Chapter 14

Land

Section 1: How We Use Land

DAY ONE
Land Use and Land Cover

• We use land for many purposes, including farming, mining, building cities and highways, and recreation.

• Land cover is what you find on a patch of land, and it often depends on how the land is used.
  – For example, land cover might be a forest, a field of grain, or a parking lot.

• There are different types of land cover and different human uses for each cover type.
Land Use and Land Cover

Land Use in the United States

- Parks and preserves: 13%
- Urban land: 6%
- Other: 7%
- Forest land: 28%
- Cropland: 20%
- Rangeland and pasture: 26%
Land Use and Land Cover

- **Urban** describes an area that contains a city, or an area that contains **2,500 or more** people and usually has a **governing body**, such as a city council.

- **Rural** describes an area of open land that is often used for farming, or any population not classified as urban.

- Most land provides one or more resources that humans consume.
  - wood in forests
  - crops in farmland
  - mineral resources
Where We Live

• Until about 1850, most people lived in rural areas.
• Many of them were farmers, who grew crops and raised livestock.
  – Others managed the forests, worked in local mines or mills, or manufactured the necessities of life for the town.
• The Industrial Revolution changed this pattern as machinery made it possible for fewer people to operate a farm or grain mill and better transportation allowed manufacturers to be located farther from their customers.
Where We Live

• Thousands of rural jobs were eliminated, and many people had to move to cities to find jobs.

• As a result, urban areas grew rapidly during the 20th century and spread over more land.

• The movement of people from rural to urban areas happened in developed countries between about 1880 and 1950. Now, this movement is occurring rapidly in developing countries.
Where We Live

- Today, most people throughout the world live in urban areas.
The Urban-Rural Connection

• Whether people live in cities or in the countryside, people are dependent on resources produced in rural areas.

• These resources include:
  – clean drinking water
  – fertile soil
  – land for crops
  – trees for wood and paper
  – much of the oxygen we breath, which is produced by plants.

• An ecosystem service is the role that organisms play in creating a healthful environment for humans.
## The Urban-Rural Connection

### Examples of Ecosystem Services

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<thead>
<tr>
<th>Service</th>
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<tr>
<td>purification of air and water</td>
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<td>preservation of soil and renewal of soil fertility</td>
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<td>prevention of flood and drought</td>
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<td>regulation of climate</td>
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<td>maintenance of biodiversity</td>
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<td>movement and cycling of nutrients</td>
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<td>detoxification and decomposition of wastes</td>
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<td>aesthetic beauty</td>
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Supporting Urban Areas

• The area of rural land needed to support one person depends on many factors
  – the climate
  – the standard of living
  – how efficiently resources are used

• Each person in a developed country uses the ecosystem services provided by about 8 hectares of land.
  – But, many people in developing countries do not have access to all the resources for a healthy life, and may use ecosystem services from less than a hectare of land per person.
Land Use and Land Coverage
Ticket out the Door

1. List three reasons why we use land.
2. List two resources humans use from land.
3. What portion of history changed from where we used to live (rural land) to why we live in the urban areas now?
4. List three resources that make up the urban rural connection.
5. List two factors that support one person who resides on a piece of rural land.
Chapter 14
Land
Section 2: Urban Land Use

DAY ONE
Urbanization

- **Urbanization** is an increase in the ratio or density of people living in urban areas rather than in rural areas.
  - People usually leave rural areas for more plentiful and better paying jobs in towns and cities.
- In developed countries, urbanization slowed in the second half of the 20th century.
- As urban populations have grown, many small towns have grown together and formed large urban areas called metropolitan areas.
  - An example would be **Washington D.C.-Baltimore**.
Urbanization

• Urban areas that have grown slowly are often relatively pleasant places to live, in part because roads and public transportation have been built to handle the growth allowing traffic to flow freely.

• Buildings, roads, and parking lots are mixed with green spaces that provide these urban areas with much needed ecosystem services such as
  – moderation of temperature
  – infiltration of rainwater runoff
  – aesthetic value
The Urban Crisis

• **Infrastructure** is the basic facilities of a country or region, such as roads, bridges, sewers, and railroads.

• A rapidly growing population, however, can overwhelm the infrastructure, leading to:
  
  – traffic jams
  
  – substandard housing
  
  – polluted air and water

• When more people live in a city than its infrastructure can support, the living conditions deteriorate.

• This growth problem has become so widespread throughout the world that the term *urban crisis* was coined to describe it.
Urban Sprawl

• **Urban sprawl** is the rapid spread of a city into adjoining suburbs and rural areas.

• Much of this growth results in the building of suburbs, or housing and associated commercial buildings on the boundary of a larger town.

• Many of these suburbs are built on land that was previously used for food production.

• In fact, each year suburbs spread over another 1 million hectares *(2.5 million acres)* of land in the United States.
Development on Marginal Lands

• Many cities were first built where there was little room for expansion.

• As the cities grew, suburbs were often built on **marginal land**, or land that is poorly suited for building.

• For example, Los Angeles was built in a basin, and has expanded onto slopes that are prone to landslides.

• Structures built on marginal land can become **difficult or impossible to repair** and can be expensive to insure.
Other Impacts of Urbanization

- Environmental conditions in the center of a city are different from those of the surrounding countryside, as cities both generate and trap more heat.

- **Heat island** is an area in which the air temperature is generally higher than the temperature of surrounding rural areas.

- Heat is **generated** by the infrastructure that makes a city run.
  - Roads and buildings **absorb** and retain heat longer than vegetation does.
Other Impacts of Urbanization

• Scientists are beginning to see that heat islands can affect **local weather patterns**.
  – Hot air rises over a city, cooling as it rises, and eventually produces rain clouds.

• In Atlanta, Georgia, and many other cities, **increased rainfall** is a side effect of the heat island effect.

• The heat-island effect may be moderated by **planting trees for shade** and by installing **rooftops that reflect rather than retain heat**.
Urban Planning

- **Land-use planning** is a set of policies and activities related to potential uses of land that is put in place before an area is developed.

- The federal government requires developers to prepare detailed reports assessing the environmental impact of many projects, and the public has a right to comment on these reports.

- Developers, city governments, local businesses, and citizens often disagree about land-use plans.
Intelligent Design

- Land-use planners have sophisticated methods and tools available to them today.

- The most important technological tools for land-use planning involve using the **geographic information system**.

- A geographical information system (GIS) is an automated system for **capturing, storing, retrieving, analyzing, manipulating, and displaying geographic data**.
Intelligent Design

• GIS software allows a user to enter different types of data about an area, such as
  – the locations of sewer lines
  – roads
  – parks to then create maps with the data

• Each image corresponds to a different combination of information.

• The power of GIS is that it allows a user to display layers of information about an area and to overlay these layers, like overhead transparencies, on top of one another.
Transportation

- Most cities in the United States are difficult to travel in without a car.
- Most cities in the United States were constructed after the invention of the **automobile**.
  - In addition, availability of land was not a limiting issue, so many American cities sprawl over large areas.
- By contrast, most cities in Europe were built before cars, and are compact with narrow roads.
Transportation

• In many cities, **mass transit systems** were constructed in order to get people where they wanted to go.
  – Mass transit systems use **buses and trains** to move many people at one time.

• Mass transit systems:
  – **save energy**
  – limit the **loss of land** to roadways and parking lots
  – **reduce highway congestion**
  – **reduce air pollution**.

• Where the construction of mass transit systems is not reasonable, **carpooling** is an important alternative.
Open Space

- Open space is land within urban areas that is set aside for scenic and recreational enjoyment.
  - It also has many environmental benefits and provides valuable functions.
- Open spaces include parks, public gardens, and bicycle and hiking trails.
- Open spaces left in their natural conditions are often called **greenbelts**.
  - These greenbelts provide important ecological services.
Open Space

- The plants in open spaces absorb carbon dioxide, produce oxygen, filter out pollutants from air and water, and help keep a city cooler in the summer.

- Open spaces, especially those with vegetation, also **reduce drainage problems** by absorbing more of the rainwater runoff from building roofs, asphalt, and concrete resulting in less flooding.

- These open spaces also proved urban dwellers with much-needed places for exercise and relaxation.
GIS Views of Seattle, Washington
Heat Island – Weather Channel
Ticket out the Door

1. What is urbanization?
2. What is an urban crisis?
3. What is an urban sprawl?
4. What is a geographical information system?
5. What are two benefits of mass transit systems?
Chapter 14
Land
Section 3: Land Management and Conservation

DAY ONE
The main categories of countryside lands are

- farmland
- rangeland
- forest land
- national and state parks
- wilderness.

We have sometimes managed these lands sustainably so that they will provide resources indefinitely. We have also sometimes reduced their productivity by overusing or polluting them.

The condition of rural land is important because of the ecological services that it provides.
Farmlands

• Farmland is land that is used to **grow crops and fruit**.
  – The U.S. contains more than **100 million hectares** of prime farmland.

• However, in some places, urban development **threatens** some of the most productive farmland.

• In 1996, the U.S. government established a national **Farmland Protection Program** to help state, county, and local governments protect farmland in danger of being paved over or otherwise developed.
Rangelands

• Land that supports different vegetation types like grasslands, shrublands, and deserts and that is not used for farming or timber production is called **rangeland**.

• Rangelands can be arid, like the rangelands in the desert southwest, or relatively wet, like the rangelands of Florida.

• The most common human use of rangeland is for the **grazing of livestock**.
Rangelands

- **Cattle, sheep, and goats** are common livestock on the rangeland, which are valued for their meat, milk, wool, and hides.
- Native wildlife also grazes these lands.
- Like farmland, rangeland is essential for maintaining the world’s food supply.
- World population growth may require a **40 percent** increase in the food production of rangeland from 1977 to 2030.
Problems on the Range

- **Overgrazing** is the depletion of vegetation due to the continuous feeding of too many animals.

- Overgrazing often results in changes in the plant community.
  - Less desirable plants may invade the area and replace more-desirable plant species.

- In cases of severe overgrazing, all the vegetation that covers the land is eaten. Once the plants are gone, there is nothing to keep the soil from eroding.
Maintaining the Range

• Much of the rangeland in the U.S. is **public land** managed by the federal government, which leases the rangeland to ranchers.
  
  – However, much of the rangeland in the U.S. is degraded.

• The **Public Rangelands Improvement Act of 1978** was enacted to reverse this trend and improve land management practices.

• Sustaining the productivity of rangeland generally means **reducing** overgrazing by limiting herds to sizes that do not degrade the land.
Maintaining the Range

• Improving rangeland that has been degraded by overgrazing often includes methods
  – killing invasive plants
  – planting native vegetation
  – fencing areas to let them recover to the state they were in before they were overgrazed.

• Ranchers also control grazing by digging many small water holes so that the vegetation around a single water hole is not overgrazed.

• Rangeland can also be left unused for periods of time so that the vegetation can recover.
Forest Lands

- Trees are **harvested** to provide products we use every day, such as paper, furniture, and lumber and plywood for our homes.
- In addition to wood and paper, we also valued forest products such as **maple syrup and turpentine**.
- There are many ecosystem services provided by forests. However, one of the most important is the removal of CO$_2$ from the air.
Harvesting Trees

- People use enormous amounts of wood.
- The worldwide average is $1,800 \text{ cm}^3$ of wood used per person each day.
- However, on average, each person in the United States uses about 3.5 times this amount.
- About 1.5 billion people in developing countries depend on firewood as their main source of fuel.
Harvesting Trees

• The timber industry classifies forest lands into three categories:
  • **Virgin forests**: forests that have never been cut.
  • **Native forests**: forests that are planted and managed.
  • **Tree farms**: areas where trees are planted in rows and harvested like other crops.
• The two most widely used methods of harvesting trees are **clear-cutting and selective cutting**.
Harvesting Trees

• Clear-cutting is the process of **removing** all of the trees from an area of land.

• Clear-cutting large areas **destroys wildlife habitat and causes soil erosion.**

• Selective cutting is the process of **cutting and removing only middle-aged or mature trees.**
  
  – It is more expensive than clear-cutting, but is usually much less destructive. It is usually practiced on smaller areas owned by individuals.
Deforestation

- **Deforestation** is the process of clearing forests.
- Most countries become severely deforested as populations expand and the demand for forest products increases.
- Forests are cleared to convert the land into farmland, and to make space for roads, homes, factories, and office buildings.
- Deforestation reduces wildlife habitat, but it has other impacts, too.
Deforestation

• For example, when forests are cleared from hillsides, soil erosion usually results if the area is not quickly planted with a cover crop.

• Without tree roots to hold the soil in place, it is easily washed or blown away into the valley below.

• The rate of deforestation is especially high in tropical rain forests, where the soil is relatively thin.

• Farmers who clear forests in these areas must always move from one plot of land to another, clearing more forest land each time.
Reforestation

- **Reforestation** is the reestablishment and development of trees in a forest land.
- In some places, reforestation is happening faster than trees are being cut down.
- The price of deforestation, which causes soil erosion, landslides, and flooding, is sometimes too high, so in some areas the forest has been allowed to regenerate or has been replanted.
Reforestation

• Some governments require reforestation after timber has been harvested from public land.
  – However, worldwide, more than 90 percent of all timber comes from forests that are not managed by an agency that monitors the health of forest ecosystems.

• Many governments are currently working to improve reforestation efforts and to promote less destructive methods.
  – Private organizations have established tree-planting programs on roadsides and in cities.
Parks and Preserves

- In the 1870s, a group of explorers approached Congress with news of a magnificent expanse of land in Wyoming and Montana they believed would be damaged by the development that had changed the northeastern United States.

- Congress agreed to protect this land by setting it aside for the public to use and enjoy, and the first national park, **Yellowstone**, was created.

- Today, the U.S. has about 50 national parks.
Parks and Preserves

• Most public lands are not as protected as the national parks are.

• Some public lands are leased to private companies for logging, mining, and ranching.

• Others are maintained for hunting, fishing, wild-life refuges, or to protect endangered species.

• International efforts include the Biosphere Program that has set up several hundred preserves, called biosphere reserves, that include people in the management plan of the reserves.
Wilderness

- The **U.S. Wilderness Act**, passed in 1964, designated certain lands as wilderness areas.
- **Wilderness** is a region that is not cultivated and that is not inhabited by humans.
- So far, **474 regions** covering 32 million acres have been designated as wilderness in the United States. These areas are open to hiking, fishing, and camping.
- Building roads or structures and using motorized equipment is not allowed in wilderness areas.
Benefits of Protected Areas

• Protected areas often provide the only place where unspoiled forests, deserts, or prairies remain.

• Without these areas, the plants and animals that can survive only in these ecosystems would disappear.

• Wilderness areas serve as outdoor classrooms and research labs where people can learn more about the natural world.

• These protected areas also provide recreation, such as hiking and camping, for many people.
Threats to Protects Areas

• Around the world, more people visit national parks and wilderness areas each year and leave their mark on the land.

• **Litter and traffic jams** now plague many of our national parks.

• Rangelands, mining and logging sites, oil and gas operations, power plants, and urban areas are often close enough to affect the parks.

• In addition, preserved areas are affected by **climate change** and by air and water pollution, as are most other parts of the world.
Threats to Protect Areas

• In attempts to protect wilderness from damage, **limits** have been set in some areas on the number of people permitted in the area at any given time.

• Some areas are **completely closed** to visitors to allow wild animals to breed.

• In addition, volunteer programs are now active in many wilderness areas.

• Volunteers help pick up trash, build trails, control invading or exotic species, and help educate the visiting public.
Time-lapse Devastating Deforestation
Ticket out the Door

1. List three main categories of the countryside.
2. What is farmland?
3. What is rangeland?
4. How does overgrazing affect plant communities?
5. What is deforestation?