

Chapter One – The Concept of Ecosystem

Introduction to the Chapter

Before students learn about a specific ecosystem, they need to know what an *ecosystem* actually is.

In the complete study unit, students learn about what constitutes an ecosystem, consider ecosystems of different sizes, and examine the flow of energy and nutrients (food chains) in ecosystems. They will learn about the fourteen major ecosystems (biogeoclimatic zones) across British Columbia.

Objectives for Chapter One

1. Students will understand the concepts of ecosystems, food chains, and food webs.
2. Students will understand that ecosystems exist on many scales.
3. Students will gain an awareness that there are fourteen major ecosystems in British Columbia, also called Biogeoclimatic Zones.
4. Students will learn the major characteristics of each of the biogeoclimatic zones in southeastern BC.
5. Students will become familiar with names of species living in the Interior Cedar Hemlock forests.

In the complete study unit, this chapter includes six sets of lesson plans:

Lesson One What is an Ecosystem?
Lesson Two Food Chains
Lesson Three Create an Old Forest Food Chain Mobile, then Web the Chains.
Lesson Four What is a Biogeoclimatic Zone?
Lesson Five Biogeoclimatic Zones of British Columbia
Lesson Six Biogeoclimatic Zones of Southeastern British Columbia

This abridged version of the Old Forest Ecosystem Study Unit includes Lessons One and Two.

Lesson One – What is an Ecosystem?

Objectives of Lesson

1. Students will be able to define the word "ecosystem".
2. Students will understand that ecosystems occur on different scales.
3. Students will understand that components of an ecosystem interact with each other.

Materials Needed

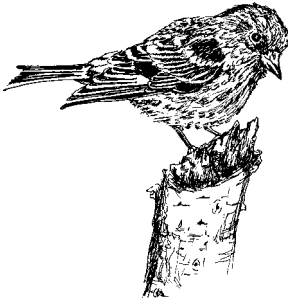
Class set of the worksheet titled "What is an Ecosystem?" (one page).

Teaching the Lesson

1. Introduce the lesson by reading aloud the first two paragraphs of the worksheet.
THIS SIMPLE DEFINITION OF AN ECOSYSTEM WILL BE RECALLED
THROUGHOUT THIS ENTIRE STUDY UNIT.
2. Have the students brainstorm a list of ecosystems and write them down on the board.
Be sure to include ecosystems of different scales.
3. Choose an ecosystem from the brainstorming list. Lead the students in constructing a chart of the ecosystem's components. Keep this chart for use in the next lesson.
 - First list the major members of the ecosystem (plants, animals, insects, etc.).
 - List the major elements of the surroundings (lake, rocks, waterfall, and mountain).
 - Make a web using these elements, to show their relative arrangements in real life.
 - Be sure to include verbs such as "eats" or "hides in" or "hunts" to show how the living things and their surroundings interact. **Verbs indicate the "processes" that link the nouns (animals) together into a dynamic chain.**
 - Relate the chart back to the definition of ecosystems. The chart should show "living and non-living components of the ecosystem, plus the interactions between them".
3. Now, hand out the worksheets for the students to complete.

Name _____

What is an Ecosystem?



An ecosystem includes all of the living things in an area, plus their surroundings, plus all the ways in which they interact with each other.

Ecosystems exist on many different scales. You can consider the ecosystem of a rotting log in the forest, of a pond or a lake, of an alpine meadow, or of an entire range of mountains.

Remember that in real life, no ecosystem can truly be isolated from the other ecosystems surrounding it or including it.

For example, a lake's ecosystem is related to the ecosystem of the stream that feeds it, and the stream's ecosystem is related to the forested mountain side through which it runs, and perhaps the forest's ecosystem has been influenced by a nearby forest fire... and so on.

1. Choose an ecosystem that occurs near your school or choose one from the list of ecosystems that your class talked about. Using the back of this page, create a web of ecosystems that are joined to yours. Put your chosen ecosystem at the centre, then list the larger ecosystems of which it is a part, and then list the smaller ecosystems that occur within your chosen ecosystem.
2. Define the word "ecosystem".

Lesson Two – Food Chains

Objectives of Lesson

1. Students will understand that nutrients are recycled through an ecosystem, but that energy is continually being used up.
2. Students will construct simple food chains.
3. Students will be able to define the words producer, consumer, and decomposer.

Materials Needed

Class set of worksheet titled "Food Chains" (three pages).

Teaching the Lesson

1. Introduce the concept of food chains as a "list of who eats who". Have students give several examples of food chains. They can put some of them up on the blackboard.
2. Have students read the text on the worksheet and answer the worksheet questions.
3. Ask students to refer back to the ecosystem chart that the class developed during Lesson One. Ask them to identify producers, consumers and decomposers on the chart. These terms are explained on the worksheet.

Clarify that:

- A food chain shows one of several possible pathways along which nutrients and energy can flow through an ecosystem.
- A food web is a series of interlocking food chains.

A Challenge for Students Who Want to Investigate Further

- Plants are able to fix energy from sunlight, through photosynthesis, and only plants are photosynthetic. Can students find another other chemical process by which natural systems fix energy? Have students research hydrogen sulphide reducing bacteria, which are found near deep ocean vents, and form the basis of an entire food chain that is independent of sunlight. These bacteria are chemosynthetic, not photosynthetic.

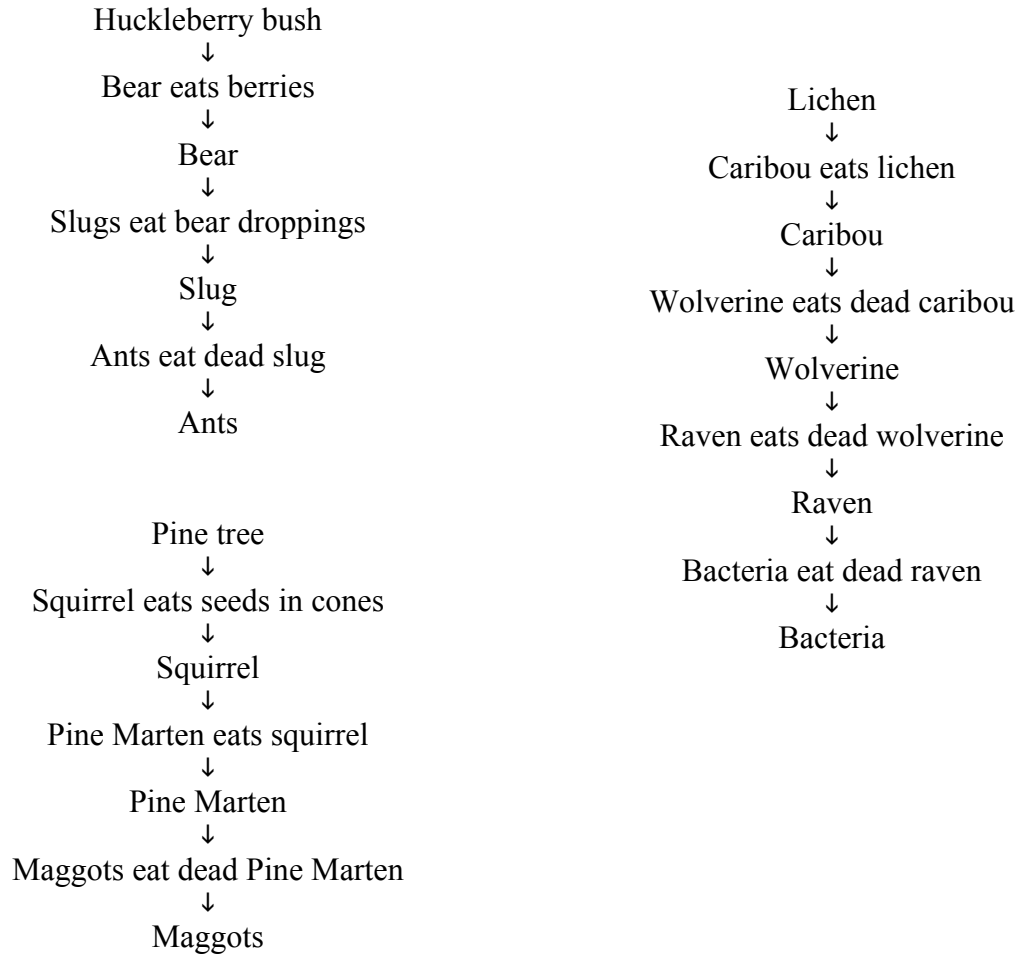
A Story-Writing Activity to Reinforce the Food Chain Concept

Read the book "A Tree in the Forest", by Carol Reed-Jones, published by Dawn Publications, Nevada City, California (1995). This wonderful picture book follows the pattern of the story "This is the house that Jack built" to describe a food chain in an old forest.

Students can follow up the reading with the following activity:

1. Draw a diagram of the ecosystem described in the story.
2. Write a similar style of story for a food chain of their choice.

Some Examples of Food Chains:



Food Chains

1.

What ties ecosystems together? The simplest answer is "food". Food is continually being passed through an ecosystem.

Within an ecosystem, nutrients are recycled as living things go about their daily business of eating food and excreting waste products. All living things exist as part of a nutrient recycling chain - an enormous chain defined by what eats what. This is called the **food chain**. Food chains are the pathways along which nutrients pass through an ecosystem.

Recycling nutrients in the ecosystem is important because only plants can create new nutrients by combining molecules from the soil or air. Not all of the building blocks required by plants are readily available, and they must be carefully conserved within the ecosystem. Other members of the food chains re-use the nutrients assembled by plants.

Think of food as something other than a tasty item you like to eat.

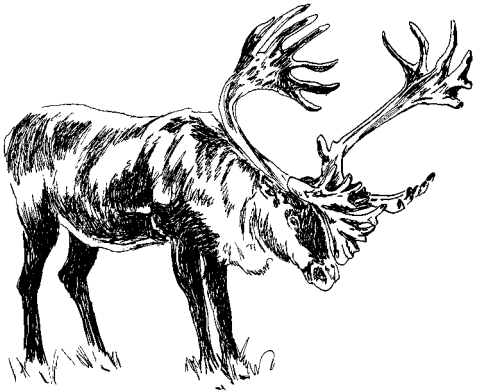
Try thinking of it on a more basic level -picture food as packages of nutrients and energy.



Blueberries are producers.

2

Energy is also passed through the food chain. **But unlike nutrients, energy is continually being lost.** Energy is used up as organisms grow, digest, reproduce, and move around. Food chains require constant supplies of new energy to make up for the continual losses. Fortunately for all of us, nature has devised ways to capture new energy. The most common way is through **photosynthesis**, the process by which green plants use the sun's energy to build sugars out of carbon dioxide and water.



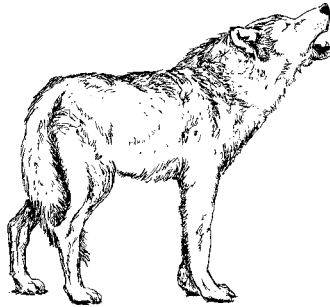
Mountain Caribou are consumers.

Because green plants are able to capture this energy, and make it available to other living things, green plants are called **producers**.

Other living things take advantage of the ability of green plants to capture the sun's energy. They capture the plants! Creatures that depend in some way upon plants to capture energy are

called **primary consumers**.

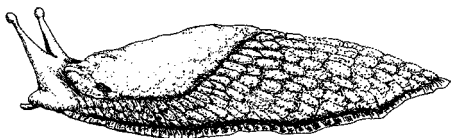
Some consumers eat plants directly (example, Mountain Caribou) and they are called primary consumers. Other consumers eat the primary consumers (example, wolves) and they are called **secondary consumers**.



Wolves are secondary consumers.

Some consumers eat both producers and other consumers (examples, bears and humans). These consumers eat from several levels of the food chain.

Decomposers, such as slugs, earthworms, fungus, and bacteria, are important nutrient recyclers. When producers, consumers and decomposers die, the decomposers recycle the nutrients tied up in dead bodies. Usually these nutrients end up back in the soil, and they are once again available to plants.



Slugs are decomposers.

3

Because energy is always being lost along a food chain, food chains must always have more producers than consumers. As the food chain progresses further and further away from the producers, fewer animals can be supported.

For example, a hectare of meadow can support hundreds of grass plants. The grass plants will support dozens of mice. However the dozens of mice will support only one owl.

4 .

Answer the following questions on a separate piece of paper.

Refer to the text above for help with the answers.

1. Food can be thought of as packages of _____ and _____.
2. Define these words: producer, consumer, and decomposer.
3. Give three examples of each of the following. Do not use examples from the above text.
 - a) Producers
 - b) Primary consumers
 - c) Secondary consumers
 - d) Organisms that eat from several levels of the food chain (e.g. humans).
 - e) Decomposers
4. List five ways that energy is used by organisms in their daily life.
5. What would happen if there was no new energy added to an ecosystem, or if nutrients stopped being recycled?
6. Why are there always more producers in an ecosystem than consumers?
7. What is the source of energy for most of the world's producers?
8. How do consumers renew their energy and nutrient supplies?
9. What is the role of decomposers in an ecosystem?

Teacher's Key for Worksheet: "Food Chains"

1. Food can be thought of as packages of food and energy.
2. Producer - an organism which converts the sun's energy into food.
Consumer - an organism that eats others for food.
Decomposer - an organism which breaks down dead organic material.
3. Producers - cedar trees, blueberry bushes, wheat (any three green plants)
Primary consumers - Mountain Caribou, cows, seed eating birds such as Pine Siskin (list any three herbivores)
Secondary consumers - Rainbow Trout, wolves, tigers. (list any three carnivores)
Organisms which eat from several levels of the food chain - ravens, pigs, skunks (list any three omnivores)
Decomposers - any kind of fungus, wood-eating ants, slugs, flies (maggots), bacteria
4. Energy is used up by muscular activity, growth, building up new molecules, etc.
5. If there was no new energy added to an ecosystem, or if nutrients stopped being recycled, the living parts of the ecosystem would eventually die.
6. There are always more producers in an ecosystem than consumers because energy and nutrients are lost at each link in the food chain. Each successive link in the chain needs a broader base of food items to draw upon.
7. The sun is the source of energy for most of the world's producers.
8. Consumers renew their energy and nutrient supplies by eating other consumers or producers.
9. Decomposers return nutrients to the producers, e.g. some kinds of fungus can break down wood into its basic components, into a form once again useable to plants.