

Sustaining Ecosystems: Land Use, Conservation, & Management

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Outline

1. Land Use & Conservation in the U.S.
1400–1960
2. The Environmental Movement
1960–1998
3. Public Lands in the U.S.
management policies, survey of lands & agencies
4. Managing National Parks
park issues
5. Managing Rangelands
grazing issues
6. Protecting Biodiversity & Conservation
wilderness & biodiversity issues

1. Land Use & Conservation

The range of the American bison shrank severely between 1500 and 1906 as the result of hunting pressure by European colonists.

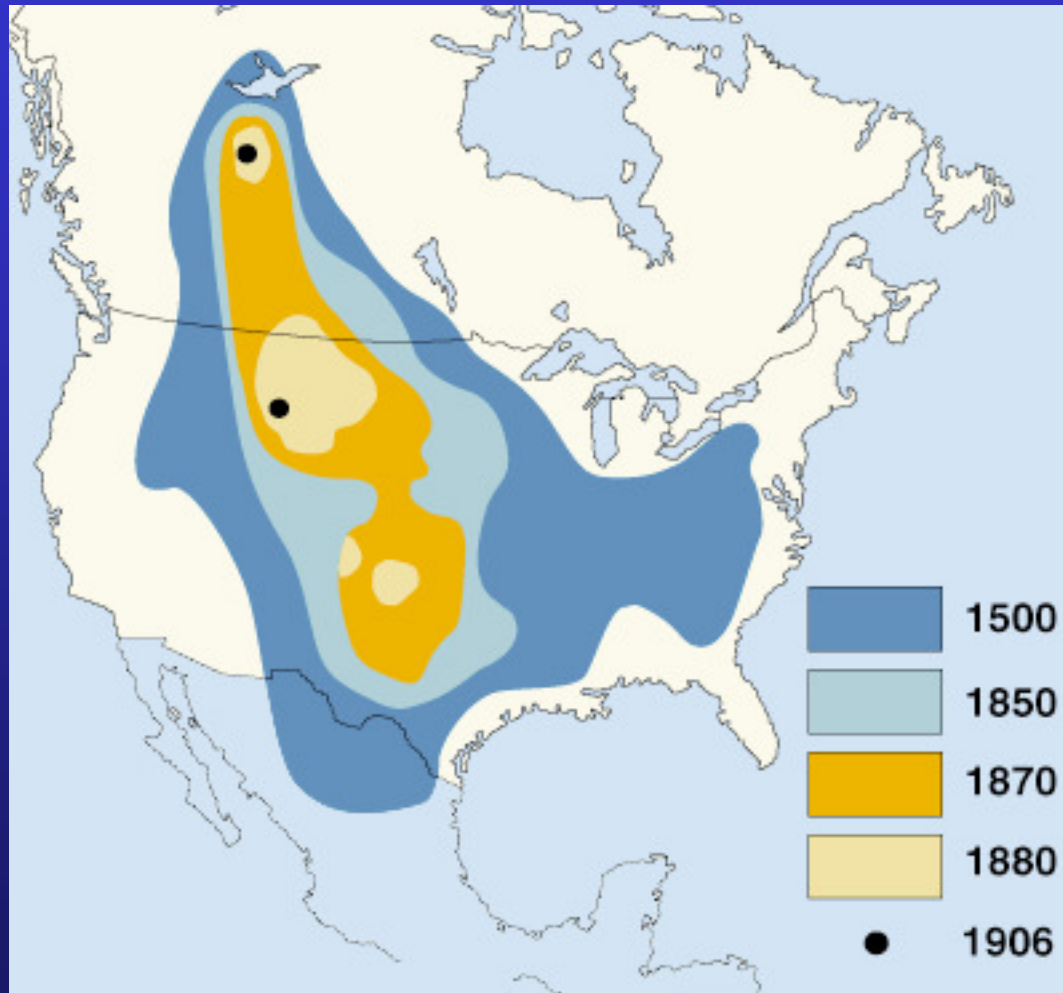


Fig. 23-2

The Frontier Worldview

European colonists viewed North America as a hostile wilderness to be conquered (cleared & planted) & exploited for its vast resources (frontier worldview).

- frontier worldview was in sharp contrast to Native American views that had deep respect for the land & its plants & animals;
- frontier worldview led to enormous waste of resources because of belief that there would always be more;
- by 1850 about 80% of land was owned by U.S. government, most taken from Native Americans;
- by 1900 more than half of U.S. public land was given away or sold cheaply to promote settlement.

Early Conservationists

Between 1832 & 1870 various early conservationists became alarmed at the scope of resource depletion & degradation.

- included George Catlin, Horace Greeley, Ralph Waldo Emerson, Frederick Law Olmsted, Charles W. Eliot, Henry David Thoreau, & George Perkins Marsh;
- these conservationists urged that part of the unspoiled wilderness be protected as a legacy for future generations;
- their warnings were largely ignored or vigorously opposed.

Growing Concern About Conservation

Between 1870 & 1900 concerns about environmental & public health hazards began to increase.

- serious environmental problems of U.S. cities included air pollution from burning coal, contaminated water, horse manure, inadequate garbage collection, overcrowding, unsafe working conditions, & infectious diseases;
- between 1872 & 1927 the federal government increased its role in resource conservation & public health;
- president Theodore Roosevelt, 1901–9, protected large tracts of land and tripled the size of forest reserves (his term was called the Golden Age of Conservation).

Some Major Events in Conservation

- 1872 Yellowstone National Park established;
- 1891 Forest Reserve Act – protected forest lands (later became National Forests)
- 1892 Sierra Club founded by John Muir
- 1891–97 Timber cutting banned on large tracts of public land
- 1900 Lacey Act – banned transport of live or dead animals
- 1902 Reclamation Act – promoted irrigation & water development projects in arid west
- 1903 First wildlife refuge
- 1906 Pure Food & Drug Act
- 1912–16 National Park System established
- 1920–27 Public health boards established in most cities
(Fig. 23–3)

Wise Use vs. Preservation

- the **wise–use** or **utilitarian** school believed that public lands should be managed wisely & scientifically to provide needed resources;
- the **preservationist** school believed that remaining wilderness should be left untouched;
- **Gifford Pinchot**, first chief of U.S. Forest Service, early leader of wise–use school;
- **John Muir**, founder of Sierra Club, early leader of preservation school (followers include Aldo Leopold);
- 12 year environmental battle (1901–1912): Pinchot favored damming of the Hetch Hetchy Valley to use water for San Francisco, whereas Muir favored preservation of Hetch Hetchy.

More Major Events in Conservation

- 1914–18 post World War I era of economic growth & expansion;
- 1921–33 federal government promoted increased resource removal from public lands at low cost;
- 1929–41 Great Depression decreased transfer of federal lands to state governments & private individuals;
- 1933 Civilian Conservation Corps (CCC) ceased to provide jobs for 2 million unemployed;
- 1933–45 second wave of national resource conservation;
- 1934 Taylor Grazing Act required permits for use of federal grazing land (but not well enforced);
- 1934 Migratory Bird Hunting Stamp Act raised funds to create sanctuaries for waterfowl;
- 1935 Soil Conservation Service (now called Natural Resource Conservation Service) formed;
- 1940 U.S. Fish & Wildlife Service formed.

2. The Environmental Movement

Various events in the 1960s launched the environmental movement.

- 1962, Rachel Carson published *Silent Spring*, which documented pollution of air, water, & wildlife from pesticides such as DDT;
- 1964, Wilderness Act, authorized protection of undeveloped public land as part of the National Wilderness System;
- numerous environmental disasters increased public awareness of pollution.

Events that Increased Awareness

- 1963, air pollution in New York city killed about 300 people & injured thousands;
- mid-1960s, foam from non-biodegradable detergents appeared in rivers & lakes;
- 1969, Cuyahoga River (Cleveland, Ohio) caught fire because of oil & volatile chemicals;
- 1969, oil spill off of Santa Barbara, California, coated beaches & wildlife;
- late 1960s, water pollution in Lake Erie so severe that millions of fish died & beaches were closed;
- late 1960s, bald eagle, grizzly bear, whooping crane, peregrine falcon, & other wildlife threatened with extinction.

Environmental Events of the 1970s

The 1970s is sometimes called the first decade of the environment.

- 1970–80 many environmental laws passed (Endangered Species Act, Clean Water & Clean Air Acts enhancement...);
- 1970 first Earth day; EPA established;
- 1972 Oregon passes first beverage bottle recycling law; Limits to Growth published; UN Conference on the Human Environment in Stockholm;
- 1973 OPEC oil embargo causes major oil shortages;
- 1974 chemists Sherwood Roland & Mario Molina suggested CFCs may deplete ozone in stratosphere;
- 1978 Love Canal, NY, housing development evacuated because of leaks of toxic waste from old dumpsite;
- 1979 oil supplies decreased because of Iran's Islamic revolution; Three Mile Island Nuclear accident.

Environmental Events of the 1980s

The 1980s is noted for the anti–environmental Sagebrush Revolution.

- 1981–88 president Ronald Reagan (a leader of the Sagebrush Revolution) and his administration appointed anti–environmentalists to key federal positions, cut federal spending for energy conservation, & increased resource extraction from public lands;
- 1986 Chernobyl nuclear disaster; Times Beach, MO, evacuated by EPA because of dioxin contamination;
- 1987 Montreal Protocol to halve ozone–depleting CFC emissions signed by 24 countries;
- 1988 Industry–backed Wise Use movement established to destroy U.S. environmental movement;
- 1989 Exxon Valdez oil tanker accident in Alaska's Prince William Sound.

Environmental Events of the 1990s

The 1990s is emerging as decade with mixed environmental developments.

- 1990 twentieth annual Earth Day observed by 200 million;
- 1991 Persian Gulf War to protect oil supplies in Middle East; 39 nations agree to 50–year moratorium on mining in Antarctica; National People of Color Summit to promote environmental justice;
- 1992 U.N. Earth Summit in Rio de Janeiro, Brazil;
- 1994 U.N. Conference on Population & Development in Cairo, Egypt;
- 1995–98 efforts in U.S. Congress to weaken environmental laws, most vetoed by President William Clinton;
- 1997 Kyoto Climate Change Summit in Kyoto, Japan, to negotiate treaty to slow global warming;
- 1997 evaluation of 1992 Earth Summit showed little progress.

3. Public Lands in the U.S.

About 42% of U.S. land is public (see Fig. 23–9):

- 73% of this land is in Alaska;
- 22% is in western U.S. (in west 60% of land public);

Public lands can be classified into three categories:

- **multiple–use lands**, which include National Forests (National Forest Service) & National resource lands (Bureau of Land Management);
- **moderately–restricted use lands**, which include National Wildlife Refuges (U.S. Fish & Wildlife);
- **restricted–use lands**, which include National Parks (National Park Service), & the National Wilderness Preservation System.

Public Lands in the U.S.

National forests, national parks, and wildlife refuges managed by the U.S. federal government.

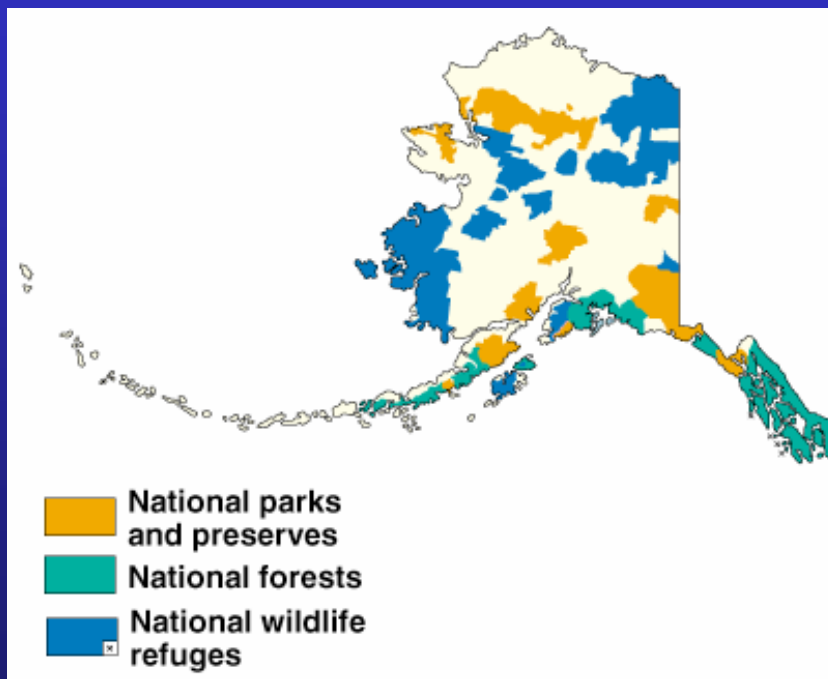


Fig. 23-9

Multiple–Use Public Lands

Two policies have been applied to management of multiple–use public lands:

- **principle of sustainable yield:** potentially renewable resources (such as trees) should not be harvested or used faster than they are replenished;
- **principle of multiple use:** the same land should be managed simultaneously for a variety of uses (e.g., timber harvest, grazing, recreation, & wildlife conservation);

Recently a new policy is being applied:

- **ecosystem management:** uses modern understanding of ecology to manage for system integrity;

Multiple–Use Public Lands

Multiple–use lands:

- **National Forest System:** 156 forests & 20 grasslands, managed by the U.S. Forest Service (USFS), an agency of the Department of Agriculture; the dominant use of National Forests has been logging; the USFS is the largest road builder, building roads to subsidize logging operations;
- **National Resource Lands:** in the western states & Alaska, managed by the Bureau of Land Management (BLM), an agency of the Department of Interior; the dominant use of national resource lands is grazing & supply of mineral & energy resources; grazing permits are generally sold at a price far below prices in private lands.

Moderately Restricted–Use Lands

- **National Wildlife Refuges:** 508 units, managed by the U.S. Fish & Wildlife Service (USFWS), an agency of the Department of Interior; about 24% of this land is designated wilderness; most refuges protect habitat & breeding areas for waterfowl & big game; some protect endangered species; USFWS is charged with administering the Endangered Species Act, which protects species in danger of extinction.

Restricted–Use Public Lands

- **National Park System:** 375 units, managed by the U.S. Park Service (USPS), an agency of the Department of Interior; its goals are to preserve scenic & unique natural landscapes, preserve & interpret the nation's historic & cultural heritage, protect wildlife & wilderness areas, & provide certain types of recreation; about 49% of Park land is designated as wilderness;
- **National Wilderness System:** 630 roadless areas within national parks (42%), national forests (33%), wildlife refuges (20%), & BLM national resource lands (5%); roads, logging, grazing, mining, & commercial activities are banned, except when they predate the wilderness designation (e.g., mining under the 1872 mining act).

4. Managing National Parks

More than 1,100 national parks larger than 1000 hectares (2500 acres) are located in more than 120 countries.

- U.S. national parks are generally managed under the **principle of natural regulation**, which is essentially a hands-off policy; in recent times park managers recognize an increasing need for active management;
- popularity is the biggest problem of U.S. national parks, such that parks are overcrowded & heavily impacted along roads & easily accessible locations;
- parks everywhere, & especially in developing countries, face problems of local people extracting wild resources, including poaching, cutting trees, mining, & gathering of wild plants;
- most national parks are too small to sustain many larger animal species.

5. Managing Rangelands

Almost half of Earth's ice-free land is rangeland, land that supplies forage for grazing & browsing animals & that is not intensively managed.

- the primary management of rangeland involves control of stocking rate, the number & kind of animals permitted to graze;
- **overgrazing** occurs when too many animals graze for too long & exceed the carrying capacity of a grassland;
- based on limited data, research indicates that most of the world's rangelands have been degraded to some degree, mostly by overgrazing & desertification (see Fig. 14–19);
- although seriously degraded, the condition of U.S. public rangelands are gradually improving.

6. Biodiversity & Conservation Biology

In recent years major concerns about biodiversity & conservation have emerged.

- biodiversity loss has emerged as a major concern:
 - increased scientific knowledge of biodiversity, ecological processes, & impacts of environmental degradation on biodiversity;
 - increased loss of habitat, depletion of wild populations of plants & animals, & threat of extinction;
- **conservation biology** is the multi–disciplinary science created to deal with the crisis of biodiversity loss;
- emphasis on the preservation of **ecological integrity**, the conditions & processes that generate & maintain biodiversity;
- emphasis on **ecological health**, the degree to which biodiversity & ecological integrity are intact.

Protecting Biodiversity

Most biologists believe that the best way to protect biodiversity & ecological integrity is through a worldwide network of reserves, parks, wildlife sanctuaries, wilderness, & other protected areas.

- In 1981 U.N. Educational, Scientific, & Cultural Organization (UNESCO) proposed designation of **biosphere reserves** to be set up in each of Earth's 193 biogeographical zones;
- a well–designed reserve includes 1) a core area that has little or no human disturbance, 2) a buffer zone where activities are managed to protect the core, & 3) a second buffer where sustainable resource extraction is permitted.
- in recent years additional attention has been given to the need for corridors, which connect protected areas & enable migration of wild species.

Protecting Biodiversity

Percentage of land area set aside as protected parks, wildlife refuges, & nature preserves in various regions of the world. The International Union for the Conservation of Nature (IUCN) has identified an additional 3,000 sites worthy of being designated as national parks or wildlife refuges.

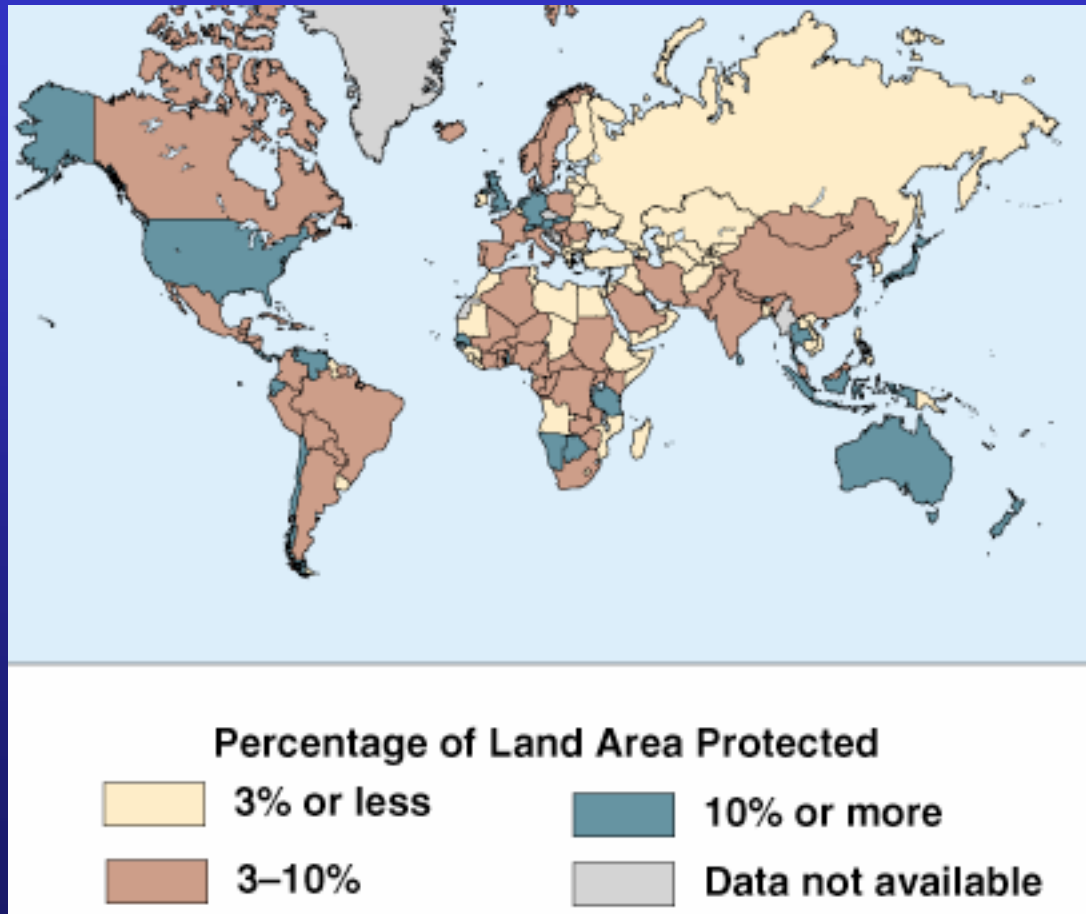


Fig. 23–16

Protecting Biodiversity

The earth's most diverse countries. Developing countries, with 80% of world population, also harbor 80% of the world's biodiversity but only 15% of the world's wealth. Protecting the world's biodiversity requires financial & scientific help from developed countries.



Fig. 23–18

Protecting Biodiversity

Wilderness areas by major geographical areas. According to wilderness supporters, we need wild places where we can experience the beauty of nature & observe natural biological diversity, & enhance our mental & physical health.

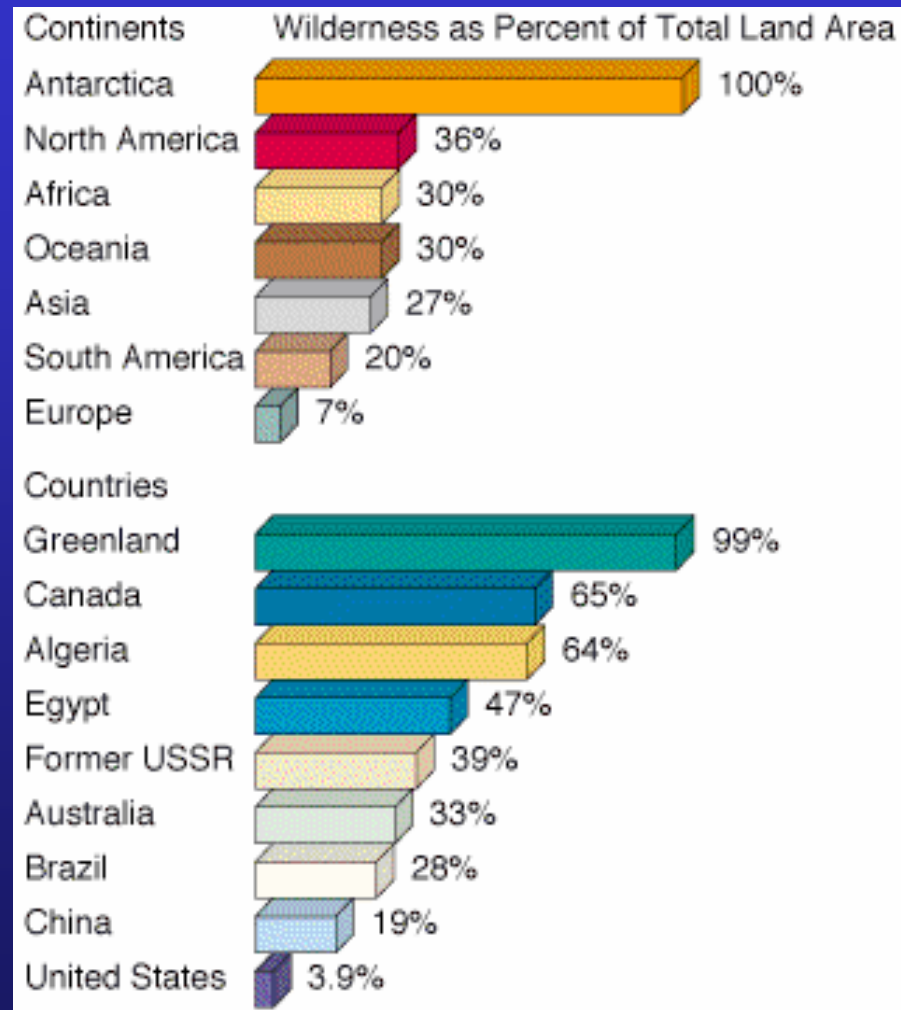


Fig. 23-19

Protecting Biodiversity

Design of a model biosphere reserve. Unlike traditional parks & reserves, biosphere reserves recognize local people's needs for access to sustainable use of resources in parts of the reserve.

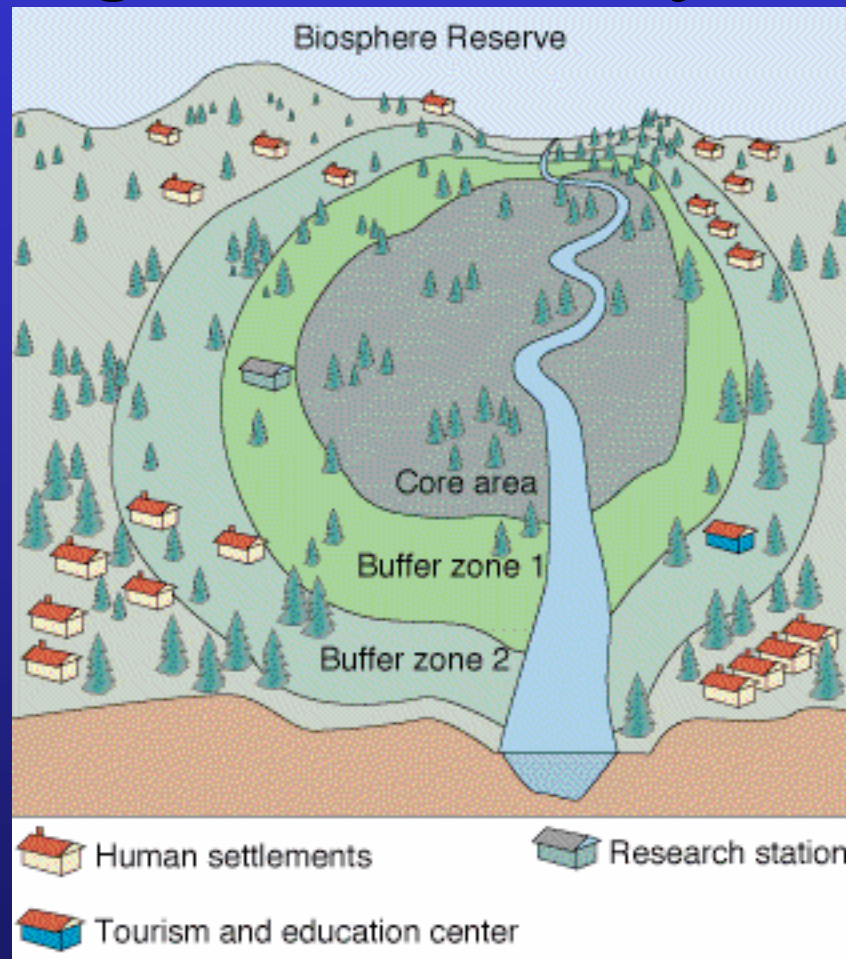
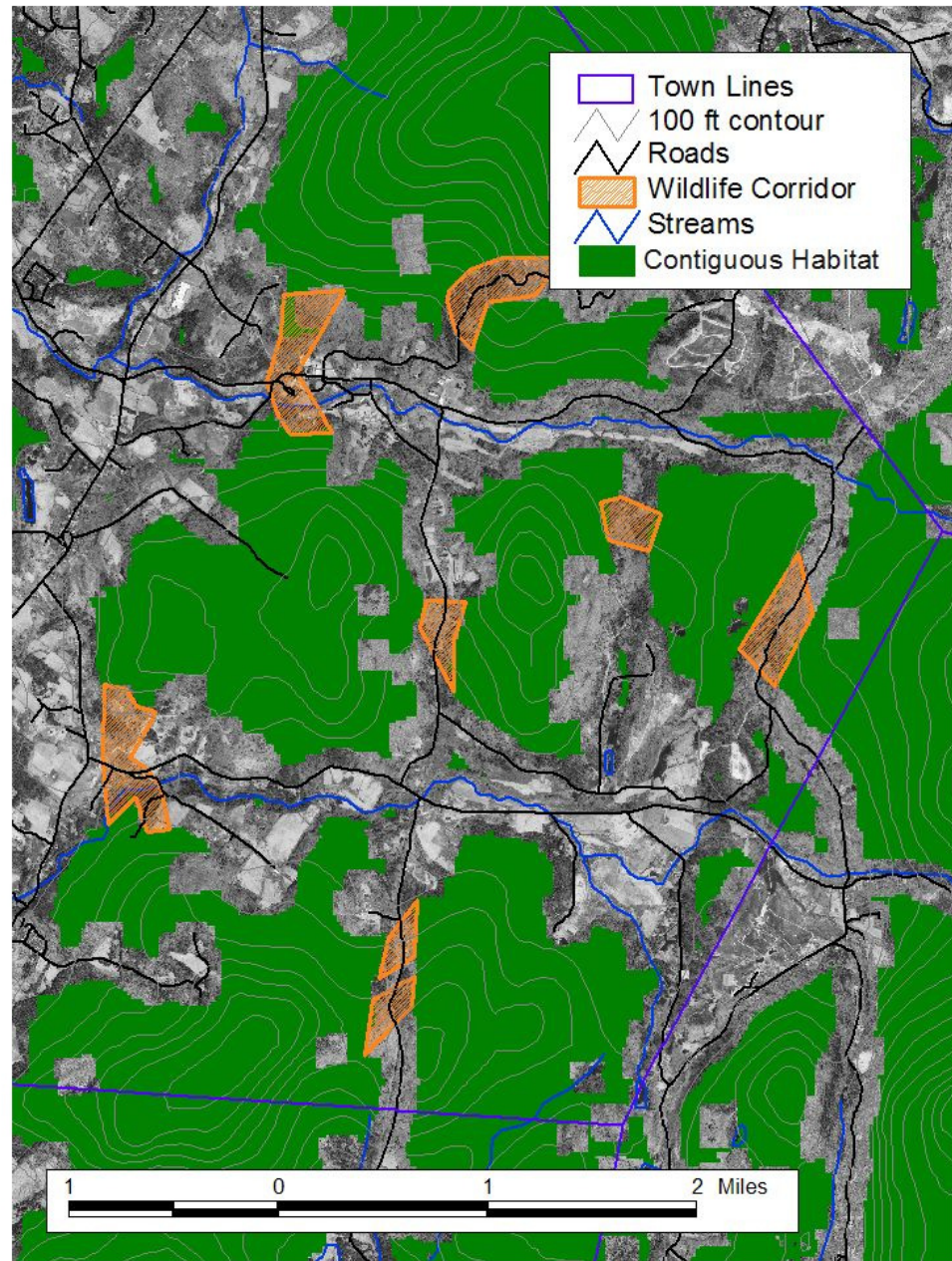


Fig. 23-17

Habitat Corridors



Protecting Biodiversity

Should conservation efforts focus on sustaining ecosystems or species?

- the consensus among conservation biologists is that protecting biodiversity requires both whole ecosystem & species-by-species approaches;
- the advantage of the whole ecosystem approach is that it focuses on protecting sufficient land to protect ecological integrity & provide habitat for the majority of wild species;
- the advantage of the species-by-species approach is that it identifies which species are at greatest risk & focuses attention on those species.

Protecting Biodiversity

What is gap analysis?

- **gap analysis** assesses how adequately native plant & animal species & natural communities are protected by the network of conservation lands;
- practically, this involves comparing maps of species ranges & natural communities with maps of protected lands;
- areas in need of protection, but not currently protected, are known as "gaps".

The task of protecting the earth's biodiversity & ecological integrity is enormous, but possible if enough of us become involved.

Protecting Biodiversity

In 1986, gap analysis was used to determine that less than 10% of the ranges of endangered Hawaiian birds on the island of Kauai were in protected reserves. Since then, several areas of high endangered bird richness have been protected by the Nature Conservancy and state and federal agencies.

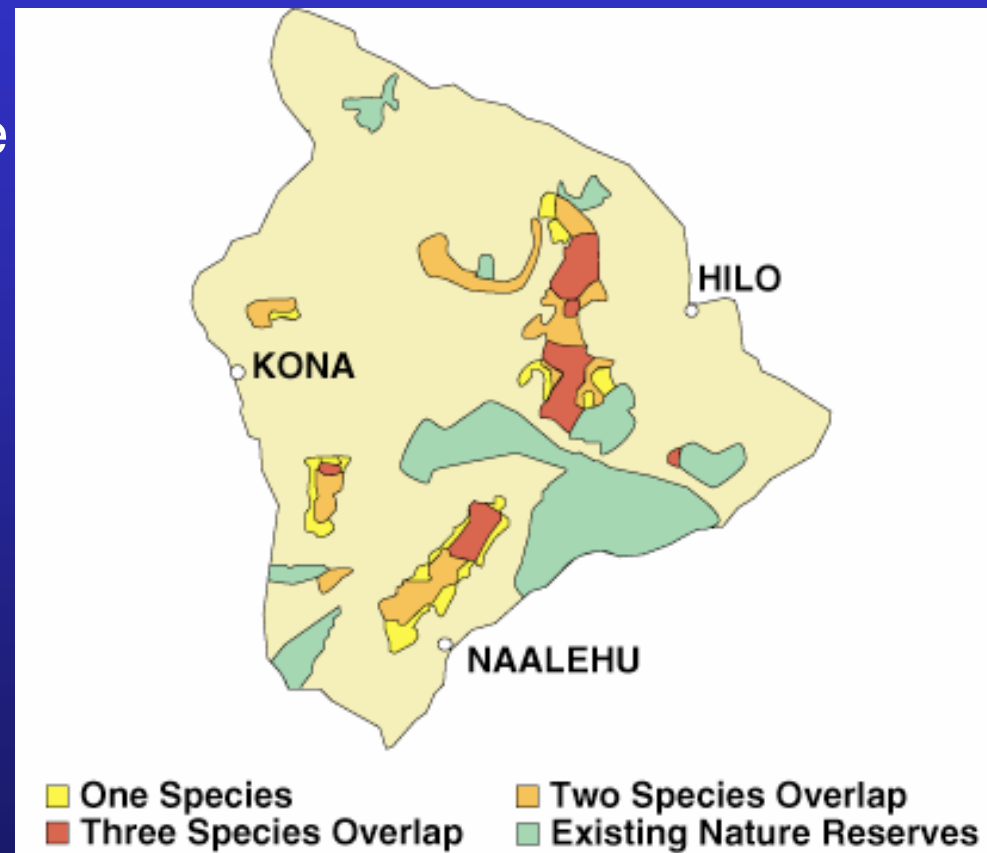


Fig. 23-20