
Module 2

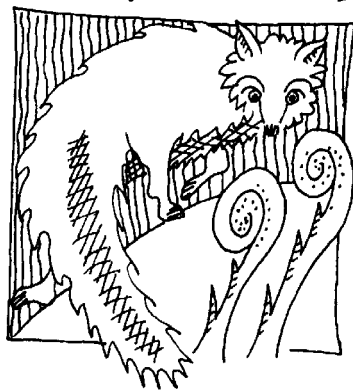
Connections:

The Basics of Biodiversity

Caribou & Cottongrass



Fox & Fiddleheads



MODULE 2. CONNECTIONS: THE BASICS OF BIODIVERSITY

Learning outcomes

Activities (page) Curriculum connections	2-4	2-5	2-8	2-10	2-12	2-13
	Science	Science	Science	Science	Science	Science
	Language Arts	Fine Arts				Social Studies
						Fine Arts
Knowledge — In these activities, students will learn more about:						
1. how to identify specific plant and animal species within their own community;	•	•	•	•		•
2. appropriate terminology related to the study of biodiversity;	•	•		•		•
3. important biodiversity-related concepts: habitat and niche, adaptation and change, succession;	•	•	•	•		•
4. levels of biodiversity: species, genetic and ecosystem.			•		•	•
Attitudes and Values — Following participation in these activities, it is hoped that students will:						
1. demonstrate personal attitudes, values and behaviours which contribute to preservation of biodiversity;	•	•			•	•
2. participate enthusiastically in investigations of the biodiversity of their communities or area;	•	•	•	•	•	•
3. express perceptions and feelings about biodiversity through the arts, using all senses and expanding on their curiosity and wonder.	•	•				•
Skills and processes — Through these activities, students will practise their ability to:						
1. use appropriate terminology and describe and use appropriate scientific equipment to study plant and animal biodiversity in the field;	•	•	•	•	•	•
2. collect, analyze and explain data collected regarding biodiversity in their area and draw conclusions from their observations;	•	•	•	•	•	•
3. work cooperatively.	•	•	•	•	•	•

Activities legend

- 2-4 Animal Mania!
- 2-5 Be a Biodiversity Detective!
- 2-8 Amazing Diversity Down Under!
- 2-10 Biodiversity Means Differences
- 2-12 Genetic Diversity and Us!
- 2-13 Reach Out!

A WORD TO THE TEACHER

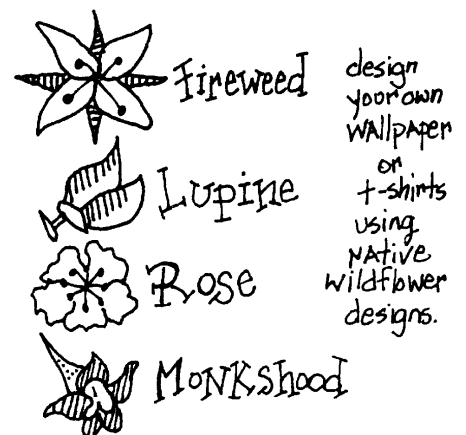
Connections: The Basics of Biodiversity presents the basic concepts of biodiversity by introducing students to field studies in their own school or backyards. Using basic field study strategies to create awareness of the diversity of organisms, the section features important terminology and activities for searching out biodiversity.

Focus on Student Experience

1. Brainstorm and develop a biodiversity web using words that students have heard of known. Keep a journal of biodiversity vocabulary.
2. Try different kinds of walks. Take a *Shape* walk and look for natural shapes, a *Colour* walk and look for as many colours as you can find, or find objects of different colours. Take a *Change* walk, listing all of the things that are changing as you walk (twigs bending, birds landing, insects carrying things, plants squashed). Take a *Question* walk (ask questions; the only “answer” allowed is another question). Take a *Silent* walk (how many sounds can you hear?). Take an *Up and Down* walk (walk only looking up at things; walk only looking down). Take an *ABC walk* (find living things that begin with each letter of the alphabet).
3. Spend some time developing the concept of systems. What systems do your students already know about? What do systems have in common?
4. Invite a naturalist or well-known person in your community to speak to your class about the important natural features of the area.



Flowers of the Yukon



BACKGROUND

Humans share the planet with million of types of other living things. All living things, including humans, are interconnected. This variety of living things on Earth is called **biodiversity**.

There are three very important concepts related to biodiversity: species diversity, genetic diversity and ecosystem diversity.

Species Diversity

A species is a group of plants or animals that are more or less alike and that are able to breed and produce fertile offspring under natural conditions. From the time of the great biologist Linneaus in 1756, scientists have created a system that classifies all living things. In this classification system, every living thing is assigned to a species. For example, all breeds of domesticated dogs are members of the same species.

One way of describing the biodiversity of a region is to measure the number of species of living things. This is called **species diversity**. Climate, geography, history, and other environmental factors influence species diversity.

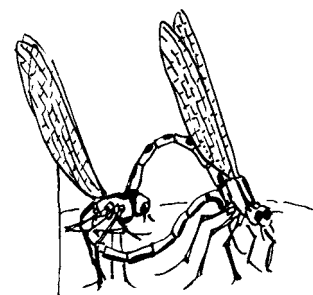
Genetic Diversity

Within each species there are many variations. **Genetic diversity** is a very important kind of biodiversity. Genes carry the genetic code and are inherited from parents. They affect how organisms look and behave. Genetic diversity refers to how each individual is different in some way from every other individual of its species.

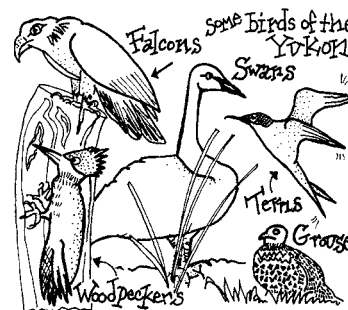
In humans, genetic diversity may appear as colour differences (e.g. eye colour), size differences (big feet/small feet), or behavioural differences. Or it may exist in less obvious forms inside our bodies, affecting the way we grow, think and resist disease, for example.

Genetic diversity exists in all species and is very important to the ongoing health of each species. Species with high genetic diversity can adapt better to changing conditions in their environment. Genetic variation in species also provides the raw material from which new species can evolve.

biodiversity
is the diversity
of life in all its forms
and processes.



a species is a group of plants or animals that are able to breed & produce offspring that are fertile.

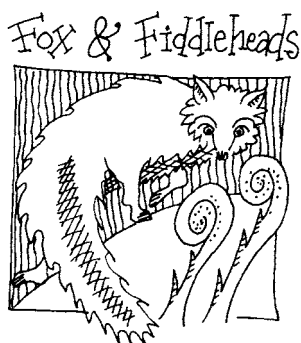


ECOSYSTEM DIVERSITY

Ecosystem diversity describes the variety of different natural systems found in a region, in a country and on the planet.

An ecosystem consists of all the living and nonliving things in a given area that interact with one another. An ecosystem can be as tiny as a drop of pond water or a square meter of a garden. Or it can be as large as an ocean, a forest or a desert. Different combinations of animals, plants, micro-organisms and the water, soil and air they inhabit result in numerous ecosystems around the world.

an ecosystem is all
living & non-living
things in a given
area.



All ecosystems undergo continual, gradual change. This natural change over time is called *succession*. The changes people make to natural habitats, however, often affect natural succession. Wildlife sometimes cannot change or *adapt* to survive in areas which undergo drastic and sudden change or in which their habitats disappear altogether, especially when these areas become isolated.

Since preserving habitat is much easier than fixing it up after it has been destroyed, many people in the Yukon are now working hard to protect the ecosystems of our territory so that biodiversity can be preserved for generations to come.

Key points

1. Biodiversity refers to the variety of living things on the Earth.
2. Species diversity varies from region to region and is affected by climatic, geographic, historical and other environmental factors.
3. Genetic diversity is important for the ongoing health of a species.
4. Ecosystems change naturally over time, but can be damaged by drastic or sudden change.

Succession in a forest...



Begins with a disturbance
like a fire..



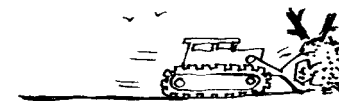
pioneer species move in...



the forest matures...



slowly it becomes old growth
forest with a great diversity
of species & habitats...



wildlife sometimes cannot
adapt to habitats which
undergo too drastic a
change.

ANIMAL MANIA!

Aim...

To introduce the procedure for studying an animal and thus to basic concepts of biodiversity.

Ready...Set...

Choose a favourite animal (bird, fish, mammal, reptile, amphibian, etc.) that you would like to learn more about. Then participate in some of the following activities as you begin your animal study:

1. Brainstorm all of the different kinds of animals you know. Then divide them into categories. Talk about what the animals in each category have in common.
2. Make a list of some of the things you would like to know about your animal.
3. Read some of the stories or poems or novels that have been written about your animal. Pay attention to what you can learn about your animal from storytellers and poets.

GO!

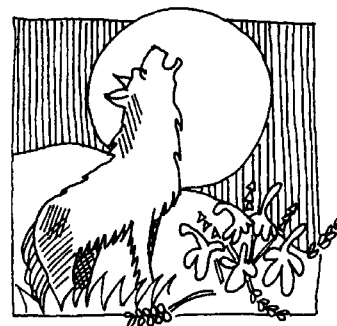
Complete your research on your animal, and create your own Animal Study Guide. Write the following questions and activities on a sheet of paper (leave lots of room for answers, photographs and drawings). Work on your own or with partners. Each person might research the information for a different section.

My Animal Study Guide

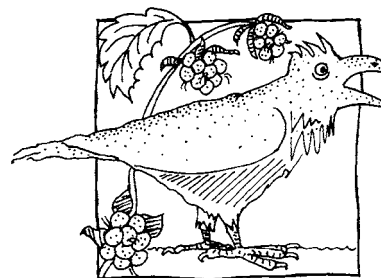
1. What are some of the things all (*your animal*) _____ have in common? Include several pictures or drawings of your animal.
2. Where do _____ live? What is their habitat?
3. What do _____ eat?
4. Make a food web showing the ways _____ connect with the living things in their habitat.

Follow-up

Complete your own field-guide to the animal of your choice. Use the answers to your questions, along with drawings or photographs, to illustrate your guide. Make photocopies for everyone to share.



The wolf and the crow are both important to Yukon First Nations. They represent the two matrilineal clan systems. According to tradition, crow was the creator of the world. He made people from poplar bark.



BE A BIODIVERSITY DETECTIVE!

Aim...

To provide an imaginative way of learning about the species diversity of your community.

Ready...

Whether you live in an apartment building, house, trailer or log cabin, you require: air to breathe, a source of nearby water, food, safe shelter, and enough space in which to live and grow. If your home excluded one of these basic needs, you and your family would suffer.

The living things in your backyard have the same needs as you—food, water, shelter and space to live and move.

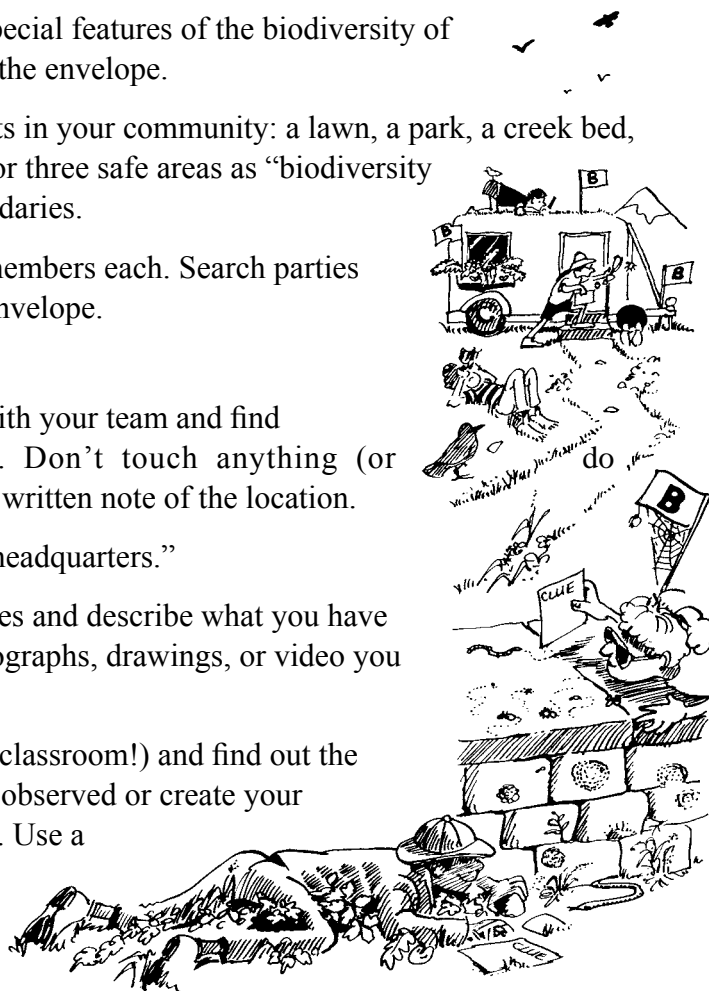
Start learning how to recognize the biodiversity in your area by becoming a biodiversity detective. (See Yukon Species List (Appendix 3)).

Set...

1. Set up a biodiversity “headquarters” at your school. Photocopy the page of biodiversity clues (2-7). Cut on the dotted lines and put all of the clues in an envelope.
2. Add five more cards for clues about special features of the biodiversity of your area. Put them with the others in the envelope.
3. Plan a trail through a variety of habitats in your community: a lawn, a park, a creek bed, the intertidal zone, etc. Mark out two or three safe areas as “biodiversity search sites.” Use flags to set the boundaries.
4. Divide into “search parties” of three members each. Search parties will each receive two clues from the envelope.

GO!

1. Fan out along the flagged safe areas with your team and find what your clues ask you to find. Don’t touch anything (or any collecting). Just make a mental or written note of the location.
2. Regroup with the rest of the class at “headquarters.”
3. Now lead the class to your location sites and describe what you have found, or make a presentation of photographs, drawings, or video you have taken in the field.
4. Take your clues to the “research lab” (classroom!) and find out the scientific names of the two things you observed or create your own meaningful and consistent names. Use a Taxonomy Reference to help you. (See References and Appendix Appendix 3)) Create a Biodiversity Taxonomy Chart for headquarters.



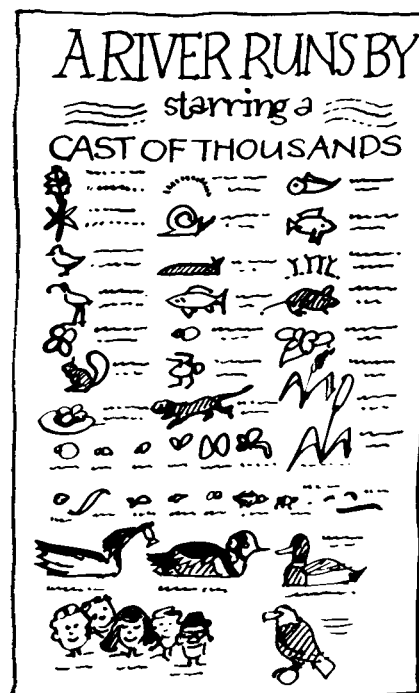
Record on a big sheet of poster paper the names of all the organisms identified by the detective teams in your class.

5. Use the Yukon Species List (Appendix 3) to help you answer the following questions:

- a) What kinds of plants grow in your study area?
- b) What kinds of animals (birds, mammals, insects and others) live there?
- c) Was there one area where there were more clues than others?
Can you think of a reason why?
- d) Brainstorm some words that describe the biodiversity of your area.

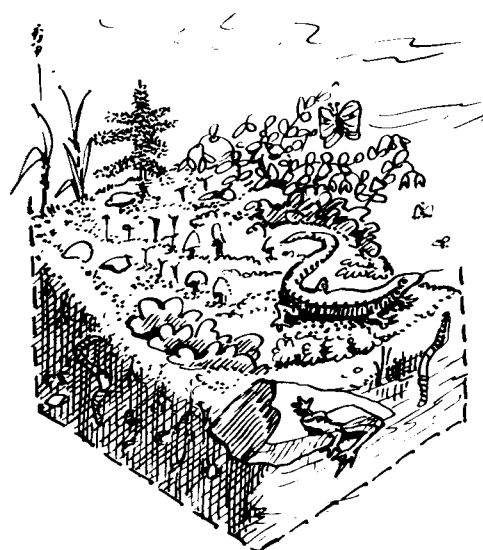
6. Using all the different clues you collected, create an “artist’s conception” of the biodiversity picture for your study area. Give your picture a neat name.

7. Using the Yukon Wild poster can you recognize species from your study area?

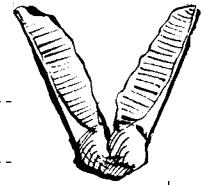


Follow-up

1. Save all the data from your detective team and do a biodiversity search during another season. Compare the result.



Biodiversity clues



Find three different-sized leaves from the same plant.

Find at least three different kinds of plants growing under a tree.

Find at least three different organisms and give them names which describe how they look, move or behave.

Find at least three different kinds of plant “skins” or surfaces.

Find a plant which has three different colours.

Find biodiversity in at least three different shapes—square, triangle, oval, heart, rectangle.

Find at least three different kinds of seeds.

Find at least three different kinds of leaf stalks.

Find three different spider webs.

Find three different lichens.

Find at least three different kinds of holes made by animals.

Find three different signs of an animal having eaten something.

Find at least three different kinds of leaves.

Find at least three leaves with different textures.

Find at least three different plants.

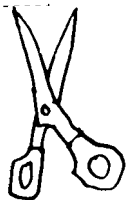
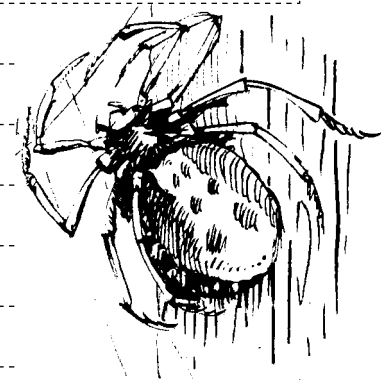
Find three different kinds of consumers (animals) or evidence of them.

Find three different kinds of decomposers.

Find at least three plants with different odours.

Find at least three different insects.

Find three different flowers.



AMAZING DIVERSITY DOWN UNDER!

Aim...

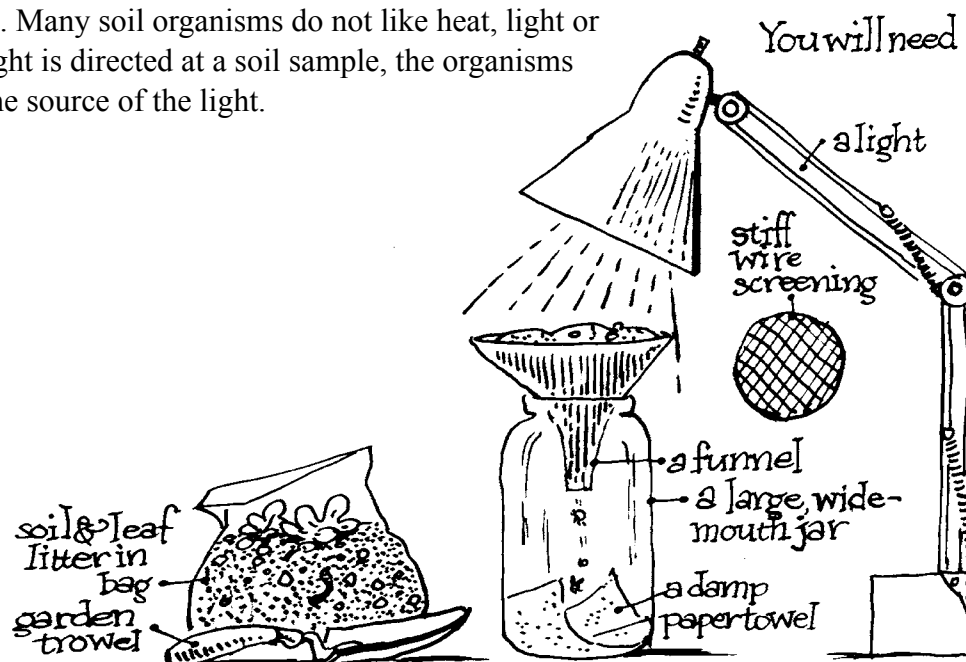
To introduce the importance and diversity of soil organisms and to help you identify individual species by their unique characteristics.

Ready...

Soil contains an ecosystem that is rich with a variety of organisms, including bacteria, fungi, algae and animals—both vertebrates (animals with backbones) and invertebrates (animals without backbones). These organisms are very important in the formation and maintenance of the soil. This ecosystem is as rich, complex and diverse as any other ecosystem on earth. Many soil organisms do not like heat, light or dryness. When a light is directed at a soil sample, the organisms move away from the source of the light.

Set...

You will need:



GO!

1. Use the trowel to collect some soil and leaf litter. Collect samples from different environments including the forest, meadow or garden. Label them in separate bags.
2. Set up your equipment inside, near an electrical outlet. Cut the screen to fit inside the funnel. Place the damp paper towel in the bottom of your jar and set the funnel in the open end of the jar. Place the light above the funnel.
3. Put the soil sample into the funnel and turn on the light so that it shines directly over the funnel. The rest of the room should be dark.
4. Leave the equipment set up overnight. The creatures in your sample will try to get away from the heat and light of your lamp by burrowing deeper into the soil. Eventually they will fall into the jar below. Look for animals in the sample that may not get through the screen. Ensure there is a damp paper towel at the bottom of the jar.
5. Gently pick up each creature so you can get a closer look with your magnifying glass.

6. Examine each of the organisms for similarities and differences. Assemble and classify organisms that are alike. Would you classify these similar looking organisms as the same species?
7. When you have finished, return the animals and the soil to their habitat.

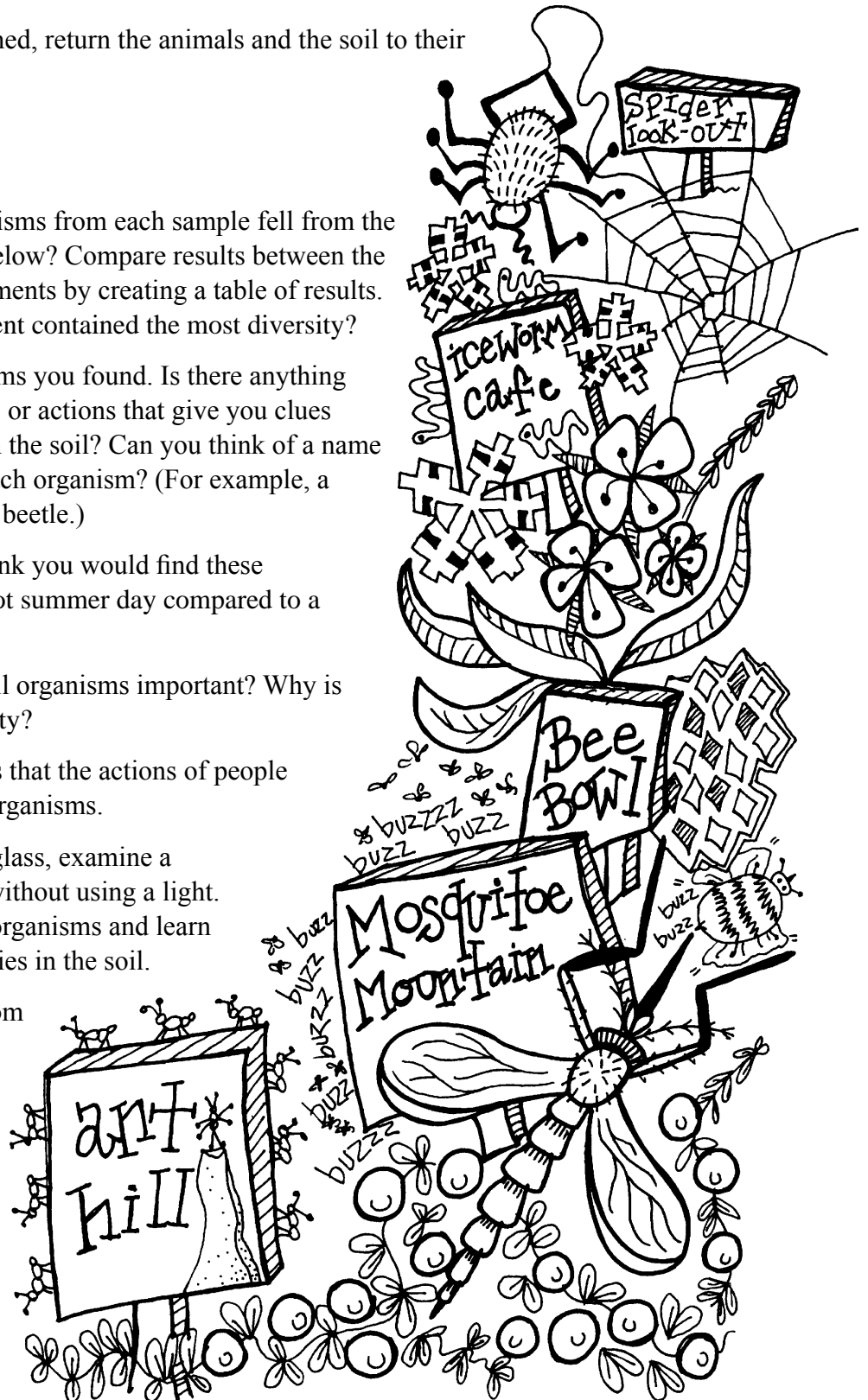
Follow-up

1. Questions

- How many organisms from each sample fell from the soil into the jar below? Compare results between the different environments by creating a table of results. Which environment contained the most diversity?
- Draw the organisms you found. Is there anything about the features or actions that give you clues about their role in the soil? Can you think of a name that would suit each organism? (For example, a five-legged black beetle.)
- Where do you think you would find these organisms on a hot summer day compared to a cool rainy day?
- Why are these soil organisms important? Why is there such a variety?
- Explain two ways that the actions of people could harm soil organisms.

2. Using a magnifying glass, examine a soil sample for life, without using a light. Research one of the organisms and learn more about its activities in the soil.

3. Collect organisms from other ecosystems, for example, under the rocks in a stream or in the mud of a mudflat, marsh or pond. Examine these samples for species diversity and abundance. Compare to other environments.



BIODIVERSITY MEANS DIFFERENCES

Aim...

To introduce the concept of differences or genetic diversity among individuals of the same species.

Ready...

Within any species there are many variations. Explore the biodiversity of one species that lives in your backyard.

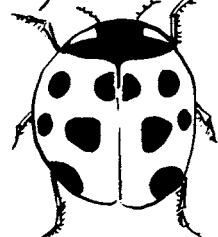
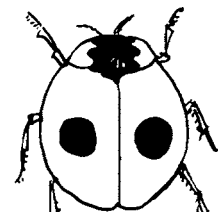
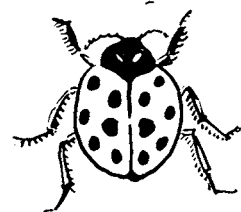
Set...

Work with a group of three or four people. Your team will need:

1. the worksheet on the next page
2. 1 magnifier
3. 1 ruler
4. 1 cup, plastic/paper
5. 5 - 10 spoons
6. 5 - 10 bug boxes/paper cups
7. a sketch pad or notebook
8. optional: net or binoculars (for bird study)



three different species of ladybird beetle



GO!

1. With your team, collect six to eight specimens of the same type of plant or animal. Examine the differences. If you can't collect them, observe them closely and either photograph or sketch them. Following are some suggestions for study.

Plants*	Animals*		
mosses	birds	bees	mosquitoes
grasses	earthworms	ladybird beetles	spiders
trees	caterpillars	flies	centipedes
lichens	snails	beetles	millipedes
herbs	squirrels	dragonflies	moths/butterflies
shrubs	frogs	fish	



***Note:** Your collection or photographs should be of the same species of plant or animal. There are, for example, just over 900 species of beetles in the Yukon and some 350,000 known species of beetles in the world.

2. Now be a scientist and slowly and carefully make your collections or observations.

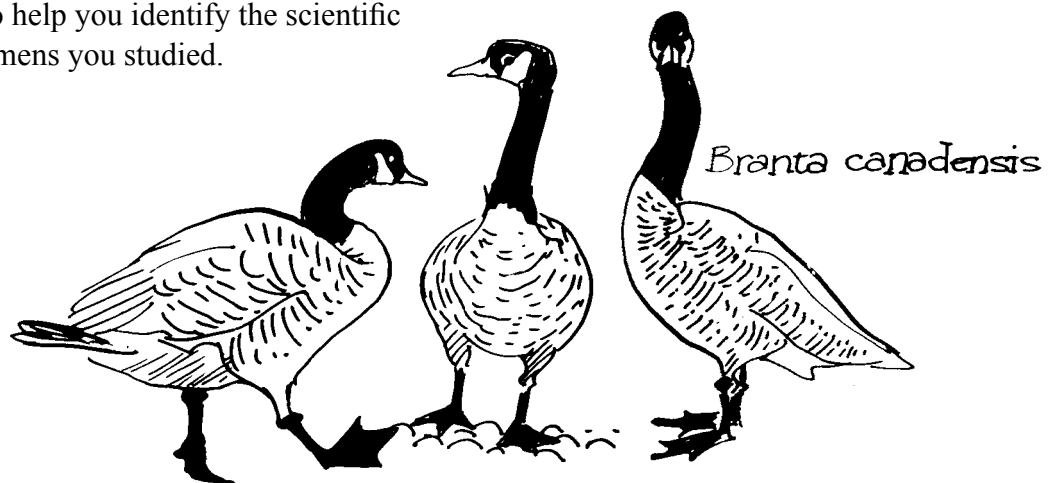
Biodiversity in the same species recording sheet

Date	Study location
Group names	
Species studied	Number studied
Observations	

Specimen number	Size (measure if you can)	Shape	Colour	Location	Identifying marks
1					
2					
3					
4					
5					
6					
7					
8					
9					

Follow-up

1. List the differences between individuals of the same species.
2. Why do you think there are these differences?
3. Scientists often give names to species based on their description. Think of a fun name for each of your specimens.
4. Use a field guide to help you identify the scientific names of the specimens you studied.



GENETIC DIVERSITY AND US!



Aim...

To explore the concept of genetic diversity.

Ready...

All humans belong to the same species. But no two people are genetically the same except for identical twins. The following activity will help you to understand the wonderful variety of differences among us.

Set...

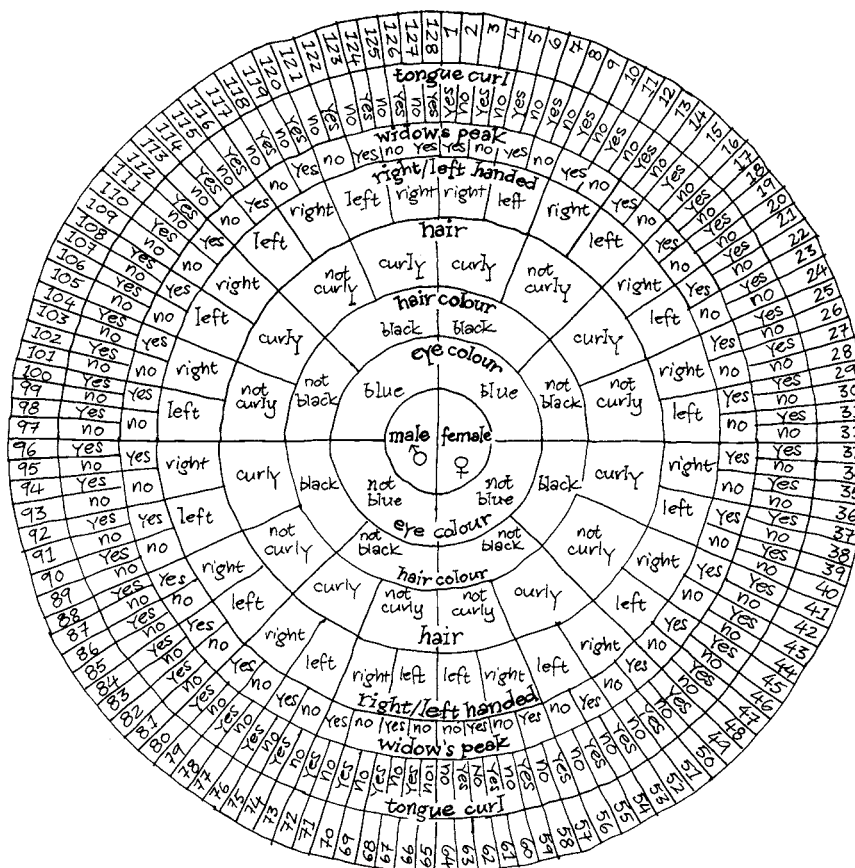
You will need a copy of the genetic wheel.

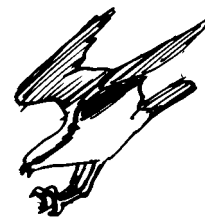
Colour in each characteristic as it applies to you. Move circle by circle from the centre to the outside. Record the number you get when you reach the edge of the circle.

GO!

Follow-up

1. Compare your number to others. How many of you had the same number? Find out where your numbers branched off.
2. Use this activity with your parents to generate “genetic math sentences.” [e.g. #116 (dad) + #52 (mom) = #27 (you)]
3. Describe or draw a family tree of common characteristics among the various generations and members of your family.

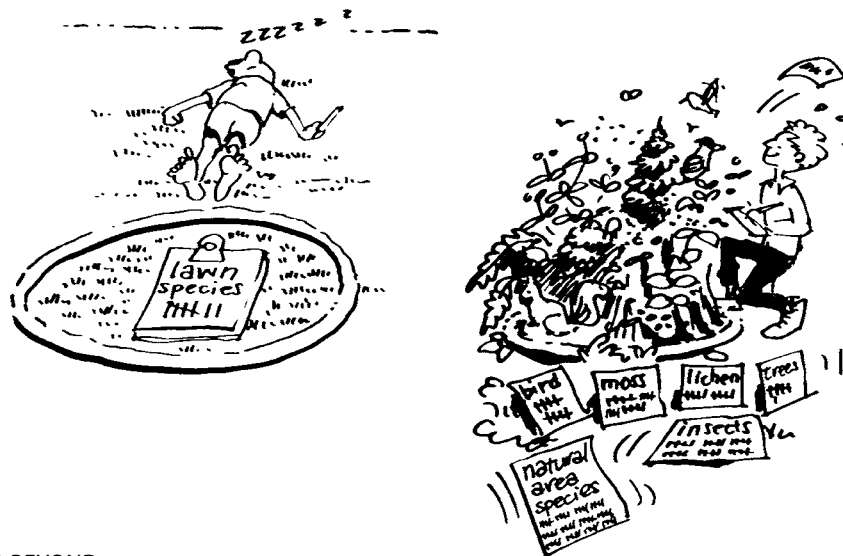




Reach Out!

Mostly Science

1. Scientists know that a good mix of genes in a species contributes to stronger and healthier living things. If new genes are not continually being introduced and mixed into a population, both individuals and the population as a whole may suffer, especially if the population is small. Investigate this concept by finding out what happens over a number of generations to families where sisters and brothers intermarry or by researching the problems food producers have when they “over specialize”—raise too many individuals of the same variety over a long period of time. One example to look at is the fish farming industry.
2. Pretend you are a scientist in a new colony on Mars. A catastrophe on Earth kills all of the humans there. The inhabitants of your colony are the only survivors of the species. What would happen to the human genetic diversity on earth if the survivors who returned to repopulate Earth from Mars were the students in your class? What would happen if they all had a rare blood disease or carried the gene that resisted the effects of antibiotics? Now discuss why it is important to protect the genetic diversity of all living creatures. Write a column for your Mars newspaper discussing this crisis.
3. Why are plants or animals in one area badly damaged by a pest or disease that does little damage to the same plants or animals in another area? Use the term genetic diversity in your answer.
4. Measure the species diversity of a section of your schoolyard by throwing a hula-hoop and count the number of species and/or individuals you find within the area inside the hula-hoop. You can do this anywhere—on the pavement, on a track field, in a grassy area, in a shrubby area, in the forest. From which area did you get the highest counts? Why?
5. Try something else! Compare the species diversity at the edge of a forest or a grassy field and in the core (middle) of it. Is there a difference between the two areas? Why?



Mostly Social Studies

Explorers travel in search of new lands and riches. Often they bring home unexpected treasure such as new food products. In your unit on explorers find out the history of “the spice trade,” potatoes, tobacco, pineapple, kiwi fruit, bananas, coffee and tea. Make up a bananas, coffee and tea Trivial Pursuit type game. Include questions like: What cargo bound for England was the *Bounty* carrying when its crew mutinied (as portrayed in the movie *Mutiny on the Bounty*)? Who held the first “tea party”? Which explorer first brought tobacco home?

Take it home! Study the history of fur trade in Canada. Find out which species’ pelts were specially favoured by people in the 17th century and on. Why and how? Study animal products that trappers used to bait the trap with. Study the plants first nation people used as medicine. Research how they shared their knowledge with the *Coueurs des bois*. Talk to a local trapper and find out why trapping is still important to the people of the north. Find out how he/she manages the trapline to keep its species diversity.

Mostly Fine Arts

Create an ecosystem collage. Use pictures cut from magazines or photocopied from books. Or draw your own. Be sure to include different plants, trees, insects, birds, animals, soil, water, climate, etc. Create an ecosystem collage by fitting together the puzzle pieces of an ecosystem. Do this as a cooperative activity and explain your ecosystem to the rest of the class.

