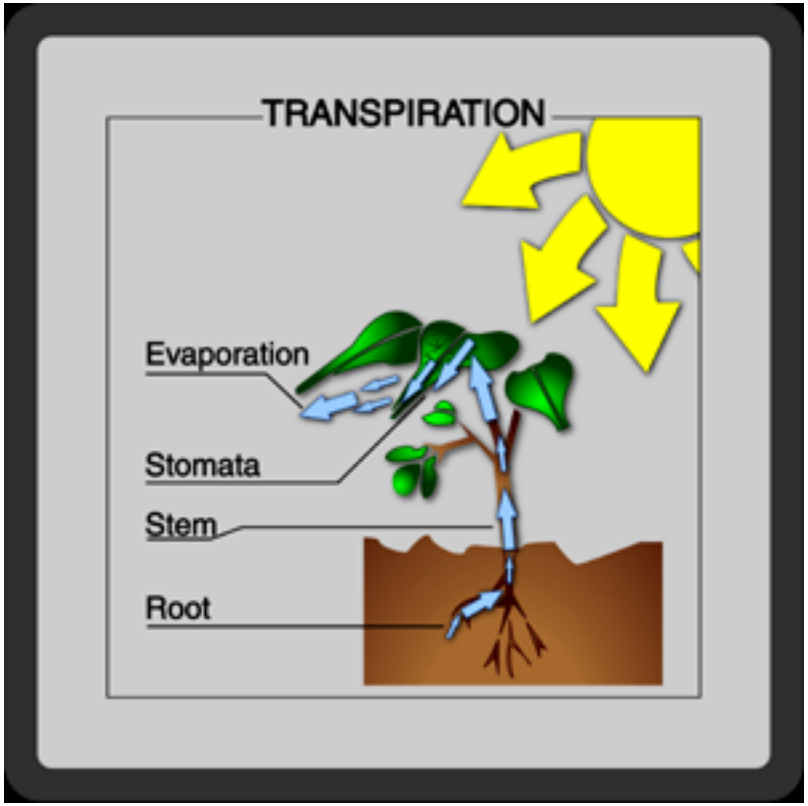
Ecosystems as Resources

Chapter 12

Natural Services of Ecosystems

1.Modification of climate

Plants absorb solar radiation and release water monitoring temperature and maintaining an even climate



2. *Maintenance of the hydrologic cycle*

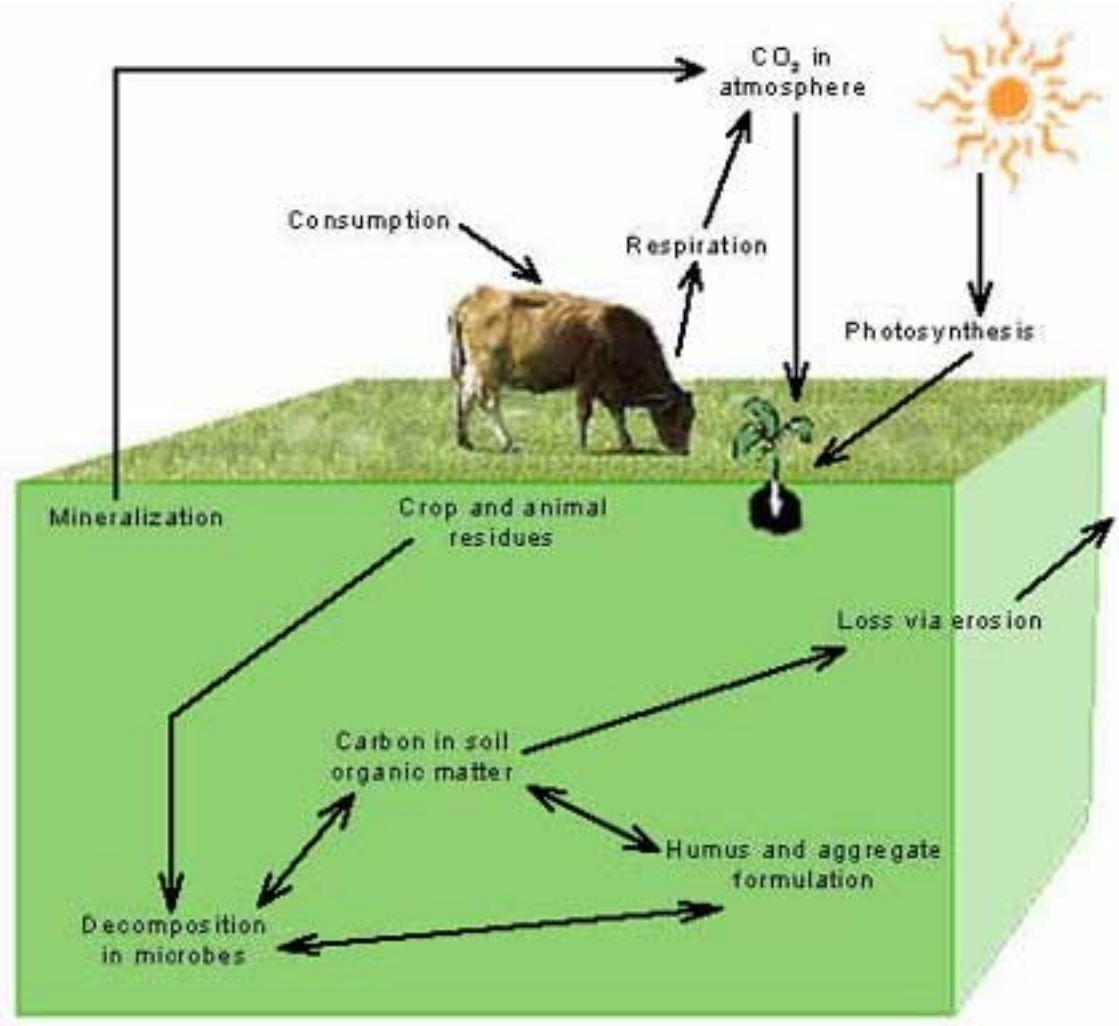
Plants absorb water from soil and return it to the atmosphere by transpiration. Forests, grasslands and wetlands prevent flooding by absorbing water when it is abundant and releasing it gradually

3. *Erosion control and soil building*

Plant cover and ground litter absorb the potentially destructive impact of rainfall and prevent breakup of soil. Forests prevent erosion on hilly terrain

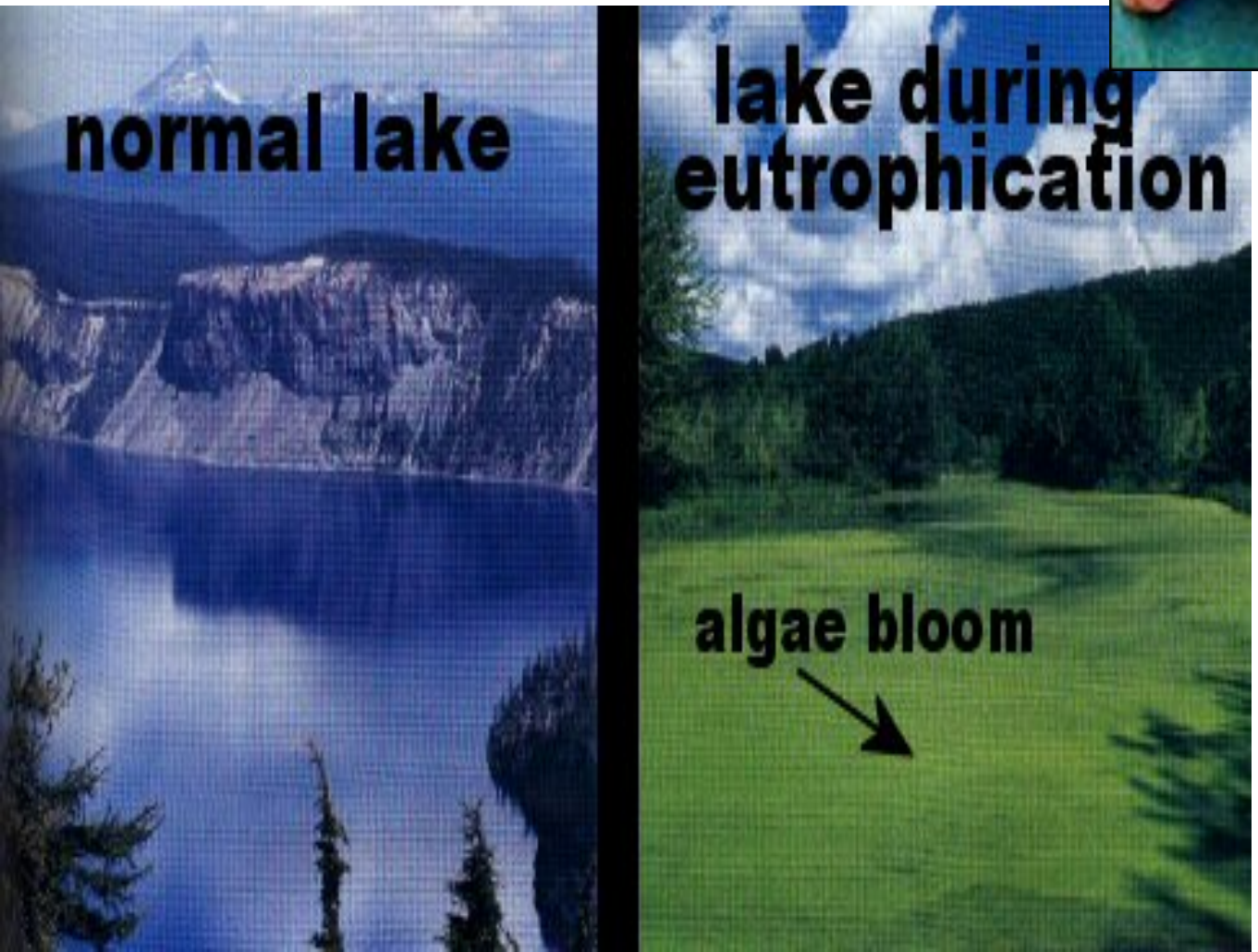
4. *Maintenance of the oxygen and nitrogen cycles*

Photosynthesis continually regenerates oxygen and microbes maintain soil fertility through nitrogen fixation



5. Waste Treatment

Wetlands stabilize sediments, absorb excess nutrients, and prevent eutrophication



6. Pest Management

Natural ecosystems contain a diverse array of insect predators

7. Carbon storage and maintenance of the carbon cycle

Over 500 billion metric tons of carbon are stored in the standing biomass of forest – more than is found in the entire atmosphere

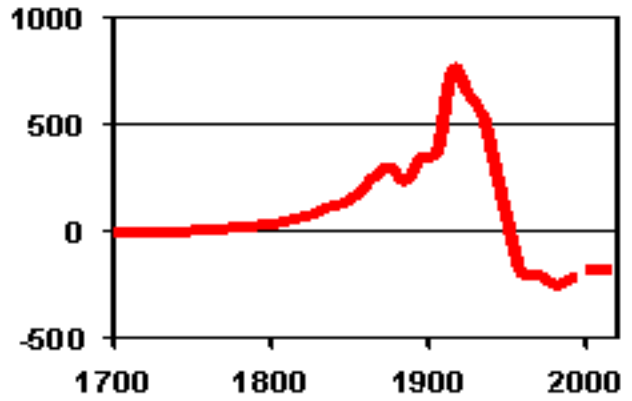
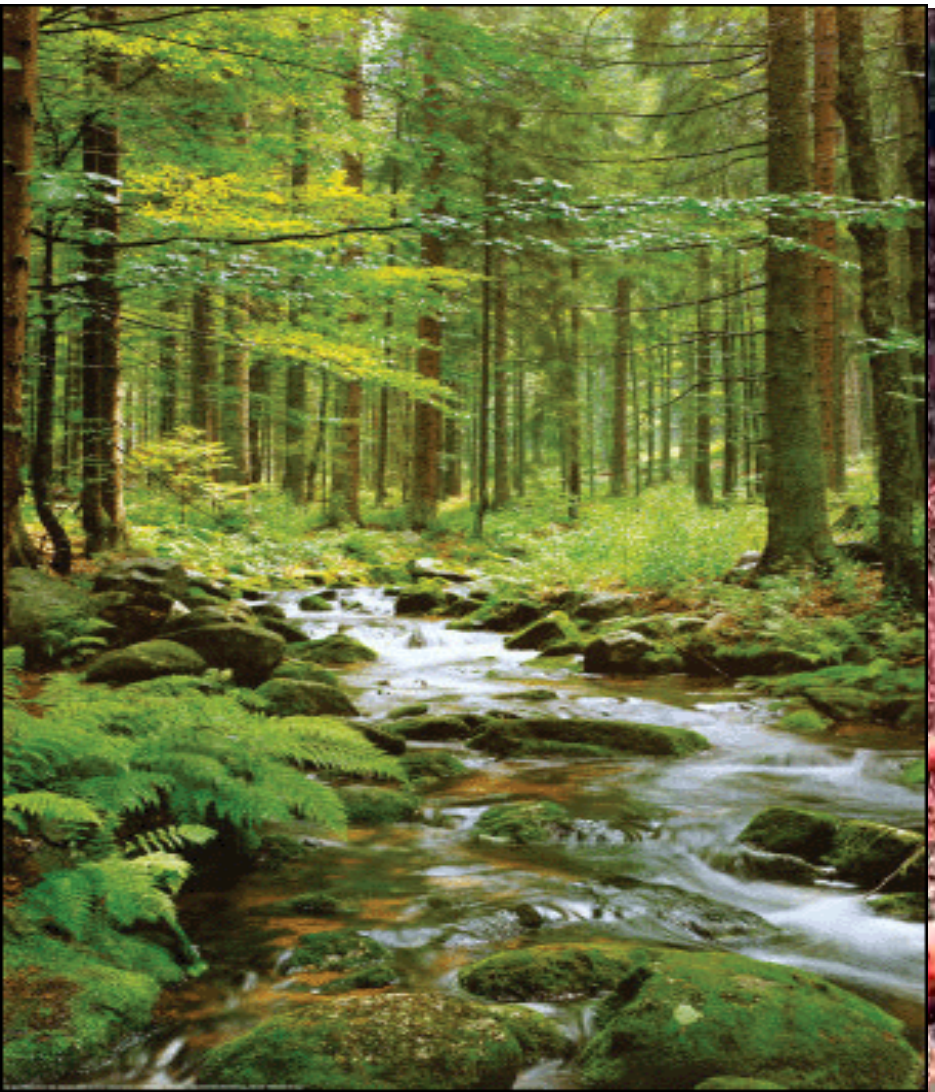


Figure 1—Carbon balance of the U.S. forest sector in millions of metric tons of carbon per year. The large flux of carbon from forests to the atmosphere (from logging and deforestation) peaked in 1915 at 760 million metric tons of carbon per year. Currently forests take up about 250 million metric tons of carbon per year. From Birdsey et al. (2006).

A natural area will receive protection only if the value a society assigns to its natural functions is higher than the value the society assigns to exploiting its natural resources

Renewable Resource – **biological resources, such as trees, that may be renewed by reproduction and re-growth. Conservation and protection of the environment is still needed**



Conservation vs. Preservation

Conservation – to manage or regulate use so that it does not exceed the capacity of the species of system to renew itself (tree can be cut at a rate that allows recovery)

Preservation – to ensure the continuity of species and ecosystems, regardless of their potential utility (trees must not be cut down at all)

Consumptive Use vs Productive Use

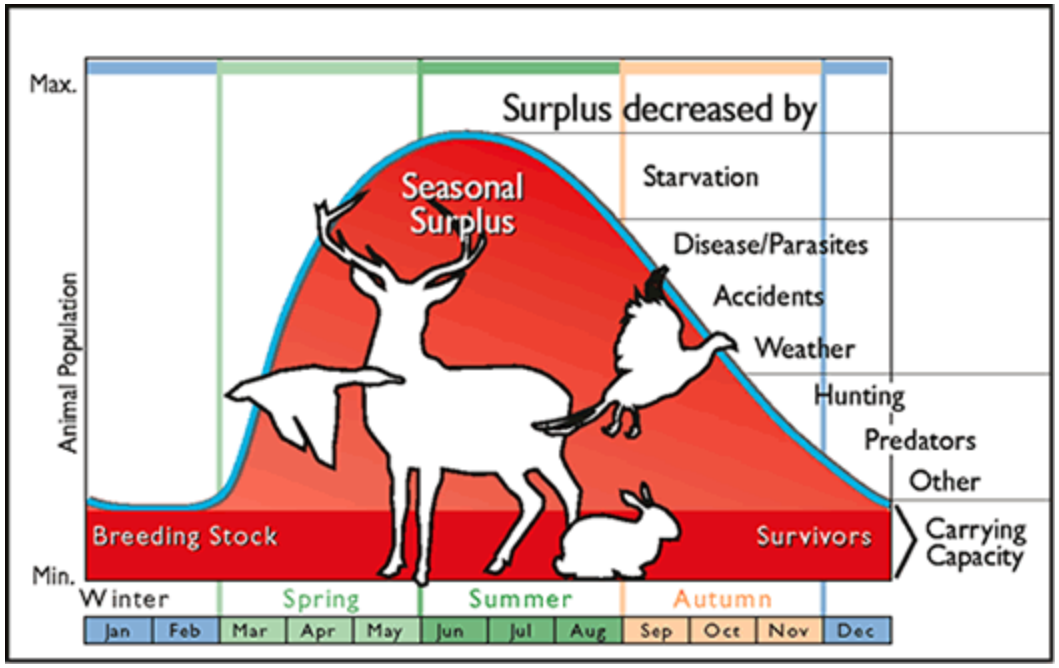
Consumptive Use – The harvesting of natural resources in order to provide for people's immediate needs for food, shelter, fuel, and clothing

Productive Use- the exploitation of ecosystem resources for economic gain

Maximum Sustainable Yield – The maximum amount of a renewable resource that can be taken year after year without depleting the resource.

Ex- the maximum rate of tree cutting that can be balanced by regrowth

Carrying Capacity-the maximum population of a given species that an ecosystem can support without being degraded or destroyed in the long run. Carrying capacity may be exceeded but not without lessening the system's ability to support life in the long term

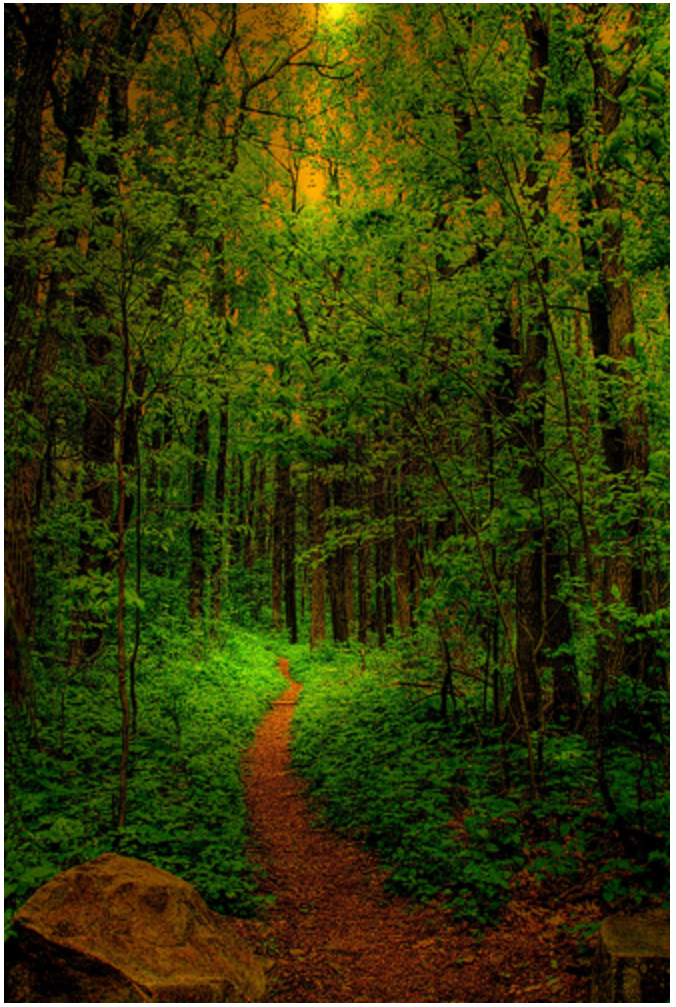


Biomes and Ecosystems under Pressure

Forest Biomes –

Perform Natural Services **-conserve biodiversity, moderate regional climates, prevent erosion, store carbon and nutrients, and provide recreational opportunities**

Afford Vital Goods **– lumber, raw material for making paper, fodder for domestic animals, fruit and nuts, fuel for cooking and heating**

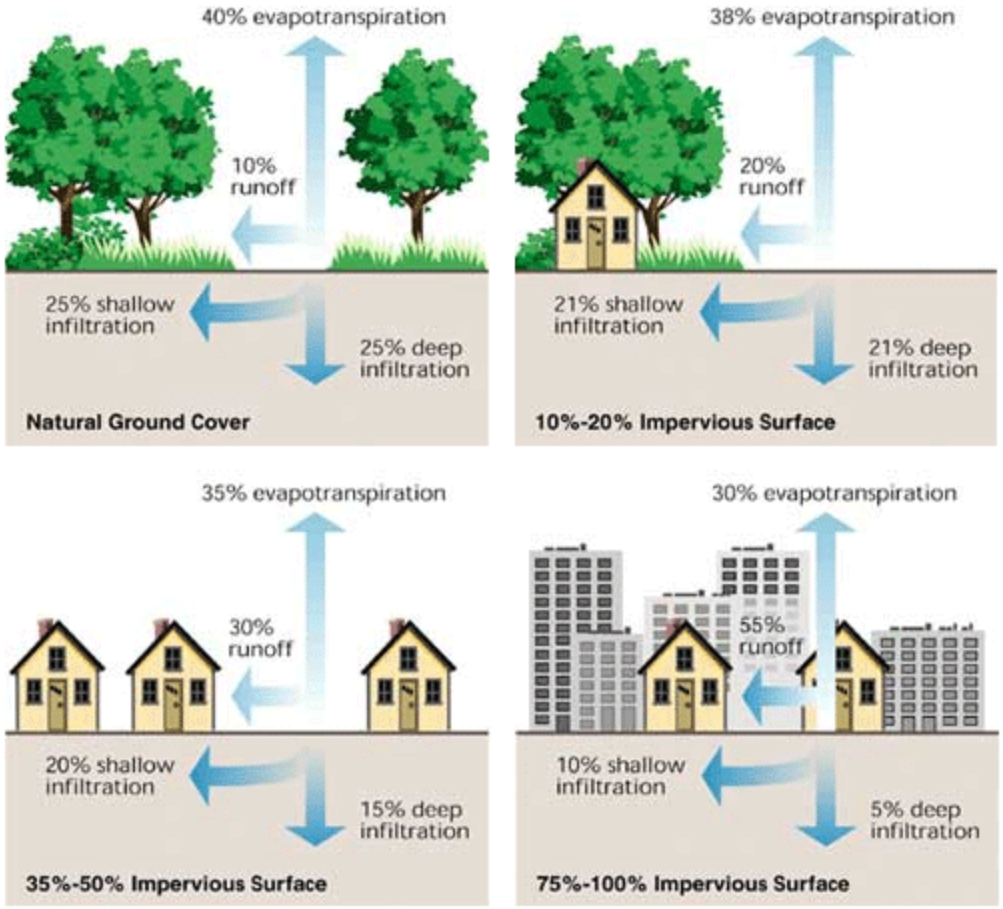


Clearing a forest has immediate consequences for the land and its people:

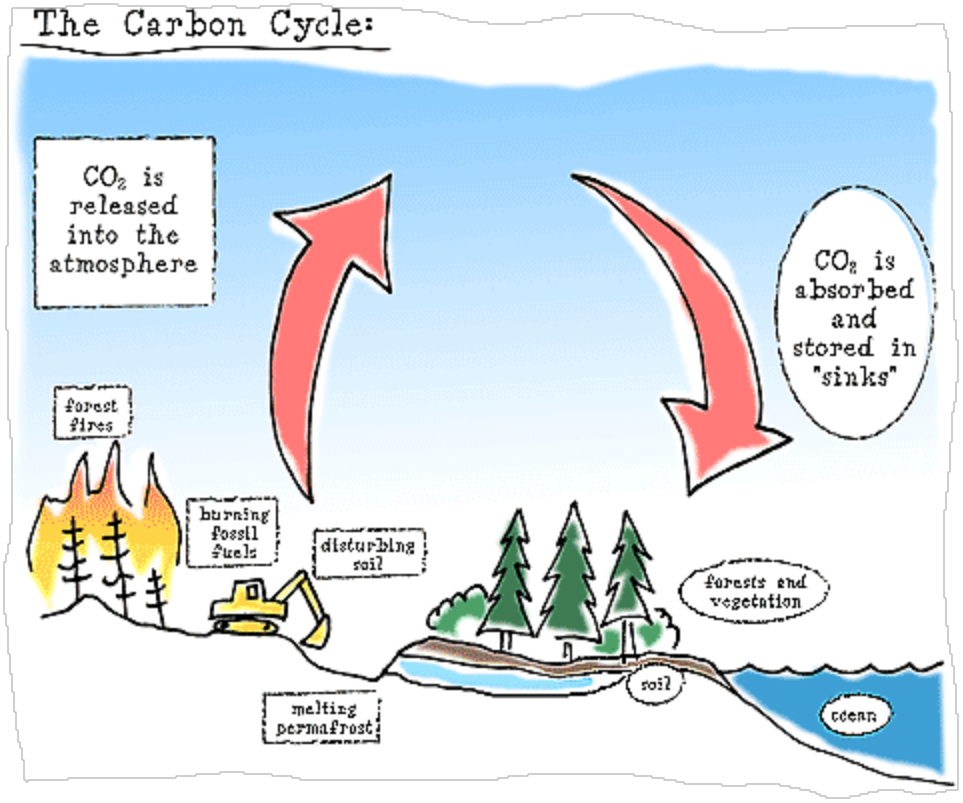
1. **Overall productivity of the area is reduced**
2. **Standing stock of nutrients and biomass, once stored in trees and leaf litter, is enormously reduced**
3. **Biodiversity is greatly diminished**

4. Soil is more prone to erosion and drying

5. The hydrologic cycle is changed, as water drains off the land instead of being released by transpiration through the leaves of trees or percolating into groundwater



6. A major carbon dioxide sink (removal of CO_2 from the air) is lost



7. The land no longer yields either wood for fuel and building or non-wood forest products

Tropical Forests

Because of ongoing deforestation, tropical forests are of greatest concern

Rafflesia -a disembodied flower. A rootless, leafless and stemless parasite, it drains nourishment and gains physical support from its host vine. 1 meter wide weighing over 6 lbs

Importance of Tropical Forests

- **Provides habitats for millions of plant and animal species**
- **Crucial in maintaining Earth's climate**

Major causes of deforestation

- **Expanding subsistence agriculture**
- **Large resettlement programs in Asia and Latin America**

Rain forest felled for subsistence farming-Peru →

Ocean Ecosystems

Marine Fisheries

Employ 200 million people

Provide 15 of total human consumption of protein