

Environment

THE SCIENCE BEHIND THE STORIES

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11

**Land use, forest
management, and
creating livable cities**



PowerPoint® Lecture prepared by Jay Withgott

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This lecture will help you understand:

- Land use decisions
- Urbanization and urban sprawl
- Forestry and forest management
- Agricultural land use
- Parks and reserves
- Planning for livable cities

Central Case: The Chicago-Area Forest Preserve System

- Chicago was one of the world's fastest growing cities.
- Fortunately, several key people had the foresight to plan a ring of forest preserves around the metropolis.
- Today the system allows for a welcome escape to nature for city dwellers and suburbanites.

The forest preserve system



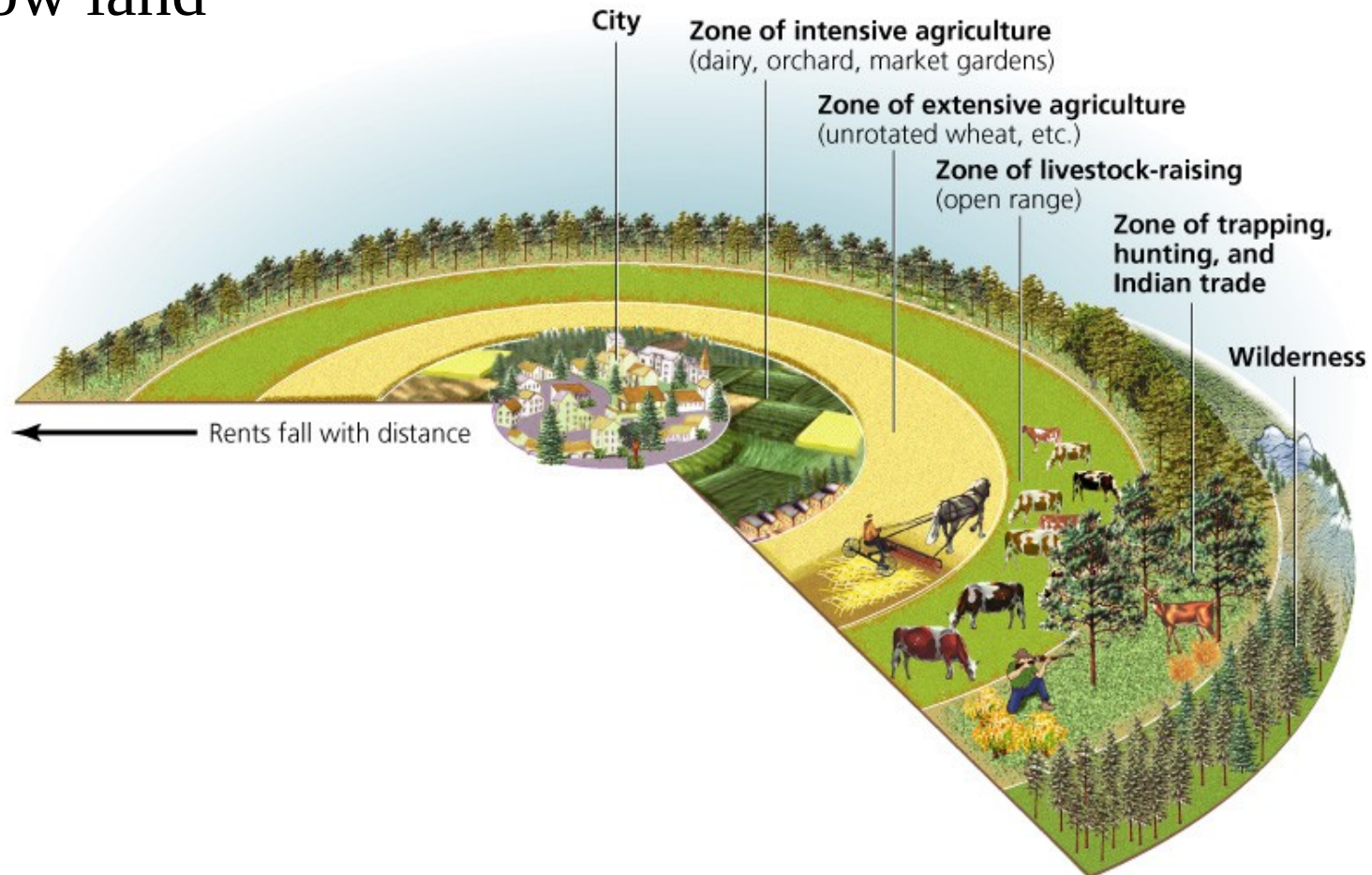
Forest preserves (green) of four different counties form a ring through the sprawling Chicago suburbs.

Urban environments need natural land

- Cities are sinks for resources; they depend on a vast countryside to supply them with necessities.
- Cities need ecosystem services that natural lands provide: clean water and air, nutrient cycling, waste treatment...
- Natural lands provide recreation, scenery, greenery, open space, and escape from the stresses of city life.
- Many urban residents feel an ethical obligation to preserve some natural land.

Cities, land, and resources

Cities typically trade finished products to their hinterlands in exchange for resources. Aspects of commerce largely determine how land surrounding a city becomes used.



Land use and resource management

Cities, suburbs, and countrysides alike struggle with decisions on **land use**, issues pertaining to the ways we apportion areas of land for different functions.

This is intertwined with **resource management**, strategic decision making about who should extract resources and in what ways, so they are used wisely and not wasted.

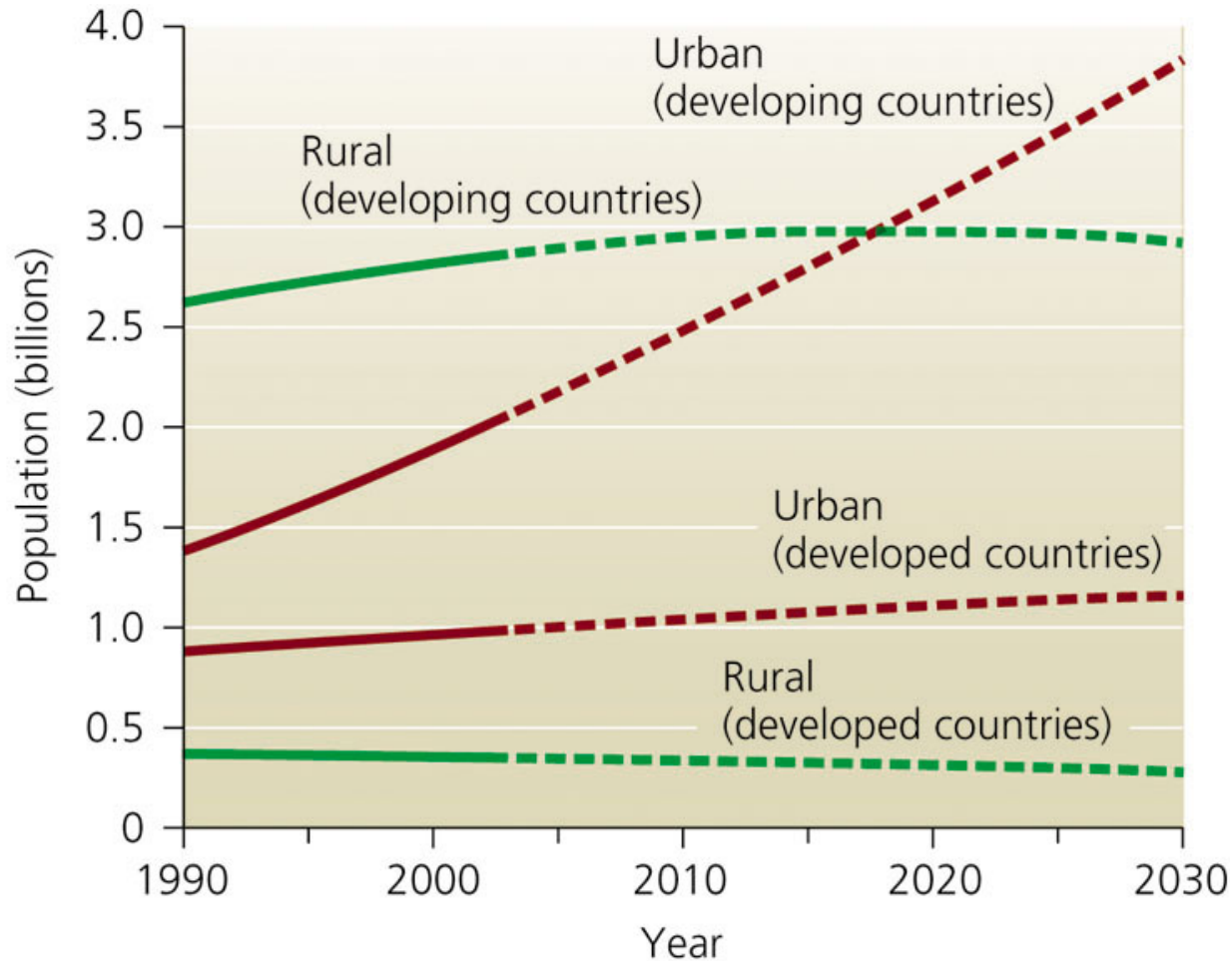
Urbanization

Cities have been part of human culture for thousands of years.

But the scale of our cities, and the speed at which they are growing, is new.

People have been moving from country to city as nations have developed.

Urbanization



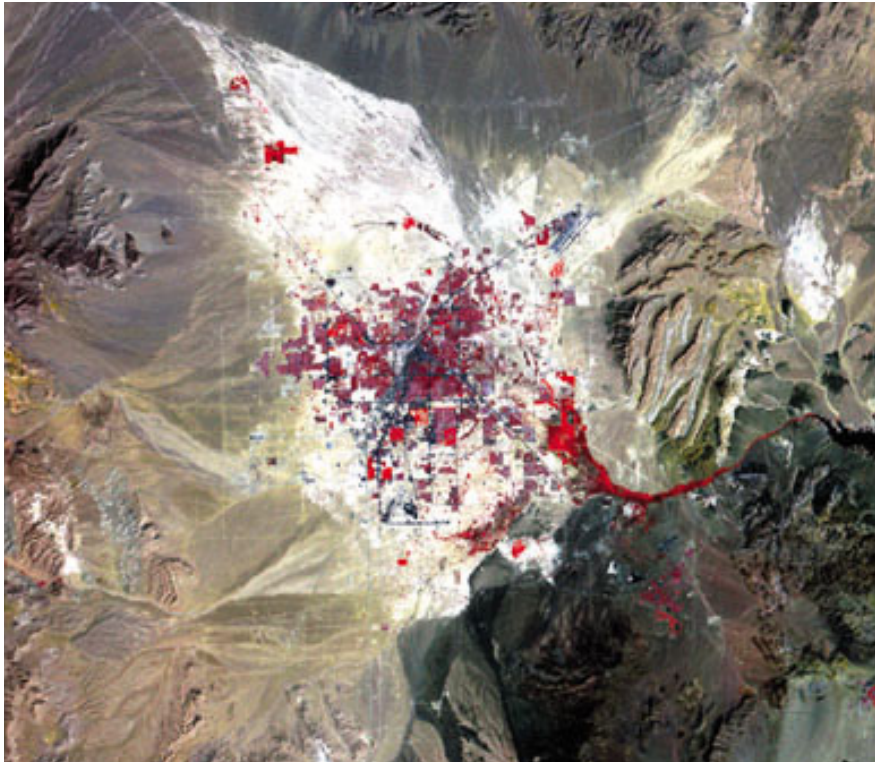
Urban populations are growing and rural populations are shrinking, especially in the developing world.

Urbanization

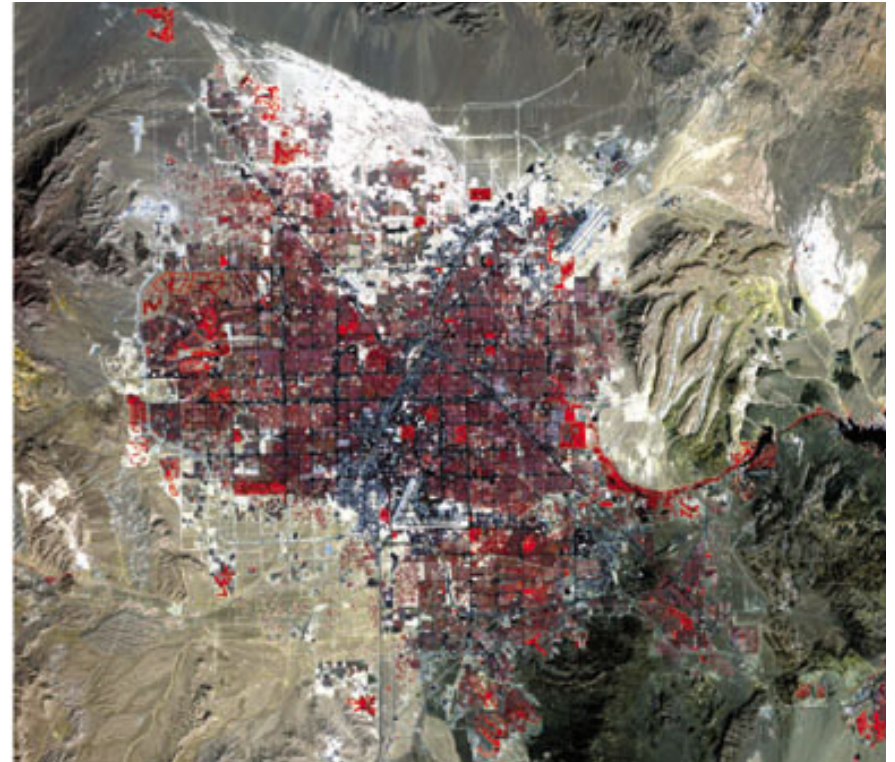
Chicago grew faster than almost any other city in the late 19th and early 20th centuries, then declined slightly as residents moved to its suburbs.

Urbanization

Today cities like Phoenix and Las Vegas are growing as fast as Chicago once did. They are spreading across the landscape, as shown by these satellite photos of Las Vegas:



1972



2002

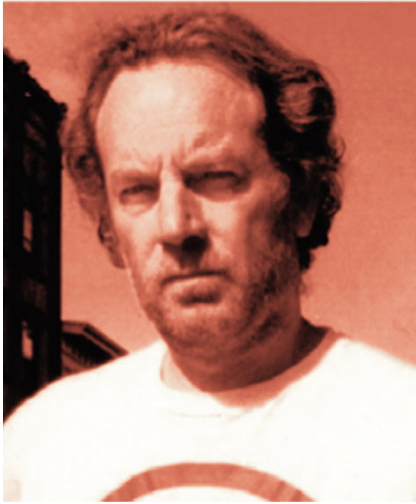
“Growth” vs. “sprawl”

Economists, politicians, and city boosters traditionally encouraged growth, assuming it was economically good.

Today many people have doubts. Many residents who fight traffic jams going to work each day are no longer supportive of growth, and want an end to “sprawl.”

(Note the positive connotation of “growth” and the negative connotation of “sprawl.”)

Viewpoints: Suburban sprawl



Al
Norman

“The low-density, automobile-dependent sprawl that now chokes our suburbs comes at a high price. You can’t buy small-town quality of life at Wal-Mart... But development does not have to be sprawl. We can determine how we grow.”

Samuel
Staley

“Anti-sprawl policy is problematic: Is the goal to save farmland, stop outward housing development, increase densities, or reduce automobile use? If the answer is “yes,” then public policy may well be ignoring the housing preferences of the vast majority of Americans.”

Forest management

Forests provide us timber, and this has helped our society achieve the standard of living we enjoy today.

Forests are also natural ecosystems that are severely altered by timber harvesting.

The practice of forestry has had to balance these two identities in trying to manage forest resources.

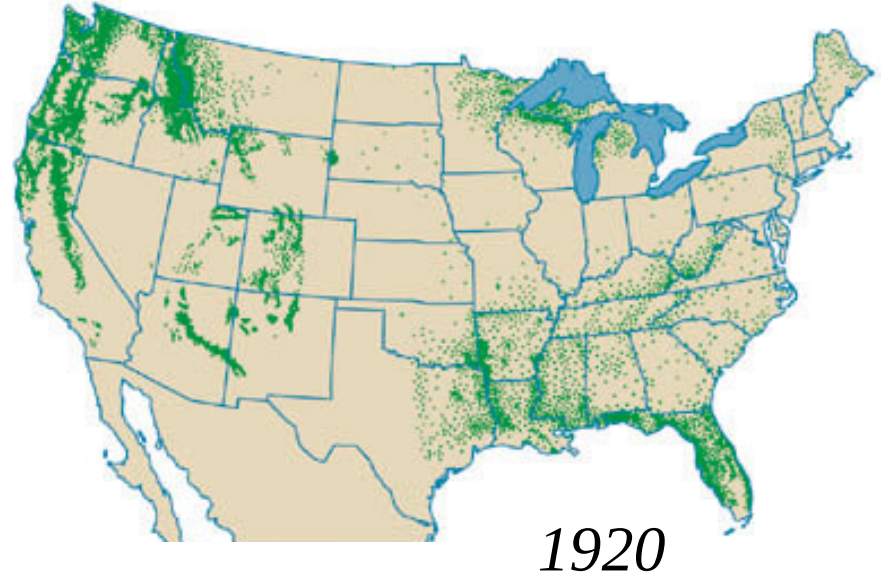
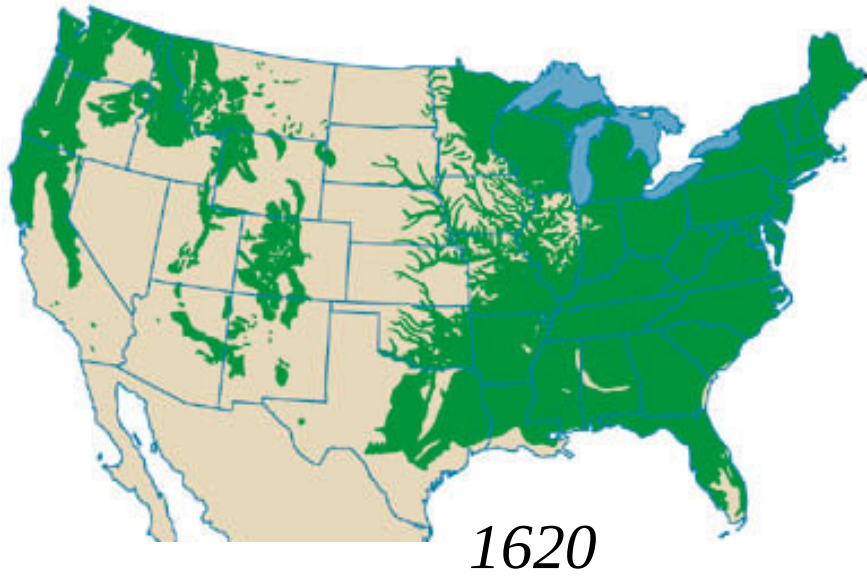
Forests and deforestation

Demand for wood products, and for open land for agriculture, has led to **deforestation**, the clearing and loss of forests, throughout the world.

Africa and Latin America are losing their forests most quickly.

Forests are starting to grow back in North America and Europe after centuries of deforestation.

Deforestation



Measuring forest cover

A 2001 international study used GIS with satellite data to put together an accurate inventory and map of the world's forest cover.

20% of Earth's surface remains covered by closed forest.

88% of this is sparsely inhabited by people.

80% is concentrated in just 15 nations.

Timber harvesting

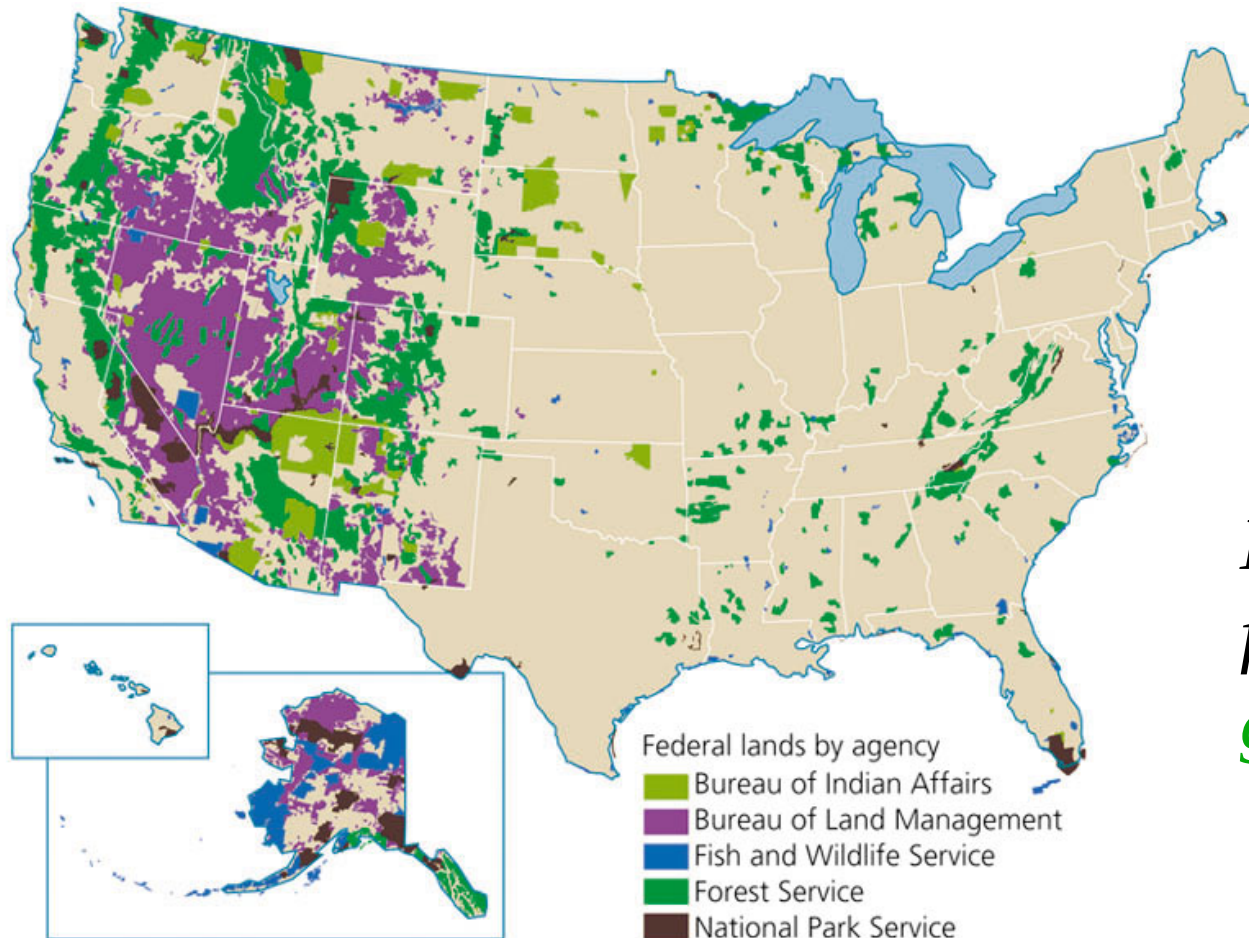
Most timber harvesting in the U.S. takes place on private land, especially land owned by timber companies.

But much takes place on public land—**national forests**.

The U.S. National Forest system was established at the turn of the last century, and the Forest Service manages forests for sustainable timber yield, and, increasingly, recreation and ecosystem health.

Federal lands

U.S. federal agencies own a large amount of land in the western U.S., allowing resource extraction on most of it.



*National
forests =
green*

Figure 16.10

Methods of logging

Clear-cutting = all trees cut, leaving only stumps. Most cost-efficient; most environmentally damaging.

Seed-tree cutting = some mature trees left standing to reseed cut area

Shelterwood cutting = trees cut in multiple cuttings over multiple years, leaving some to reseed and protect against erosion

Selective logging = only some trees chosen and cut; forest left standing. But biggest trees taken, and machinery damages forest floor.

Methods of logging

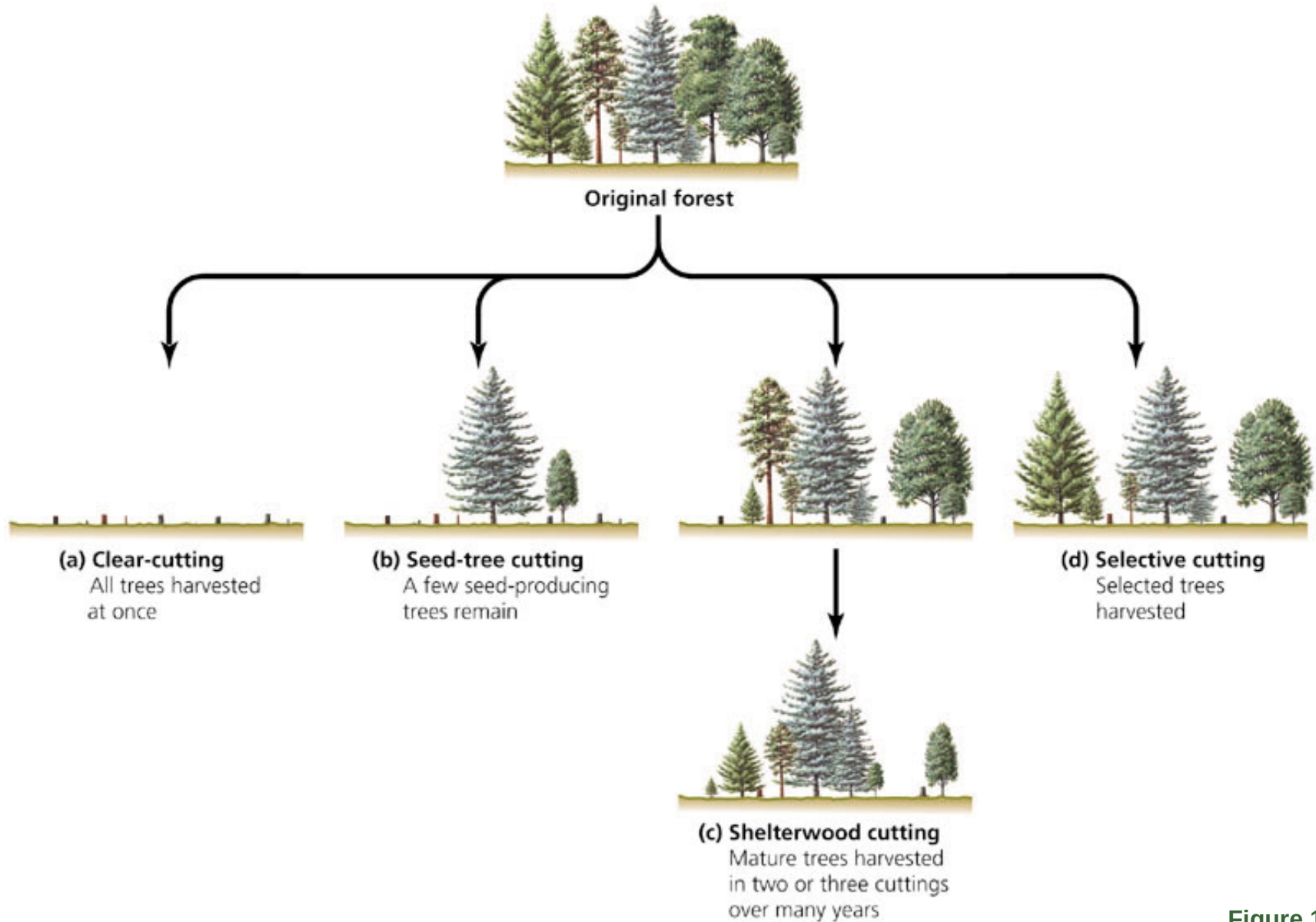


Figure 16.11

Growth and removal of timber

Forests are **growing back** faster than they are being **cut** on all types of land except timber company land.

Logging subsidies

Although timber harvests are falling and forests are growing on national forest lands, the Forest Service still loses an estimated \$100 million of taxpayers' money each year by accommodating private company harvests on public land:

- Selling timber well below cost
- Marketing and administering harvests
- Building and maintaining access roads

Managing forests

Critics of the Forest Service have urged it to manage forests for recreation, wildlife, and ecosystem integrity, not just timber:

Manage forests as ecologically functional entities, not just cropland for trees.

The Forest Service has responded, in part. Some of its biologists now pursue **ecosystem management**, trying to protect, recover, or restore degraded ecological communities.

Management for forest fires

Fire policy has posed a particular challenge for forest management.

Fire is a natural phenomenon that can renew forests.

But decades of human fire suppression allowed lots of combustible debris to accumulate in forests.



So when fires occur, they often are damaging rather than renewing.

Figure 16.14

Management for forest fires

So foresters and others:
 have used controlled burning and
 have cleared brush and understory trees
 to reduce fuel loads and restore ecosystems.

However, fire suppression continues, because so many people's homes are located in or near forested areas.

Agricultural land use

Agriculture now covers more of Earth's surface than forests.

38% of planet's land surface = agriculture

26% pasture/rangeland

12% cropland

Intensive monocultures completely displace natural ecosystems and have a heavy impact on the land.

Figure 16.15

Agriculture and wetlands

Most of North America's wetlands have been drained, filled, and converted for agricultural use.

*Monoculture
farmland
encroaches on
prairie pothole
wetlands in North
Dakota.*

Figure 16.16

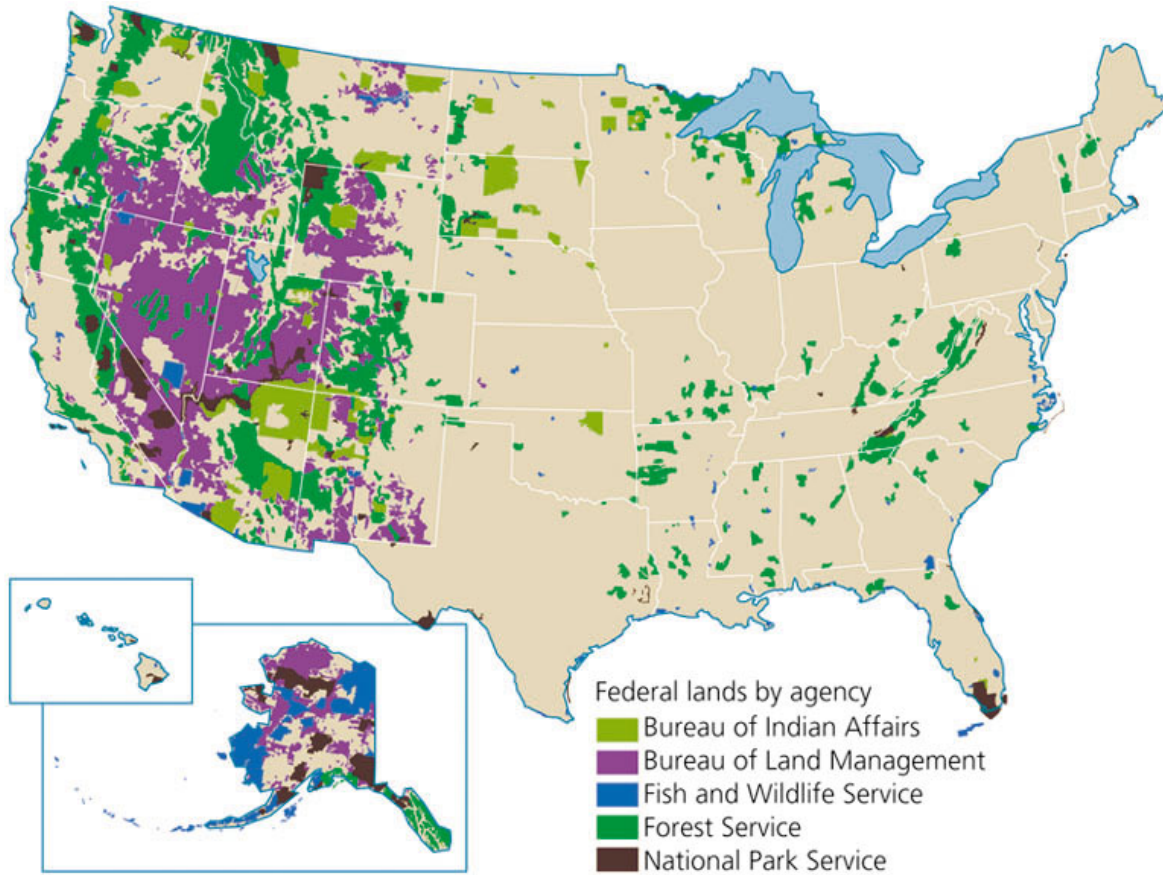
Rangelands

Livestock grazing:

Done badly, it can ruin soils, cause erosion and desertification.

Done responsibly, it can sustain grasslands, allow wildlife use.

Rangelands



Most ranching takes place on federal land managed by the Bureau of Land Management (BLM)—purple in map.

Grazing fees are extremely cheap.

Why create parks, reserves, and wildlands?

Why set aside land and voluntarily refrain from developing and exploiting its resources?

- To protect enormous, beautiful, unusual landscape features (*monumentalism*)
- To make use of sites that have little economic value otherwise
- For utilitarian benefits—e.g., watershed protected for drinking supply
- For recreational use for outdoors activities
- To preserve biodiversity

Why create parks, reserves, and wildlands?



“Monumentalism”:

- *19th-century landscape painters raised great interest in the American West’s scenery—and its new national parks.*
- *Here, Bridalveil Falls in Yosemite by Albert Bierstadt*

U.S. national parks

1872 – Yellowstone National Park becomes the world’s first national park:

“a public park or pleasuring-ground for the benefit and enjoyment of the people”

Today, the U.S. national park system includes 388 sites and receives 277 million visits each year.

It is managed by the National Park Service.

U.S. national wildlife refuges

1903 – President Theodore Roosevelt begins system of national wildlife refuges

Today, 541 sites are managed by the Fish and Wildlife Service:

“from preservation to active manipulation of habitats and populations”

Hunting, fishing, and other recreation and allowed; policies vary from refuge to refuge.

Wilderness areas

1964 – Congress passes **Wilderness Act**

Wilderness areas can be designated within existing federal lands.

They are open to public recreation, but not exploitative development.

Wilderness areas



“To assure that an increasing population...does not occupy and modify all areas ... leaving no lands designated for preservation and protection in their natural condition.” — U.S. Congress

Opposition to land set-asides

Restriction of activities in wilderness areas has generated opposition from some quarters.

State governments of Western states would like to have control over more land within their borders.

Nevada = 80% of land federally owned

ID, OR, UT = 50%+ federally owned

Opposition to land set-asides

Wise use movement = loose confederation of individuals who live off the land and industries that extract resources, who oppose advances of environmental advocacy, and:

- Want to protect private property rights
- Oppose government regulation
- Want federal lands transferred to state, local, private hands
- Want more motorized vehicle recreation on public lands

Land trusts

Besides federal and state governments, private nonprofit groups called *land trusts* also set aside land for protection from development.

Local or regional organizations

900 in U.S. have helped preserve 1.1 million ha
(2.7 million acres)

International parks and reserves

Protected areas have been growing fast in many countries.

The world now has 38,500 protected areas, covering 9.6% of the planet's land surface.

But many of these are “paper parks”—protected on paper, but subject to illegal exploitation because of lack of funding for enforcement.

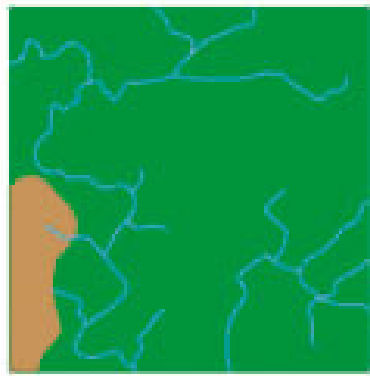
International parks and reserves

Biosphere reserves that straddle international boundaries consist of three zones, combining preservation with sustainable development.

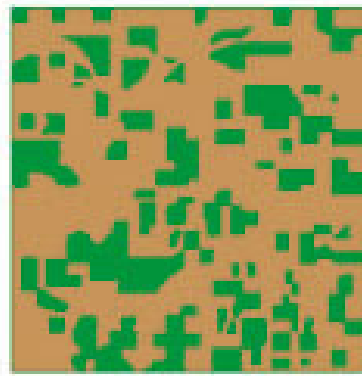
Design of protected areas

How parks and reserves are designed has consequences.

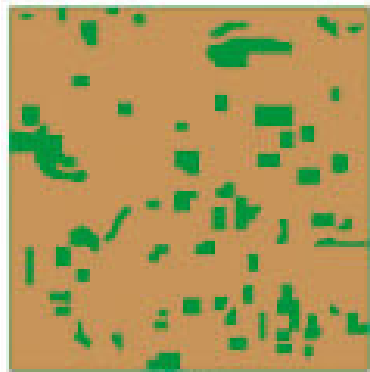
Recall how habitat is fragmented by development:



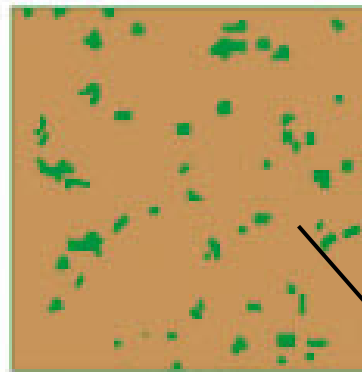
1831



1882



1902



1950



*Forest fragmentation at
Mt. Hood N.F., Oregon,
and
in Cadiz Township,
Wisconsin, 1831–1950.*

Design of protected areas

Questions for reserve design:

What is better for biota: single large or several small (“**SLOSS**”)?

How important are **corridors** for wildlife to travel from one reserve to another?

These are key issues in conservation biology.

Creating livable cities: City parks

City parks were widely established at the turn of the last century.

They used aesthetic ideals borrowed from European parks: lawns, shaded groves, curved pathways.

Landscape architect Frederick Olmsted was influential in many cities.

Conflict:

Passive recreation for wealthy elites

vs.

Active recreation for the working class

City parks and city planning

Parks and park systems played a key role in early **city planning**, the professional pursuit that attempts to design cities so as to maximize their efficiency, functionality, and beauty.



*Central Park in
Manhattan—
19th century*

Figure 16.21

City planning

Portland, Oregon, and Curitiba, Brazil, are two success stories in creating livable cities.

Key components are:

- Strong public transportation
- Pedestrian and bike friendly
- Zoning to limit sprawl
- Environmental education
- Self-sufficient neighborhoods



Public transport in Portland

Conclusions: Challenges

Urban populations continue to grow, making it necessary to improve conditions in cities.

Urban sprawl eats up undeveloped land.

Balancing timber production with preservation of forest ecosystems, and managing for fire, poses challenges.

Agriculture comprises huge amounts of land, and often degrades it.

There is debate over how much land should be protected.

There is debate over how best to design reserves.

Conclusions: Solutions

Effective city planning and better public transportation can make cities more livable and can mitigate the impacts of urban sprawl.

The Forest Service has begun moving toward a better balance of management for timber, ecosystems, and fire.

Agricultural practices can be further improved to lessen the impacts upon soil and biodiversity.

Democratic debate over land protection policy is healthy.

Through science, conservation biologists are progressing in determining how best to design reserves.

QUESTION: Review

The U.S. Forest Service...?

- a.** Burns forests to restore ecosystems.
- b.** Helps put out fires that threaten homes.
- c.** Builds roads used to log forests.
- d.** Manages the national forest system.
- e.** Does all of the above.

QUESTION: Review

Which is NOT a reason national parks were created?

- a.** For outdoor recreation
- b.** To protect beautiful and unusual natural features
- c.** To provide timber products
- d.** To preserve biodiversity

QUESTION: Review

A supporter of the wise use movement would...?

- a.** Want to see a beautiful mountain range in Utah made into a wilderness area.
- b.** Want to open Yellowstone National Park to unrestricted snowmobile use.
- c.** Oppose a mining project to exploit a newly discovered silver deposit in Nevada.
- d.** Want federal officials to crack down on private landholders in Wyoming violating the Endangered Species Act.

QUESTION: Review

Which is NOT something modern city planners might do to make a city more livable?

- a.** Develop a new light rail line
- b.** Encourage neighborhood shops and restaurants
- c.** Eliminate bicycle lanes on city streets
- d.** Revise zoning codes to limit sprawl
- e.** Create a new city park in place of an abandoned warehouse

QUESTION: Interpreting Graphs and Data

In developed nations...?

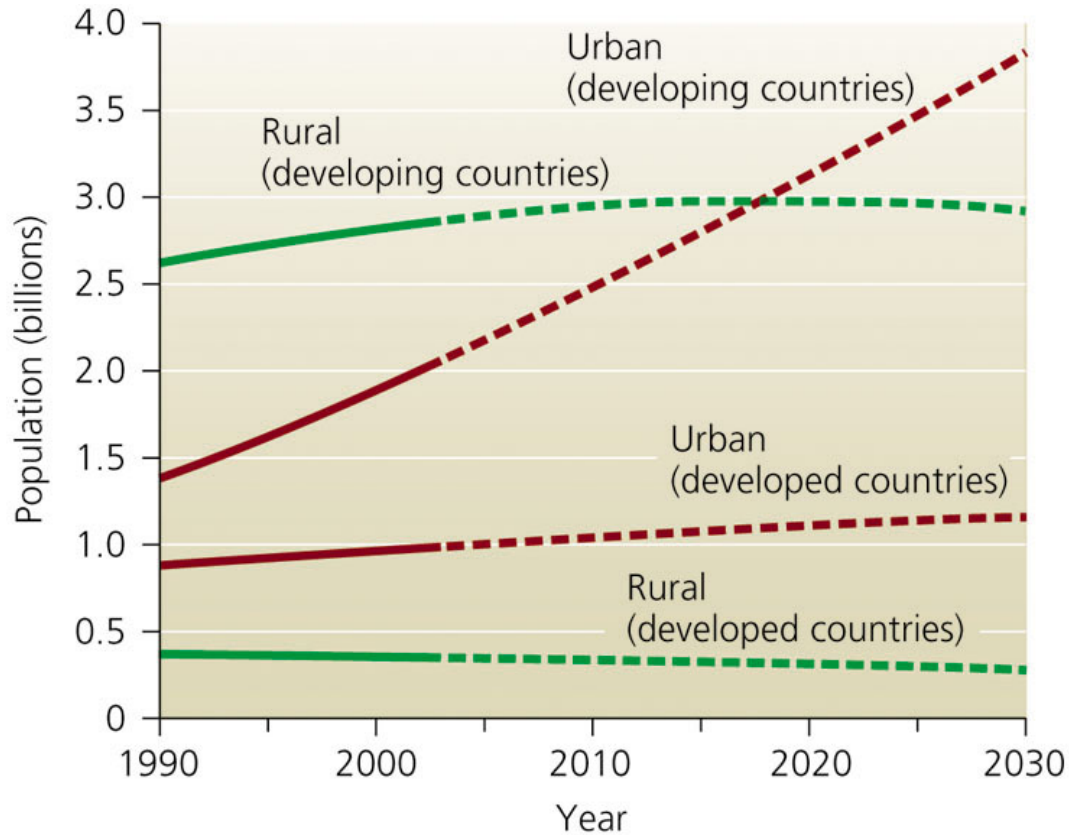


Figure 16.4

- a. People are moving mostly from cities to rural areas.
- b. Urbanization is progressing more quickly than in developing nations.
- c. The rural population is bigger than the urban population.
- d. Rural populations are declining.

QUESTION: Interpreting Graphs and Data

In the U.S. national forests...?

- a.** *Trees are growing faster than they are being removed.*
- b.** *Trees are being removed faster than they are growing.*
- c.** *More trees are being removed than on timber industry land.*

QUESTION: Viewpoints

Is sprawl a problem?

- a.** Yes; it degrades quality of life, and we should take all actions necessary to slow or stop it.
- b.** It causes problems, but is difficult to deal with because it results from the choices individual people make about where and how to live.
- c.** No; it reflects people's choices and therefore is not a problem.