Figure 6. A red alder plantation at age 10 years. Trees have straight boles and average 4 inches in diameter and 35 to 40 feet in height. (USDA Forest Service photo.)

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How Serious Is Tropical Deforestation?

Are the world's tropical forests being rapidly deforested? Only in places, say the authors.

Roger A. Sedjo and Marion Clawson

It is part of today's conventional wisdom that the world's forests, particularly the tropical forests, are disappearing at alarming rates as growing numbers of people seek land to cultivate, wood to burn, and raw materials for industry. But some deforestation may be necessary to meet the full range of social, environmental, and developmental goals. How serious is deforestation and what difference does it make?

Today there is considerably more information for assessing the question of global deforestation than was available in 1980, when Norman Myers's report, *Conversion of Tropical Moist Forests*, was published by the National Academy of Sciences (Washington, D.C.). Myers's work became the definitive study (although not the only study) and its estimate of the rate of tropical forest disturbance has substantially influenced public perception of the problem—partly because the estimate was used to project deforestation rates in the famous *Global 2000 Report* (*see* sidebar on page 794). At the time of the report, however, Myers acknowledged that his estimate was a "crude approximation at best."

A study published in 1982 under the sponsorship of

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The evidence shows that current rates of deforestation are quite modest for the world's virgin tropical forests.

the United Nations Food and Agricultural Organization (FAO) and the United Nations Environment Program (UNEP) under the direction of Jean-Paul Lanly has now replaced Myers's work as the best data available (FAO Forestry Paper No. 30, Rome). The UN study involved large numbers of specialists examining a wide variety of data, both official and unofficial, for 76 countries. In addition to normal techniques, the researchers made use of satellite imagery for a number of countries where other data were absent or suspect.

The UN study estimates the rate of deforestation of the closed tropical broadleaf forests at 7.1 million hectares per year (for 1976–1980)—about a third of Myers's estimates of 20 to 24 million hectares per year. Furthermore, the UN projects negligible increases in the rate of deforestation in the future.

Why the Difference?

How might we explain the difference between the pessimistic conclusion of the Myers study and the relatively reassuring results that emanate from the UN? Although Myers discusses a large number of countries in his study, his empirical estimates of the rates of deforestation are limited to only 11 countries. For most of these countries the annual average rates of deforestation are relatively high; some are over 2 percent. However, Myers fails to stress that the estimates varied considerably among countries, with only a few countries experiencing really high deforestation rates. For example, while Myers estimates the Ivory Coast rate of deforestation at 5.3 percent, his estimate for Brazil is just 0.342 percent. If these rates continued, by the end of this century the Ivory Coast forests would totally disappear while Brazilian forests would be reduced by only 6 percent.

We do not believe that serious shortages of industrial wood are likely to occur.

A somewhat surprising finding of the UN study is that the undisturbed or "virgin" broadleaf closed forest's rate of deforestation is only 0.27 percent annually, whereas the logged-over secondary forest has a deforestation rate of 2.06 percent annually. This finding is important since the biologically more diverse forests are typically these same virgin forests. Hence, in the aggregate, the study implies that the deforestation pressure is least severe on the forests that are biologically most fragile.

To some extent the differences reflect two definitions of what constitutes deforestation. While Myers defines deforestation as a disturbance, the UN study uses the more common definition of land being taken out of forest "to be used for other purposes." This can be seen by a country-by-country comparison of the deforestation rates for the 11 countries for which both Myers and the UN offer quantitative estimates. Myers's broader definition yields estimates that average about one-third higher than those of the UN. However, his aggregate estimate of 20 million hectares is almost three times that of the UN.

The major conversion between the studies appears to result from Myers's aggregate estimate of the rate of conversion of tropical forests, which he derived independently from his empirical estimates for individual countries. The aggregate estimate is the result of suppositions about the rate at which forest farmers are converting forestlands, together with other factors that contribute to conversions. Myers asserts that there are about 20 million forest farmer families and that each family deforests about 1 hectare per year. Using these assertions, Myers obtains his estimate of the rate of tropical deforestation at 20 million hectares per year, a rate that corresponds closely with the figure used in the *Global 2000* projections.

In short, although some local effects of deforestation may be severe, the evidence does not support the view that either the world or the tropics are undergoing rapid aggregate deforestation. Furthermore, the evidence shows that current rates of deforestation are quite modest for the world's virgin tropical forests.

Potential Problems of Deforestation

What are the potential difficulties generated by deforestation, and how serious are they today? Four separate and identifiable types of potential problems appear to arise from deforestation:

- shortages of industrial wood
- shortages of fuelwood
- environmental problems
- genetic resource problems.

Each of these problem areas can, in principle, be either local or global in nature, and perhaps both.

The question of industrial wood availability is global, since industrial wood and wood products are heavily traded internationally. Without developing the argument here, we do not believe that serious shortages of industrial wood are likely to occur, since the potential of forest management and high-yielding plantations is just beginning to be realized, and market incentives are readily available.

The fuelwood issue, by contrast, is almost entirely local or regional, and as such is, in principle, amenable to local solutions. Fuelwood scarcity certainly is a serious problem in many regions such as Africa's Sahel, and we anticipate this regional problem to persist.

Environmental problems can be either local or global. Clearly, numerous serious local environmental problems are caused by deforestation both in the tropics and elsewhere. The downstream flooding in India caused by deforestation in Nepal is just one example.

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The study implies that the deforestation pressure is least severe on the forests that are biologically most fragile.

However, we find little evidence that serious global environmental damage is related to current rates of deforestation. The most discussed candidate as an example of a serious global environmental problem caused by deforestation is the climate change that is believed to accompany the rising levels of carbon dioxide (CO_2) in the atmosphere.

Although we are not technically competent in this area, scientific consensus maintains that deforestation will not significantly increase future atmospheric CO_2. For example, the authoritative *Carbon Dioxide Review 1982* states flatly, "No one any longer suggests land-use changes will produce a significant fraction of man's total future releases of CO_2. If there is a carbon dioxide problem in the future, it will be due to the burning of fossil fuels; *not* the burning of forests." This conclusion is strengthened when it is recognized that the best current estimate of the rate of deforestation—the UN study—is well below earlier estimates; and that net afforestation in the temperate regions is probably offsetting some of the CO_2 effects of deforestation in the tropics.

Finally, there is the question of losses of the world's genetic resource base to deforestation. Our investigation suggests that this is certainly a potential and probably an actual problem. However, the extent and seriousness of the problem are difficult to assess. Hard evidence is lacking. Estimates of future losses of species are, at best, the crudest of guesses. Even estimates of past losses of species are crude.

Nevertheless, there are reasons to believe that unique genetic resources, particularly those confined to limited areas of tropical forests, are being destroyed at socially excessive rates. It is also clear that the habitats housing some unique genetic resources are threatened, particularly in coastal Brazil and in Madagascar, and that if some of these habitats are not preserved, genetic losses will occur.

Looking at the entire deforestation question, our analysis suggests that most problems of excessive deforestation, especially in the tropics, are related to the resource's nature as common property. A resource that belongs to everyone ultimately belongs to no one. Hence, no individual or group wants to incur costs to protect and maintain the resource in the face of growing pressure. The result of the common-property nature of the resource is what biologist Garrett Hardin has labeled "the tragedy of the commons." In this situation the resource is exploited not only beyond its biological sustainability but also beyond what is economically optimal. Hence, neither ecologic nor economic criteria are satisfied.

We believe that the common-property problem is the principal source of many, if not most, of the local environmental and fuelwood problems associated with deforestation in the developing world—as well as a potential destroyer of genetic resources. Enlightened policy, therefore, must design institutions that will address this problem. ■

Global Revision

Sedjo and Clawson's article is adapted from a chapter by the same authors, titled "Global Forests," in the forthcoming book *Global 2000 Revised*. The book was edited by Julian Simon, a professor of economics and business administration at the University of Illinois, and by the late Herman Kahn, director of the Hudson Institute.

The book is a response by 22 academics and researchers to the report *Global 2000*, released in 1980 by the Carter Administration (U.S. Government Printing Office). Carter had called for the report in his 1977 environmental message to Congress. The President's Council on Environmental Quality did most of the writing, with help from the State Department. *Global 2000*'s authors asserted that their work "depicts conditions that may occur if there are no changes in public policy, institutions, or technology." In other words, since such things are certainly going to change somehow, *Global 2000* was more of a warning than a prediction—an attempt to spur changes that would prevent the dire conditions described in the report.

One such description covered growing stock in less developed countries, which the *Global* authors said was heading for a decline of 40 percent between 1978 and 2000. By 2020, "virtually all of the physically accessible forest in the less developed countries (LDCs) is expected to have been cut," the report stated.

Global 2000 came under heavy fire as soon as it was released. Marion Clawson argued that the report's "processes are suspect, its data lacking, its inconsistencies too prevalent, and many of its conclusions unwarranted." (*See* Luke Popovich's article, "Global Despair—Chicken Little Comes to Town," August 1981 *Journal*, p. 523.)

The critics' concerns led to *Global 2000 Revised*, which was funded in part by the conservative Heritage Foundation. The new report stands the original *Global 2000* on its head. The Carter Administration report had said, "If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption . . . despite greater material output, the world's people will be poorer in many ways than they are today."

The *Revised* report retorts: "If present trends continue, the world in 2000 will be less crowded (though more populated), less polluted, more stable ecologically, and less vulnerable to resource-supply disruption than the world we live in now . . . the world's people will be richer in most ways than they are today."

Along with Sedjo and Clawson's relatively optimistic review of tropical deforestation, the report states that soil erosion is declining in the United States, that extinction of plant and animal species is not nearly as rapid as *Global 2000* had said, and that increases in atmospheric carbon dioxide do not threaten immediate harm.

Some draft chapters of *Global 2000 Revised* were released during a symposium at the annual meeting of the American Association for the Advancement of Science held in Detroit, Michigan, in May. The report sparked some criticism of its own, most notably by former President Carter. Carter and other *Global* backers admitted that the original report was flawed, but that its conclusions served as catalysts for environmental work. *Revised* editors Simon and Kahn argued at the AAAS meeting that *Global 2000*'s exaggerations "badly served" and "scared" the public.—*Ed.*