Answers

Science Links 9 Workbook Answers

Unit 1 Sustainable Ecosystems and Human Activity

Safety in Your Science Classroom, page 5

Examples may vary.

1. C, J, H, D, I, A, F, E, G, B

Using Your Appendices, page 7

2. You can gather information from the Internet, books, and local experts.

3. Bias is a personal or one-sided point of view. It can influence how material is presented.

4.

Pros	Cons
• Rat population decreases	• Poison could affect other animals
• Nests not destroyed	• Poison will run off in water ways
• Number of bird eggs increase	• Poison could affect plants
• Number of nestlings surviving increases	• Poison could cause birth defects

4. a) Answers will vary. Should include a description of the threat and the link to the ecosystem or species chosen.

b) The steps should include identifying the issue, doing research, identifying alternatives, considering the alternatives, making a decision, evaluating the decision, and taking action and communicating the decision.

Topic 1.1 What are ecosystems and why do we care about them?

Reading Check, page 8

1. The two main components of an ecosystem are the abiotic part and the biotic part.

2. Answers should include any change that could occur to either a living or non-living component of an aquatic ecosystem. For example: excessive rain, changes in temperature, changes in acidity, or overfishing.

Cloze Activity, page 10

1. ecology

2. interact, environment

3. ecosystem.

4. biotic

5. abiotic

6. terrestrial

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7. aquatic
8. healthy
9. balance

Applying Knowledge, page 11

Answers will vary.

1. Answer should include non-living parts such as water, soil, sunlight, and temperature.
2. Answer should include living parts such as plants, animals, and micro-organisms.
3. Answers should illustrate how a non-living part can affect a living part of the ecosystem or how a living part can affect a non-living part.
4. The explanation should include the change and the impact that occurs to the ecosystem.

Illustrating Concepts, page 12

1. Answers should include either common species names or general names for at least ten different plants and animals from the local area.
2. The abiotic factors could include water, soil, nutrients, sunlight, weather, or any non-living part of the ecosystem.
3. Answers will vary. The answers should show a connection between a human action and what effect it will have on the ecosystem.
4. Diagrams will vary. Some diagrams may include illustrations while others will only be words. Students are expected to link concepts together.

Assessment, page 13

1. F
2. A
3. G
4. D
5. H
6. C
7. E
8. B
9. Answers could include water, oxygen, nutrients, suitable temperature range, and suitable weather patterns.
10. The factors that can contribute to the size and shape of an ecosystem are the types and numbers of connections that an ecologist identifies.
11. Abiotic refers to not living parts of an ecosystem while biotic refers to the livings parts of an ecosystem.
12. In order for an ecosystem to stay healthy, there must be a balance maintained between the abiotic and biotic parts of the ecosystem.

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Topic 1.2 How do interactions supply energy to ecosystems?

Reading Check, page 14

1. Glucose, or sugar, is produced by photosynthesis and is used to fuel cellular respiration.
2. As the food chain progresses, energy is lost in the form of unusable heat.

Comprehension, page 16

1. During the process of photosynthesis, light energy from the Sun is captured and changed into chemical energy.
2. Green plants and certain kinds of single-celled organisms use photosynthesis to make their food.
3. Other forms of energy such as kinetic energy and heat are formed during cellular respiration.
4. Nearly all living things on Earth use cellular respiration to release their stored energy.
5. Producers make their food through photosynthesis.
6. Animals get the energy they need to live by eating, or consuming, producers.
7. Energy moves through a food chain from a producer to a consumer and then onto one or more consumers.
8. Answers will vary. Answer should demonstrate an understanding of how each part of an ecosystem is linked and depends on each other.
9. Only about 10 percent of food energy flows from a producer to a consumer.

Applying Knowledge, page 17

	Photosynthesis	Cellular Respiration
1. How is energy changed during the process?	• Light energy is changed to chemical energy	• Chemical energy is changed to other forms of energy
2. What substances are used during the process?	• Carbon dioxide • Water	• Sugars • Oxygen
3. What substances are produced during the process?	• Sugars • Oxygen	• Carbon dioxide • Water
4. Write the word equation for the process.	Carbon dioxide + water + sunlight → glucose + oxygen	Glucose + oxygen → carbon dioxide + water vapor + energy
5. Give two examples of why the process is important.	• Transforms the Sun's energy into a form living things can use • Produces oxygen	• Releases energy to allow living things to survive • Produces carbon dioxide that green plants can use to carry out photosynthesis
6. What types of living things use the process?	• Green plants • Single-celled organisms	• Nearly all living things on Earth

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Interpreting Illustrations, page 18

1. bunchgrass
2. photosynthesis
3. the grasshopper, spotted frog, and red-tailed hawk
4. The lines should be drawn pointing from the bunchgrass to grasshopper to spotted frog to red-tailed hawk. There should be lines pointing outwards from each level of the food chain to illustrate heat loss.
5. consumer
6. from the deer, berries and flowers, marmot, and chipmunk
7. all the animals in the food web

Assessment, page 19

1. D
2. H
3. C
4. G
5. A
6. F
7. B
8. E
9. The energy stored in food originates in the Sun.
10. Green plants use the process of photosynthesis to make their own food.
11. The process used by living things to release chemical energy is cellular respiration.
12. Producers get their energy by making their own food while consumers eat producers to get the energy they need to live.

Topic 1.3 How do interactions in ecosystems cycle matter?

Reading Check, page 20

1. A cycle is a pattern of change that repeats itself forever.
2. Answers could include burning trees, using fuel, or using fertilizers.

Cloze Activity, page 22

1. decomposers
2. carbon, nitrogen, iron
3. producers, consumers

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4. nutrient cycle
5. photosynthesis, cellular respiration
6. sugar
7. water
8. global warming
9. proteins
10. algal bloom

Applying Knowledge, page 23

A. producers
B. non-living substances
C. heat
D. consumers
E. decomposers

1. Photosynthesis produces sugars for the consumers, releases oxygen into the air and takes carbon dioxide from the environment.
2. Cellular respiration uses oxygen and sugars to release carbon dioxide and water into the surrounding environment.
3. Decomposition results in the release of carbon, nitrogen, iron, and other chemicals that can be used as nutrients for producers and consumers.
4. Any activity by humans that changes the number of producers, consumers, or decomposers will upset the balance of a nutrient cycle.

Interpreting Illustrations, page 24

Why is the nitrogen important?	The nitrogen is a major part of cells, a building block of proteins.
What is happening at B?	Algae and plants are growing quickly, blocking sunlight from reaching deeper water.
What is happening at C?	Deep-water planet die off due to lack of sunlight.
What is happening at E?	Oxygen in water is used up, fish and other aquatic organisms suffocate and die.
What could be the cause of the changes to this aquatic ecosystem?	Run-off containing substances such as fertilizers were carried by rain from farms, gardens, lawns.

Assessment, page 25

1. E
2. G

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3. D
4. H
5. C
6. F
7. A
8. B
9. Evaporation happens when water changes from a liquid to a gas. Condensation happens when water changes from a gas to a liquid.
10. Examples of decomposers could include soil insects, earthworms, moulds, mushrooms, and certain kinds of bacteria.
11. The two gases recycled by photosynthesis and cellular respiration are oxygen and carbon dioxide.
12. When extra carbon dioxide builds up in the atmosphere, heat is trapped and the atmospheric temperature rises leading to global warming.

Topic 1.4 What natural factors limit the growth of ecosystems?

Reading Check, page 26

1. A population cannot increase forever. Eventually there will be some type of limit on the resources that support the population.
2. The European starling and the Eastern bluebird could have been competing with each other for a resource. The starling won.

Comprehension, page 28

1. True.
2. False. Carrying capacity is the largest population size an ecosystem can sustain.
3. False. When resources are reduced for a population, fewer members of the population will be born, and more members of the population will die.
4. True.
5. False. Population growth in aquatic ecosystems is usually limited by the amount of oxygen present while terrestrial ecosystems are usually limited by the amount of water present.
6. False. In an aquatic ecosystem, if the oxygen supply is decreased and the food supply is decreased then the populations of fish will decrease.
7. True.
8. True.
9. False. Animal are not the only living things that compete for resources in their ecosystems.

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Applying Knowledge, page 29

1. Term: Competition

Explanation: Harmful interaction between two or more organisms as they compete for the same resource. The knapweed prevents other species from populating the soil by releasing a chemical.

2. Term: Predation

Explanation: One organism (predator) eats all or part of another organism (the prey). The lynx is the predator and the snowshoe hare is the prey.

3. Term: Parasitism

Explanation: One species benefits and another is harmed. The pine beetle has its food source and the pine tree is destroyed.

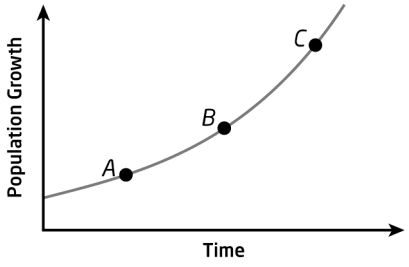
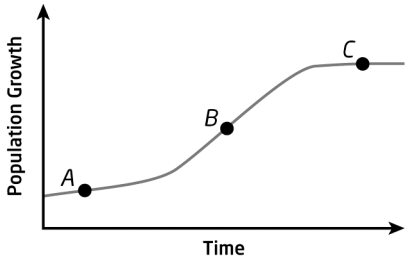
4. Term: Competition

Explanation: Both the brook stickleback and the nine-spine sticklebacks compete for the same nutrient resource.

5. Term: Parasitism

Explanation: The moose is the host for the parasite. The moose is harmed by the presence of the brainworm.

Extension Activity, page 30

	Point	Description	Reason
	A	Increasing slowly	Small population, limited reproduction occurring
	B	Increasing faster	More are reproducing
	C	Increasing exponentially	Population is healthy and reproducing.
	Prediction for future	In time, population will decrease	In time, limiting factors will decrease population growth.
	A	Slowly increasing	Limited numbers reproducing
	B	Increasing quickly	Reproduction increased
	C	Carrying capacity reached	Population reached maximum growth
	Prediction for future	Remain at same level	Will remain at same level as long as limiting factors are balanced

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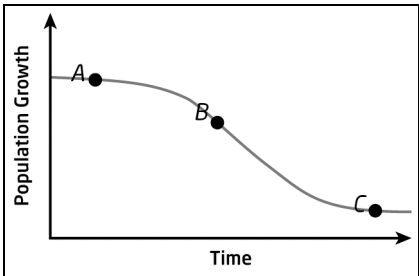	A	At carrying capacity for population	All factors are balanced.
	B	Decreasing rapidly	Limiting factor is decreasing population.
	C	New carrying capacity	Limiting factors have changed the size of population that can be supported.
	Prediction for future	Increase or decrease	Future dependent on presence or absence of limiting factors

Assessment, page 31

1. D

2. A

3. G

4. B

5. H

6. C

7. E

8. F

9. When resources become limited, the carrying capacity of an ecosystem is reduced.

10. Examples of limiting factors for an aquatic environment could include decreasing oxygen, decreased food supply, disease, predators, or limited space.

11. Abiotic factors that could limit the size of population in an environment could include water, living space, nutrients, sunlight, and weather.

12. The lynx benefit by getting the food they need while the rabbit population is reduced. This reduces the number of sick, old, or weak members of the population and therefore decreases the competition between the members of the rabbit population.

Topic 1.5 How do human activities affect ecosystems?

Reading Check, page 32

1. The construction of a building will remove surface soil, killing soil organisms and plants, change the shape of the land, change drainage, remove habitats for birds and insects, change light sources.

2. Introduced species can compete for food, nests, living space, resources, and water.

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Cloze Activity, page 34

1. impact
2. balance, resources
3. change
4. biotic, abiotic
5. air, water, soil
6. wastes, recycled
7. native
8. decrease
9. wetland
10. watersheds

Applying Knowledge, page 35

Human activity	Consequences
Construction of roads and buildings	• Surface soil is removed, killing soil organisms and plants. • The shape or slope of the land is changed, changing patterns of drainage of rain. • Farmland is taken over so it is no longer used for crops and livestock.
Dam-building	• Change to the course of rivers and streams • Flooding of land and creation of lakes in new locations
Manufacturing	• Soil and plant life removed • Factories consume energy. • Wastes produced leading to pollution
Consumption of goods	• Stores consume energy • Goods generate wastes • Disposal and recycling of wastes consumes energy
Describe another type of human activity that would have consequences.	Answers will vary but should show consequences for both abiotic and biotic parts of an ecosystem.

Comprehension, page 36

1. The starling came from Europe.
2. Someone introduced 100 of them in New York.
3. An introduced species is a kind of plant, animal, or other organism that lives in a place where it is not found naturally.

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4. Apples, corn, and many other food crops have caused no harm to ecosystems in Ontario.
5. Limiting factors such as consumers and disease can keep introduced species populations in balance.
6. Purple loosestrife looks beautiful, but it invades aquatic ecosystems, drains the water, and takes away resources for other plants and animals, reducing the diversity of, and killing, the aquatic ecosystem.
7. Descriptions of consequences could include competition with native species, competition for food, covering surfaces, and interfering with other aquatic organisms. When they cover surfaces, they affect how those items function. They also affect the spawning patterns of other aquatic organisms. When they filter feed, they concentrate toxins in their tissues, often causing harm to organisms that eat zebra mussels.

Assessment, page 37

1. D
2. F
3. B
4. A
5. E
6. C
7. Human populations have a greater impact on ecosystems than other organisms because humans are more numerous, and because they use resources in different ways, such as drilling or mining, which disturb the balance of an ecosystem.
8. An invasive species will take over resources such as nesting areas, food, and space, causing a decrease in the population of the native species.
9. When an introduced species is well-established the species diversity in an ecosystem tends to decrease.
10. Pollutants will eventually end up in the land or water surrounding the local watershed. The pollutants will work their way into the water that feeds into the watershed.

Topic 1.6 How can our actions promote sustainable ecosystems?

Reading Check, page 38

1. If a population exceeds its carrying capacity it uses all of its resources and is no longer sustainable.
2. Questions could include: where the products are made, what they are made of, how they are packaged, ecological principles of the company, and whether we even need the type of product.

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Cloze Activity, page 40

1. climate change
2. sustainability
3. abiotic, biotic
4. biodiversity
5. balance
6. high
7. wetland
8. biocontrol
9. smart growth
10. society, individuals, change

Applying Knowledge, page 41

Activities	Consequences	Efforts to maintain or rebuild the ecosystem.
Mining in the Alfred bog, Ontario.	• Wetland at risk • Biodiversity at risk • Numerous species at risk	• Nature reserve set up • 70% of wetland protected
Overhunting of native elk populations in Ontario	• Elk population decreased	• Re-establishment of populations in designated areas (Sudbury, Bancroft/North Hastings, Lake of the Woods, Lake Huron)
Introduction of purple loosestrife	• Purple loosestrife population dominates local ecosystem	• Beetle introduced to reduce population of purple loosestrife • Biocontrol method introduced
Trees removed by logging	• Reduction of nesting sites for birds	• People in rural and urban areas set up special nesting boxes for birds
Urban sprawl	• Reduction of natural areas and farmland	• Smart growth implemented to concentrate growth in the centre of a city

Extension Activity, page 42

Answers will vary.

1. Students should demonstrate that they have addressed issues or concerns related to the ecosystems in their local community.
2. Answers will vary depending in individual and his or her local community. Changes could be small or on a larger scale.

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Assessment, page 43

1. E

2. H

3. D

4. G

5. B

6. C

7. F

8. A

9. As the population bypasses the carrying capacity of an ecosystem, resources are used up and the ecosystem is not available for future generations.

10. A sustainable ecosystem has a balance between its diverse living parts and its non-living parts.

11. Examples could include setting up a nature reserve, restoring animal populations, using biocontrol methods to fight against introduced species, setting up nesting boxes, implementing smart growth when urban sprawl occurs.

12. Examples could include choices related to being a consumer, acting as a volunteer, or being a responsible citizen.

Literacy Test Preparation, page 45

1. D

2. D

3. C

4. B

5. Summaries should include the main idea and one supporting point, and be written in paragraph form.

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