

## Topic 5.1

# The Tragedy of the Commons

## You Will Learn to:

- Describe the tragedy of the commons.

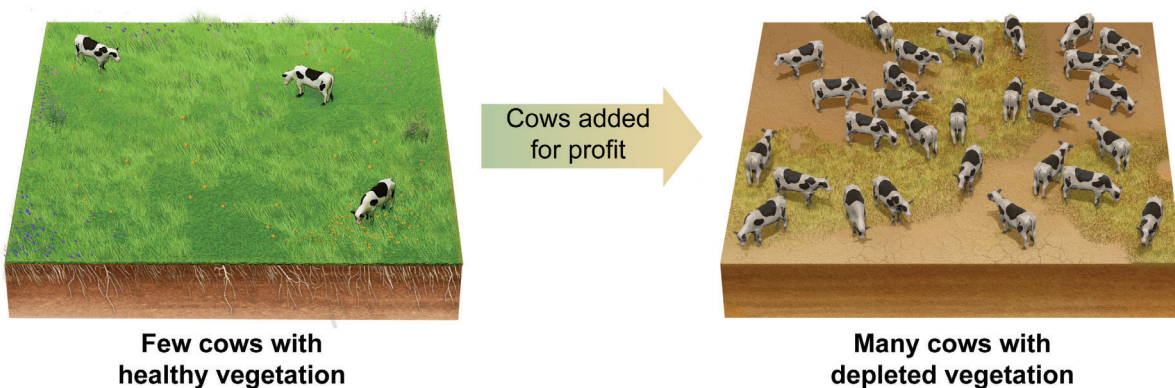
## By the End of the Topic, You Should Be Able to Answer:

- What are examples of commons?
- What is the tragedy of the commons?
- How can the tragedy of the commons be prevented?

## The Tragedy of the Commons

Societies use resources for a variety of purposes, such as food production, manufacturing, and energy production. Resources can be found on privately owned properties or in open, shared spaces, called **commons**. Examples of commons include oceans, aquifers, the atmosphere, and public lands.

Because commons are not owned by anyone, individuals can use the shared resources found within those commons for their own personal gain, which can eventually lead to depletion of the resources. This depletion, which prevents future use of resources, is referred to as the **tragedy of the commons**.



For example, public grasslands can be used by farmers for the purpose of livestock grazing. When each of the farmers only graze small numbers of livestock on the grassland, the vegetation that supports the livestock does not become depleted, leaving the grassland to continue being used by everyone.

However, some farmers may add large numbers of livestock to increase profits, which can result in overgrazing of the grassland. Because overgrazing depletes vegetation and prevents future use of the grassland, this depletion exemplifies the tragedy of the commons. Other scenarios that illustrate the tragedy of the commons include:

- Overdrawing water from aquifers (see Topic 5.5).
- Overfishing the oceans (see Topic 5.8).
- Polluting the atmosphere (see Topic 7.1).

## Preventing the Tragedy of the Commons

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As human populations grow, the increased demand for resources can increase the risk of resource depletion. The depletion of shared resources and the tragedy of the commons can be prevented by:

- Government regulations, such as fishing catch limits in public waterways.
- Establishing protected areas where resource extraction is prohibited.

### Things to Remember

- The tragedy of the commons occurs when a shared resource, such as land, water, or organisms, is depleted by individuals for their own self-interest, without consideration for the good of all.

### 5.1 Vocabulary

<b>Commons</b>	Resources that are shared by an entire community.
<b>Tragedy of the Commons</b>	The use of a shared resource by individuals for personal gain without regard for what is left over for others in the community.

## 5.1 Check for Understanding

**1. Which of the following is considered a commons?**

- A. Office building
- B. Oil well
- C. Atmosphere
- D. Factory

**2. Which of the following scenarios does NOT illustrate the tragedy of the commons?**

- A. Releasing pollutants into the atmosphere from factories
- B. Mining minerals from privately owned land
- C. Overpumping water from an aquifer during a drought
- D. Clearcutting lumber from a national forest

**3. Which of the following is most likely to prevent the tragedy of the commons?**

- A. Limiting the number of cows that can graze on public grasslands
- B. Converting publicly owned land to privately owned property
- C. Removing restrictions on air pollution emissions
- D. Decreasing leasing costs for mining operations

## Topic 5.2

# Clearcutting

## You Will Learn to:

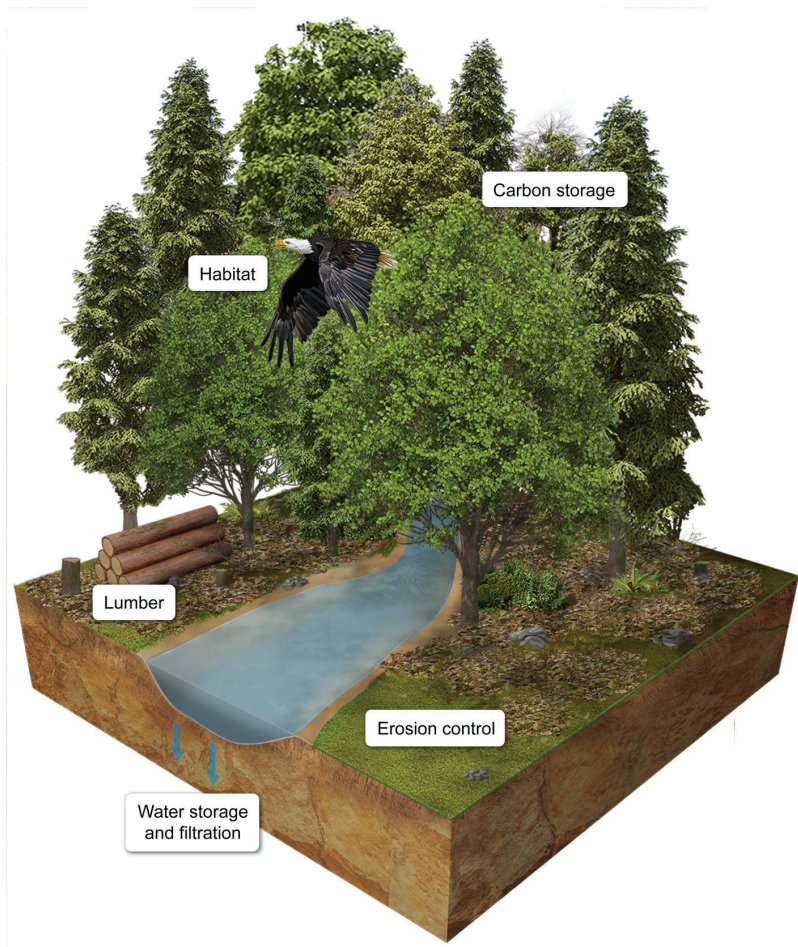
- Describe positive and negative effects of clearcutting forests.

## By the End of the Topic, You Should Be Able to Answer:

- What ecosystem services do forests provide?
- What are the benefits of clearcutting?
- What are the environmental impacts of clearcutting?

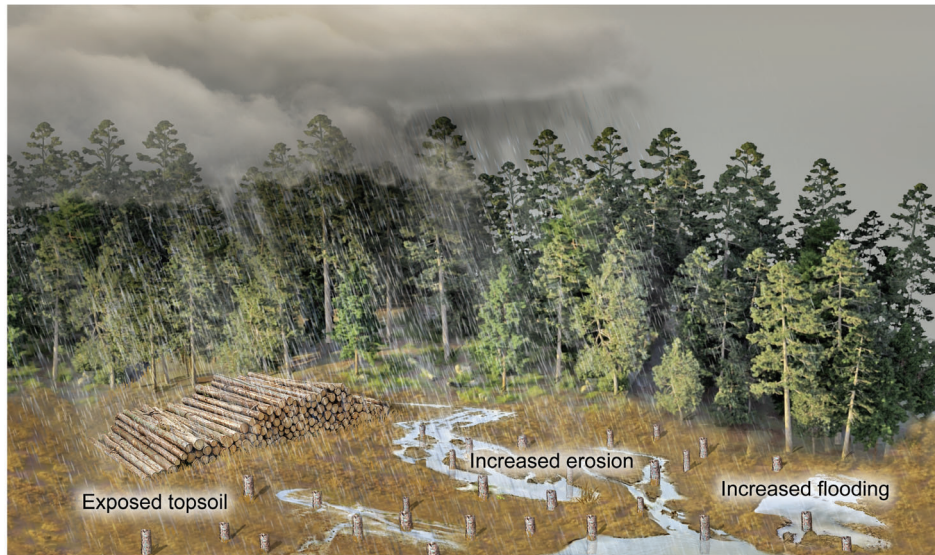
## Forest Ecosystem Services

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Forests provide several **ecosystem services** (natural processes provided by ecosystems that benefit human society and economies), such as absorbing pollutants, storing atmospheric carbon dioxide (CO<sub>2</sub>), and providing a source of lumber. Although forests benefit societies, many human activities, such as logging, can negatively impact the forests' ecosystem services.

## Clearcutting



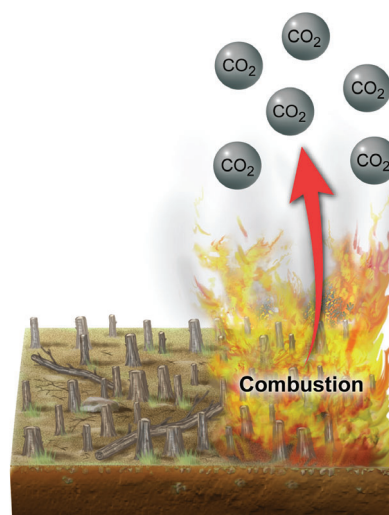
Large-scale logging operations involve the harvesting of trees to obtain wood for the production of lumber and paper. Although wood can be harvested in many ways, the most economically advantageous logging practice used is **clearcutting** (the uniform removal of all trees in an area).

Because the removal of all the trees in a given area exposes the forest floor, clearcutting has many environmental drawbacks, including:

- Decreased protection from sunlight, which leads to increased soil temperatures.
- Increased soil erosion, which leads to increased water temperatures in nearby aquatic ecosystems.
- Decreased soil infiltration, which leads to increased flooding.
- Increased habitat fragmentation, which leads to a loss of biodiversity.

To minimize these environmental impacts, alternative logging practices can be implemented (see Topic 5.17).

## Cleared Forests



After forests have been clearcut, logging companies sometimes burn leftover vegetation on the forest floor. The burning of leftover vegetation and tree remnants releases previously stored CO<sub>2</sub>, which contributes to climate change by altering atmospheric conditions.

Once forests have been cleared, the land is often repurposed into developments, grazing lands, or tree farms. Although tree farms provide a source of wood products, they do not support high levels of biodiversity. In contrast to tree farms, forests that have been undisturbed for hundreds of years, such as primary forests, have the highest biodiversity.

## Things to Remember

- Forests protect the environment by absorbing pollutants and storing carbon dioxide (CO<sub>2</sub>), a greenhouse gas. Clearcutting and burning forests release CO<sub>2</sub> into the atmosphere, contributing to climate change.
- Clearcutting is a logging practice that involves removing a large number of trees in an area. Although it is economically advantageous, clearcutting has environmental drawbacks, such as increases in soil erosion, soil and stream temperatures, and flooding.

## 5.2 Vocabulary

<b>Clearcutting</b>	The uniform removal of all trees in an area.
<b>Ecosystem services</b>	Natural processes provided by ecosystems that benefit human society and economies.

## 5.2 Check for Understanding

- 1. Which of the following is a negative environmental impact of clearcutting?**
  - A. Clearcutting is expensive compared to other harvesting techniques.
  - B. Clearcutting reduces the amount of water available to replenish rivers.
  - C. Clearcutting promotes plant growth by removing tall shade trees.
  - D. Clearcutting increases water temperature due to soil erosion.
  
- 2. Which of the following ecosystem services is disrupted by burning vegetation after clearcutting?**
  - A. Storing carbon dioxide
  - B. Weathering minerals
  - C. Transporting sediment
  - D. Forming new crust
  
- 3. Which of the following is an environmental drawback of tree plantations?**
  - A. Tree plantations cause climate change by releasing carbon dioxide.
  - B. Using tree plantations can reduce clearcutting of old-growth forests.
  - C. Soil erosion is reduced by using tree plantations for clearcutting.
  - D. Tree plantations do not support high levels of biodiversity.