

UNIT LEARNING PACKS
FOCUS IN ACTION

Grade 7 Science in Action
Unit A - Interactions and Ecosystems

'Focus in Action' UNIT LEARNING PACKS

These booklets are designed to provide Grade 7 students with all the resources needed to review or reinforce concepts, covered in the Alberta Science Curriculum, and included in the Grade 7 Science Final Exam in June. There are circumstances in which **an entire unit** may be missed and covering the concepts from that unit (for the final exam) can be difficult. This can happen for a number of reasons:

- Students – new to the school – register throughout the year (from other provinces, school jurisdictions or countries)
- Students may be ill or have surgery and often can miss one or more units
- Students have extended holidays throughout the year
- Transfers from another school, who have completed the units in a different order

For additional support, students are directed to the **Edquest Middle School Science Website** or, Scienceman Resource (www.scienceman.com/scienceinaction/pgs/hot_7u1.html)

Unit 1 – Interactions and Ecosystems



- **Section 1 Notes & Quiz**
- **Section 2 Notes & Quiz**
- **Section 3 Notes & Quiz**
- **Section 4 Notes & Quiz**
- **Unit Summary**
- **Review Booklet** (Covered in class, prior to the Final Achievement Exam)
- **Unit Test**
- **Answer Key for Section Quizzes and Unit Test**

Additional support will be provided, in the form of practice Achievement Test Questions, during the course review in June. Multiple Choice Questions and Numerical Response Questions will be reviewed, as these are the types that will make up the Science 7 Final Exam

Handouts and other activities, to reinforce the concepts covered in this Unit, will be made available based on need. If you require further information or resources, email Edquest directly: edquest@gmail.com.

Finding Solutions to Problems, instead of Making Excuses

Student Instructions for use of this Learning Pack

The purpose of this Learning Unit Pack is to provide you with the resources that will help you cover the material from the curriculum that will be tested on the Final Exam in June. Follow these steps to successfully complete this Unit Learning Pack:

Step 1 – Read the **Topic Notes**

Step 2 – Use a **highlighter** to identify the key words or phrases in the Topic Notes and reread the material again paying close attention to those words that you highlighted. If necessary, modify your highlights to make sure you understand the material in the notes.

Step 3 – Complete the **Topic Quiz**

Step 4 – Correct the Topic Quiz by **checking the answers** in the back of this Learning Pack.

Step 5 – Using your **textbook** and the **completed quiz**, find the page where the question and correct answer can be found and write it next to the question number in your Learning Pack.

Step 6 – **Repeat Steps 1-5** for each of the other Topics in this Unit.

Step 7 – Look over the **Unit Outline** to review the **Key Concepts** once you have completed all of the Topics.

Step 8 – Complete the **Unit Review**, using your **Learning Pack** and **Textbook**.

Step 9 – **Highlight** those sections of the Review that you had difficulty with and review those sections with your teacher prior to taking the Unit Test.

Step 10 – Take the **Unit Test** and correct it using the answer key provided in the back of the Learning Pack.

Step 11 – You should now be ready to answer any questions on the **Final Exam** related to this Unit.

Anything you still do not understand should be discussed with your teacher. Congratulations on your **Independent Study**, and Good Luck on the Final Exam. I hope you have made good use of this resource. Please provide feedback to your teacher, so that this resource can be improved.

Additional support is available in the form of practice Achievement Test Questions. **Multiple Choice Questions** and **Numerical Response Questions** will be made available on request, as these are the types that will make up the **Science 7 Achievement Exam**.

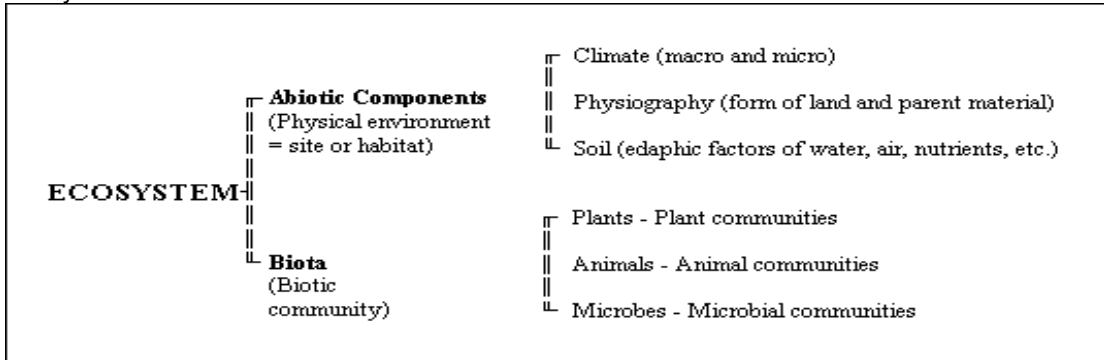
Handouts and other activities, to reinforce the concepts covered in this Unit may be acquired by visiting the Edquest Middle School Science Resource Website

<http://www.edquest.ca>

1.0 Relationships exist between living things and their environments

1.1 Defining an Ecosystem and Learning about Basic Needs

Ecology is the study of the relationship between living organisms and their environment. An ecologist is someone who studies those relationships. An ecosystem is a place, such as a rotting log, a forest, or even a schoolyard, where interactions between living and non-living things occur. All living organisms and non-living parts within this place are interacting all the time and adjustments must occur if the organisms are to survive. Living organisms make up the biotic components of the ecosystem, while non-living things make up the abiotic parts of the same ecosystem.



Ecosystems vary in size and complexity. In order to study an entire ecosystem, ecologists often study only a small aspect of an ecosystem and then work with other ecologists to piece together the overall picture of how the ecosystem functions.

The World Within An Ecosystem

Species within an ecosystem refers to those living things that can reproduce and have young that can also reproduce. When there are a number of individuals of the same species within an ecosystem the group is called a **population**. All the populations of the many different species that live and interact together in the same ecosystem is referred to as **community**.

The Needs of Living Things



Living things need food.



Living things need a suitable habitat.



Living things need water.



Living things exchange gases.

Living things are always interacting with each other and with the non-living things in their environment.

1.2 Interactions among Living Things

Symbiotic Relationships

When two species live closely together in a relationship that lasts over time symbiosis occurs. There are three forms of symbiosis:

- **Mutualism**

Mutualism occurs when there is a relationship between two different organisms, in which each partner benefits from the relationship. Examples include:

Mutualism
between plants
and their
herbivores



3-way Mutualism between an ant,
a butterfly caterpillar, and an
acacia plant



- **Parasitism**

Parasitism occurs when there is a relationship between two different organisms, in which one partner benefits from the relationship, while the other partner is harmed. Typically, the partner that benefits (the **parasite**), lives on or in the other organism (the **host**), and feeds on it. Examples include:

Aphid mummy - the
result of parasitism



A *Kalahari barking
gecko* is crucified by a
Shrik.
They store them as a
cache for a later meal.



- **Commensalism**

Commensalism occurs when there is a relationship between two different organisms, in which one partner benefits from the relationship, while the other neither benefits, nor is harmed. Examples include:

Anemonefishes
dwell among the
tentacles of *Tropical
Sea Anemones*



*Insects and
Flowers*



Both partners apparently benefit from the relationship,

Adapting To The Environment

Living things are adapted, so they **'fit'** into their surroundings, to ensure survival. An **adaptation** is an **inherited** characteristic that helps an organism survive and reproduce in its environment. Sometimes adaptations are **learned** during the organism's lifetime.

1.3 Human Impacts on Ecosystems

Symbiotic relationships are only a few ways that organisms interact with one another within an ecosystem. Other interactions may involve the physical changing of the ecosystem by the organisms living in it and interacting with parts of it. **Natural Resources** are the materials and products found in nature that people use to meet their basic needs. The impact that people have on the use of resources can be very small, or can be huge, and can lead to positive or negative consequences. The needs of all living things now have to be met with the available natural resources. How we are able to satisfy these needs with minimal conflict will determine how resourceful we can be.

Declining Beaver Population

When a family of beavers makes a dam, the stream below the dam dries up, killing the water organisms that need the water to survive. Above the dam, a pond changes the habitat and limits the kinds of organisms that can survive there. For every action in an ecosystem there is a resulting effect and reaction which will change the make-up of the ecosystem in some way. The decline in the beaver population in Yoho National Park has been as a result of improved firefighting equipment and fire-monitoring techniques. Young Aspen trees (the beavers preferred source of food and shelter) are scarce and the other trees in the forest are growing too large for the beavers to use effectively.

Dealing With our Garbage

The ways people interact with the environment has changed over time. Machines and advanced technologies have caused a higher impact than in the past. All of the needs people had in the past were satisfied by the natural resources they were able to find in the environment around them. Nowadays, resources are transported throughout the world, as the demand gets higher. Lifestyle changes over time have increased the pressure on different environments and the ecosystems we live in.

Needs are basic to survival, whereas, '**wants**' are things that just make survival more comfortable or enjoyable. Each time a need or a want is satisfied, natural resources or energy are used up. This impacts the environment we live in. Transporting food from all around the world, just so we can have the luxury of choice impacts other regions as well, because those regions had to clear land, use fuel (energy) and through the industrial processes caused pollutants to enter the air. When our 'want' demands conflict with the health of our ecosystems, we need to begin making some more responsible choices. The needs of wildlife can be negatively impacted by the wants of people. When this happens we need to decide whether our want is more important than their need.

The Garbage Solutions

The production of wastes on our planet is increasing. The storage or disposal of these wastes - until they can be returned naturally back to the environment is a major problem. Waste disposal techniques include recycling, composting, incinerating, and hazardous waste operations. **Sanitary landfills** are similar to landfills, where waste is spread over a large area and then covered with soil to encourage the natural decomposition of the waste. To prevent and control leaking of hazardous products from the sanitary landfills, a clay liner and a system of drainage pipes is put into place.

Section 1 – Relationships Quiz

Student Name

Class

1.1 Ecosystems – Biotic/Abiotic – Species/Population/Community - Basic Needs

1. A salamander hides under the bark, fungi grows on the rotting log and other forest dwelling organisms use the hollow core as a home. This rotting decaying log is an ...
 - A. ecotrust
 - B. ecosystem
 - C. environment
 - D. ecological subsystem
2. An ecosystem thrives with biotic & abiotic parts. An example of an **abiotic** part of an ecosystem is ...
 - A. lichen
 - B. fungus
 - C. minerals
 - D. fern plants
3. An example of a **biotic** part of an ecosystem is ...
 - A. sand
 - B. wind
 - C. precipitation
 - D. micro-bacteria
4. Individuals able to Reproduce, young able to reproduce and appearance similar to parents describes a ...
 - A. plant
 - B. animal
 - C. species
 - D. organism
5. To determine an organism's '**niche**', all of the following must be determined, **EXCEPT** ...
 - A. what it eats
 - B. where it lives
 - C. how it is classified
 - D. what relationships it has with other organisms
6. When a number of individuals – all of the same species – live together in the same area, the group is referred to as a ...
 - A. species
 - B. community
 - C. biotic group
 - D. population
7. Which of the following should be classified as a **community**?
 - A. A wetland marsh
 - B. A flock of birds
 - C. A pack of wolves
 - D. A school of dolphins
8. Living things have basic needs. Throughout the first section in this unit the **needs of living things** were examined in depth. The four basic needs of living things are:
 - A. food, clothing, oxygen, love
 - B. oxygen, water, food, habitat
 - C. water, oxygen, habitat, protection
 - D. food, water, habitat, space

1.2 Relationships – Adaptations

- Some living things depend on each other in a very close relationship, which lasts over time. This relationship is called ...
 - sybiosis**
 - parasitosis**
 - mutualosis**
 - commensalosis**
- Tapeworms live inside organisms and feed on the nutrients of the organism they live in. A tapeworm is an example of ...
 - patriotism**
 - mutualism**
 - parasitism**
 - commensalism**
- A particular relationship where one organism benefits (like a tree orchid – which receives access to sunlight) and the other organism (the tree) is not harmed or helped is called ...
 - divisionism**
 - parasitism**
 - mutualism**
 - commensalism**
- The relationship where both organisms help each other - such as the goby fish and the snapping shrimp is called ...
 - partnerism**
 - parasitism**
 - mutualism**
 - commensalism**
- A parasitic relationship is demonstrated by a
 - mosquito sucking blood from its host**
 - a whale that has barnacles on it**
 - butterflies pollinating flowers**
 - cattle with birds on their backs**
- Because some of the lamprey's victims die after it has attached itself to its host, the relationship that exists is considered to be ...
 - dependent**
 - parasitism**
 - mutualism**
 - commensalism**
- Adaptations are inherited characteristics that help an organism to survive and reproduce in its environment. Looking both ways before crossing a street helps us survive because it is ...
 - a survival adaptation**
 - an inherited survival experience**
 - learned through experience**
 - inherited from our parents**
- The great blue heron's long, sharp beak and long legs are adaptations that help it to satisfy this basic need ...
 - consume water**
 - obtain oxygen**
 - suitable habitat**
 - gather food**

1.3 Human impacts on ecosystems – garbage

1. The beaver population in *Yoho National Park* has declined due to ...
 - A. more hunting permits
 - B. lower water flow
 - C. fewer forest fires
 - D. more Aspen trees
2. **100,000 toads** are killed on highways in England each year. To prevent the extinction of this population the government has provided ...
 - A. protective gear for the toads
 - B. toad resistant tires for the cars
 - C. tunnels for them to cross the highway
 - D. bridges for them to cross the highway
3. Which of the following actions - **to get rid of waste in 'dumps'** - was common in the past?
 - A. Lining the dump with plastic to prevent leaching
 - B. Covered with soil to prevent spreading by wind
 - C. Sorted and carefully monitored by inspectors
 - D. Open pits where anything could be put in
4. '**Wants**' are things that make our life more enjoyable. The distinction between a '**need**' and a '**want**' has become blurred. Satisfying our needs and wants usually uses natural resources. Which of the following is an example of a '**want**'?
 - A. water from a well
 - B. designer bed sheets
 - C. potatoes from a garden
 - D. crabapples from your tree
5. Determining what '**needs**' and '**wants**' are can often be challenging. Which statement is correct?
 - A. I want food so I don't starve
 - B. I need a place to sleep tonight
 - C. I want air to help me breath in the cave
 - D. I need that computer game for my collection
6. All of the following are ways that humans have positively impacted the 'garbage problem', **EXCEPT** ...
 - A. recycling
 - B. composting
 - C. consuming
 - D. incinerating
7. A clay liner and a system of pipes is used in a sanitary landfill to ...
 - A. prevent leakage
 - B. recycle waste
 - C. restore oxygen
 - D. prevent disease
8. During the recycling process all of the following is done to materials that will be reprocessed, EXCEPT...
 - A. sorted
 - B. cleaned
 - C. crushed
 - D. compacted

2.0 The flow of energy and the cycling of matter can be traced and interpreted in ecosystems.

2.1 Ecosystems Have interactions among Predators, Consumers and Decomposers

You And Other Animals Are Food Consumers

All of the organisms within an ecosystem have different roles. These roles are called **niches**. Organisms can have more than one niche and knowing the niches of an organism can help to explain why they act and interact the way they do. To determine an organism's niche, you need to identify what it eats, where it lives and how it interacts with the other organisms in the same ecosystem. Niches include:

- **Producers** - produce food energy for themselves and others
- **Consumers** - consume the food made by the producers
- **Herbivores** - eat producers (plant eating niche)
- **Carnivores** - eat other consumers (meat eating niche)
- **Predators** - eat *prey*
- **Omnivores** - eat both producers and consumers

Food Consumers Depend On Food Producers

The Process of Photosynthesis

The raw materials needed by plants to produce their own food -with the energy from the Sun - are water and carbon dioxide. The products produced are food (sugars) and oxygen, which is released back into the atmosphere. The food making process is called photosynthesis.

The Importance of Photosynthesis

Light Energy + Carbon Dioxide + Water → Food (Sugars and Starches) + Oxygen

This is important for 2 reasons: the sun's energy can be converted into a form you can use and oxygen is made available for you to breathe.

Oxygen Is For More Than Just Breathing

Plants need oxygen as well. All living things are able to release the energy that is stored in food through the process of cellular respiration.

Food (Sugars & Starches) + Oxygen → Carbon Dioxide + Water + Energy (used by living things)

A Vital Interaction

The products of one chemical reaction (photosynthesis) are used by the other chemical reaction (cellular respiration)



Scavengers are organisms that feed on dead or decaying plant or animal matter. They usually don't kill their own food.

Magpies, crows and wolverines are examples.

Decomposers are different from scavengers because they do not actually eat dead material. They grow on or in the dead or waste matter, absorbing the nutrients directly into their cells, which are then recycled back into the environment.

Bacteria and Fungi are examples.

Decomposers can be Helpful or Harmful

Helpful		Harmful	
Baker's yeast	- produce a by-product that makes dough rise	Candida albicans	-cause a disease called thrush
E. coli (found in your large intestine)	-break down nutrients in food to make vitamins you need to stay healthy	E Coli bacteria 0157-H7	- produce toxic chemicals that result in food poisoning
Nitrogen-fixing nodules	- home to bacteria which make nitrogen available to the plant		

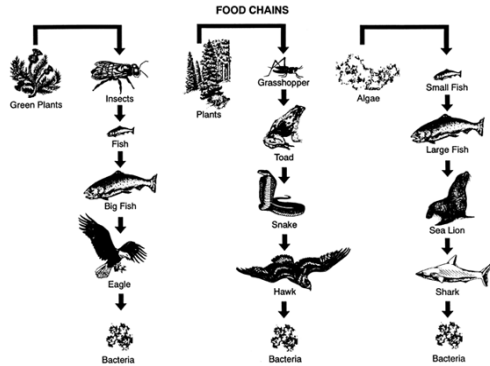
Decomposers Are Essential To All Ecosystems

Their actions make them the 'clean-up crew' and mean that plants will always have the nutrients they need to maintain life. They are the bridge between the biotic and abiotic parts of an ecosystem.

2.2 Food Chains Demonstrate the Flow of Energy in Ecosystems

Food Chains

A food chain is a model that shows how energy stored in food passes from organism to organism. It starts with the original food source -a producer.

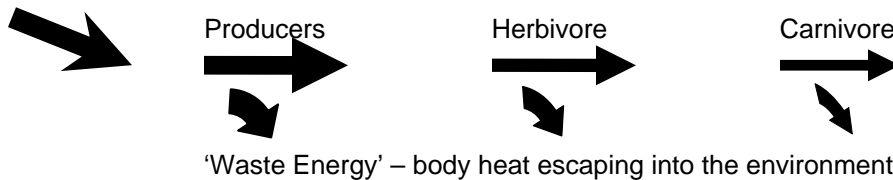


Energy flow is the movement of energy, starting with the sun, and passing from one organism to another.

As energy flows from one organism to another a food chain is established. Food chains usually involve more than three organisms.

Energy Flow In Ecosystems

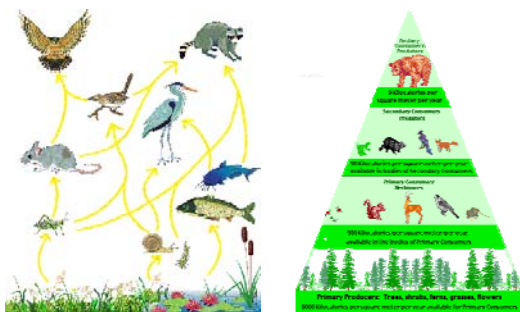
Ecosystems get energy originally from the Sun through the process of **photosynthesis**. Light energy is used by plants to make food, which contains the chemical energy that plants use for their life functions. 90% of this energy is used by the plant and the remaining 10% is available to the herbivore that eats the plant. The herbivore uses 90% of this energy to maintain life functions and provides the remaining 10% to the carnivore. Most of the energy is used to maintain body heat, which escapes into the environment and cannot be used. The flow of energy is one way.



2.3 Food Webs

A **Food Web** is a combination of many different food chains, showing the interrelationships between and among many different producers and consumers in an ecosystem.

A **Food Pyramid** is a model representing the numbers of organisms consumed at each successive level of the pyramid. The size of the level indicates the number of organisms at that level. There are always more animals being eaten than are eating.



To find out how much energy is being transferred from one level of the pyramid to the other, **biomass** needs to be calculated.

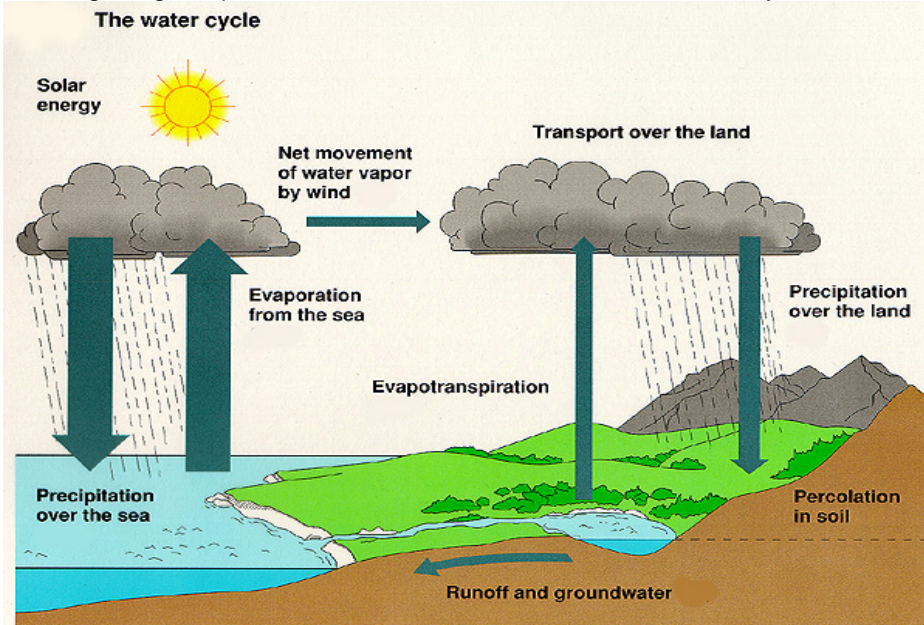
Biomass is the total of all the organisms in the ecosystem. As you move up the pyramid, there is less biomass. The most biomass is found at the base, where the producers are.

2.4 Matter Cycles in Ecosystems

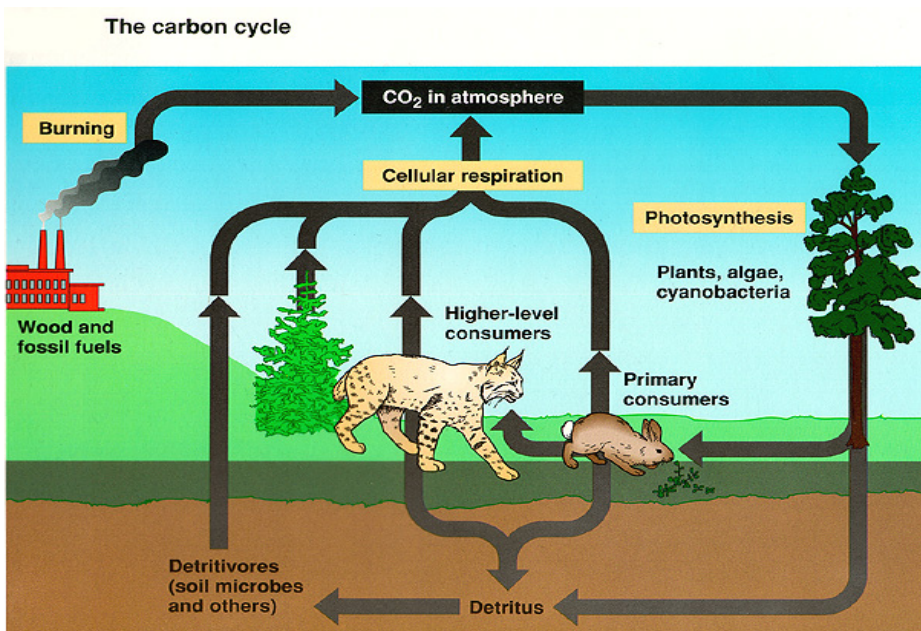
When organisms breathe, the gases are recycled in the air and used by other organisms. When organisms die, the nutrients they are composed of are recycled back into the environment and used as well.

Water and Carbon Cycles

All living things require water to survive and this water is also recycled over and over again.



The water cycle (as illustrated) contains 4 processes: evaporation and transpiration – move water from the Earth to the atmosphere, condensation and precipitation return the water to Earth.



Carbon is necessary for all life to exist and is recycled in the environment.

Section 2 – Energy Flow Quiz

Student Name

Class

2.1 Consumers/producers – photosynthesis – cellular respiration – scavengers/decomposers

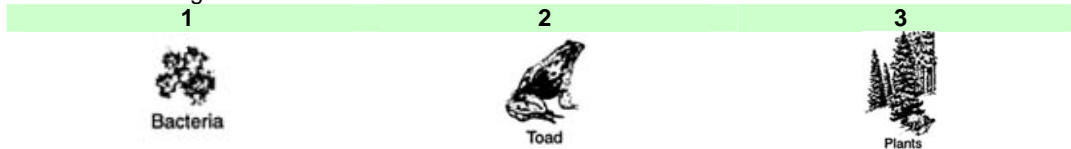
1. What effect would there be on the ecosystem we live in, if **All** biting insects were eliminated?
 - A. Very little effect
 - B. No effect at all
 - C. Catastrophic effect
 - D. A minor inconvenience
2. Organisms in an ecosystem can be classified as **producers** or **consumers**. The producers provide food for the consumers. An organism that consumes both producers and other consumers is called a ...
 - A. herbivore
 - B. omnivore
 - C. carnivore
 - D. prey
3. Organisms that consume only producers are known as ...
 - A. herbivores
 - B. omnivores
 - C. carnivores
 - D. predators
4. Organisms that consume other consumers are known as ...
 - A. herbivores
 - B. omnivores
 - C. carnivores
 - D. producers
5. **Photosynthesis** is the food production process that takes place in this part of the plant ...
 - A. roots
 - B. stem
 - C. flower
 - D. leaves
6. The two things that plants need - as **raw materials** to make food - are ...
 - A. nitrogen and water
 - B. oxygen and carbon dioxide
 - C. water and carbon dioxide
 - D. nitrogen and oxygen
7. Which of the following word equations describes **cellular respiration** ?
 - A. Light energy + carbon dioxide + water → food + oxygen
 - B. Food + oxygen → carbon dioxide + water + energy
 - C. Light energy + oxygen + carbon dioxide → water + food
 - D. Food + carbon dioxide + energy → water + oxygen
8. **Decomposers** – known as the clean-up crew - are the decomposers. Scavengers also get rid of the waste in an ecosystem. **Scavengers** differ from decomposers because they ...
 - A. do not kill organisms for food
 - B. do not eat dead organisms
 - C. break down larger organisms
 - D. only feed on living plants and animals
9. Which of the following decomposers are helpful?
 - A. Baker's yeast and E coli
 - B. Candida albicans and nitrogen-fixing nodules
 - C. E coli and E coli 0157:H7
 - D. Candida albicans and Baker's yeast

2.1 Food chains – energy flow

1. A food chain is a convenient way to show how **this** moves among living things in an ecosystem ...
- food
 - sugar
 - energy
 - interaction

2. A **food chain** starts with ...
- a small animal
 - the consumer
 - a primary consumer
 - the original food source

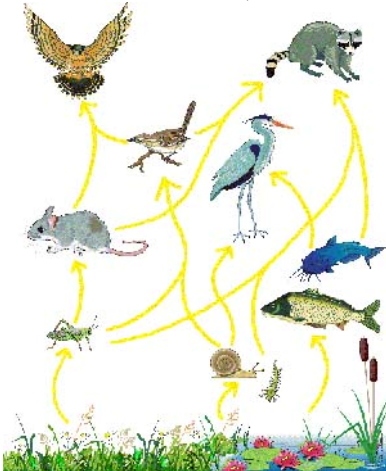
3. Identify the **correct order** – showing how energy flows, from beginning to end, in a food chain that includes these organisms:



- 1 - 2 - 3
 - 1 - 3 - 2
 - 2 - 1 - 3
 - 3 - 2 - 1
4. Rank the following members of an ecosystem
Carnivores – Herbivores - Producers
in term of their numbers. Highest to lowest
- Herbivores - Producers - Carnivores
 - Herbivores - Carnivores - Producers
 - Producers - Carnivores - Herbivores
 - Producers - Herbivores - Carnivores
5. All the organisms included in this - indicate how many of each type of organism is included in the total energy transfer. It is referred to as a
- food web
 - food chain
 - pyramid of biomass
 - pyramid of numbers
6. A plant uses most of the energy it gets from the Sun to support it's life functions. The following percentage represents the amount of energy that a plant provides to a consumer, such as a herbivore.
- 5 %
 - 10 %
 - 15 %
 - 20 %
7. Who do herbivores depend on to get the energy they need to sustain life?
- producers
 - omnivores
 - carnivores
 - all of the above
8. What happens to '**waste**' energy in an ecosystem?
- It is absorbed by plants
 - It is absorbed by animals
 - It is used as recycled energy
 - It is given off into the atmosphere

2.2 Food webs

- The members of different food webs are interdependent. When changes in these occur in an ecosystem food web, which of the following would affect the members of that food web?
 - Biotic factors only**
 - Abiotic factors only**
 - Both abiotic and biotic factors**
 - Neither biotic nor abiotic factors**
- A food web pyramid visually shows the relationships among the members of a particular food web. Which of the following would you likely see at the very top of the pyramid?
 - herbivores**
 - omnivores**
 - carnivores**
 - producers**
- Food chains and food webs** are models in science, which visually show us the different relationships within an ecosystem. The primary difference between the food chain and the food web is ...
 - a food chain shows how energy is stored**
 - a food web shows how energy is used**
 - a food web is a complex system of food chains**
 - a food chain is a combination of different food webs**
- In a meadow food web, like the one illustrated here:




Which of the following would represent just one of the many food chains?

- Snail → Blue heron → Hawk**
 - Plants → Grasshopper → Raccoon**
 - Water plants → Catfish → Mouse**
 - Plants → Snail → Raccoon**
- In the meadow food web, what would happen to the owl, if a pesticide killed all of the grasshoppers?
 - Nothing, because owls don't eat grasshoppers**
 - They would get sick and die**
 - All the organisms in the food web will die**
 - Their population would likely increase**
 - The light colored arrows in a food web show how energy and nutrients are passed on to ...
 - decomposers**
 - carnivores**
 - herbivores**
 - producers**

2.3 Cycles (water and carbon)

1. Carbon is an integral part of an ecosystem. It is cycled throughout the ecosystem as it is used and then reused. It is necessary for all life to exist. Carbon is released by plants in the process of ...
 - A. **respiration**
 - B. **photosynthesis**
 - C. **transpiration**
 - D. **deterioration**
2. Petroleum products, which contain carbon, are burned, and the carbon escapes into the atmosphere, as carbon dioxide, BUT, how does it get into the petroleum in the first place?
 - A. **refineries**
 - B. **dead plants**
 - C. **decomposing plankton**
 - D. **photosynthesis in plants**
3. All living things need water to live. The water cycle has four main processes. The two processes that return water to the earth are ...
 - A. **evaporation and condensation**
 - B. **condensation and precipitation**
 - C. **transpiration and condensation**
 - D. **evaporation and transpiration**
4. The two processes that release water back into the atmosphere are ...
 - A. **evaporation and condensation**
 - B. **condensation and precipitation**
 - C. **transpiration and condensation**
 - D. **evaporation and transpiration**
5. The process in which water, goes through a change of state, from a gas to a liquid, is called ...
 - A. **evaporation**
 - B. **transpiration**
 - C. **condensation**
 - D. **precipitation**
6. A Naturalist learns how to preserve and protect the natural environment. They are often referred to as our environmental ...
 - A. **birdwatchers**
 - B. **watchdogs**
 - C. **eager beavers**
 - D. **eyes and ears**
7.



This illustration represents the desalination of water. Salt is removed from the water in this process.

Which cycle on the Earth does this illustration represent?

 - A. **The water cycle**
 - B. **The carbon cycle**
 - C. **The nitrogen cycle**
 - D. **The life cycle of aquatic organisms**
8. Scientific discoveries are endless. One recent discovery was one that determine the shape of a raindrop. A raindrop is shaped like a ...
 - A. **teardrop**
 - B. **diamond**
 - C. **broken heart**
 - D. **hamburger bun**

3.0 Changes can be observed and monitored in ecosystems

3.1 Investigating the Distribution of Living things in an Ecosystem

Distribution of Living Things

Ecosystem monitoring (also called - *environmental monitoring*) is a way to check the condition - health - of an ecosystem by comparing results of investigations done at different times. Monitoring helps scientists understand impacts of disturbances and changes - sudden and gradual - in order to try to reverse or reduce the impact. Biotic and abiotic factors are monitored.

Ecosystem Monitoring Types

Physical, uses satellites to track changes in the landscape over time.

Environmental tracks changes in climate, temperature and weather patterns.

Chemical, assesses the quality of air, soil and water

Biological, tracks the changes in organisms or populations of organisms



Environmental monitoring usually begins after a disturbance has taken place. It can also begin before a disturbance occurs. A key part of the monitoring program is to provide the evidence on which environmental decisions can be made to maintain the balance between human needs and the needs of other organisms in the environment. **Continuous monitoring** gives us the scientific data we need to make informed decisions about how we affect the environment over time.

Long-Term Monitoring Programs

Amphibians are very sensitive to environmental change, which makes them an indicator species. By using this indicator species, scientists all over the world can study the effects of pesticides, acid rain, loss of habitat and introduction of non-native species on these amphibians.

http://www.biology-online.org/4/6_monitoring_populations_2.htm

<http://www.earth.nasa.gov/outreach/biodiversity/paper1.html>

Monitoring programs may be **qualitative**, **semi-quantitative**, or **quantitative**. Monitoring involves the use of **indicators**, **indicator species** or **indicator communities**. The presence or absence of the indicator or of an indicator species or indicator community reflects environmental conditions. **Dichotomous Key (Identification Key for Alberta Amphibians)**

<http://www3.gov.ab.ca/srd/fw/amphib/identify.html>

Baseline Data gives scientists a starting point to compare changes in the environment. Scientists to monitor change use permanent plots, or study areas. The report that provides the data that has been collected - identifying how a certain activity will affect the environment - is called an **Environmental Impact Assessment**.

Quadrant Sampling is a technique used to study a large area. The quadrant is selected and the species is counted in the quadrant. The number of quadrants in the area provides the multiplier to estimate the **Quadrant sampling** is one way that ecologists estimate the distribution of different populations of species in an **ecosystem**. Studying the sample is called **quadrant analysis**.

3.2 Interactions and Changes Occur in Ecosystems

In any ecosystem a balance between living populations must exist if these populations are to be maintained. Setting a forest on fire (*a controlled burn*) is often necessary to maintain a balance in the ecosystem. These fires get rid of small trees, leaves, needles and other debris that settles on the forest floor. The new growth after a fire becomes food for elk, deer and other animals that need these nutrients from the forest floor. A **wetland** ecosystem is also important. Drainage of wetlands to provide land for farming and housing put the populations that used these ecosystems, as their habitat, were at risk of extinction. Pollution also destroyed many wetland areas. The importance these wetlands to the overall diversity of living things has meant that many wetlands are now protected by law.

All Things Change

Bioinvasion

When species that are not native to a particular area are introduced they tend to take over and multiply quickly – taking necessary food or nutrients away from the native species. The native species suffer as a result and many have been **extirpated** (extinct in a specific area). The species that is introduced may have no natural predators and will overtake the area (using up the food supply) so that other organisms cannot survive.

Introducing a species not natural to a particular area can cause more problems than what it solves.

This happened when **zebra mussels** **Purple loosestrife** – sometimes called the “*beautiful*



were introduced into the Great Lakes. It has become a major problem.



killer’ – was introduced into North America has taken over valuable wetland habitat, pushing out native species.

Competition

All living things compete for food, water and habitat. Because there is only so much to go around many species cannot survive because they are fewer in numbers and have more predators than other species.

Examples of birds that have multiplied very quickly and compete for food with many native birds.

House sparrows

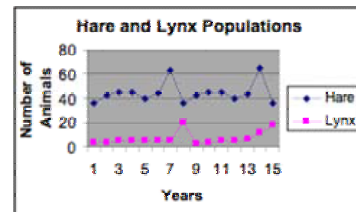


European Starlings



Predation

Predation occurs when one animal hunts other animals for food. The organisms that are hunted are called **prey**. The hunters are called **predators**. The predator and prey populations increase and decrease as they numbers change. When prey population increases, the predator population will also increase. When the prey population decreases, the predator population also decreases.



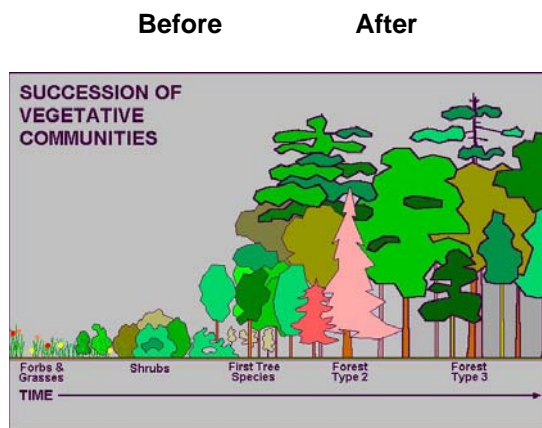
Weather

Weather can also affect ecosystems. Temperature, and the amount of precipitation will affect the growth of plants (the producers) positively or negatively. Natural disasters can also impact the populations of producers.

3.3 Succession: How Ecosystems Change over Time

The gradual process by which some species within an ecosystem replaces other species is called **succession**.

Primary succession is the gradual growth of organisms in an area that was previously bare – like a rocky slope. Organisms to first appear (called **primary species**) are those that can cling to the rock and grow, such as mosses and lichens. These organisms break down the rock and died. Other organisms use the nutrients to begin to grow.

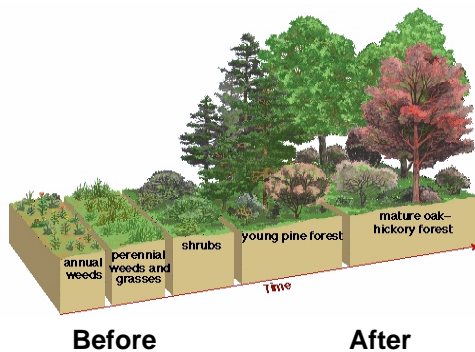


Examples of areas in which a community has never lived before would be:

- new lava or rock from a volcano that makes a new island or a new landscape
- a sand bar that arises from shifting sands in the ocean
- exposure of igneous rock surfaces by a land slide
- a meteor makes a depression that fills with rainwater or fresh water from underground streams.

A **climax community** is a stable community with a lot of diversity and is not easily replaced by other communities.

Secondary Succession The gradual growth of organisms in an area after a disturbance, such as a fire, or when a large tree falls, is known as **secondary succession**.



Examples of secondary succession include:

- A farmer's field
- a vacant city lot
- a newly forested area
- a strip mine.

Section 3 – Change in Ecosystems Quiz

Name _____

Class _____

3.1 Investigating the Distribution of Living Things in an Environment

1. Changes occur within ecosystems all the time. Natural disasters or human activity can change an ecosystem forever. The extinction of the Auk occurred around 1844. The cause was ...
 - A. a flood
 - B. a meteor
 - C. overhunting
 - D. forest-clearing

2. Scientists study ecosystems by counting all of the study species in a particular are. If there are too many to be counted individually, they estimate the number by using this method ...
 - A. abiotic sampling
 - B. biotic sampling
 - C. quadrant sampling
 - D. sectionalization

3. When students studied their schoolyard to identify what human impact had on the numbers of organisms they recorded their data in a table. Two places where they likely studied were the ...
 - A. climbing apparatus and parking lot
 - B. climbing apparatus and the tarmac
 - C. parking lot and the soccer field
 - D. tarmac and the nature garden

4. To identify the types of living things that they couldn't easily recognize, that lived in both these areas, the students used a ...
 - A. classification key
 - B. dictionary
 - C. thesaurus
 - D. textbook

5. The ideal size of a quadrant is the smallest size that contains the same number of species as would be contained in a ...
 - A. local marsh
 - B. larger one
 - C. small puddle
 - D. medium sized one

6. A long-term change to an ecosystem will likely occur as a result of this type of human impact ...
 - A. drought
 - B. flood
 - C. tsunami
 - D. clearing forests

3.2 Interactions and Changes Occur In Ecosystems

1. At one time, wetlands were not considered to be very important. Human activity in many countries destroyed the wetlands for farmland and housing. Another reason they were destroyed was a result of ...
 - A. overhunting
 - B. pollution
 - C. reforestation
 - D. tornadoes
2. The introduction of a new species to an area will likely negatively impact the native species in that. Scientists call this introduction of new species ...
 - A. bioinvasion
 - B. biodiversity
 - C. biohazardous
 - D. biomagnification
3. Purple loosestrife has taken over many wetland and marshy areas. Because this was first introduced from Europe, it is not considered to be ...
 - A. harmful
 - B. invasive
 - C. native
 - D. hazardous
4. The overabundance of European starlings causes problems in farmer's fields and hazards at airports. This introduced species competes with other birds, such as bluebirds, woodpeckers and flycatchers for ...
 - A. insecticides
 - B. nesting sites
 - C. migration patterns
 - D. predation
5. The problem with introducing species is that they usually take over the habitat and compete for food with native species. Canada's total number of invasive plant species is more than ...
 - A. 25%
 - B. 40%
 - C. 50%
 - D. 75%
6. A predator-prey relationship exists between organisms that hunt and are hunted for food. The interactions between the predators and their prey can affect ecosystems. If there are too many predators, the prey population will ...
 - A. increase
 - B. decrease
 - C. not be affected
 - D. be forced to leave

3.3 Succession: How Ecosystems Change over Time

1. **Succession** is a gradual process within an ecosystem in which some species replace other species. When a forest fire destroys a certain area, regeneration occurs. This is an example of ...
 - A. **micro-succession**
 - B. **eco-succession**
 - C. **primary succession**
 - D. **secondary succession**
2. A forested area has been cleared and redeveloped as prime agricultural land. This change to the forest ecosystem has resulted in ...
 - A. **an increase in the warbler population**
 - B. **a decrease in the warbler population**
 - C. **an decrease in the cowbird population**
 - D. **both bird populations decline**
3. The first living species to arrive in an area are usually alga and fungus. Together their mutual relationship is visible in their form they can be observed - lichen. Lichen grows on bare rock and is considered to be the ...
 - A. **invasive species**
 - B. **primary species**
 - C. **pioneer species**
 - D. **climax species**
4. When populations of many different species grow and relace one another within a particular area, a stable community of a diverse number of species that is not easily replaced by other communities will result. This is called a ...
 - A. **climate community**
 - B. **climax community**
 - C. **continuous community**
 - D. **competitive community**
5. Succession is different in different habitats. On sand dunes, species that usually succeed are the following ...
 - A. **grasses, shrubs and trees**
 - B. **mosses, fungi and grasses**
 - C. **ferns, bushes and trees**
 - D. **lichen, fungi and mosses**
6. All of the following are examples of secondary succession, **EXCEPT** a ...
 - A. **farmer's field**
 - B. **lava flow**
 - C. **vacant city lot**
 - D. **strip mine**

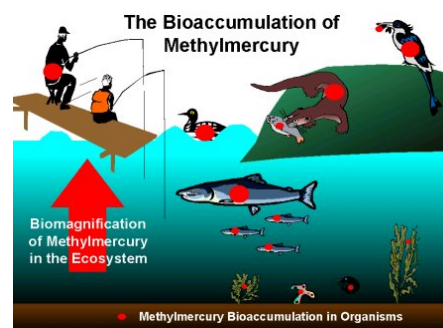
4.0 Maintaining sustainable environments requires knowledge, decisions and actions.

4.1 There are Intended and Unintended Consequences of Human Activities within Ecosystems

Human Impact On Ecosystems: Chemical Use

Mosquito populations in Borneo were causing malaria among the Dyak people. The World Health Organization used the pesticide DDT to kill off the mosquito population. However the DDT also killed a species of parasitic wasp that ate a certain species of caterpillar. This species of caterpillar began eating the material roofs of houses were made of and the roofs began falling on people's heads. DDT also affected small bugs that were food for the geckos. The geckos began to move slowly and the cats, which normally ate rats, switched to the slower moving geckos. The cats eventually died of the DDT magnified in their food supply and the rat population increased. The rats were infested with fleas that carried a bacteria causing typhus malaria – a much worse form of the original malaria.

Bioaccumulation is the process in which a substance builds up in a living organism from the surrounding air or water, or through the consumption of organisms that already have the substance that is being accumulated. It will vary for different species and will depend on sources of contamination, as well as water quality and temperature. It provides increasing levels harmful to species higher up the food chain, because of "**biomagnification**", where substances like mercury will increase in concentration from microorganisms, to fish, to fish eating predators like otters and loons, and to humans.



The accumulated mercury is shown by the red dots.

Source: Communication Canada

Human Impact On Ecosystems: Too Little Too Late?

Many species in North America and in Canada specifically are in danger of **extinction**. If a species becomes extinct, it can no longer be found anywhere in the world. Sometimes the organism is only lost in a large region. If this occurs, the species is **extirpated**. If a particular species is in danger of becoming extinct, or extirpated, it is placed on the **endangered species list**. The classification of species whose numbers are declining is **threatened**. There are special protection programs and laws made to protect endangered species.

Canada's Endangered Species <http://raysweb.net/specialplaces/pages/canada-es.html>

Alberta's Endangered Species <http://www3.gov.ab.ca/srd/fw/escc/aeslist.html>

Famous Potatoes

The small town of [Pemberton, British Columbia](#) is home to world-famous potatoes. These potatoes are virtually free of virus and disease because only locally cultured and laboratory-inspected seeds are used to grow them.

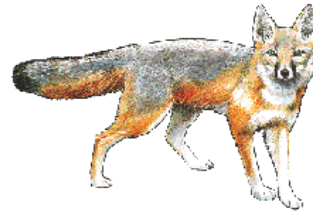
4.2 Information from Scientific Investigations Can Assist Environmental Decision-Making

The Saving of the Peregrine Falcon



[[Find out more](#)] [Peregrine Falcon](#)

Knowing what effects you are having on the environment (or will likely have) will help you make decisions. The use of **DDT** (a chemical pesticide) was found to have a negative effect on **Peregrine Falcons**. It wasn't until the species was almost lost completely that something was done. DDT was banned and recovery programs were put in place to restore the numbers of peregrine falcons.



[Find out more] [Swift Foxes](#)

Swift foxes were accidentally poisoned because certain predators were seen as 'pests' or 'unnecessary' animals. When the Swift foxes used the poison instead, the species almost became extinct. Natural control is necessary in any ecosystem. If this natural control is upset, the impact can have ripple effects, which were never anticipated.

Captive breeding programs are used to help threatened species recover.

[Sustainable Resources Development](#) (Alberta Government)

You can also get additional information on other species that are threatened in ALBERTA..

Find out also about Canada's most Endangered Species – the [Vancouver Island Marmot](#). – and what they are trying to do to save it.

4.3 There are Limitations to Scientific and Technological Knowledge

Science and technology cannot always solve the environmental problems we face. The mystery of the missing GOLDEN TOAD of Costa Rica is one such example. Scientists have theories, but no conclusive evidence has been found to support one as the primary cause of the problem.

The top 4 theories include: climate change, pollution, disease and the thinning of the ozone layer.

The Walk That No Wolf Would Take



Overpasses and Underpasses - to help wildlife cross the highways more safely have been built in Banff National Park. There are many reasons that determine the suitability of a crossing structure to a particular species. Grizzlies are influenced by the distance the structure is from Banff. Elk are influenced the structure's length. Wolves and cougars choose underpasses near drains. When humans used the underpasses or overpasses, the effectiveness of the structures was reduced.

[Wildlife Crossing Structures](#) – Monitoring by Parks Canada

4.4 Using Evidence from many Sources Can Help Analyze a Local Problem

Ecological Footprint

The ecological footprint was developed to help people understand why they need to find a sustainable way of life. To calculate your **ecological footprint**, you need to determine the **total area of land that you use and water needed to supply all of the energy and materials that you use, as well as absorb all of the waste that you produce.** **Materials** that are included are: food, water, supplies to build shelter and raw materials needed to produce the manufactured products you use. **Energy** includes: electricity, natural gas, as well as all the energy needed to produce, and transport all of the manufactured products you use.

Comparing Ecological Footprints

We depend on the environment and we are part of the environment. **Sustainability** means that the resources from the environment can be replaced as quickly as they are used. Are we putting back what we take out, or, are we using up all the resources before they can be replaced? The amount of land available on Earth to support each person living is 1.7 ha. The average ecological footprint per person worldwide is 2.2 ha. The average Canadian ecological footprint is 7.7 ha. We are using more than we should!

Sustainability



Large Ecological Footprint



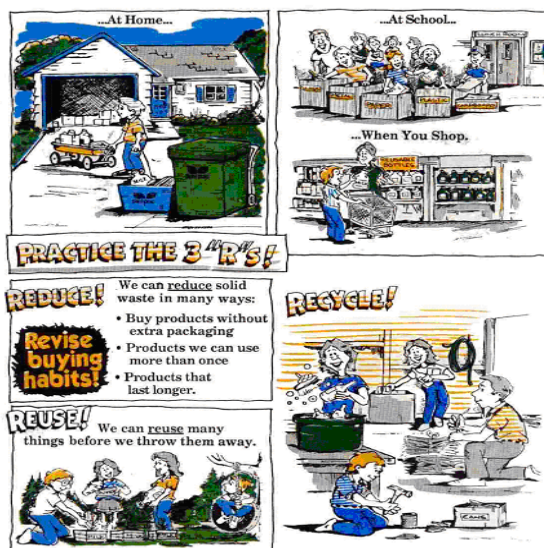
The ecological footprint of average Canadians is very large, because they are using many more resources and creating much more waste than is sustainable.

Factors That Can Reduce Your Ecological Footprint

Ways to **reduce ecological footprint** include:

1. **Be aware** of the products you consume in a typical day
2. **Reduce** the energy you use
3. **Reduce** the number of products you buy
4. **Reduce** the amount of garbage you produce

Reduce, Reuse, Recycle



Section 4 – Sustainability Quiz

*Student Name**Class***4.1 There are Intended and Unintended Consequences of Human Activities within Ecosystems**

- The malaria problem facing the Dyak people of Borneo was addressed by using DDT to kill the malaria-carrying mosquitoes. Who's bright idea was this?
 - NATO** (North Atlantic Treaty Organization)
 - WHO** (World Health Organization)
 - WDCC** (World Disease Control Centre)
 - CDC** (Centre for Disease Control)
- The DDT also killed a parasitic wasp. This was unfortunate, because the wasps were needed to keep this population under control ...
 - rats**
 - cats**
 - geckos**
 - caterpillars**
- The organization that contributed to the first problem, actually made it worse by parachuting these in to the infested area
 - Live cats**
 - Super rats**
 - Flying geckos**
 - Malaria-eating bacteria**
- DDT was found to negatively affect the population of Bald Eagles. When the DDT entered the water system it was in a concentration of 0.000003 ppm. When the Bald Eagles ate fish further up in the food chain, the DDT concentration had increased to 25 ppm. The DDT concentration had increased about ...
 - 10,000 times**
 - 100,000 times**
 - 1, 000, 000 times**
 - 10, 000, 000 times**
- The reason the Bald Eagle population declined was the same reason the Peregrine Falcon population declined. The DDT caused ...
 - infected habitats**
 - soft egg shells**
 - featherless young**
 - nerve damage**
- Extinction occurs when no individuals of a species are left ...
 - in a particular area**
 - anywhere in the world**
 - In a specific ecosystem**
 - In a controlled area**
- Ginseng is a natural root that is used to improve the human immune system. Because of its widespread and increased use as a medicine, it has been added to the list of living organisms that is Extinct, threatened or endangered in Canada. Ginseng is listed as ...
 - extinct**
 - extirpated**
 - endangered**
 - threatened**
- The Pemberton potato is respected internationally because it is ...
 - very large**
 - tasty**
 - disease free**
 - easily harvested**

4.2 Information from Scientific Investigations Can Assist Environmental Decision-Making

1. Scientist and researchers study the life cycles of insects so they can better control them ...
 - A. **teach them tricks**
 - B. **without using pesticides**
 - C. **and lengthen their overall life span**
 - D. **to use as food for other research animals**
2. Scientists who study the relationships among living things and their environment are called ...
 - A. **egocentric**
 - B. **ecologist**
 - C. **economics**
 - D. **ergonomics**
3. An organization in Canada that observes, monitors and assesses the status of endangered wildlife is called **COSEWIC**. This acronym stands for ...
 - A. **Canadian Organization Selecting Endangered Wildlife In Canada**
 - B. **Canadian Wildlife Service's Committee on the Status of Endangered Wildlife In Canada**
 - C. **Canadian Observation Service Examining Wildlife in Canada**
 - D. **Canadian Wildlife - Endangered In Canada Agency**
4. The goal of this committee is to increase ...
 - A. **funding for the organization**
 - B. **numbers of extinct species in Canada**
 - C. **numbers of at-risk species in Canada**
 - D. **public recognition of their work**
5. The pesticide that caused the thinning of the Peregrine falcon's eggshells was banned. The chemical used by agricultural operators was ...
 - A. **CDC**
 - B. **ABC**
 - C. **DAT**
 - D. **DDT**
6. Recovery programs developed to help rescue populations of the Peregrine Falcon were called ...
 - A. **Captive Breeding**
 - B. **Controlled Habitat**
 - C. **Tag and Monitor**
 - D. **Search and Rescue**
7. The recovery program was so successful with the Peregrine Falcon that their status on the COSEWIC list was downgraded from ...
 - A. **extinct to endangered**
 - B. **threatened to endangered**
 - C. **threatened to released**
 - D. **endangered to threatened**
8. High cliffs are natural nesting spots for peregrine falcons, but when they are release close to a city, the Peregrine Falcons will build nests on...
 - A. **Playground structures**
 - B. **Ledges of tall buildings**
 - C. **Elevator shafts**
 - D. **Chimneys and Smokestacks**

4.3 There are Limitations to Scientific Knowledge

1. Ultraviolet radiation comes to us from space. The primary source of this radiation is the Sun. Luckily for living organisms on our planet, most of this deadly radiation doesn't reach us, because it is ...
 - A. **absorbed by oxygen in the atmosphere**
 - B. **released as a by-product of ozone**
 - C. **bounced off our atmosphere into space**
 - D. **resistant to our atmosphere**

2. The case of the golden toad is one in which scientists and researchers have no idea about. What are they puzzled about?
 - A. **The change in colour**
 - B. **The toad's resistance to disease**
 - C. **The disappearance since 1988**
 - D. **The lack of webbed feet it has developed**

3. Scientists believe they know what has happened, with certain amphibian populations, around the world. The top 4 theories include:
 - A. **Global warming, thinning of the ozone, pollution, earthquakes**
 - B. **Disease, climate change, pollution, volcanic activity**
 - C. **Climate change, thinning of the ozone, pollution, disease**
 - D. **Volcanic activity, hurricanes, pollution, climate variation**

4. Wildlife overpasses and underpasses were completed in Banff National Park in 1996. This project was designed to help prevent 'road kill'. Wolf populations in the Banff Park ...
 - A. **only use the underpasses**
 - B. **only use the overpasses**
 - C. **don't use either type of walkway**
 - D. **use both types of wildlife walkways**

5. Monitoring devices have been set up to observe the use of the overpasses and underpasses. The monitoring devices have observed elk, deer, coyotes and other mammals using this many overpasses ...
 - A. **2**
 - B. **3**
 - C. **5**
 - D. **10**

4.4 Analyzing local problems – Reducing Ecological Footprint

1. Living beyond our means can have a devastating effect on our environment. So how much of an impact we make determines our ...
 - A. **sustainability**
 - B. **consumer bias**
 - C. **ecosystem balance**
 - D. **ecological footprint**
2. To determine your ecological footprint, all of the following calculations are necessary, EXCEPT for ...
 - A. **energy supply needed**
 - B. **type of house you need**
 - C. **amount of water you use**
 - D. **amount of waste you produce**
3. One way of changing our impact on the environment we live in is to ...
 - A. **pack our garbage in smaller bags**
 - B. **using a car instead of a bus to get to work**
 - C. **take a bath every day instead of showering**
 - D. **become aware of all the resources you use**
4. The average Canadian has an ecological footprint of ...
 - A. **5.0 ha**
 - B. **7.7 ha**
 - C. **75 m²**
 - D. **10,000 m²**
5. To reduce our ecological footprint, we can ...
 - A. **consume more water and less food**
 - B. **create more waste and recycle it**
 - C. **use materials that require less energy to produce**
 - D. **take longer more relaxing showers**
6. There are many waste-reducing practices, which are being suggested to lower the impact we are making in our environment. The most effective practice is ...
 - A. **reusing**
 - B. **reducing**
 - C. **reclaiming**
 - D. **recycling**
7. When materials that have been used once are used over and over again the environmentally friendly practice is ...
 - A. **reusing**
 - B. **reducing**
 - C. **recycling**
 - D. **reclaiming**
8. When used materials are turned into new materials like kitchen scraps placed in a compost bin the practice being used is ...
 - A. **reusing**
 - B. **reducing**
 - C. **recycling**
 - D. **replacing**

REVIEW ... Key Concepts

Unit 1 – Interactions and Ecosystems

1.0 Relationships in an Ecosystem

- ❖ Ecosystems are where **biotic** and **abiotic** factors interact
- ❖ Symbiotic relationships include: **Commensalism** (One benefit – other no effect), **Mutualism** (Both benefit), **Parasitism** (One benefits – one harmed)
- ❖ Basic Needs include: Water, Energy, Food, Exchange of gases, Space (Habitat), Waste disposal
- ❖ Responsible Environmental Decision-making is made with scientific information and considers the impact such decisions have on the environment

2.0 Energy Flow

- ❖ **Food Webs** allow energy (supplied by the Sun) to flow
- ❖ Matter continuously moves from non-living to living and back to non-living in two cycles: **Water cycle** and **Carbon Cycle**
- ❖ Changes in a food web affect all living things in that ecosystem

3.0 Environmental Monitoring

- ❖ Ecosystems provide all needs for living things
- ❖ Ecosystems change because of: Human activity, Bio-Invasion, Resource competition, Predation, Weather

4.0 Sustainability in an Ecosystem

- ❖ Pesticides can be deadly, as they enter and move through an ecosystem
- ❖ Human actions can impact the local and global communities
- ❖ Scientific information can help in decision-making, but cannot explain everything
- ❖ Local environmental problems require input from many sources before a final informed decision can be made

1.0 Relationships in an Ecosystem

- ❖ Ecosystems are where **biotic** and **abiotic** factors interact

Describe the difference between biotic and abiotic parts of an ecosystem

Illustrate your schoolyard and identify biotic and abiotic parts of that ecosystem. Indicate the various relationships between the biotic and abiotic parts in your schoolyard (with different colored lines) and a brief description of the relationship.

Explain what each of the following is and give three examples to show you understand the difference.

species _____

Examples: _____

population _____

Examples: _____

community _____

Examples: _____

❖ **Basic Needs:**

What are the basic needs of living organisms in order for survival?

What are some things that you could do without and still have all of your basic needs met?

❖ **Symbiotic** relationships

What is **symbiosis**? _____

❖ **Commensalism** (One benefit – other no effect),

Describe two examples of **commensalism**

❖ **Mutualism** (Both benefit),

Describe two examples of **mutualism**

❖ **Parasitism** (One benefits – one harmed)

Describe two examples of **parasitism**

There are two different types of adaptations: **behavioral and structural**. Describe each with examples and explain how each type of adaptation enables an organism to survive.

Behavioral Adaptations

1. _____

2. _____

Structural Adaptations

1. _____

2. _____

❖ Responsible Environmental Decision-making is made with scientific information and considers the impact such decisions have on the environment

Explain why the beaver population in Yoho National Park was declining.

What is the difference between a 'dump' or landfill – and a **sanitary landfill**?

List the 5 basic garbage 'solutions' we have been involved in to clean up our act.

Describe some unintended consequences for discarding the plastic 6-pack pop/beer can holders in your household garbage.

2.0 Energy Flow

❖ Ecosystem Interactions

Describe each of the following **consumers** compared to each other.

Carnivores _____

Herbivores _____

Omnivores _____

Producers can make their own food and supply the matter and energy they need for survival. Illustrate the food-making process of **photosynthesis** carried out by producers.

Illustrate a word equation for the process of **photosynthesis**.

Illustrate a word equation for the process of **cellular respiration**.

What are the two reasons that photosynthesis is important?

Describe the interaction/relationship between **photosynthesis** and **cellular respiration**.

Describe the difference between **scavengers** and **decomposers**.

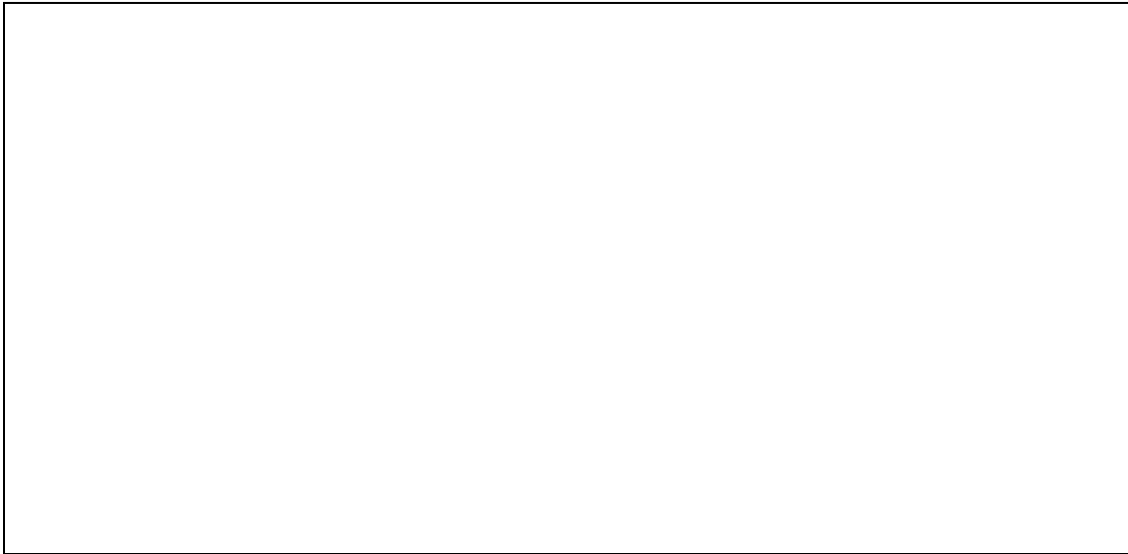
Complete the chart below identifying whether the organism is helpful or harmful and why.

Scavengers		Decomposers			
Crows	Helpful	Harmful	Baker's yeast	Helpful	Harmful
Why _____		Why _____		_____	
_____		_____		_____	
Magpies	Helpful	Harmful	Mushroom	Helpful	Harmful
Why _____		Why _____		_____	
_____		_____		_____	
Housefly larvae (maggots)	Helpful	Harmful	Ecoli	Helpful	Harmful
Why _____		Why _____		_____	
_____		_____		_____	
Wolverines	Helpful	Harmful	Ecoli 0157:H7	Helpful	Harmful
Why _____		Why _____		_____	
_____		_____		_____	

❖ **Food Chains** allow energy (supplied by the Sun) to flow

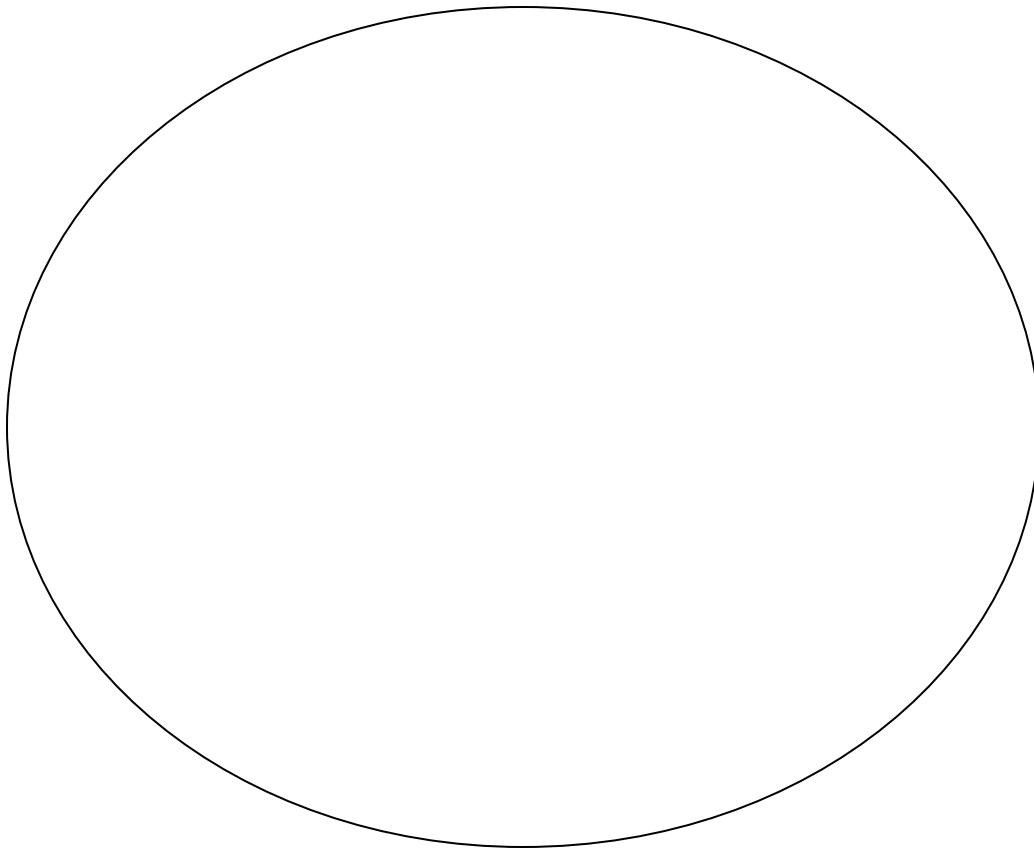
Illustrate an example of a food chain (include arrows showing the flow of energy). Identify the type of organism you are illustrating (eg. producer, primary consumer, secondary consumer, decomposer, etc.)

Illustrate the **flow of energy** from producer to primary consumer, to secondary consumer, to tertiary consumer, to scavenger, to decomposer.



❖ **Food Webs** allow energy (supplied by the Sun) to flow

Illustrate a **Meadow Food Web**

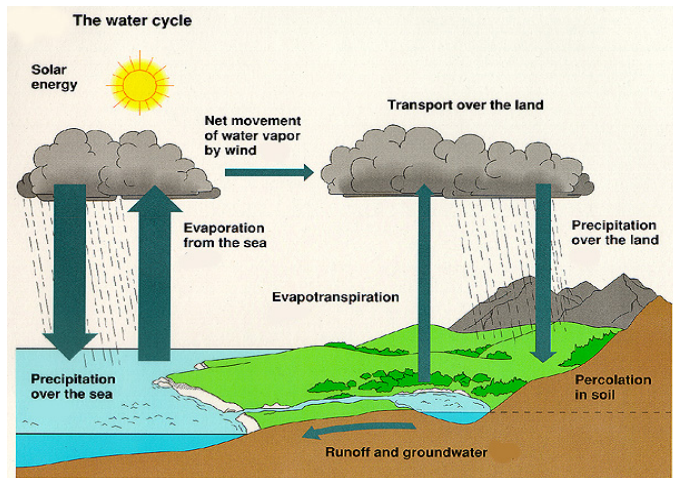


- ❖ Changes in a food web affect all living things in that ecosystem

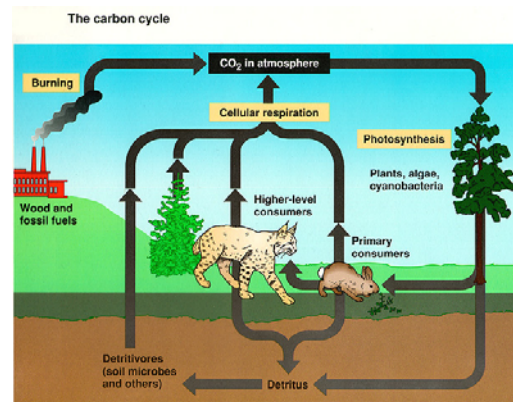
What would happen if the meadow mice were poisoned and became extirpated?

- ❖ Matter continuously moves from non-living to living and back to non-living in two cycles: **Water cycle** and **Carbon Cycle**

What are the three main processes responsible for the Water Cycle?



What activities or organisms add carbon to the Atmosphere?



What activities or organisms take carbon out of the atmosphere?

- ❖ What other substance are cycled in the environment?

3.0 Environmental Monitoring

- ❖ Ecosystems provide all needs for living things

How do scientists determine the distribution of organisms in an environment?

- ❖ Ecosystems change because of: human activity, Bio-Invasion, Resource competition, Predation, Weather

Explain the ecosystem changes identified and give an example of organisms that this affects.

Bioinvasion

Resource Competition

Predation

Weather

Describe the difference between **Primary Succession** and **Secondary Succession**

What is a **pioneer species** and describe the role they play in an environment (their *niche*)?

What is a **climax community**?

4.0 Sustainability in an Ecosystem

❖ Pesticides can be deadly, as they enter and move through an ecosystem

Explain the '*unintended consequences*' of the use of the pesticide DDT, in Borneo.

❖ Human actions can impact the local and global communities

Why is **DDT** a banned chemical in North America?

What are the differences between **threatened**, **endangered**, **extirpated**, and **extinct**?

Why are Pemberton potatoes special?

❖ Scientific information can help in decision-making, but cannot explain everything

What does **COSEWIC** stand for and what does it do?

Describe one of the successes of COSEWIC

❖ Local environmental problems require input from many sources before a final informed decision can be made

Why are there '**wildlife overpasses and underpasses**' in Banff national Park?

How effective are these wildlife structures (overpasses and underpasses)?

How do you determine your **ecological footprint**?

What are some ways you can reduce your ecological footprint?

What is meant by **sustainable lifestyle**?

Section 1 – Relationships

Ecosystems – Biotic/Abiotic – Species/Population/Community - Basic Needs

1. An ecosystem thrives with biotic & abiotic parts. An example of an **abiotic** part of an ecosystem is ...
 - A. lichen
 - B. fungus
 - C. minerals
 - D. fern plants
2. Which of the following should be classified as a **community** ?
 - A. A wetland marsh
 - B. A flock of birds
 - C. A pack of wolves
 - D. A school of dolphins
3. Living things have basic needs. Throughout the first section in this unit the **needs of living things** were examined in depth. The four basic needs of living things are:
 - A. food, clothing, oxygen, love
 - B. oxygen, water, food, habitat
 - C. water, oxygen, habitat, protection
 - D. food, water, habitat, space

Relationships – Adaptations

4. A particular relationship where one organism benefits (like a tree orchid – which receives access to sunlight) and the other organism (the tree) is not harmed or helped is called ...
 - A. divisionism
 - B. parasitism
 - C. mutualism
 - D. commensalism
5. The relationship where both organisms help each other - such as the goby fish and the snapping shrimp is called ...
 - A. partnerism
 - B. parasitism
 - C. mutualism
 - D. commensalism
6. Because some of the lamprey's victims die after it has attached itself to its host, the relationship that exists is considered to be ...
 - A. dependent
 - B. parasitism
 - C. mutualism
 - D. commensalism

Human impacts on ecosystems – garbage

7. The beaver population in **Yoho National Park** has declined due to ...
 - A. more hunting permits
 - B. lower water flow
 - C. fewer forest fires
 - D. more Aspen trees

8. **100,000 toads** are killed on highways in England each year. To prevent the extinction of this population the government has provided ...
- protective gear for the toads**
 - toad resistant tires for the cars**
 - tunnels for them to cross the highway**
 - bridges for them to cross the highway**
9. A clay liner and a system of pipes is used in a sanitary landfill to ...
- prevent leakage**
 - recycle waste**
 - restore oxygen**
 - prevent disease**

Section 2 – Energy Flow

Consumers/producers – photosynthesis – cellular respiration – scavengers/decomposers

10. Organisms in an ecosystem can be classified as **producers** or **consumers**. The producers provide food for the consumers. An organism that consumes both producers and other consumers is called a ...
- herbivore**
 - omnivore**
 - carnivore**
 - prey**
11. Which of the following word equations describes **cellular respiration** ?
- Light energy + carbon dioxide + water → food + oxygen**
 - Food + oxygen → carbon dioxide + water + energy**
 - Light energy + oxygen + carbon dioxide → water + food**
 - Food + carbon dioxide + energy → water + oxygen**
12. **Decomposers** – known as the clean-up crew - are the decomposers. Scavengers also get rid of the waste in an ecosystem. **Scavengers** differ from decomposers because they ...
- do not kill organisms for food**
 - do not eat dead organisms**
 - break down larger organisms**
 - only feed on living plants and animals**
13. Which of the following decomposers are helpful?
- Baker's yeast and E coli**
 - Candida albicans and nitrogen-fixing nodules**
 - E coli and E coli 0157:H7**
 - Candida albicans and Baker's yeast**

Food chains – energy flow

14. Rank the following members of an ecosystem **Carnivores – Herbivores - Producers** in order of their numbers. Highest to lowest
- Herbivores - Producers - Carnivores**
 - Herbivores - Carnivores - Producers**
 - Producers - Carnivores - Herbivores**
 - Producers - Herbivores - Carnivores**

15. A plant uses most of the energy it gets from the Sun to support its life functions. The following percentage represents the amount of energy that a plant provides to a consumer, such as a herbivore.
- A. 5 %
 - B. 10 %
 - C. 15 %
 - D. 20 %
16. What happens to **'waste' energy** in an ecosystem?
- A. It is absorbed by plants
 - B. It is absorbed by animals
 - C. It is used as recycled energy
 - D. It is given off into the atmosphere

Food webs

17. The members of different food webs are interdependent. When changes in these occur in an ecosystem food web, which of the following would affect the members of that food web?
- A. Biotic factors only
 - B. Abiotic factors only
 - C. Both abiotic and biotic factors
 - D. Neither biotic nor abiotic factors
18. **Food chains and food webs** are models in science, which visually show us the different relationships within an ecosystem. The primary difference between the food chain and the food web is ...
- A. a food chain shows how energy is stored
 - B. a food web shows how energy is used
 - C. a food web is a complex system of food chains
 - D. a food chain is a combination of different food webs
19. In the meadow food web, what would happen to the owl, if a pesticide killed all of the grasshoppers?
- A. Nothing, because owls don't eat grasshoppers
 - B. They would get sick and die
 - C. All the organisms in the food web will die
 - D. Their population would likely increase

Cycles (water and carbon)

20. All living things need water to live. The water cycle has four main processes. The two processes that return water to the earth are ...
- A. evaporation and condensation
 - B. condensation and precipitation
 - C. transpiration and condensation
 - D. evaporation and transpiration
21. The process in which water goes through a change of state, from a gas to a liquid, is called ...
- A. evaporation
 - B. transpiration
 - C. condensation
 - D. precipitation

22.



This illustration represents the desalination of water. Salt is removed from the water in this process.

Which cycle on the Earth does this illustration represent?

- A. The water cycle
- B. The carbon cycle
- C. The nitrogen cycle
- D. The life cycle of aquatic organisms

Section 3 – Change in Ecosystems

Investigating the Distribution of Living Things in an Environment

23. Changes occur within ecosystems all the time. Natural disasters or human activity can change an ecosystem forever. The extinction of the Auk occurred around 1844. The cause was ...
- A. a flood
 - B. a meteor
 - C. overhunting
 - D. forest-clearing
24. When students studied their schoolyard to identify what human impact had on the numbers of organisms they recorded their data in a table. Two places where they likely studied were the ...
- A. climbing apparatus and parking lot
 - B. climbing apparatus and the tarmac
 - C. parking lot and the soccer field
 - D. tarmac and the nature garden
25. A long-term change to an ecosystem will likely occur as a result of this type of human impact ...
- A. drought
 - B. flood
 - C. tsunami
 - D. clearing forests

Interactions and Changes Occur In Ecosystems

26. The introduction of a new species to an area will likely negatively impact the native species in that area. Scientists call this introduction of new species ...
- A. bioinvasion
 - B. biodiversity
 - C. biohazardous
 - D. biomagnification
27. Purple loosestrife has taken over many wetland and marshy areas. Because this was first introduced from Europe, it is not considered to be ...
- A. harmful
 - B. invasive
 - C. native
 - D. hazardous

28. The overabundance of European starlings causes problems in farmer's fields and hazards at airports. This introduced species competes with other birds, such as bluebirds, woodpeckers and flycatchers for ...
- A. insecticides
 - B. nesting sites
 - C. migration patterns
 - D. predation

Succession: How Ecosystems Change over Time

29. The first living species to arrive in an area are usually alga and fungus. Together their mutual relationship is visible in their form they can be observed - lichen. Lichen grows on bare rock and is considered to be the ...
- A. invasive species
 - B. primary species
 - C. pioneer species
 - D. climax species
30. When populations of many different species grow and replace one another within a particular area, a stable community of a diverse number of species that is not easily replaced by other communities will result. This is called a ...
- A. climate community
 - B. climax community
 - C. continuous community
 - D. competitive community

Section 4 – Sustainability

There are Intended and Unintended Consequences of Human Activities within Ecosystems

31. DDT was found to negatively affect the population of Bald Eagles. When the DDT entered the water system it was in a concentration of 0.000003 ppm. When the Bald Eagles ate fish further up in the food chain, the DDT concentration had increase to 25 ppm. The DDT concentration had increased about ...
- A. 10,000 times
 - B. 100,000 times
 - C. 1, 000, 000 times
 - D. 10, 000, 000 times
32. Extinction occurs when no individuals of a species are left ...
- A. in a particular area
 - B. anywhere in the world
 - C. In a specific ecosystem
 - D. In a controlled area
33. Because of its widespread and increased use as a medicine, Ginseng has been added to the list of living organisms that is Extinct, threatened or endangered in Canada. Ginseng is listed as ...
- A. extinct
 - B. extirpated
 - C. endangered
 - D. threatened

Information from Scientific Investigations Can Assist Environmental Decision-Making

34. Scientist and researchers study the life cycles of insects so they can better control them ...
- teach them tricks**
 - without using pesticides**
 - and lengthen their overall life span**
 - to use as food for other research animals**
35. Recovery programs developed to help rescue populations of the Peregrine Falcon were called ...
- Captive Breeding**
 - Controlled Habitat**
 - Tag and Monitor**
 - Search and Rescue**
36. High cliffs are natural nesting spots for peregrine falcons, but when they are release close to a city, the Peregrine Falcons will build nests on...
- Playground structures**
 - Ledges of tall buildings**
 - Elevator shafts**
 - Chimneys and Smokestacks**

There are Limitations to Scientific Knowledge

37. Ultraviolet radiation comes to us from space. The primary source of this radiation is the Sun. Luckily for living organisms on our planet, most of this deadly radiation doesn't reach us, because it is ...
- absorbed by oxygen in the atmosphere**
 - released as a by-product of ozone**
 - bounced off our atmosphere into space**
 - resistant to our atmosphere**
38. The case of the golden toad is one in which scientists and researchers have no idea about. What are they puzzled about?
- The change in colour**
 - The toad's resistance to disease**
 - The disappearance since 1988**
 - The lack of webbed feet it has developed**
39. Scientists believe they know what has happened, with certain amphibian populations, around the world. The top 4 theories include:
- Global warming, thinning of the ozone, pollution, earthquakes**
 - Disease, climate change, pollution, volcanic activity**
 - Climate change, thinning of the ozone, pollution, disease**
 - Volcanic activity, hurricanes, pollution, climate variation**

Analyzing local problems – Reducing Ecological Footprint

40. To determine your ecological footprint, all of the following calculations are necessary, EXCEPT for ...
- energy supply needed**
 - type of house you need**
 - amount of water you use**
 - amount of waste you produce**
41. To reduce our ecological footprint, we can ...
- consume more water and less food**
 - create more waste and recycle it**
 - use materials that require less energy to produce**
 - take longer more relaxing showers**

42. There are many waste-reducing practices, which are being suggested to lower the impact we are making in our environment. The most effective practice is ...
- A. reusing
 - B. reducing
 - C. reclaiming
 - D. recycling

These are **Numerical Response** Questions –
Follow your teacher’s instructions about how to complete them.

NR1 - There are many different roles for organisms in an ecosystem. Match the role with its description.

- 1 are plant eaters
- 2 are meat eaters
- 3 are food for other organisms
- 4 eat other organisms

- _____ **producer**
- _____ **consumer**
- _____ **carnivore**
- _____ **herbivore**

	.	.	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

NR2 - There are different kinds of **monitoring practices** that help us check the health of an ecosystem. Match the description with the type of monitoring it describes.

- 1 physical
- 2 environmental
- 3 chemical
- 4 biological

- _____ **Changes in weather**
- _____ **Quality of air, soil, and water**
- _____ **Changes in organisms**
- _____ **Changes in landscape**

	.	.	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Interactions and Ecosystems Section Quiz – Answer Keys

		1.1	1.2	1.3
Section 1 Quiz (1.1, 1.2, 1.3)	1.	B	A	C
	2.	C	C	C
	3.	D	D	D
	4.	C	C	B
	5.	C	A	B
	6.	D	B	C
	7.	A	C	A
	8.	B	D	B

		2.1	2.2	2.3	2.4
Section 2 Quiz (2.1, 2.2, 2.3, 2.4)	1.	C	C	C	A
	2.	B	D	C	B
	3.	A	D	C	B
	4.	C	D	B	D
	5.	D	D	D	C
	6.	C	B	A	B
	7.	B	A		A
	8.	A	D		D
	9.	A			

		3.1	3.2	3.3
Section 3 Quiz (3.1, 3.2, 3.3)	1.	C	B	D
	2.	C	A	B
	3.	D	C	C
	4.	A	B	B
	5.	B	A	A
	6.	D	B	B

		4.1	4.2	4.3	4.4
Section 4 Quiz (4.1, 4.2, 4.3, 4.4)	1.	B	B	A	D
	2.	D	B	C	B
	3.	A	B	C	D
	4.	D	C	A	B
	5.	B	D	A	C
	6.	B	A		B
	7.	D	D		A
	8.	C	B		C
	9.	B	B		D

Interactions and Ecosystems Unit Test – Answer Key

1	C	12	A	23	C	34	B
2	A	13	A	24	D	35	A
3	B	14	D	25	D	36	B
4	D	15	B	26	A	37	A
5	C	16	D	27	C	38	C
6	B	17	C	28	B	39	C
7	C	18	C	29	C	40	B
8	C	19	D	30	B	41	C
9	A	20	B	31	D	42	B
10	B	21	C	32	B	NR1	3421
11	B	22	A	33	D	NR2	2341