

# Population and ecosystems

**E**COSYSTEMS sustain life on Earth. They provide vital “ecological services” by cleaning up and absorbing pollution, protecting coastlines, supplying “wild” food from fish to bushmeat, conserving genetic resources needed for crops and pharmaceuticals, maintaining soils and hydrology, pollinating crops and much more. But the demands of rising human populations in many regions are now impacting most of the world’s ecosystems.

Humans have been altering their environment for thousands of years. The process probably began with the setting of fires in savannah grassland to aid hunting. Most forests contain the marks of human-set fires, clearance and tree planting, and little strictly “virgin” vegetated land surface now remains.

In the past 10 000 years the dominant technological influences have been the use of timber for building and the spread of crop cultivation. This has accelerated, particularly in the past 150 years during which time the rising population has doubled the area of arable land in use on the Earth’s surface.

During this period the burning of fossil fuels has for the first time had a major impact on ecosystems, through pollution and, most recently, climate change. In the past three decades, the widespread saturation of ecosystems with nitrogen compounds, such as ammonia and nitrogen oxides from agricultural fertilizers and air pollution, has emerged as a new global-scale threat.

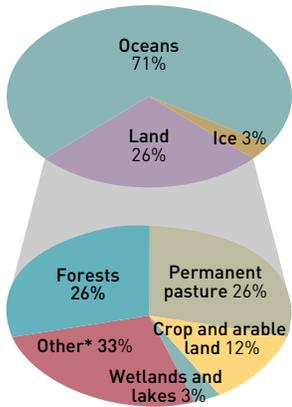
The extent of ecosystem loss and alteration is closely related to population density, which is very uneven across the planet. Today, one half of the human population lives on less than 10 percent of the Earth’s land, and three quarters on only 20 percent<sup>1</sup>.

For much of human history, the most heavily populated regions of the planet, and the most ecologically disturbed, have been Europe and South and East Asia – and that remains the case. The population densities of the Americas and Africa have only now risen to those achieved in Europe and India by 1750<sup>2</sup>. In India today, population density is more than 300 people per square kilometer, seven times the global average; little land is unused by humans; and almost 80 percent of the original forest cover has been lost. In particularly uninhabitable parts of the planet population density is very low. In Alaska, for example, it is less than a tenth of the global average, and most of the landscape remains untouched.

Land affected by human activity can be divided into areas transformed – notably by agriculture, which in some parts of the world such as the North American prairies is characterized by low population density but high ecosystem loss – and areas degraded and fragmented by pollution, sporadic human activity including hunting and tourism, or infrastructure development such as highways and pipelines.

The extent of forests, which once covered a large part of the planet, is one good measure of ecosystem survival. Overall, at least half of the world’s forests have disappeared at the hand of humankind – three quarters of these in the past 300 years and the majority within the past century.

### PLANET EARTH



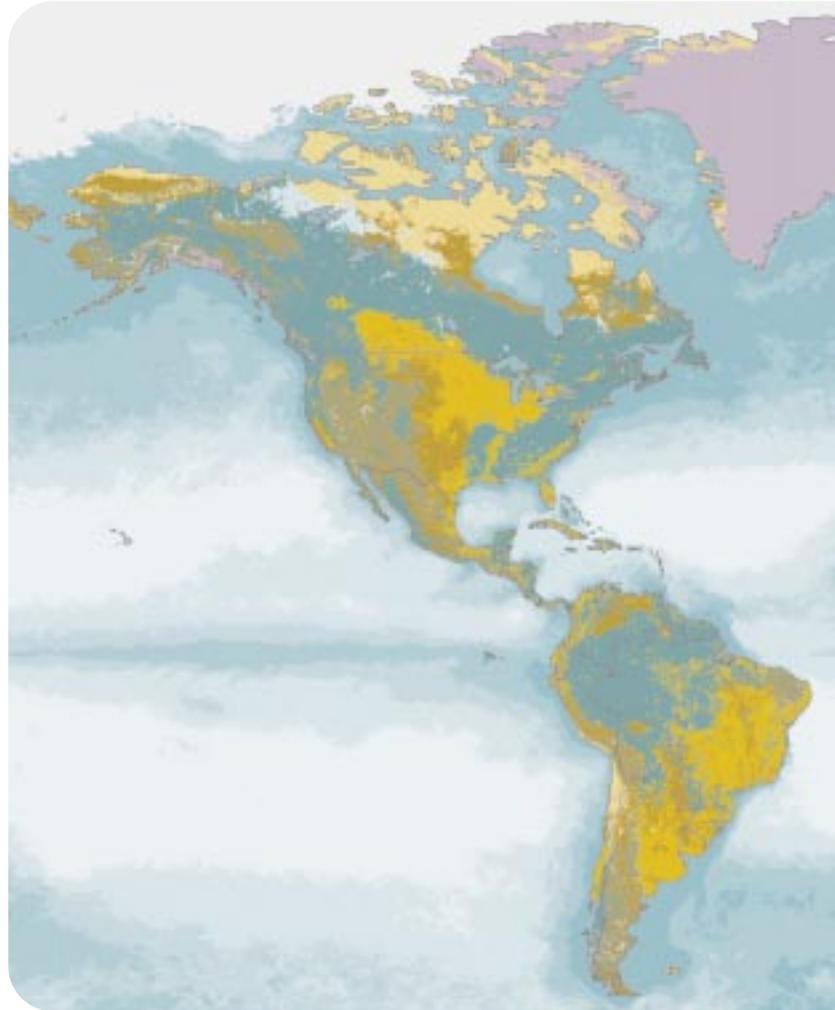
\* Includes arid areas, wastelands, urban areas, roads, rivers and grasslands not used as permanent pastures

Source: WRI; FAO.

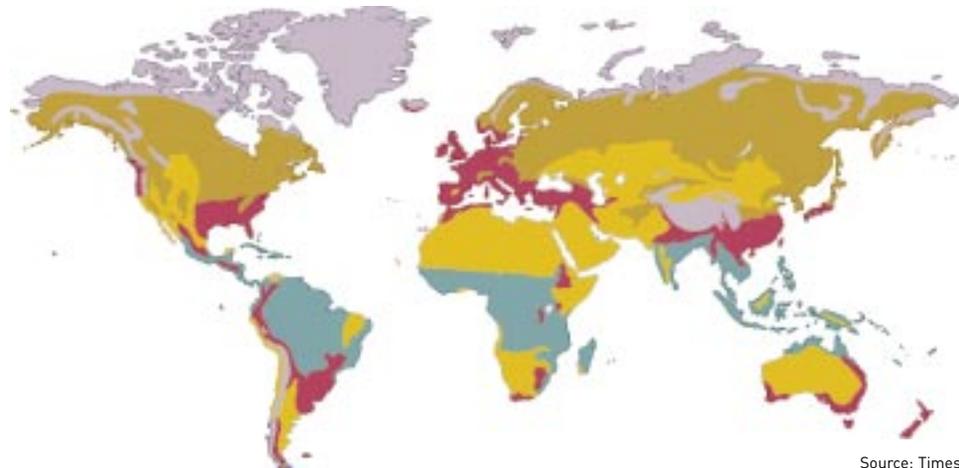
### MAIN LANDCOVER TYPES AND OCEAN PRODUCTIVITY



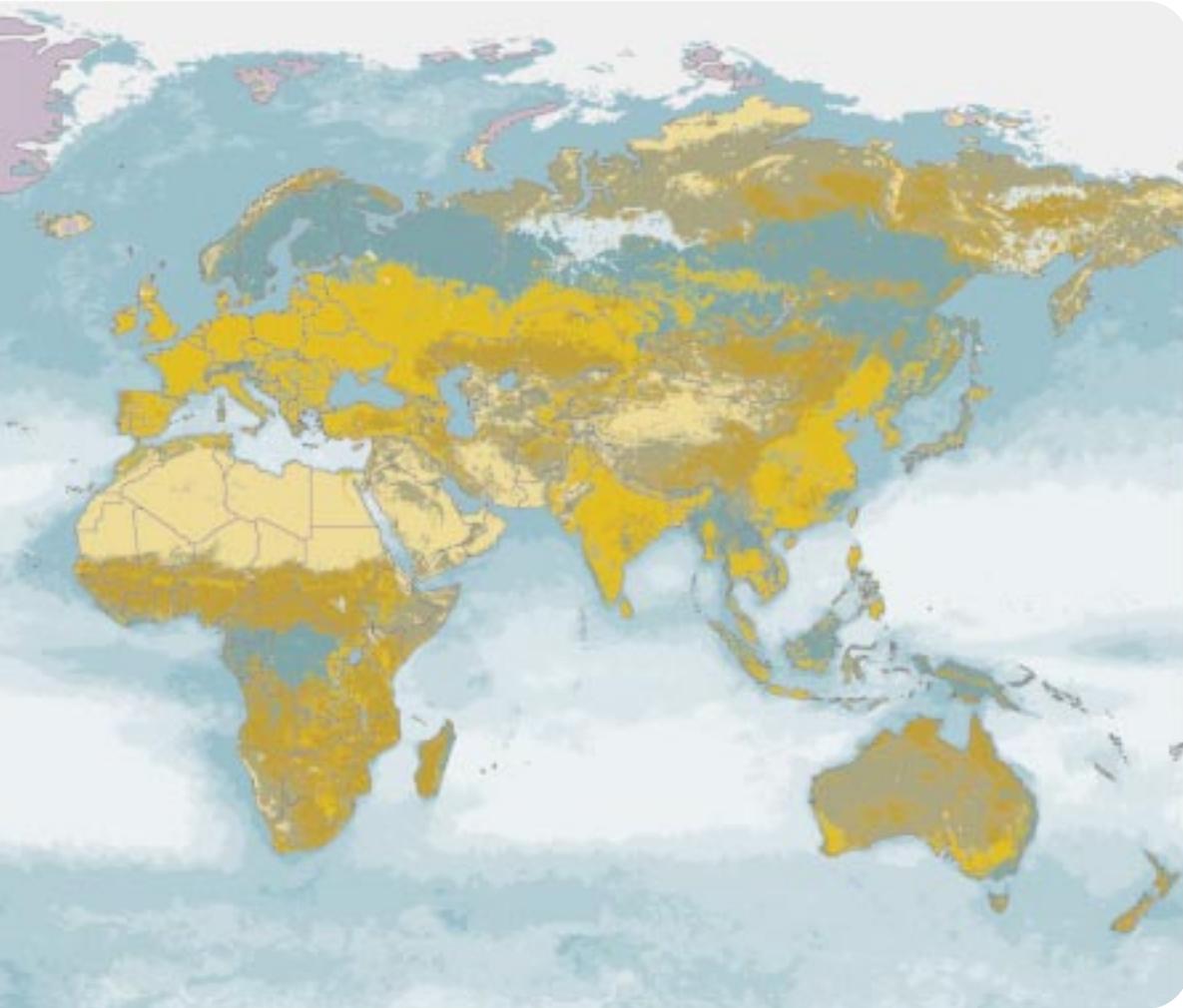
The map shows a simplified image of landcover types and ocean productivity. Ongoing in-depth study of these is crucial to understanding the roles played by the various ecosystems in the overall well-being of the planet.



### CLIMATIC REGIONS OF THE WORLD

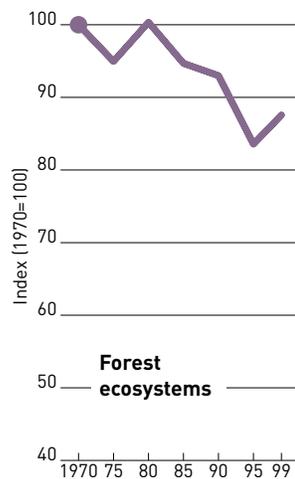
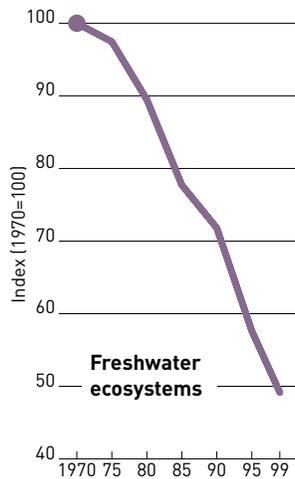
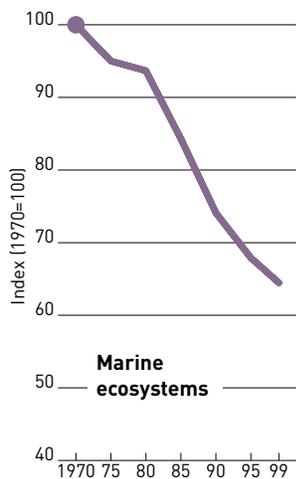


Source: Times.



Source: NASA; USGS.

**THE LIVING PLANET INDEX, 1970-99**



The living planet index, developed by the World Conservation Monitoring Centre (UNEP-WCMC) and WWF, the conservation organization, provides an indicator of the health of the three major ecosystem types of the planet. Based on the population trends of marine, freshwater and forest species, it shows that there has been a considerable decline in the health of all three ecosystem types since 1970.

Their survival is lowest where population density is highest. The Asia/Pacific region has lost 76 percent of its original forest cover, mostly to agricultural development but also to urbanization and mineral exploitation. Losses in Europe (excluding Russia) average 75 percent, in Russia 24 percent, in Africa 68 percent, and in the Americas 35 percent, but with much higher rates in more densely populated areas such as the coastal regions and Central America<sup>3</sup>.

The largest tracts of wilderness survive only in the less populated areas of the world, which for various reasons have proved hard for humans to colonize in any numbers. These include the jungles of the Amazon basin and Central Africa; the frozen taiga regions of Siberia and remote areas of North America; and some desert, mountain and wetland regions. Examples of the latter types include the African Sahara, the mountainous Himalayan regions of otherwise densely populated South Asia, and the Florida Everglades, nature's largest preserve on the eastern coast of the United States<sup>4</sup>.

Often, rising wealth and economic activity among human populations intensify their impact on local ecosystems by increasing demand for natural resources and generating pollution from industry and energy generation. But not always. Wealth can provide the resources for a clean-up of pollution, as occurred with a number of European rivers in recent years. Likewise, many European countries are replacing farmland and old industrial developments with quasi-natural forests. This is possible because they have the wealth to buy food from elsewhere or to invest in high-input intensive agriculture to grow more food from less land, and have the desire to restore ancient habitats<sup>5</sup>. The United Kingdom, for instance, is planting a "national forest" in the heart of a former Midlands mining and industrial zone.

Some technological advances are more ambiguous. The development of coal burning in the 18th century was initially heralded in Europe as a solution to a growing shortage of fuelwood, and slowed deforestation across the continent. Only later did the environmental downside of fossil fuels emerge.

The link between population density and environmental damage is also disrupted when prosperous or powerful communities, either deliberately or accidentally, buy local ecological conservation at the expense of damage to other areas. Such transference has a long history. The ancient city of Rome turned North Africa into a grain-growing "breadbasket" to supply its million-plus population, until most African soils were exhausted. The grain, meanwhile, was transported across the Mediterranean aboard a fleet of a thousand ships made of wood cut from the Levant.

In the modern era, Japan's demand for timber has deforested much of Southeast Asia, while East African forests have been cleared to grow tea, coffee and other cash crops for export to Europe, and South American pampas grasslands have all but disappeared to provide pasture for meat supplying Europe and North America<sup>6</sup>.

Additionally, ecological damage may occur despite low population densities where key environmental resources are in locally short supply. One example is the extreme stress on fluvial ecosystems resulting from water shortages in the arid Middle East where, despite recent increases, overall population density is low by world standards.

Human activity has also created a series of long-distance threats to ecosystems, some of them global in extent. These include acid deposition, the thinning ozone layer, the spread of persistent organic pollutants (POPs), climate change and the spread of nitrogen compounds through soils and fluvial ecosystems<sup>7</sup>.