Sustaining Ecosystems: Deforestation, Biodiversity, & Forest Management

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Outline

1. Forests
   Types & Importance

2. Temperate Deforestation
   old–growth forest, U.S. & Canada

3. Tropical Deforestation
   clearing & degrading forests, loss of biodiversity

4. Managing Forests
   management practices, sustainability, reducing deforestation

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Slightly more than half of forests are in the tropics. The rest are in temperate & boreal zones. More than 60% of forests are in seven countries: Brazil, Russia, Canada, the U.S., China, Indonesia, & Congo.

Fig. 7–11
The Problem of Deforestation

Estimated annual rates of deforestation 1981–90. During this period tropical forests decreased by 8%. Similar rates of deforestation have continued during the 1990s.

Fig. 24–2
Economic Importance of Forests

Some of the many useful products obtained from trees. Forests produce more than $300 billion in economic products each year.

Fig. 24–3
Forests play various important ecological roles:

- **regulate the flow of water**
  slow runoff, provide continual recharge of groundwater & streams, reduce soil erosion & stream sediments

- **influence climate**
  increase local precipitation & lower local temperatures

- **vital to carbon cycle**
  take up 90% of carbon fixed by terrestrial ecosystems

- **provide wildlife habitat**

- according to one calculation a typical tree provides $196,250 worth of ecological benefits in its lifetime
  oxygen, air purification, soil fertility & erosion control, water recycling & humidity control, wildlife habitat
Since 1600 most of the old–growth forests in the lower 48 states have been cleared. Second–growth forests grow as the result of secondary succession after forests are cut.

Fig. 24–4
Old–Growth Temperate Forests

Old–growth forests are uncut & regenerated forests that have not been seriously disturbed for several hundred or thousands of years.

• temperate examples: forests of Douglas fir, western hemlock, giant sequoia, & coastal redwoods in the western U.S.; loblolly pine in the southeast; boreal forests in Russia, western Canada, & Alaska;

• niches for multitude of species;

• diversity of tree ages, dead trees (snags), & fallen logs; significant recycling of nutrients.

Fig. 4–13
Today U.S. forests generally bigger & often healthier than in 1900.

- due to reversion of marginal farmlands to forests, planting of tree farms, more efficient use of wood products, recycling, & substitutes for wood products;

- since 1950 total volume of timber increased 50%;

- 85–95% of U.S. old–growth forests cleared;

- most remaining old–growth forests are in fragmented areas of the northwest.
Old–Growth Forest Controversy

Should old–growth forests be cut or preserved?

• in Pacific northwest requires about 350 years for an old–growth forest to reach its prime in terms of growth & biodiversity;

• timber industry stress economic importance of old–growth forests, support more than 100,000 loggers & millworkers;

• conservationists stress ecological, scientific, aesthetic, & recreational values;

• environmentalists use the threatened northern spotted owl, which lives almost exclusively in old–growth pacific northwest forests, as a means to halt or slow the cutting of old–growth forests.
3. Tropical Deforestation

Tropical forests cover about 6% of Earth's land area...

- four countries contain more than half of the world’s tropical forests: Brazil, Indonesia, Zaire, & Peru;
- high biodiversity: tropical forests contain 50–90% of Earth's terrestrial species;
- economic products: half annual harvest of hardwoods, food (coffee, tea, spices, nuts, chocolate, fruits...), medicines, latex rubber, resins, dyes, essential oils;
- home & source of resources for indigenous peoples.
Causes of Tropical Deforestation

Primary Causes:
• population growth;
• poverty;
• exploitive government policies;
• exports to developed countries;
• failure to include ecological services in evaluation of forest resources.

Secondary Causes:
• roads, logging, mining;
• unsustainable peasant farming;
• cash crops, tree plantations;
• cattle ranching;
• flooding from dams
• oil drilling.

Fig. 24–13
Tropical Deforestation

Building roads into previously inaccessible areas leads to forest fragmentation, destruction, & degradation.

Fig. 24–15
Case Study: Madagascar

Madagascar, fourth largest island in world, harbors unique & abundant biodiversity:

- 160,000 plant & animal species unique to island (e.g., lemurs, orchids, butterflies, birds...); among the world's most endangered;
- deforestation is primary threat to biodiversity;
- major conservation effort underway, involving local government, international conservation organizations, & scientists.

Fig. 24–7

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Scarcity of fuelwood, driven by population growth in developing countries, is one of the major factors causing tropical deforestation.
4. Managing Forests

About 25% of the world's forests are managed for wood production.

• **Rotations** involve a forest management cycle of tree growth & harvest.

• Wood volume produced is maximized in relatively long rotations.

Fig. 24–18
Selective cutting involves removing only some trees, and allows natural regeneration from surrounding trees.

Fig. 24–19
Clear-cutting involves removing all trees. After clear-cutting the site is generally planted with seedlings, leading to even-age stands. Erosion can be severe after clear-cutting.

Fig. 24–19
Can forests be managed sustainably?

- various examples of temperate forests that can be managed sustainably;
- few examples of tropical forests managed sustainably, except in cases where much of the forest is left intact;
- sustainable forestry requires knowledge of the type of forest, sufficiently long rotations, & appropriate management (planting, thinning, monitoring…);
- major difference between forests managed for plantation purposes vs. to maintain ecological integrity.

Managing Forests

Some ways to improve federal forest management in the United States:

• institute policy that makes sustaining biodiversity a high priority;
• full–cost accounting of ecological services provided by forests;
• prohibit logging of at least half of remaining old–growth forests;
• reduce or ban timber harvest from National Forests & fund lands from recreational user fees;
• reduce building of new roads in national forests;
• require that timber be sold at costs that include road building, site preparation, & site regeneration;
• do not use money from timber sales to supplement the Forest Service budget;
• eliminate loopholes in current ban on exporting timber from public lands;
• provide increased aid & job retraining for displaced workers.
Some ways to decrease tropical deforestation:

- **ecotourism**: promoting tourism that benefits from the aesthetic, educational, & recreational opportunities provided by intact forest;

- **debt–for–nature swaps**: forgiving foreign debt in exchange for preserving forest;

- **extractive reserves**: sustainable harvest of forest products such as nuts, fruits, herbs, spices, oils, medicines, & latex rubber;

- **decreasing the fuelwood crisis**: planting fast-growing fuelwood trees & shrubs, burning wood more efficiently, & switching to other fuels.