocabulary and use language to bring meaning to what is seen, felt, smelled, heard, tasted, and thought

202-1 use personal observations when asked to describe characteristics of materials and objects studied

101-1 explore how characteristics of materials may change as a result of manipulating them

Science 1

201-5, 100-8, 203-2 identify, conduct, measure, and record observations about animals and plants using appropriate terminology

200-1, 100-4, 100-5, 100-7 question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs

Assessment:

- Sort pictures of living and non-living things.

Questions:

- What types of living things do you find in a forest?
- What types of non-living things do you find in a forest?
- What types of animals do you find in a forest?
- What types of plants do you find in a forest?

Skills:

- observing
- questioning

Materials:

- folding shovel (optional)
- index cards
- magnifying glass
- Nature Scavenger Hunt Item List
- non-latex gloves (optional)
- pictures of items commonly found in forests
- tongue depressors (optional)

Procedure:

- Teachers should prepare a set of either index cards, pictures, and/or tongue depressors with a list of items commonly found in forests. The Nature Scavenger Hunt Item List presents a list of items that work well for this investigation.
- Teachers should then take young scientists to a forested area and distribute one card to each student. The student is then responsible for finding the item on their index card. Non-latex gloves and/or a folding shovel can be used to pick up the items. Once all of the items have been collected, they can be inspected more closely by using a magnifying glass. Teachers should ask questions such as, Would you be able to find this item in different seasons? Why or why not? Do all trees look the same? Do trees look the same all year long?
  This investigation serves as an introduction to the types of items that may be found in forests in later investigations. It also asks questions that will begin to direct investigations into how trees and forests change over time.

Science Vocabulary:

bark, leaves, needles, rough, smooth

Nature Scavenger Hunt Item List:

1. rough bark
2. smooth bark
3. white bark
4. brown bark
5. flat leaves
6. needle from a tree
7. acorn
8. pine cone
9. maple leaf
10. moss
11. fungi
12. insect
13. spider
14. decomposing leaves
15. something living in the soil
16. something that smells good
17. something that is noisy
18. three different shapes of leaves
19. three different patterns of bark
20. a tree with different colours on the same bark
21. type of plant that feels dry
22. type of plant that feels wet
23. a tree that is prickly
24. a tree that is tall
25. a tree that is short

Investigation 2: What Is Under Trees?

Outcomes:

Students will be expected to

Science Primary

100-1 develop vocabulary and use language to bring meaning to what is seen, felt, smelled, heard, tasted, and thought

202-1 use personal observations when asked to describe characteristics of materials and objects studied

101-1 explore how characteristics of materials may change as a result of manipulating them

Science 1

201-5, 100-8, 203-2 identify, conduct, measure, and record observations about animals and plants using appropriate terminology

200-1, 100-4, 100-5, 100-7 question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs

Assessment:

- Classify objects as living and non-living.

Questions:

- Do you think that trees look the same all year? Explain.
- Why do you think trees lose their leaves?
- When would a tree have the most leaves?
- When would a tree have no leaves?
- What season is this? How would this tree look in six months from now?

Skills:

- inferring
- observing
- questioning

Background Information:

Take a walk outside before the class begins to find an area where a few different tree species grow. Try to identify any trees that are the same. Look at trees that have different features, such as needles, rough leaves, and smooth bark, to see if they have anything in common. The tree cookies species included in the Pack to Nature activity backpack are red maple, white birch, white pine, red spruce, eastern hemlock, and balsam fir. More information about these trees can be found in Appendix A: Tree Descriptions. Collect natural and other objects from the ground underneath the trees. These will be used later in the mystery boxes.

Materials:

- *Atlantic Canada Science Curriculum: Grade 1* (Nova Scotia Department of Education 2005)
- camera (optional)
- clipboard (optional)
- hula hoop (segmented)
- paper and pencils
- Recording Chart: Nature Observation
- Recording Chart: Tree Cookies
- Recording Chart: What Is Under Trees?
- non-latex gloves
- science logbook
- small container
- tree cookies (red maple, white birch, white pine, red spruce, eastern hemlock, and balsam fir)

Procedure:
Outside

- Teachers should ask young scientists questions about what they see outside in the natural environment. Some introductory questions may be, Are all of the trees the same? Does every tree have the same thing under it? Are all trees the same size? Do you think trees have different colours? What do you think we can find around the tree or within the tree? Give evidence to support your answers.

  These questions provide a segue to operational questions that may invoke curiosity about the trees and their surroundings.

- Teachers should create an observation chart similar to the following or use the sample recording chart provided in this investigation.

Nature Observations	
Properties	Describing Words

At this level, teachers should record some of these questions to use later in class. A clipboard for outside use is helpful.

Young scientists should observe objects at the bottom of a tree. Using the segmented hula hoop, they can encircle a tree and try to identify what they see under the tree inside the hoop.

If there are nature mentors (students from grades 4 to 6 or volunteers), this may allow for smaller groups. Mentors should listen to the discussions and record observations. Observations are key at this level. From the observations, describing words should be suggested and recorded.

Questions such as the following could be asked by the teacher or the mentor.

- What do you see?
- What do you smell?
- Should we taste anything outside?
- What do you hear?
- Does it sound like anything you know?
- How does bark feel?
- How does moss feel?

Observations arising from these questions should also be recorded. Someone could be assigned to take pictures of what is under the tree or everyone might draw it in their science logbook. Young scientists may wish to touch the objects and some may wish to use rubber gloves.

Procedure:

In Class

- Discussion in class should focus and expand on the questions and the observation chart. From the discussion, further observations can be made and recorded on a class chart. Teachers should look at the guide, *Atlantic Canada Science Curriculum: Grade 1* (Nova Scotia Department of Education 2005). Using senses will help young scientists.

  Using a small container, collect the materials that are under the tree and place them in the container. Now smell the contents and identify the smell of the mixture.

  ⚠ Remember that tasting should not happen.

  Ask students to use words that describe the objects under the tree. Elaborate the discussion with some questions for them to think about such as, Do all trees look the same? Do trees change? Does every tree have the same thing under it?

Tree Cookies

- Have young scientists examine the tree cookies and then discuss the following questions: Do you think they are all from the same tree? What do you see on your cookie? What types of markings did you see? The class observations should be recorded. A sample chart is included in this investigation.

  As a class, discuss the tree cookies. Make observations about the tree cookies using the senses.

Science Vocabulary:

bark, branches, grass, insect life, leaves, lichens, listen, look, moss, needles, seeds from the tree, smell, soil, twigs

Recording Chart: What Is Under Trees?

Describing Words
Observations
Questions
Inferences

Recording Chart: Nature List Observations

Properties	Describing Words

Recording Chart: Tree Cookies

Properties

Observations

Investigation 3: Getting to Know Trees

Outcomes:

Students will be expected to

Science Primary

100-1 develop vocabulary and use language to bring meaning to what is seen, felt, smelled, heard, tasted, and thought

100-2 explore and select different ways to represent ideas, actions, and experiences and to communicate with others

100-3 detect consistency and pattern in objects and events and use language to describe these patterns

200-1 ask questions that lead to exploration and investigation

201-4 observe, using one or a combination of the senses

Science 1

100-9 identify each of the senses and demonstrate how each of the senses helps us to recognize, describe, and safely use a variety of materials

201-5, 100-8, 203-2 identify, conduct, measure, and record observations about animals and plants using appropriate terminology

200-1, 100-4, 100-5, 100-7 question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs

Assessment:

- Discuss how a tree feels to your touch.
- Discuss the smell(s) of the tree(s) that you observed.
- Discuss what you hear around the tree. Do you hear anything when you listen to the tree trunk? Explain.

Questions:

- What do I know about trees?
- What do trees need in order to live?
- What do trees feel like when you touch them?
- What do trees smell like?
- What do you hear inside and around the trees?

Skills:

- communicating
- inferring
- observing

Background Information:

It is suggested that the class visit an area where there is a variety of trees for young scientists to feel and smell different types of bark.

Materials:

- non-latex gloves (optional)
- paper and pencils
- Recording Chart: My Trees
- science logbook
- stethoscope
- tree cookies

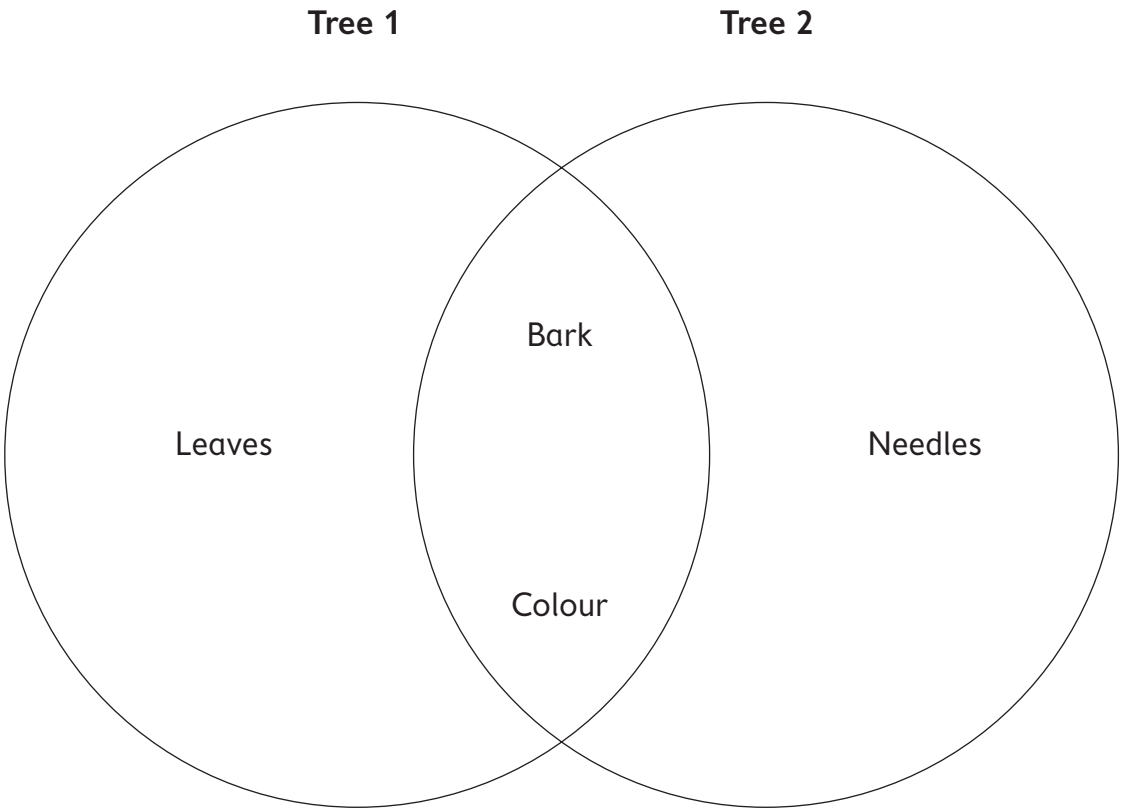
Procedure:

- Have students close their eyes and feel the trunks of at least two different trees. These may be the same type of tree or two different types. Have young scientists do bark rubbings of the two different trees. A bark rubbing is done by placing a piece of paper over the bark and rubbing a soft-lead pencil or the side of a crayon over the bark to reproduce its pattern. Record student comments and discuss them.
- Have students smell the trees. Record their comments. Have a discussion and modify their comments if necessary. This will demonstrate how observations and comments tend to be revised by scientists. Ask the students who are working as young scientists, Do all trees look alike? Do they all smell alike? Do some not have a smell? What do you think makes the smell? Do smells change with the season? Do you think a tree would smell differently in a different season? Students can also record their findings in their science logbook.
- Invite students to listen to the sounds they can hear around the tree. Have them use the stethoscope to listen for anything happening inside the tree.
- Teachers may show pictures of various maple trees as well as the tree cookies. Ask students about the red maple's tree rings. Is there any difference among the rings? There are several species of maple trees native to Nova Scotia such as sugar, red, striped, moose, and mountain. Talk about trees asking questions such as, Are they alive? How do you know? Teachers should explain that evidence is needed to support inferences. Evidence is the observations made by scientists. Discuss what these trees may need in order to live.

  Elaboration: What do you need to live? What do you think a tree needs to live? Do you and the tree need the same things to live?
- Design a chart to compare trees and/or use Recording Chart: My Trees to record observations.

Science Vocabulary: bark, evidence, inferring, maple trees, observation, rubbing

Recording Chart: Nature List Observations



What the trees have in common.

Investigation 4: Our Changing Trees

Outcomes:

Students will be expected to

Science Primary

101-1 explore how characteristics of materials may change as a result of manipulating them

201-4 observe, using one or a combination of the senses

202-1 use personal observations when asked to describe characteristics of materials and objects studied

203-1 communicate questions, ideas, and intentions while conducting their explorations

Science 1

200-1, 100-4, 100-5, 100-7 question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs

103-2 recognize that humans and other living things depend on their environment and identify personal actions that can contribute to a healthy environment

202-9, 102-5, 202-7, 203-1 predict and communicate questions and answers to investigations about seasonal changes and describe these changes

Assessment:

- Discuss observations using pictures and words.

Questions:

- What kinds of trees did we see?
- What types of objects were under the trees?
- Were any objects alive? Which ones?
- Do you think the tree changes during the year? Discuss
- Do all trees change the same way? Explain.
- How does a softwood tree change?
- How does a hardwood tree change?

Skills:

- analyzing data
- collecting data
- communicating
- inferring
- observing
- predicting

Background Information:

Taking pictures of the trees and the objects around and under them will allow students more opportunities to see and discuss how trees change.

Materials:

- camera
- magnifying glass
- printed tree pictures taken with the camera (optional)
- Recording Chart: Our Changing Trees
- science logbook
- specimens (leaves, needles, seeds, acorns, catkins, lichens, fungus, cones)

Procedure:

- Teachers may discuss how to take simple photos. Teachers and/or students can take pictures of various trees and the objects under them. Invite students to look at the pictures with a magnifying glass to see if they recognize something that they did not remember seeing before. Have students record their observations.
- Identify a tree for students to investigate throughout the year. Throughout the year, take pictures as the tree changes. Collect and identify specimens of the tree if there is a storage plan for the specimens. Teachers may have students make a life-size tree for the classroom on which they can add specimens or representations. As a class, talk about how the tree changes with the seasons, the weather, and the reasons that trees might change. Use a recording chart to keep track of the tree's changes over time. A sample chart is included in this investigation. Once a month, check on the tree and record the results. Students may record their findings in their science logbooks.

Science Vocabulary: analyzing, collecting, graphing, hardwood, logbook, observing, predicting, softwood, specimen, young scientist

Recording Chart: Our Changing Trees

Date: **Season:**	
Observations	Picture(s)
Specimens and/or photos from my tree (leaves, needles, seeds, acorns, cones, catkins, lichens, fungus)	

Investigation 5: Does My Tree Change During the Year?

Outcomes:

Students will be expected to

Science Primary

101-1 explore how characteristics of materials may change as a result of manipulating them

200-1 ask questions that lead to exploration and investigation

202-1 use personal observations when asked to describe characteristics of materials and objects studied

203-1 communicate questions, ideas, and intentions while conducting their explorations

Science 1

200-1, 102-4, 201-5 investigate and describe, using a variety of formats, how the daily changes affect the characteristics, behaviours, and locations of living things

202-9, 102-5, 202-7, 203-1 predict and communicate questions and answers to investigations about seasonal changes and describe these changes

101-6 describe ways of qualitatively measuring and recording environmental changes that occur in daily and seasonal cycles

200-1, 100-4, 100-5, 100-7 question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs

Assessment:

- Record data as scientists would record their data (private science).
- Post data (public science).
- Present data.

Questions:

- What does my tree look like?
- How has my tree changed throughout the year?
- What do the leaves or needles look like?
- Are there any animals that make their home in and around my tree?
- What does a tree look like when I am laying on the ground?
- What is the crown of a tree? Where is it?

Skills:

- analyzing data
- collecting data
- graphing
- inferring
- observing
- predicting
- questioning

Background Information:

Teachers should explain how to record the data. Teachers may provide a chart or develop one with students. A science logbook is ideal for private science. For class presentations, teachers may need to model what a presentation could look like for students. At the end of the year, students will have a record of their tree and everything that happened with it. This is a study that scientists do on a regular basis. Teachers should remind the students they are acting as young scientists throughout all their science investigations.

Materials:

- camera
- clipboard (optional)
- non-latex gloves (optional)
- magnifying glasses
- measuring tools
- paper and pencil
- Recording Chart: My Tree Data
- science logbook

Procedure:

- The first observation day will be the baseline for this investigation about a tree. A variety of materials and equipment, such as magnifying glasses and measuring tools, should be available for everyone's use. Different groups of young scientists may choose different trees. They will be investigating a tree, or trees, over a length of time that is determined by the class. They may do this in groups or individually. Teachers may plant a native tree species to be used for this investigation and continuing use. Students can use a camera or draw a picture of the tree in order to document what happens during the year.

  Encourage students to lie on their back under the tree. Have them look under the branches of the tree and describe what they see. What is happening around the tree and/or under it should be included. Teachers may introduce ground cover at this time. This investigation allows young scientists to do a study over time. Every two weeks or so, students should visit their tree to record their observations in a chart. A sample chart has been included in this investigation. Students could make predictions of what will happen to their tree when the seasons change and record their findings in a chart in their science logbook.

- Have students hug their tree. Take a picture of them hugging their tree. How many children holding hands are needed to hug all the way around the tree?

- Teachers may make a class chart to compare the different trees. Observations should be qualitative and quantitative.

Science Vocabulary:

baseline, branches, circumference, crown, foliage, ground cover, predicting, qualitative, quantitative

Recording Chart: My Tree Data

Day 1: Baseline Observations
(approximate height, fullness of the tree, animal homes in the tree):

Observations (every two weeks)

Date	Leaf Colour/ Needles	Amount of Leaves/ Needles	Observations

Questions:

- What did the ground cover look like?
- How many students did it take to hug the tree?
- Change partners. Now how many students does it take?

Investigation 6: Trees and Me

Outcomes:

Students will be expected to

202-1 use personal observations when asked to describe characteristics of materials and objects studied

203-1 communicate questions, ideas, and intentions while conducting their explorations

100-1 develop vocabulary and use language to bring meaning to what is seen, felt, smelled, heard, tasted, and thought

Science 1

100-11, 101-3, 101-4 demonstrate and describe change in materials using the five senses

201-5, 100-8, 203-2 identify, conduct, measure, and record observations about animals and plants using appropriate terminology

103-4 investigate and describe human preparations for seasonal changes

Assessment:

- Draw a picture and write a comment about how you think trees help the world.

Questions:

- What do you like best about trees?
- What do you think is beautiful about trees?
- What are some reasons that people like to have trees in the parks, on the streets, and on the school grounds?
- How do trees matter to you?
- How do trees grow?

Skills:

- observing
- communicating
- questioning

Materials:

- camera (optional)
- mats to sit on
- paper and pencils
- science logbook
- stethoscope (optional)

Procedure:

- Take students outside to an area with trees. Perhaps the school has small mats or blankets that can be used so that everyone can sit on these under the trees. Take a few quiet moments to look at the trees and smell the air. Students should close their eyes and listen. Have them pay attention to the sounds that trees make, such as leaves rustling in the wind. Have them pay attention to the sounds animals make, such as insects buzzing or squirrels scurrying. When trees are coming to life in the spring, teachers and students may use a stethoscope to listen to the tree to hear the sap running. Teachers may record a list of the sounds on a class chart.

Ask students what they think trees are providing for them. Are they providing clean air? Are they providing shade? Discuss these questions so students can think about trees and their value. Ask students what the world is like with trees and what would the world be like without trees.

- Invite students to draw or take pictures of trees and post them for viewing. Ensure the whole tree can be seen from top to bottom in the pictures.

  Have students record their observations for the day in their science logbook. This science logbook can be used throughout the year to make drawings and record information about their trees. This allows students to track how the trees change throughout the seasons as well as how they grow.

Science Vocabulary: adult, baby, bottom, crown, sapling, seed, senses, shade, top, young scientist

Investigation 7: Mystery Boxes

Outcomes:

Science Primary

Students will be expected to

100-1 develop vocabulary and use language to bring meaning to what is seen, felt, smelled, heard, tasted, and thought

100-3 detect consistency and pattern in objects and events and use language to describe these patterns

101-1 explore how characteristics of materials may change as a result of manipulating them

200-4 select and use materials to carry out their own explorations

201-1 follow a simple procedure where instructions are given one step at a time

201-4 observe, using one or a combination of the senses

202-1 use personal observations when asked to describe characteristics of materials and objects studied

Science 1

202-4, 100-13 compare and describe various materials and report the results using a variety of formats

200-3, 200-4, 201-5, 203-3 predict and connect investigations on various materials, recording the results

203-4 listen and respond to another student's description of an animal or plant

Assessment:

- Infer what you think is in the mystery box and record your answers. Record observations to support your answer.

Questions:

- What objects could be found under a tree?
- What do these objects sound like when you shake the box and cannot see them?
- What do these objects feel like?
- How does a star-nosed mole explore its home?
- What do you think is in the mystery box?

Skills:

- inferring
- listening
- observing

Background Information:

Prepare approximately five mystery boxes by numbering them and placing an object from under the tree in each box. Teachers may already have a collection of materials from a previous investigation. This investigation allows students to suggest possibilities (make inferences) and write observations to support their answers. Many times in science we explain things without actually seeing what they are. Students will act as star-nosed moles to examine the boxes.

Materials:

- Class Recording Chart: Mystery Boxes
- mystery boxes (5) numbered, each containing an object from under a tree (use objects from the backpack such as the tree cookies, measuring tapes, folding loupe magnifiers, and the mesh bag)
- science logbook

Procedure:

- Look up information about the star-nosed mole and how it tastes with its nose. Talk about the star-nosed mole. Students are encouraged to place their hands on their nose so their hands act like the tentacles the mole uses to explore its world. Students can explore the mystery boxes as a mole might. They can discuss which senses are used for this investigation.

Photo: Charles C. Hill, © 2014

- Have students shake a box so they can listen to what is inside it. Ask them to describe what they think is inside the box. Have students record their inferences and supporting observations in their science logbook. Teachers may make a class data table for all the mystery boxes. A sample table has been provided in Class Recording Chart: Mystery Boxes. After students have decided what they think is in one box, have them try another box. After all inferences have been made, have students open the boxes to check the inferences and discuss their findings.

Science Vocabulary:

circumference, observation, tactile, textures

Class Recording Chart: Mystery Boxes

Box Number	What I Think Is in the Box and Why
1	
2	
3	
4	
5	

Investigation 8: Trees and Size

Outcomes:

Students will be expected to

Science 1

100-9 identify each of the senses and demonstrate how each of the senses helps us to recognize, describe, and safely use a variety of materials

100-11, 101-3, 101-4 demonstrate and describe change in materials using the five senses

201-5, 100-8, 203-2 identify, conduct, measure, and record observations about animals and plants using appropriate terminology

203-4 listen and respond to another student's description of an animal or plant

202-2 place materials and objects in a sequence or group according to various sorts

202-9, 102-5, 202-7, 203-1 predict and communicate questions and answers to investigations about seasonal changes and describe these changes

Science 2

201-7 identify and use a variety of sources to get ideas for creating new materials

102-9, 201-3 identify and measure evidence of moisture in the environment, in materials, and in living things

200-3, 200-4, 200-1, 203-3 predict, investigate, and communicate the properties of materials according to their ability to absorb water

202-7 propose suggestions for meeting the needs of the organism being investigated and draw conclusions about its growth patterns or stages based on observations

202-9 identify new questions about the needs and growth patterns of other organisms

Assessment:

- Complete the Recording Chart: Trees and Size.

Questions:

- Which of your trees is the largest?
- Which of your trees is the smallest?
- Which of your trees has the largest leaves? the smallest?
- Are all the leaves on a tree the same? Discuss this.
- Do different trees have the same leaves? different leaves?

Skills:

- analyzing
- classifying
- collecting data
- measuring

Background Information:

Choose two or three trees for students to examine. Have students make comparisons of the trees by size. Comparing two different trees works best at this level. Teachers may model part of the comparison.

Materials:

- camera (optional)
- measuring tape
- non-standard measuring tools (e.g., string, paper clips, ribbon)
- paper and pencil
- Recording Chart: Trees and Size

Procedure:

- Have students hug a tree. Ask, How many students standing shoulder to shoulder does it take to form a circle around the trunk of the tree? When hugging a smaller tree, can you touch your elbows? Can you touch your wrists? What body measurements can be used to measure how big around the tree is? Use string or a non-standard measuring tool to record the length of the tree trunk. Have students suggest questions that they can explore. Teachers may need to make these operational questions, questions that are doable, and allow collection of information both qualitatively (using the senses) and quantitatively (using how much and how many).
- This investigation can be done in groups. Cameras may be helpful. Have students measure the circumference (the distance around) of the tree trunk and record it. Do this for at least three different trees, recording the results. Teachers should direct students to look at the height and circumference of trees. Students should decide which is higher, which has a greater circumference, and any other observations they wish to make. The observations for height would not be measurements, but rather qualitative such as “greater than” comparisons. Record these observations. Teachers may make a class chart about different trees. A sample chart is included in this investigation.
- Have students measure three different leaves from the same tree. Record the measurements and observations. Do not use needles at this time.

Science Vocabulary: circumference, classify, measurement, qualitative, quantitative, trunk

Recording Chart: Trees and Size

Tree	Circumference	Observations
1		
2		
3		
Leaves	**Length**	**Observations**
1		
2		
3		

GRADES 2–4

Introduction

Careful observation of the natural world reveals patterns of growth—how plants grow and respond to their natural environment. Students' awareness of plants begins with a variety of informal encounters in their environment; however, deeper understanding grows best from experience in planting, nurturing, and observing over time.

This section aims to build on the skills of the previous section, as well as develop students' ability to collect and classify data and present it in the form of charts and bar graphs.

Focus and Context

In grades 2–4, students will explore how wildlife uses trees and what is needed for trees to live. Observations and measurements of tree cookies to interpret growth patterns by collecting and analyzing data will provide valuable information about the tree. Investigations about the life around a tree may be made by taking a walk outside. Reporting what is seen will be presented in various formats. When students investigate the tree's habitat, organisms involved in the tree's life cycle could be listed and explored. Data should be collected.

Investigation 9: What Types of Products Are from Trees?

Outcomes:
Science 2

Students will be expected to

100-17, 100-18, 201-5 examine and record the properties and interactions of familiar liquids and solids

102-9, 201-3 identify and measure evidence of moisture in the environment, in materials, and in living things

100-27, 200-4, 201-5 describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes

103-7 describe the effects of weather and ways to protect things under different weather conditions

Assessment:

- Sort given objects by "made from a tree" and "not made from a tree." Give reasons to support the sorting/classification key.

Questions:

- What do trees do for us?
- What natural objects come from trees?
- Are trees useful? Explain.
- What objects are made from trees? Give examples.
- What do you think would happen if we did not have trees?

Skills:

- classifying
- graphing
- inferring
- observing
- questioning

Background Information:

Teachers should discuss the nature of objects so that students can explore what is naturally produced by trees and what is made from trees. Various objects should be available for touching. Students may need this exploration to begin to form concepts of how things are made.

Materials:

- bins containing collected materials
- camera (optional)
- chart paper and marker
- ground sheet marked into halves with masking tape, or learning carpet
- mat or blanket
- non-latex gloves (optional)
- objects found in nature
- objects made from trees (pictures or real; tree cookies may be used)
- paper and pencil
- Recording Chart: What Types of Products Are from Trees?
- tree cookies (optional)

Procedure:

- Take students outside to sit in an area with trees. If needed, they may sit on a mat or blanket. Discuss the characteristics trees have, such as leaves, bark, and roots, and the objects that might be found under or on the trees. Have students draw or take a picture of a tree that they are using. Collect objects from the tree and around it. Sometimes objects are found in nature that are not expected. Ask students how these objects might have gotten there.
- The next day, ask questions such as, Do you think we can make things from trees? What could we make? List the answers. Ask probing questions to help students think about the uses of trees. Using the bins of materials, Ask students to sort the objects into "from trees" and "not from trees." For the materials, collect objects that are found in nature—some that are made from or come from trees and some objects that may be made by people and not from trees. This is a dichotomous method of sorting. Use a rubber ground sheet divided into halves with masking tape if you are outside, or a learning carpet if you are in the classroom. Record comments. A sample chart is included in this investigation.

  Possible bin materials: leaves, acorns, rocks, paper towel rolls, bottle caps, wooden toys, small cars, plastic containers, wooden toothpicks, newspaper, books, apples. Discussion may take place about how these objects could possibly get under a tree. Discuss the objects that are made from trees.

  After sorting, the class may discuss things that are made from trees. Invite them to think about what might happen if we did not have trees. Do all trees look the same? Do all trees look the same all year?

Science Vocabulary: acorns, bark, classifying, dichotomous, leaves, roots

Recording Chart: What Types of Products Are from Trees?

From Trees	Not from Trees
Observations	Observations
From Trees	**Not from Trees**
Observations	Observations

Investigation 10: How Does Wildlife Use Trees?

Outcomes:

Students will be expected to

Science 2

101-7, 201-5, 203-3, 102-6 describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle

202-7 propose suggestions for meeting the needs of the organism being investigated and draw conclusions about its growth patterns or stages based on observations

Science 3

100-28 identify and describe parts of plants and their general function

100-29 identify, investigate, and suggest explanations for life needs of plants and describe how plants are affected by conditions in which they grow

102-12, 102-13, 203-5 describe and respond to ways in which plants are important to living things and the environment and how the supply of useful plants is replenished

Assessment:

- Identify wildlife that uses trees.
- Classify different species of wildlife.

Questions:

- What important life-giving things do trees supply to wildlife?
- What types of wildlife use trees? What do they use them for?
- What are signs of wildlife using a tree?

Skills:

- classifying
- communicating
- measuring
- observing

Background Information:

The *Canadian Oxford Dictionary* (2006), used in Nova Scotia classrooms, defines wildlife as wild animals. Other dictionaries expand this definition to include everything that is alive and not domesticated, such as trees, plants, insects, mammals, birds, amphibians, reptiles, fungi, lichens, bacteria, worms, and microbes. For our purposes, we will use the *Canadian Oxford Dictionary* definition.

Trees supply many things to the wildlife around them. Food, shelter, space, and water can all be supplied by a tree. The food can be in leaves, bark, seeds, and the decaying tree. Shelter is given from free-standing trees against winter winds and the scorching sun. Nurseries in the form of nests are built in live and dead trees by squirrels, birds, racoons, bats, and insects. Some insects spend one or more life cycles on, in, or under trees. Trees make shadows that keep the ground underneath it moist and through transpiration in the leaves, contributing to the water cycle. Trees supply a place for predators and prey to hide from each other.

Materials:

- boundary markers
- camera (optional)
- class or student list of wildlife
- clipboard (optional)
- magnifying glass
- measuring tools
- paper and pencil
- Recording Chart: Nature Collector's List

Procedure:

- As a class, discuss how wildlife uses trees. Questions that may be used include, What animals live around trees? How would you recognize animal signs (signatures)? What do the following suggest: seed piles, holes in the trees from insects and woodpeckers, scat (droppings), and cocoons.

  Depending on the season, use the magnifying glass to look at what smaller animals may be around the trees. Have students take a picture of the animals or draw one. Have students measure, if possible, the size of the animal. Record the measurement. Do you think that trees need animals? Use a chart to record the observations. A sample chart has been included in this investigation.

- Ask each student to name a specific kind of wildlife that uses trees and create a list. Students may pretend to become that wildlife. Designate a natural area where there are trees, bushes, and grass. Mark the boundary lines for this area.

  A class or student list of the wildlife should be used for this investigation. Some examples include black bear, fox, osprey, coyote, bald eagle, owl, salamander, turtle, snake, woodpecker, mallard duck, gull, bees, dragonfly, ant, mosquito, June bugs, and butterfly. As an extension, teachers may wish students to sort (classify) the wildlife in different ways.

- One young scientist should be assigned as the field scientist who has a list and the others are the wildlife. The field scientist covers their eyes and counts to 25 loudly and slowly. At the start of counting, the wildlife tries to find somewhere within the playing field to camouflage (hide). Once they are hidden, the field scientist warns the wildlife that the search is beginning. First, the field scientist sees if there is any wildlife to be seen without moving. The field scientist approaches the wildlife, stating that this is being added to the wildlife list. When the field scientist touches the wildlife, it tells them what specific kind of wildlife it is. The field scientist writes this down on the list. The field scientist proceeds to add wildlife to the list until there are 10 items (wildlife). The remaining wildlife are left in nature. At the end of the first round, ask the wildlife to stay where they are and select a new field scientist from the group of wildlife that was caught by the first collector. The second collector starts a new list of wildlife. When he or she counts to 25, it is a chance for all the others to hide again.

  Play several rounds so the class has at least five lists. Using the lists, set up a classification scheme with the class, using a simple dichotomous key.

Science Vocabulary: animal signatures, camouflage, domesticated, habitat, predator, prey, wildlife

Recording Chart: Nature Collector's List

Wildlife name:	Comments:
How well does it hide (camouflage)? What helps?	
Wildlife name:	Comments:
How well does it hide (camouflage)? What helps?	
Wildlife name:	Comments:
How well does it hide (camouflage)? What helps?	

Investigation 11: Food, Water, Shelter, Space

Outcomes:

Students will be expected to

Science 2

200-3, 200-1, 200-2 question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object

201-7 identify and use a variety of sources to get ideas for creating new materials

203-1, 102-10, 201-3 demonstrate that air is a substance and communicate their findings by conducting multiple activities

200-3, 200-4, 200-1, 203-3 predict, investigate, and communicate the properties of materials according to their ability to absorb water

103-7 describe the effects of weather and ways to protect things under different weather conditions

202-9 identify new questions about the needs and growth patterns of other organisms

Science 3

200-1, 201-5, 202-4 question and record relevant observations and measurements while investigating various growing conditions for plants

100-28 identify and describe parts of plants and their general function

100-29 identify, investigate, and suggest explanations for life needs of plants and describe how plants are affected by conditions in which they grow

201-3, 203-3, 202-4 observe, describe, and measure, using written language, pictures, and charts, changes that occur through the life cycle of a flowering plant

Science 4

204-6, 302-1 examine and investigate, using various methods and questions, local habitats and their associated populations of plants and animals

Assessment:

- Identify the environmental changes and factors that affect plant growth and changes to trees.

Questions:

- How do you think trees get "energy"?
- Do you think trees need air?
- Do you think trees need water?
- Can trees live where there is no air? Give reasons to support your answer.
- Can trees live where there is no water? Give reasons to support your answer.
- What animals live around trees? Do you see any evidence of animals? What do you see?
- Do you think animals need trees?
- Do you think trees need animals?
- Do you think trees need soil?

Skills:

- collecting data
- identifying
- inferring
- measuring
- observing
- predicting

Background Information:

Teachers may talk about air and water as it relates to life. When talking about the growth of a tree, look at the trees as they are. The cycle of a tree may happen later in discussions. Asking about animals and trees may help students question the needs of both.

Materials:

- camera (optional)
- magnifying glass
- measuring tape
- paper and pencil

Procedure:

- Go outside to look at a tree or trees. Draw a picture of the tree or take a picture. Measure and record the size of the tree trunk.

  Ask the class what is needed in order for living things to grow. Food, water, and shelter may be suggestions. Ask questions about trees such as, Does a tree grow? Does it need air? Does it need water? Where does air and water come from for a tree? Does a tree move? How does it move? Do trees grow too close together? Do they grow too far apart? Make a list of what a tree needs to exist. Take pictures for evidence. Discuss again what is needed for a tree to live and compare it to what people may need to live. Have students record the answers to these questions.

Science Vocabulary:

air, cycle, energy, habitat, water

GRADES 3–6

Introduction

Careful observation of the natural world reveals patterns of growth—how plants grow and respond to their natural environment. Everyone's awareness of plants begins with a variety of informal encounters within their environment; however, deeper understanding grows best from experience in planting, nurturing, and observing over time.

This section aims to continue building on the abilities that may have been developed in grades primary–2 while introducing several new concepts. The ability to classify and analyze data is prominent, as is the ability to find sources of error, communicate results, and use general problem-solving and decision-making skills.

Focus and Context

In grades 3–6, students will examine tree cookies, tree habitats, and life around the trees. They will also examine timber and non-timber products and the potential opportunities for businesses to use these resources in the forestry sector. Students will also participate in scientific studies, collecting and analyzing data, and drawing conclusions about forests. Students will determine what gives leaves colour, how to measure forest health, and factors that impact plant growth.

Investigation 12: Tree Cookies—A Tree's Life Story

Outcomes:
Science 3

Students will be expected to

200-1, 201-5, 202-4 question and record relevant observations and measurements while investigating various growing conditions for plants

100-28 identify and describe parts of plants and their general function

100-29 identify, investigate, and suggest explanations for life needs of plants and describe how plants are affected by conditions in which they grow

201-3, 203-3, 202-4 observe, describe, and measure, using written language, pictures, and charts, changes that occur through the life cycle of a flowering plant

100-30 observe and describe changes that occur through the life cycle of a flowering plant

100-35 investigate and describe how living things affect and are affected by soils

Assessment:

- Explain the story that a tree ring tells.
- Prepare a report on a tree cookie.

Questions:

- What do the rings on a tree cookie mean?
- What do the spaces between the rings suggest about the tree?
- How old are trees? How do you know?

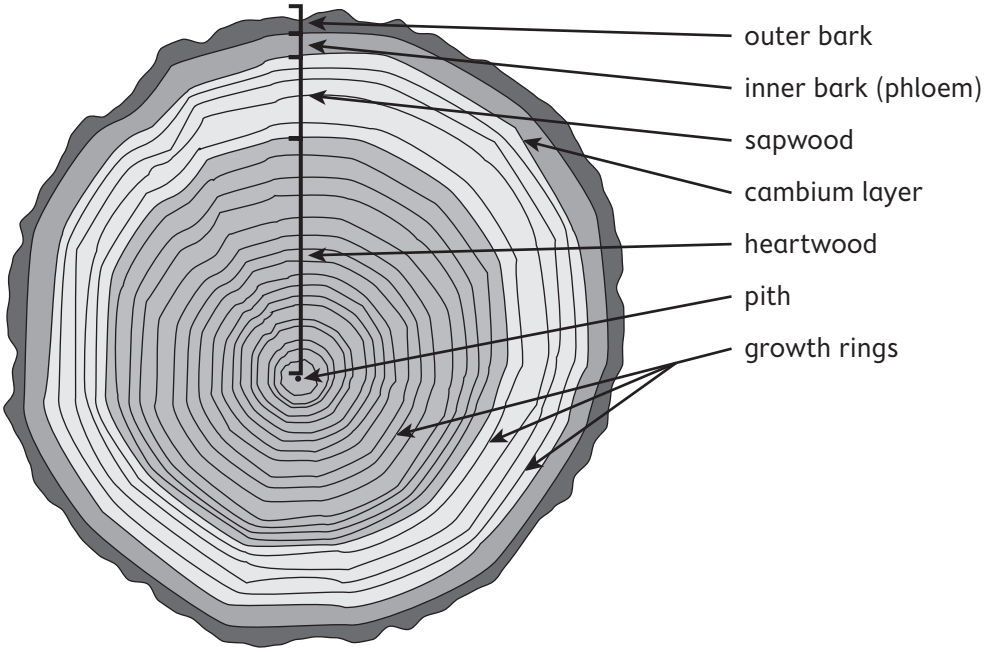
Skills:

- analyzing data
- collecting data
- counting
- measuring

Background Information:

Teachers may wish to create a larger image of a tree cookie that can be used as a model to show how to count the tree rings. Teachers may model for students how to count the rings. A ring rubbing of the tree cookies can be made. Use white paper and the edge of a soft pencil to make the rubbing. Discuss the numbers and the age of the tree.

Cross Section of a Tree



Materials:

- chart
- magnifying glass
- measuring tape
- paper and pencil
- paper for rubbings
- pencil (soft lead)
- science logbook
- tree cookies

Procedure:

- **Distance between rings:** Have students measure the distance between two rings on a tree cookie. Repeat this two more times. Record the results in a table so that there are at least three readings. (A scientist always repeats collecting data to compare accuracy and precision.) Ask students what they think this tells us about how the tree may have been growing.
- **Counting rings to determine age:** In the Pack to Nature activity backpack there are six bags, each containing a different tree cookie and other materials. Teachers should divide their class so each group has a tree cookie. Have students count the rings on the tree cookie and record the results. Use a class chart to show all tree cookie ring counts. Each student can also make a rubbing of the tree cookie and count and record the number of rings. The group will decide on the correct number to be added to a class chart.

  Discuss how old the tree was that the tree cookie was part of before the tree was cut. Ask students whether or not the tree is older than they are and if they can tell you the age of the tree.

- **Data table:** Students should count the rings of two different tree cookies. Have students create a table to record their data in their science logbook. Ask them to measure the diameter of the tree cookies. Repeat this two more times and record all three measurements in a data table. Find the average and record it. Discuss the results as a class or compare results from the different groups.
- **Guest speaker:** Invite a guest speaker to the class. A forester might show how to use an increment borer to examine the rings in a tree without cutting it down. An archeologist might tell how the rings have been used to tell about life in an area.
- **Bar graph:** Students should draw a bar graph of the information from the tree cookie. On the horizontal axis (the *x*-axis), put the ring number or age of the tree. This may be difficult to get, but a sampling of five rings works as well. On the vertical axis (the *y*-axis), plot the distance each ring is from the centre of the tree cookie. A discussion should include questions and explanations such as, Are all of the distances the same? Give reasons and make inferences to explain what the graph might be telling.
- **Write a story:** Ask students to write a story about a tree cookie, including some environmental events that may have happened, such as a windstorm or a drought. Have them draw pictures to illustrate what may have happened.
- **Tell us about the tree:** Ask students to look for any different colours or markings on a tree cookie. This may look like dark blotches and/or irregular patterns. Discuss what they think this may tell us about the tree. Teachers can talk about things that may have happened to the tree to cause the tree stress, such as ice jams, forest fires, high winds, drought, and flooding.

Science Vocabulary: archeologist, drought, forester, horizontal axis, tree cookies, tree rings, vertical axis, windstorm

Investigation 13: Two Habitats

Outcomes:

Students will be expected to

Science 3

200-1, 200-3 ask questions and make predictions that lead to exploration and investigation about the composition of soil

100-38, 200-3 describe, predict, and compare the absorption of water by different types of soil

100-39 observe and describe the effects of moving water on different types of soil

100-35 investigate and describe how living things affect and are affected by soils

101-12, 203-1 demonstrate and describe earth materials while exploring objects made from them

Science 4

104-6, 204-1 identify questions to investigate the types of plants and/or animals at a local habitat using the terms habitat, population, and community

204-3, 300-1, 300-2, 302-2 compare the external features, behavioural patterns, structural, and/or behavioural adaptations for an animal to survive a particular habitat, real or imagined

105-1, 106-4, 108-1 describe how scientists' knowledge of plant growth has led to agricultural and technological innovations and the impact on local and regional habitat issues

301-1, 301-2 predict how the removal of a plant or animal population affects the rest of the community and relate habitat loss to the endangerment or extinction of plants and animals

Assessment:

- Record observations and inferences about the life of a tree.
- Discuss the organisms around a tree and their relationship to the tree.
- Draw a diagram connecting the various organisms and the tree with each other.
- Describe a food chain with a tree as the focus.

Questions:

- How do trees and where they live work together? Discuss a food chain with a tree as the focus.
- Does a tree support the life of other trees and organisms around it? Explain.
- What is a habitat?
- Do students have habitats? Explain.

Skills:

- observing
- predicting

Materials:

- hula hoop (segmented)
- paper and pencil
- Recording Chart: Two Habitats
- science logbook

Procedure:

- Take students to a forested area and identify two different habitats close by. These can include habitat under a log, a living tree, rotting logs, or the soil. Use the segmented hula hoop to identify an area to investigate. This will help focus attention to a small area. Assign students an organism that is typically found in the forest, such as an earthworm, a mole, or a flower. Students should state which habitat would best suit their organism and explain why it would be more suitable. Have each student make a list of the properties of their habitat that suit their organism. A sample chart is included in this investigation. When they return to the classroom, provide a class data table for students to fill in their information as they complete the investigation.

Science Vocabulary: community, habitat, organism, population, soil, suitability

Recording Chart: Two Habitats

Organism:	Properties:
Habitat:	
Organism:	Properties:
Habitat:	
Organism:	Properties:
Habitat:	

Observations:
Questions I have:

Investigation 14: The Tree's World

Outcomes:
Science 4

Students will be expected to

104-6, 204-1 identify questions to investigate the types of plants and/or animals at a local habitat using the terms habitat, population, and community

204-6, 302-1 examine and investigate, using various methods and questions, local habitats and their associated populations of plants and animals

108-3, 108-6 identify their own and their families' impact on habitats and describe how personal actions help conserve habitats

204-3, 300-1, 300-2, 302-2 compare the external features, behavioural patterns, structural, and/or behavioural adaptations for animal to survive a particular habitat, real or imagined

105-1, 106-4, 108-1 describe how scientists' knowledge of plant growth has led to agricultural and technological innovations and the impact on local and regional habitat issues

206-1, 302-3 classify organisms and draw diagrams to illustrate their role in a food chain

301-1, 301-2 predict how the removal of a plant or animal population affects the rest of the community and relate habitat loss to the endangerment or extinction of plants and animals

Assessment:

- Describe a tree's habitat, and explain how habitats and populations are connected.
- Predict how the loss of a tree or trees may affect a habitat, and discuss the features of a tree that help habitats survive.

Questions:

- Do all the places where a tree lives look the same? Explain.
- Does the habitat help the tree live?
- What does the habitat of a tree tell you?
- What do you think is in a habitat?

Skills:

- classifying
- inferring
- observing
- predicting

Materials:

- hula hoop (segmented)
- paper and pencil
- standard and non-standard measuring tools (e.g., string, measuring tape, yarn, hula hoop)

Procedure:

- In this investigation students will determine what is included in a tree's world. Students should choose a tree to study. As a class, discuss habitats as a place where organisms live. Ask students what they think would be a part of the tree's habitat, both above and below ground.

  As a class, design a chart to include the information students will collect. Using the materials provided, have students document the tree's habitat. This can include measuring tree diameter, distance between trees, and identifying plant species present within a certain area. This last measurement can be done by placing the segmented hula hoop on the ground at random and identifying everything within it. Record observations both qualitatively (using the senses) and quantitatively for the measurements.

- Have students take the information they collected and draw and label a map of the tree's habitat. Ask them to write a paragraph or a short story describing life around the tree.

- Discuss how a wildlife habitat is useful when managing trees and the forest, and record the comments. Have students think about food, shelter, and reproduction requirements of different animals and how trees help with all of these.

- As a class, talk about woodlot owners, foresters, and biologists and how these people manage species, desirable or not, in order to make a forest healthy. Habitats can be in a specific area, like a small pool in a forest stream, or they can include an entire forest, depending on the needs of the plants and animals in the habitat. Discuss the role a tree plays in a habitat.

Science Vocabulary: habitat, organism, population, woodlot

Investigation 15: Web of Life

Outcomes:

Students will be expected to

Science 4

104-6, 204-1 identify questions to investigate the types of plants and/or animals at a local habitat using the terms **habitat**, **population**, and **community**

204-6, 302-1 examine and investigate, using various methods and questions, local habitats and their associated populations of plants and animals

108-3, 108-6 identify their own and their families' impact on habitats and describe how personal actions help conserve habitats

204-3, 300-1, 300-2, 302-2 compare the external features, behavioural patterns, structural, and/or behavioural adaptations for an animal to survive a particular habitat, real or imagined

206-1, 302-3 classify organisms and draw diagrams to illustrate their role in a food chain

301-1, 301-2 predict how the removal of a plant or animal population affects the rest of the community and relate habitat loss to the endangerment or extinction of plants and animals

108-3 demonstrate respect for the local environment

204-1, 205-7 investigate rocks and minerals and record questions and observations

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

301-15, 104-5, 204-6 classify and compare the adaptations of closely related animals living in their local habitat and in different parts of the world and discuss reasons for any differences

Assessment:

- How are different organisms connected to form an ecosystem?
- What are some effects individual organisms can have on their ecosystem?

Questions:

- How are different parts of an ecosystem connected?
- What happens to an ecosystem when a part of it is removed?
- What happens to other organisms when a part of its ecosystem is removed?

Skills:

- comparing
- inferring
- predicting
- questioning

Materials:

- ball of yarn
- tree cookies
- Web of Life Cards

Procedure:

- Look at the tree cookies. Do these show evidence of animal life that lived in the trees? Is there evidence of stress or markings that may be the result of animals having lived there? What is the evidence? Is this evidence an observation or an inference? Discuss to support the findings.
- Have students form a circle. Using the Web of Life Cards included in this investigation, distribute one card to each student and have them hold their cards out so other players can see what it says. Each card lists an animal or resource.

  A student is chosen at random to start and is given a ball of yarn. The student with the ball of yarn then says what their card is, and they are to select another student in the circle that has a card that is connected to their "character." For example, if the first student were a salamander, he or she could say "I'm a salamander and I eat earthworms." The student would then toss the ball of yarn to the person who holds the earthworm card. The student with the earthworm card would then repeat this process. They could say, "I am an earthworm and I live in soil," and then pass the yarn to the student holding the soil card. A student can be passed the ball of yarn multiple times to simulate multiple connections in the ecosystem.

  When each student has a part of the yarn, have them observe the web that is formed in the middle of the circle. This web demonstrates all of the connections in an ecosystem. If one of these connections were to be lost all of the things that depend on it would be affected. This can be demonstrated by choosing a student and having them let go of their piece of yarn. Any student who had their yarn connected to the item lost would be affected.

  Extension: To further demonstrate how everything in an ecosystem is connected, the class could view the video that shows what happened in Yellowstone National Park in the United States when wolves were reintroduced after a 70-year absence. The video can be found at http://themindunleashed.org/2014/11/brought-wolves-yellowstone-clue-result.html.

Science Vocabulary: connection, ecosystem, food chain, habitat, organism, suitability

Web of Life Cards

water	carbon dioxide
oxygen	air
soil	earthworm

mushroom	moss
ants	bees
longhorn beetle	woodpecker

porcupine	squirrel
acorn	pine cone
bird nest	tree roots

spider	hair clip
plastic bag	pop can
red maple	white birch

balsam fir	white pine
red spruce	eastern hemlock
oak tree	pencil

salamander	lichens
robin	blueberry bush
deer	coyote

Investigation 16: Weather and Trees

Outcomes:

Students will be expected to

Science 5

105-1 identify examples of weather phenomena that are currently being studied

303-12, 303-13 observe, investigate, and describe how forces can act directly (contact) or from a distance (non-contact) to move or hold objects in place

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

Assessment:

- What influence does weather have on a tree and its growth?
- Give examples of the effects of a weather event on a tree's life.
- Do the annual rings on a tree show weather effects? Explain.
- What is needed to make a tree grow?

Questions:

- What impact does weather have on trees?
- What are some weather events that have affected trees?
- What are aspects of weather systems' influence on trees?
- How do different weather systems influence trees?
- Does weather affect the tree's habitat? Explain.

Skills:

- analyzing data
- inferring
- observing
- questioning

Background Information:

Hurricanes, floods, forest fires, drought, snowstorms, wildfires, and other weather-related events can change the landscape of an area. Discussion of some of these, with examples, will help explain how the weather is an influence on the life of a tree. Teachers may wish to extend this discussion with references to properties of air, movement of air and water, and environmental issues. Questions such as, How does a tree go from a seed to a chair? may promote interesting discussions. Teachers and students may wish to talk about weather folklore examples.

Materials:

- paper and pencil
- pictures of a variety of trees
- pictures of different types of landscapes
- tree cookies

Procedure:

- Teachers can reference a recent weather event when starting this investigation, or teachers may ask students to ask other adults about events they may have experienced or heard about. Individually or in groups, students should choose a weather event. Teachers may assign different events to students so that a variety of weather events are examined.

Using a picture, decide what the tree and the area may have looked like before an event, during an event, and after an event. Drawing pictures of trees at these different stages will illustrate the effects on the tree when it endures a weather event. Ask how this affects everything that depends on the tree.

- Look at the tree cookies. Do these show evidence of weather events that happened? Is there evidence of stress or markings that may be the result of a weather event? What is the evidence? Is this evidence an observation or an inference? Discuss to support the findings.

Students may make a class event chart that shows what happens to a tree, focusing on before, during, and after a weather event. Discussions and feedback will help give insights into the effects weather can have on trees and regions.

Science Vocabulary: drought, earthquake, fire, flood, hurricane, snowstorm

Investigation 17: Mass of Leaves

Outcomes:
Science 5

Students will be expected to

104-5, 205-3, 300-11 follow a given set of procedures to relate the mass of a whole object to the sum of the masses of its parts and suggest possible explanations for variations in the results

Assessment:

- Predict and provide possible explanations as to why there is a variance between the mass of a whole object and the sum of the masses of its parts.

Questions:

- How does the mass of leaves change as you add more to a pile?
- What is the effect of the mass of leaves when they are cut into pieces in comparison to their mass when they are whole?
- What is the effect of the mass of a twig(s) when it is broken into pieces in comparison to the mass when it is whole?
- What happened with the leaf in a plastic bag?
- What do you think was lost when the leaf dried up?

Skills:

- analyzing data
- collecting data
- inferring
- observing
- predicting
- questioning

Materials:

- balance scales (electronic works best)
- camera (optional)
- clear plastic bags
- clipboards (optional)
- elastic bands
- leaves
- masses for the balance scale
- paper plates
- Recording Chart: Condensation (Part 2)
- Recording Chart 1: Mass of Leaves (Part 3, Treatment 1)
- Recording Chart 2: Mass of Leaves (Part 3, Treatment 2)
- tree cookies
- twigs

Procedure:

- Different parts of this investigation require various amounts of time to complete.

Part 1

- Divide students into groups and go outside. Each group should find a tree—the trees can be the same type and/or different types. The group will adopt that tree. Observe the tree in detail. Have students put a clear plastic bag over a branch with leaves and close it. Check the bags for condensation on a daily basis for several days. Have students record what they observe.

- Students should try to identify their trees. Does their tree match any of the tree cookies that are in the backpack? Students should write a personal profile about the tree. Profile items can include such things as the tree's name, where it lives, its interests, its favourite place, and its likes and dislikes.
- Each student in the group will write a short note (up to 140 characters) to make an information text about their tree. The group leader will write the first line, the next student will add a line to it, the next student will add another line, and so on, to make a story.

Part 2

- Divide students into groups of four. Teachers may choose to give each student a role (leader, materials person, recorder, presenter). Students will go outside and choose a tree that they would like to examine (adopt for the school year). The tree that they choose should be one that students can visit on a daily or weekly basis. Once students choose their trees, they should put their clear plastic bags over a branch that contains leaves. This bag will be sealed around the branch using an elastic band. Students should make initial observations of what they see on the interior of the bag. They may take photos every day for one week to compare what the inside of the bag looks like on day 1. Ideally, a total of five observations will be made. A sample chart for recording this data is included in this investigation.

Part 3

- Students will gently remove four leaves from their tree. Each of their leaves can either be traced onto a page or photos may be taken. Students are to record their initial observations about things such as differences in size or colour, deformities, and damage due to diseases and/or pests. They may classify the objects that were collected using a dichotomous key. Half of the groups will be following treatment 1 directions and the other half of the students will be following treatment 2.

  Treatment 1: Leaves will be weighed on day 1 using an electronic scale. To do this, students must first find the mass of a medium-sized paper plate and then obtain a mass of the four leaves and the paper plate. Students can then use both masses to determine the mass of their leaves on day 1. A total of three masses will be taken, and an average will be determined and recorded in a table. A sample recording chart is included in this investigation. Once an average mass is obtained, students will cut their leaves in five pieces and find the mass again. Did the masses change? Students will continue to determine the average mass of their leaves (with plates) on a weekly basis for one month.

  Treatment 2: The mass of the leaves will be found on day 1 using an electronic balance scale. Students must first find the mass of a clear plastic bag and put their four leaves into the bag and a mass will be obtained

of both the bag and the leaves. Students can then use both masses to determine the mass of their leaves on day 1. A total of three masses will be taken, and an average will be determined and recorded in a table. A sample chart is included in this investigation. Once an average mass is obtained, students will cut their leaves in five pieces and find the mass inside the bag. Did the masses change? Students will then tie a secure knot to seal the bag and continue to determine the average mass of their leaves (in bags) on a weekly basis for one month.

- Students should be able to relate the condensation that accumulates in the plastic bag in Part 1 with the large decrease in mass in treatment 1 and the smaller decrease in mass in treatment 2.

  Questions asked should be related to having students gain a better understanding of conservation of mass and energy such as, What happened to the mass that was lost in both treatment groups? What happened to the energy that was able to sustain the life of that leaf from day 1?

Science Vocabulary: condensation, conservation of mass, evaporation, leaves, mass, observations, pests, tree cookie

Recording Chart: Condensation (Part 2)

Day	Condensation Observations
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	

Recording Chart 1: Mass of Leaves (Part 3, Treatment 1)

Observations			
Day 1 Date:	Mass of plate/bag (g)	Mass of plate/bag + leaves (g)	Mass of leaves (g)
Trial 1			
Trial 2			
Trial 3			
Average mass (g)			
Observations			
Day ___ Date:	Mass of plate/bag + leaves (g)	Mass of leaves (g)	Mass lost (g)
Trial 1			
Trial 2			
Trial 3			
Average mass (g)			
Observations			
Day ___ Date:	Mass of plate/bag + leaves (g)	Mass of leaves (g)	Mass lost (g)
Trial 1			
Trial 2			
Trial 3			
Average mass (g)			

Recording Chart 2: Mass of Leaves (Part 3, Treatment 2)

Illustration and Type of Leaves	Mass of the Leaves as a Whole	Mass of the Parts of the Leaves
Trial 1		
Trial 2		

Investigation 18: Shapes and Colours

Outcomes:

Students will be expected to

Science 5

301-9, 205-5, 301-10 observe and identify changes in an object's appearance, state and/or reversibility and classify it as a physical change or not

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

Assessment:

- Identify the differences in various types of leaves and sort them accordingly.
- Explain the function of leaves as they relate to supporting the growth of trees.

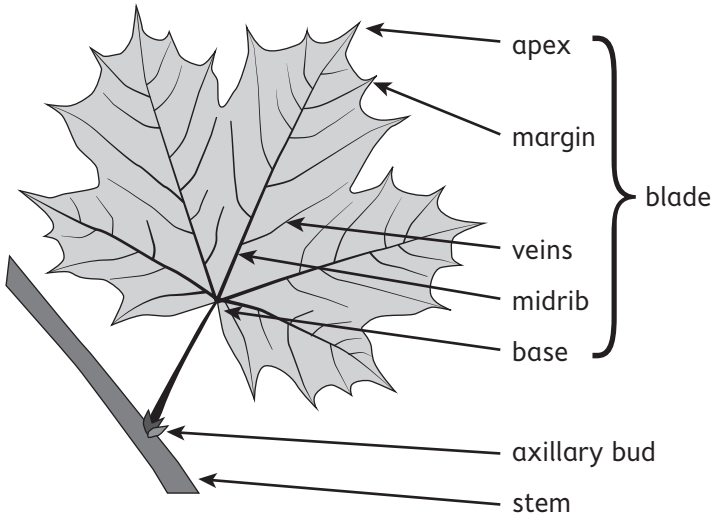
Questions:

- In the spring, do you notice a difference between leaf shape and decomposition? What do you notice?
- What colours do you see for leaves?
- Do all leaves change colour? Discuss.
- How do the leaves grow? How do you know?

Skills:

- analyzing data
- collecting data
- inferring
- observing
- predicting

Background Information:



Function of Leaves

The function of leaves is to absorb sunlight to supply trees with protein and sugars. Protein and sugars give the tree what it needs for photosynthesis. Leaves also make the oxygen in the air that we breathe.

Colours in Leaves

Chlorophyll (a chemical in leaves) is what gives leaves their green colour and helps photosynthesis happen. As winter approaches, there is not enough light or water for photosynthesis to take place. Trees begin to shut down their food-making factories. At this time, the green chlorophyll disappears from the leaves of hardwood (deciduous) trees. As the green fades away, one begins to see colours such as yellow, orange, and red. Small amounts of these colours have been in the leaves all along, but cannot be seen in the summer because they are masked by the green chlorophyll.

Materials:

- leaves
- magnifying lenses
- paper and pencils
- rubber mallet
- standard and non-standard measuring tools

Procedure:

This investigation could be done both in the spring and in the fall.

- In groups, have students collect a variety of leaves. Teachers should explain that needles are also leaves that are found on softwood (coniferous) trees. Have students observe the leaves using a magnifying lens. Students should draw what they observe. Have students discuss the value of leaves in helping trees grow and be healthy. Students should discuss what they think causes the change in the colour of leaves from spring/summer to fall.

  The length, diameter, and other measurements of the leaves may help with observations. Various measuring tools may be used.

- Teachers may wish to have students do research to find out what causes the colour in leaves and to identify the parts of a leaf. Teachers could collect and press leaves to be used for this investigation.

  After students have drawn different leaves they have observed, they should take leaves of different colours back to the classroom. Have students place a leaf between two pieces of paper, and gently hit the "leaf sandwich" with a rubber mallet. This will transfer the colour from the leaf's chlorophyll to the page. Repeat this process with different coloured leaves. This will help reinforce the concept of different types of chlorophyll providing leaves with different colours.

Science Vocabulary:

apex, base, blade, chlorophyll, coniferous, deciduous, hardwood, magnifying lens, margin, midrib, petiole, photosynthesis, softwood, vein

Investigation 19: Timber and Non-timber Forest Products

Outcomes:

Students will be expected to

Science 5

104-5, 205-3, 300-11 follow a given set of procedures to relate the mass of a whole object to the sum of the masses of its parts and suggest possible explanations for variations in the results

107-8, 205-8, 300-12 use a variety of sources and technologies to identify and describe the source of the materials found in an object, changes to the natural materials required to make the object, and how manufactured materials have been developed to improve living conditions

204-7, 207-3, 206-2, 204-5 work with team members to develop and carry out a plan to distinguish a material based on its chemical properties and display the results of the data

301-9, 205-5, 301-10 observe and identify changes in an object's appearance, state, and/or reversibility and classify it as a physical change or not

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

206-1, 206-9, 300-15 create and analyze your own chart or diagram for classifying and describe the role of a common classification system

Assessment:

- What are non-timber forest (NTFP) products? Give reasons to use them.
- Discuss three timber products and their uses.

Questions:

- What is a timber product? Give examples.
- What is a non-timber forest product? Give examples.
- Do you think these timber and non-timber forest products are useful? Give examples.
- What do you need to know to decide if the products are worthwhile?
- What factors help focus on decisions that determine the usefulness of a product?

Skills:

- inferring
- observing

Background Information:

Non-timber forest products (NTFP) are generally defined as any goods that come from or are made from forest plants or animals, other than timber or firewood. NTFPs are gathered from the forest and used for foods, health, personal care, landscape and garden application, and decorative and aesthetic products. NTFP harvest complements other commodity-based economic development, such as ecotourism, and allows for traditional use of the forest for hunting and trapping. Some examples of NTFPs include baskets, holiday wreaths, mushrooms, blueberries, scenery, and wildlife. Buying locally is supportive of

your neighbourhood and small businesses. (See Nova Scotia's Code of Forest Practice on pages 79–80 for a more detailed list of NTFPs).

The purpose of this investigation is to have students learn what timber and non-timber forest products are and be able to recognize and distinguish the differences between them.

Materials:

- large container
- paper and pencil
- photos or real examples of NFTP and timber products
- recording chart
- species cards (if available)
- tree cookies

Procedure:

- Students should go to a green space where a variety of trees are present. Have students (with teacher guidance and assistance) identify some specific trees and the products that may come from them. They should begin a list of products made from trees and/or tree parts.

  Teachers should divide the class into groups of four students. There will be a series of stops set up beforehand that will provide a challenge for each group to do. Students can only proceed to the next sequentially ordered stop when they have successfully completed the previous stop. There must be several adults present for this investigation in order to facilitate each stop. Teachers may decide to have a time limit per investigation or an adult can decide when to move on. The logistics of this investigation should be discussed before students go outside so they understand the rules.

  The following are a list of mini challenges that can be used:

  – **NTFP Relay Race:** Copy and use photos of various NFTP and timber products for this portion of the investigation. Each group of students will form its own single file line at the starting line. Approximately 15 meters away is a container filled with these photos (or real objects if the teacher chooses). There will be a container available for each group of students. Students will be given a description of an NTFP and each student at the front of line will run as quickly as possible to retrieve the desired photo or object. Depending on how many adults are available, each group can have its own assigned adult to read out the relay items. If only one adult is available, groups of students can complete each task together, and there will be no winning team.

  – **NTFP Scavenger Hunt:** Teachers can hide images of NFTP products in areas where the object will be most likely found. For example, a photo of a Christmas tree can be tacked onto a balsam fir or a photo of blueberries can be placed amongst the branches of a low-lying bush. Each group of students will be given a list of pictures/objects to locate. Upon locating them, students are to take a photo of their picture/object.

When students locate and have photos of each object they can present their completed scavenger hunt to a teacher or adult volunteer. (A list of possible scavenger hunt items follows.)

- **NTFP Draw-a-Rama:** Teachers can set up four to six stations. Each station should include a piece of paper with an item from the Draw-a-Rama list written on it, a large pad of paper, and a pencil or marker to draw with. Students should be divided into two teams. One student will be selected, and will be given 60 seconds to draw the item listed at the first station. The team of the person drawing will try to guess what the student is drawing for a limited amount of time. Students will then move on to the next station. (A list of possible Draw-a-Rama Items follows.)
- **NTFP Trivia:** As an overview, teams may be created to complete the multiple choice Non-timber Forest Products Trivia. Have students research their answers.

Science Vocabulary: non-timber forest products, timber

Nova Scotia's Code of Forest Practice

Integrated Forest Use: Non-timber Forest Products (NTFP)

Non-timber forest products are items gathered from the forest and used for foods, health, personal care, landscape, and garden application, and decorative and aesthetic products. Non-timber forest product harvest complements other commodity-based economic development such as ecotourism and allows for traditional use of the forest for hunting and trapping.

Included are ecosystem/ecological functions, scenic values, consumer surplus, resource integrity management, and scientific and educational benefits. Although the following list is far from exhaustive, the Nova Scotia non-timber forest products categories with a suggested level of management are as follows:

- Tourism and Visual/Viewscape Features
- Restricted Use / Protected Areas
- Recreation and Leisure
- Education
- Ecosystem Services (ecological functions, goods and services)
- Biochemicals: Oil/Extracts
- Food/Forage
- Horticulture/Silviculture/Crafting
- Aesthetics
- Cultural

Tourism and Visual/Viewscape Features

- Addresses tourist industry requirements, general and specific visual/viewscape/landscape features of great importance.

Restricted Use / Protected Areas

- Areas of special interest and concern have been legislated or designated protected under federal, provincial, and municipal acts and legislation. Includes areas of both natural and historical significance.

Recreation and Leisure

- **Trail activities:** walking, running, hiking, biking, ATVs, snowmobiling, cross-country skiing, equestrian, nature observation, etc.
- **Water activities:** canoeing, kayaking, boating, fishing, swimming, diving, and hunting
- **Back country activities:** hiking, camping, mountaineering, foraging, wilderness experience, natural observation, hunting
- **Cottage activities:** all of the above, sense of place, peace and tranquility, privacy, view potential
- **Wildlife-related activities:** birding, wildflowers, hunting, nature photography

Education

- Representative ecoregion forest stands and vegetation at different age classes and structural features provides a "natural" classroom for ecological and cultural education. Forest part of scientific research and environmental monitoring on local to global scales.

Ecosystem Services (ecological functions, goods and services)

- **Forest structure:** water quality filters
- **Forest structure:** wind control features
- **Forest structure:** sound/noise filters

Biochemicals: Oils/Extracts

- Some forest species provide useful products for society: pharmaceuticals, biochemicals, botanicals, industrial chemicals, aromatics, essential oils.

Food/Forage

- **Ethno-botanical:** using the forest as a place for gathering plants (fiddleheads, maple products, wild mushrooms, etc.).
- Traditional hunting and fishing.
- Development of a suitable habitat for wildlife reproduction and harvesting.

Horticulture/Silviculture/Crafting

- Native species reproduction destined for ecological restoration efforts of degraded forest ecosystems, and the identification and development of superior native regional species
- **Wildcrafting:** uses woody or herbaceous species to provide materials for the floral and craft industries (branches, twigs, foliage, bark peels, cones, flowers, berries [can be fresh, dried, or preserved]).

Aesthetics

- Forest cover for spiritual retreats, values related to artistic endeavours and social values at the community, regional, and provincial levels.

Cultural

- Fence lines, artifacts, fossils/minerals, landscape settlement patterns and use.
- First Nations traditional knowledge values.
- Traditional and oral knowledge has a valuable role in identifying and managing non-timber forest products in a sustainable manner.
- Uses include harvesting non-timber forest products such as berries, birch bark, or wild rice to traditional drum ceremony locations, pictograph sites, or seasonal habitation areas.

Source: *Guidebook 4 – Integrated Forest Use*, Nova Scotia Department of Natural Resources, 2004, pp. 27–33

Non-timber Forest Products Scavenger Hunt

Teachers can hide a variety of objects and/or pictures of objects around the trees where the non-timber forest product would originate. For example, a photograph of blueberries can be placed amongst some bushes to demonstrate to students that blueberries come from a bush as opposed to a tree. Some other potential items that can be used are as follows:

- baskets
- blueberries
- Cabot Trail
- camping
- canoeing
- decorative wreaths
- erosion control
- fiddleheads
- fireweed (acne treatment)
- hiking
- maple products
- mushrooms
- peace
- snowmobiling
- strawberries
- tranquility
- wildlife
- wind control

Non-timber Forest Products Draw-a-Rama

The following is a list of items students can draw. They will have 60 seconds to draw the item given and their team successfully guess what it is. Students who are drawing are not allowed to speak or gesture. These are all items that can either be used or seen as a part of enjoying the non-timber forest products.

- bald eagle
- bee or hornet nest
- blue jay
- blueberries
- chrysalis or cocoon
- cranberries
- cross-country skiing
- decorative wreaths
- dogwood flowers
- fiddleheads
- kayak
- landscape
- owl
- maple syrup
- moose
- moss
- mushroom
- porcupine
- roots of trees
- snowshoes
- spiderwebs
- strawberries (wild)
- tree frogs
- wind control
- woodpecker

Non-timber Forest Products Trivia

1. Non-timber forest products are

a. medicinal forest plants
b. guided walking tours in the forest
c. forest mushrooms
d. all of the above

2. Non-timber forest products include both consumable and non-consumable products.

a. true
b. false

3. What human values do non-timber forest products hold?

a. cultural
b. social
c. spiritual
d. economic
e. all of the above

4. What essential vitamin do rose hips contain?

a. vitamin A
b. vitamin B
c. vitamin C
d. vitamin D

5. Hemlock bark was used in what industry?

a. tanning hides
b. tea making
c. soap making
d. honey production

6. Essential oils are made from

a. powdered roots
b. distilled plant extracts
c. dried mushrooms
d. wood pulp

7. To market a new pharmaceutical drug in Canada takes, on average,

a. 10 to 12 days
b. 6 to 8 days
c. 10 to 12 years
d. 4 to 8 weeks

8. Xylitol is

a. a sugar found in birch bark
b. a resin found in pine trees
c. a forest mushroom
d. a cold remedy

9. Blueberries and bilberries are good sources of

a. xylitol
b. paclitaxel
c. anthocyanin
d. vitamin B

10. Forest plants used for medicinal purposes include

a. fireweed
b. hawthorn
c. ground hemlock
d. all of the above

11. Wildcrafting is

a. making crafts from wild products
b. taking products from your neighbour's lands
c. boating down a dangerous river
d. gathering wild products from the land

12. Fiddleheads are best picked when

a. they are still tightly coiled
b. after the first frost
c. their leaves have expanded
d. they are still below the ground

13. Blueberries contain the largest amount of antioxidants in their

a. leaves
b. pulp
c. seeds
d. skin

14. The ratio of sugar maple sap to maple syrup averages about

a. 100:1
b. 60:1
c. 40:1
d. 20:1

15. Chanterelle mushrooms are usually found

a. in cow pastures
b. on trunks of dead trees
c. on the forest floor
d. in roadside ditches

16. The largest exporter of wild mushrooms in Canada is

a. Newfoundland and Labrador
b. Nova Scotia
c. Nunavut
d. British Columbia

17. Highbush cranberries are members of the

a. blueberry family
b. cranberry family
c. liverwort family
d. honeysuckle family

18. Shearing of balsam fir Christmas trees should begin when the tree is

a. about 1 metre in height
b. over 2 metres in height
c. bursting its buds in the spring
d. overtopped by vegetation

19. Insect pests of balsam fir include

a. spruce budworm
b. balsam woolly adelgid
c. balsam gall midge
d. all of the above

20. Wreaths and sprays can be made from

a. balsam fir tips
b. red-twig dogwood
c. birch twigs
d. all of the above

21. Balsam fir twigs and needles can be distilled to make

a. paclitaxel
b. essential oils
c. xylitol
d. none of the above

22. Highly prized wood grains of maple include

a. tiger stripe
b. curly
c. bird's eye
d. all of the above

23. Bunchberries are forest ground plants used in

a. tanning hides
b. soap-making
c. landscaping
d. basket weaving

24. The most common greenhouse gas is

a. carbon monoxide
b. hydrogen sulphide
c. hydrogen chloride
d. carbon dioxide

25. Non-timber forest products can be managed alongside timber products.

a. true
b. false

26. The best way to gather non-timber forest products is to proceed carefully, and to never over-harvest.

a. true
b. false

Answer Key

1 – d	4 – c	7 – c	10 – d	13 – d	16 – d	19 – d	22 – d	25 – a
2 – a	5 – a	8 – a	11 – d	14 – c	17 – d	20 – d	23 – c	26 – a
3 – e	6 – b	9 – c	12 – d	15 – c	18 – a	21 – b	24 – d	

Investigation 20: Becoming an Entrepreneur—Timber and Non-timber Forest Products

Outcomes:

Students will be expected to

Science 5

104-5, 205-3, 300-11 follow a given set of procedures to relate the mass of a whole object to the sum of the masses of its parts and suggest possible explanations for variations in the results

107-8, 205-8, 300-12 use a variety of sources and technologies to identify and describe the source of the materials found in an object, changes to the natural materials required to make the object, and how manufactured materials have been developed to improve living conditions

204-7, 207-3, 206-2, 204-5 work with team members to develop and carry out a plan to distinguish a material based on its chemical properties and display the results of the data

301-9, 205-5, 301-10 observe and identify changes in an object's appearance, state, and/or reversibility and classify it as a physical change or not

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

206-1, 206-9, 300-15 create and analyze your own chart or diagram for classifying and describe the role of a common classification system

Assessment:

- Assess the woodlot business plans according to a class-designed rubric. Assessment will be ongoing throughout the process with brief reports from the teams during the planning process. This will help direct the groups in their plans. Data tables, graphs, drawings, plans, lists, and presentations should also be included.

Questions:

- Do timber and non-timber forest products make a difference in our lives? Explain with examples.
- How do competitors influence a product's market value?
- What is meant by "seasonal" products?
- What non-timber forest products can be made from trees?
- Who decides what products will be made and promoted?
- How do woodlot owners design plans for non-timber forest products as a source of income?
- Are woodlots similar to gardens or farms? How?

Skills:

- analyzing data
- collecting data
- communicating
- decision making
- graphing
- interpreting data
- problem solving

Background Information:

Nova Scotia's Department of Natural Resources has a website with a wealth of information on woodlot management (http://woodlot.novascotia.ca). Nova Scotia Woodlot Owners and Operators Association (www.nswooa.ca) may also have valuable information. Teachers may wish to consult these resources before beginning this investigation to better inform themselves about the processes involved with woodlot management.

Materials:

- paper and pencils
- Business Plan Outline

Procedure:

- Ideally, teachers should have their own example that they can model for students.
- As a class, design the rubric for this investigation.
- Students may generate a list of words and definitions that relate to this topic. Some discussion on these will lay the groundwork for their presentations. Being able to explain the words will help the delivery of the presentations. Some of these words include **non-timber forest products, entrepreneur, market, direct competitor, indirect competitor, woodlot management, and presentations**.
- **Business Plan:** Provide groups of students with the Business Plan Outline (on page 88). Discuss each section of the plan with students before they begin their work on their own woodlot business plan.

  Woodlot Plan: Have students plan their own 10 m × 10 m woodlot. Give students examples of things that could be in their woodlots, such as various tree and wildlife species, as well as potential uses for their woodlot, such as timber or pulp harvesting or a network of walking trails. Give students at least six examples of different kinds of woodlots (each group should have a different product or service). Teachers may wish to consult with an ecologist or woodlot owner who can provide more information about sustainable woodlot development.

  Presentations: Each member of the group should have an assigned role. The teacher should discuss expectations for each role. For example, in a group of four, two students may wish to work on research and two others work on the plan development. Teachers should remind students to keep it simple and specific and to be innovative and creative as well.

- **Extension:** Students can plan how the presentations will happen. For example, students can form a panel to assess other students' presentations. Students can present their business plans to the panel, and then reverse the roles. Teachers may invite guests to act as the assessors for the products/services. It should be reinforced with students that they should be supportive of one another's presentations and look for areas that worked well as well as areas where students can improve, instead of unproductive criticism.

Non-timber Forest Products: Business Plan Outline

Design a small business plan for a non-timber forest product or service using the following outline.

Business Plan Outline

Product type	What non-timber forest product or service will your company provide?
Company name	What is the name of your company? Design a company logo and product label as well.
Target market	• What determines the target market? • Who are the people most likely to purchase this product or service? • Is your product seasonal? What will this mean for your business? Which season(s) will it be available? • What will affect your market? Will the seasons affect it? • Create a profile of yourself as a woodlot owner. You may wish to include information such as: your residence, income level, age, gender, and level of education • Will your customer base expand over time, such as from the roadside to the farmer's market to a major grocery store to exporting? • Who might become future customers if the base expands?
Competition	Who are your three nearest direct competitors? Who are your indirect competitors?
Market growth	Are your markets growing, steady, or declining? Comment on these.
Pricing	What kind of pricing strategy will your company use?
Budget	Where will the funds be raised? How much money will the company need to begin production? How much will be allotted for marketing these products?
Advertising	Will you promote this product through advertising? If so, what kind will you use (e.g., print, television, radio, Internet)? Which advertising will be the most effective for reaching your target audience?

Investigation 21: Reforestation

Outcomes:

Students will be expected to

Science 4

104-6, 204-1 identify questions to investigate the types of plants and/or animals at a local habitat using the terms **habitat**, **population**, and **community**

204-6, 302-1 examine and investigate, using various methods and questions, local habitats and their associated populations of plants and animals

205-5, 205-10, 206-6 construct and/or maintain a model of a natural habitat and, through observations, suggest improvements to make it more habitable for organisms

105-1, 106-4, 108-1 describe how scientists' knowledge of plant growth has led to agricultural and technological innovations and the impact on local and regional habitat issues

301-1, 301-2 predict how the removal of a plant or animal population affects the rest of the community and relate habitat loss to the endangerment or extinction of plants and animals

Science 5

206-5, 303-21 relate the transfer of energy from the sun to weather and discuss the sun's impact on soil and water

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

107-11, 207-4, 301-16 identify changes in animals over time and research and model the work of scientists

Assessment:

- How do variables such as fertilizer and sunlight impact plant growth?
- Predict the impact of different variables on plant growth, and design an experiment to test predictions.

Questions:

- What factors affect the growth of plants?
- How do we test the effect of variables on plant growth?

Skills:

- analyzing data
- collecting data
- inferring
- observing
- predicting
- questioning

Materials:

- containers
- fertilizer (optional)
- folding shovel
- seeds
- soil

Procedure:

- Students will explore variables that can affect the way plants grow. Teachers can begin by taking students to a forested area and getting them to observe the variability of plant life across different parts of the forest. Teachers can ask students what variables they think impact the ability of plants to grow in different places. These variables could be temperature, moisture, light, soil quality, salt, earthworms, or various types of fertilizers. Students should share and discuss these ideas amongst themselves or with the class.

  Once a list of variables is made, have a group of three to four students choose which variable they want to experiment with. It is important that each group only experiment with one variable in order to isolate the effects of their treatment. For example, if students would like to investigate fertilizers, the application of fertilizer will be considered the treatment for their experiment.

  After the variable selection, students can start planning their project. Students have to first decide what type of plant they would like to grow. Beans, corn, and grasses grow quickly and are good candidates for growing within the classroom. Students should then research the growth of their chosen plant and make predictions on what results their experiment will yield.

- After the decisions about the number of trials, there should be one plant that has the treatment applied to it and one plant that does not. The plant that does not receive the treatment is referred to as the control plant.

  The next step is for students to decide how to evaluate their variable. A single measurement may provide clearer results. Some of the data that can be taken can either be quantitative (measured data such as height, diameter, length, number of sprouts, etc.) or qualitative (leaf colour, overall appearance, fullness of plants, day of sprout, etc.).

  Students can then use their logbooks to make tables to record their measurements and observations. Data should be collected throughout the length of the trial so that enough information is collected to support a conclusion.

  Results of the experiment can be represented using tables, charts, and graphs. It would be beneficial to all students if each group shared its findings through a poster, presentation, or other format.

Science Vocabulary: light, measurements, moisture, soil quality, temperature, treatment, variable

Investigation 22: Trees around the World

Outcomes:
Science 6

Students will be expected to

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

Assessment:

- Do a research project on a tree from another part of the world.
- Compare the habitat the local tree grows in and that of the tree you are researching.

Questions:

- In what area of the world does the tree you are researching grow?
- How does the habitat of the tree you are researching differ from that of a tree where you live?
- How do humans use your researched tree?
- What effect on the habitat of the researched tree do humans have?

Skills:

- classifying
- predicting

Materials:

- resources about trees
- camera (optional)
- clipboard (optional)
- coloured pencils
- paper and pencil

Procedure:

- Have students go outdoors to observe trees using sight, hearing, smell, and touch, and record what they observe about the tree's habitat. Have students look up the name of the tree they are observing. Students should either draw their tree or take a picture of it.
- In groups, have students discuss the names of trees they are aware of from different parts of the world. As a class, share the names, and make a list of the trees on chart paper. Have each student choose a tree to do research on, answering the questions provided in this investigation. Students should draw a picture of the tree they are researching and compare it with the tree they have chosen in their local habitat. Have students present their tree project. Students may wish to use various formats for their presentation.

Science Vocabulary: habitat, research

Investigation 23: Salamander Search

Outcomes:

Students will be expected to

Science 4

104-6, 204-1 identify questions to investigate the types of plants and/or animals at a local habitat using the terms **habitat**, **population**, and **community**

204-6, 302-1 examine and investigate, using various methods and questions, local habitats and their associated populations of plants and animals

108-3, 108-6 identify their own and their families' impact on habitats and describe how personal actions help conserve habitats

301-1, 301-2 predict how the removal of a plant or animal population affects the rest of the community and relate habitat loss to the endangerment or extinction of plants and animals

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

107-11, 207-4, 301-16 identify changes in animals over time and research and model the work of scientists

Assessment:

- Predict and provide possible explanations of how different forest characteristics (canopy cover, leaf litter, etc.) impact salamander populations.
- Describe how salamander abundance can be used to determine forest health, as well as how human impacts on the forest can impact animals.

Questions:

- What aspects of a forest are important to salamanders?
- Why are there more salamanders in one area than another?
- What does the number of salamanders tell us about the forest?
- How could changes to the forest affect salamanders?
- What do salamanders do to contribute to a healthy forest?

Skills:

- analyzing data
- collecting data
- inferring

Background Information:

- Most amphibians live close to a water source, such as a lake or a brook. Many amphibians breathe through their skin so they need access to water to prevent their skin from drying out. Terrestrial salamanders are common in Nova Scotia and are unique amphibians because they live in forests relatively far from any sources of water. In order to survive away from water, they live in forests with dense canopy cover and plenty of leaf litter. These two characteristics help moderate the temperature of the forest floor, prevent moisture from escaping, and provide moisture through leaf transpiration.

- Forest health can be measured in a variety of ways; some of the most common factors used are canopy cover and leaf litter. Healthy forests have an abundance of both. The more canopy cover and leaf litter found in a forest, the more salamanders will be found there. Therefore, the more salamanders found, the healthier the forest. Salamander monitoring is used by many organizations to monitor forest health because of the abundance of salamanders, their sensitivity to changes in their environment, and the ease of identifying them.

Photo: courtesy of Nova Scotia Museum

Materials:

- clipboards
- flagging tape
- folding shovel
- pencils
- Recording Chart: Salamander Search, Method 1
- Recording Chart: Salamander Search, Method 2
- non-latex gloves (optional)
- untreated wooden boards (1' × 1') (20) (optional)

Procedure:

This investigation can be conducted in one of two ways, depending on the time available for the investigation. The first method requires a shorter time investment and may be more suited for younger students, while the second method more closely emulates current scientific practices for measuring forest health.

For either method, teachers should identify ahead of time two study sites to be used for this investigation. The first site should be a forest with dense canopy cover and lots of leaf litter on the forest floor. The second site should be sparsely populated with trees. Teachers may also wish to try to find some salamanders themselves to ensure there are some for their students to find.

Method 1

- Bring students to the first study site. Briefly explain the types of areas where salamanders are found, such as under rocks, logs, and leaves. Divide students into groups and give each group a copy of the Salamander Search Recording Chart, Method 1. Give each group 10 minutes to see how many

salamanders they can find, and record their findings. Then have students go to the second study site and record their findings. Be sure to remind students to gently replace anything they look under so they disturb the habitat as little as possible.

When the time is up, ask each group how many salamanders they found, and tally up the total for the entire group. Compare the results of the two study sites. Ask students where they found the most salamanders. Ask, Why do you think salamanders prefer some areas to others?

- Ask, If you were a salamander, would you prefer to live in the habitat of the first study site or the second? What would happen to salamanders if people cut down trees in the first study site? What would happen if trees were planted in the second study site? Why were there more salamanders in the denser forest? What does this tell you about the forest?

Method 2

- The first step of this method is to prepare the study site for later observation. Bring students to the first study site. Briefly explain the types of areas where salamanders are found, such as under rocks, logs, and leaves. Have students place wooden boards in a straight line and a consistent distance apart, ideally 5 to 10 metres. Leaf litter should be gently brushed away using the folding shovel or gloves, the boards placed flush to the soil, and then the leaf litter should be replaced. Mark the start and finish of this "transect line" with flagging tape so they can be easily found later. Repeat this process for the second study site.
- After a month, return to the first study site. Divide students into 10 groups, and give each group a copy of the Salamander Search Recording Chart, Method 2. Have each group slowly lift a wooden board and quickly count how many salamanders they find (before they run away) and record their findings. Repeat this process at the second study site.
- When students have finished, ask each group how many salamanders they found and tally up the total for the entire group. Compare the results of the two study sites. Ask students where they found the most salamanders. Ask, Why do you think salamanders prefer some areas to others? If you were a salamander, would you prefer to live in the habitat of the first study site or the second? What would happen to salamanders if people cut down trees in the first study site? What would happen if trees were planted in the second study site? Why were there more salamanders in the denser forest? What does this tell you about the forest?

Science Vocabulary: canopy, forest floor, forest health, leaf litter, study site, transect line, transpiration

Recording Chart: Salamander Search, Method 1

Study Site 1	
Habitat type (under rocks, logs, etc.)	Number of salamanders found
Total number of salamanders found:	
Study Site 2	
Habitat type (under rocks, logs, etc.)	Number of salamanders found
Total number of salamanders found:	
Notes	

Recording Chart: Salamander Search, Method 2

Study Site 1		
Wooden board #	Habitat type (under rocks, logs, etc.)	Number of salamanders found
Total number of salamanders found:		
Study Site 2		
Wooden board #	Habitat type (under rocks, logs, etc.)	Number of salamanders found
Total number of salamanders found:		
Notes		

GRADES PRIMARY–6

Introduction

This section addresses the life of a tree through the student's eyes at each grade level. Students may do a before, during, and after version of their learning about a tree or this may be a culminating learning experience.

Focus and Context

This section gives students the opportunity to integrate various curriculum areas and skills as students represent their knowledge, values, and attitudes in their presentations. Schools may wish to show all grades in a showcase to illustrate various perspecitves and activities at different grade levels.

Investigation 24: Through the Eyes of a Tree

Outcomes:

Students will be expected to

Science Primary

100-2 explore and select different ways to represent ideas, actions, and experiences and to communicate with others

Science 1

200-1, 100-4, 100-5, 100-7 question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs

Science 2

202-7 propose suggestions for meeting the needs of the organism being investigated and draw conclusions about its growth patterns or stages based on observations

Science 3

100-29 identify, investigate, and suggest explanations for life needs of plants and describe how plants are affected by conditions in which they grow

Science 4

301-1, 301-2 predict how the removal of a plant or animal population affects the rest of the community and relate habitat loss to the endangerment or extinction of plants and animals

Science 5

301-9, 205-5, 301-10 observe and identify changes in an object's appearance, state and/or reversibility and classify it as a physical change or not

Science 6

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

Assessment:

- Prepare and do a presentation about how a tree or an ecosystem develops.

Questions:

- How does a tree change over time?
- How does an ecosystem change over time?
- How do organisms impact their ecosystem?

Skills:

- collecting data
- inferring
- observing
- predicting
- questioning

Materials:

- Recording Sheet: Through the Eyes of a Tree (grades primary–2)
- tree cookies (optional)
- tree corer (optional)

Procedure:

- This investigation should be done after students have had the opportunity to explore trees, and have completed the outcomes from the investigations in this resource at their grade level.

  The extent of this investigation will depend on the grade of the students completing it. Students at the lower elementary grades may use pictures to

describe what their tree might have seen over time. Students at the upper elementary grades may wish to do research on the history of the area in which the trees they have observed have grown. From this research, students could develop a story, basing it on "Through the Eyes of a Tree." Students should be given the opportunity to share their stories with the class.

If this investigation is done by all classrooms in a school, it would provide an opportunity to see how students' perceptions and understanding of trees and forests progresses with each grade level.

Grades Primary–2

- Students at these grade levels should create a presentation about the changes they observe in a tree throughout the seasons. The story should be accompanied by illustrations of the tree in each season. A sample recording sheet, "Through the Eyes of a Tree," is included in this investigation.

Grades 3–4

- Students at these grade levels should expand their presentation to include the forest as a whole and the changes it experiences through the seasons and its life cycle. It should be accompanied by illustrations of how the forest and its inhabitants develop over the course of their lives.

Grades 5–6

- Students at these grade levels may build upon the ecosystem level presentation of grades 3 and 4 by collecting data about the forest. Students should expand on what they have previously learned. This could include tree bores or tree cookies using the rings to show the development of the tree, or any other measurements students choose. This information should be compiled into a presentation or a poster to share with other students in the class as well as the school.

Science Vocabulary: ecosystems, habitat, seasons, tree bores, tree cookies

Recording Sheet: Through the Eyes of a Tree

Spring	Summer
Fall	Winter

APPENDICES

Appendix A: Tree Descriptions

Species 1

Name: Red Maple (*Acer rubrum)*
(See tree cookie number 1.)

Type: Hardwood

Life span: 80–130 years

Mature height: 8–22 metres

Shade tolerance: Moderate

Root depth: Shallow

Reproduction: The red maple reproduces through winged seeds that are dispersed in late spring to early summer. It can also reproduce through stump sprouts after the tree has been cut.

Habitat: Red maple is one of the most adaptable deciduous species and can grow in conditions ranging from swamps to dry sandy soils.

Uses: The wood from red maple trees, although not as highly valued as sugar maple wood, can be used to make flooring, furniture, and musical instruments. Sap from the tree can also be used to make maple syrup. Red maple buds are an important part of the winter diet of deer and moose.

Species 2

Name: White Birch (*Betula papyifera)*
(See tree cookie number 2.)

Type: Hardwood

Life span: 80–130 years

Mature height: 15–21 metres

Shade tolerance: Low

Root depth: Shallow

Reproduction: The white birch reproduces through tiny seeds that are dispersed from fall to early spring. These tiny seeds can travel many kilometres.

Habitat: Because white birch cannot grow in the shade and its seeds can travel great distances, it is referred to as a "pioneer" species. This means that it can commonly be found on sites after major disturbances such as fires and clear cuts.

Uses: White birch can be used to make flooring, furniture, and pulp, and can be burned as firewood. Long ago First Nations people used the bark to make canoes.

White birch is the provincial tree of Saskatchewan.

Species 3

Name: White Pine (*Pinus strobus)*
(See tree cookie number 3.)

Type: Softwood

Life span: 200–400 years

Mature height: 30–35 metres

Shade tolerance: Moderate

Root depth: Deep

Reproduction: The white pine's large cones are dispersed in late summer to early fall.

Habitat: The white pine prefers cool, well-drained soils but can also grow in bogs and rocky terrain.

Uses: The wood from the white pine is very valuable and is used for interior finishing. In colonial times it was a very sought-after species for masts in tall ships.

White pine is the provincial tree of Ontario.

Species 4

Name: Red Spruce (*Picea rubens)*
(See tree cookie number 4.)

Type: Softwood

Life span: 250–350 years

Mature height: 21–25 metres

Shade tolerance: High

Root depth: Shallow

Reproduction: The red spruce reproduces through cones that are dispersed in fall to early winter.

Habitat: Red spruce trees thrive in deep, rich soil along streamsides but can also grow on nutrient-deficient sites.

Uses: Red spruce is one of the most valuable species for both pulp and softwood lumber. It is also highly sought after for use in musical instruments.

Red spruce is the provincial tree of Nova Scotia.

Species 5

Name: Eastern Hemlock (*Tsuga canadensis)* (See tree cookie number 5.)

Type: Softwood

Life span: 300–400 years

Mature height: 18–21 metres

Shade tolerance: High

Root depth: Shallow

Reproduction: Eastern hemlock produces small cones that are dispersed in late summer to early fall.

Habitat: The eastern hemlock prefers cool, moist, nutrient-rich areas and is most commonly found on northern-facing slopes.

Uses: Wood from the eastern hemlock is used for rough-dimensional lumber and is great for bridges because of its rot-resistant nature. Its dense, thick foliage provides winter protection for deer.

Species 6

Name: Balsam Fir (*Abies balsamea)*
(See tree cookie number 6.)

Type: Softwood

Life span: 60–100 years

Mature height: 12–18 metres

Shade tolerance: High

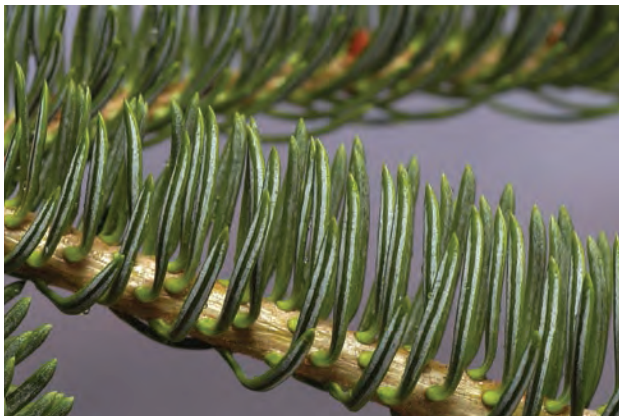
Root depth: Shallow

Reproduction: Medium-sized cones are dispersed from the balsam fir in early fall.

Habitat: The balsam fir can grow in a variety of conditions but prefers cool, moist areas.

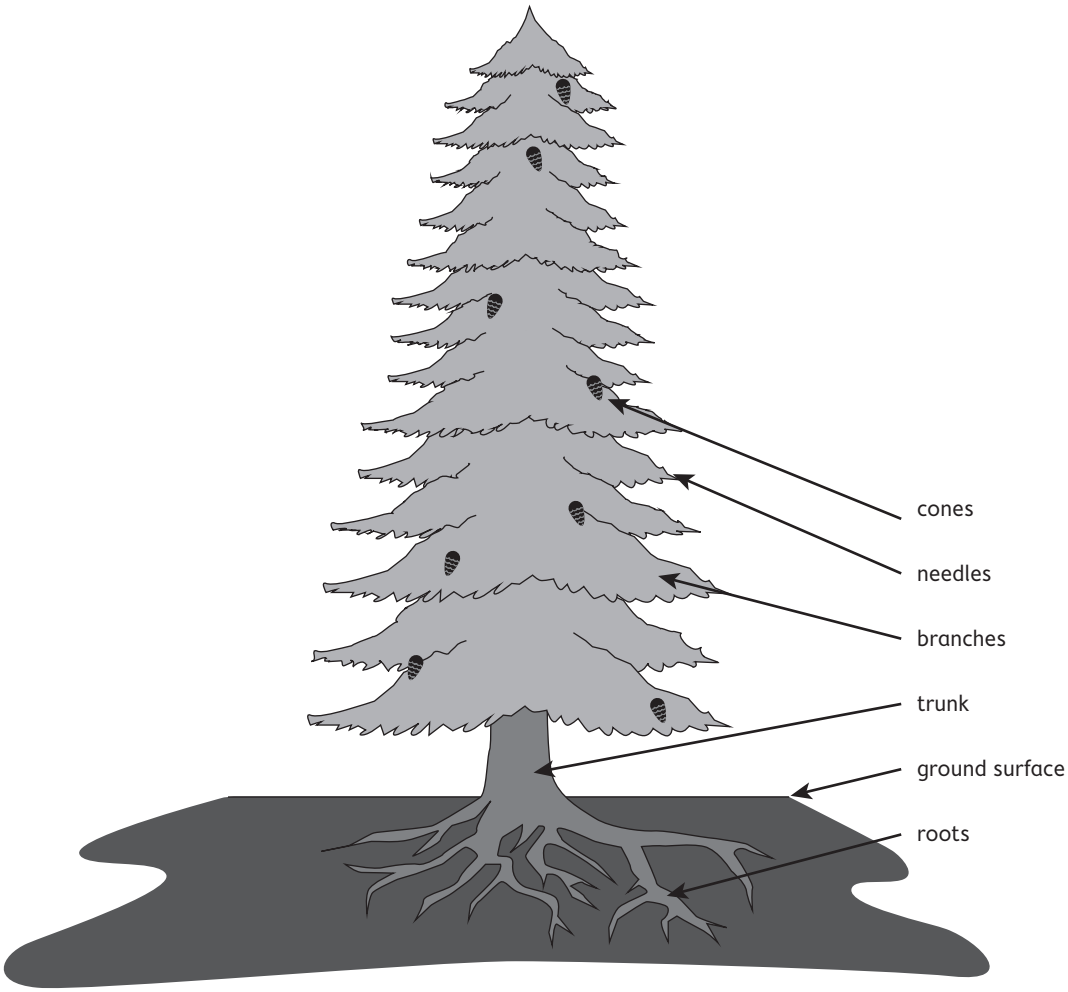
Uses: The balsam fir is most commonly recognized as a Christmas tree, but it is also used for lumber and pulp. Its resin has many medicinal purposes ranging from preventing infection to use as a cough remedy.

The balsam fir is the provincial tree of New Brunswick.

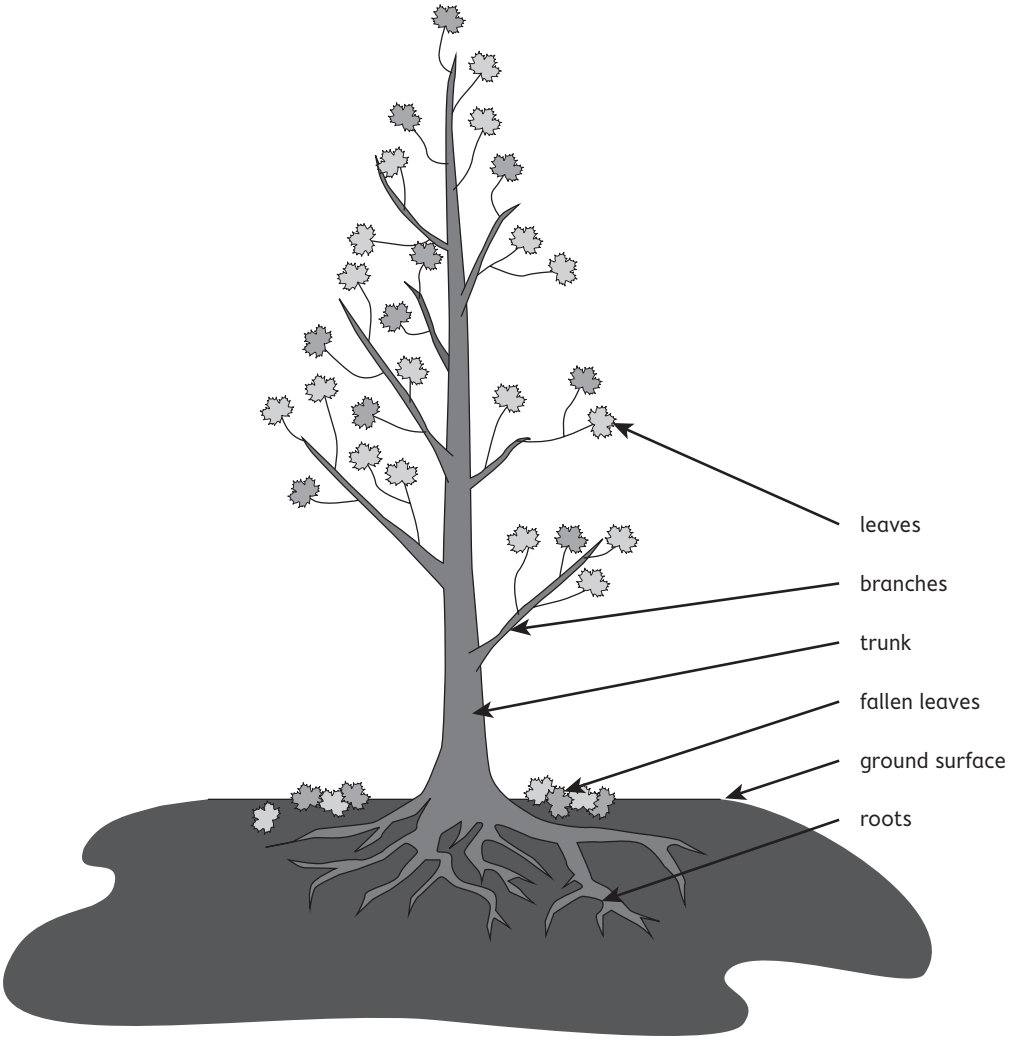


Appendix B: Coniferous and Deciduous Trees

Basic Structures of a Coniferous Tree



Basic Structures of a Deciduous Tree



Appendix C: Family Investigations–Let's Go Outside!

Outcomes:
Science Primary

Students will be expected to

Our Tree

100-1 develop vocabulary and use language to bring meaning to what is seen, smelled, heard, tasted, and thought

Science 1

Our Tree's Shadow

100-14 observe and describe daily and seasonal changes in heat and light from the sun

Science 2

Weather Elements and Trees

100-27, 200-4, 201-5 describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes

Science 3

Exploring a Part of a Tree

100-28 identify and describe parts of plants and their general function

Science 4

A Tree and Its Home

205-5, 205-10, 206-6 construct and/or maintain a model of a natural habitat and, through observations, suggest improvements to make it more habitable for organisms

Science 5

Preserving Our Leaves

301-9, 205-5, 301-10 observe and identify changes in an object's appearance, state, and/or reversibility and classify it as a physical change or not

Science 6

Then and Now

204-1, 108-8 propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources

Background Information:

- The following investigations are meant to bring science into homes. Students should be encouraged to take an investigation home to do with a family member. Each investigation has a recording sheet for the student and their family member to fill in. Students should be encouraged to bring the recording sheet (models, designs, etc.) back to school and share their experience with the class. Recording sheets can be printed on card stock or photocopy paper. Outcomes from English language arts and visual arts can be incorporated into these investigations.

Our Tree (Science Primary)

With a family member, find a tree that you would like to explore. Illustrate and describe the tree in the space provided. Answer the questions below.

Our Tree

Do you think your tree is alive? How do you know?

Our Tree's Shadow (Science 1)

With a family member, choose a tree you would like to explore. Observe the tree during a sunny day when it produces a shadow and during the evening when it is dark. Illustrate the tree and its shadow during the day and what it looks like in the evening. Answer the questions below.

Our tree during a sunny day.

Our tree when it is dark outside.

Did you see your shadow when you saw the tree's shadow? Was your shadow the same size as you? Why or why not?

Weather Elements and Trees (Science 2)

With a family member, choose a tree you would like to explore. You can observe the tree when it is clear outside and then when it is raining or snowing. Illustrate and describe the tree when the weather is clear and when it is raining or snowing. Answer the question below.

Our tree when the weather is clear.	Our tree when the weather is _____.

How might a tree protect animals when it is raining or snowing?

Exploring a Part of a Tree (Science 3)

With a family member, choose some trees you would like to explore. From these trees you can gather a variety of leaves and/or needles. Discuss with your family member the types of shapes and patterns that can be found with the leaves and/or needles you collected. Illustrate the various leaves and/or needles you found by doing leaf rubbings. (Put a plain piece of paper over the leaf/needles, take the paper label off of a crayon and use the side of a crayon to rub the area covering the leaf/needles. The shape and design of the leaf/needles will be transferred onto the paper.) You may wish to make a collage with your rubbings, cutting them out, and placing them in a pattern on paper. You may also want to do a tree rubbing by placing a plain piece of paper on the bark of a tree and rubbing a crayon over the paper.

A Tree and Its Home (Science 4)

With a family member, choose some trees you would like to explore. Take notes and/or make sketches of how close the trees are and what is growing around them. From these notes and sketches, draw an illustration of the trees' habitat. You can also make a model of the habitat you have illustrated (using a shoe box, a cereal box, etc.). If you are in an urban area where there is not a lot of trees grouped together, you may wish to make a model of an individual tree.

Illustration and sketches of our trees and their habitat.

Preserving Our Leaves (Science 5)

This investigation will have the best results if carried out in the fall or early winter. You will need an iron, ironing board, wax paper, paper towels, and a cloth. With a family member, explore the habitat around where you live and look for various types, colours, and sizes of leaves.

- Place paper towel on the ironing board to protect its cover.
- Make sure the leaves are clean and dry by ironing them between two pieces of paper towel or cloth on the lowest setting without steam.
- Cut wax paper so that when it is folded, the leaf being waxed will be covered completely on both sides.
- Place the leaf between pieces of wax paper.
- Set the iron on a medium heat with no steam and iron the wax paper (covered by a cloth) with a slow, even motion. This will melt the waxed paper under the leaf.
- After the wax paper and leaf has cooled, open the wax paper and remove the leaf. The leaf is now coated with a layer of wax and is ready for display.
- The waxed leaves may be displayed on paper with the type of tree they came from identified below. See sample below.

Our Waxed Leaves

Maple Leaf

Oak Leaf

Then and Now (Science 6)

With a family member, choose an area where there are trees. Look at the land around the trees. Discuss what might have been in the area where the trees are now and how humans have had an effect on them. Imagine what the tree may have been exposed to as it grew. You may wish to research the area to learn its history. Make an illustration of how the area around the trees looks now and how it looked (or may have looked) in the past. Answer the questions below.

Area around the trees in the past:

Area around the trees now:

How did the area change over time? Do you think the changes improved the area? Why?

Glossary

acorn—the fruit of the oak tree, with a smooth nut in a rough cup-like base

adult—mature; grown-up

analyzing—examining the structure of something in detail

animal signatures—any sign that an animal has left in its environment (i.e., dung, rubbed bark)

apex—the highest point; the tip or pointed end

archeologist—a person who studies human history and prehistory through the excavation of sites and the analyzis of physical remains

baby—a thing that is small of its kind (e.g., sapling, baby corn)

bark—the tough protective outer sheath of the trunks, branches, and twigs of trees or woody shrubs

baseline—a line used as the base or starting point

blade—the flat, narrow, usually pointed leaf of grass and cereals; the broad, thin part of a leaf apart from the petiole

branches—a limb extending from a tree or bough

cambium—cellular plant tissue responsible for the increase in girth (thickness) of the stems and roots of a plant; the material forming the annual rings of a tree

camouflage—the natural colouring of an organism that enables it to blend in with its surroundings

canopy—the top of a forest formed by the leaves and branches of the trees; the density of the canopy determines how much light reaches the forest floor

chlorophyll—the green colour found in most leaves responsible for absorbing light to convert into energy for food (photosynthesis)

circumference—the enclosing boundary, especially of a circle

classify—arrange in classes or categories

collecting—to gather or accumulate a number of items

community—all the people living in a specific place

condensation—any condensed material, especially water on a cold surface

coniferous—a softwood tree or bush that has needle-like leaves and bears its seeds in cones; also referred to as a conifer

connection—two or more things that are joined together; the act of connecting; the state of being connected

conservation of mass—a law of physics that states that the total mass of a system must remain constant over time

crown—the part of a plant just above and below the ground; the leaves and upper branches of a tree

cycle—a recurrent series or period of events

deciduous—a hardwood tree or bush that sheds its leaves seasonally every year

dichotomous—a division into two

domesticated—a plant or animal kept by humans for work, food, or companionship; not wild

drought—the continuous absence of rain; dry weather

earthquake—a convulsion of the superficial parts of Earth due to the release of accumulated stress as a result of faults in strata or volcanic action

ecologist—a person who studies the branch of biology dealing with the relations and interactions between organisms and their environment, including other organisms

ecosystem—an interrelated and interdependent community of plants and animals and their habitats

energy—the quantity of work a system is capable of doing; usually measured in joules

evaporation—the process of turning from a solid or liquid state to a gaseous state

evidence—the available facts, circumstances, etc., supporting or otherwise; a belief, proposition, etc., indicating whether or not a thing is true or valid

flood—an overflow of water beyond its normal confines

foliage—leaves

food chain—"who eats who" in the ecosystem

forest floor—the layer of decomposed organic debris, such as leaves, branches, bark, and stems, forming the upper soil of a forest

forest health—the condition of a forest based on ecological indicators

forester—a person in charge of a forest or skilled in forestry; a person or animal living in a forest

ground cover—plants or plant material that covers the forest floor

habitat—the place where an animal lives

hardwood—a deciduous tree; one that loses its leaves in the fall

heartwood—the dense inner part of a tree trunk yielding the hardest timber

horizontal axis—the axis of a chart that is parallel to the plane of the horizon (*x*-axis); the line that runs from left to right

hurricane—a tropical cyclone with winds greater than 65 knots (75 mph / 120 km/h) accompanied by heavy rain

inferring—making suggestions based on facts and reasoning

leaf litter—dead plant material, such as leaves, bark, needles, and twigs, that has fallen to the ground

lichens—any plant organism of the group *Lichenes*, composed of a fungus in symbiosis with an alga and having a green, gray, or yellow tint and growing on and colouring rocks, tree trunks, walls, etc.

logbook—a book containing a detailed record of things done or experienced

magnifying glass/lens or magnifier—a convex lens used to show an item at an increased size for easier viewing

maple trees—a tree with usually lobes leaves, frequently grown for shade, ornament, wood, or its sap

margin—the edge or the border of a surface

measurement—the act or instance of measuring the size, quantity, or extent

midrib—the central or middle rib of a leaf

moss—any small plant of the class Musci, growing in dense clusters on the surface or the ground, in bogs, on trees, stones, etc.

needles—the leaves of coniferous (evergreen) trees

non-timber forest products (NTFP)—any product that comes from the forest that is not wood

observation—an act or instance of noticing; the scientific study or investigation of a phenomenon, etc.

organism—a living thing consisting of at least one cell; an individual plant or animal

pests—a destructive animal, especially an insect that attacks crops, livestock, etc.

petiole—the slender stalk joining a leaf to a stem

phloem—the tissue conducting food material in plants

photosynthesis—the process in which the energy of sunlight is used by organisms, especially green plants, to synthesize carbohydrates from carbon dioxide and water

population—the total number of inhabitants in a place

predator—an animal naturally preying on others

predicting—making a statement about the future or something that hasn't happened yet

prey—an animal that is hunted or killed by another for food

pulp—soft, shapeless mass of ground wood used to make paper

qualitative—concerned with or depending on quality or qualities

quantitative—concerned with quantity or quantities

research—an endeavour to discover new or collate old facts by the scientific study of a subject or by a course of critical investigation

roots—the part of plants normally below the ground attaching it to Earth and bringing it nourishment

rubbing—an impression or copy made by rubbing

sapling—a young tree

sapwood—the soft outer layers of recently formed wood between the heartwood and the bark

seasons—the four periods of time into which a year is split (spring, summer, fall, winter); a time of year determined by the climate

seed—a flowering plant's unit of reproduction capable of developing into another such plant

senses—any of the faculties, as sight, hearing, smell, taste, or touch, by which humans and animals perceive stimuli originating from outside or inside the body

shade—a place or area sheltered from the sun; something that excludes or moderates light

snowstorm—a heavy fall of snow

softwood—the wood of pine, spruce, or other conifers; trees producing such wood

soil—The naturally-occurring unconsolidated or loose material at the surface of the earth that is capable of supporting plant and animal life.

soil quality—the health of the soil that determines its continued capacity to function as a vital living ecosystem that sustains plants, animals, and humans

specimen—an individual or part taken as an example of a class or whole, especially when used for investigation or scientific examination

study site—a specific area being studied

suitability—well-fitted for a specific purpose

tactile—the sense of touch

transpiration—the process of evaporation of water from a plant, particularly from the leaves through pores called stomata

temperature—the degree or intensity of heat contained in a substance; can be perceived by touch as hot or cold

textures—the surface of a thing assessed in terms of its roughness, smoothness, softness, etc., by the sense of sight and touch

timber—wood that has been prepared for use as building material

transect line—a line or strip across the earth's surface or through any object, along which a survey or observations are made

treatment—subjection to the action of a chemical, physical, or biological agent

tree bores—a cylindrical piece of tree removed with an instrument (borer) for the purpose of studying the internal condition and structure of a tree

tree cookie—a cross section of the trunk of a tree

tree rings—a ring in the cross section of a tree, produced by one year's growth

trunk—the main stem of a tree as distinct from its branches and roots

variable—something that is not constant; can be varied or adapted; tending to change in structure or function

vein—a slender bundle of tissue forming a rib in the framework of a leaf; a streak or stripe of a different colour in wood, marble, cheese, etc.

vertical axis—the axis of a chart that is perpendicular to the plane of the horizon (y-axis); the line that runs up and down

wildlife—wild animals

windstorm—a storm with heavy wind, but little or no precipitation

woodlot—a treed plot of land, especially on a farm

young scientist—a young person using scientific processes of investigation

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