

Grade 4: Nature's Recyclers



Table of Contents:

Learning Objectives & Curriculum Connections	2
Hike Development Resources	3
Extra Activities	59
Appendix A: Rotten Log Organisms Identification Sheet	62
Appendix B: Classification Game Cards	65
Appendix C: Example Hike.....	71

Disclaimer: Don't be discouraged by the length of this document! Most of these pages are photos.

INTRODUCTION

Students will learn how nutrients are recycled in forest ecosystems and why this is important. They will also learn which organisms act as recyclers.

LEARNING OBJECTIVES:

By the end of this lesson, students will:

- Be able to identify several decomposers and recyclers
- Understand how nutrients are recycled in nature
- Understand why recycling nutrients and byproducts is important to forest ecosystems

LOCATION:

A rural, forested setting is ideal, but in more urban places go to a natural area within city limits or a provincial park.

SET UP:

Print out this document (double sided) and scout out your field trip site ahead of time to see if you can find some of the items listed throughout this document such as fungi, scat, or other animal traces. When you find them, mark them with flagging tape to make them more visible when you deliver the hike with the students. If there are items that you wish to discuss but cannot find, please use the photos provided. You can keep these photos in your backpack or attach them to a tree with flagging tape/string for the students to find.

EXTRA ACTIVITIES:

Mark out the areas ahead of time using pylons (or other boundary markers). Prepare the game cards and label buckets.

SAFETY PLAN:

Leader must carry a first aid kit and be aware of their surroundings on the hike (i.e., bear safety, fallen trees, and waterbodies). Ensure any students with bee, wasp, or other severe allergies carry their Epi-pen.

GRADE: 4

TEACHER PREPARATION TIME: 45 minutes

LESSON DURATION: 60+ minutes

PREREQUISITE: None

WORKSHEETS: Attached

CONNECTIONS TO SCIENCE CURRICULUM TOPIC A:

A-1 Identify plant and animal wastes, and describe how they are recycled in nature.

A-9 Identify ways in which materials can be reused or recycled.

MATERIALS

Attached Worksheets

- Hike pictures
- Rotten Log Organisms Sheet
- Producer, Consumer, Decomposer game pieces

Additional

- Flagging tape
- Printed hike photos (optional)

Extra Activities

- Pylons (or other boundary markers)
- 6 Buckets (3 colours preferred- 2 of each colour)
- Small shovels or trowels (1 per pair)
- Magnifying 'bug viewers' (1 per pair)

PROCEDURE:

You are going to create a hike based on nature's recyclers using the information provided in this document. We have provided more than what you would need for the hike. The extra information is meant only to serve as a reference.

1. Introduction: (Approx. 10 minutes)

Introduce topic for the day and rules (Boundaries, respecting wildlife, etc.)

- 'What is the name of the biggest forest in Alberta?' Answer: Boreal Forest!
(If you don't live in Northern Alberta, ask about the forest you live in)
- 'The Boreal Forest is one of the **biggest on Earth**; it goes around the whole globe and is an important habitat for many species of insects. It is really important so I want to make sure you all learn the name. Let's yell it as loud as we can!' Answer: Boreal Forest!
- 'We are going on a short hike into the forest to look at some of nature's recyclers. We are going to learn how parts of the forest will be broken down into the soil and used again by new plants.'
- 'The recyclers I am talking about can be decomposers which break down dead things in the forest, but they may also be other types of animals too.'
 - What kinds of organisms break down dead things in the forest? Answer: mushrooms, bacteria, insects, other fungi
 - 'Decomposers are important because they put nutrients back into the ecosystem/soil that would otherwise stay trapped in the dead organism'

Curriculum Links: A-1,2

2. Hike Development Resources: (Approx. 50-60 minutes)

*This outline gives many types of items you may encounter on the hike- please use as many as you find adequate. Photos are included below for your own identification purposes as well as demonstration if you cannot find a particular item. You can keep these photos in your backpack for more information or attach them to a tree for students to find. An example hike can be found in **Appendix C.***

B. Fungi you may encounter:

Fungi are helpful to decompose dead things by using the nutrients found inside the plant/animal to grow. When they feed on dead material they are called saprophytic. On the other hand, if a fungus is growing on a live tree it is harmful to the tree because the fungus is taking nutrients away from the plant- these are parasitic fungi.

You may choose to find some samples/images ahead of time or you may let the students look for fungi in an area suitable for fungal growth. What you decide may depend on your location, time of year, etc.

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1. Oyster mushroom- A softer fungus that has a sweet smell that some people liken to licorice.



2. Red belted conk- A very firm fungus, it is not always red on the outer ring, sometimes it is orange or cream coloured.



3. Smoky polypore- This fungus may be used in the future to clean up pollutants in the environment due to its ability to break down certain compounds (polycyclic aromatic hydrocarbons, or PAHs, in particular which are found in coal and other fossil fuels).



4. Tinder conk- This fungus was once used by aboriginal people to carry a flame to a new spot and to start new fires.



5. Artist's conk- This fungus can be scratched on the underside to leave a permanent mark. As the name implies, artists can use this conk to create unique works of art.



6. Morel mushroom- This fungus looks like a brain and can be found in large numbers after a forest fire.



7. Puffball- This fungus disperses its spores (similar to a plant's seeds) in little 'puffs' of what looks like dust when the puffball is impacted or splits open.



8. Wolf's Milk Slime (slime mold) – This fungus looks like brightly coloured spots, and is found mainly on nearly decomposed logs.



9. Comb Tooth-This fungus is found on decomposing logs; it is bright white with a very distinctive shape.



10. Earthstar- This unique fungus is found mainly under spruce trees.



11. Galerina- tiny mushrooms that grow in moss and may be found on **nurse logs**. Nurse logs are fallen trees that provide nutrients which allow new plants to grow on them.

C. Scat you may encounter:

All animals make scat (or poop)! But where does it go? Answer: Decomposers like insects, bacteria, and fungi break down the scat. There are many nutrients in scat which makes it a useful source of food for many decomposers. If we did not have our trusty recyclers breaking it down, we would be up to our necks in scat! Yuck. **Ask them what kinds of animals live here and some scat that they may see.**

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1. Coyote Scat- This scat may have hair, bones, grass, and berries in it; and has a tapered end.



2. Bear Scat- This scat may have hair, bones, and grass in it. It will also most likely have berries in it in late summer and fall. Bears are omnivorous, so it is equally likely to find both plant and animal material in their scat.



3. Domestic dog scat- This scat likely won't have any hair in it, it may be drier in appearance (from the kibble the dog ate) and doesn't have a tapered end.



4. Deer scat- This scat is small and **oval** shaped with an overall **smooth** texture. This scat resembles chocolate covered raisins.



5. Hare scat- This scat is small and **round** in shape with an overall **coarse** texture. This scat resembles M&Ms.



6. Moose scat- This scat is larger than that of deer and oval in shape.
This scat resembles chocolate covered almonds.

D. Animal Recyclers:

Fungi and bacteria are very important decomposers but there are animals that can help break things down or even recycle them to make something new and useful.

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1. Wasps use old wood that they bite off and chew up mixed with their saliva to make a thin paper-like material that they build their nests with.



2. Birds- Many birds build nests out of things that they find in the forest- they may use dead grass, twigs, moss, and even hair from other animals. Birds need these materials to keep their babies safe and warm in the nest.



3. Bones or antlers with small teeth marks- Small animals like mice chew on these bones/antlers to obtain nutrients like calcium which keeps them healthy.



4. Woodpecker holes- Woodpeckers listen closely for signs of movement inside of dead trees and then they make holes in the wood to get at them and slurp them up with their long tongue.



5. Cavities in trees make great nests for owls- Owls do not make their own nests so they need to find good places to raise their babies that are ready to move into. Many owls (for example the Northern Saw-whet Owl pictured here) use cavities in trees to make their nests. These holes may have been made by another animal damaging the trees or from some other source of injury to the tree.

E. Other fun points:



1. Moss- Moss is one of the first things to colonize a new area (rocks, fallen logs, etc.) and release nutrients from it for the plants to come.



2. Lichen- a symbiotic relationship between algae and fungus that allows it to grow in areas where fungi/algae alone could not live.
Caribou lichen is pictured.



3. *Nurse logs* are fallen trees that have moss, fungus, lichens, and even new plants growing on them! They are excellent examples of nature's recyclers because they give a visual of new life growing from dead material.

3. Decomposition Investigation (10-15 minutes)

Activity Introduction:

'In this activity we are all going to be detectives and search for signs of decomposition and the agents that do the decomposing! Can anyone remind me what those 'agents' might be? Answer: bacteria, fungi, and insects. In partners, you will spread out and search the forest. Dig into old logs that may be partially broken down, fallen leaves that are turning brown, or dig into the soil a bit to find the agents of decomposition: centipedes, worms, mushrooms, spiders, and whatever else you can find. It's very important that you stay within the area marked out, and that you don't hurt any of the creatures that we find. Lastly, don't put any mushrooms in your mouth or squish them with your hands. When you find something cool put it into your container and we will all go around and talk about the interesting things we found.'

Materials needed:

- Rotten log organisms sheet (Appendix A)
- Small shovels or trowels
- Magnifying bug viewers or containers and magnifying glasses

Instructions/Prep:

- Mark out the area that you want the students to search and tell them to stay within the boundary.
- Break them into partners or groups (depending on how many students are in the class).
- Distribute an identification sheet, small shovels/trowels, and magnifying bug viewers/containers and magnifying glasses.
- Let them look for signs and agents of decomposition for about 10 minutes. You may need to help them look (e.g. break into logs).
- When each group has found something, call them back in and arrange them in a circle for sharing.
- Go around the circle and let each group describe what they found and why they think it's a) interesting, and b) how it relates to decomposition.
- Go through the debriefing questions below.
- Then instruct the students to put back everything back where they found it and collect the materials.

Debriefing Questions:

- **Decomposing Logs:** 'Did the logs on the ground look different from live trees? Did they feel different? Did they smell different?' Answer: yes they did! They might be a different colour, feel more crumbly and soft, and they smell more like the soil. 'Why might they look, feel, and smell more like soil or dirt?' Answer: because trees that fall down are broken down and return to soil so new things can grow!

- **Fallen trees/Succession:** 'Is this part of the forest dead?' Answer: Yes and no. These trees may be dead, but decomposers and recyclers will clean it up and make those nutrients available to new plants and animals so that they grow and take over this section.
- **Leaves:** 'Do leaves on the ground look different then leaves on the tree? How?' Answer: they might be yellow, orange, red, or even brown. They are decomposing, that explains why we don't have a layer of leaves as tall as we are even though the trees lose their leaves every year—they turn back into soil!

4. Producer, Consumer, Decomposer Classification Game: (Approx. 5-10 minutes)

Game Introduction:

'Our next activity involves producers, consumers, and decomposers. All living things in the Boreal forest can be put into one of these three categories. Can anyone guess what a producer might be? *Answer: Plants.* Producers are plants. It's easy to remember because they both start with the letter P. They take energy from the sun, carbon dioxide and water and **produce** oxygen and sugars. So if plants are producers, what do you think might be a consumer? *Answer: Animals.* A lot of animals are consumers. Consumers are things that consume, or eat, either plants, or other animals. Can someone give me an example of a consumer? *Answer: Moose, rabbit, wolf, etc.* Our last category is decomposers. Decomposers are things that break down dead matter to release the nutrients. Decomposers include things like fungi, insects, and bacteria.

For this game you are going to be in two teams. Each team must form a line behind their start positions. Everyone will receive a card with a picture of something that lives in the Boreal forest. **Your job will be to decide if your card shows a producer, consumer, or decomposer.** There are three buckets ahead of each line, one for producers, one for consumers, and one for decomposers. When I say go, the person at the front of each line will run up to your team's buckets and drop it in whichever category you think it belongs in. Then you will run back and tag the next member of your team so they can run their card up. After the sorting race is done, we will see which team was the fastest, and which team got the most cards in the right buckets.'

Materials:

- 6 buckets (same colours as cards- e.g. 3 red, 3 orange)
 - 2 labelled producer, 2 labelled consumer, and 2 labelled decomposer (each team should have one of each)
- Classification cards for producers, consumers, decomposers
 - Mount these onto coloured paper (orange and red)

Instructions/Prep:

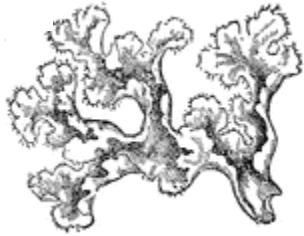
- Before your field trip, cut out the playing cards from Appendix B and mount them onto coloured paper. You will need two sets mounted on two different colours of paper (e.g. red and orange).
- When you arrive to your field trip site, lay out your playing area with pylons, place the 6 buckets at one end of the area and sort the class into two and have them line up in their group at the other end.
- The first group will get red cards, the other will get orange cards; these correspond to the colours of the buckets.
- Disperse one card to each student. The cards will have a picture of a producer, a consumer, or a decomposer.
- One at the time the students will look at their card, run down the field and drop it in one of their team's labelled buckets, and then they run back and tag the next teammate to do the same.
- The first team to finish sorting the cards correctly wins. If the fastest team does not have all of their cards sorted correctly, then the team with the **most** correct cards wins.

APPENDIX A: Rotten Log Organisms Identification Sheet

Rotten Log Organisms



Fungi



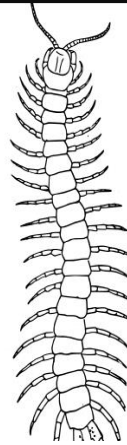
Lichen



Shrub Seedling



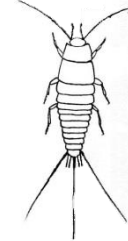
Millipede



Centipede



Termite



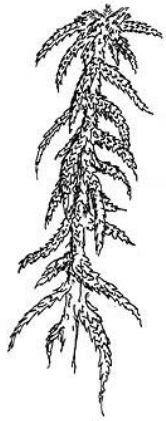
Bristletail



Springtail



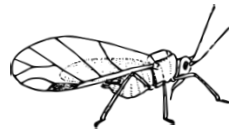
Slug



Moss



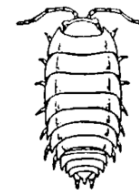
Tree Seedling



Aphid



Spruce Beetle



Wood louse
or sow bug



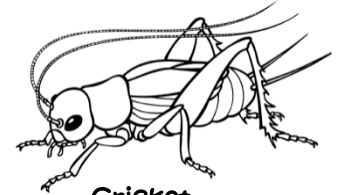
Earthworm



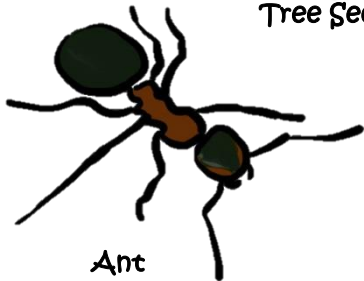
Moth
Cocoon



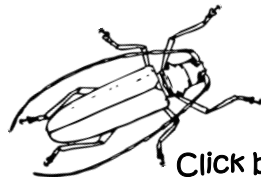
Daddy
Long-legs



Cricket



Ant



Click beetles
and larvae



Bark beetles
and larvae



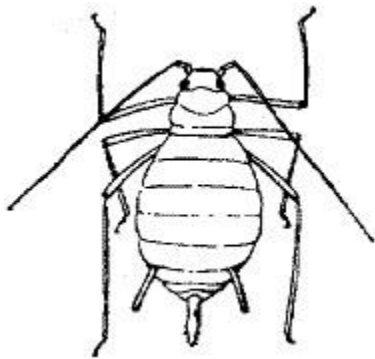
Butterfly Chrysalis



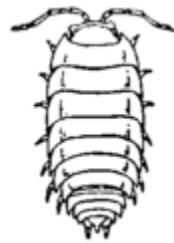
Land Snail

Every rotting log will be home to a slightly different community of organisms. Here are some to look for!

Soil Organisms



Aphid



Sow Bug



Spider



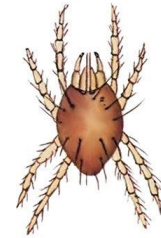
Centipede



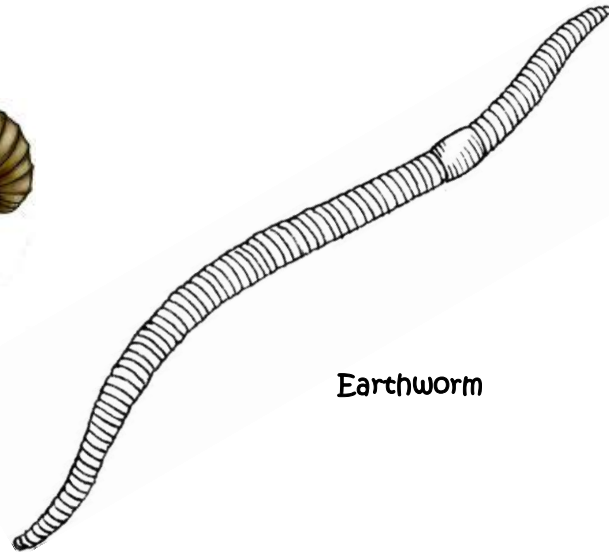
Millipede



Wire worm



Mite



Earthworm

Some organisms you may find in the soil!

Appendix B: Classification Game Cards



BLACK SPRUCE TREE



**TREMBLING ASPEN
TREE**



PRICKLY WILD ROSE



WHITE BIRCH TREE



**WILD STRAWBERRY
PLANT**



**WILD RASPBERRY
BUSH**



HORSETAIL



LABRADOR TEA



SPHAGNUM MOSS



GRASS



WALLEYE



COYOTE



BLACK BEAR



SNOWSHOE HARE



LYNX



AMERICAN ROBIN



**BOREAL CHORUS
FROG**



WHITE-TAILED DEER



RED SQUIRREL



CHICKADEE



EARTHWORM



BACTERIA



SNAIL



SLUG



SOW BUG



CENTIPEDE



CLICK BEETLE



LIMACELLA FUNGI



**GANODERMA SHELF
FUNGI**



**MYCORRHIZAL
FUNGI**

Appendix C: Example Hike

1. Introduction: (Approx. 10 minutes)

Introduce topic for the day and rules (Boundaries, respecting wildlife, etc.)

- 'What is the name of the biggest forest in Alberta?' Answer: Boreal Forest!
(If you don't live in Northern Alberta, ask about the forest you live in)
- 'The Boreal Forest is one of the **biggest on Earth**; it goes around the whole globe and is an important habitat for many species of insects. It is really important so I want to make sure you all learn the name. Let's yell it as loud as we can!' Answer: Boreal Forest!
- 'We are going on a short hike into the forest to look at some of nature's recyclers. We are going to learn how parts of the forest will be broken down into the soil and used again by new plants.'
- 'The recyclers I am talking about can be decomposers which break down dead things in the forest, but they may also be other types of animals too.'
 - What kinds of organisms break down dead things in the forest? Answer: mushrooms, bacteria, insects, other fungi
 - 'Decomposers are important because they put nutrients back into the ecosystem/soil that would otherwise stay trapped in the dead organism'

2. Hike: (Approx. 45 minutes)

A. Fungi:

Fungi are helpful to decompose dead things by using the nutrients found inside the plant/animal to grow. When they feed on dead material they are called saprophytic. On the other hand, if a fungus is growing on a live tree it is harmful to the tree because the fungus is taking nutrients away from the plant- these are parasitic fungi.

You may choose to find some samples/images ahead of time or may let the students look for fungi in an area suitable for fungal growth. What you decide may depend on your location, time of year, etc.

- Artist's Conk- These fungi are found on trees and can be scratched on the underside to leave a permanent mark.
- Puffball- These fungi are found on the ground and disperse spores differently than most mushrooms i.e. the spores come out in little 'puffs' of what looks like dust when the puffball is impacted or splits open

C. Scat you may encounter:

All animals make scat (or poop)! But where does it go? Answer: Decomposers like insects, bacteria, and fungi break down the scat. There are many nutrients in scat which makes it a useful source of food for many decomposers. If we did not have our trusty recyclers breaking it down, we would be up to our necks in scat! Yuck.

Ask them what kinds of animals live here and some scat that they may see.

- Coyote- Coyotes eat all types of different things so the scat may have hair, bones, grass, and even berries in it, it will also have a tapered end.
- Deer- Deer eat a variety of plants and you may be able to spot some pieces of the plants in the scat. It is small and oval shaped with a smooth texture.

D. Animal Recyclers:

Fungi and bacteria are very important decomposers but there are animals that can help break things down or even recycle them to make something new and useful.

- Wasps- wasps use old, dead wood that they bite off and chew up and mix with their saliva to make a thin paper-like material that they build their nests with.
- Birds- many birds build nests out of things that they find in the forest- they may use dead grass, twigs, moss, and even hair from other animals. 'Why do they make nests?' To protect their babies and keep them warm. Birds need these materials to keep their babies safe and warm.
- Bones with small teeth marks- 'Who was chewing on this bone?' Answer: the tiny teeth marks are from small mammals like rodents. 'Why would they do this?' Answer: to get nutrients like calcium that help keep their bones and teeth strong. Small animals like mice need these bones to stay healthy.
- Woodpecker holes- 'as we talked about earlier, insects feed off of dead material in the forest, but what eats them?' Answer: many animals, but woodpeckers are a really good example. Woodpeckers listen closely for signs of movement inside of dead trees and then they make holes in the wood to get at them and slurp them up with their long tongue.

D. Other fun points

- Moss- One of the first things to colonize a new area (rocks, fallen logs, etc.) and release nutrients from it for the plants to come.
- Lichen- a symbiotic relationship between algae and fungus that allows it to grow in areas where fungi/algae alone could not live. Caribou lichen is pictured.
- Nurse logs are fallen trees that have moss, fungus, lichens, and even new plants growing on them! They are excellent examples of nature's recyclers because they give a visual of new life growing from dead material.

3. Extra Activities: (Approx. 20 minutes)

Following the hike, you can have them do the Decomposition Investigation and then the Classification Game.