VISUAL AIDS (VIDEOS) FOR PRE-FIELD TRIP PREPARATION

Videos are an excellent classroom aid to prepare students prior to the field trip. Following are a list of suggested resource titles that may be available from your School District Learning Resource Centre. This is not a comprehensive list, neither may your Learning Resource Centre stock all these videos, but it is a place to start. Noted below are title of the resource, name of distributor/producer, year of production and length. Please refer to your updated Learning Resource catalogue for more extensive description and NEW resources available for classroom use for Intermediate/Junior Secondary students.

- **The Benefits of Insects.** National Geographic, 1990. 17 Minutes.
- **Bill Nye The Science Guy-Biodiversity.** PB, 1994. 26 minutes.
- **Bill Nye The Science Guy-Food Web.** PB, 1994. 26 minutes.
- **Biomes: Introduction.** COR, 1989. 12 minutes.
- **Champions of the Wild Series-Grizzlies.** NFB, 1997. 25 minutes.
- **Communities of Living Things.** GWF, 1976. 15 Minutes.
- **Creatures of the Sun-A Natural History of the Painted Turtle.** NFB, 1997. 24 minutes.
- **Cycles of Life-Ecosystems in the Biosphere**. MLC, 1996. 27 minutes.
- **The Digital Field Trip to the Wetlands.** MLC, 1997, Computer Software, 1 CD ROM.
- **Ecology Series-Food Chains.** BCLC, 1992. 14 minutes.
- **Ecology Series-Succession.** BCLC, 1992. 14 minutes.
- **An Ecosystem: A Struggle to Survival.** NGS, 1975. 22 minutes.
- **Ecosystems: Nature in Balance.** Canadian Learning, 1993. 13 minutes.
- **I Know a Pond.** CYMA, 1973. 30 minutes.
- **The Marsh: Nature's Nursery with David Suzuki.** MAG, 1988. 15 minutes.
- **Mountain Habitat Series: Mountain Forest.** KAR, 1981. 15 minutes.
- **Nature's Ever Changing Community.** MAG, 1973. 14 minutes.
- **Profiles of Nature: Life in a Pond.** KegPro, 1985. 23 minutes.
- **Replanting the Tree of Life.** MC, 1986. 10 minutes
- **Secrets of the Pond.** Image, 1987. 29 minutes
- **Still Life For Woodpecker?** Thomas Howe, 1992. 27 minutes.
- **The Tree.** National Film Board, 1977.
- **Turning Down the Heat: The New Energy Revolution.** National Film Board of Canada, 1999. 47 minutes.
- **A Walk in the Forest.** MCB, 1976. 30 minutes.

Activity 1: Eco-What? Let's Get the Language Straight!

Teacher Information:

Ecosystem represents an idea more than a place or set of things. Ecosystem combines two words: ecology with its connection to the idea of 'eco' meaning home or the knowledge of home being nature with 'system', a set of interactions overtime among living or non-living elements.

For the purpose of the Classroom with Outdoors, ecosystem consists of "plants and animals interacting with each other and with their non-living environment".

Definitions of Ecosystem:

- "An interacting and interrelated community of living and non-living things that constantly changes". Wild BC, Wildlife Trees of British Columbia
- "Any area of nature that includes living organisms and non-living substances interacting to produce an exchange of materials between the living and non-living parts." E. P. Odum
- "Ecosystem describes a system in which there are living organisms, non-living components and a primary source of energy, the sun". Project Wild
- "Ecosystems may be viewed as a set of elements, living and nonliving, interacting overtime, within a defined local". Project Wild
- "Ecosystem is a balanced community of creatures living together, all needing each other and using non-living things such as soil, water and air." David Suzuki, Looking at the Environment.
- "Ecosystem is a term of convenience so that we can draw an imaginary line around a section of the larger world and decide to treat its elements separately from the rest." Project Wild

ACTIVITY 1

Suggested Timeline:
One language arts period

Materials Required:
Acetate of Definitions of Ecosystems
Photocopy double-sided Ecosystem Glossary of Terms

Setting:
Indoors

Summary:
Ecosystems have a language of their own. Classroom with Outdoors Educators are the translators that connect students to ecosystems. Part of this translation is a common vocabulary of terms.

All ecosystems have a foundation of the four key non-living elements, essential for all life on earth. These elements are critical and are continually interacting with each other. They include:

Soil – the upper layer of the earth in which plants grow. Soil is the thin skin that covers our planet. It has evolved over billions of years through the weathering of rock as it is broken down by physical and or chemical processes. Along with minerals soil contains organic matter from decomposed plants and animals broken down largely by fungi and bacteria. Between the broken up rock minerals and organic matter, the pores are filled with water and air. 98% of the world's food comes directly or indirectly from soil. Soil provides plants with minerals and nutrients and transports water to plant roots.

Sunlight – radiant energy that illuminates and warms the Earth's surface. All living things need the sun's energy. Plants use the sun's energy to make sugar from C02 and H20, a process called photosynthesis. Sunlight and soil are used directly by plants and indirectly by animals. Plants get minerals from the soil. Animals get their nutrients and energy from plants or animals that eat plants.

Air – a most precious element on Earth. Without it for a matter of minutes we would die or suffer from brain damage. Air is a mixture of 78% nitrogen, 21% oxygen, .9% argon, .04% carbon dioxide and other gases. During plant photosynthesis, carbon dioxide is used to build sugar. Oxygen helps many plants and animals metabolize sugar in their cells. This consumption of sugar supplies energy to living things.

Water – the combination of two colourless and odorless gases – hydrogen and oxygen. Our bodies are 70% water which is constantly recycled and in need of replenishing. It is needed to dissolve and carry nutrients in solution for transport of food and waste. The process of photosynthesis also requires water. We constantly need to re-supply our bodies with water. Humans can live without food for a few weeks but would die without water after about 4 days.

ECOSYSTEM - GLOSSARY of TERMS

(Definitions taken from *Project Wild, Oxford Concise Dictionary, Forests in Focus and Water Stewardship*)

Abiotic: a non-living factor in an environment (e.g. air, water, sunlight, wind, snow, flood)

Animal: a living organism which feeds on organic matter (plants or animals that eat plants) with specialized sense organs and nervous system with the ability to respond rapidly to stimuli.

Biotic: relating to living things

Carnivore: a meat eater

Community: an association of organisms plant and animal living together in a common environment, each occupies a certain position, interacting with each other by food chains and other interrelations.

Consume: eat or drink.

Consumer: utilizes the producer or plants for its food; it may in turn be used as food by a secondary consumer. A rabbit is a primary consumer while a lynx would be a secondary consumer.

Decomposer: those organisms (bacteria, fungi, protozoa, insects, etc.) which convert dead organic materials into inorganic materials; a plant or animal that feeds on dead material and causes its mechanical or chemical breakdown.

Ecosystem: An ecosystem consist of plants and animals interacting with each other and with their non-living environment (soil, water, air) over time in a defined area driven by the energy of the sun.

Food chain: the transfer of food energy from the source in plants through a series of animals, with repeated eating and being eaten. A simple food chain would be a grass, eaten by a grasshopper, eaten by a bird.

Food web: an interlocking pattern of food chains

Forest: a complex vegetation community dominated by trees and other woody shrubs that are growing close enough together that the treetops touch or overlap creating various degrees of shade on the forest floor.

Fresh water: clean, unpolluted water without salt in it.

Grassland: a vegetative community in which grasses are the most conspicuous members.

Habitat: the life range of an animal this includes food, water, shelter and space all suitably arranged to meet the animals' needs.

Herbivore: a plant eater

Microorganisms: an organism microscopic in size, observable only through a microscope.

Old-growth Forest: climax forest communities where there is a combination of very old trees (120-250+ years old) both live and dead as well as immature (<80 years) and mature (80-120 years) trees growing among them, and which has been disturbed little by people.

Omnivore: an animal, which eats both plant and animal materials

Plant: any living organism of the kingdom Plantae which can make its own food and oxygen from chlorophyll, sunlight, carbon dioxide and water and lacks the ability to move around.

Predator: an animal that kills and eats other animals.

Prey: animals that are killed and eaten by other animals.

Producers: food makers namely plants.

Species: a population that is more or less alike, that is able to breed and produce fertile offspring.

Stewardship: the concept of responsible care taking of the environment, based on the fact that we do not own resources, but simply look after the resources and are responsible to future generations for their condition.

Succession: the orderly, gradual and continuous replacement of one plant or animal by another.

Symbiosis: a close living relationship between organisms

Water cycle: the continuous circulation of water in systems throughout the planet. Involves evaporation, condensation, precipitation, runoff, and transpiration.

Watershed: all the land area that drains into a particular body of water

Wetland: an area that is waterlogged for all or part of the year so that the soil remains soggy and water-loving plants and creatures that are adapted to these conditions live there.

Wildlife: plants and animals that are not tamed or domesticated.

When reviewing the words help students to understand the meaning of terms using prefix or meaning of the word and the suffix, which changes the function of the word in a sentence.

Common Eco Prefixes	Common Eco Suffixes
Bi-two Bio-life De-removal, reversal, from Eco-home Inter-between Micro-small Pre-before Re-back/again Sub-under	Able/ible-capable of Ance/ence-state of Eur/ist/er/or/ant-one who Dom-condition of Ful-full of Less-without Ment/ness-state of Ology-study of Ours/ious-full of Tion/sion – state of Y-full of

Activity 1: Eco-What? Let's Get the Language Straight!

Student Activity:

1. Lead a discussion. What is an "ecosystem"? The word is more of an idea or a concept than a thing. There are many ways to define ecosystem. An ecosystem can be as large as a planet and as small as a puddle or log. For students to decode terms it helps to break down the word – eco=home + system=interactions over time. Make an overhead of the various definitions provided above. Read them as you project them on the screen. As you read the various ECOSYSTEM definitions, ask the student to listen for key words that are repeated in the various definitions e.g. interacting, living, non-living, system, etc. Record these common words on the board. Have students write their own definition of an ecosystem. Share their definitions with the class.

ACTIVITY 1 OBJECTIVES

Define terms used to discuss ecosystems by breaking them down into affixes, prefixes (bio, micro, pro) and suffixes (ology, ment, y).

Correctly spell key terms.

Recall terms and utilize them in their vocabulary when discussing ecosystems.

2. In their scribblers ask the students to create three columns with the following headings: **scientific term, my own definition, and image/picture/symbol.**
3. From the Ecosystem – Glossary of Terms, choose a selection of grade appropriate words. For example: Grade 4 - animal, carnivore, omnivore, producer, consumer, fresh water, and wildlife. Grade 5 – forest, old-growth forest, watershed, prey, habitat, biotic, fresh water. Grade 6 – animal, carnivore, consumer, decomposer, food chain, micro organisms, plant, species, wildlife. Grade 7 – ecology, food webs, stewardship, succession, producer, consumer, decomposer, symbiosis.
4. Have students use the classroom dictionary, biology textbook, or the previous glossary to:
   i. define the following terms by locating the glossary words assigned by the teacher in column #1;
   ii. write their own definition in their words in column #2; and
   iii. draw an image/picture/symbol of the term in column #3.
5. Use the terms as part of a spelling test.

Activity 2: Water Magic

Teacher Information:

Earth is the only planet in our solar system with water, which covers 70% of its surface. Funny, just like the Earth, we too are mostly water – almost 2/3 our body weight. Water is in every one of our cells and it moves continuously in our bodies carrying various body fluids from blood to saliva.

Water is truly a magical potion. It comes not only in liquid form but also a solid and gas. It dissolves many different materials like rock, salt and soil. Water can be black to turquoise in colour and it can store large amounts of heat, releasing it slowly into the air. Next to air, it is what our body needs most. Without water in 4 days dehydration occurs, a condition that is life threatening.

A water molecule is polar, attracting other molecules that stick together in drops. Imagine a water molecule looks like a Mickey Mouse head, with an oxygen atom as the head and hydrogen, the lightest of all the known atoms forming the ears. Hydrogen is positive and oxygen negative. Hydrogen (+) attracts the oxygen (-) proving likes repel and unlike attract. So water is a mass of weak attractions that stick together forming beads or droplets with surface tension.

ACTIVITY 2

Suggested Timeline:
One science period

Materials Required:
Part A: Plastic yogurt tub or clean shallow dish, water, paper clip, fork, eyedropper, dish detergent.

Part B: Glass or beaker of water, red food colouring, celery sticks with leaves on top.

Part C: Clear plastic cup, water, felt pen.

Part D: Kettle, water, thermometer, graph paper, pan or pot lid.

Setting:
Indoors

Summary:
Water is a magic potion that has many fascinating properties.

Water Magic taken from "**Water Stewardship: A Guide for Teachers, Students and Community Groups**" by Dr. Milton McClaren, Kim Fulton and Chris McMahen. Ministry of Environment, Lands and Parks. Government of B.C., 1995.

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Activity 2: Water Magic

Student Activity:

Activity 2A: Tension Trick

ACTIVITY 2 OBJECTIVES

Discover the many properties of tap water. Be prepared to transfer this knowledge with the properties of water in natural ecosystems.

- Wash and dry hands thoroughly.
- Put some water into a clean dish or yogurt tub.
- Put a paper clip on a fork and lower it slowly onto the surface of the water. Think about why the metal floats and doesn't sink.
- Once the clip is floating, use an eyedropper to carefully add one drop of dish detergent, but be careful not to create a splash or disturb the water and paper clip. What happens to the paper clip?

Explanation of the Trick:

The electrical charges of water also explain why we need to use soap for washing. The soap molecules get between the water molecules and break up the clumps of water, making water wetter! You may have tried to wash without soap. The water beads or blobs on the skin making hard to get wet and remove the dirt. Soap breaks up the attraction between the water molecules making water wetter!

Teacher Led Discussion:

Many aquatic insects skate on the surface of the water due to surface tension. If this was impaired by pollution such as phosphates from washing detergents, how could this affect water striders, which are eaten by fish, which are caught by … and the effect goes on.

Activity 2B: Capillary Action

- Get a glass of water and stir in several drops of red food colouring.
- Place a stalk of celery into the coloured water and leave it over night.
- What happened?

Explanation of the Trick:

Due to the fact that the water molecules are stuck together, water will rise in a tube through capillary action. It is why trees (like the celery) can pull water over 100 metres upward from the roots to the crown of the tree far above the forest floor.

Teacher Led Discussion:

Trees are some of the thirstiest plants on earth. The water that they pull up to the crown of the trees moves into the surrounding air thereby moderating the climate and adding moisture to the air, which may condense as dew back into the forest. What happens to climates when large numbers of trees are removed?

Activity 2C: Ice Makes Dense Sense

- Pour water into the cup.
- Mark the level of the water with a felt pen on the outside.
- Put the cup in the freezer and let the water freeze solid.
- Take the container out and compare the level of the ice with your original mark.

Explanation of the Trick:

Ice or solid water expands when it freezes at 0C perhaps causing lids to pop off or containers to crack. Ice floats on top of liquid water. It floats because it is less dense. In fact there is less actual matter in a litre of ice than in a litre of water. Suppose ice didn't float and instead sank to the bottom when the water temperature reached 0C. Would this make a difference to life on Earth?

Teacher Led Discussion:

If ice sank it would displace water on a continuous basis causing lakes and oceans to overflow their natural levels. Ice also creates a bridge for animals and humans to travel across in winter. What will happen as the climate changes and ice melts?

Activity 2D: Letting off Steam

- Pour water into a kettle.
- Record the temperature of the water. Heat up the water.
- Every three minutes take the water temperature and record the results.
- Measure the temperature when the water begins to boil and record the results.
- BUT BE CAREFUL – boiling water and steam can burn your skin.
- Ask for help if you are unsure what to do.
- Place the pan or put lid over the steam.
- Continue boiling for another 5 minutes. Take the temperature again.
- Turn off the heat and take the temperature again.
- Describe what you saw. Once the water began to boil, did it get any hotter? What would happen if you continued to boil the water and didn't turn off the heat? What happened to the steam on the lid?

Explanation of the trick:

Water forms a gas or water vapor at 100 C at sea level. When it cools it condenses back into water droplets and when it gets too heavy it falls. The water molecule is not lost; it just changes its form from gas to liquid. Water will evaporate as gas into dry air even when the temperature is low. Think closes drying outside. The sun's energy evaporates water.

Teacher Led Discussion:

Water evaporating and condensing illustrates the continuous cycle of water through nature. Water is a finite resource. The Earth is a closed system with a fixed number of water molecules – no more are being made and none are taken out of the system. What does change however on a daily basis is the amount of clean, fresh water, suitable for humans without the need for advanced treatment, which is costly and not available to everyone on Earth. Can you trace where your communities drinking water comes from? Where does waste water go when it leaves your home? Trace the route of the water from the school to your community's primary, secondary and tertiary treatment facility and finally discharge back into the ecosystem.

Activity 3: SOIL – Building Blocks of Life

Teacher Information:

The various parts of our natural environment – air, water, soil, plants and animals – all work together to make our planet healthy and a good place to live. If we endanger one element, the other partners are badly affected too. Soil is the forgotten partner in our complex natural environment. But without healthy soil, no living think on our planet could survive. Most of the food the students eat comes from or depends on the soil.

Soil covers the earth like a layer of skin. The upper most fertile layer is the topsoil and averages only 5-7 inches or 12-18 cm thick. In this narrow band, we grow most of the foods we eat.

Soil is a complex, dynamic ecosystem sustaining physical processes and chemical transformations vital to life on Earth. Soil takes hundreds to thousands of years to form. It is made up of weathered rock particles (clay, silt, sand), nutrient ions (calcium, potassium, etc.), dead organic plants and animals, living animals (mites, springtails, worms, millipedes, etc.), microorganisms (bacteria, protozoa, algae, etc.), gases and water. These plants and animals feed on each other and nutrients in the air. One organism's waste becomes another's meal. They utilize the moisture in the soil and enrich it with their waste and dead bodies. Rich, dark, humus is black gold for plants and animals.

ACTIVITY 3

Suggested Timeline:
One science period

Materials Required:
Rocks, sand, flour, leaves or grass clippings, air, water, gummy worms, ants in a container, empty container, chef hat or apron, glass pickle jar, two jars of soil samples taken from different locations (e.g. school yard, home flower bed), magnifying glasses, microscopes(optional), newspaper.

Setting:
Indoors

Summary:
Soil is the thin skin that covers the land and is what grows the food that sustains us.

Recipe for soil is simple:

- Start with parent rock that is ground up into minerals due to physical weathering caused by the sun, water or wind or chemical weathering. Water is the most powerful of all dissolving agents. These particles could be large enough to see like sand or powdery like silt. Most soils contain sand, silt and clay.
- Add air and water. Soil is part solid, part liquid and part gas. Minerals and organic matter makes up the solid portion. Spreading through the soil is a network of spaces called pores that are filled with water and air. When the roots of plants take up water, the space is filled by air. When rain falls the water filters down through the pores in the soil and pushes out the air. Water trapped in the soil is called groundwater.
- Combine with dead plants and animals to become part of the soil's organic matter. Dead things form the diet of billions of earthworms, bacteria and microorganisms. The process of breaking down dead materials is called decomposition. The work of the micro gang is never done because plants and animals are constantly dying. When plants and animals

are completely decomposed or rotted they create a nutrient rich matter called humus, which is important to plant growth and helps soil to hold its moisture.

If you are what you eat then your name is mud. Soil directly supplies 98% of the world's food growing grains like rice, corn and wheat that in turn also feed the domestic animals we depend on like cows, chickens and pigs.

From **"Our Endangered Planet: SOIL"** by Suzanne Winckler and Mary M. Rodgers. Lerner Publications Company, Minneapolis, 1994.

Activity 3: SOIL – Building Blocks of Life

Teacher Demonstration:

- Put on a chef hat or apron.
- At the front of the class have all the different components of soil. Add them systematically to the jar. Play it up like the Soil Chef.
- Shake up the jar and spin around symbolizing hundreds to thousands of years and produce a jar of soil, which you cleverly switch under the desk.

Student Activity:

1. Have the students lay out newspaper. Break them into groups and have them examine the soil samples:
   - How does it look, feel, and smell?
   - Can you see any living things in the soil?
   - Look at the soil under a microscope if possible. Can you see the spaces that can be filled by air or water? What living things do you see? Draw the animals and plants you see.
2. Measure out 50 ml of soil in a yogurt container. Pour it into a piece of rag (an old sheet works well). Tie the bundle closed with string. Weigh it and record the mass.
3. Fill up the yogurt container half full with water. Soak the soil bag for 3 minutes. Remover the bag and let the excess water drip. Weigh the bag again and calculate the mass of water in each sample by subtracting the dry weight from the wet weight.
4. Record the mass.
5. Repeat with a different soil sample.

ACTIVITY 3 OBJECTIVES

Materials Required:
Chef hat and apron.
Ingredients of soil – sand/silt/gravel, water, air, dead plants (leaves or moss), microorganisms (bacteria can't see so just improvise) and living animals (made up or rubber ants, centipedes, millipedes, springtails etc.)
Large jar;
Old newspapers;
Variety of soil samples in a yogurt container taken from: the garden, forest, school yard, ditch, etc.;
Magnifying glasses;
Microscopes and glass slides;
Paper and pencil;
Squares of old sheets;
String;
Yogurt containers;
Scale for measuring weight;
Water

Setting:
Indoors

Summary:
Students will be able to list all the ingredients of soil.

Discussion:

How did the soils feel and look when dry? Why this difference? What is the size of the parent material (broken up rock)? Is it the size of sand, silt or clay? Can you tell what type of rock it is? Which type holds more air or water? Which do you think is better for plant growth?

Activity 4: Plants – Givers of Our Daily Bread

Teacher Information:

Our world is filled with plants. Unlike animals they do not walk or talk but they do shape, modify and interact with the world around animals. They are sensitive to movement, touch, vibration and light. Plants play an integral role in the recycling of water through transpiration. Twenty five percent of the active ingredients in prescriptive drugs today come from plants. Plants directly or indirectly produce our daily bread, supply us with timber to build our homes and keep us clothed.

Plants have perfected the magic of photosynthesis, the process by which plants convert energy from the sun into chemical (or food) energy such as sugars. In doing this they consume carbon dioxide and in turn add oxygen back to the air. Plants use a compound called chlorophyll, which absorbs light and converts solar energy into chemical energy in the form of simple sugars. Plants then convert the sugar into many nutrients their tissues require. Many organisms such as animals, fungi and microorganisms eat the plants for food. It is estimated that 95% of our food comes from just 20 species of plants. Tea and coffee are the world's most popular drinks, and both are made from plants.

ACTIVITY 4

Suggested Timeline:
One science period

Materials Required:
Paper and Pencil

Setting:
Indoors

Summary:
From this brainstorm and discussion activity students recognize that all food and most building materials originate with plants. Some of the energy used in products can be reintegrated into the ecosystem while some is lost as simply waste.

Plants feed the world and give us our daily bread. Each ecosystem operates with a source of energy with the sun driving the entire system. Green plants are the 'sun catchers' that transform some of the energy by photosynthesis into plants that are food, a useable energy form for other organisms including humans.

Activity 4: Plants – Givers of Our Daily Bread

Student Activity:

Break the class into two groups – students who like to cook and those who like to build.

To help them understand the scope and nature of what plants provide for us on a daily basis, give students the following assignment.

Group 1: Cooks:

1. Develop a meal plan for a day for your family. Breakfast, lunch, dinner and snacks.
2. Make a complete grocery list to cook the meals.
3. Determine whether the ingredient is from a plant or an animal by placing a P or A beside the ingredient. Estimate the percentage of grocery list that is from plants and animals.
4. Trace the animal products back to what the animal eats to grow.
5. Which of the animal products come from wild or domesticated animals.
6. Why have animals been domesticated? (E.g. efficiency, convenience, cultural preference.
7. What are the costs to the domestication of animals to ecosystems? E.g. effect on wild plants and animals, energy used, pollution of water, prices higher.

Group 2: Engineers

1. Make a list of everyday products – hockey sticks, computer, book, backpack, cars, etc.
2. Choose 3 items. Discuss your choices with your teacher.
3. List every material used to make the product, including all the parts.
4. Are the parts biotic or abiotic in origin (see glossary of terms for definition)?
5. Where is the source for the material? Can you buy it locally, within the region, nationally or internationally?
6. Is it made from renewable or non-renewable sources?
7. How many different resources were used to make the products?
8. Describe the impact that may result from the production of this product?
9. What happens to it when it is no longer useful? Can it be reused, recycled? How is it disposed of? Within ecosystems energy, nutrients and materials are exchanged through a series of cycles of eating and being eaten called a food chain. What parts of the object are potentially dangerous to the environment? Which components will take a very long time, if ever to decompose?