

Sustaining Ecosystems: Deforestation, Biodiversity, & Forest Management

tutorial by Paul Rich

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

1. Forests

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.

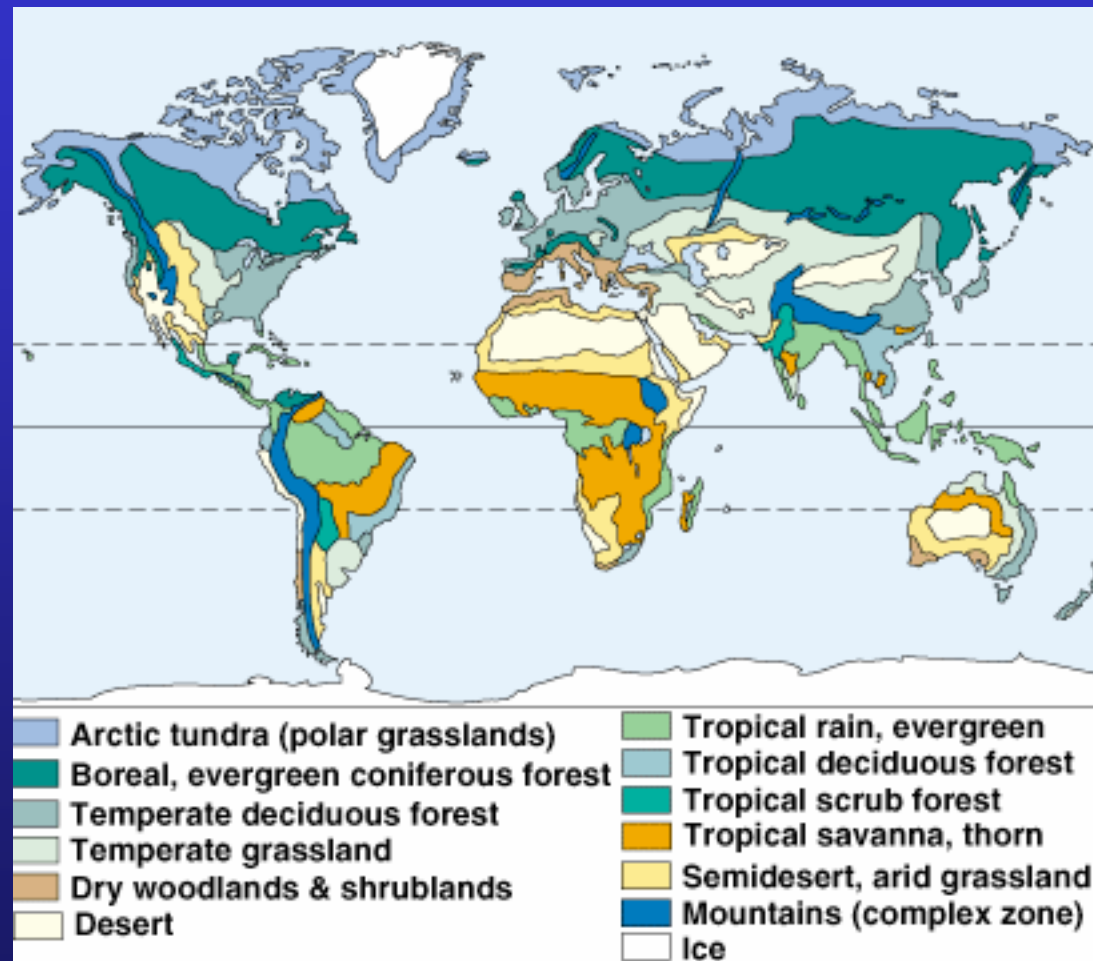


Fig. 7-11

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.

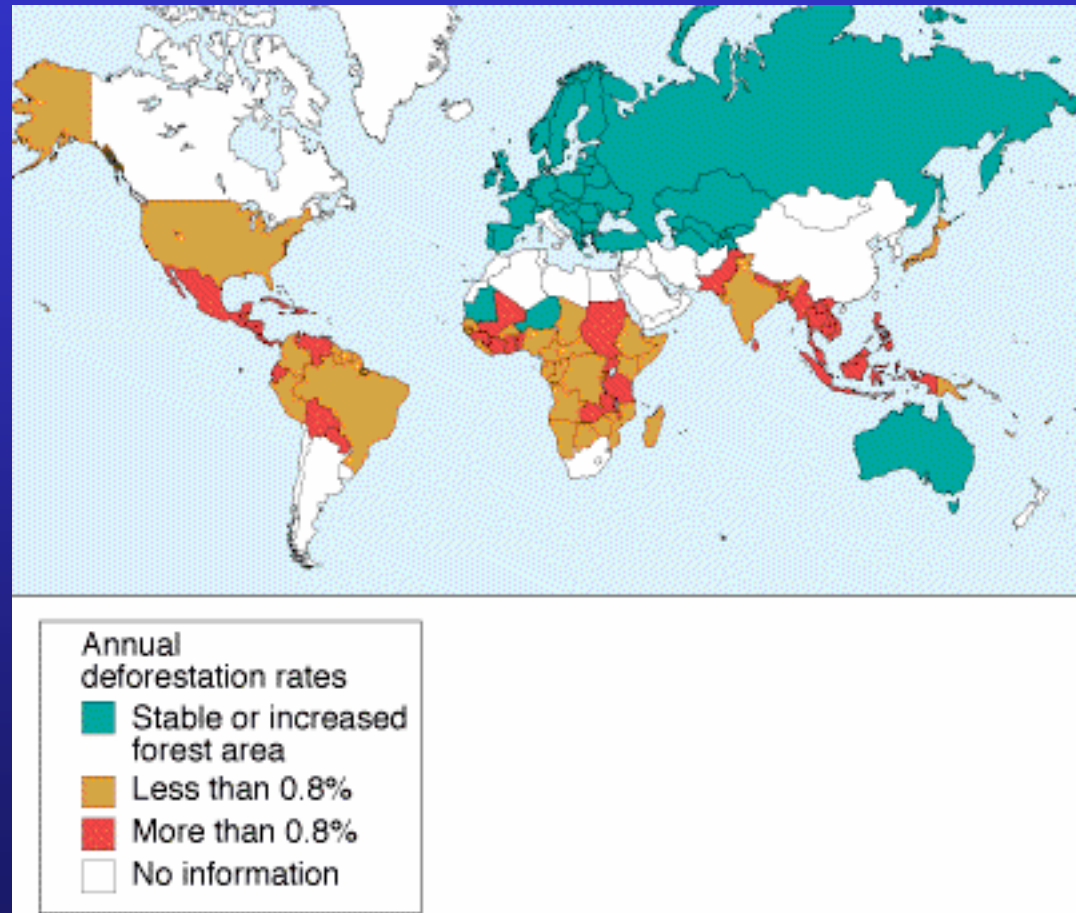


Fig. 24–2

Economic Importance of Forests

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

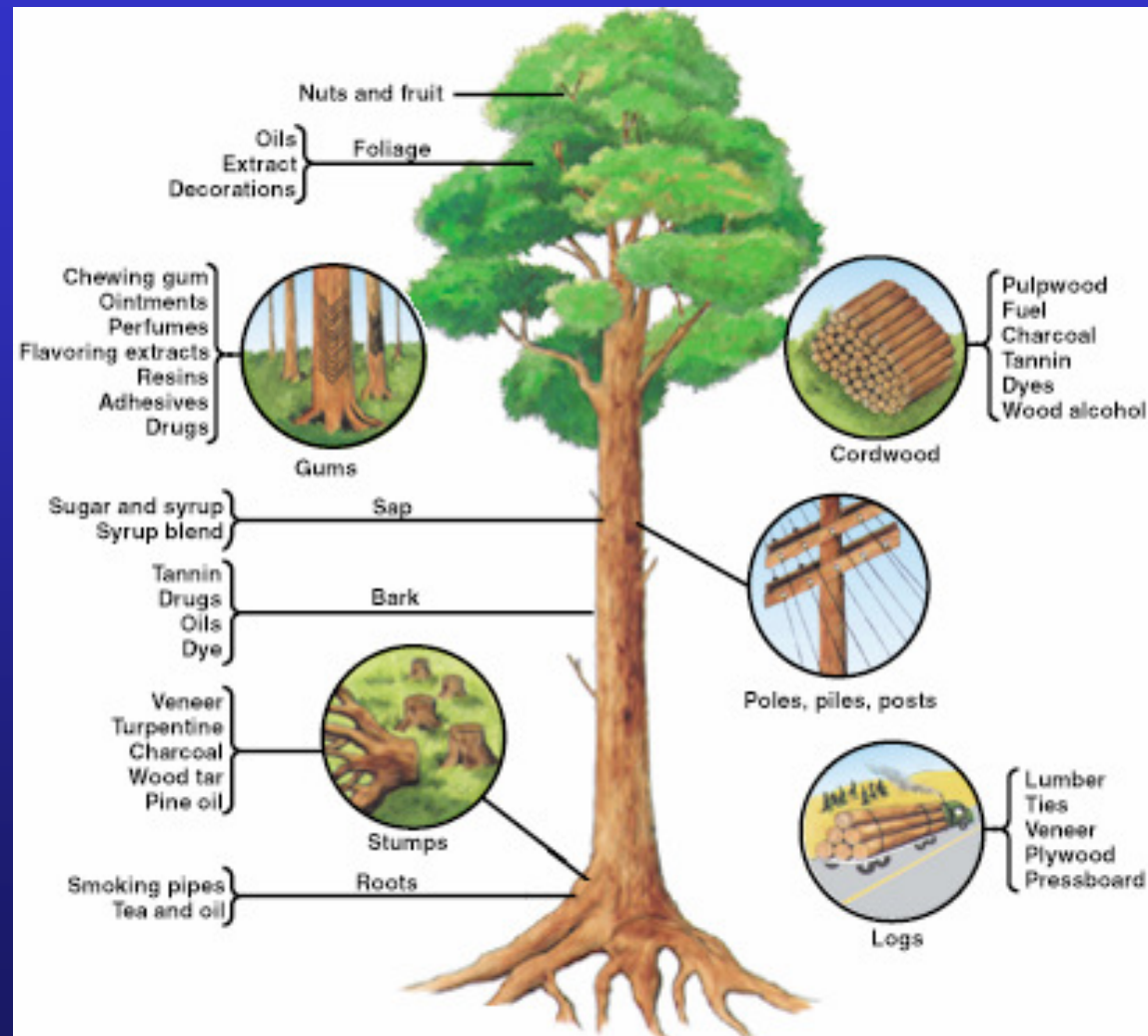


Fig. 24-3

Ecological Importance of Forests

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

2. Temperate Deforestation

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.

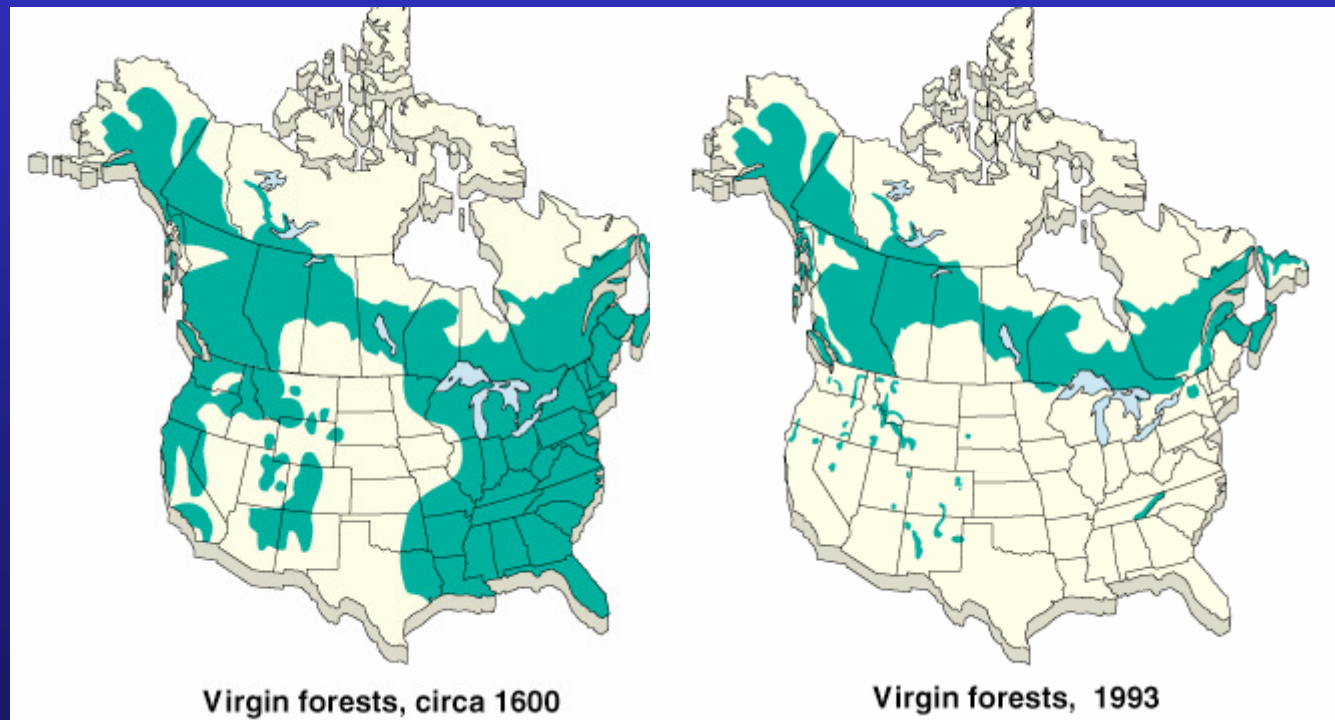


Fig. 24-4

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.

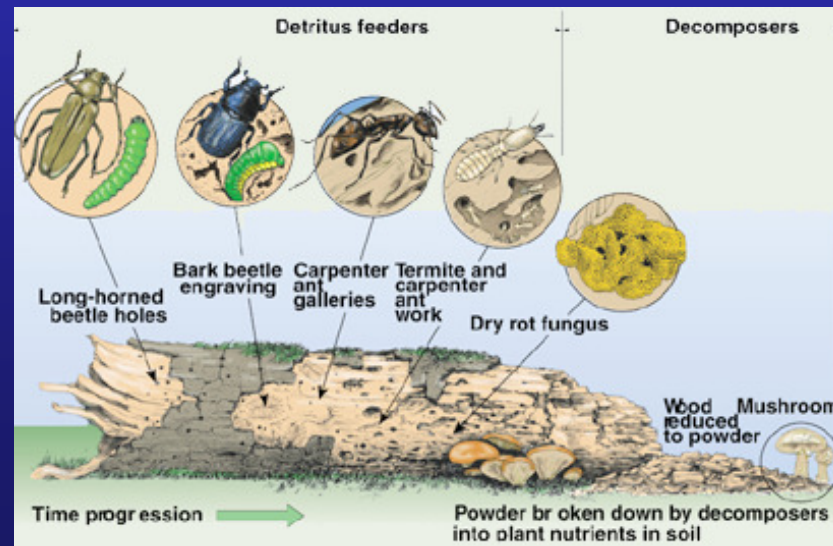


Fig. 4-13

Status of U.S. Temperate Forests

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

© Brooks/Cole Publishing Company / ITP

Tropical Deforestation

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

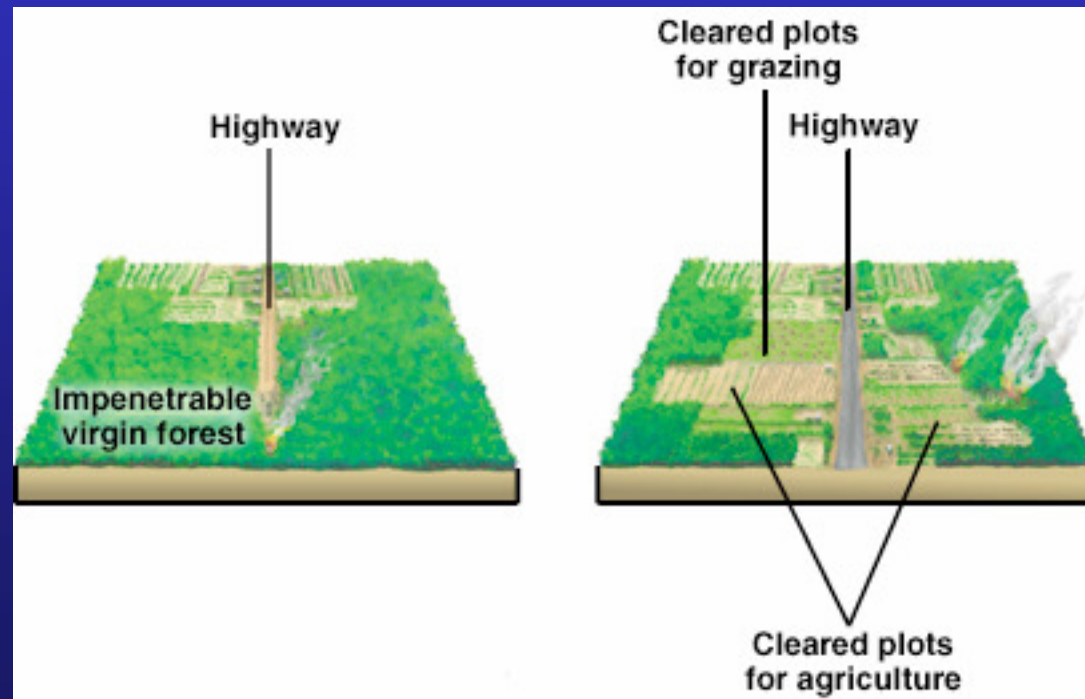


Fig. 24–15

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.

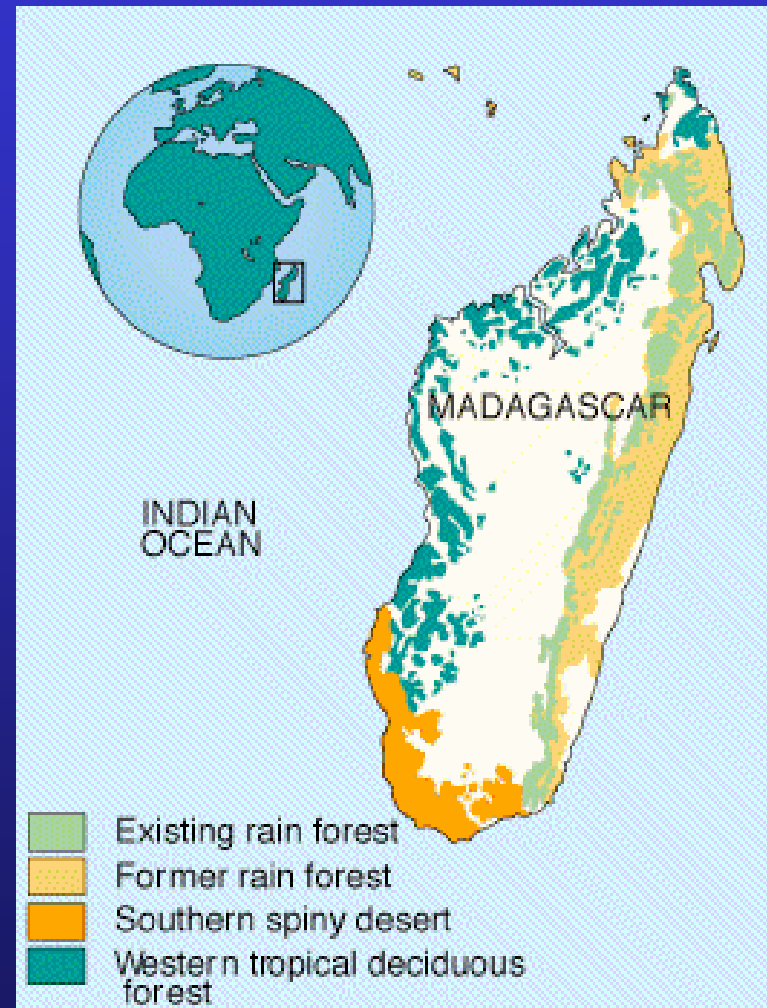


Fig. 24–7

Fuelwood Crisis

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

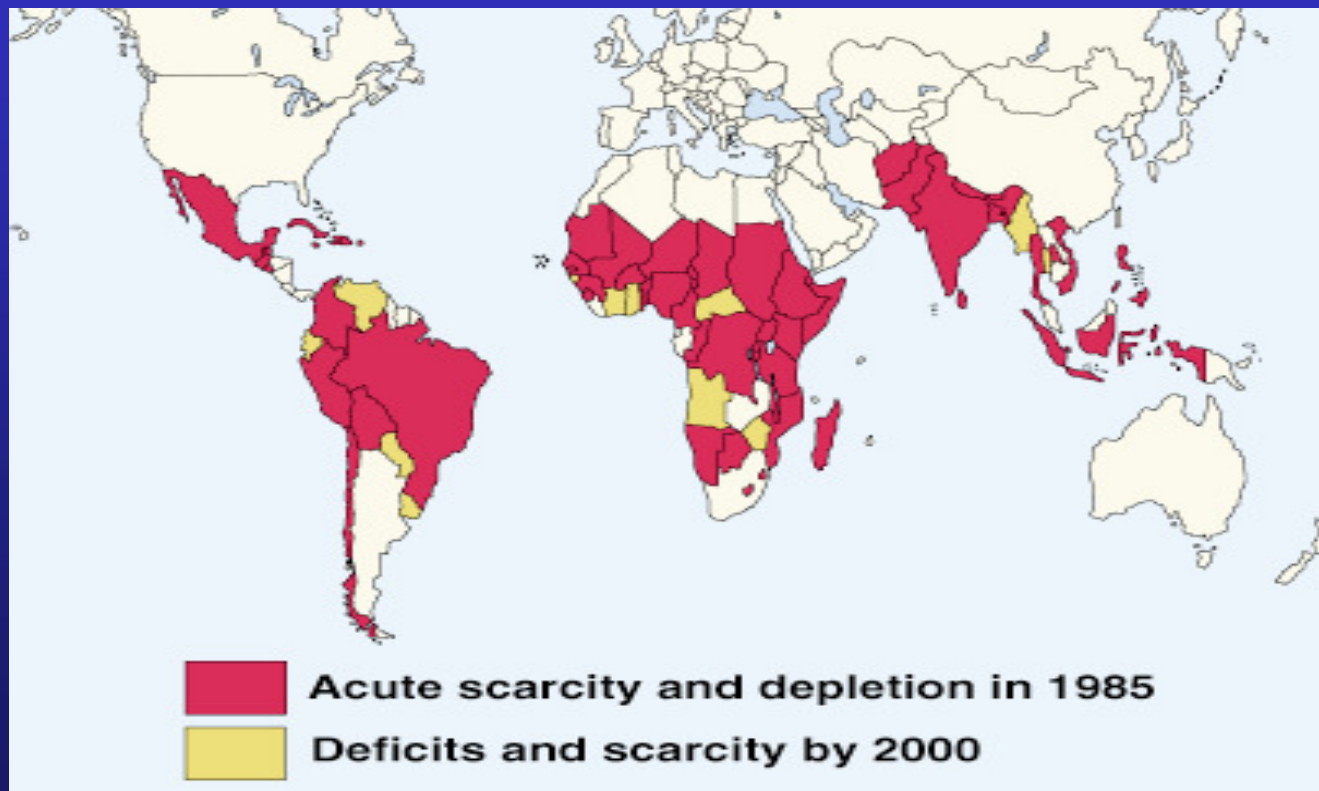


Fig. 24-16

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.

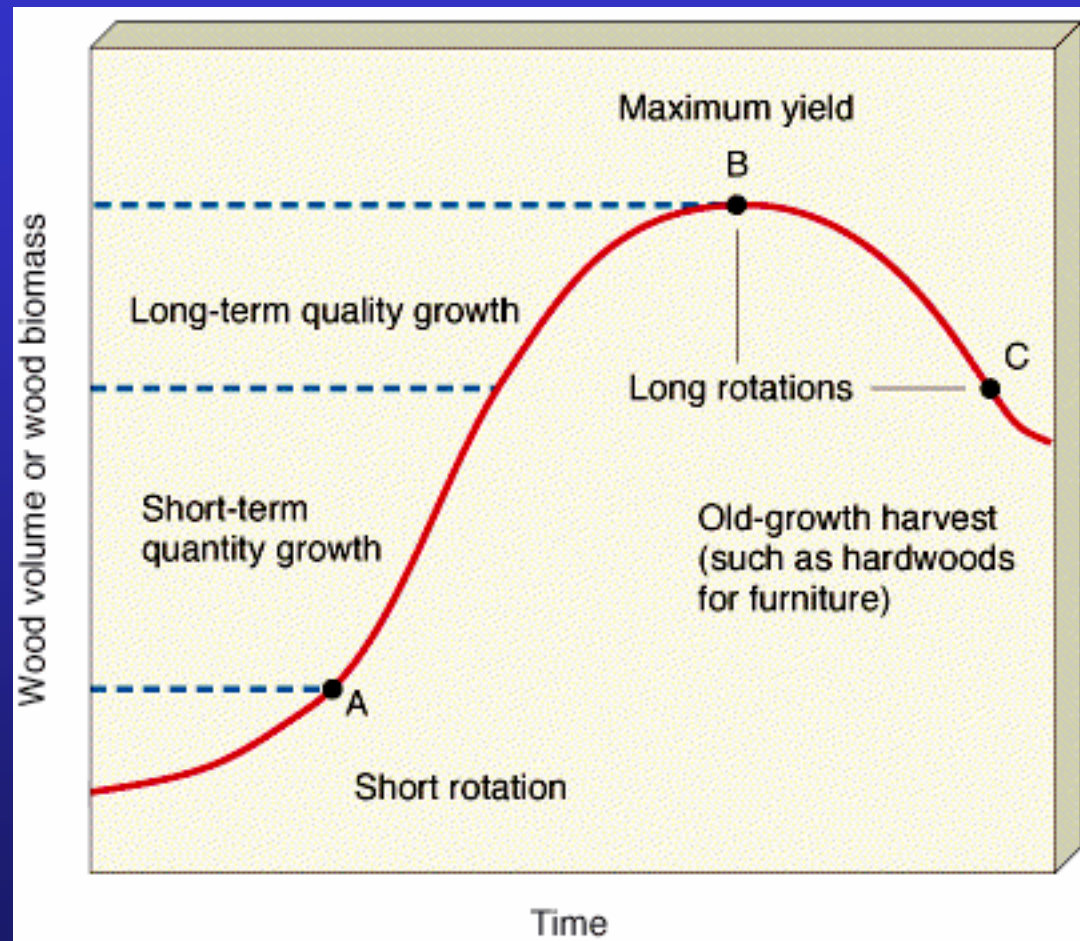


Fig. 24–18

Managing Forests

Selective cutting involves removing only some trees, & allows natural regeneration from surrounding trees.



Fig. 24–19

Managing Forests

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.

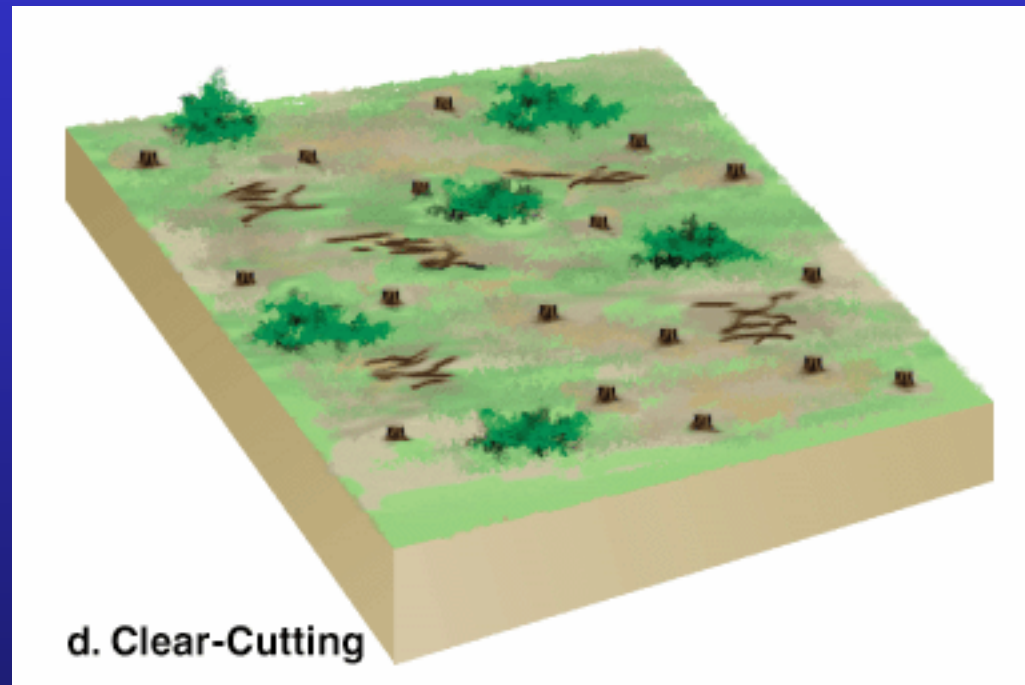


Fig. 24-19

Managing Forests

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.

Video; <http://video.nationalgeographic.com/video/player/environment/going-green-environment/conservation-in-action/sustainable-logging.html>

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.

Managing Forests

Some ways to decrease tropical deforestation:

- **ecotourism:** promoting tourism that benefits from the aesthetic, education, & 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.