



TEN STRESSES ON THE PLANET

Land Conversion

Humans are destroying ecosystems as we convert complex forests and grasslands into monocultures, fill wetlands, extract metals, and pave the land for roads or buildings. Globally, appropriation of forest lands is one of the most serious conversions. Eight thousand years ago our planet had 15 billion acres of forest; today close to half of it is gone, and the rate of destruction is increasing.

FOREST LAND

In his book *Collapse*, Jared Diamond cites deforestation as a factor in the collapse of many civilizations. The Mayan civilization, for example, was a complex and highly organized society with vast cities by 700 B.C. but had collapsed by 900 A.D., in large part because of forest destruction. As a recent example, Diamond describes population pressure leading to deforestation and soil fertility losses in Rwanda, as factors in the 1990s genocide there.

TROPICAL RAIN FORESTS

Large expanses of broad-leafed evergreen woodlands near the equator where at least 100 inches of rain fall each year significantly impact planetary climate, the hydrological cycle, soil, and biodiversity. Scientists call these forests the "lungs of the planet" because of the vast amounts of carbon dioxide they absorb and oxygen they release. Tropical forests serve as reservoirs for two-thirds of available fresh water on Earth; more water is stored in forests than in lakes.¹ Forest vegetation holds soil in place. One-fifth of Indonesia's soil has eroded since the country logged its rain forests. Forest loss also means loss of the rich diversity of plant and animal life as well as diverse indigenous human tribes. (See "Loss of Biodiversity.")

Fifty years ago tropical forests covered 12 percent of Earth's land area. Now they cover less than six percent.² Between 2000 and 2005, the worst deforestation rate occurred in Nigeria, which could lose its primary forests within a few years.

Logging is responsible for at least 25 percent of rainforest destruction. The US is the third largest importer of tropical woods such as teak, mahogany, rosewood, ebony, lauan, and ramin. Rain forests are also cleared to grow crops for export, such as bananas, coca, citrus fruits, coffee, and soybeans, often to pay international debts. About 80 percent of tree-cover loss in Haiti, for example, was for coffee production.³ In four decades, 40 percent of all the rain forests in Central America have been cleared or burned, mostly for cattle pasture used to produce fast-food hamburgers, hot dogs, and pet food for export.

Because the fragile soils underlying tropical rain forests cannot support continuous cropping or grazing, farms are generally abandoned after a few years, and new land is opened. Even small clearings surrounded by undisturbed forest can take 100 years to regenerate. Tropical forests cleared by mechanized logging can take up to 1000 years to regenerate, if conditions allow it at all.⁴ When the bulk of large forest areas is removed, as is happening in Brazil's Amazon Basin, resultant climate change (lack of rain) can essentially prevent regeneration. In this respect the forest cannot be considered a renewable resource.⁵

TEMPERATE FORESTS

Temperate old-growth forests, which lie above or below tropical forests in latitude, are complex mature forest ecosystems with trees of multiple ages, dead trees, and fallen logs. They are very unlike tree plantations, where trees of the same age and type are typically cut in 40-80 year cycles. Whereas tropical rain forests retain about 95 percent of nutrients in vegetation, temperate forests retain 95 percent in the soil. This is where the bulk of life is found. Scientists estimated that 8000 species of underground arthropods inhabit one study site in Oregon. They believe that these sow bugs, centipedes, ants, beetles, and mites recycle tons of litter and debris that fall to the forest floor. Chris Maser, a researcher, says, "A tree that's fallen and has been on the forest floor for 100-150 years is twice as alive as when it died." Other creatures too, such as flying squirrels and birds, find their homes in dead snags.⁶

Plant and animal life are highly interdependent in Pacific Northwest conifer forests. Fungi wrap around the tips of tree roots, passing water and nutrients to them. In return, trees send carbohydrates (from photosynthesis) back down to the roots, nourishing the fungi. Foresters have found that conifer seedlings don't thrive when planted in locations where fungi aren't naturally found.⁷ Fungi also depend on red-backed voles, deer mice, and flying squirrels, which eat them, to disperse their spores to other parts of the forest. These small mammals, in turn, are food for the marten, cougar, and owl.⁸

Temperate old-growth forests are cut for lumber and for paper pulp used for newspapers, phone books, toilet paper, paper towels, and disposable diapers. Since over 90 percent of Oregon and Washington's old-growth forests have already been cut, lumber companies have increased operations in British Columbia and Alaska.

CROP AND GRAZING LAND

Farming and grazing benefit the land by keeping it vegetated, but they also destroy habitat for wildlife. The great grasslands, which covered 40 percent of the present US when Europeans arrived, have declined to one percent.⁹ Overgrazing of grasslands allows annual weeds and tough shrubs to replace native perennial grasses that once anchored the soil. Cattle trample down bare ground, allowing rainwater to carry off the topsoil. The earth's dry rangeland is losing its ability to support plants and animals. According to water-resources consultant Jim Myron, livestock grazing has been responsible for the loss of more native plants and animals than any other human activity in the Western United States.¹⁰

Industrial agriculture also results in soil erosion, loss of fertility, appropriation of fresh water, nutrient runoff into streams, and pesticide contamination. These impacts are covered in other sections. (See "Loss of Topsoil," "Loss of Fresh Water," and "Toxic Chemicals.")

WETLANDS

Wetlands, which include swamps, marshes, bogs, and pools, act as natural water-purification systems. Sediments and pollutants in water passing through their marsh grasses, cattails, and sedges are filtered out. Wetlands buffer shorelands from hurricanes and provide significant erosion control by retaining sediments. They allow surface water to seep into the ground and replenish ground water. By absorbing water during heavy rainfall, they protect against flooding.

Wetlands are among the most biologically productive areas on the planet, harboring more species and biomass per acre than other ecosystems.¹¹ For instance, the Prairie Pothole Region of the US is

thought to provide breeding grounds for 50-75 percent of the ducks born on the continent.¹² About one-half of the fishes, two-thirds of the birds, and three-fourths of the amphibians listed as threatened or endangered in the US are associated with wetlands.¹³

Where wetlands have been drained, such as along the Mississippi River, heavy rains rush into the river, widening the channels through erosion, and floods are more frequent and severe.¹⁴ Between the 1780s and the 1980s, the lower US sacrificed 53 percent of its wetlands to other uses. California lost the largest percentage at 91, and Florida lost the most acreage.¹⁵ The rate has slowed, but the US continues to convert our wetlands at a rate of 70,000-90,000 acres a year.¹⁶ (For coastal wetlands, see "Degradation of the Oceans.")

MINING LANDS

Large metal and coal open pit mines permanently scar landscapes and leave behind acid mine drainage. Mining companies often go bankrupt and fail to restore sites to even minimum requirements. The Butte copper mine in Montana, for example, leveled mountains and created a 2,200 foot deep pit. The pit water, containing dissolved heavy metals, is so acidic that it kills birds that drink it.¹⁷ Some of the world's largest copper mines in Papua, New Guinea create hundreds of thousands of tons of rock waste and tailings daily. The tailings spill down the river valleys and across valley floors destroying large areas of rainforest and killing fish. Some descend as far as the coastline wetlands and estuaries.

In heap-leach gold mining, operators extract huge quantities of ore and pour cyanide over it to leach out the gold. Thirty tons of low-grade ore are required to produce one ounce of gold.¹⁸ Cyanide is extremely poisonous: one teaspoon can kill a person. In Montana millions of tons of cyanide were released into the soil and water before citizens banned heap-leach mining by initiative.¹⁹

In the 1970s, strip mining of coal spread across Appalachia, leaving some soils that are too acidic to be productive.²⁰ Now operators are using mountain-top mining to retrieve underground seams of low-sulfur coal. In one of North America's most biological diverse ecosystems, entire mountain tops are dynamited away and pushed into nearby streams. Some of the valley fills are hundreds of feet deep and several miles long.²¹ More earth is moved in these operations than for any other human activity.²²

Mine production of sand, gravel, and stone for use in roads and concrete construction exceeds production of all other types of mining.²³ Mining sand and gravel along rivers damages riparian habitat and consumes large areas of prime farm soils, permanently removing them from agricultural production. A better alternative source for construction rock is quarrying of stone from upland areas, where farmland is poor and streams are not nearby.

WHAT IS BEING DONE?

Around the globe, land is being preserved by setting it aside as parks, wilderness, or protected areas. For example, as a result of lobbying by nongovernmental organizations (NGOs) such as Greenpeace, Rainforest Action Network, Sierra Club, and ForestEthics, Canada announced in 2006 a protection plan for the five-million-acre Great Bear Rainforest. Logging will be banned in the protected area, and in another ten million acres, logging practices are to be sustainable. In developing countries large NGOs, such as the World Wildlife Fund and the Nature Conservancy, have had some success purchasing conservation concessions (leases granted by governments for

specific purposes). In other cases, NGOs or land trusts acquire land or conservation easements from private parties.

In the US, environmental organizations have used protests, boycotts, and consumer education campaigns to protect forests. In the 1990s, thousand of demonstrators blocked logging roads on Vancouver Island, tree-sitters attempted to prevent cutting of ancient redwoods in California, and non-profits carried out a campaign to convince Home Depot to stop selling lumber from old-growth forests. As a result, major paper purchasers cancelled contracts, home improvement centers made new commitments, and the state of California purchased threatened forest land. In other countries like China, India, and Turkey, strong government policies involving cutting restrictions and tree planting are bringing about a shift to reforestation.

Landowners are also changing forestry, agricultural, and grazing practices voluntarily. Since the development of the Forest Stewardship Council certification, more sustainable harvesting practices are now used on 180 million acres of forests, helping to protect wildlife habitat.²⁴ In the US, Allan Savory has introduced Holistic Management for cattle ranchers—working with ecological processes to rebuild biological biodiversity. Land is grazed intensively but then given a rest, and ranchers report increases in perennial grass species and wildlife. The US Department of Agriculture has a cost-sharing program for farmers called Conservation Reserve that encourages them to convert environmentally sensitive acreage to grasses, trees, or wildlife plantings.

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