

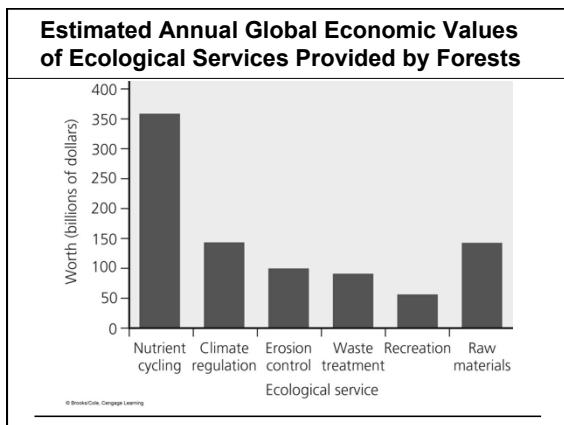
Natural Capital: An Old-Growth Forest and an Old-Growth Tropical Forest

Forests Provide Important Economic and Ecological Services (1)

- Support energy flow and chemical cycling
- Reduce soil erosion
- Absorb and release water
- Purify water and air
- Influence local and regional climate
- Store atmospheric carbon
- Provide habitats

Forests Provide Important Economic and Ecological Services (2)

- Wood for fuel
- Lumber
- Pulp to make paper
- Recreation
- Employment



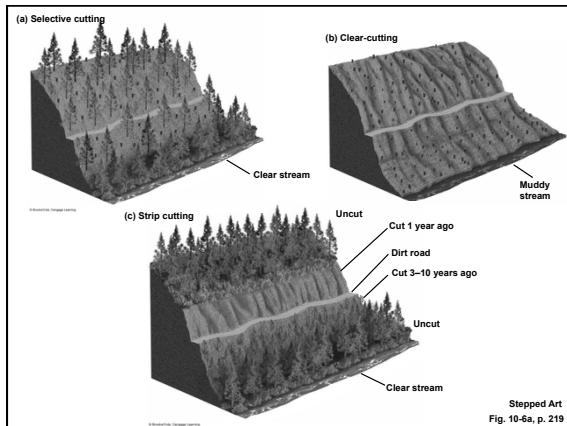
Unsustainable Logging is a Major Threat to Forest Ecosystems (1)

- Increased erosion
- Sediment runoff into waterways
- Habitat fragmentation
- Loss of biodiversity

Unsustainable Logging is a Major Threat to Forest Ecosystems (2)

- Major tree harvesting methods:
 - Selective cutting
 - Clear-cutting
 - Strip cutting

Clear-cut logging in Washington State



Trade-offs: Advantages and Disadvantages of Clear-Cutting Forests

TRADE-OFFS	
Clear-Cutting Forests	
Advantages	Disadvantages
Higher timber yields	Reduces biodiversity
Maximum profits in shortest time	Destroys and fragments wildlife habitats
Can reforest with fast-growing trees	Increases water pollution, flooding, and erosion on steep slopes
Good for tree species needing full or moderate sunlight	Eliminates most recreational value

Fire, Insects, and Climate Change Can Threaten Forest Ecosystems (1)

- Surface fires

- Usually burn leaf litter and undergrowth
 - May provide food in the form of vegetation that sprouts after fire

- **Crown fires**

- Extremely hot: burns whole trees
 - Kill wildlife
 - Increase soil erosion

Surface and Crown Fires



We Have Cut Down Almost Half of the World's Forests

▪ Deforestation

- Tropical forests
 - Especially in Latin America, Indonesia, and Africa
- Boreal forests
 - Especially in Alaska, Canada, Scandinavia, and Russia

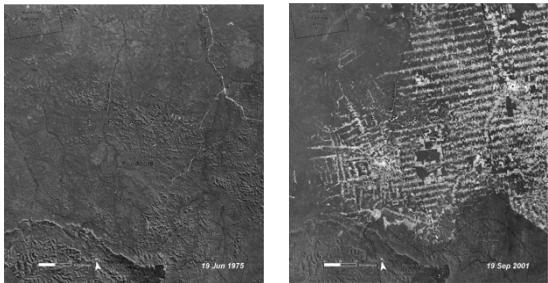
Natural Capital Degradation: Harmful Environmental Effects of Deforestation

NATURAL CAPITAL DEGRADATION

Deforestation

- Decreased soil fertility from erosion
- Runoff of eroded soil into aquatic systems
- Premature extinction of species with specialized niches
- Loss of habitat for native species and migratory species such as birds and butterflies
- Regional climate change from extensive clearing
- Release of CO₂ into atmosphere
- Acceleration of flooding

Satellite Images of Amazon Deforestation between 1975 and 2001



Natural Capital Degradation: Large Areas of Brazil's Amazon Basin Are Burned



10-2 How Should We Manage and Sustain Forests?

- **Concept 10-2** We can sustain forests by emphasizing the economic value of their ecological services, protecting old-growth forests, harvesting trees no faster than they are replenished, and using sustainable substitute resources.

Solution: Sustainable Forestry



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SOLUTIONS

Sustaining Tropical Forests

Prevention

Protect the most diverse and endangered areas

Educate settlers about sustainable agriculture and forestry

Subsidize only sustainable forest use

Protect forests with debt-for-nature swaps and conservation concessions

Certify sustainably grown timber

Reduce poverty

Slow population growth



Restoration

Encourage regrowth through secondary succession



Rehabilitate degraded areas



Concentrate farming and ranching in already-cleared areas

Fig. 10-19, p. 231

10-3 How Should We Manage and Sustain Grasslands?

- Concept 10-3** We can sustain the productivity of grasslands by controlling the number and distribution of grazing livestock and restoring degraded grasslands.

Some Rangelands Are Overgrazed (1)

- Important ecological services of grasslands
 - Soil formation
 - Erosion control
 - Nutrient cycling
 - Storage of atmospheric carbon dioxide in biomass
 - Maintenance of biodiversity

Some Rangelands are Overgrazed (2)

- Overgrazing of rangelands (exceeding carrying capacity)
 - Reduces grass cover
 - Leads to erosion of soil by water and wind
 - Soil becomes compacted
 - Enhances invasion of plant species that cattle won't eat

Natural Capital Degradation: Overgrazed and Lightly Grazed Rangeland

10-4 How Should We Manage and Sustain Parks and Natural Reserves?

- **Concept 10-4** Sustaining biodiversity will require protecting much more of the earth's remaining undisturbed land area as parks and nature reserves.

National Parks Face Many Environmental Threats

- Worldwide: 1100 major national parks in 120 countries (most are too small to sustain large species)
- Parks in developing countries
 - Greatest biodiversity
 - 1% protected from:
 - Illegal animal poaching
 - Illegal logging and mining

Solutions: National Parks

SOLUTIONS

National Parks

- Integrate plans for managing parks and nearby federal lands
- Add new parkland near threatened parks
- Buy private land inside parks
- Locate visitor parking outside parks and provide shuttle buses for people touring heavily used parks
- Increase federal funds for park maintenance and repairs
- Raise entry fees for visitors and use resulting funds for park management and maintenance
- Seek private donations for park maintenance and repairs
- Limit the number of visitors in crowded park areas
- Increase the number of park rangers and their pay
- Encourage volunteers to give visitor lectures and tours

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Case Study: Controversy over Wilderness Protection in the United States

Wilderness Act of 1964

- How much of the United States is protected land?
 - 4.6% mostly in AK
 - Only 4 of 413 in lower 48 are large enough to sustain spp
- Roadless Rule – temporary protection ca. 20 yrs
- 2005: end of roadless areas within the national forest system
 - Can no longer qualify as “wilderness”

Case Study: Costa Rica—A Global Conservation Leader

- 1963–1983: cleared much of the forest for grazing cattle
- 1986–2006: forests grew from 26% to 51%
 - Goal: to reduce net carbon dioxide emissions to zero by 2021
- Eight zoned megareserves
 - Designed to sustain around 80% of Costa Rica’s biodiversity

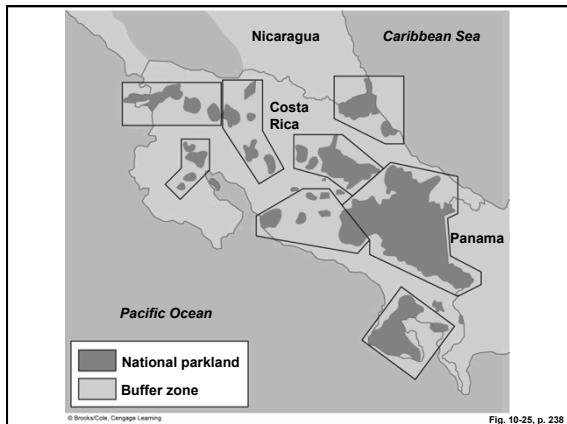


Fig. 10-25, p. 238

10-5 What is the Ecosystem Approach to Sustaining Biodiversity? (1)

- **Concept 10-5A** We can help sustain biodiversity by identifying severely threatened areas and protecting those with high plant diversity and those where ecosystem services are being impaired.
- **Concept 10-5B** Sustaining biodiversity will require a global effort to rehabilitate and restore damaged ecosystems.

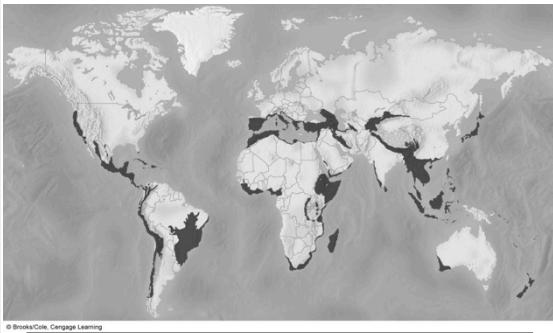
10-5 What is the Ecosystem Approach to Sustaining Biodiversity? (2)

- **Concept 10-5C** Humans dominate most of the earth's land, and preserving biodiversity will require sharing as much of it as possible with other species.

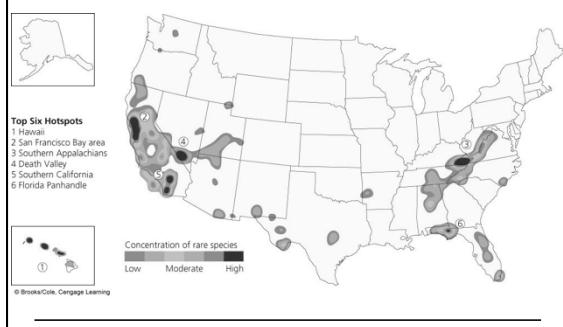
We Can Use a Four-Point Strategy to Protect Ecosystems

- Map global ecosystems; identify species
- Locate and protect most endangered species
- Restore degraded ecosystems
- Development must be biodiversity-friendly
 - Incentives and technical help to landowners
- Are new laws needed?

Endangered Natural Capital: 34 Biodiversity Hotspots



Endangered Natural Capital: Biodiversity Hotspots in the U.S.



Protecting Ecosystem Services Is Also an Urgent Priority

- U.N. Millennium Ecosystem Assessment: 2005
 - Identify key ecosystem services
 - Human activities degrade or overuse 62% of the earth's natural services
- Identify highly stressed **life raft ecosystems**
aka areas of severe poverty

We Can Rehabilitate and Restore Ecosystems That We Have Damaged (1)

- Study how natural ecosystems recover
 - Restoration
 - Return to natural state
 - Rehabilitation
 - Return to functional ecosystem
 - Replacement
 - Change to another ecosystem
 - Degraded forest -> tree plantation
 - Creating artificial ecosystems
 - wetlands

We Can Rehabilitate and Restore Ecosystems That We Have Damaged (2)

- How to carry out most forms of ecological restoration and rehabilitation
 - Identify what caused the degradation
 - Stop the abuse
 - Reintroduce species, if possible
 - Protect from further degradation

Will Restoration Encourage Further Destruction?

- Preventing ecosystem damage is cheaper than restoration
- About 5% of the earth's land is preserved from the effects of human activities

Case Study: The Blackfoot Challenge— Reconciliation Ecology in Action

- 1970s: Blackfoot River Valley in Montana threatened by
 - Poor mining, logging, and grazing practices
 - Water and air pollution
 - Unsustainable commercial and residential development
- Community meetings led to
 - Weed-pulling parties
 - Nesting structures for waterfowl
 - Developed sustainable grazing systems

What Can You Do? Sustaining Terrestrial Biodiversity

WHAT CAN YOU DO?

Sustaining Terrestrial Biodiversity

- Adopt a forest
- Plant trees and take care of them
- Recycle paper and buy recycled paper products
- Buy sustainably produced wood and wood products
- Choose wood substitutes such as bamboo furniture and recycled plastic outdoor furniture, decking, and fencing
- Help to restore a nearby degraded forest or grassland
- Landscape your yard with a diversity of plants natural to the area
