



Science Unit: *Plants and Ecosystems*

Lesson 4: *Examining Ecosystems Examinons les ecosystems*

School Year: 2006/2007
Developed for: Queen Elizabeth Annex Elementary School, Vancouver School District
Developed by: Sara Harbord (scientist), Joanne Lloyd & Karine Pharand (teachers)
Grade level: Presented to grades 2-3; appropriate for grades 1 – 4 with age appropriate modifications ; Présenté au niveau de la 2^e et 3^e année; approprié aux niveaux de la 1^{re} à la 7^e année en y apportant les modifications nécessaires.
Duration of lesson: 1 hour and 20 minutes
Notes: The school in which this lesson was taught is a dual track French Immersion and English speaking school. The lesson was delivered to students in an English speaking class and a French speaking class.

Objectives

1. Learn about the field of ecology.
2. Learn to make a quadrat survey.
3. Examine the differences within a single ecosystem; examine the differences between ecosystems.
4. Apply scientific reasoning to a science activity.

Background

The whole living world is called the biosphere. The biosphere is too complex to study all at once (even though each part interacts) so scientists divide it into smaller pieces with particular sets of plants and animals, called ecosystems. Ecosystems comprise all the living and non-living elements of a given area. An ecosystem, though smaller than the biosphere, can also be very large (e.g. tropical forest, desert, coral reef). Ecologists are the people who study how organisms in an ecosystem are connected in a given environment. Since an ecosystem is too large to study all at once, ecologists will study or sample quadrats (smaller areas within an ecosystem) to get an idea of what types of living things (biotic features: plants, animals, insects) are present and how they interact with the non-living things (the abiotic features: soil, rocks, temperature, litter, etc). It is valuable for students to recognize how ecosystems in close proximity to each other can provide unique environments for different plant, animal, and insect communities. For example, our school, Queen Elizabeth Annex is within blocks of a temperate rain forest and a bog, two unique and important ecosystems.

Vocabulary

<u>Word:</u>	Brief definition.
Ecology	The science of how plants and animals interact with their environment.
Ecosystem	The collection of biotic and abiotic elements of a given area within the biosphere.
Quadrat	A square apparatus used to mark an small area within an ecosystem to study it (usually about 1 m squared)
Biotic	Any living organism in an environment (e.g. plants, animals, insects).
Abiotic	Any non-living factor in an environment (e.g. soil, temperature)



Vocabulaire

<u>Mot:</u>	Brève définition.
L'écologie	Science étudiant les interactions des plantes et des animaux avec leur environnement.
Un écosystème	Collection d'éléments biotiques et abiotiques d'un endroit donné à l'intérieur de la biosphère.
Un quadrat	Équipement de forme carrée utilise pour identifier un petit endroit à étudier à l'intérieur d'un écosystème (habituellement environ 1 mètre carré).
Biotique	Tout organisme vivant dans un environnement (ex.: plantes, animaux, insectes).
Abiotique	Tout facteur non-vivant dans un environnement (ex.: terre, température).

Materials

For Activity 1 and 2

- Clipboards
- Paper (to draw out a quadrat map)
- Quadrat frame materials (1 for each group)
 - meter sticks or string would work
 - (quadrats are 1 metre x 1 metre)
- guides to local plant/animal life

Matériaux

Pour Activité 1 et 2

- Un écriitoire à pinces
- Papier (pour colorier une carte du quadrat)
- Matériel pour déterminer un quadrat (1 par groupe)
 - des règles métriques ou de la ficelle peuvent être utilisées (Les quadrats mesurent 1 mètre X 1 mètre)
- Livres de ressources à propos de la vie de la faune de la flore de l'endroit étudié

In the Classroom

Introductory Discussion

1. HOOK: Tell the following story about ecosystems:

A long time ago, ships coming from Europe and Asia would dock on the west coast and sometimes when things were unloaded, seeds coming from around the world that snuck onto the ships would unload too. A pretty purple plant called purple loosestrife that normally grows in the wetlands of Asia and Europe came over this way. Also, this plant was pretty and also was known to be medicinal, so some people grew it in their gardens. Well, purple loosestrife loved it here. I mean really loved it. It liked the kinds of environment we have over here so it could grow really well. Plus, where it was from, a bunch of pesky beetles kept eating it and in Canada there weren't any mean beetles to eat it up. Yup, purple loosestrife liked Canada just fine. Its plant neighbours on the other hand, didn't much like their new foreign friend. Since purple loosestrife could keep growing and growing and growing with no one to eat it, it started crowding out other plants that had lived there for a long, long time. Cattails just couldn't handle their pushy neighbour and started to die out. That wasn't very good for the crayfish that ate them and they started to disappear too. Well, the crayfish were eaten by water bug beetles that were then eaten by ducks, so the ducks started disappearing too. Plus, cattails are home to a lot of insects and birds (who are also eaten by different things) and all of a sudden they were homeless. Wetlands are really important to people and other animals because they filter our water



SCIENTIST IN RESIDENCE PROGRAM

and absorb a lot of stormy weather. Now people work really hard to control purple loosestrife so that we can keep this particular environment safe.

Comments about the story:

You can see what a delicate balance there is between plants and animals living in a particular area. This isn't the only example of a new plant coming to a new area and causing trouble to the local environment. It can happen with animals too. Australia has a big problem with rabbits that were brought over from the English for example. People who study this kind of thing are called ecologists. They look at the relationship between plants and animals and their environment. A specific area with certain plants and animals are called ecosystems.

Questions to ask:

What ecosystem did I talk about in the story?
Can you think of other ecosystems?

2. TO REVIEW:

- a. What is an ecosystem?
- b. How does an ecologist survey an ecosystem?

3. SCIENCE ACTIVITY:

Activity 1: The ecology of the schoolyard. Each student will mark out an area of the school yard (or a quadrat). They will then map out all of the living and non-living things that they find in their quadrat. The quadrats of different students can be compared for similarities and differences

Activity 2: The ecology of the forest. The same activity as above but in a different ecosystem (the forest). What are the similarities? What are the differences?

Science Activity/Experiment

Activity 1: The ecology of the schoolyard.

Purpose of Experiment: To have the students appreciate the different abiotic and biotic factors that make up their environment. To compare and contrast the different quadrats.

Methods:

Set up before the lesson: Prepare quadrats. You can use metre sticks, string, wire, cardboard or any other materials that could make a metre by metre square. Remember that the quadrat will be set down on the ground to define an area. Have enough quadrats groups of 3 students.

Instructions

1. Go into the schoolyard.
2. Have the students spread out and pick a spot to survey.
3. Record the number of plants that they see in their quadrat (total number)
4. Record the number of different types of plants in their quadrat.
5. Have the students make a quadrat map of their area (Draw and write down the plants, animals and insects that they see within each area of their quadrat). (*see activity sheet*)
6. You may wish to have a good field guide to local species available to identify plants.
(*Note: 5,6 may be too advanced for younger classes, visualizing the similarities and differences may be enough for grades 1-3*)
7. Go back to the classroom and compare between quadrats.



SCIENTIST IN RESIDENCE PROGRAM

Activity 2: The ecology of the forest.

Purpose of Experiment: To have the students appreciate the different abiotic and biotic factors that make up a forest and to compare and contrast the different quadrats.

Methods:

Instructions

Same as Activity 2 but in a different environment, a forest.

Note: Remember to practice “no trace” science. We do not want to disturb the environments that we are visiting.

Optional Questions:

1. What is an ecosystem? (an area of the enviro where plants and animals interact)
2. Give an example of an ecosystem. (Forest, bog, desert, prairie)
3. What is a quadrat? (A square to sample an ecosystem).
4. What is the name of a scientist that studies an ecosystem? (an ecologist)
5. What is a biotic factor in an ecosystem? (something alive)
6. What is an abiotic factor in an ecosystem (something non-living)
7. Name a biotic factor in the forest. (trees, ferns, squirrels, birds)
8. Name an abiotic factor in the forest (soil, rocks, litter)
9. What are the two ecosystems that we studied? (forest, bog)
10. Name one type of plant or animal that lives at the Camosun bog (Bog Laurel, Bullfrog, Ducks, Sphagnum moss, sundew, Labrador Tea)
11. What type of plant was found in the bog that we also have in the classroom? (sundew)
12. How does a sundew work? (catches bugs on sticky, shiny hairs, slowly folds over, breaks down insect)

Closure Discussion

- Discuss the similarities and differences between the forest and the schoolyard

References

1. Burnie, David. 1991. How Nature Works: 100 Ways Parents and Kids Can Share Nature. Pages 38-51, The World of Plants and Fungi. Reader's Digest Association Inc. ISBN: 0895773910
2. Van Cleave, Janice. 1997. Guide to the Best Science Fair Projects. Pages 50-51. John Wiley & Sons, Inc. ISBN: 0471148024
3. Zwinenberg, A.J. and Van Gelder, J. 1983. Encyclopédie de la nature alphanbetique et systématique. Pages 108-109. Chantecler.
4. <http://en.wikipedia.org/wiki/Ecosystem> Wikipedia, the free encyclopedia [Information about ecosystems]
5. <http://en.wikipedia.org/wiki/Wetlands> Wikipedia, the free encyclopedia [Information about wetlands]
6. <http://www.naturalhistory.bc.ca/CamosunBog/>: Information about the Camosun bog.



Extension of Lesson Plan

(Before the lesson): Practicing quadrat surveying. Set up four different small areas to represent quadrats and place 3 different kinds of beans in them. Have groups of students survey four different quadrats and report the results. This is to note how different quadrats within the same ecosystem are, and why it is important to survey several quadrats.

This activity is based on a lesson developed during the Scientist in Residence Program.

See: Marine Pollution science unit, Lesson 2, *Scientific Sampling* <http://www.scientistinresidence.ca>

(Activity 4) The ecology of the Camosun bog.

Purpose of Experiment: To have the students appreciate the importance of the bog, to learn about the different abiotic and biotic factors that make up a bog, to compare and contrast the different quadrats within the bog and to compare and contrast the bog environment to the forest environment.

1. Have each student observe a quadrat in the bog and compare it to what they have learned from the schoolyard and forest quadrat.
2. *(see activity 2 methods)*
3. Bogs are delicate ecosystems. You will likely not be able to put down a quadrat in the bog, but you can observe different quadrats from the footbridge.

Note: The Camosun bog and the GVRD lead tours of the bog for school groups. These tours book up early, so plan at least two months in advance. *(see above website listing)..*



Date: _____

Scientist: _____

Examining Ecosystems

Ecosystem/Environment surveyed: _____

Number of plants in your quadrat (estimate): _____

Number of different kinds of plants in your quadrat: _____

Draw a map of your quadrat. Draw the plants that you see in each part of your quadrat. You can also write down the names of plants if you know them.



Date: _____

Scientifique: _____

Examining Ecosystems

L'écosystème ou l'environnement: _____

Nombre de plantes dans ton quadrat (estimation): _____

Nombre de plantes différentes dans ton quadrat: _____

Dessiner les plantes dans ton quadrat. Tu peux écrire le nom des plantes que tu connais.
