Ecosystem Explorers

Ecosystem Explorers

Curricular Connection

3.0 LIFE SCIENCE: The students will use the scientific skills and processes to explain the dynamic nature of living things, their interactions, and the results from the interactions that occur over time.

A. DIVERSITY OF LIFE

1. Explain the idea that in any particular environment, some kinds of plants and animals survive well, some less well, and some cannot survive at all.

a. Identify and describe features of some of the plants and animals living in a familiar environment and explain ways that these organisms are well suited to their environment.

b. Based on information about the features and behaviors of animals and plants from very different environments describe reasons that they might not survive if their environment changed or if they were moved from one environment to another.

E. FLOW OF MATTER AND ENERGY

1. Recognize that some source of energy is needed for all organisms to grow and survive.

a. Identify the sun as the primary source of energy for all living organisms.

- Plants use sunlight to make food.
- Plants and animals use food for energy and growth.

c. Provide examples that justify the statement "Most animals' food can be traced back to plants."

Background

What is an Ecosystem?

An **ecosystem** is a community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area or **environment**. Some ecosystems are very large. On the other hand, some ecosystems may be physically small, such as a meadow, a forest, or along the shores of a lake or stream. How does everything fit together in a forest ecosystem versus a meadow ecosystem? While some **species** may be found naturally in both areas, the species that live in the forest ecosystem are usually very different from those that inhabit the meadow, even though the two environments are right next to each other.

Resource: Adapted from: UBC Bo0tanical Garden and Center for Plant Research
http://www.botanicalgarden.ubc.ca/kids/ecosystem.php

Dynamic interactions take place in ecosystems between plants, animals, microorganisms and the environment. The way that everything works together helps to maintain balance. Ecosystems will

Background (continued)

fail if they do not remain in balance. The availability of food, shelter and water determines the numbers and kinds of animals and plants found in a particular ecosystem. No ecosystem can support more organisms than its food, water, and shelter can accommodate. Natural phenomena such as fire, disease, and the number of predators and prey also affect ecosystem balance as does human induced changes.

Resource: Adapted from Oracle ThinkQuest website at http://library.thinkquest.org/11353/ecosystems.htm

Each organism in an ecosystem has its own niche, or role, to play. Producers, or plants, collect energy from the sun. Consumers process the food and energy generated by the producer, making it available to the decomposers when they die.

Consumers can be either herbivores (plant eaters), carnivores (meat eaters), or omnivores (plant and meat eaters.) Scavengers are also consumers that eat dead plant and animal remains. Decomposers, such as insects and microorganisms, use the energy left in dead organisms and return nutrients from the bodies to the environment.

Each organism in an ecosystem is in competition with all other organisms for resources and survival. Animals have evolved specific characteristics (adaptations) that promote their survival. For example, the teeth of carnivores are much sharper than those of herbivores. Sharp teeth allow carnivores to tear meat, while the flat molars of herbivores allow them to grind up vegetation. Another example would be that squirrels have clawed-hind feet that rotate 180 degrees to allow them to climb up and down trees, while beavers have webbed feet that allow them to swim powerfully through the water.

Resource: http://www.ehow.com/about_5402395_animals-ecosystem.html

Ecosystem food webs represent how energy is passed from one organism to another. When a herbivore eats, only a fraction of the energy (that it gets from the plant food) becomes new body mass; the rest of the energy is lost as waste or used up by the herbivore to carry out its life processes (e.g., movement, digestion, reproduction). Therefore, when the herbivore is eaten by a carnivore, it passes only a small amount of total energy (that it has received) to the carnivore. Of the energy transferred from the herbivore to the carnivore, some energy will be "wasted" or "used up" by the carnivore. The carnivore then has to eat many herbivores to get enough energy to grow. Because of the large amount of energy that is lost at each link, the amount of energy that is transferred gets less and less. The energy loss in an ecosystem is represented in an energy pyramid by the broad base and the narrow top.

Resource: http://www.vtaide.com/png/foodchains.htm

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(1of each item per group)</td></tr>
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skull ID cards
fur ID cards
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carrying case
map of Fairview
compass
clipboards
pencils
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Handle materials properly with respect and safety in mind. No Horseplay!
Make sure all the students have on appropriate footwear and are dressed properly for the weather.
The students are to remain in groups with teacher at all times.
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<tr><td>Enduring Questions and Focus Questions
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What is an ecosystem and how does it support life?
What are the biotic (living) and abiotic (nonliving) components of an ecosystem and how do they interact?
Focus Questions
How does energy flow through an ecosystem?
What environmental factors affect the growth and survival of animals?
What happens to animals when the environment is changed?</td></tr>
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Vocabulary

herbivore- organism that eats only plants
carnivore- organism that eats only meat
omnivore- organism that eats meat and plants
ecosystem- a system formed by the interaction of a community of organisms with their environment
environment- surroundings and what's around you; it's where an organism lives including living and nonliving factors
environmental factors- a living(biotic) or nonliving (abiotic) thing that affects the ecosystem
organism-any living thing
preferred environment- the environment that provides all the resources an organism needs for survival
optimum environment- the environment which is most suitable for an organism's growth and survival
range of tolerance- a definite range of environmental conditions in which an organism can survive
habitat- the natural environment of an organism; place that is natural for the life and growth of an organism
population- the number of organisms in an environment
natural resources- materials or substances that occur naturally in the environment; water, trees, and soil
predator- any organism that exists by preying upon other organisms
prey- an animal hunted or seized for food, especially by a carnivorous animal

5 E Model	Time Frame	Activity
Engage 	30 minutes	**Slide 1: Exploring Ecosystems** Use PowerPoint presentation and bear pelt, skull, tracks and scat. Direct the students' attention to the picture of the fawn. Have the students turn and talk about the following questions: • What animal do you see in the picture? • What characteristics did you use to help you determine that it is a fawn? • What if the living animal was no longer there? • What evidence would the animal leave behind that would provide clues that they were once there? Lead the students to the conclusion that there would be scat, tracks, and animal remains such as skulls, bones, teeth, and fur. **Slide 2: Ecosystem Explorers** The students will be using clues – skulls, scat, tracks, and fur - to identify the animal and determine its role in the ecosystem. Introduce the focus questions to the students. Have the students identify any important vocabulary in the questions and determine what the words mean. • What are the living and nonliving characteristics of an ecosystem? • How does energy flow through an ecosystem? Show the video clip**:** What is an ecosystem? **Slide 3: Three Ecosystems** Introduce the three ecosystems. Have the students turn and talk about the similarities and differences. Have the students share their ideas with group. **Slide 4: Field Investigation** **Click 1 – Scat** Show the students the scat sample and the scat cards and describe how the students will be using the scat cards. Emphasize that the information on the back of the cards is important. Allow a few minutes for students to turn and talk about which animal the scat belongs to. **Click 2 – Track** Show the students the track sample and the track cards and describe how the students will be using the track cards. Emphasize that the information on the back of the cards is important. Allow a few minutes for students to turn and talk about which animal could belong to the tracks that were left behind. **Click 3 – Teeth (definition)** Show the students the skull sample (emphasize teeth) and the skull/dentition

Engage (continued) 		cards and describe how the students will be using the teeth cards. Allow a few minutes for students to turn and talk about which animal could belong to the set of teeth. **Click 4 – Skull** Show the students the skull sample and skull/dentition cards and describe how the students will be using the skull cards. Allow a few minutes for students to turn and talk to discuss which animal could belong to the skull example. **Slide 5: Mother Bear and Cubs** Before you show students this slide, have a few students share out what they think the animal could be and why they thought that. Then show the picture on slide 5 of the bears. **Slide 6: Your Mission** Explain to the students that they will be acting as explorers. Their job is to observe and discuss clues animals left behind in the three different ecosystems. Using that evidence, they are to draw conclusion about how the animals survive in a particular environment. **Click on link to data sheet** and explain things they will be looking for when we go outside to explore. Explain that when we are done with our hike, we will be looking at examples left behind by animals and trying to identify the animal that was there. **Slide 7: SAFETY** Discuss safety issues with students and check for understanding. • Travel as a group to the following sites: forest, pond, and meadow.

Explore 	**The maximum time allowed for the hike is 60 minutes.** **Allow 10 minutes at each of the ecosystem sites for discussion and exploration.** **Allow for approximately 10 minutes of hiking time between each site.**	**EXPLORATORY HIKE** **1. Take the students on a hike from the dining hall through the woods to the Dry Pond. When you arrive at Dry Pond ask the following questions to stimulate student thought and discussion:** Take a look around you. What ecosystem are we in now? How do you know? What are the living things that you see here? What are the non-living things you see here? What characteristics (adaptations) would animals need in order to survive in this ecosystem? Discuss. **2. Hike from the Dry Pond to Willow Pond, using the Nature Trail. When you arrive at Willow Pond ask the following questions to stimulate student thought and discussion:** Take a look around you. What ecosystem are we in now? How do you know? What are the living things that you see here? What are the non-living things you see here? What characteristics (adaptations) would animals need in order to survive in this ecosystem? Discuss. **3. Hike from Willow Pond through the Meadow/Arboretum and stop on a hill overlooking the meadow environment. Ask the following questions to stimulate student thought and discussion:** Take a look around you. What ecosystem are we in now? How do you know? What are the living things that you see here? What are the non-living things you see here? What characteristics (adaptations) would animals need in order to survive in this

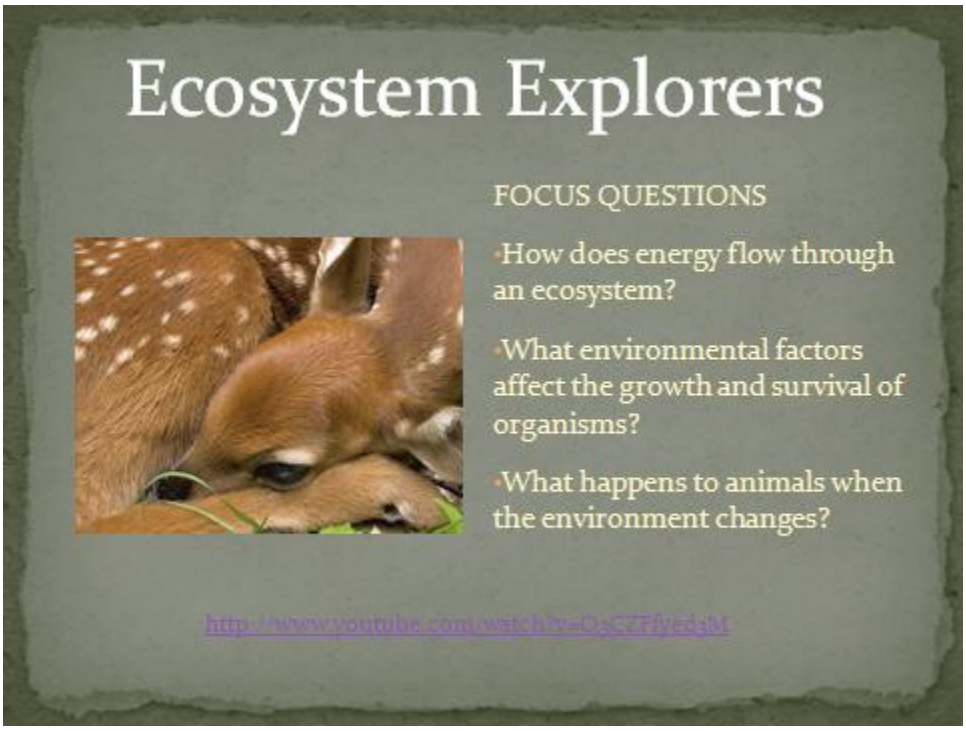
Explore (continued) 		ecosystem? Discuss. **4. Leave the Meadow and hike to the Dining Hall. Once there divide students into subgroups.** **Assign students to a table. (a table several boxes of animal skulls, scat and tracks and a forensic kit). At the forensic station, they will work together to identify the animal represented by the skull, scat and tracks. Give the students time to identify the animals at their forensic station.** Ask probing questions to reveal misconceptions and incorrect techniques such as: • How did you determine the role of the animal?(*teeth are sharp for tearing, rounded teeth for grinding; eye orbits in front for finding prey; orbits on the side for seeing predators; scat had seeds, hair, or both*) • What clues did you see that might lead you to an understanding of how the animal survives in this ecosystem? (*teeth, feet, fur, special features such as climbing, or running fast*) • What characteristics of the ecosystem are essential for the animals' survival?(*food , water, shelter, ways to avoid predators*) • Ask students to identify ways that humans alter ecosystems and how (specifically) this impacts the animals' ability to survive. (*For example: removing the fruit and nut bearing trees and shrubs from a meadow limits food sources for the animals that depend on them; building permanent structures that affect animals homes*) **Rotate subgroups around to another forensic station. Students should have the opportunity to identify animals from at least two of the ecosystems, or three as time permits. After all the rotations, the students should share their findings with the whole group.**

Evaluate 	15 minutes	**Slide 8: Journal activity (Word Splash)** Read prompt aloud to the students. • Choose an animal from one of the ecosystems that you explored today. • Think about that animal. What features and behaviors make it well suited for its environment? Why might the animal not survive if they were moved from the environment or the environment changed? • With your group, generate a list of vocabulary words that could be used in your response. Allow the students 2-3 minutes to generate list and share the list they suggest with the whole group. Click PowerPoint to show teacher generated list. Additional words can be added to the list if necessary. Encourage the students to use as many words as possible from the list in their response. Allow the students time to write responses. Consider having the students work with a partner or in a small group for differentiation purposes. Have the students share their responses with the whole group. **Slide 9: Focus Questions** **Enduring Questions** • What are the nonliving (abiotic) and living (biotic) characteristics of an ecosystem? • How does energy flow through an ecosystem? **Focus Questions** • How does energy flow through an ecosystem? • What environmental factors affect the growth and survival of animals? • What happens to animals when the environment is changed?
Career Links 	• forensic scientist • officer for the Department of Natural Resources • wildlife biologist • ecologist • park ranger • zoologist • marine biologist • wildlife rehabilitator • animal welfare advocate	

Considerations for Larger Groups 	Optimal group size is 16, with four subgroups of 4. For groups larger than 16, increase the size of subgroups. If two parent chaperones are available, split the group greater than 16 into two groups(3 or 4 subgroups in each) and send the parent group to the Meadow first, the teacher group to the Pond and rotate sites in the following order: Parent group – Meadow, Pond, and Forest; Teacher group – Pond, Forest, and Meadow. Make sure that parents know that they are to monitor the student groups at all times within each site and that they have a method of timing the students to keep the activity on schedule. Provide the parents with focus questions for the discussion at each site.
Inclement Weather Back-Up Plan 	**Severe weather** – Move all stations into either the dining hall or the bus pavilion. Dining hall can be used for severe cold, thunderstorm warnings, etc. Bus pavilion can be used for heavy rain events without the threat of thunder or lightning or deep snow and/or ice. In the event of very cold temperatures when students will have limited time outside, the pre and post lesson can be extended, some stations can be done inside and the field work time can be reduced to minimize student exposure.
Cleaning Up and Setting Up for the Next Teacher 	✓ Make sure that student forensic kits are intact and a new data sheet is on the clipboard. ✓ Reset PowerPoint to the beginning and cover bear pelt.

Slide 1

Slide 2



Slide 3

Slide 4

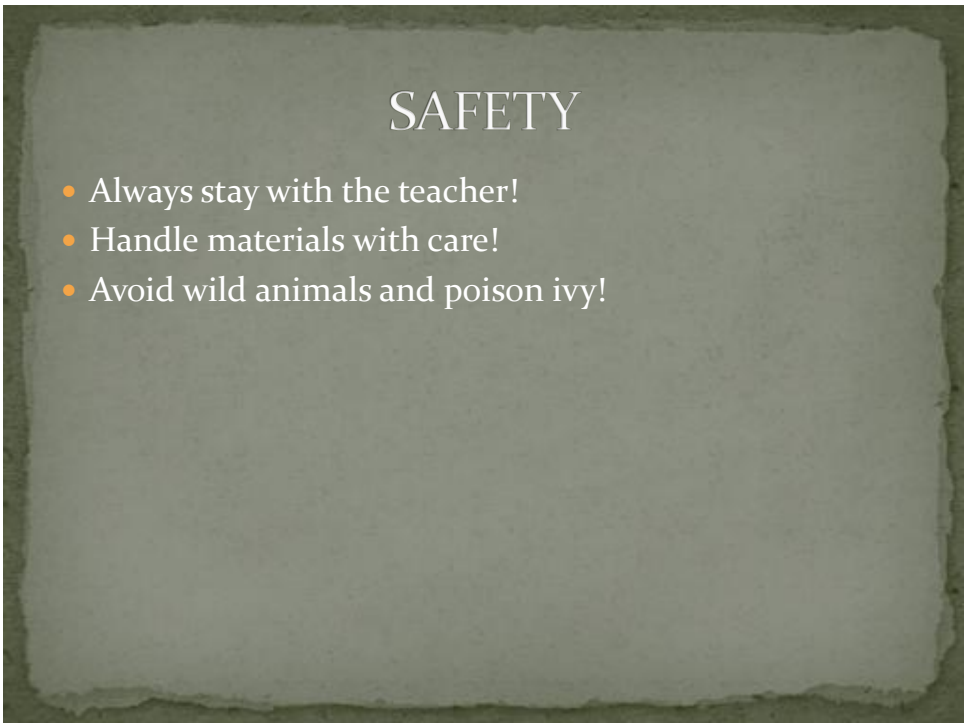
Slide 5

Slide 6

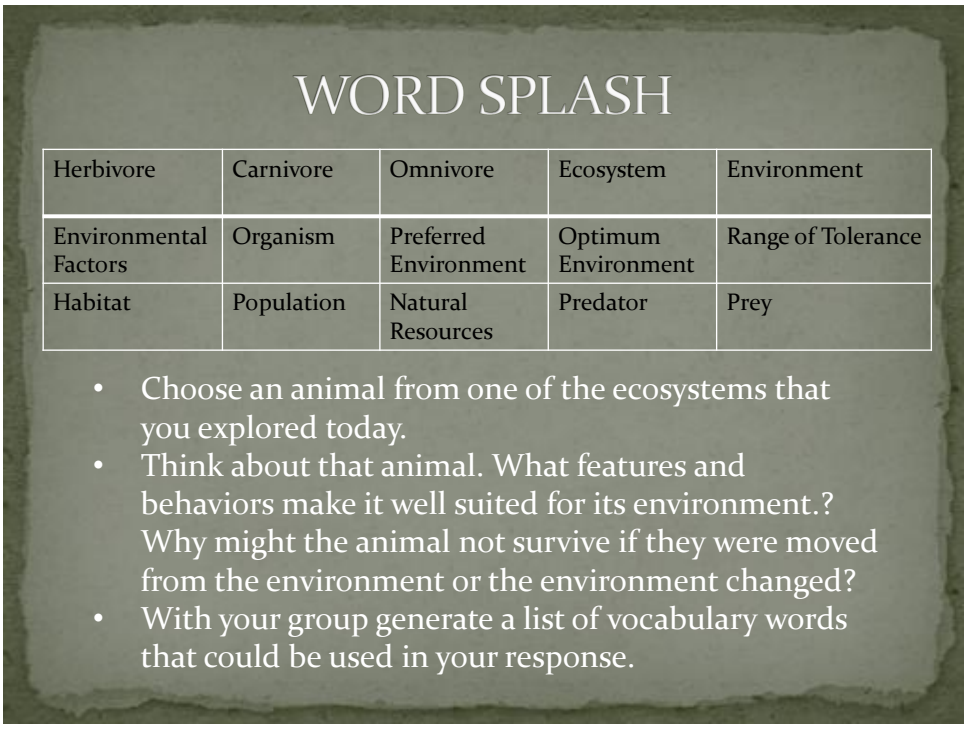
YOUR MISSION

- Ecosystem Explorers DATA collection sheet.docx

Slide 7



Slide 8



Slide 9

Ecosystem Explorers

FOCUS QUESTIONS

- How does energy flow through an ecosystem?
- What environmental factors affect the growth and survival of organisms?
- What happens to animals when the environment changes?

Ecosystem Explorers Data Collection Key

BOX Number		Animal	Role C = Carnivore O = Omnivore H = Herbivore	Diet	Characteristics that allow this animal to survive in this ecosystem. (Think about finding food, shelter and escaping predators.)
Example		**Bear**	**O**	**Animals, nuts, berries, grasses, insects, and aquatic life**	**Sharp claws Able to stand on hind legs Sharp canines for tearing meet**
MEADOW	1	Rabbit	H	Plants	Fast, blends in with its environment
	2	Skunk	O	Plants, animals and insects	Nocturnal, use scent glands for protection from predators, sharp claws
	3	Deer	H	Plants, berries and fruits	Fast, excellent hearing, blends in with environment
	4	Red Fox	O	Rodents, insects, nuts and berries	High sense of smell and hearing, stealthlike (great hunter)
POND	5	Beaver	H	Plants (young trees)	Sharp incisors, Excellent swimmer, webbed feet, flat tail, waterproof fur
	6	Mink	C	Crayfish, birds, fish, small rodents	Excellent swimmer, sharp teeth to eat meat, webbed back feet.
	7	Muskrat	O	Plants, fish, crustaceans	Webbed back feet, excellent swimmer, sharp incisors, waterproof fur
	8	River Otter	C	Fish and crustaceans	Excellent swimmer, waterproof fur, webbed feet, streamlined body
FOREST	9	Raccoon	O	Plants and animals, berries, fish and shellfish	Nocturnal, uses paws like hands, sharp claws for climbing trees, sharp teeth for eating meat and cracking shells.
	10	Opossum	O	Insects, fruits, berries, eggs, small mammals, birds, garbage	Nocturnal, marsupial (pouch), prehensile tail – acts as a fifth hand.
	11	Bobcat	C	Small animals – rodents and rabbits	Retractable claws, fast, stealthy, sharp teeth for tearing meat
	12	Coyote	O	Berries and deer, small mammals	Fast, sharp teeth for tearing meat, fur to keep them warm

Quick View For Ecosystem Explorers

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Probing Questions:
• How did you determine the role of the animal?(teeth are sharp for tearing, rounded teeth for grinding; eye orbits in front for finding prey; orbits on the side for seeing predators; scat had seeds, hair, or both)
• What clues did you see that might lead you to an understanding of how the animal survives in this ecosystem? (teeth, feet, fur, special features such as climbing, or running fast)
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