# Workbook Preview

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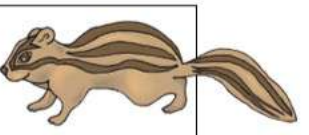
# Grade 7 Science Unit

## Interactions in the Environment

B1 - Relating Science and Technology to Our Changing World
B2 - Exploring and Understanding Concepts



| | Curriculum Expectations | Pages |
|---|---|---|
| **B1.1** | assess the impact of various technologies on the environment | 64-66, 97-109, 117-118, 122-123 |
| **B1.2** | assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment | 110-116, 119-121 |
| **B1.3** | analyse how diverse First Nations, Métis, and Inuit practices and | 124-132 |
| **B3.1** | | -26, 60- |
| **B3.2** | | 24-36 |
| **B3.3** | and decomposers within an ecosystem | 60-61 |
| **B3.4** | describe the transfer of energy in a food chain, and explain the effects of altering any part of the chain | 46-66 |
| **B3.5** | describe how matter is cycled within the environment, and explain how the cycling of matter promotes sustainability | 67-78 |
| **B3.6** | explain the differences between primary succession and secondary succession in ecosystems | 79-86, 95-96 |
| **B3.7** | explain how biotic and abiotic factors limit the number of organisms an ecosystem can sustain | 87-89, 93-96 |
| **B3.8** | describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems | 64-66, 97-121 |

Preview of 100 pages from this product that contains 214 pages total.

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# Grade 7 Science Unit

## Strand A - STEM Investigation and Communication Skills

| | Curriculum Expectations | Pages |
|---|---|---|
| **A1.1** | use a scientific research process and associated skills to conduct investigations | 18, 37-40, 90, 137, 140 |
| **A1.2** | use a scientific experimentation process and associated skills to conduct investigations | 90-92 |
| **A1.3** | use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems | 18-23, 37-40, 90-92 |
| **A1.4** | follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials | 18-23, 37-40, 90-92 |
| **A1.5** | communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes | 18-23, 91-92 |
| **A2.1** | write and execute code in investigations and when modelling concepts, with a focus on planning and designing programs | 133-138 |
| **A2.2** | identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades | 133-137 |
| **A3.1** | describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems | 133-135, 137, 139, 141 |
| **A3.2** | investigate how science and technology can be used with other subject areas to address real-world problems | 41-42, 133-137, 139-141 |
| **A3.3** | analyse contributions to science and technology from various communities | 42, 133-136 |

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# INTERACTIONS IN THE ENVIRONMENT




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Curriculum Connection
B3.1, B3.2

# Ecosystems

**What is an Ecosystem?**

An ecosystem is a network of interactions among living organisms and their environment. A **living organism** is anything alive, which includes plants, animals, and microbes. Living organisms are the **biotic** parts of an ecosystem, while non-living things are the **abiotic** parts.

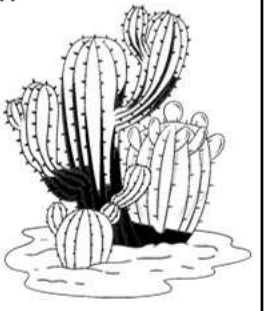
The living organisms in an ecosystem need each other, as no one plant, or animal could survive by itself. Plants need animals in many ways, while animals need plants to survive.

Organisms also interact with the abiotic parts in their ecosystem, like the sun, soil, water, rocks and air. The biotic components of an ecosystem meet their needs by interacting with the abiotic components. Biotic components in an ecosystem use abiotic components for shelter. Animals will live under rocks, in dens, or in trees. These abiotic elements often contain a thriving ecosystem as you may learn when you have flipped a rock!

PREVIEW

**Interesting Facts about Ecosystems**

- Coral reefs are busy underwater ecosystems. Corals look like plants but are actually animals. They have skeletons and form reefs where a lot of other organisms live, like crabs, starfish, clams, eels and fish.
- Half of the world's species live in tropical rainforests. These ecosystems are home to plants, animals, fungi, and many microscopic organisms.
- The desert is a dry ecosystem where there is very little rain. To live in the desert, you must be able to save water. Cactuses store water and can live without rain for months. The Kangaroo Mouse rarely drinks water and gets its water from food.



- Freshwater ecosystems are home to rare species. Ponds, lakes, streams, and rivers are freshwater ecosystems home to species that can't live in the salty ocean water. These ecosystems are all over the world.
- Most tundra ecosystems are located in the Arctic in the Northern Hemisphere. The tundra is massive and has no trees because the ground is permanently frozen.

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Curriculum Connection
B3.1, B3.2

## Questions

Use information from the text to support your answer.

1) How do biotic and abiotic elements interact with each other?

2. Define the terms below.

| | |
|---|---|
| **Biotic** | |
| **Abiotic** | |
| **Ecosystem** | |

PREVIEW

## Visualizing

Draw what you are picturing as you were reading. Explain the picture.

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1. An ecosystem is a community of living things interacting with dead things. | True | False |
| 2. Half of the world's species live in tropical rainforests. | True | False |
| 3. Only plants and animals that can hold water can survive in the desert. | True | False |
| 4. The ocean is a freshwater ecosystem. | True | False |
| 5. Not much grows in the tundra because the ground is frozen. | True | False |

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Curriculum Connection
B3.1, B3.2

# Terrestrial Ecosystem

**What is a Terrestrial Ecosystem?**
A **terrestrial ecosystem** is a land-based community of organisms. The picture below shows a terrestrial ecosystem that is home to biotic and abiotic components. The biotic things interact with each other and the abiotic components to survive.



PREVIEW

**Interpret** Analyze the picture and answer the questions below.

| How are the organisms interacting with the abiotic and other biotic components in their ecosystem? List 5 ways. |
|---|
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

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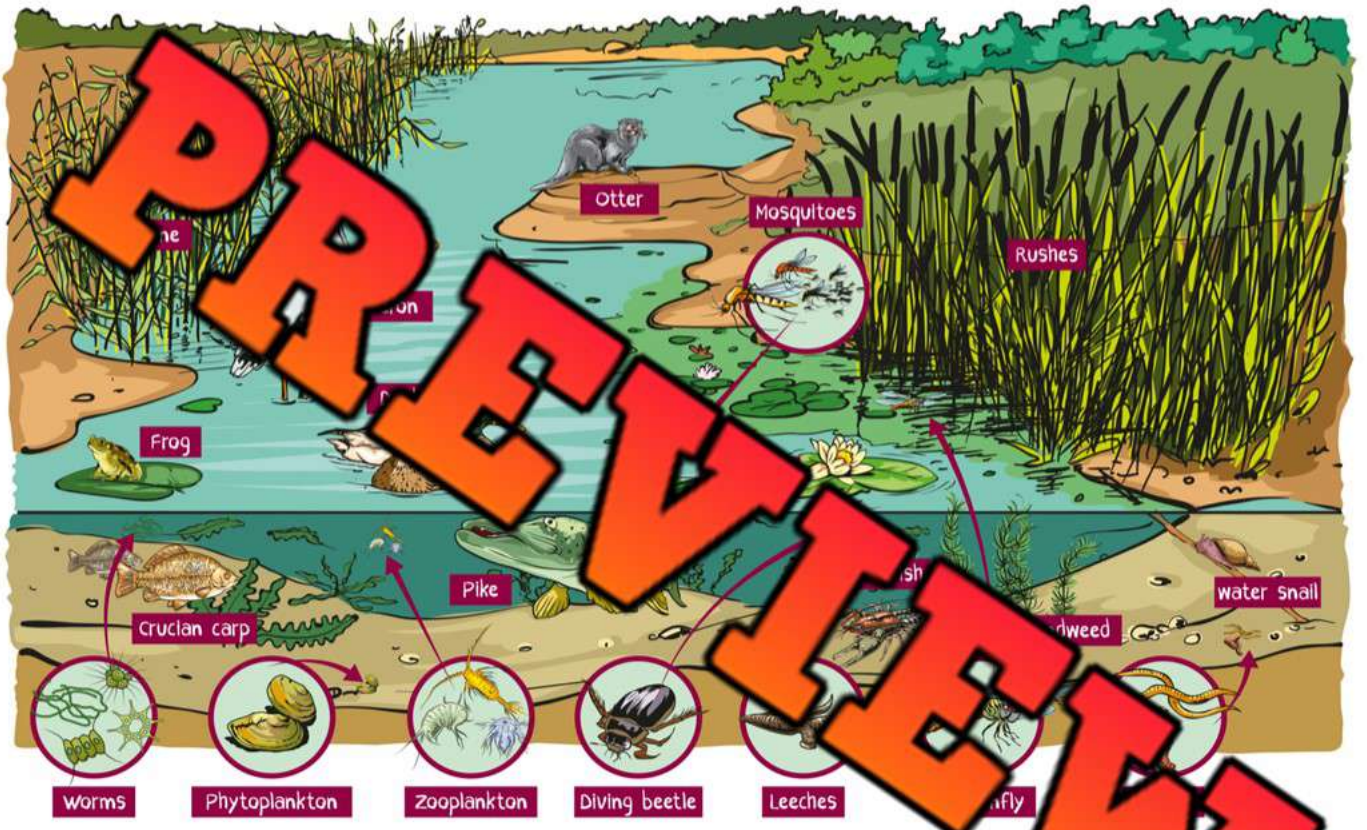
Curriculum Connection
B3.1, B3.2

# Aquatic Ecosystem

**What is an Aquatic Ecosystem?**
An **aquatic ecosystem** is community of organisms that live in and around a body of water. The picture below shows an aquatic ecosystem that is home to biotic and abiotic elements. The biotic things interact with each other and the abiotic components to survive.




PREVIEW

**Interpret** Analyze the picture and answer the questions below.

| How are the organisms interacting with the abiotic and other biotic components in their ecosystem? List 5 ways. |
|---|
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

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Curriculum Connection
B3.1, B3.2

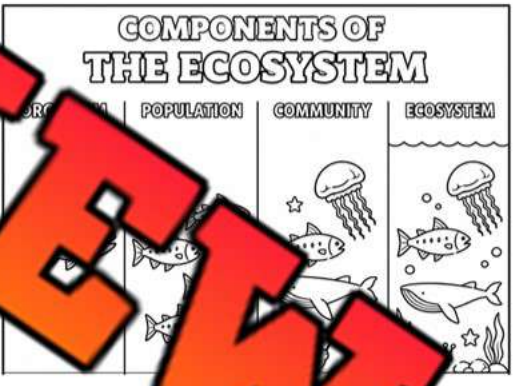
# Living Things – Basic Needs

**Basic Needs of Living Things**

Biotic components of an ecosystem have basic needs they must meet. If they don't, they will become an abiotic component.

Plant Basic Needs

1) **Light** – ceived from the sun and used to make food as part of photosynthesis
2) **Wate** – ll provides water to plants so that the plant can spread nutrients
3) **Air** – lants dioxide that they find in the air in our atmosphere.
4) **Warmth** – s can in colder temperatures (cedar trees, boxwood hedges) while nee Either way, all plants need some warmth.
5) **Space** – All plants ne o gro ystem has a carrying capacity that will allow it to provide life for ain components




Animal Basic Needs

1) **Food** – Animals need to find food in their eco m. Animals eat other living things, like plants or other animals.
2) **Water** – Animals need freshwater to drink. Freshwater is found puddles, rivers, etc. Freshwater is not found in oceans.
3) **Shelter** – Animals find shelter using abiotic components, like rocks, logs and dead trees. Some animals live in caves, or in other biotic components like trees and plants. Animals use these shelters for protection so they can hide from predators.
4) **Air** – Animals need oxygen from the air in our atmosphere. Our air is made of 78% nitrogen and 21% oxygen. Many other gases make up the remaining 1%.
5) **Space** – Animals also need space to survive. They need room to gather resources like food and water. An ecosystem has a carrying capacity for animals. If too many animals live in an ecosystem, overpopulation problems like not enough food will occur.

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Curriculum Connection
B3.1, B3.2

## Questions

Use information from the text to support your answer.

1) What do all biotic components in ecosystems need to survive?

2) How do biotic things use abiotic things to survive in their ecosystem?

PREVIEW

## Questioning

Write three questions about the reading.

| | |
|---|---|
| 1) | |
| 2) | |
| 3) | |

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) All biotic things need air and water. | True | False |
| 2) All biotic things need shelter. | True | False |
| 3) Some animals need freshwater while other animals need saltwater. | True | False |
| 4) All marine animals can survive in freshwater, like lakes, rivers and ponds. | True | False |
| 5) Ecosystems can be overpopulated with too many biotic components. | True | False |

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Curriculum Connection
B3.1, B3.2

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Is the statement true or false?

| | | |
|---|---|---|
| Plants use photosynthesis for food. | T | F |
| Freshwater is found in oceans. | T | F |
| Animals need carbon dioxide. | T | F |
| Plants need nitrogen from air. | T | F |
| Air is 78% oxygen. | T | F |

Name: _____

Is the statement true or false?

| | | |
|---|---|---|
| Plants use photosynthesis for food. | T | F |
| Freshwater is found in oceans. | T | F |
| Animals need carbon dioxide. | T | F |
| Plants need nitrogen from air. | T | F |
| Air is 78% oxygen. | T | F |

Name: _____

Is the statement true or false?

| | | |
|---|---|---|
| Plants use photosynthesis for food. | T | F |
| Freshwater is found in oceans. | T | F |
| Animals need carbon dioxide. | T | F |
| Plants need nitrogen from air. | T | F |
| Air is 78% oxygen. | T | F |

Name: _____

Is the statement true or false?

| | | |
|---|---|---|
| Plants use photosynthesis for food. | T | F |
| Freshwater is found in oceans. | T | F |
| Animals need carbon dioxide. | T | F |
| Plants need nitrogen from air. | T | F |
| Air is 78% oxygen. | T | F |

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Curriculum Connection
B3.2

# Biotic Factors in Forests

**Forest Ecosystems**

Forests are ecosystems that are communities for living and non-living things. Scientists use the term **biotic** to refer to anything living and **abiotic** as anything non-living. Examples of biotic and abiotic things we find in forests include:

| | |
|---|---|
| **Biotic** | Trees, shrubs, birds, mammals, fish, insects, grasses, fungi, ferns, bacteria |
| **Abiotic** | wind, sunlight, water, rocks, air, temperature, human-made things |

**Biologis** who study living things. They look at how living things are affec and c things. When a biotic or abiotic thing affects a biotic thing, we call biotic ctor.



**Biotic Factors** g thin t trees

- Leaf Miner – A le er i n insect that lives inside a leaf and eats the le like m who get inside the plant and eat it. Most lea inse hs, flies, and beetles. The larva need to ea plan urvive.
- Tent Caterpillars – Caterpillars are s utterfl oths in the larva stage. They need to eat plants to survive. Tent caterpillars ar lar moths. The adult moth lays eggs in the branches of a tree. When the atch uild silk "tents" in the branches. The larvae are hungry! They can l th e in just days! This is called **defoliation**. When there is a infestation terpill a forest, it can lead to the defoliation of tens of thousands of hec res
- Blight – Blight is a plant disease that happens when a fungi or bac gh a plant. Blight causes the browning of leaves and small branches bacteria destroy the chlorophyll inside the plant that is needed to keep ant green and healthy. A tree with blight cannot survive as it also needs chlorophy o make food.



- Yellow-bellied Sapsucker – Just like the name implies, the yellow-bellied sapsucker sucks the sap out of trees. They use their sharp beak to drill holes in the tree so the sap can seep out of the holes. The sapsucker eats the sap and can cause the tree to die if too much sap is lost.
- Deer – A deer is a herbivore consumer, meaning they eat only plants. They enjoy the leaves of trees. Sometimes, deer can cause damage to trees by eating the tender bark of younger trees. This causes the tree to die. Trees will also die if the deer eats all of the leaves.

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Curriculum Connection
B3.2

## Questions

Use information from the text to support your answer.

1) How do biotic things affect forests?

2) What bi[illegible]factor did you find most interesting? Explain how it damages living things.

PREVIEW

## Making Connections

[illegible] the [illegible]emind you of?

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1. Rocks, soil, and wind are all biotic factors. | True | False |
| 2. An abiotic factor is something non-living affecting living things. | True | False |
| 3. Leaf-mining happens when larva eat plant leaves from the inside out. | True | False |
| 4. Deer are abiotic factors affecting living things. | True | False |
| 5. Biologists study both biotic and abiotic factors. | True | False |

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Curriculum Connection
B3.2

# Abiotic Factors in Forests

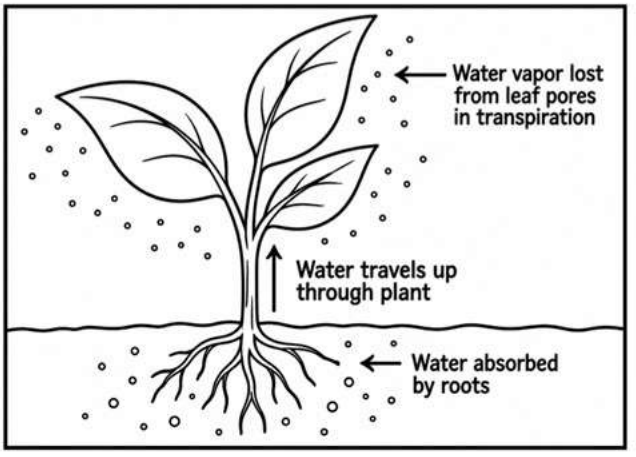
**Abiotic Factors** – How Non-Living Things Affect Trees
Trees and forests need non-living things to survive. Soil, temperature, wind, sunlight, and water are all examples of abiotic factors. Read about them below.

**Soil –** Trees need quality soil to grow. Good soil is able to hold water and also drain the right amount of water as well. This allows the plants to receive the perfect amount of water. G d soil should also have nutrients in it. The nutrients make the soil slightly acidic, wh eeded for plants to grow. Soil can be too dry, wet, loose, or compres oil in forests is quality soil because of all the plants already grow ts decay, they add nutrients to the soil, making it even better.

**Temper re –** Tr n ideal temperature to survive. Depending on the tree, some will die old eratures. For example, a warm March and April can bring early bloo ple t re then killed by a May frost. In Canada, two main types of trees oniferous. Deciduous trees lose their leaves when the tempera op wh ferous trees do not. These trees can survive the cold temperatu o m growing when it warms up.

**Wind –** Trees are great at blocking the us, d you know that trees actually need wind? They need the wind to blo nst the au that causes their roots to grow deeper into the soil, which in turn supp e tre grows taller.

**Sunlight –** Almost every living thing needs sunli o s are no exception. Some trees need less sunlight than other l trees n This is because they use sunlight as part of photosynthesis to e n t need to survive.




**Water –** Trees need wa ater is a key part of photosynthesis, is the process of plants creating food for themselves. The process of photosynthesis requires sunlight + water + carbon dioxide to make glucose (sugar) that it uses for food. But
plants need water for more then just photosynthesis. They also use water for transpiration. Transpiration is the process of water travelling from the soil and roots up through the trunk and branches where it exits through tiny holes in the leaves. Transpiration is important because as the water travels, it carries nutrients from the soil into the plant.

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Curriculum Connection
B3.2

## Questions

Use information from the text to support your answer.

1) How do abiotic factors affect trees?

2) Why is w[illegible]r so important for trees? How do trees get water?

PREVIEW

## Summarizing

Explain[illegible] a[illegible] idea[illegible] supporting details from the reading.

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1. Abiotic means non-living. | True | False |
| 2. Transpiration is the process of water moving through a plant. | True | False |
| 3. Sunlight + water + oxygen produces carbon dioxide and fructose for plants. | True | False |
| 4. When plants transpire, water is lost through the roots of a plant. | True | False |
| 5. Plants need wind so they can grow stronger roots. | True | False |

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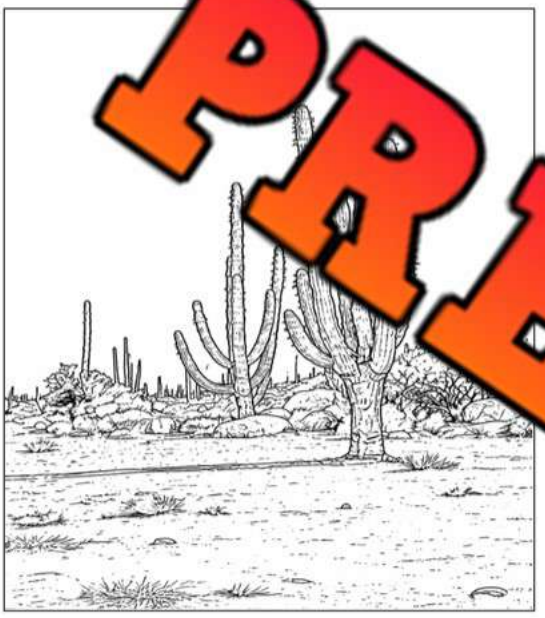
Curriculum Connection
B3.2

# Abiotic Factors - Biodiversity

An ecosystem will thrive if the abiotic factors are favourable for a large variety of organisms. Conversely, if an ecosystem provides unfavourable abiotic factors, it will be difficult for a lot of biodiversity to exist in the ecosystem.

**Interpret** How do the abiotic factors affect the ecosystems in the pictures?



| | |
|---|---|
| Water | |
| Wind | |
| Tem | |
| Soil | |



| | |
|---|---|
| Water | |
| Temperature | |
| Soil | |
| Rocks | |

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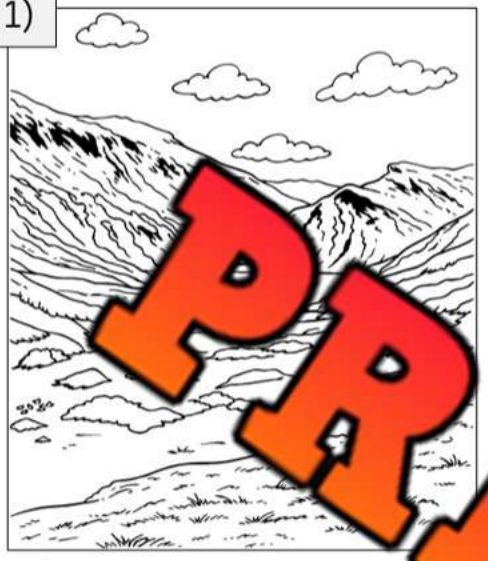
Curriculum Connection
B3.2

# Abiotic Factor - Biodiversity

**Interpret** How do the abiotic factors affect the ecosystems in the pictures?

1)



| | |
|---|---|
| Water | |
| Temperature | |
| | |

2)



| | |
|---|---|
| Wa | |
| Temperature | |
| Soil | |

Which ecosystem would you find more biodiversity? Explain.

_____

_____

_____

_____

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Curriculum Connection
A1.1, A1.3, A1.4

# Experiment – Designing a Zoo Enclosure

**Research Question** What do animals need to survive?

You work at a zoo and need to build another enclosure for at least 3 different animals to live in. Which three animals will you bring to your zoo? Make sure these animals c rvive together in the same enclosure.

**Mate** do we need for our activity?

1) Clay
2) A box – shoebo ot
3) Pipe cleaners
4) Toothpicks or wooden dow s
5) Straws
6) Construction paper




PREVIEW

**Method** How do we complete the experiment

1) Decide which animals you want to buy for your zoo.
2) Research what the animals need to survive.
3) Write down things on the backside of the page that you want to include in your enclosure.
4) Draw a plan of your zoo enclosure.
5) Complete the checklist to make sure the animals have everything they need.
6) Begin making the model of your zoo enclosure.
7) Complete the extension activity – math connection.

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Curriculum Connection
A1.1, A1.3, A1.4

**Planning** Answer the questions below.

1) Which animals will you choose for your enclosure?




2) What will you [illegible] enclosure so that your animals can survive? Look online at enc[illegible]the[illegible]imals and include some of the same abiotic and biotic features.

3) What could you put in the enclosure so that the animal has fun?

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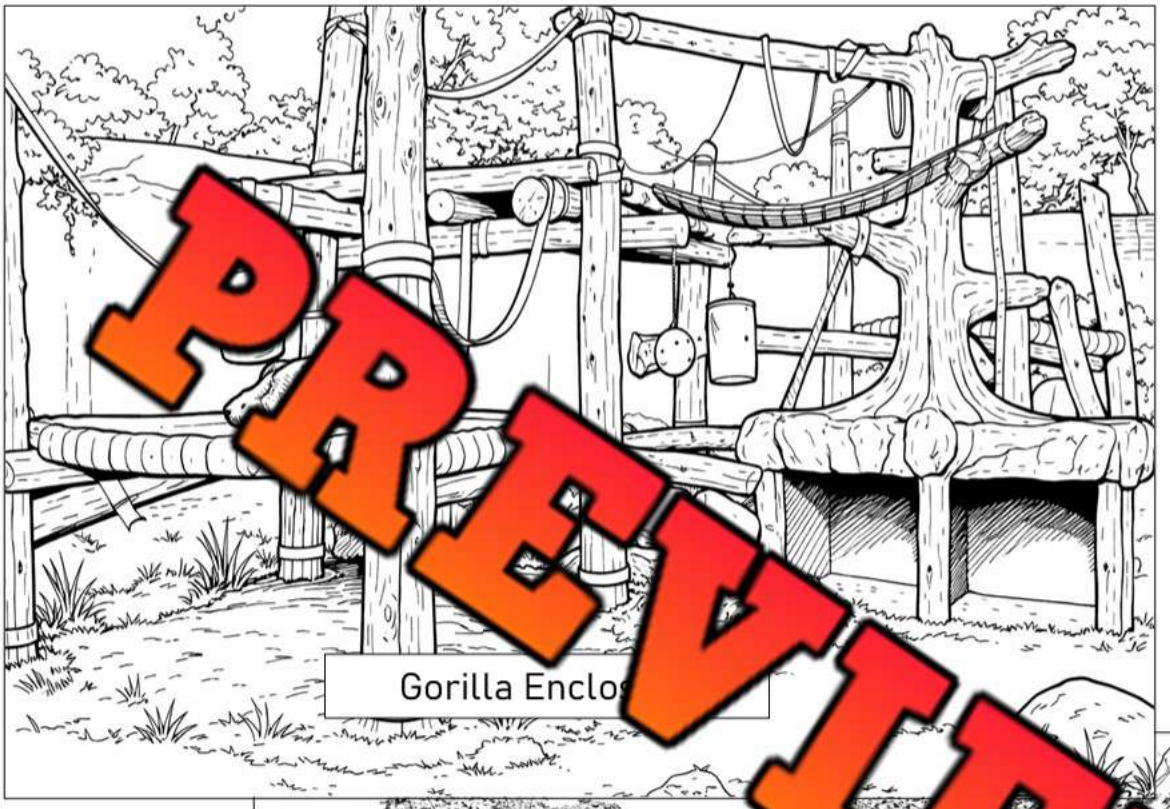
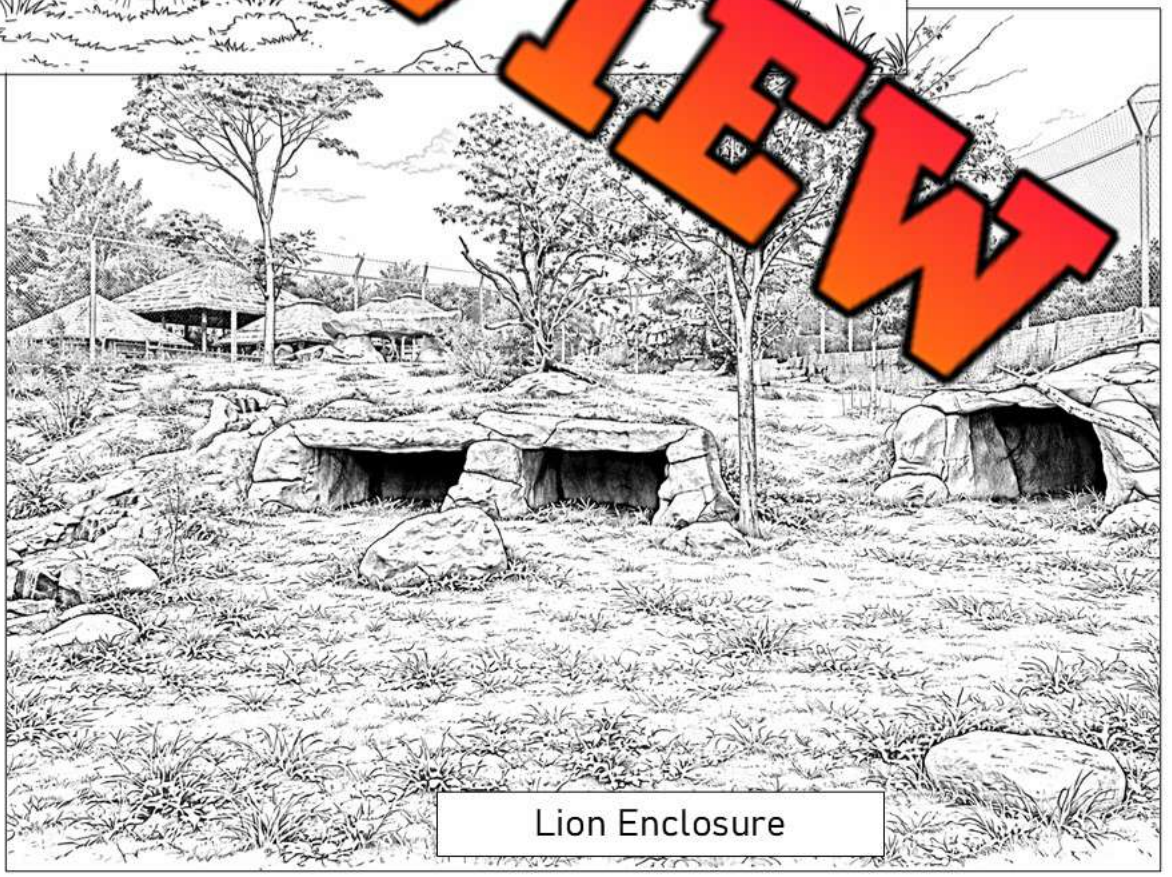
Curriculum Connection
A1.1, A1.3, A1.4

# Zoo Enclosure Examples

**Planning** Look at the examples below.



Gorilla Enclo



Lion Enclosure

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Curriculum Connection
A1.1, A1.3, A1.4

# STEAM – Designing a Zoo Enclosure

**Draw** Draw a plan of your enclosure from a bird's eye view.




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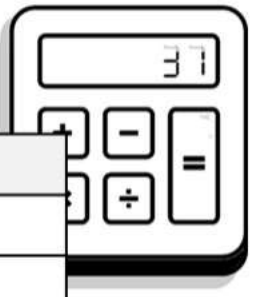
Curriculum Connection
A3.2

# STEAM – Designing a Zoo Enclosure

Materials are not free! How many materials did you use? Find out how much your enclosure cost to make.

**Math** Answer the questions below.



| Material | Cost |
|---|---|
| Pipe Cleaners | $1.25 each |
| Cardboard Boxes | $5 each |
| Clay | $6 for one piece |
| Toothpicks | $0.30 each |
| Wooden Dowels | $2.50 each |
| Straws | $0.75 each |
| Pieces of Paper | $1.50 each |

How many of each material did you use? Write the number and calculate the cost.

| Material | Number | Cost |
|---|---|---|
| Pipe Cleaners | | |
| Cardboard Boxes | | |
| Clay | | |
| Toothpicks | | |
| Wooden Dowels | | |
| Straws | | |
| Pieces of Paper | | |
| **Total Cost** | | |

If you charged $1.25 for a visitor to see the animals in your enclosure, how many visitors would you need to pay back the enclosure?

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Curriculum Connection
A3.2, A3.3

# Zoo Enclosure – Real World Problem

Lions are carnivores. They only eat meat. Also, lions are predators. They hunt and stalk their prey.

**Think** Look at the picture and answer the questions.



1) Is it fair to lions to have humans behind glass in their enclosure? Explain.

_____

_____

_____

_____

_____

_____

2) [illegible] ures used?

_____

_____

_____

_____

3) How do you think the lions feel in this picture?

_____

_____

_____

_____

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Curriculum Connection
B3.3

# Food Chain – Producers and Consumers

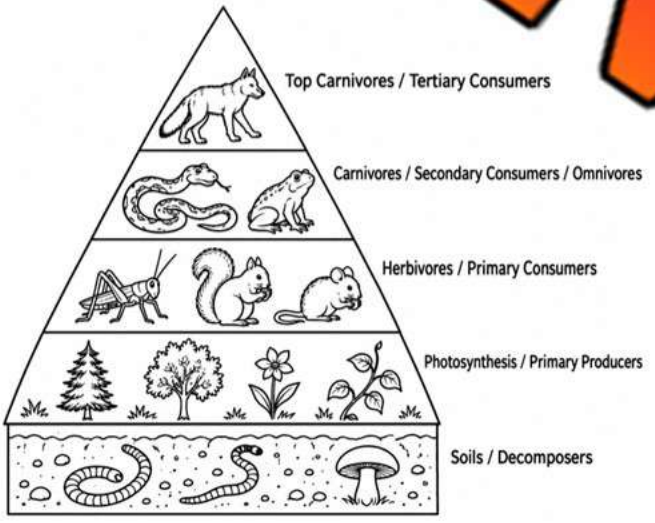
**Food Chain**

Every living thing needs energy in order to survive. When we run, jump, swim, and do anything, we are using energy. We obtain the energy we need from the food we eat. All living things need energy, which means all plants and animals need energy. Plants get energy from sunlight, water, and nutrients in a process called photosynthesis. Animals obtain energy by eating plants and/or animals. All living things need energy to grow. In the food web, we can see how each living thing gets food and how the nutrients are passed from creature to creature.

Read about how the food chain in a pond ecosystem works and how the energy is passed between living organisms.

**Producers**

Producers are the plants in our environment. They are called **producers** because they can produce their own food. They do this by using light energy from the sun, carbon dioxide from the air, and water from the soil. This process is called photosynthesis and it leads to glucose/sugar as the food that they consume. In a pond, green plants produce their own food so they can grow. Examples of producers in a pond are algae, water lily, duckweed, and cattails.




**Consumers**

Animals are called **consumers** because they cannot make their own food on their own. They need to consume plants and/or animals in order to get the energy they need to survive. Humans are consumers because we cannot produce our own food and therefore need to rely on plants and/or animals for food. **Carnivores** are animals that eat other animals. **Herbivores** are animals that eat only plants and **omnivores** are animals who eat both plants and animals.

In a pond, the consumers are animals that eat living plants and/or animals. Examples of consumers in a pond are beavers, tadpoles, ducks, dragonflies, turtles, frogs, birds, snakes, and fish.

**Decomposers**

**Decomposers** are bacteria and fungi that eat decaying matter in the form of dead plants and animals. They break down the decaying matter so that it turns into soil to be used by plants. When they break down the dead plants and animals, they release nutrients and mineral salts that go into the soil. This makes the soil rich in nutrients for plants to grow. Examples of decomposers in a pond are molds, fungi, insects and worms that reuse and recycle materials that were formerly living.

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B3.3

## Questions

Use information from the text to support your answer.

1) What is the difference between a producer and consumer?

2) What is a decomposer? Why do you think they are important?

3) What is the difference between a carnivore, herbivore, and an omnivore?

4) How does the food chain in a pond work?

PREVIEW

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1. Most humans are carnivores. | True | False |
| 2. Examples of producers in a pond are mold and fungi. | True | False |
| 3. Producers are plants who can produce their own food. | True | False |
| 4. Consumers are animals who cannot produce their own food. | True | False |
| 5. An omnivore is at the top of the food chain. | True | False |
| 6. Decomposers provide nutrients for soil. | True | False |
| 7. Plants produce their own food via a process called photosynthesis. | True | False |

Curriculum Connection
B3.3

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Is the statement true or false?

| | | |
|---|---|---|
| 1) Carnivores are animals that eat both plants and animals. | T | F |
| 2) The process of photosynthesis results in the production of glucose or sugar in plants. | T | F |
| 3) Humans are considered producers because they consume both plants and animals for energy. | T | F |
| 4) Tadpoles and dragonflies in a pond ecosystem are examples of producers. | T | F |

Name: _____

Is the statement true or false?

| | | |
|---|---|---|
| 1) Carnivores are animals that eat both plants and animals. | T | F |
| 2) The process of photosynthesis results in the production of glucose or sugar in plants. | T | F |
| 3) Humans are considered producers because they consume both plants and animals for energy. | T | F |
| 4) Tadpoles and dragonflies in a pond ecosystem are examples of producers. | T | F |

Name: _____

Is the statement true or false?

| | | |
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| 1) Carnivores are animals that eat both plants and animals. | T | F |
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| 3) Humans are considered producers because they consume both plants and animals for energy. | T | F |
| 4) Tadpoles and dragonflies in a pond ecosystem are examples of producers. | T | F |

Name: _____

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|---|---|---|
| 1) Carnivores are animals that eat both plants and animals. | T | F |
| 2) The process of photosynthesis results in the production of glucose or sugar in plants. | T | F |
| 3) Humans are considered producers because they consume both plants and animals for energy. | T | F |
| 4) Tadpoles and dragonflies in a pond ecosystem are examples of producers. | T | F |

PREVIEW

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Name: _____ 46

Curriculum Connection
B3.3, B3.4

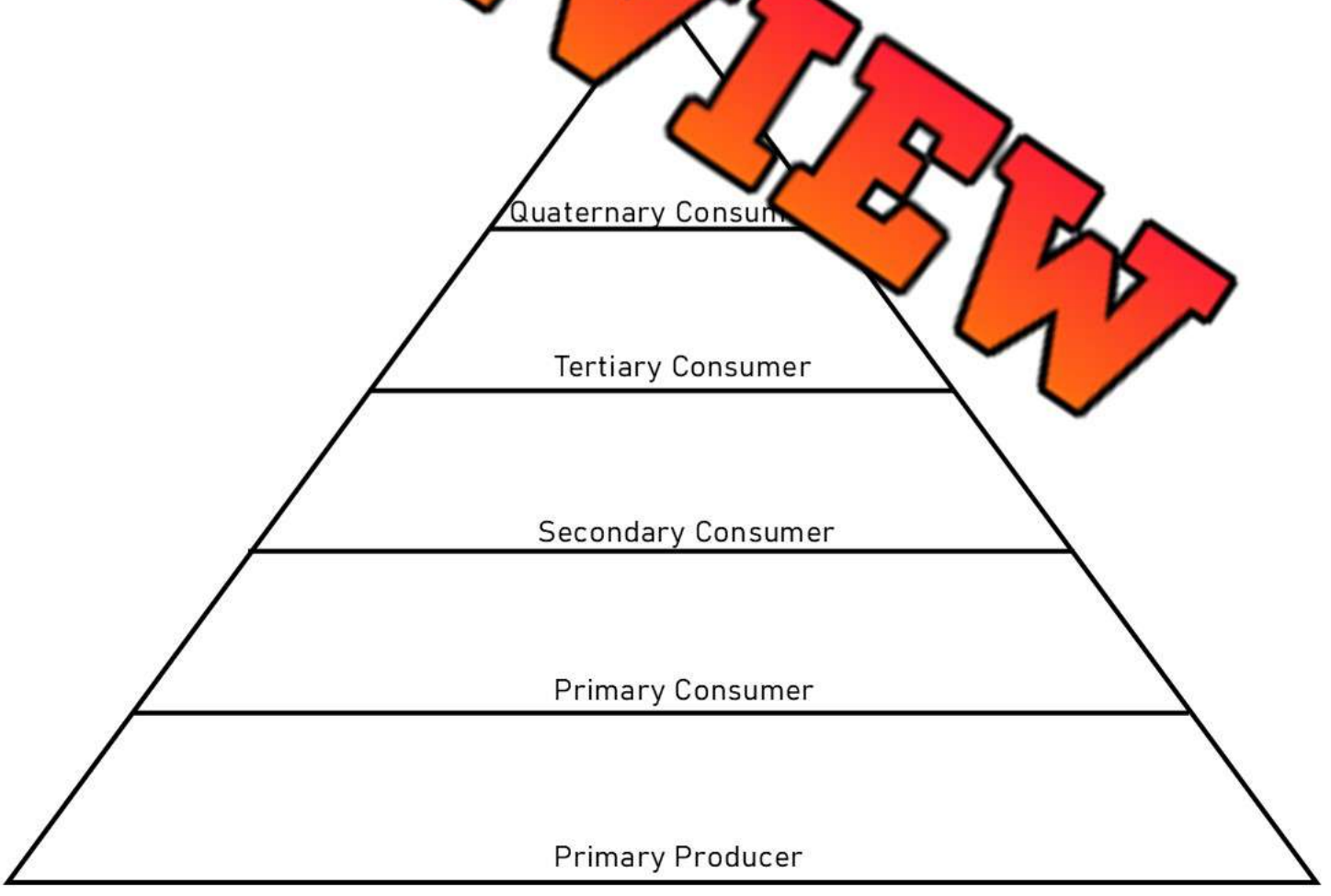
# Nutrient Cycle – Food Chain

**Nutrient Cycle**
A nutrient cycle refers to the movement and exchange of nutrients from plants to animals and then back to plants. When plants grow, they produce food for animals. When animals die, their decaying matter becomes nutrients for the soil so that plants can grow again. This completes the cycle.

**The Food Chain**
The bottom of the food chain is made of primary producers, which are plants. The primary consumers are herbivores that eat only producers – plants. They tend to be smaller in size and there are many of them. The secondary consumers are next on the food chain, and they eat both plants and animals. The tertiary consumers eat the other animals below them in the food chain. They are the herbivores. A quaternary consumer is an animal who is at the top of the food chain. This means it's the top predator who has no natural enemies. When it dies, the nutrients passed from plants to animals is restored back into the soil. As the pyramid rises, plants and animals contain the sun's energy from the previous step. The problem is that the energy flow is inefficient. Energy is lost each time it is passed on.

PREVIEW

| Research | Create your own food chain by filling in plants and animals. |
|---|---|

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Name: _____ 48

Curriculum Connection
B3.3, B3.4

# Decomposers and Detritivores

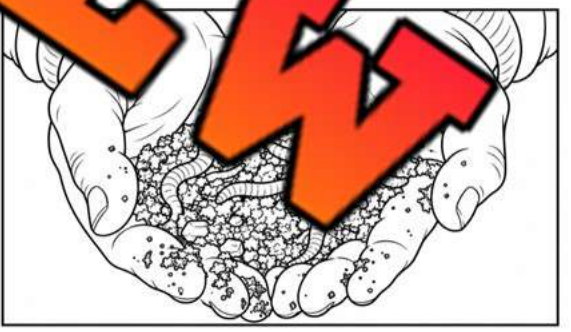
**What are Decomposers?**

A **decomposer** is an organism that breaks down organic material. **Organic material** is any material that was alive but is now dead. For example, the remains of a deceased animal will be broken down by decomposers. Also, the fruits and vegetables that were alive before the[illegible]re picked are now organic material that will be broken down by decompo[illegible]mples of decomposers are bacteria and fungi.

**Fund[illegible] Decom[illegible]**

Decomposers a[illegible]tan[illegible]ecause they allow organic material to be recycled in an ecosystem. Can y[illegible]ine wh[illegible]system would look like it there were skeletons, leaf piles, and other o[illegible]ni[illegible]al [illegible]ound?

Decomposers are **het[illegible]c**, w[illegible] they get their energy from the nutrients in dead organic matter. Bacte[illegible]ngi w[illegible]by releasing enzymes that begin to decay the dead organism. When the [illegible]nic mate[illegible]s br[illegible]down by decomposers, the nutrients from the organic matter is releas[illegible]the so[illegible]y this because when an animal dies and is decomposed, often plan[illegible]w[illegible]lea[illegible]ains as the soil is richer in nutrients.



Most decomposers are microscopic organisms, meaning you can't see them without a microscope.

**What are Detritivores?**

A detritivore is similar to a decomposer.

**Detritivores** are organisms that eat dead plant and animal remains. Worms are one of the most important detritivores. Worms take in food through their mouths and pass a 'cast' through their rear end. The cast is very valuable fertilizer for the soil. When it is mixed with the soil, plants will grow efficiently in it.

Both detritivores and decomposers work together to clean up our ecosystems. Without them, we would have organic material everywhere.

PREVIEW

Name: _____ 49

Curriculum Connection
B3.3, B3.4

## Questions

Answer the questions below using evidence from the text.

1) What is the difference between decomposers and detritivores?

2) Why are decomposers and detritivores important for the nutrient cycle?

PREVIEW

## Visualizing

What were you picturing in your head while you were reading?

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) A worm is a decomposer. | True | False |
| 2) Bacteria is a detritivore. | True | False |
| 3) Detritivores and decomposers work together to break down organic matter. | True | False |
| 4) Without decomposers and detritovores, we'd have leaf piles everywhere. | True | False |
| 5) Decomposers and detritovores are the clean-up crews in our ecosystems. | True | False |

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Curriculum Connection
B3.3, B3.4

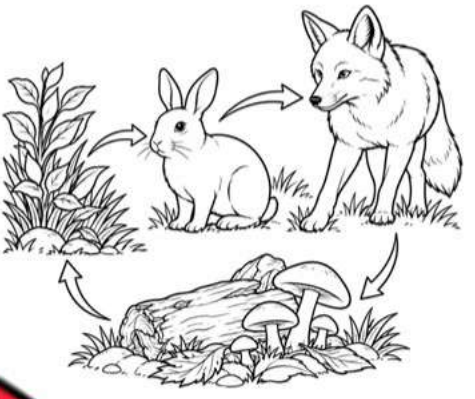
# Memory Game: Who Eats Whom?

**Objective** — What are we learning about?

Students will identify producers, consumers, predators, and prey and recognize feeding relationships within an ecosystem by matching related cards.

**Materials** — What will you need for the activity?

- Me y gam rovided) with the terms on one set a nitio nother set.
- A flat surface like t he fl lay out the cards.



**Instructions** — How will you complet the acti

1) Divide the class into groups of 3 or 4. Give ch a se mory Game cards. (Provided)
2) Have each group lay all the cards face down in a grid on a h .
3) The students take turns flipping over two cards at a time, tr ing a matching term and its definition.
4) If a student finds a match, they remove those cards from the grid and keep them.
5) If the cards do not match, they are turned back over, and the next student takes a turn.
6) The game continues until all the cards have been matched.
7) After the game, review the terms and definitions with the class.
8) Discuss how the organisms depend on one another and what might happen if one organism disappeared from the food chain.

PREVIEW

Name: _____ 51

Curriculum Connection
B3.3, B3.4

Cards | List Ecosystem Connections

| Term | Definition |
| --- | --- |
| **Ecosystem** | Living and non-living things interacting in an area. |
| **[illegible]sm** | An individual living thing. |
| **Biotic** | A li[illegible]art of an [illegible]m. |
| **Abiotic** | A non-living p[illegible]t of an ecosystem. |
| **Producer** | An organism that makes its own food. |

PREVIEW

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Curriculum Connection
B3.3, B3.4

Cards | List Ecosystem Connections

| Term | Definition |
| --- | --- |
| **Consumer** | An organism that gets energy by eating others. |
| **D[illegible]poser** | An organism that breaks down dead matter. |
| **Predator** | ani[illegible]at hunts and ea[illegible]imals. |
| **Prey** | An animal that is [illegible]unted by another animal. |
| **Food Chain** | A sequence showing how energy moves between organisms. |

PREVIEW

Name: _____ 53

Curriculum Connection
B3.3, B3.4

Cards | List Ecosystem Connections

| Term | Definition |
| --- | --- |
| **Food Web** | A network of connected food chains. |
| **Habitat** | The natural place where an organism lives. |
| **Population** | [illegible] one species [illegible] area. |
| **Community** | Different populations living and interacting in an area. |
| **Limiting Factor** | A factor that restricts the size of a population. |

PREVIEW

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Curriculum Connection
B3.3, B3.4

Cards | List Ecosystem Connections

| Term | Definition |
| --- | --- |
| **Competition** | A struggle between organisms for limited resources. |
| **S[illegible]sion** | The gradual change of an ecosystem over time. |
| **Biodiversity** | [illegible] living things [illegible]tem. |
| **Sustainability** | Using resources [illegible]hout harming their future availability. |
| **Invasive Species** | A non-native species that can harm an ecosystem. |

PREVIEW

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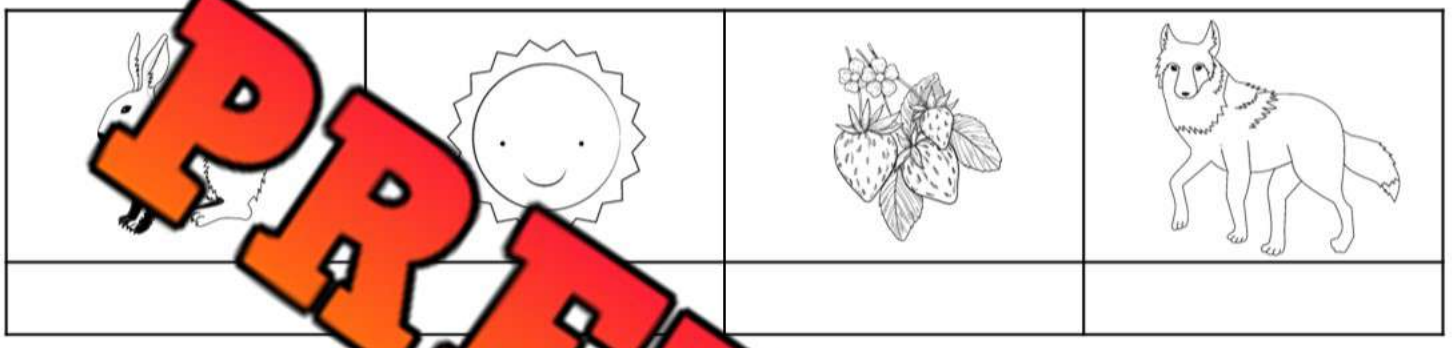
Curriculum Connection
B3.4

# Ordering Energy Chains

**Energy Chain** Order the plants and animals by numbering them.

## 4-Link Energy Chain

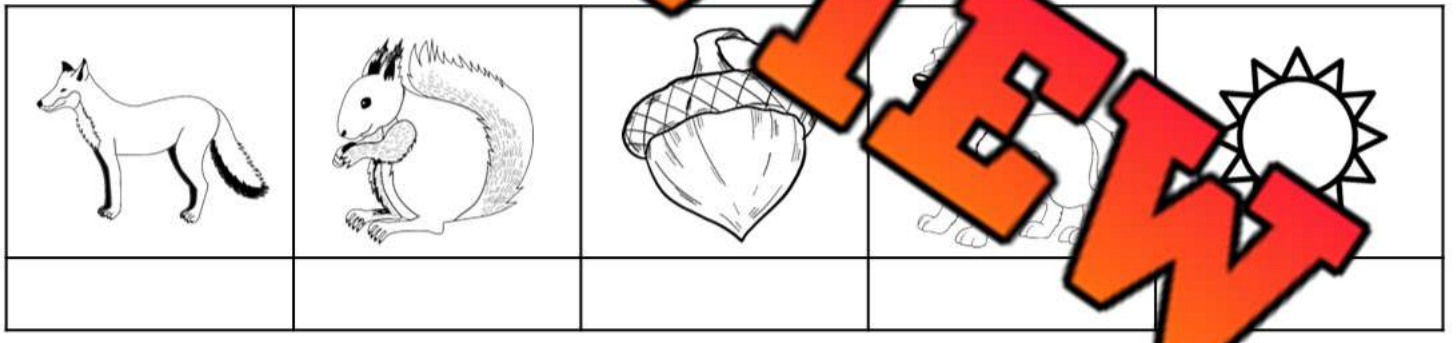
Number the plants/animals 1-4



PREVIEW

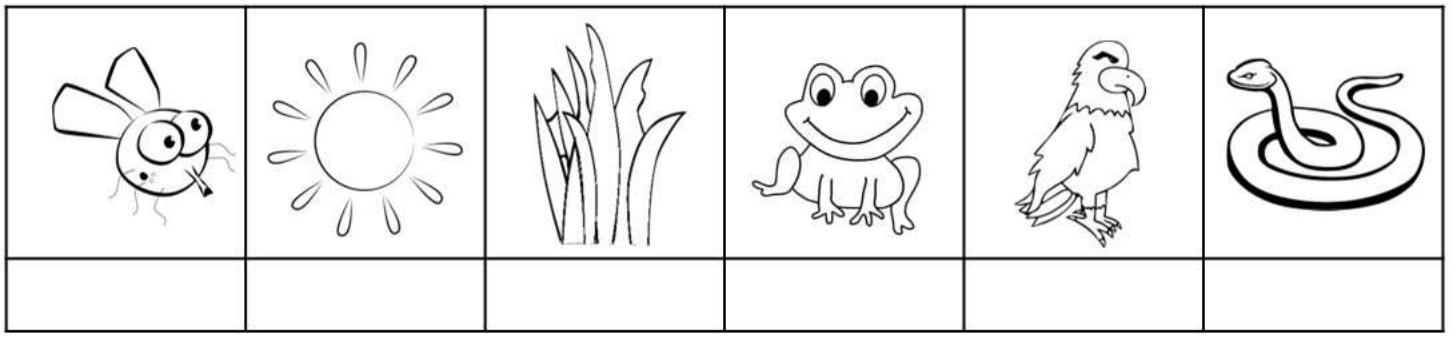
## 5-Link Energy Chain

Number the plants/animals 1-5



## 6-Link Energy Chain

Number the plants/animals 1-6



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Name: _____

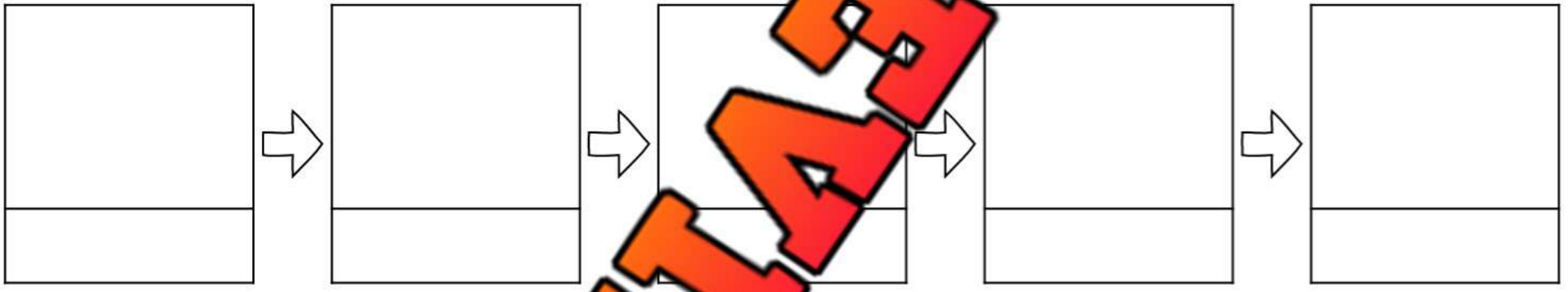


Curriculum Connection
B3.4

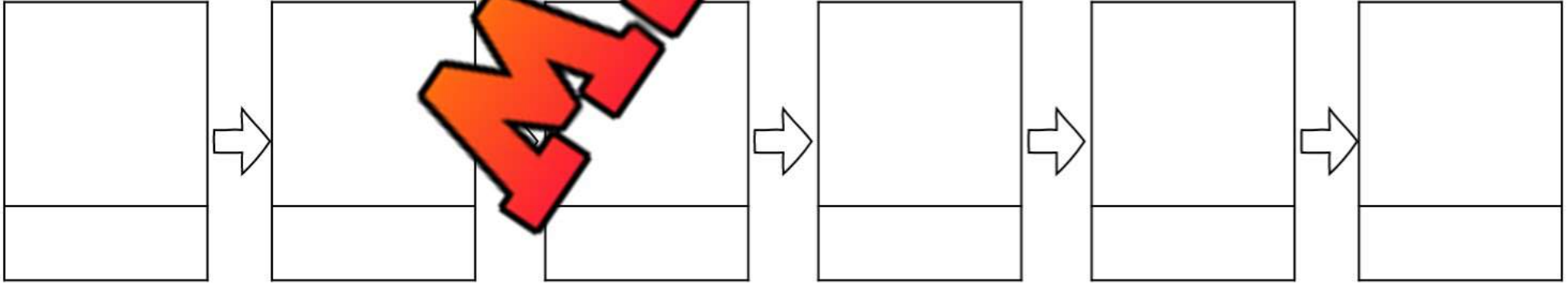
# My Energy Chains

**Energy Chains** Draw your own energy chains bel

5-Link Energy Chain



Energy Chain



PREVIEW

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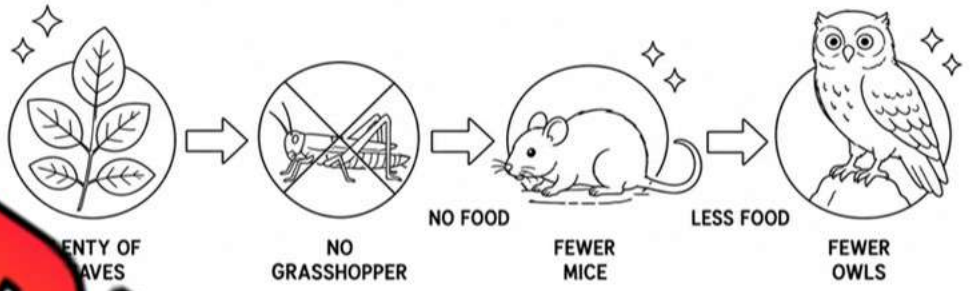
# Altering the Food Chain

## IMPORTANCE OF THE FOOD CHAIN




**Chan[illegible]d C[illegible]**

When we [illegible]hange [illegible]ems we can sometimes cause unintended changes to food chains that can [illegible]n man[illegible]t ways. In the basic example above, you can see that if we get rid of g[illegible]hop[illegible]ulation will grow drastically while the mice population will shrink. Wit[illegible] to h[illegible]l population will also shrink.

**Altering the Food Chain – Real Li[illegible] Exa[illegible]**

In Borneo, DDT was used as a pesticide [illegible] mosqu[illegible]ried malaria. Malaria is a disease caused by a parasite that mosquitoes sp[illegible] peop[illegible] can be deadly but usually causes flu-like symptoms.

The problem with using DDT was that it didn't just [illegible]squi[illegible] also killed all the other insects in the region it was used. This meant the cock[illegible]ach[illegible]ch were the main food for lizards. The number of lizards dropped dram[illegible]l as the number of cats that ate the lizards. The cats kept the rat population under [illegible]trol. With less cats, the rat population grew tremendously.

The overpopulation of rats became a serious problem in Borneo. The rats ended up causing multiple epidemics that caused more deaths than malaria caused in the first place. To solve the problem of too many rats, the government of Borneo brought in thousands of cats from other countries. "Operation Cat Drop" was a success! With cats back in Borneo, they began to control the rat population.

Many lessons were learned from Borneo. Mainly that if you don't understand the inter-relationships between things, solutions often cause more problems.

PREVIEW

Name: _____ 63

Curriculum Connection
B3.4

## Questions

Use information from the text to support your answer.

1) What can happen if we alter a food chain?

2) Give yo xample of a food chain. Discuss what would happen if humans affected one part ip

PREVIEW

## Summarize

What happened in Bor

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) When humans get rid of pests, it can affect other animals. | True | False |
| 2) In Borneo, the use of DDT was successful in eliminating mosquitos. | True | False |
| 3) Getting rid of mosquitos would have no other consequences. | True | False |
| 4) Eliminating one species will only affect the organisms that feed on them. | True | False |
| 5) One small change in an ecosystem can cause big changes to all organisms. | True | False |

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Name: _____ 64

Curriculum Connection
B1.1, B3.4, B3.8

# Overfishing – Effects on Food Chain

**What is Overfishing?**

**Overfishing** is when humans fish for one type of species too much, which causes the population of the species to become underpopulated. The result can sometimes lead to the endangerment or extinction of that species.

**Overfishing Effects on the Food Chain**

When one species becomes underpopulated, it affects other species a great deal. The ocean ecosystem is complex. The apex predators, like sharks, dolphins, and seals, eat large fish. The large fish eat smaller fish and shellfish. The smaller fish eat smaller organisms like krill and phytoplankton.

The problem is that all organisms will eat essentially anything they can find. Whales eat anything from small fish to plankton, krill, or algae. Sharks are the same way. A shark is an apex predator that will eat almost anything, including other sharks and krill.

Therefore, when we overfish one species, like cod, we affect the food source of sharks and whales, as well as the organisms in the food chain above and below the target species.




**Example – Overfishing in the European North Sea**

- Norwegian cod were overfished after humans overfished the area.
- Local fishermen began to fish for pout because the cod were no longer available. Pout fish are small fish in the same family as cod.
- The overfishing of pout became a problem as the pout populations decreased. The pout fish eat a lot of krill, which caused a massive increase in the krill population.
- Krill eat copepods, which meant that with more krill, the populations of copepods decreased significantly.
- With less copepods, the juvenile cod who eat copepods had less to eat. This meant that the efforts to increase the Norwegian cod populations again by not fishing them were slowed as the juvenile cod had less food to eat.

PREVIEW

Name: _____ 65

Curriculum Connection
B1.1, B3.4, B3.8

## Questions
Use information from the text to support your answer.

1) What is overfishing? Why does overfishing happen?

2) How do [illegible]shing cause problems for the food chain?

PREVIEW

## Visualizing
Draw what you we[illegible]ictu[illegible]ere reading. Explain the picture.

## True or False
Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Sharks eat anything from krill to other sharks. | True | False |
| 2) The food chain in an ocean is simple. | True | False |
| 3) Organisms in the ocean only eat organisms from the level just below them. | True | False |
| 4) Overfishing one species can cause problems for many other species. | True | False |
| 5) In the European North Sea, Norwegian cod were saved by not fishing them. | True | False |

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B1.1, B3.4, B3.8

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the Blanks Questions.

1) When one species becomes underpopulated, it affects other species a great deal because the ocean food chains are _____.

2) Overfishing one species, like tuna, affects the food source of sharks and _____.

3) The overfishing of pout caused a massive increase in the _____ population.

Name: _____

Fill in the Blanks Questions.

1) When one species becomes underpopulated, it affects other species a great deal because the ocean food chains are _____.

2) Overfishing one species, like tuna, affects the food source of sharks and _____.

3) The overfishing of pout caused a massive increase in the _____ population.

PREVIEW

Name: _____

Fill in the Blanks Questions.

1) When one species becomes underpopulated, it affects other species a great deal because the ocean food chains are _____.

2) Overfishing one species, like tuna, affects the food source of sharks and _____.

3) The overfishing of pout caused a massive increase in the _____ population.

Name: _____

Fill in the Blanks Questions.

1) When one species becomes underpopulated, it affects other species a great deal because the ocean food chains are _____.

2) Overfishing one species, like tuna, affects the food source of sharks and _____.

3) The overfishing of pout caused a massive increase in the _____ population.

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Name: _____ 67

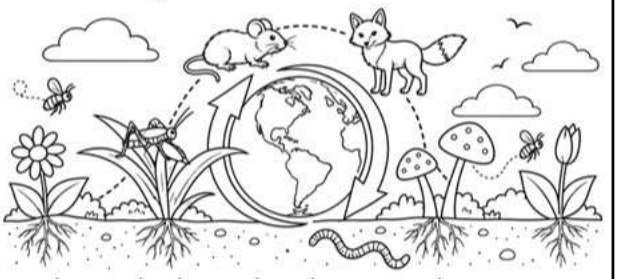
Curriculum Connection
B3.5

# Sustainability – Cycle of Matter

**What is Sustainability?**

**Sustainability** for our ecosystems is their ability to continue in a healthy manner. This means they continue to provide resources for the biotic components of the ecosystem to survive and flourish. An unsustainable ecosystem is one that has declining plant or animal populations that could cause the decline of other populations. This is unsustainable as the ecosystem is changing, meaning it did not continue in a healthy manner.

**Cycle of M – Nutrient Cycle**



**Nutrients** iving substances that living things need to nts are examples of matter that f ystems, giving living things uilding y need to grow and carry out life pr mpl of nutrients are vitamins and m vita zinc. These nutrients help animals grow bones, fight infections, a wou

Flow of Nutrients (Matter)

- Decomposers release n her k down dead organisms
- The nutrients are added to oil
- Plants suck up the nutrients from th ing th nts
- The nutrients pass on to the primar sumers at plants
- The nutrients pass on to the higher-level cons s whe at the lower-level consumers
- When living things die, the cycle repeats as dec p ar e dead organisms

**Matter Moves Throughout The Environment**

The flow of matter doesn't happen all in one place. Matter can be taken from one place in an ecosystem and brought to a new place. Check out the example below:



1) A bear catches salmon from a stream.
2) It brings the salmon into the forest and eats it.
3) The remains of the salmon as well as the waste from the bear is broken down by decomposers.
4) The nutrients from the broken down remains and waste is added to the soil.
5) New plants will grow in the soil that was enriched from the salmon.

This is why we sometimes have unwanted plant growth in areas where we don't want it. Animals will spread nutrients through their waste, creating nutrient rich soil that plants will grow in. Combine that with the spread of seeds from the wind, and you could find new ecosystems anywhere that is left untouched. This cycle of nutrients promotes sustainability, as the earth's natural processes encourage the survival of ecosystems.

PREVIEW

Name: _____ 68

Curriculum Connection
B3.5

**Questions** Answer the questions below using evidence from the text.

1) What does sustainability mean? Why is it important for ecosystems to have sustainability?

2) How do [illegible]r (nutrients) flow through our ecosystems? Why does that help sustaina[illegible]

PREVIEW

**Example** Write your own example of h[illegible]ter is [illegible]throughout our environment.

**True or False** Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) If the environment is left alone, it will stop growing new plants. | True | False |
| 2) The environment needs humans to spread fertilizer and seeds. | True | False |
| 3) Matter is moved around our environment naturally by organisms. | True | False |
| 4) The flow of matter through the environment helps sustainability. | True | False |
| 5) Living organisms need nutrients to survive. | True | False |

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Curriculum Connection
B3.5

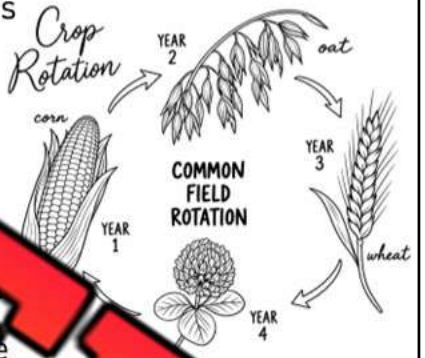
# Sustainability – Crop Rotation

**What is Crop Rotation?**

**Crop rotation** is the planned sequence of growing different crops year after year to get better results. If you grow the same crop every year, you will have problems with:

- Weed buildup – weeds that enjoy the stable environment you have created by growing the same crop each year will grow out of control
- Pests – pests like locusts or Japanese beetles enjoy certain types of crops. If you continue to grow the same crops, these pests will stick around and destroy your crops
- Disease – diseases like black spot or blight will survive in the soil year after year if crops are not rotated as the same crops are usually not good hosts for the disease

When farmers rotate their crops, they usually receive yields of 10 to 15% higher than growing the same crop each year.




**Benefits of Crop Rotation**

The problems mentioned above will be lessened, as changing environments cause the problems of weeds, pests and diseases to be minimized. Furthermore, when one type of crop is used each year, as the crop decays at the end of the growing season, the nutrient profile will provide valuable nutrients for a new crop next season.

PREVIEW

Common Crop Rotation – Soybeans and Corn

Corn and soybeans are commonly rotated year after year. Corn needs lots of nutrients, especially nitrogen. Adding nitrogen to the soil is expensive for farmers, so instead, they grow soybeans the year before growing corn. When soybeans decompose, they provide the soil with nitrogen, which then naturally fertilizes the soil for the corn the next year.







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Curriculum Connection
B3.5

## Questions

Use information from the text to support your answer.

1) What is crop rotation? Why is it used?

2) How do corn and soybean crop rotation work? How does it help corn?

PREVIEW

## Questioning

Write 3 questions you have about the reading.

| | |
|---|---|
| 1) | |
| 2) | |
| 3) | |

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Crop rotation can help reduce pests, disease, and weeds. | True | False |
| 2) Crop rotation using any crops is the best method. | True | False |
| 3) The crops used last year will provide nutrients for the new crops. | True | False |
| 4) Crop rotation creates sustainability because crops can grow year-after-year. | True | False |
| 5) When corn decomposes, it provides nitrogen for soybeans to grow in. | True | False |

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Curriculum Connection
B3.5

# Invasive Species in Ontario

**What are Invasive Species?**
Invasive species are plants, animals, insects, or other organisms that come from other places and can cause harm in their new environments. In Ontario, invasive species can damage forests, lakes, rivers, and wetlands. Here are some important examples found in Ontario.

**1) Garlic Mustard**
Garlic mustard is an invasive plant originally from Europe. It was brought to North America in the early 1 as an edible herb. Today, it is one of Ontario's most aggressive forest invaders. It w in forests, along roadsides, and near rivers. Garlic mustard spreads quickly a t native plants such as trilliums.

How Garlic
People c help b identify garlic mustard and removing it carefully from their property. Invas ould ed in the garbage rather than composted or left in natural areas. Hi also s and keep pets on a leash to reduce the spread of seeds.

**2) Zebra Mussels**
Zebra mussels are small freshw muss lly came from Europe. They were first found in Lake St. Clair in 1988 and la d thr ut the Great Lakes and into many inland lakes and rivers.

Zebra mussels attach themselves to hard surf and c water pipes. They also filter large amounts of plankton from the water, g aq bs and affecting native species.



Preventing Zebra Mussels
Boaters can help prevent the spread of zebra mussels by cleaning, draining, and drying boats and equipment before travelling between bodies of water. Preventing their movement is important because invasive species can be extremely difficult to remove once established.

**3) Emerald Ash Borer**
The emerald ash borer is an invasive beetle native to Asia. It was first discovered in Ontario in 2002 near Windsor. The insect attacks ash trees. Its larvae feed beneath the bark, interfering with the tree's ability to move water and nutrients. Large numbers of ash trees have been killed in Ontario because of this invasive insect.

Managing Emerald Ash Borer
Managing emerald ash borer includes watching ash trees for signs of infestation and following rules designed to slow the movement of invasive pests. People can also help prevent the spread of forest pests by avoiding the movement of firewood over long distances.

PREVIEW

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Curriculum Connection
B3.5

## Questions

Answer the questions below using evidence from the text.

1) What makes a species invasive?

2) What methods are being used to control or prevent these invasive species?

PREVIEW

## Making Connections

Have you heard of any invasive species? Did you know about the damage the Emerald Ash Borer can have in Ontario?

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Garlic Mustard was brought to North America from Europe. | True | False |
| 2) Zebra Mussels are freshwater mollusks. | True | False |
| 3) Emerald Ash Borers are native to Ontario. | True | False |
| 4) Garlic Mustard can push out native forest plants. | True | False |
| 5) Emerald Ash Borer larvae can damage ash trees. | True | False |

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Curriculum Connection
B3.5

# Activity – The Sports Field Debate



**Debate** | Ecological Balancing Act: The Sports Field Debate

1) **Introduction** (15 mins): Begin the class by discussing the basics of debate: the importance of clear arguments, evidence, listening, and respectful rebuttal. Next, present the issue to be debated: A proposal has been made to build a sports field on a piece of land that is currently a forest/wetland. Discuss what a forest/wetland is, its ecolo importance, and what a sports field would bring to the community.

2) **Tea** (5 mins): Depending on the size of the class, divide them into two t ns n team and the development team. If the class is large, you nt to h l debates with smaller teams.

- The Conse will e against building the sports field in order to protect the forest/w
- The Developmen m v sports field, focusing on the benefits to the community.

3) **Research and Preparation** ins time to research and prepare their arguments. They should focus ecolo cial, and economic implications of their stance. You ca vide so s to help them get started, like articles about similar cases, infor on on portance of wetlands/forests, or benefits of sports fiel

4) **Argument Development** (15 mins): Each team wil esent th uments to the class. Remind students that respectful listening dur tim Each student should have a chance to speak.

5) **Rebuttals** (15 mins): After both sides have presented, each tea opportunity to rebut the other's arguments. Encourage them to use f nd evidence to refute points, not personal attacks.

6) **Closing Statements** (10 mins): Each team will make a final argument summarizing their stance and the most compelling reasons to support it.

7) **Class Vote** (5 mins): Following the debates, hold a class vote to decide which team made the stronger argument. Remind students that they are voting based on the quality of the argument, not their personal beliefs on the issue.

8) **Reflection** (10 mins): End the activity with a discussion on what students learned from the activity, how their perspectives may have changed, and the importance of considering multiple viewpoints when making decisions that impact both the community and the environment.

PREVIEW

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Curriculum Connection
B3.5

**Research** Answer the questions below.

1) Which team are you on? What are you arguing?

2) How w[illegible]e[illegible]el[illegible]pment affect each of the following? Remember to look for inform[illegible]et[illegible]r argument.

| | |
|---|---|
| **Ecological**<br><br>Plants and Animals | |
| **Economy**<br><br>Money (Jobs, Taxpayer Money, Profits) | |
| **Social**<br><br>Affecting People (Hurting/ Helping People and their Community) | |

PREVIEW

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B3.5

**Research** Answer the questions below.

| 3) List your top 5 arguments from the research you found. | |
|---|---|
| 1 | |
| 2 | |
| 3 | |

PREVIEW

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B3.5

**Research** Answer the questions below.

4

5

PREVIEW

4) Write your closing statement below.

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Curriculum Connection
B3.5

**Research** Answer the questions below.

5) While your opponent is sharing their arguments, write down rebuttals you think of. You can use jot notes (not full sentences). You will share these rebuttals after both sides get a chance to share their arguments.

PREVIEW

6) What did you learn from the debate? Which side did yo[illegible]? W[illegible]y a[illegible]uments that stood out to you.

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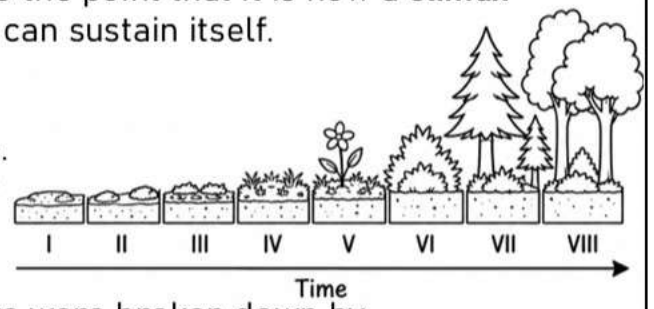
Curriculum Connection
B3.6

# Ecological Succession

**What is Ecological Succession?**

**Ecological succession** is the gradual and progressive growth of species in any given area. Ecosystems are developing slowly all around us. An ecosystem has reached a steady state, when the interactions between biotic and abiotic factors are sustainable. The ecosystem has undergone ecological succession to the point that it is now a **climax community**, as it has developed to the point that it can sustain itself.

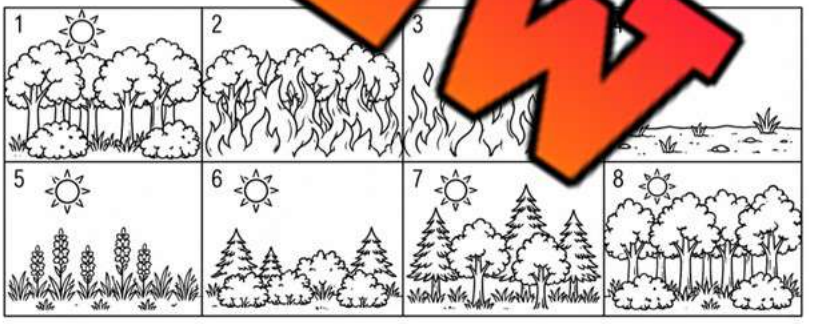



**Primary Succession**

When an area has no living organisms, it is lifeless. **Primary succession** is the growth or succession of living organisms that colonize the lifeless land. When Earth formed, there was no soil. The Earth's crust was made of rocks. These rocks were broken down by microorganisms to the point that soil formed. The soil allowed plants to grow.

The first living organisms are called the pioneer species. Fungi and lichen are the most common pioneer species in primary succession because they can break down minerals to form soil. Soil is necessary for species like grasses, mosses, and small plants will grow.

Primary succession will happen when new parts of land is created. Often, this happens when a volcano spews lava and the lava cools. The rocks can form islands that become home to pioneer species. For example, Hawaii is made of islands that were formed when lava cooled. Hawaii is home to active volcanoes that continue to spew lava that increases the size of the islands. As new land is formed, primary succession continues to occur as plants and animals begin to live on the land.




**Secondary Succession**

When an ecosystem gets destroyed or disturbed, secondary succession begins. **Secondary succession** is the development of a new ecosystem in the area that was damaged or destroyed.

Secondary succession is different than primary succession as primary succession is the development of an ecosystem from new land or completely destroyed land that has no soil. **Secondary succession** is the development of an ecosystem that hasn't been completely destroyed. The land will have soil, which allows development to happen faster.

For example, when a forest fire burns forests to the ground and kills everything except the soil, secondary succession begins. The decaying of the organic matter will create nutrient rich soil that will allow a new ecosystem to develop quickly, The pioneer species in secondary successions are usually grasses, shrubs, and small plants.

PREVIEW

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Curriculum Connection
B3.6

## Questions
Use information from the text to support your answer.

1) What is the difference between primary and secondary succession?

2) Which t[illegible]ccession will take longer? Explain why.

PREVIEW

## Definitions
What do the term[illegible]belo[illegible]

| | |
|---|---|
| **Ecological Succession** | |
| **Primary Succession** | |
| **Secondary Succession** | |

## True or False
Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Primary succession is the development of an ecosystem from nothing. | True | False |
| 2) Secondary succession is the development of an ecosystem from only soil. | True | False |
| 3) When a volcano creates new land, secondary succession begins. | True | False |
| 4) When a flood wipes out most of an ecosystem, secondary succession begins. | True | False |
| 5) The pioneer species in a primary succession would likely be a tree. | True | False |

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B3.6

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Circle the correct answer.

| | |
|---|---|
| 1) Which type of succession occurs on newly formed land with no soil? | Primary / Secondary |
| 2) What do fungi and lichen help to create during primary succession? | Soil / Water |
| 3) What is the steady state of an ecosystem called when it can sustain itself? | Climax / Pioneer |
| 4) What type of succession follows a forest fire that leaves soil intact? | Secondary / Primary |
| 5) Which of the following is typically a pioneer species in secondary succession? | Grasses / Lichen |

Name: _____

Circle the correct answer.

| | |
|---|---|
| 1) Which type of succession occurs on newly formed land with no soil? | Primary / Secondary |
| 2) What do fungi and lichen help to create during primary succession? | Soil / Water |
| 3) What is the steady state of an ecosystem called when it can sustain itself? | Climax / Pioneer |
| 4) What type of succession follows a forest fire that leaves soil intact? | Secondary / Primary |
| 5) Which of the following is typically a pioneer species in secondary succession? | Grasses / Lichen |

Name: _____

Circle the correct answer.

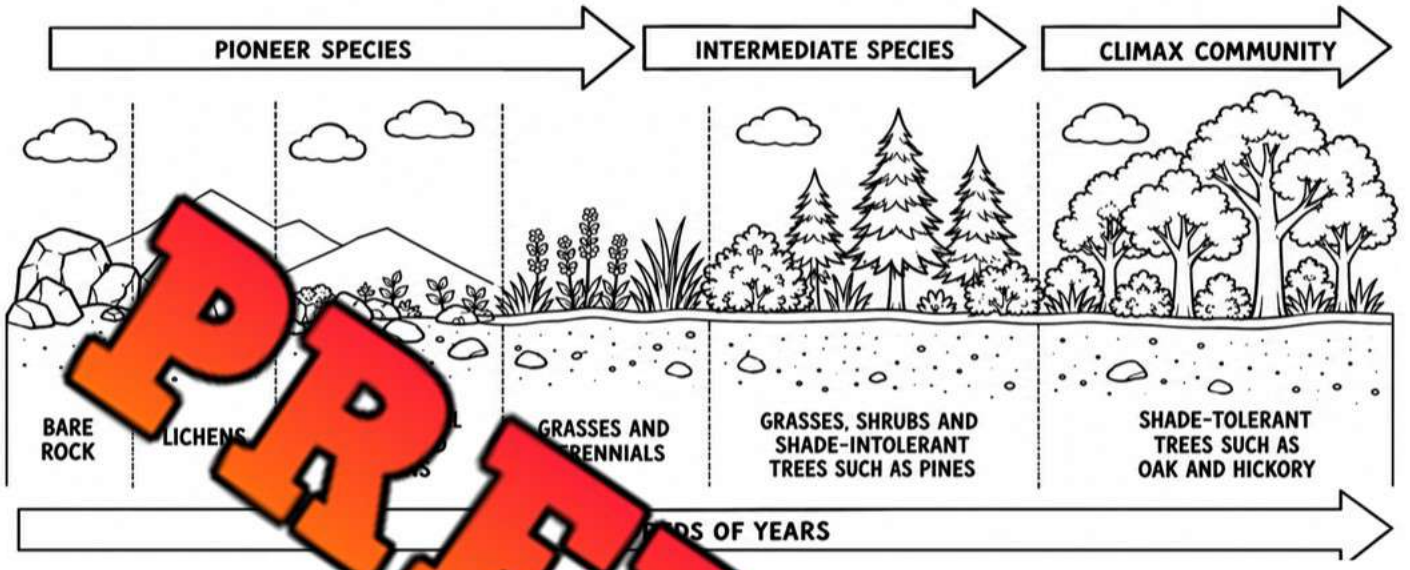
| | |
|---|---|
| 1) Which type of succession occurs on newly formed land with no soil? | Primary / Secondary |
| 2) What do fungi and lichen help to create during primary succession? | Soil / Water |
| 3) What is the steady state of an ecosystem called when it can sustain itself? | Climax / Pioneer |
| 4) What type of succession follows a forest fire that leaves soil intact? | Secondary / Primary |
| 5) Which of the following is typically a pioneer species in secondary succession? | Grasses / Lichen |

PREVIEW

Name: _____ 82

Curriculum Connection
B3.6

# Primary Succession Diagram




PREVIEW

**Questions** Answer the

1) What is the pioneer species in this p succes

2) What are some other pioneer species in this s ion?

3) Describe the stages in this example of primary ess

4) What is a climax community? What is the difference between the climax community and intermediate species community?

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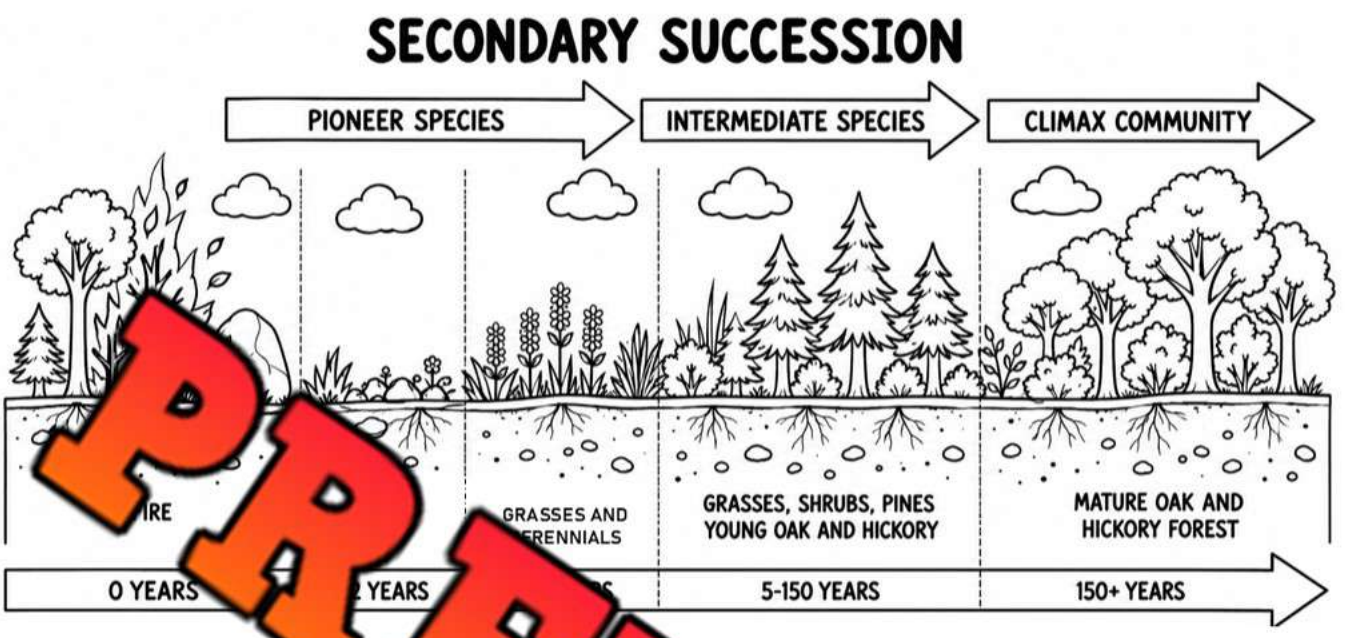
B3.6

# Secondary Succession Diagram




PREVIEW

| Questions | Answer |
|---|---|

1) What are the pioneer species in this s succ ?

2) What caused the secondary successio What oth atur asters could cause a secondary succession?

3) Describe the stages in this example of secondary succession?

4) How long does it take for secondary succession to develop through all the stages?

5) Could this ecosystem go through another secondary succession? Is this a cycle?

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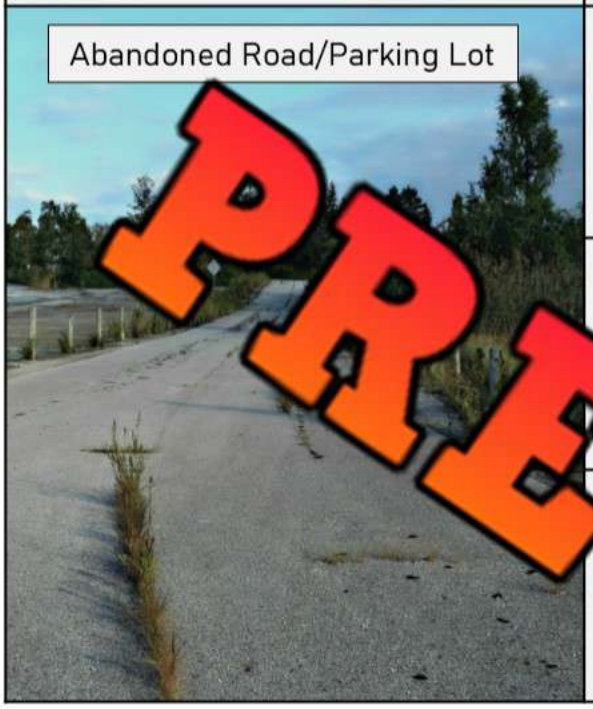
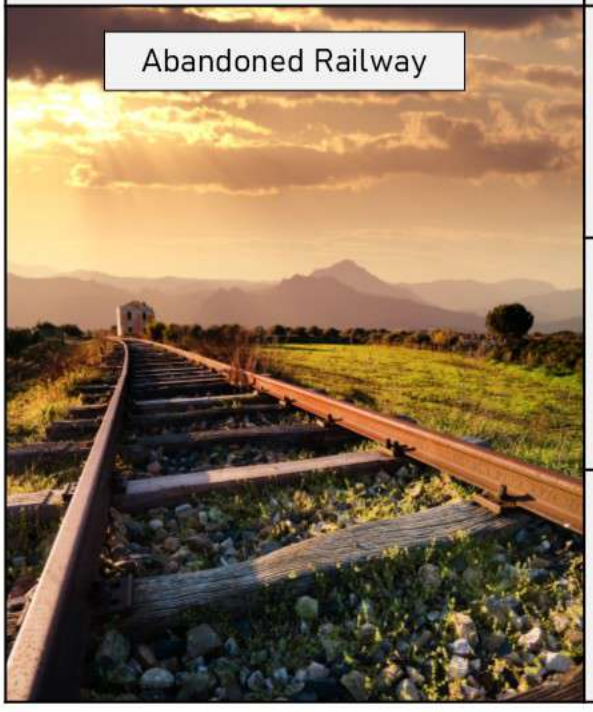
B3.6

# Predicting The Future of Ecosystems

**Predict** What will the ecosystem look like if left by humans after 10, 20, and 100 years?

| Ecosystem | Time | What Will the Ecosystem Look Like? |
|---|---|---|
|  Abandoned Road/Parking Lot | 10 Years | |
| | 20 | |
| | 1 | |

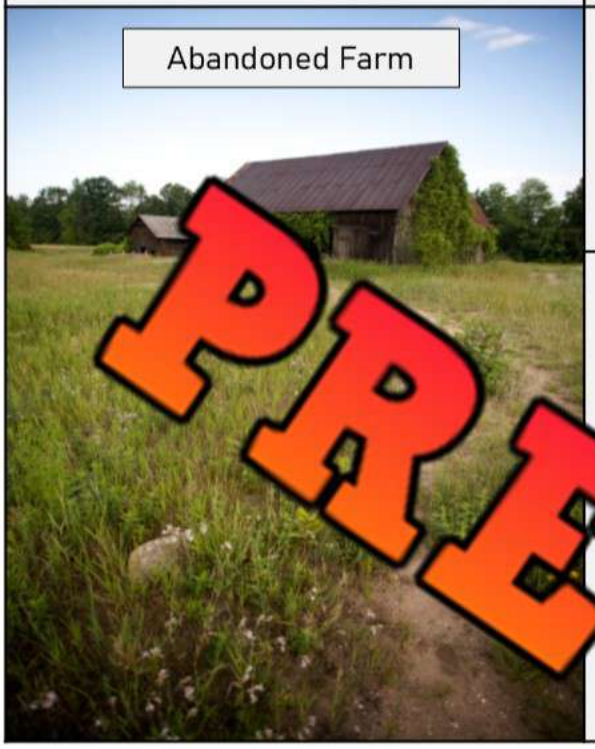
| Ecosystem | Time | What Will the Ecosystem Look Like? |
|---|---|---|
|  Abandoned Railway | 10 Years | |
| | 20 Years | |
| | 100 Years | |

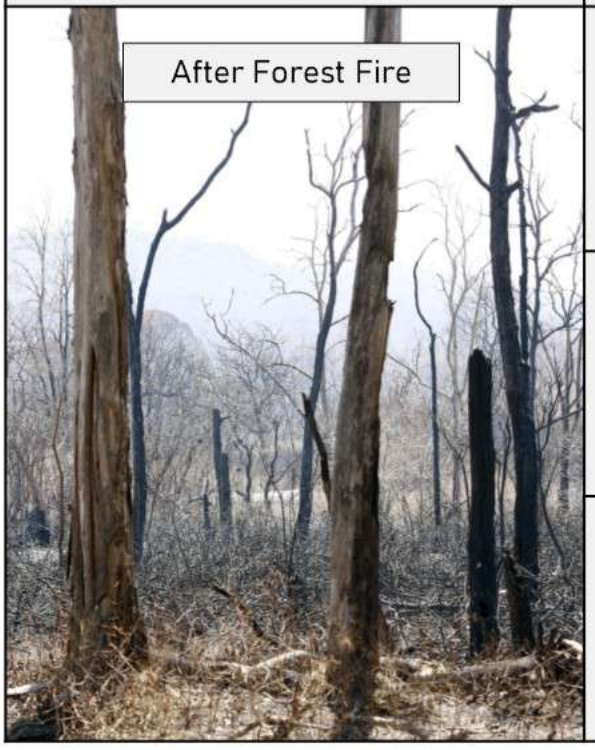
PREVIEW

Name: _____ 86

Curriculum Connection
B3.6

**Predict** What will the ecosystem look like if left by humans after 10, 20, and 100 years?

| Ecosystem | Time | What Will the Ecosystem Look Like? |
|---|---|---|
|  Abandoned Farm | 10 Years | |
| | 20 Years | |
| | 10 Ye | |

| Ecosystem | Time | Look Like? |
|---|---|---|
|  After Forest Fire | 10 Years | |
| | 20 Years | |
| | 100 Years | |

PREVIEW

Name: _____ 87

Curriculum Connection
B3.7

# Ecosystems – Biotic and Abiotic Limiting Factors

**Limits of Habitats**

Every ecosystem has its limits. The classroom you are in now is a learning environment that has its limits. Imagine adding 30 more students into your learning environment. The outcome would be a challenging situation for all the students and your teacher.

Your learning environment has a certain number of resources that are shared amongst y ssmates. Students would be fighting over desks, chairs, school supplies and mor h would not be able to support each of you the way they were before the e t.

PREVIEW

Biotic Limiting

The availability of t hings ts many other living things can survive in an ecosystem. Some examp limiti rs are food, mates, and competition with other organisms for abiotic re .

If the population of one animal sp omes pulated in an ecosystem, it could strain the entire ecosystem. These a mals ha sa , which means there will be a lack of food supply for the overpopulat ulatio a their prey will be overhunted, which will lead to their population to bec This w e the population of their prey to become overpopulated.



Abiotic Limiting Factors

Non-living limiting factors can also affect how much population an ecosystem can support. Some abiotic limiting factors include temperature, space, soil, altitude, water, and amount of sunlight available in an ecosystem.

In Africa, the availability of water is a common limiting factor for an ecosystem. Watering holes are scarce in some parts of Africa, and all animals need water to survive. Even humans avoid living in secluded deserts because the lack of water makes it impossible for humans to survive. Some species, like cacti, have adapted to survive using limited water.

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Curriculum Connection
B3.7

## Limiting Factors

List the biotic and abiotic limiting factors for growing ecosystems.

| | |
|---|---|
| Biotic Limiting Factors | |
| Abiotic Limiting Factors | |

## Questi[illegible]ion from the text to support your answer.

1) What abioti[illegible]ors [illegible]n an ecosystem near you? Why isn't there more biodiversity in th[illegible]tem?

2) What abiotic limiting factors affect human pop[illegible]ns i[illegible]ecosystems?

PREVIEW

## Biotic Limiting Factors

Explain what would happen to the ecosystem if...

| What would happen in an ecosystem if the biotic factors below were removed? | |
|---|---|
| Trees | |
| Plants | |
| Predators | |
| Prey | |

Curriculum Connection
B3.7

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Sort each limiting factor into the correct group. Write each word in the correct box.

| Limiting Factors to Sort | | |
|---|---|---|
| Food | Water | Competition |
| ight | Mates | Temperature |
| | Predators | Soil |
| Factors | | Abiotic Limiting Factors |
| | | |

PREVIEW

Name: _____ Mark

Sort each limiting factor into ect each word in the correct box.

| Limiti to | | |
|---|---|---|
| Food | ter | Competition |
| Sunlight | Mates | mperature |
| Space | Predators | oil |
| Biotic Limiting Factors | imiti rs | |
| | | |

Name: _____ Mark

Sort each limiting factor into the correct group. Write each word in the correct box.

| Limiting Factors to Sort | | |
|---|---|---|
| Food | Water | Competition |
| Sunlight | Mates | Temperature |
| Space | Predators | Soil |
| Biotic Limiting Factors | Abiotic Limiting Factors | |
| | | |

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Curriculum Connection
A1.1, A1.2, A1.3, A1.4

# Experiment – Ecosystem in a Bottle

## Research Question

What are we learning more about?

Can you build an ecosystem that has a water and land connection? What does the ecosystem need to survive?

## Materials

What do we need for our activity?



- ✓ One [illegible] bottle
- ✓ [illegible]
- ✓ [illegible] – mater[illegible]sorbs water (cotton)
- ✓ Wat[illegible] – pon[illegible]p water that has sat outside for 24 hours [illegible] kill [illegible]rine)
- ✓ Soil
- ✓ Plants – you co[illegible]se s[illegible]all sprouting plant
- ✓ Small rocks for water e[illegible]
- ✓ A dead leaf for water ecosy[illegible]m
- ✓ Living things for water and land ec[illegible]ms (sn[illegible] worms)

PREVIEW

## Method

How do we complete the exp[illegible]

1) Remove the label from the bottle.
2) Cut the bottle about 1 cm below the shoulder.
3) Poke a hole in the bottle cap for the string (wick) to go through.
4) Wet the string and put it through the hole.
5) Fill the bottom of the bottle with water and small rocks.
6) Add a dead leaf (it is full of microorganisms) for the snails to eat.
7) Add soil to the top part (land ecosystem). If possible, layer the soil with larger rocks (gravel) on the bottom and then finer soil on top. Add the top to the bottom (see above).
8) Add a worm to the soil.
9) Add plants.
10) Ensure the wick is in the soil and is soaking up water from the bottom.

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Curriculum Connection
A1.2, A1.3, A1.4, A1.5

**Journal Observations** | Fill in the date and write what you observed that day.

Date -

Date -

Date -

Date -

Date -

PREVIEW

Name: _____ 92

Curriculum Connection
A1.2, A1.3, A1.4, A1.5

**Results** Answer the questions below.

1) What are the abiotic elements in your land-water ecosystem?

2) What a[illegible] biotic elements in your land-water ecosystem?

3) How are the biotic e[illegible]s interac[illegible]th the abiotic elements? Explain at least 2 interactions.

4) How is your ecosystem doing? Is it thriving? Is it crashing – on its way to extinction? Explain.

PREVIEW

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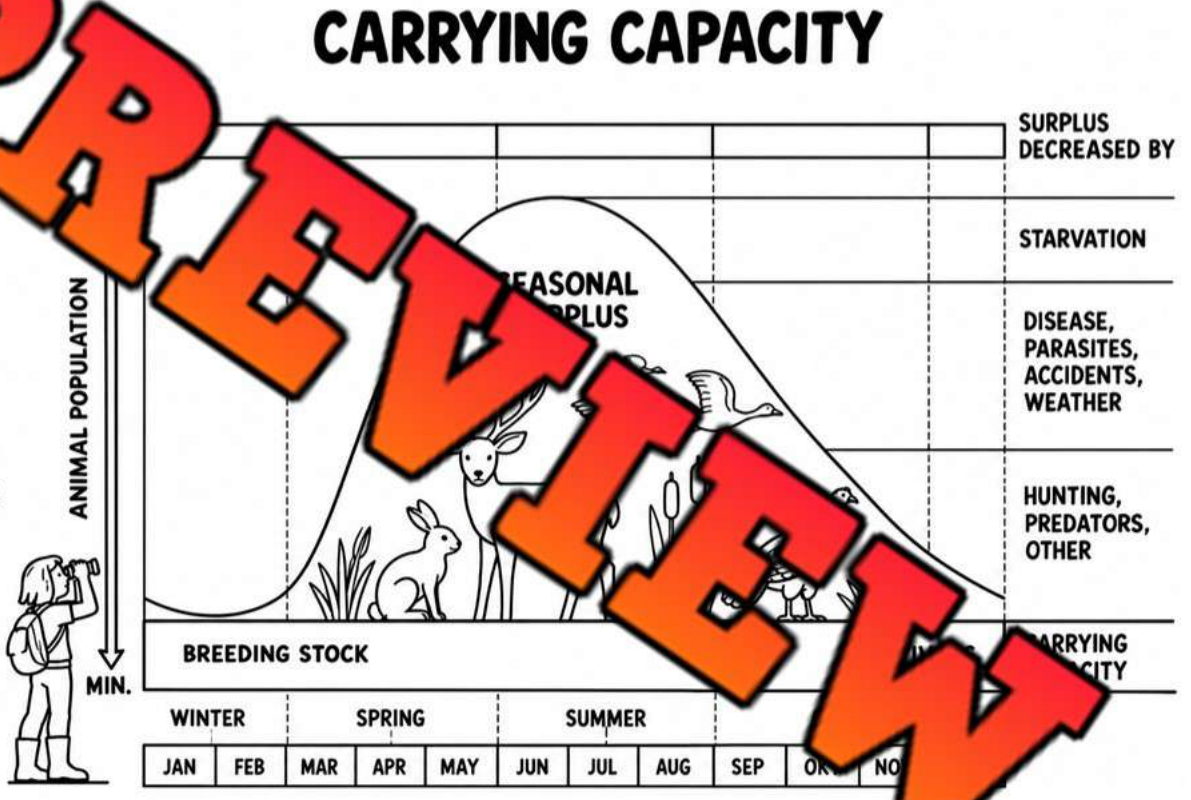
Curriculum Connection
B3.7

# Ecosystems – Carrying Capacity

**Carrying Capacity**

In an ideal ecosystem, populations could grow without constraints on resources. The problem we know is that resources are limited. The amount of resources in an ecosystem determines the carrying capacity of that ecosystem.

**Carrying capacity** refers to the number of plants and animals an ecosystem can support. When too many plants and animals enter an ecosystem, it can lead to competition for food, mates, water, space, and sunlight. If there is not enough prey animals in a forest to feed a large population of predators, then food becomes the limiting factor. Likewise, if there is not enough space in a pond for a large number of fish, then space is the limiting factor. Every ecosystem has a carrying capacity, however, some ecosystems can support a higher population than other ecosystems.




PREVIEW

**Reaching the Carrying Capacity**

Overpopulation in an ecosystem will naturally resolve itself. If the animal population becomes too large, many animals will starve as they won't be able to find food. Also, the reproduction of new animals will decrease if animals cannot find a mate. These factors will reverse the overpopulation of an ecosystem.

In temperate climate zones, there are usually four seasons. The changing of seasons affects the populations in ecosystems. As you can see in the graphic, animal populations are highest in the spring and summer months. The carrying capacity is controlled by not only starvation, but also the weather, diseases, parasites, accidents, hunting by humans, as well as predators.

During the winter months, the animal populations in most ecosystems is very low as many animals hibernate or migrate because of the lack of food available.

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B3.7

## Questions

Use information from the text to support your answer.

1) What does carrying capacity mean? What happens when a carrying capacity is reached in an ecosystem?

2) How [illegible] the populations and carrying capacities for ecosystems?

3) How is overpopulation [illegible] ecosystem?

PREVIEW

## Seasons

Describe the animal populations during each of the

| | |
|---|---|
| Fall | |
| Winter | |
| Spring | |
| Summer | |

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Curriculum Connection
B3.6, B3.7

# Fact or Fiction – Ecosystem Limits and Change

## Objective

What are we learning about?

Students will strengthen their understanding of limiting factors, population size, ecological succession, and ecosystem change by deciding whether different statements are fact or fiction.

## Materials

What will you need for the activity?

- A [illegible] of statements about ecosystem limits and change
- A 'Fact' sign and a 'Fiction' sign to distinguish the two sides of the room
- Designated areas in the classroom for the 'Fact' and 'Fiction' signs, allowing enough space for students to move to either side




## Instructions

How will you complete the activity?

1) Your teacher will read statements. Pay close attention as each statement is shared.
2) Consider carefully whether you think the statement is true or false.
3) If you decide the statement is true, walk to the 'Fact' side of the room.
4) If your guess is that it's not true, move to the 'Fiction' side of the room.
5) Stay on your chosen side and listen attentively for the correct answer to be revealed.
6) When the right answer is announced, return to your seat, ready for the next round.
7) Have fun getting up and moving!

PREVIEW

Name: _____ 96

Curriculum Connection
B3.6, B3.7

**Fact or Fiction** | Read the statements to the class.

| # | Statement | Fact or Fiction |
|---|---|---|
| 1 | A drought can limit the size of an animal population. | Fact |
| 2 | Populations can grow forever if predators are absent. | Fiction |
| 3 | A forest can slowly recover after a wildfire. | Fact |
| 4 | Ecolo[illegible]al succession always happens within a few days. | Fiction |
| 5 | Food [illegible]come a limiting factor when populations grow. | Fact |
| 6 | [illegible]cosystem are caused by humans. | Fiction |
| 7 | Pr[illegible]tors c[illegible]ntrol the population of their prey. | Fact |
| 8 | Adding m[illegible]isms [illegible]makes an ecosystem healthier. | Fiction |
| 9 | Sunlight can be a l[illegible]ctor f[illegible] | Fact |
| 10 | Primary succession begi[illegible]her[illegible]well developed. | Fiction |
| 11 | Competition may increase when food bec[illegible]scar[illegible] | Fact |
| 12 | A flood can change the populations living[illegible]n e[illegible] | Fact |
| 13 | Secondary succession can occur after a forest[illegible] | Fact |
| 14 | Limiting factors only affect animal populations. | [illegible] |
| 15 | Removing a predator can affect several other populations | [illegible]ct |
| 16 | Every ecosystem can support an unlimited number of organisms. | Fiction |
| 17 | New species can appear as an ecosystem goes through succession. | Fact |
| 18 | Temperature never affects how many organisms an ecosystem supports. | Fiction |
| 19 | A population will always decrease when more food becomes available. | Fiction |
| 20 | Disease can act as a limiting factor in a population. | Fact |

PREVIEW

Name: _____ 97

Curriculum Connection
B1.1, B3.8

# International Trade – Introducing Invasive Species

**What is an Invasive Species?**

An **invasive species** is an organism that causes problems in a new environment where it is not native. Quite often, an invasive species is an organism that grows and spreads quickly in a new area. The reason they spread quickly in a new area is because they often do not have the us predators that control their population. This means the invasive species populatio ome out of control.



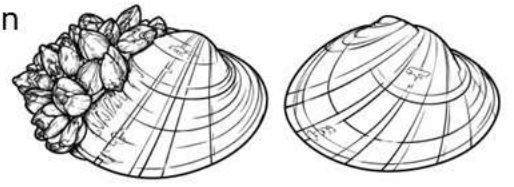

**How Species**

When we rade in y, w receive shipments from untrie rm of shipping containe d p g most common form of tra tha delivers these items are ocean li s. S countries can unintentionally get into these ships, containers or ever ages.

**Problems with Invasive Species - Zebra Mussel**

Zebra mussels are an invasive species in Ontario that o the B d Caspian Seas. The Zebra mussels came in the ballast water of ships lin an port. When the ballast water was released into the great lakes, the re accidently brought into a new environment where they have wreaked hav

First, Zebra mussels eat phytoplankton which causes clearer water, allowing more sunlight to penetrate deeper. This forces light-sensitive fish, such as walleye, into deeper and darker waters. Secondly, the fish and birds who eat Zebra mussels are struggling to digest the invasive species. With the Zebra mussels putting other species at risk, they are reducing the biodiversity in Ontario. The Walleye have been directly affected as they have had to move environments and the birds and fish who feed on the Zebra mussels are dying as a result.



PREVIEW

Name: _____ 98

Curriculum Connection
B1.1, B3.8

**Visualizing** What were you picturing in your head while you were reading?

| | |
|---|---|
| | _____ |

**True or False** Or [illegible] ther the statement is true or false.

| | | |
|---|---|---|
| 1) Invasive spe[illegible] heir n[illegible] | True | False |
| 2) Species from othe[illegible] s and end up in new places. | True | False |
| 3) Invasive species can be [illegible] the [illegible] ironment. | True | False |
| 4) Zebra mussels helped the wa[illegible] syst[illegible] | True | False |
| 5) Zebra mussels travelled in ballast w[illegible] ships f[illegible] e. | True | False |

**Questions** Answer the questions below usin[illegible] denc[illegible] t.

1) What is an invasive species? How does trade create inv[illegible] cie[illegible]?

_____

_____

_____

_____

2) How were the Zebra mussels introduced to the waters in Ontario? Why are they an invasive species and why are they harmful?

_____

_____

_____

_____

PREVIEW

Name: _____ 99

Curriculum Connection
B1.1, B3.8

# Human Use of Forests – Past and Present

## Human Use of Forests

Since the beginning of time, humans have used forests to their advantage. Our use of forests has changed as humans have developed new technologies. There is concern that our forests are not being managed properly, and that if we continue using them the way we do now, we will damage the wildlife that need forests to survive.

## How Humans Used Forests in the Past

For thousands of years, people have found food and medicine in forest ecosystems. Berries, apples, nuts, sugar, and syrup are all examples of foods that are found in forests. Tea brewed from tree leaves and stems helped treat illnesses. Alder leaves and bark was used to stop bleeding and cure a fever. Spruce bark was used to make a tea high in Vitamin C which could cure scurvy.

People also used forests to get wood to build things like shelters, furniture, fences, canoes, snowshoes, and sleighs. These things made life easier by providing people with comfortable homes to live in and ways to travel. Tools were also built out of things found in forests. Wood and rocks were used to make hammers, and tree branches were used to make traps for animals.

When humans made things in the past, it required quite a bit of work. This meant that when something was made, it wasn't discarded. It was needed and it took time and effort to make, so it was cherished.

## How Humans Use Forests in the Present

In today's world, lumber is a valuable natural resource. Many wood countries sell to other places to make money. A lumber mill or sawmill is a place where logs are cut into lumber. We now have machines that can take a chopped down tree and turn it into different shaped pieces of lumber in minutes. This lumber is sold in stores all over Canada and the world. We use wood to build houses, boats, and to burn for fires, for paper, sporting equipment, pencils, musical instruments and much more.



We still use forests in the same manner as humans did in the past, but more is wasted in today's world. This is because it is so easy for businesses to manufacture wood products and sell them to us. The problem is that half of the world's forests have already disappeared. As it stands now, the world loses more than 23 million acres of forests each year.

**Deforestation** is the permanent removal of trees. Deforestation happens for two main reasons – (1) to produce lumber for humans, (2) to clear forests for farming.

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Curriculum Connection
B1.1, B3.8

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) People wasted more in the past than they do now. | True | False |
| 2) Lumber is wood that has been made into certain shapes and sizes | True | False |
| 3) Deforestation is the replanting of trees after you cut them down. | True | False |
| 4) Many forests are cut down to provide space for farming. | True | False |
| 5) Each year, 20 million acres of forests are destroyed. | True | False |

## Making C[illegible]s

What does the reading remind you of in your life?

PREVIEW

## Questions

Use information from the text to supp[illegible]nswer

1) How were forests used in the past compared to how they a[illegible] used[illegible]e?

2) What is deforestation? Why is it happening and why do you think it is a problem?

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B1.1, B3.8

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark ____

**Check only the true statements.**

| Statement | ✓ |
|---|---|
| Humans have used forests for thousands of years. | |
| People in the past used forests only for food. | |
| Wood was used to build shelters and furniture. | |
| Modern machines can process trees into lumber. | |
| Forest use today produces no wasted wood. | |
| Lumber is an important natural resource in Canada. | |
| Deforestation means planting new trees in forests. | |
| Forests may be cleared to create farmland. | |

Name: _____ Mark ____

**Check only the true statements.**

| Statement | ✓ |
|---|---|
| Humans have used forests for thousands of years. | |
| People in the past used forests only for food. | |
| Wood was used to build shelters and furniture. | |
| Modern machines can process trees into lumber. | |
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| Forests may be cleared to create farmland. | |

Name: _____ Mark ____

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| Statement | ✓ |
|---|---|
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| Wood was used to build shelters and furniture. | |
| Modern machines can process trees into lumber. | |
| Forest use today produces no wasted wood. | |
| Lumber is an important natural resource in Canada. | |
| Deforestation means planting new trees in forests. | |
| Forests may be cleared to create farmland. | |

Name: _____ Mark ____

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| Statement | ✓ |
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| Humans have used forests for thousands of years. | |
| People in the past used forests only for food. | |
| Wood was used to build shelters and furniture. | |
| Modern machines can process trees into lumber. | |
| Forest use today produces no wasted wood. | |
| Lumber is an important natural resource in Canada. | |
| Deforestation means planting new trees in forests. | |
| Forests may be cleared to create farmland. | |

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B1.1, B3.8

# Agriculture – Clearcutting Forests

**What is Clearcutting?**

**Clearcutting** is a strategy used in the logging industry where all trees in an area are cut down at once. The loggers do not consider the tree type, age, or the effects on the ecosystem. Clearcutting is used to harvest wood and create land for agriculture. The new farmland is used to grow crops and/or raise livestock that need areas to graze.

Using the clearcutting method allows wood prices to be steady, and relatively inexpensive. If clearcutting is not used, the wood prices would rise. Clearcutting also provides the necessary farmland to keep up with our growing human population.




**Problems with Clearcutting**

When a forest is clearcut, all the animals and plant life in the forest lose their habitat. The animals must leave, while the plant life is destroyed. The process of clearcutting often kills animals as well. When part of an ecosystem is clearcut, the loss of animals from the clearcut area can affect the food chain in the entire ecosystem.

Clearcutting affects the soil in many ways. First, when an area is clearcut, the carbon in the soil is released into the air, which contributes to climate change.

Second, when we clearcut a forest, the soil becomes loosened, which results in soil erosion into rivers and streams. Losing soil into our water systems means we have less soil to grow plants that allow for terrestrial ecosystems.

Lastly, the loose soil can also cause landslides. Landslides can have devastating effects on other nearby ecosystems and habitats, including neighbourhoods.

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Curriculum Connection
B1.1, B3.8

## Questions

Use information from the text to support your answer.

1) What is clearcutting? Why is it done?

2) How do[illegible]utting affect the environment and ecosystems?

PREVIEW

## Questioning

Write 3 questions you h[illegible]ding.

| | |
|---|---|
| 1) | |
| 2) | |
| 3) | |

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Clearcutting helps keep wood prices low. | True | False |
| 2) Clearcutting is used to create more farmland for plants and livestock. | True | False |
| 3) Clearcutting only affects the plants and animals living in the forest. | True | False |
| 4) Soil erosion can happen due to clearcutting. | True | False |
| 5) Clearcutting has no impact on food chains. | True | False |

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# Infographic Example - Deforestation




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B1.1, B3.8

**Analyze** Write five things you learned from the infographic.

| | |
|---|---|
| 1) | |
| 2) | |
| 3) | |
| 4) | |
| 5) | |

PREVIEW

**Questions** Use information from the text to support y... ver...

1) Why are forests shrinking?

_____

_____

_____

2) What does the large picture in the middle of the infographic symbolize? Explain.

_____

_____

_____

_____

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Curriculum Connection
B1.1, B3.8

# Deforestation Statistics – Infographic Activity

The rate we are developing our land is affecting the environment. When we cut down forests to build farmlands, we are destroying ecosystems that many different species of animals depend on. The destroying of these ecosystems causes less biodiversity, which has led to many species going extinct. Check out the statistics below:



- The wo has lost one third of its forest due to deforestation
- 10 mil ares of forests are lost each year to make more fa d livestock grazing
- 2,4 ees ar each minute
- Every sec the s football field is cut down
- In the last 50 ye nim worldwide have declined 68%
- In the last 10 years, 4 cie have clared extinct
- 53% of all land in Canada is land
- By 2030, projections are that we wi only 1 e world's rainforests left
- Over half of the world's wildlife species live in ainfo
- 25% of all cancer fighting medicines come fr e rai st
- 75% of deforestation in South America is due to ill ging

PREVIEW

**Statistics** Which statistics will you use for your infographic?

| | |
|---|---|
| 1) | |
| 2) | |
| 3) | |
| 4) | |
| 5) | |

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Curriculum Connection
B1.1, B3.8

# My Infographic - Deforestation




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B1.1, B3.8

# Livestock Farming – Effects on Ecosystems

**What is Livestock Farming?**

**Livestock farming** is the strategic management and breeding of animals for the purpose of using their meat and products (milk, eggs, leather, etc.). It occurs when companies raise animals for human consumption or to obtain meat, milk, wool, honey and many other things.

**Why Livestock Farming Is Important**

By the year 2050, the human population will grow to nearly 10 billion people. Producing enough fo meet the demands of the growing population means we need predictable sources of vestock farming allows farmers to control the breeding and management of their a

2, it was concluded that approximately 86% of the world eats meat. verage ats 97kg (213lbs) of meat and poultry each year. Livestock farming provides fo products such as meat, eggs, milk, and cheese. Without livestock farm would eat much less meat and find their calories from other food source

**Problems with Livestock F r our tems**

Livestock farming has bee the f oblems:

- Deforestation – 39% of the s ha sed for livestock farming. Forests and trees are cleared to provide lan als e and to grow crops for livestock to eat.
- Pollution – Livestock farming produces mass ounts n. Animal waste emits around 400 different harmful gases int tmo e air pollution. Water pollution is also problematic. For example, n und th issippi River loses roughly 15,000 square kilometres a year of ara ue to ltural runoff.
- Greenhouse gases – Livestock farming releases almost on th greenhouse gas emissions. Some organizations believe this num rds of 51%. Either way, livestock farming produces more greenhouse gase the cars, trucks, planes, and ships in the world!
- Desertification – Livestock overgrazing turns arable soil that has a variety of plant life into desert or arid soil that has no vegetation. Overgrazing happens when the livestock are confined to smaller areas where they eat the plants down to the roots. With no plants or leaves to protect the soil, the soil is exposed to hot temperatures, which causes it to dry out.



- Loss of Biodiversity – It has been estimated that livestock farming has contributed to approximately 30% loss in global biodiversity. The most biodiversity is in our forests, and many forests have been clearcut to make more farmland.

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Curriculum Connection
B1.1, B3.8

## Questions

Use information from the text to support your answer.

1) What is livestock farming? Why is it important?

2) How m[illegible] livestock farming require? Why is it so much?

PREVIEW

## Problems

What are 5 problems t[illegible]stock [illegible]g causes to our ecosystems?

| Problem | [illegible]natio |
|---|---|
| | |
| | |
| | |
| | |
| | |

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B1.2, B3.8

# Locally Grown Food

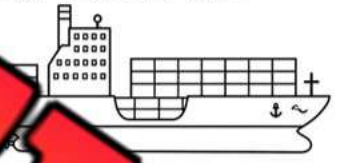
**Locally Grown Food**



Food that is grown locally means the food has been grown nearby. Local food could have been grown down the street from where you live. The best way to buy local f[illegible]is to go to a farmers' market. At a farmers' m[illegible]cal farmers bring their crops and sell th[illegible]

[illegible]we sh[illegible]a[illegible]ery store, almost all of the food is not grown locally. [illegible]and [illegible]ables come from Mexico, where the growing season is longer. Canada h[illegible]ee tr[illegible]g[illegible]t with Mexico, which keeps the cost for these plants low.

Some foods we cannot b[illegible]lly. [illegible], bananas, pineapples, and mangoes do not grow in Canada. Also, during the [illegible]months [illegible]ng grows in Canada. This means we can't buy fresh fruits and vegetables fro[illegible]l far[illegible]



**Benefits of Buying Local Food For Ecosystems**

1) Local food doesn't have to travel as far to arrive o[illegible]e. Wh[illegible]buy fruits and vegetables from Mexico, the food had to travel on transp[illegible], car[illegible]e airplanes. The use of these transportation methods creates $CO^2$[illegible]damage ecosystems
2) Canada has strict regulations on how food is grown and harvested. When we buy Canadian food, we know the food was not grown using unsafe additives, pesticides, or herbicides. The use of these substances destroys ecosystems by killing pests or affecting the quality of soil over time.
3) When we buy from local farms that we trust, we keep them in business. When we see local farms that use sustainable agricultural practices, we can support them by buying their products. This will ensure that more farms use environmentally friendly practices, like allowing their livestock to graze naturally in a pasture or silvopasture.

PREVIEW

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Curriculum Connection
B1.2, B3.8

**Questions** Use information from the text to support your answer.

1) Why is it hard to always buy fruits and vegetables locally?

2) Where [illegible] buy fruits and vegetables locally?

3) What are t[illegible]rs wh[illegible]hould buy fruits and vegetables locally?

4) How does buying locally help the environment (ecosystems and biodiversity)?

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B1.2, B3.8

# Technological Advancements Helping Ecosystems

**Technologies Helping Ecosystems**

With species being endangered and close to extinction, scientists have been developing technologies that can help monitor endangered species. Radio tracking collars, drones, and time-lapse photography are technologies that help scientists by providing them with detailed information about ecosystems.



**Radio Tra[illegible] Collars**

A radio tr[illegible]ollar is used by wildlife researchers to provide informa[illegible]at about an endangered species. The rese[illegible]llar on the animal's neck or ankle in order [illegible]ack the [illegible]ement of the animal, temperature of the animal, an[illegible]s s[illegible]live or not.

They are [illegible]to be [illegible]table for animals so that they do not even know they are wearing [illegible]h col[illegible]rs in it to detect temperature and movement. This infor[illegible]t by [illegible]rnal antenna that is inside the collar back to the researcher.

PREVIEW

**Drones**

Drones are now being used to count [illegible]monitor wild animals in ecosystems all over the world. Most animals shy away from humans, which m[illegible] it hard for scientists to perform accurate counts of animal populations. Drones allow scientists to have airborne eyes in the sky that can gather a lot of information. Data from Robot Process Automation (RPA) has been found on average to be between 43%[illegible]76 accurate than traditional ground-based data collecting.



Drones have also been used to rescue animals. When a stranded dog was lost in a mudflat area, a drone with sausages dangling from it led the dog back to safety.

**Time-Lapse Photography**

Researchers also use time-lapse photography to observe wildlife in different ecosystems. These cameras are called field cameras and are placed in strategic locations in an ecosystem. The cameras stay there for a long period of time, and they snap pictures when they detect motion. As time goes on, thousands of pictures are put together in a shorter, condensed video. Researchers can interpret these videos much more efficiently than if they had to watch the ecosystem for the entire length of time. The time-lapse photography shows the growth of the ecosystem over time.

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B1.2, B3.8

## Questions

Answer the questions below using evidence from the text.

1) Why is it important that humans use technology to track endangered species?

2) Do you think we should use collars on wild animals to track them? Explain your opinion.

PREVIEW

## Making Connections

What does the [illegible] remind you of in your life?

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Drones can be used to track endangered species. | True | False |
| 2) Animals are more afraid of drones than humans. | True | False |
| 3) Drones can even be used to rescue animals. | True | False |
| 4) Timelapse photography shows the growth of an ecosystem over time. | True | False |
| 5) Radio tracking collars are painful for animals to wear. | True | False |

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B1.2, B3.8

# Exit Cards

**Cut Out** Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Circle the correct answer.

| | |
|---|---|
| 1) What is a unique rescue method used by drones? | Sausages |
| | Nets |
| 2) How do drones help scientists monitor wild animals more accurately? | Aerial |
| | Ground |
| 3) What technology is used to create condensed videos from thousands of pictures? | Drones |
| | Time-lapse |
| 4) What information does a radio tracking collar provide about an endangered species? | Movement |
| | Diet |
| 5) What do the sensors in radio tracking collars detect in animals? | Temperature |
| | Weight |

Name: _____

Circle the correct answer.

| | |
|---|---|
| 1) What is a unique rescue method used by drones? | Sausages |
| | Nets |
| 2) How do drones help scientists monitor wild animals more accurately? | Aerial |
| | Ground |
| 3) What technology is used to create condensed videos from thousands of pictures? | Drones |
| | Time-lapse |
| 4) What information does a radio tracking collar provide about an endangered species? | Movement |
| | Diet |
| 5) What do the sensors in radio tracking collars detect in animals? | Temperature |
| | Weight |

Name: _____

Circle the correct answer.

| | |
|---|---|
| 1) What is a unique rescue method used by drones? | Sausages |
| | Nets |
| 2) How do drones help scientists monitor wild animals more accurately? | Aerial |
| | Ground |
| 3) What technology is used to create condensed videos from thousands of pictures? | Drones |
| | Time-lapse |
| 4) What information does a radio tracking collar provide about an endangered species? | Movement |
| | Diet |
| 5) What do the sensors in radio tracking collars detect in animals? | Temperature |
| | Weight |

PREVIEW

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# Indigenous Groups and The Environment

**Land Ownership**



For non-Indigenous people, land is something they can own and develop as they see fit. They change the land from raw or unfinished to places they can call home or work. They make money from the land by selling natural resources [illegible] wood, minerals, fish, and other animals.

Th[illegible] people do not feel the sam[illegible] of [illegible]d. They view the land as [illegible]methi[illegible] connected to.

**Spiritual Conn[illegible] Interc[illegible]dness**

Each First Nation [illegible] has [illegible]nnection to the land that differs from nation to nation. The [illegible] governm[illegible]nd provincial governments across Canada understand that a[illegible] writ[illegible] is connection be protected in the constitution and in the court [illegible].

**Spiritual connections** means th[illegible]ndige[illegible]elieve that everything in the universe is connected. The spirit worl[illegible] conne[illegible] to t[illegible]ortal world, the land is connected to the sea, and the sky is connect[illegible]he gr[illegible]

**Indigenous Views of Sustainability**

Since the environment has been around for so long, [illegible]geno[illegible]ple of Canada have an intricate, respectful, grateful, and prot[illegible] tie[illegible]ing connected to the environment means they feel a responsibility [illegible]nd and all the creatures that live on it. This is not just an emotiona[illegible]eel everything on the land has a spirit! If the connection between the sp[illegible]on the land is broken, the well-being of the Indigenous group is affected.

The Indigenous believe in environmental stewardship and taking care of the land. Before they make decisions, they think about the impacts the decisions will have on their ecosystems. They believe in biodiversity and protecting all species so that the environment as a whole, can stay healthy. This holistic approach is important to the Indigenous, as they believe everything is connected. If one part of the environment is unhealthy, the entire environment will suffer.

The rest of the world is learning a lot from the Indigenous views on sustainability. The greed and mismanagement of the land by corporations would not happen if everyone adopted the holistic approach of the Indigenous. Many are still learning how one part of an ecosystem affects all parts of the ecosystem.

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## Questions

Answer the questions below using evidence from the text.

1) How do Indigenous groups in Canada view the land? Why is it a sustainable approach?

2) How do [illegible]genous people view the land? What could we learn from the Indigenous?

PREVIEW

## Inference

What would have [illegible]onment if European settlers/explorers adop[illegible]ndige[illegible]way of life?

## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) The Indigenous feel connected to the environment. | True | False |
| 2) The Indigenous view land as something that can be owned. | True | False |
| 3) For the Indigenous, if one part of the environment is unhealthy, it all is. | True | False |
| 4) The Indigenous way of life is more sustainable than the non-Indigenous. | True | False |
| 5) The Indigenous sell the resources on the land to make a lot of money. | True | False |

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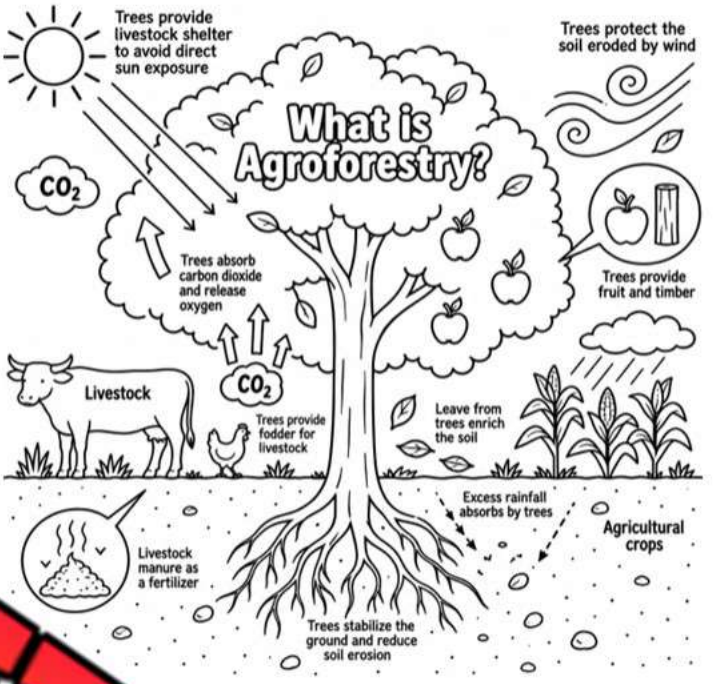
B1.3

# Indigenous Practices Promoting Sustainability

## Indigenous Farming Practices

The Indigenous people of Canada have mastered the sustainable development of their farming systems. They have been using the following methods successfully for many years.




1) Agrof[illegible]try – the planting of trees with [illegible]s allowed the Indigenous to [illegible] temperature, sunlight, [illegible]il and rain) [illegible]re tha[illegible]ts receive. Using agr[illegible] vid[illegible]hem with a wid[illegible] prod[illegible]h as food, fodde[illegible] woo[illegible] medicine while a[illegible]
2) Crop Rotations – the [illegible]s ha[illegible] been using crop rotations [illegible] and they still use them today. Many First Nations plant the three [illegible] co[illegible]ns, and squash in a crop rotation.
3) Intercropping – instead of only planting a si[illegible] crop [illegible]ld, intercropping means you plant 2 or more crops togethe[illegible]g so[illegible] the risk of single crop failure. It will also increase biodiversity [illegible] a var[illegible] predatory insects that can feed on pests.

PREVIEW

## Sustainable Indigenous Ways of Life

It is obvious that the Indigenous ways of life are more sustainabl[illegible] Canadian ways of life. This is clear because we will find more biodivers[illegible]ndigenous communities than we find in Ontario's cities.

So, what do they do differently? Check out the list below.

1) Only take resources from the land that are needed
2) No wasting of resources, including animals they hunt (every part of the buffalo is used)
3) Respect the environment. For example – show patience in allowing old crops to decompose so they can provide nutrient rich soil (as opposed to burning the old crops)
4) The priority is not about making money or more development, it is about maintaining a healthy environment by honouring the Earth.
5) No pollution – traditional Indigenous methods of transportation (canoes) emitted zero pollution.

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**Questions** Answer the questions below using evidence from the text.

1) What agricultural practices do the Indigenous use that promotes sustainability?

2) How is t enous way of life more sustainable?

PREVIEW

**Visualizing** What were you pic g in w e you were reading?

**True or False** Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Agroforestry is the planting of trees with crops. | True | False |
| 2) Intercropping is when you grow different crops each year on rotation. | True | False |
| 3) The Indigenous are more concerned with development than the environment. | True | False |
| 4) The Indigenous have always created a lot of pollution. | True | False |
| 5) The Indigenous do not waste natural resources. | True | False |

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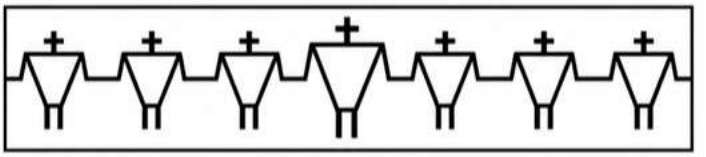
# Seventh Generation – Indigenous Teaching Sustainability

**Seventh Generation Principle – Ancient Haudenosaunee Philosophy**

The **Seventh Generation Principle** is based on an ancient Haudenosaunee philosophy that the decisions we make today should result in a sustainable world seven generations into the future.



The Seventh Generation pictograph shows that all 7 generations are connected. Decisions our great grandparents, grandparents, and parents made have affected our current environment. The decisions we make will affect our children, grandchildren, and great grandchildren. Likewise, the decisions we make will impact the next 7 generations.

Typically, the Seventh Generation Principal applies to decisions being made about our energy, water, and natural resources. But the Indigenous also apply it to decision making related to sustainable relationships with other First Nations or government organizations.

**Learning From the Seventh Generation Principle**

In 1988, an American company started named Seventh Generation. Their name is inspired by the Indigenous Seventh Generation Principle. The company sells cleaning supplies like laundry detergent, spray cleaner, and dish soap.

Their mission is to transform the world into a healthy and sustainable place for the next seven generations. They are doing the following to ensure their actions positively affect the next seven generations:

- use of renewable plant-based products
- use of recyclable materials in their packaging
- use of **biobased** products, meaning less chemicals that are harmful for the environment. When a biobased cleaning supply is washed down the drain, it isn't as harmful to the environment because the ingredients come from natural sources that will be broken down




We can all learn from the Haudenosaunee's ancient philosophy. If we think about the next seven generations before we buy a car for example, we might choose the electric vehicle that produces less emissions. If everyone considers the impact of their decisions, there is no doubt that we will achieve a more sustainable future.

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## Questions

Answer the questions below using evidence from the text.

1) What is the Seventh Generation Principle? Why is it helpful for sustainability?

2) What is [illegible]pany Seventh Generation? Why do you think they chose their name? What do [illegible]y do to ensure sustainability for 7 years?

PREVIEW

## Making Connections

What decisions h[illegible] made [illegible]or this week that could impact 7 genera[illegible]? What [illegible] yo[illegible]e done differently?

## Sustainable?

Circle yes if the action is good for the next 7 generations and no if it isn't.

| | | |
|---|---|---|
| 1) Throwing plastic into the garbage. | Yes | No |
| 2) Walking or biking to school. | Yes | No |
| 3) Convincing your parents to buy a big truck instead of a car. | Yes | No |
| 4) Burning a bunch of cardboard instead of recycling it. | Yes | No |
| 5) Leaving a TV on all night without watching it. | Yes | No |

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Curriculum Connection
A2.1, A2.2, A3.1, A3.2, A3.3

# Technology in Zoos

**Zooscaping**

Zoos have changed a lot over the last 5-10 years. In the past, animals lived in small cages for visitors to observe. TVs outside of the cages would show the public video about the animal's natural habitat and how the animal behaved in the wild.

Today, many zoos are "zooscaping," which is the building of interconnected systems of rooms or large spaces where animals can roam freely within their natural ha[illegible]t. The change has allows visitors to witness n[illegible]ural behaviours of animals.



**Tech[illegible]e**

Many [illegible] are ex[illegible]ng with new technologies t[illegible]e e[illegible]rience for visitors and t[illegible] the li[illegible]e animals.

The San Dieg[illegible]o us[illegible]ea[illegible] which is an app visitors can do[illegible]t tell[illegible] when they are near anima[illegible]ons[illegible]'s alerts to visitors using the app telling them when animals ne[illegible]y wi[illegible]w they can help.

Motion sensors are also being [illegible] help[illegible]s. At the Melbourne Zoo in Australia, motion sensors turn on a s[illegible]ver whe[illegible]tois[illegible]tand below the shower head. This allows the tortoises to cool off an[illegible] clea[illegible]

**The Internet of Things – Helping Animals**

In England, tiny computers are worn by antelopes i[illegible]a. Si[illegible]ese animals are from Africa, they are use to warm temperatures. Th[illegible]re, [illegible]uters have been combined with temperature sensors and a heater in their pen. When the temperature reads too low and the animal is in their pen lying down, the heater would turn on. If the temperature ran too high but the animal is not in their pen, the heater stays off.




The system uses the 'Internet of Things' (IoT), as different components work together to achieve a goal. The **Internet of Things** describes a network of physical objects (things) that have sensors on them so they can interact with each other.

In this example, the animals wear sensors that interact with the sensors on the heater. The sensors on the heater work by sensing if an animal is in front of them (the animals are in their pen).

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## True or False

Circle whether the statement is true or false.

| | | |
|---|---|---|
| 1) Technology is improving the zoo experience for visitors. | True | False |
| 2) Technology in zoos does not help the animals. | True | False |
| 3) Some animals in zoos are not adapted to living in cooler temperatures. | True | False |
| 4) Sensors are being used to help animals in zoos. | True | False |
| 5) Zooscan[illegible]ns zoos are bringing in smaller cages for their animals. | True | False |

## Questi[illegible] Answe[illegible]stions below using evidence from the text.

1) How is techn[illegible]ving an[illegible]zoos?

2) What is the Internet of Things? How is [illegible]elping [illegible]ope[illegible]land?

PREVIEW

## Directions

Finish the If/Else statements below for the heating and showering systems.

if sensor detects motion

then turn ☐ shower

else

then turn ☐ shower

if heat sensor detects overheating

if heater sensor detects movement

then

else

then

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Curriculum Connection
A2.1, A2.2, A3.1, A3.2, A3.3

# Remote Control Photography

Learning about endangered species in their natural habitat is difficult because they will not act naturally if they see humans. Thanks to ideas like the BeetleCam, observing endangered animals is getting easier. The BeetleCam is a small camera that takes pictures and videos. It is a small rover like device that camouflages into nearby habitats. The BeetleCam is operated using a remote control that uses coding to instruct the camera.

## Mapping

Use this map to write the code on the next page.




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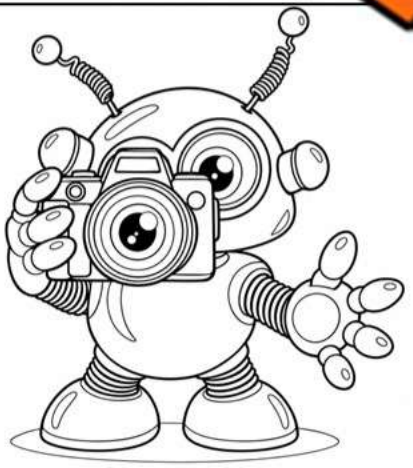
**Coding** The camera has started in position (1, 4). Move it to all the sites in an efficient path by writing code similar to the example code below. Try to write as few lines of code as possible.



**Exam**

- move to (3, 
- take 5 pictures 
- move to (5, 5)
- take 3 pictures of site8



**Code**

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**Question** Why is it helpful that robots can take photos and collect video? How does it help scientists understand natural habitats?

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# Unit Test – Interactions in the Environments

**Multiple Choice** /10

| | |
|---|---|
| 1) Which of the following is a biotic factor?<br>a) Air<br>b) Animals<br>c) Rocks<br>d) Water | 2) Which of the following is an abiotic factor?<br>a) Trees<br>b) Shrubs<br>c) Fish<br>d) Temperature |
| 3) Which ec[illegible] has the most biodiversi[illegible]<br>a) Ra[illegible]<br>b) Tundra[illegible]<br>c) Desert<br>d) Grassland | 4) Which of the following animals is an apex predator<br>a) Eagle<br>b) Chipmunk<br>c) Snake<br>d) Rabbit |
| 5) Which of the following is a[illegible]ser?<br>a) Snake<br>b) Fish<br>c) Fungi<br>d) Dragonfly | [illegible]n animal that eats both animals and<br>[illegible]Carn[illegible]<br>b) He[illegible]re<br>c[illegible]mpos[illegible]<br>d) On[illegible]y |
| 7) Which part of the food chain gets the most energy from the sun?<br>a) Decomposers<br>b) Producers<br>c) Consumers<br>d) Apex predators | 8) Clearcutti[illegible]sts [illegible]<br>a) Loss of biodiversity<br>b) Soil erosion<br>c) Landslides<br>d) All of the above |
| 9) Which system of agriculture has trees, livestock, and crops together<br>a) Factory farming<br>b) Pasture<br>c) Silvopasture<br>d) All of the above | 10) Which technology is causing a lot of problems for ecosystems and the environment?<br>a) Drones<br>b) Vehicles<br>c) Radio tracking collars<br>d) All of the above |

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**Definitions** – What does the term mean (1 mark each) /5

| Term | Definition (what does it mean) |
|---|---|
| **Ecosystem** | |
| **Primary Succession** | |
| **Secondary Succes** | |
| **Carr C** | |
| **Ecosystem** | |

**Short Answer** Questions (2 s each) /6

1) What is the difference betw bio lements in an ecosystem?

2) What is the role of decomposers in an ecosystem?

3) What is clearcutting? How does it affect ecosystems?

PREVIEW

**Long Answer (5 marks each)** **/10**

1) Describe one food chain. Use the terms: decomposers, producers, primary/secondary/tertiary and quaternary consumers? What happens when one part of the chain is removed?

2) How do agricultural practices affe[illegible]osyste[illegible]ha[illegible]ustainable agricultural practices are better for our environment?

PREVIEW