Threats to Biodiversity

Habitat destruction, mostly in the tropics, is driving thousands of species each year to extinction. The consequences will be dire—unless the trend is reversed

by Edward O. Wilson

The human species came into being at the time of greatest biological diversity in the history of the earth. Today as human populations expand and alter the natural environment, they are reducing biological diversity to its lowest level since the end of the Mesozoic era, 65 million years ago. The ultimate consequences of this biological collision are beyond calculation and certain to be harmful. That, in essence, is the biodiversity crisis.

In one sense the loss of diversity is the most important process of environmental change. I say this because it is the only process that is wholly irreversible. Its consequences are also the least predictable, because the value of the earth's biota (the fauna and flora collectively) remains largely unstudied and unappreciated. Every country can be said to have three forms of wealth: material, cultural and biological. The first two we understand very well, because they are the substance of our everyday lives. Biological wealth is taken much less seriously. This is a serious strategic error, one that will be increasingly regretted as time passes. The biota is on the one hand part of a country's heritage, the product of millions of years of evolution centered on that place and hence as much a reason for national concern as the particularities of language and culture. On the other hand, it is a potential source for immense untapped material wealth in the form of food, medicine and other commercially important substances.

EDWARD O. WILSON was one of the first to call attention to the global decline in biological diversity and to sound the alarm on the consequences of its loss. His interest in living organisms, especially ants, stems back to his childhood, which was devoted to the exploration and collection of living things, and to his undergraduate studies in evolutionary biology at the University of Alabama. He received his Ph.D. in biology from Harvard University, where he is now Frank B. Baird, Jr., Professor of Science and Curator in Entomology. Wilson has made major contributions to a number of fields, including the behavior and evolution of social insects, chemical communication and the evolution of social behavior. He has been awarded the National Medal of Science, the Pulitzer Prize in general nonfiction for his book *On Human Nature* and the Tyler Prize for environmental achievement.

It is a remarkable fact, given the interdependence of human beings and the other species that inhabit the planet, that the task of studying biodiversity is still in an early stage. Although systematics is one of the two oldest formal disciplines of biology (the other is anatomy), we do not even know to the nearest order of magnitude the number of species of organisms on the earth. With the help of other specialists, I have estimated the number of species that have been formally described (given a Latinized scientific name) to be about 1.4 million. Even conservative guesses place the actual number of species at four million or greater, more than twice the number described to date.

Terry L. Erwin of the Smithsonian's National Museum of Natural History believes the number of species to be even greater. With the help of co-workers, he applied an insecticidal fog to the forest canopy at localities in Brazil and Peru in order to obtain an estimate of the total number of insect and other arthropod species in this rich but still relatively unexplored habitat. By extrapolating his findings to moist tropical forests around the world and by including a rough estimate of the number of ground-dwelling species in his calculations, Erwin arrived at a global total of 30 million species. Even if this number proves to be a considerable overestimate, the amount of biodiversity in the world is certain to be projected sharply upward in other, compensatory ways.

Groups such as the mites and fungi, for example, are extremely rich and also very underexplored, and habitats such as the floors of the deep sea are thought to harbor hundreds of thousands of species, most of which remain undescribed. Even the number of bacterial species on the earth is expected to be many times greater than the 3,000 that have been characterized to date. To take one example, an entirely new flora of bacteria has recently been discovered living at depths of 350 meters or more beneath the ground near Hilton Head, South Carolina. Even new species of birds continue to turn up at an average rate of two per year.

Systematists are in wide agreement that whatever the absolute numbers, more than half of the species on the earth live in moist tropical forests, popularly referred to as rain forests. Occupying only 6 percent of the land surface, these ecosystems are found in warm areas where the rainfall is 200 centimeters or more per year, which allows broad-leaved evergreen trees to flourish. The trees typically sort into three or more horizontal layers, the canopy of the tallest being 30 meters (about 100 feet) or more from the ground. Together the tree crowns of the several layers admit little sunlight to the forest floor, inhibiting the development of undergrowth and leaving large spaces through which it is relatively easy to walk.

The belief that a majority of the

TROPICAL RAIN FORESTS, such as this one in northern Costa Rica, are among the most species-rich habitats on the earth. The enormous biological diversity found in these forests can be explained by the fact that the most species-rich groups on the planet, the invertebrates and flowering plants, are concentrated there. The vegetation, much of it broad-leaved evergreens, is extremely lush; the tallest trees tower as much as 30 meters (100 feet) above the rain-forest floor.