

Important Concepts . . .

Preview Review



Science

Grade 7 TEACHER KEY

***W1 - Lesson 2: Nutrient Cycles, Energy
Flows, and Changes in Ecosystems***

Important Concepts of Grade 7 Science

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Materials Required

Textbook:
Science in Action 7

Science Grade 7

Version 5

Preview/Review W1 - Lesson 2 TEACHER KEY

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Preview/Review Concepts for Grade Seven Science

TEACHER KEY



*W1 - Lesson 2:
Nutrient Cycles, Energy Flows,
and Changes in Ecosystems*

OBJECTIVES

By the end of this lesson, you should be able to

- define and draw food chains and food webs
- explain how energy and matter move through an ecosystem
- explain and draw the carbon and water cycles
- define and explain succession and the basic terms related to it

GLOSSARY

biomass - the mass of all members of a species

cycle - movement of matter along a path and eventually back to the beginning (The matter is used over and over again.)

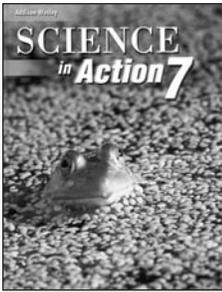
food chain - simple path of energy movement through various levels of living organisms

food web - complex path of energy movement that shows more of the connections in nature

succession - a predictable pattern of change in an area

trophic level - stage in a food chain or food web

W1 - Lesson 2: Nutrient Cycles, Energy Flows, and Changes in Ecosystems



Everything is made of matter. All living organisms require energy to carry out life processes.

Energy and matter are passed from one organism to another. Their paths can be traced, and diagrams can be made of the paths. The simplest diagram of energy and matter movement is called a **food chain**.

(Read page 35 of *Science in Action 7*.)

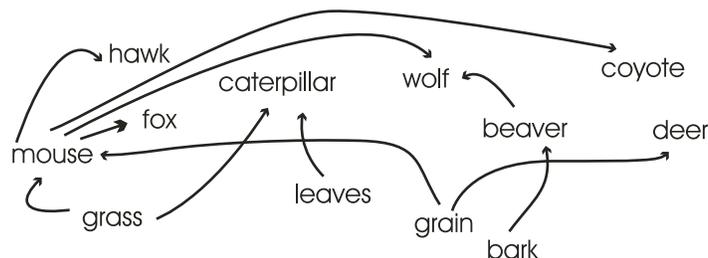
A food chain follows a single, simple path of energy starting where it enters living organisms. It shows the energy being passed from one living organism to another. Energy enters the food chain at the producer level. The first consumers are called primary (1°) consumers. Secondary (2°) consumers eat primary consumers. Tertiary (3°) consumers eat secondary consumers. Decomposers break down dead matter. Producers are called the first **trophic level**. Primary consumers are the second trophic level, and so on. When joining the components of the chain, **an arrow is used to point in the direction energy and matter are moving**.

An example of a simple food chain is



Food webs are a more complex way of tracing energy and matter movement. They are a number of related food chains drawn in an interlocking way rather than as parallel chains. They give a more realistic picture of the movement of matter and energy. Read pages 39 and 42 in the textbook. A food web might look like the following.

Note: When drawing food chains and webs, you can write the name of the organism rather than draw pictures.



1. Where does energy enter a food chain?

At the producer level/1st trophic level.

2. Draw a food chain with four members . Include a decomposer.

Answers will vary. For example, bacteria

3. Draw a 4-level food web with at least 3 types of organisms per level. Label each level.

Answers will vary. See example on previous page. Grass, grain, and trees are producers. Mouse, caterpillar, beaver, deer are 1 consumers. Hawks, fox, wolf, coyote are 2 consumers. A decomposer level could be added with bacteria and fungi of various types.

4. Imagine that one type of organism suddenly became extinct. What would happen to the organisms above and below it in the food chain?

The organisms above it would miss a food source. If it

was their only source of food, they would die. The

organisms below should increase in number as they are

eaten by fewer organisms.

Energy Flows

Not all energy in an ecosystem is usable by living organisms. For example, wind has energy, but living organisms cannot use it to keep them alive. Solar energy must first be trapped by producers, converted to chemical energy during photosynthesis, and then passed to consumers. Energy that enters biotic organisms comes mostly from the sun.

At every trophic level, a massive loss occurs as heat from the usable amount of energy. Organisms use energy to live, and they give off heat. Only what is left can be passed to the next level. That means only a small part of the energy that enters one level is available for the next level. By the time usable energy has been passed through approximately 4 or 5 levels, there is no longer enough left to keep other organisms alive. **Therefore, energy is said to flow through an ecosystem. It is not recycled.** Read pages 36-38 of the textbook.

5. Where does energy come from to replenish the supply needed by living organisms?

Most comes from the sun. Some producers get their energy from breaking apart inorganic molecules.

6. Approximately how much energy is available from one level of organisms to pass on to the next level?

10%

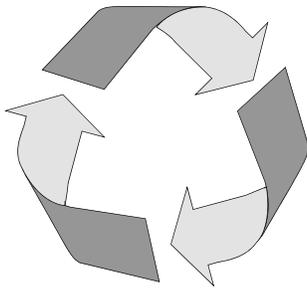
7. Assume 1000 units of energy enter a group of consumers (first level) and that 90% of that energy is lost in each level it enters. How many units of energy are available to pass on to the third level of organisms?

1st level - starts with 1000 units; passes on 100 units to

2nd level which will be able to pass on 10 units.

8. What is a food web pyramid?

A representation of numbers and/or biomass of organisms progressing through the levels of the food web. It shows that with each level, numbers and/or biomass of organisms decrease.



9. Name the three main processes involved in the water cycle.

evaporation, condensation, precipitation.

Nutrient Cycles

Unlike energy, **matter does cycle** – it is used over and over again, alternating between the biotic and abiotic parts of the environment. Most nutrients enter the food chain through producers. They are then passed through the different levels of living organisms. Decomposers break down body wastes and remains. They release nutrients that once more may be taken up by producers.

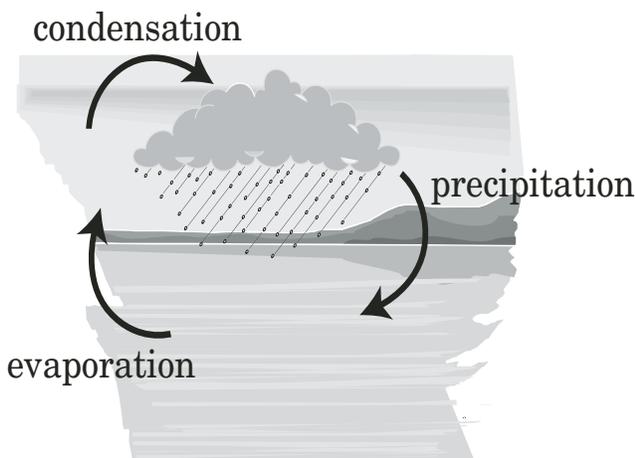
There are some well-known and important matter cycles. You need to know the **carbon** and **water cycles**. (Read *Science in Action 7*, pages 44 to 46)

The water cycle shows the movement of water from the atmosphere to the land and bodies of water and back again. The carbon cycle shows how carbon is moved between consumers, producers, and the abiotic part of the Earth.

10. Why does the number of organisms decrease as the tropic level increases?

Because of decreasing amounts of energy available at each level to support life.

11. Make a labeled sketch of the water cycle.



12. How do living organisms release carbon into the atmosphere?

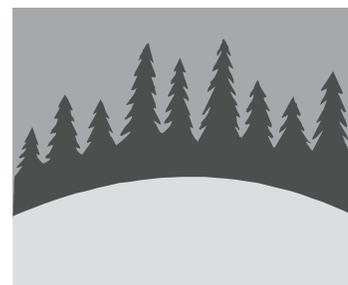
They produce carbon dioxide as a waste during cellular respiration. If they or their remains are burned, carbon dioxide is also produced.

13. How do living organisms remove carbon from the atmosphere?

Producers capture carbon dioxide and use it to make glucose during photosynthesis.

Succession

Read pages 62 to 64 of *Science in Action 7*. Sometimes the movement of matter and energy between the biotic and abiotic components in an area has never happened before. Sometimes it is interrupted by some sort of natural or human-created event. If the conditions necessary for life are available, living organisms take advantage of them. They move into the damaged or new area in a predictable order. This is called **succession**. One example of where this might occur is on new land formed by a volcano (primary succession). Another example is in an area where clear cutting has occurred (secondary succession).





Pioneer species such as grasses, weeds, and lichen are the first plants to move into or colonize a new or disturbed area. With them come animals and other organisms that can live in those conditions. That set of living organisms produces conditions that others can survive in, so they move in. Finally, a stable, mainly unchanging community called a **climax community** is formed.

14. What types of organisms do you expect to find as pioneer species in a field that has been ploughed and then left untouched for a year?

grasses, weeds, etc.

15. What is the difference between primary succession and secondary succession?

primary occurs where there was no ecosystem before

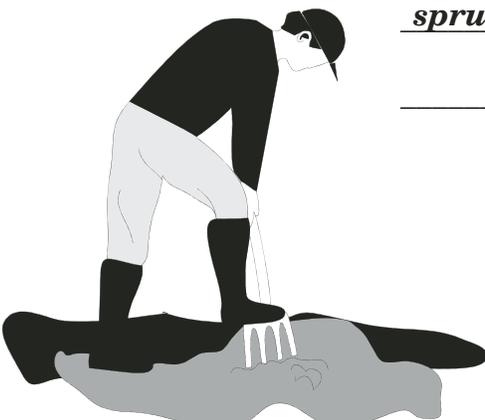
(e.g., on the slopes of a volcano)

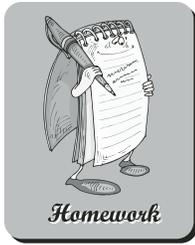
Secondary occurs where there was damage to an

ecosystem (e.g., in a forest that was clear-cut)

16. A climax community is the last stage of succession and can last for a long time. What do you think might be the climax community in the Northern Boreal forest?

spruce trees





Homework

Think of an area you know of that has been disturbed at some time in the past. Since then, it has been left alone. You might look at some land where the buildings have been removed and nothing has been done to it, for example.

- a. How long have you watched this location?

Answers will vary.

- b. How severe was the damage?

Answers will vary.

- c. What changes have you seen over the time you have watched it?

Answers will vary.

- d. What type of succession would you say this is?

Answers will vary.
