Forest Destruction – Can We Stop It in Time?

V.H. Heywood

Plant conservation has got off to a late start. Many undescribed species are certainly already extinct, their value unknown. Professor Heywood argues that, because both the losses and the potential are greatest in the tropics, attention must focus there first. Less than one per cent of tropical lowland forest is in national parks or reserves, and there are many areas where little of it may be left even by 1990. This article is the substance of Professor Heywood's talk to the ffPS at last year's Annual General Meeting.

Plants and animals cannot be treated in the same way in considering their preservation, conservation or general ecological role. Not only are plants not mobile, except through their seeds, and pollen, but they are the primary producers and constitute a major part of the landscape. Plants make up the vegetation, which is the habitat for most animals.

Conservation of plants has increasingly to concentrate on the preservation of samples of vegetation, of communities and ecosystems, rather than of individual species. The Threatened Plants Committee (TPC) of IUCN has done a great deal of work on the conservation status of individual species in Europe and the Mediterranean, and the first IUCN Plant Red Data Book was published in 1978. Now the work has expanded to take in North Africa, the Middle East and the Americas, and other organisations are also producing Red Data Books or status lists for plants.[1] But these are mainly for temperate countries; the majority of species at risk occur in the tropics, and in the main they are largely at risk because of the threat to the ecosystems they inhabit.

One of the problems is that we simply do not possess the information, and cannot get it in time, as to which tropical species are at risk. Some, of course, we know, especially those of actual or potential economic importance, but about the status of the vast majority we are ignorant, and indeed there are many tropical plant and fungus species yet to be described – and some, no doubt, that have already become extinct before even being described scientifically.

If we consider the Flowering Plants, the group that contains most species, about 160,000 are tropical in distribution, and of these about 90-100,000 occur in tropical America. In South America possibly 15-30,000 species of Flowering Plants still remain to be named and described, especially in the humid tropical forest regions such as the Amazon basin in Brazil and Venezuela. It has been estimated that Colombia alone has a flora of 50,000 species of vascular plants – compared with 12,500 for the whole of Europe and, say, 15,000 for North America. Moreover, there is no complete Flora for any South American country, and the number of botanists in some of them is few indeed. The fungus situation is even more disturbing in view of their great economic and ecological importance: 90,000 of the estimated 120,000 species occur in the tropics, and nowhere are they even reasonably well known. Botanists must therefore focus their attention more and more on the tropics where the risk of loss is greatest.

Tropical Forests

Another reason for giving special and urgent attention to the tropics is the alarming rate at which some kinds of ecosystem, such as the lowland humid tropical forest, are being converted to other uses – shifting cultivation ('slash and burn'), timber extraction, cattle rearing, industrial development, etc – for a large part of the floristic diversity is to be found in these tropical forests. Most species occur only in relatively undisturbed 'primary' forest and regenerate poorly, if at all. Regeneration in any case may take tens or hundreds of years before the forest is restored to something approaching its original structure.

Tropical moist forest is difficult to define. Myers[2] describes it as 'evergreen or partly evergreen forests, in areas receiving not less than 100mm of precipitation in any month for two out of three years, with mean annual temperature of 24°C+ and essentially frost-free; the forests usually occur at altitudes below 1300m (in Amazonia up to 1800m and generally in South-east Asia up to only 750m); and in mature examples of these forests, there are generally more or less distinctive strata'.

The tropical moist forest, so defined, occupies an estimated 9-11 million sq km. This is six per cent of the earth's land surface, but in terms of species diversity, it contains about half of all the species, plant and animal, on the planet. Four-fifths of it occurs in just nine countries: Bolivia, Brazil, Colombia, Peru and Venezuela in Latin America; Indonesia and Malaysia in South-east Asia; Gabon and Zaire in Africa.

There has been considerable debate about the rate of conversion of tropical moist forest – estimates range from losses of 56,000 sq km per year to nearly four times that amount. Norman Myers, in the latest study,[2] undertaken specifically to assess the state and rate of conversion in the light of previous estimates and many other factors, concludes that:

1. the losses are rapid in most of Australia's lowland tropical forests, where little may be left by 1990 if not earlier, and also in much of the lowland forest of Bangladesh, India, Indonesia, Sumatra and Sabah, peninsular Malaysia, Melanesia, the Philippines, Sri Lanka, Thailand, Vietnam, parts of Brazil, Central America, Colombia, Ecuador, Madagascar and West Africa, as well as the upland or mountain forest of some of these areas and also of East Africa;
2. moderate losses at intermediate rates are occurring in parts of the lowland forests of Burma, Papua New Guinea, Amazonia, Brazil, Colombia (Pacific), Amazonia (Ecuador and Peru), Cameroon;
3. little change is occurring in much of Brazil's western Amazonia lowland forests, the rainforests of French Guiana, Guyana and Suriname, or much of the Zaire basin.

The first category is especially alarming because of its speed; it is estimated that little of the forest will remain by 1990 or earlier. The causes include timber exploitation, cattle raising, planned agriculture, and particularly population pressure, especially from forest farmers, the shifting cultivators who are the largest factor. Myers estimates that they are converting 100,000 sq km of primary forest to permanent cultivation each year, and this represents over one per cent of the total remaining forest. Taking all the other factors into account, he ventures the opinion that the figure of conversion of 40ha per minute, the equivalent of over 210,000 sq km per year, suggested by the Director General of FAO at the 1978 World Forestry Congress, is a nearer estimate than the

widely quoted 20ha per minute suggested by Sommer in his 1976 assessment.

The effects of such destruction are exceedingly difficult to assess or even appreciate fully. Whether or not the rate can be slowed, it certainly means that the time-scale against which taxonomic and related studies have to be carried out is drastically foreshortened. Taxonomists have long been accustomed to a leisurely time-scale in planning and carrying out their activities, as if there was all the time in the world available. But the situation I have outlined means that for many areas there are only 10, 20 or 30 years left in which field studies, sampling and collecting can be done.

The arguments for retaining as much as possible of the tropical rainforest intact are as complex as the reasons for their degradation. Forests play a major role in retaining the often thin soil cover in the tropics and thereby help to prevent erosion; they also play an important climatic role and affect the carbon dioxide balance – widespread removal of the forest cover could lead to unpredictable and potentially hazardous consequences. They are a source of a wide array of products of great value to man – not just hardwood timber, but nuts, spices, alkaloids, oils, waxes, drugs and so on. And many of these potential uses are still unknown. The extent to which the tropical forest can be used as a source of such products (apart from timber and fuel wood) depends on the degree and intensity of exploitation, which is rather limited in the generally mineral-poor soils in these high-rainfall climates. For not only is much of the rainforest, especially primary forest, non-renewable, but, as Jacobs has put it recently, 'being the greatest storehouse of species, (it) is also the best-stocked shopping centre for variety in natural products. But this huge capital delivers interest only in tiny quantity.' In other words, most attempts to exploit the humid tropical forest lead to its destruction to some degree. The resource is more potential than actual, if it is not to be destroyed once exploited. Even small removals of tree species can affect not only the structure of the forest but also the population size of dependent species, both plant and animal. The main scientific argument for conserving the tropical forest is simply that further substantial conversion of the remaining forest will inevitably lead to an irreversible loss of evolutionary diversity and potential on a massive scale.

Since the last war the developed countries' demand for hardwoods has increased markedly. The bulk of the world's hardwood forests are in the tropics; the temperate hardwood forests have already been steadily depleted or are increasingly being protected because of well-developed environmental and conservational pressures. Since 1950, hardwood timber consumption in developed countries has gone up fifteen-fold, while the use of timber by tropical countries has only rather more than doubled. Some major hardwood species are already severely threatened with extinction. An illuminating example is afrormosia *Pericopsis elata*, a leguminous tree introduced into world trade about thirty years ago, which provides a highly regarded hardwood used in furniture and veneers; in Ghana it is the most valuable native tree. Unfortunately little is known about its reproductive biology, its natural regeneration is very poor, and replanting is only on a small scale. Consequently heavy logging of its natural stands means that it faces extinction. This will not only lead to biological loss, but have severe economic consequences.

Plantation crops of forest trees are one way of taking the pressure off natural ecosystems, but we suffer from a lack of knowledge of their reproductive

biology and physiology. This is a major area of research which deserves high priority in addition to systematic and taxonomic studies.

The preservation of adequate areas of lowland forest is one way of keeping some of our options open for the future. Unfortunately, despite some conspicuous successes, the conservation movement in the tropics is not highly developed and less than one per cent of the forest area is in reserves.

In summary, the continued large-scale destruction or conversion of the humid tropical forest will not only lead to the shortage or disappearance from our markets of many hardwoods which cannot otherwise be grown on a commercial scale, and have ecological and climatic consequences which could well be disastrous, but it will also result in a deliberate and incalculable scientific loss – in effect the irreversible destruction of a large part of the raw material of plant study. Can we seriously envisage having to say to our grandchildren 'Once upon a time there were large forests in the humid tropics . . .'?

References

1. JACOBS 1980. *Flora Malesiana Bulletin* **33**, 3431.
2. NATIONAL ACADEMY OF SCIENCES 1980. Conversion of Tropical Moist Forests. NAS, Washington, DC.

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Grassland Research Ranch

The National Audubon Society has taken over the Appleton-Whittell Research Ranch Sanctuary in the Huachuca Mountains in Arizona. Named after both the family who provided the land and the trust that endows it, the sanctuary covers 7543 acres in the high desert foothills, described by Co-director Dr Jane Bock as 'the closest we have to an approximation of a native grassland' – cattle and drought having wiped out most of the rest. Ariel Appleton has courageously kept the sanctuary going as a research ranch since the late 1960s with a no-grazing programme, and it will continue to be used as an undisturbed control area. National Audubon has plans for several research projects. One of the success stories at the ranch has been the establishment of a captive breeding population of the Mexican Bolson tortoise *Gopherus flavomarginatus*, which in the wild is decreasing and may be endangered. Several zoos have tried to do this and failed. The ffPS has been a trustee of the ranch for ten years.

Australia's Endangered Plants

Australian Flora in the Endangered Species Convention — CITES, by John Leigh and Robert Boden (National Parks and Wildlife Service, PO Box 636, Canberra, ACT 2601, free), lists the 990 plant species on Appendix 2 of the CITES, of which 210 are threatened and 780 'look-alike' species, i.e. those which are not threatened but listed because of their similarity to a threatened species. It also includes the list of 970 genera on CITES in 1979, comprising 21,456 species. Of these 17,408 are in the family Orchidaceae. Orchids are also shown to be the major species being traded.

Threatened in North Africa

The Threatened Plants Committee's first preliminary draft of the list of *Rare, Threatened and Endemic Plants of North Africa and the Middle East* includes an appeal for more data to fill 'the large gaps in the conservation coverage', so that a more complete list can be published by the end of the year. (Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB.)