

How Humans Influence Ecosystems

Textbook pages 122–137

Before You Read

What do you think of when you hear or read the term sustainability? What does this term refer to? Record your thoughts on the lines below.

Mark the Text

In Your Own Words

Write a paragraph explaining three ways resource exploitation may harm ecosystems.

Reading Check

What is sustainability?

Reading Check

List two ways overexploitation can affect organisms.

How does land and resource use affect sustainability?

Sustainability refers to the ability of an ecosystem to sustain ecological processes. We make many demands on nature through our use of land and resources. **Land use** refers to the ways we use the land around us—for cities, roads, industry, agriculture, and recreation. **Resource use** refers to the ways we obtain and use resources—naturally occurring materials, such as soil, wood, water, and minerals. Resource use is also referred to as **resource exploitation**. One example of resource use affecting sustainability is deforestation in China. The result is that less bamboo is available as food for China's giant pandas. In another example, whaling in the Pacific Ocean decreased numbers of whales—the orcas' primary food source. Orcas turned to eating other prey, such as sea otters. But sea otters eat sea urchins and when the numbers of sea otters went down, the numbers of sea urchins exploded.

How can First Nations' knowledge improve resource management?

First Nations' thorough understanding of the plants, animals, and natural occurrences in their environment is referred to as **traditional ecological knowledge**. It reflects knowledge—about local climate and resources, biotic and abiotic characteristics, and animal and plant life cycles—that was gained over centuries. It provides researchers with valuable data with regard to management practices that enhance the productivity and health of ecosystems.

How can resource exploitation affect ecosystems?

Certain effects of resource exploitation, such as those described in the table below, can affect the biodiversity and health of ecosystems.

Effect	Example of human activity	How ecosystems are affected
habitat loss	Humans take over natural space in the creation of cities and agriculture.	Habitats are destroyed and can no longer support the species that lived there.
habitat fragmentation	Agriculture, roads, and cities divide natural ecosystems into smaller, isolated fragments.	Plant pollination, seed dispersal, wildlife movement, and reproduction are adversely affected.
deforestation	Forests are logged or cleared for human use and never replanted.	The number of plants and animals living in an ecosystem are reduced.
soil degradation	Deforestation and land clearance leave land bare so water and wind erosion remove topsoil.	Organic matter, water, and nutrients are removed along with the topsoil, reducing plant growth.
soil compaction	Agricultural farm vehicles and grazing animals squeeze soil particles together.	Reduces the movement of air, water, and soil organisms in soil, hindering the growth of plants and increasing run-off of fertilizer and pesticides.
contamination	By-products of resource exploitation, such as mining, introduce toxins.	Toxins are introduced into the environment in harmful concentrations and kill plants and animals.
overexploitation	A resource—like fish or forests—is used or extracted until it is depleted.	Food web interactions are affected. Organisms become less resistant to disease and less able to adapt to environmental change. Extinction, the dying out of a species, can result. ✓

Use with textbook pages 125–134.

Sustainability

1. What is sustainability?

2. What is the difference between the terms habitat loss and habitat fragmentation?

3. What is deforestation? What are the consequences of deforestation?

4. What are the advantages of aeration, or breaking up compacted soil?

5. List four examples of contamination that can occur due to mining.

6. Explain the effects on an ecosystem when resources are overexploited.

7. Define the term traditional ecological knowledge. Summarize the various factors taken into consideration when traditional ecological knowledge is used to examine an ecosystem.

Use with textbook pages 126–134.

Effects of human activities on ecosystems

Summarize the possible effects on an ecosystem due to each of the following human activities.

Human activity	Effects on ecosystem
deforestation	<hr/> <hr/> <hr/> <hr/>
agricultural practices, such as leaving fields bare during non-planting seasons	<hr/> <hr/> <hr/> <hr/>
exploitation of mining resources	<hr/> <hr/> <hr/> <hr/>
overexploitation of natural resources, such as fish	<hr/> <hr/> <hr/> <hr/>

Name _____

Date _____

Use with textbook pages 125–134.

Sustainability

In British Columbia, we often use land in ways that affect natural ecosystems, such as switching to agriculture, expanding our urban areas, and cutting down trees. For each of the following examples, describe the effects on the habitat and suggest a sustainable approach that could help the local ecosystem survive.

Example of land use	Effects on habitat	Sustainable approach suggestions
the conversion of grasslands into cattle ranches in the Interior of British Columbia	<hr/> <hr/> <hr/> <hr/>	<hr/> <hr/> <hr/> <hr/>
clear-cutting of forests on Vancouver Island	<hr/> <hr/> <hr/> <hr/>	<hr/> <hr/> <hr/> <hr/>
urbanization of the Fraser Valley	<hr/> <hr/> <hr/> <hr/>	<hr/> <hr/> <hr/> <hr/>

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How humans influence ecosystems

Match each Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
1. _____ deforestation	A. the ability of an ecosystem to sustain ecological processes and maintain biodiversity over time
2. _____ extinction	B. the clearing or logging of forests without replanting
3. _____ habitat loss	C. ecological information passed down from generation to generation, which reflects human experience with nature
4. _____ soil compaction	D. the dying out of a species
5. _____ soil degradation	E. the squeezing together of soil particles so that the air spaces between them are reduced
6. _____ sustainability	F. damage to soil
7. _____ traditional ecological knowledge	G. the destruction of habitats that usually results from human activities

Circle the letter of the best answer.

8. Which of the following illustrates a sustainable practice?
 - A.** conversion of grassland into ranchland
 - B.** urban expansion of cities
 - C.** restoration of a streambeds
 - D.** extraction of gold in mining

9. Which of the following factors has led to the giant panda in China being considered an endangered species?
 - A.** soil degradation
 - B.** overexploitation
 - C.** contamination of ecosystem
 - D.** deforestation

10. In the Pacific Ocean, the food web, including kelp, whales, sea otters, and sea urchins, has been altered by human activities. What factor has been linked to the explosion in the sea urchin population?
 - A.** decrease in the sea otter population
 - B.** increase in kelp beds
 - C.** change in migration pattern of orcas
 - D.** increase in fur seal population

11. Which of the following is an example of traditional ecological knowledge practices?
 - A.** habitat fragmentation by urbanization
 - B.** grassland management by controlled burning
 - C.** resource exploitation by mining industry
 - D.** clear-cutting practices by forestry industry

Section 3.2 How Humans Influence Ecosystems

Comprehension Sustainability Page 46

1. Sustainability is the ability of an ecosystem to sustain ecological processes and maintain biodiversity over time. It also means that humans use natural resources in a way that maintains ecosystem health now and for future generations.
2. Habitat loss refers to the destruction of habitats while habitat fragmentation is the division of habitats into smaller, isolated fragments.
3. Deforestation is the practice in which forests are logged or cleared for human use and never reforested. This practice results in a reduction of the number of plants and animals living in an ecosystem. Erosion occurs since few plants are left to hold the soil in place. As a result of the erosion, nutrients are lost so plants are not able to grow.
4. Aeration, or breaking up compacted soil, reduces run-off by improving the movement of air and water through soil.
5. Examples of contamination due to mining could include introduction of chemicals, toxins, wastes, or micro-organisms into the environment.
6. Overexploitation can result in extinction of a species and a loss of genetic diversity. In turn, the populations are less resistant to disease and less able to adapt to changes in their environment.
7. Traditional ecological knowledge takes the form of stories, songs, cultural beliefs, rituals, community laws, and practices related to agriculture, forests, and ocean resources. It reflects the knowledge about local climate and resources, biotic and abiotic characteristics, and animal and plant cycles.

Applying Knowledge

Effects of human activities on ecosystems Page 47

HUMAN ACTIVITY	EFFECTS ON ECOSYSTEM
deforestation	<ul style="list-style-type: none"> • reduction in number of plants and animals living in an ecosystem • erosion due to lack of plant roots holding soil in place • removal of nutrients from topsoil
agricultural practices, such as leaving fields bare during non-planting seasons	<ul style="list-style-type: none"> • wind erosion • soil compaction • hindering growth of plants • addition of excess nitrogen and pollutants due to increased run-off

HUMAN ACTIVITY	EFFECTS ON ECOSYSTEM
exploitation of mining resources	<ul style="list-style-type: none"> • contamination of ground water and surface water through introduction of chemicals, toxins, wastes, or micro-organisms • contaminants affect local plant and animals
overexploitation of natural resources, such as fish	<ul style="list-style-type: none"> • reduction in population of particular fish • loss of genetic diversity in food web • species less resistant to disease and changes in environment

Analyzing Information Sustainability Page 48

EXAMPLE OF LAND USE	EFFECTS ON HABITAT	SUSTAINABLE APPROACH SUGGESTIONS
the conversion of grasslands into cattle ranches in the Interior of British Columbia	<ul style="list-style-type: none"> • livestock overgrazing • soil compaction • vehicles cause erosion and plant destruction • introduced plants compete with native plants 	<ul style="list-style-type: none"> • grassland management programs • protection of natural grasslands • aeration • weed control
clear-cutting of forests on Vancouver Island	<ul style="list-style-type: none"> • erosion • stream habitat destruction 	<ul style="list-style-type: none"> • forestry management practices that allow more trees to remain uncut • streambed restoration • less harmful road-building
urbanization of the Fraser Valley	<ul style="list-style-type: none"> • biodiversity loss • greater reliance on motorized vehicles • increased energy consumption 	<ul style="list-style-type: none"> • redevelopment of industrial areas or buildings • mix of residence, business, and industry • waste treatment • storm water collection • native plantings • additional green areas

Assessment

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1. B 2. D 3. G 4. E 5. F 6. A 7. C 8. C 9. D 10. A 11. B