

Impacts Of Different Philosophies On Natural Resources

What
is needed
most of all,
it seems
to us, is an
awareness of
the nature
of the struggle
in the world,
and a
willingness
to act
boldly and
creatively
to meet
its
challenge.

The Progressive 1966

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Natural resources are a crucial part of our world. Although actually manipulating resources is a “hands-on” job, resource management in the bigger picture is dramatically affected by the philosophies people bring to the task.

The 1998 Starker Lecture theme, “Impacts of Different Philosophies on Natural Resources,” offers a unique opportunity to consider the effects of different philosophical points of view.

Our speakers come from a variety of backgrounds, and offer diverse views of resource philosophies and their consequences for the way we treat the natural world.

At the time of the 1998 lectures, **Dennis Dykstra** was the Deputy Director General for Research at the Center for International Forestry Research in Jakarta, Indonesia. Currently, he is an international forestry consultant based in Portland, Oregon. A native Oregonian who has worked in diverse environments around the world, he addresses philosophical issues and concrete examples of management impacts in relation to tropical deforestation, climate change, and sustainable utilization of tropical forests.

Per Anglestam is a wildlife ecologist with the forestry faculty at the Grimsö Wildlife Research Station, Swedish University of Agricultural Sciences, Riddarhyttan, Sweden. He describes the changes in Swedish attitudes about

biodiversity and considers the effects of changing philosophies on planning, management, landscapes, and the maintenance of viable populations of naturally occurring species.

William Cronon is the Frederick Jackson Turner Professor of History, Geography, and Environmental Studies at the University of Wisconsin, Madison. He argues that the way people deal with their world is profoundly affected by their philosophies; human definitions of “nature” shape our interactions with nonhuman environments and pervade environmental politics in America.

As always, organizing this series required a major effort on the part of the Starker Lecture Committee. I thank Sandie Arbogast, John Sessions, Chris Maguire, Ed Starkey, and Terry Brown for the dedication and creativity that turned disparate ideas into a coherent theme and a group of outstanding speakers. It is truly a collaborative effort that accounts for the fine tradition of the Starker Lecture Series.





T. J. Starker

The Starker Lecture Series is sponsored by the Starker family in memory of Thurman James, known to all as T. J., and Bruce Starker, his son. As leaders of modern forest management, T. J. and Bruce Starker were visionaries for sustainable forestry in Oregon.

T. J. was born in Kansas and lived his youth in Burlington, Iowa. He moved with his family to Portland in 1907 and began working in and studying forestry, graduating in the first class of foresters at Oregon Agricultural College (OAC) in 1910. He then studied two years for an MS degree in forestry at the University of Michigan and returned to Oregon to work for the USDA Forest Service. Subsequent employment with



Bruce Starker

the forest products industry and a variety of summer jobs while he was teaching forestry at OAC/Oregon State College (OSC) gave T. J. broad and thorough experience in all aspects of forestry.

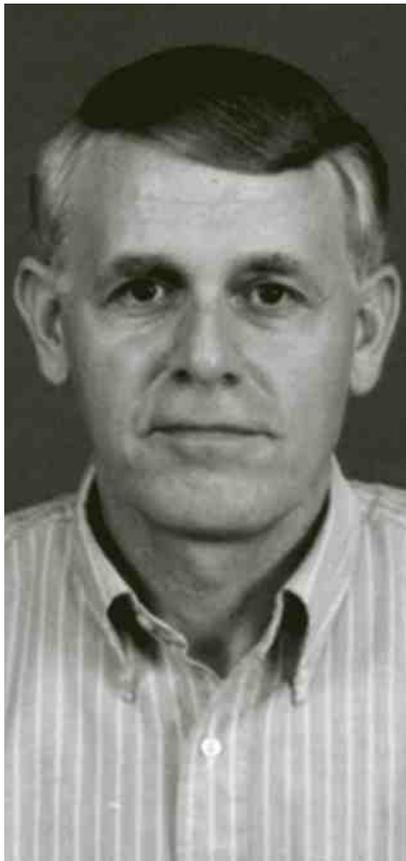
T. J. began purchasing second-growth Douglas-fir land in 1936, the beginnings of Starker Forests. Through his work experiences, and teaching forest management, T. J. had a major influence on sound forestry and community development in Oregon.

Bruce Starker studied for a forestry degree from OSC in 1940 and an MS in forestry in 1941. After service with the Coast Guard, Bruce joined his father, T. J., in acquiring and managing Oregon forest land, always with an eye for sound reforestation, management, and conservation for multiple benefits and values. He worked with university, state, and federal forestry agencies, as well as with private industry, to advance reforestation, management, and equitable taxation to encourage private forest management. Bruce continued the family tradition of active community service in many ways, including civic activities, regional forestry work, and contributing to writing the Oregon Forest Practices Act.

With advances in knowledge, technology, and public environmental issues, forestry in Starker Forests has changed, but the constant value of tending the land remains unchanged. The sound, progressive forestry and community spirit of T. J. and Bruce Starker continue today.

We at Oregon State University, College of Forestry, family, and friends are pleased to be honored with this lecture series.

Tropical Forests, Carbon, & People: A Revisionist Philosophy for the New Millennium



Dennis Dykstra
Deputy Director General for
Research, Center for
International Forestry
Research, Jakarta, Indonesia

*There are more
things in
heaven and earth, Horatio,
than are dreamt of in your
philosophy.*

—William Shakespeare

It is both a great honor and a great pleasure to speak in the 1998 Starker Lecture Series at Oregon State University. Having grown up 10 miles east of Lebanon, on the other side of the Willamette Valley, and having done both my undergraduate work and my doctoral studies here at Oregon State University, I feel as though being here today is like coming home in a very special way. Home is never quite the same as the place one leaves behind. This university, this town, and the state of Oregon have all changed rather dramatically since June 1978, when I left Corvallis with my family, and began a journey that has encompassed all of the continents, except Antarctica, and nearly all types of forests on Earth. Although home is never the same as the place we remember from our youth, it is, as the poet Robert Frost once said, “the place where, when you go there, they have to take you in.” I’m very pleased that the OSU College of Forestry has taken me in for this one day, because it gives me a chance to catch up with old friends, to meet some new ones, to see the old places with new eyes, and to see a few new places—like the building under construction behind Peavy Hall that

I’ve been told is known as the “Forestry and Forest Products Manufacturing Research Laboratory.” That’s a mouthful! In spite of its cumbersome name, this new facility promises to add tremendous value to the research programs in the College of Forestry, and is a visible sign that the College and the University are anticipating the needs of the next millennium.

In keeping with the theme of this year’s Starker Lectures, I’ve been asked to be philosophical, and whenever a scientist becomes philosophical there is a serious danger that neither the audience nor the speaker will understand what is being said, or why.

When my wife saw the title, “Tropical Forests, Carbon, and People: A Revisionist Philosophy for the New Millennium,” her immediate reaction was, “Just like a forester—you always put forests first and people last.” Her comment illustrates the importance of interdisciplinary efforts in forestry, if only to ensure that different cultural perspectives are considered before decisions are made. Some of the Great Debates in forestry have had their seeds in cultural misunderstandings based on poor communication.

The title identifies my perspective in this lecture as “revisionist philosophy.” Philosophy is “the search for wisdom,” and this year’s Starker Lectures consider the effects of different philosophies on the world’s forests. A “revisionist philosophy” is one that advocates revision of doctrines or policies, generally through evolutionary rather than revolutionary means. I hope that my remarks will be seen as doing just that. The new millennium is mentioned because I believe that the change of the millennium provides a unique opportunity for us to focus the

attention of the world's population on important issues such as the future of tropical forests. I'm pragmatic enough to believe that we need to take advantage of occasions like this to inform the general public about forests and forestry.

My objective in this presentation is to discuss tropical forests in the context of three "Great Debates": tropical deforestation, climate change, and sustainable utilization of tropical forests. I'll consider each of these three topics in some depth.

Tropical deforestation

Tropical deforestation is one of those topics that almost everyone from industrialized countries appears to know quite a lot about, or at least to have an opinion on. My intent is to summarize current data on the extent of tropical deforestation and trends in estimated deforestation rates. Then I'll discuss the major causes of deforestation, as established by recent research, and will consider what I've identified as a set of "myths" and "truths" related to tropical deforestation.

Extent and trends

The graph in Figure 1 summarizes recent data from the Food and Agriculture Organization of the United Nations' (FAO) ongoing project to track the area of forests in all countries and regions of the world. The total area of tropical forests still represents slightly more than half the world's total forest area. Globally, the net change in forest area between 1990 and 1995 was essentially nil. In contrast, the area of forests in all three tropical regions decreased over this period, with a slightly larger decrease in Latin America than in Africa and Asia. To balance this, the area of forests in the former Soviet Union increased rather substantially during the period. In *State of the World's Forests*, FAO (1997) cautions that this result is preliminary, and may be at least partially the result of changes in survey methods. In each of the nontropical regions other than the former Soviet

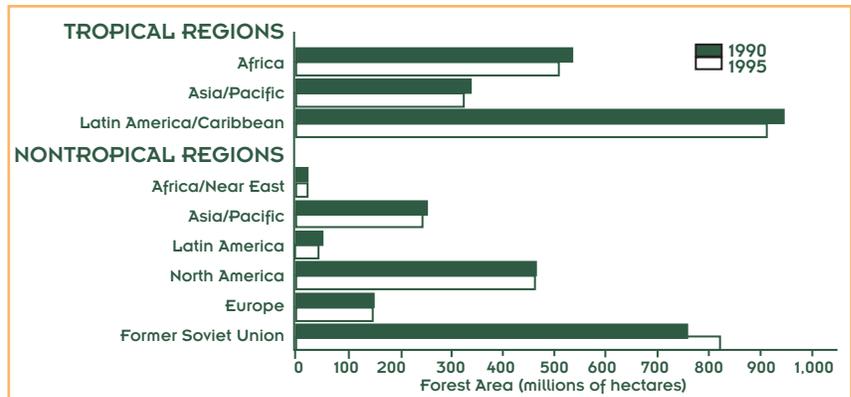


Figure 1. Summary of recent data from the Food and Agriculture Organization of the United Nations' ongoing project to track the area of forests in all countries and regions of the world (Source: FAO 1997).¹

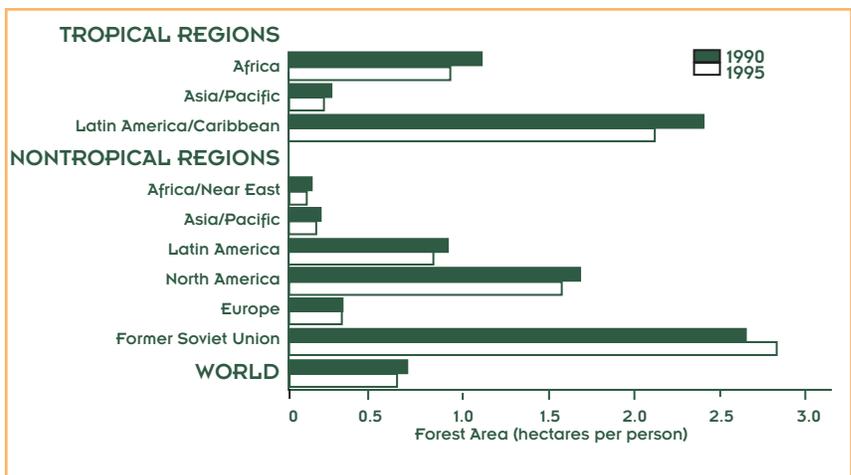


Figure 2. Area of forest per person in each region, based on recent data from the Food and Agriculture Organization of the United Nations' ongoing project to track the area of forests in all countries and regions of the world (Source: FAO 1997).²

Union, the area of forests was essentially unchanged over the 1990–1995 period.

When the data graphed in Figure 1 are expressed as a ratio to the population of the respective region, we get information on the area of forest per person in each region (Figure 2). The regions shown are the same as in the previous graph, but the additional pair of bars at the bottom of the graph indicates the world as a whole.

Figure 2 shows clearly that the forest area per capita is quite low in Asia, in spite of a relatively large total forest area. Another interesting trend is the reduction in forested area per capita in all regions of the world except Europe and the former Soviet Union.

This reduction is driven by population growth, and the net result is an overall reduction in forest area per capita for the world as a whole between 1990 and 1995.

For one critical tropical region, that of the Brazilian Amazon, Figure 3 shows estimated deforestation rates over the past 20 years. Data for the first decade are averages from a preliminary study made in 1988. Data have been collected from satellite imagery each year since then by the Instituto Nacional de Pesquisas Espaciais (INPE), the Brazilian space agency (equivalent to NASA in the United States).

1. To convert data on the horizontal axis to millions of acres, multiply by 2.5.

2. To convert data on the horizontal axis to acres per person, multiply by 2.5.

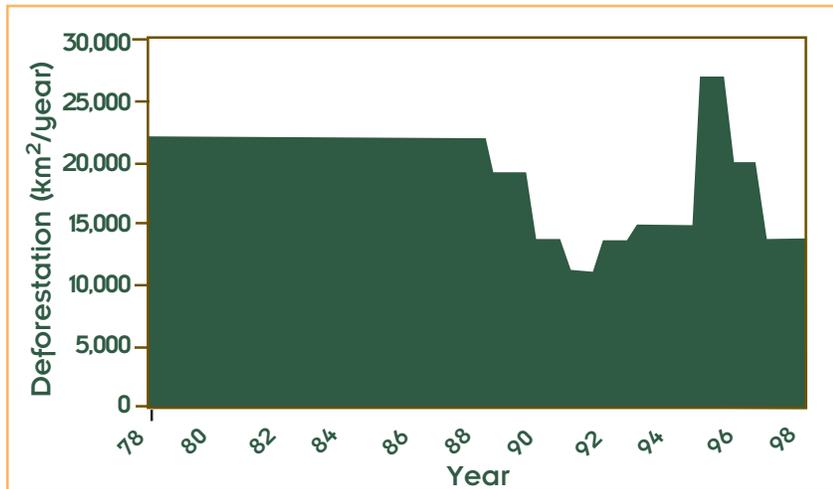


Figure 3. Estimated deforestation rates³ over the past 20 years in the Brazilian Amazon.

For purposes of comparison, the average deforestation rate between 1978 and 1988 was about 22,000 km² per year. Thus, an area approximately equal to that of the state of New Jersey was cleared each year in the Brazilian Amazon. Although the deforestation trend appears to have become much more erratic since 1988, this reflects the lack of annual data for the earlier period.

According to an analysis by INPE (1998), the deforestation rate is driven partly by beef markets and partly by economic contractions. High prices for export beef provide an incentive for people to increase the conversion of forest to pasture. Economic contractions tend to drive people out of cities in an effort to sustain their families through agriculture.

The government of Brazil claims that the general downward trend in deforestation since 1995 is the result of the removal of certain incentives, such as a subsidy on beef production. Whether or not this downward trend will actually continue can only be determined by monitoring the deforestation rate closely over time.

Causes

The permanent conversion of forests to other land uses is a complex process that has many causes. Much

of the debate on tropical deforestation has tended to oversimplify the issues, often with a focus on industrial logging. I'm no apologist for logging practices in tropical countries, but a focus on the *proximate* causes can obscure the *underlying* causes, and therefore prevent real solutions from being developed and implemented.

Research undertaken by the Center for International Forestry Research (CIFOR) and a number of other organizations has established that the most important *underlying* causes of tropical deforestation include the following:

- *Poverty and landlessness*, including hunger for land, both by individuals and by industrial organizations. This underlying cause is particularly troublesome, given that the tropical countries in which the highest rates of deforestation occur are precisely those countries in which high rates of population growth will only exacerbate land hunger in the coming decades.
- *Insecure tenure or use rights*. In many countries, as once was true in the United States, ownership of land can be established by clearing the forest. This type of policy continues to be a major cause of deforestation in most tropical countries.
- *Subsidies and incentives* that directly or indirectly lead to deforestation. Many Latin American countries

have historically subsidized beef production, although this is now changing. Malaysia and Indonesia continue to subsidize oil palm and rubber plantations, both of which are usually established on areas cleared of forest. Until recently, Indonesia also has subsidized conversion of primary forest to timber plantations.

Some of the more important *proximate* causes of deforestation are as follows:

- *Shifting cultivation*. This practice can lead to degradation and eventually deforestation in areas with both extreme poverty and rapid population growth. It is the chief proximate cause of deforestation in large parts of Africa, and in the poorest countries of Asia and Latin America.
- *Conversion of forest to pasture and agriculture*. These conversions continue to be the most important direct cause of deforestation in much of Latin America and the Caribbean. All three of the underlying causes indicated in the previous section promote such conversions.
- *Industrial agriculture*. Industrial agriculture is a major proximate cause of deforestation in Asia, and to a lesser extent in Latin America. The underlying causes are government subsidies and incentives that promote industrial agriculture.
- *Industrial logging*. Although not a major direct cause of deforestation, industrial logging facilitates colonization of forested areas by opening up road networks and reducing vegetative cover on logged-over areas. Estimates are that 10–15 percent of tropical deforestation is directly associated with logging (FAO 1997). Much of this could be avoided by providing timber companies with more secure tenure. As a result, they would have an incentive to protect the forest from colonization, as well as to invest in forest management.

3. To convert these numbers approximately to square miles, multiply by 0.4. Thus, 10,000 square kilometers is approximately equal to 4,000 square miles. (The actual number is 3,861 square miles.)

- *Economic and political shocks.* Deforestation is increased when urban workers are forced to migrate back to their home villages. This has been an important proximate cause of deforestation in Cameroon over the past decade, and may become important in Indonesia and several other Asian countries over the next few years.
- *Land speculation, resettlement, and such other factors as war.* In these situations, the people converting forests are reacting to one or more of the underlying causes cited previously.

Myths and truths

What is “truth” to one person is often “myth” to someone else, and, of course, vice-versa. Certainly the subject of tropical deforestation is no exception. Opinions about tropical deforestation tend to be rather sharply divided. Therefore, I offer the disclaimer that the “truths” I summarize here are as seen through the narrow lens of my own biases, and are based on my experience and reading of the literature.

- *Myth:* Deforestation is forever.
- *Truth:* What most people regard as deforestation often lasts only a short time before the land reverts to new forest growth; in other words, much “deforestation” is not permanent land-use change at all. This regrowth has been listed as a major complicating factor in the study of deforestation in the Brazilian Amazon by INPE (1998). The area in secondary forests is increasing rapidly throughout the Tropics, with an estimated 200 million hectares (500 million acres) of secondary forests in the Amazon Basin alone. These forests have regrown on lands that originally were cleared for agriculture or pasture, and later abandoned or left to regenerate. Although they are not identical to primary forests, secondary forests exhibit much of the biodiversity (typically 70–90 percent of

plant species diversity) and provide many of the same environmental services as primary forests.

- *Myth:* Deforestation is never the preferred option.
- *Truth:* Deforestation can increase overall wealth in areas where soils and other conditions are favorable. With the exception of the Great Plains and a few similar areas, most agricultural lands in Europe and North America were originally forested.

It’s commonly believed that tropical soils are incapable of supporting sustainable agriculture. Similar to most generalizations, this statement contains a kernel of truth, but oversimplifies to the point that the principle becomes useless. The soils in many tropical areas are relatively poor, yet, in others, nutrient levels are as high as or higher than in temperate areas. The key is to identify areas that can be converted to sustainable nonforest land uses, and then to develop incentives to retain forest areas on the marginal or more remote sites.

Each country needs to decide how much of its land area should be retained as forest, the types of forest that need to be preserved, and the desired distribution of these areas over the land. A simple focus on deforestation as an issue isolated from population growth and agricultural productivity is overly simplistic and counterproductive.

- *Myth:* Shifting cultivation is always destructive.
- *Truth:* Shifting cultivation is a practice in which farmers temporarily clear forests to grow crops. Typically the cleared area is farmed for a few years until the fertility of the soil has been reduced below a satisfactory level. The farmer then abandons the plot and lets it regenerate into secondary forest. If this fallow period is sufficiently long, soil fertility

will be replenished by the time the farmer, or the farmer’s descendants, return to clear the plot again. This system has been practiced for millennia in some areas and is, therefore, as sustainable as any agricultural system we know about. Where population growth is low and the fallow cycle is sufficiently long, shifting cultivation can be a viable, permanent land use. All too often, population growth and immigration have disrupted the cycle, thus resulting in degradation of both the forest fallows and the agricultural lands.

- *Myth:* Logged forests are always species-poor.
- *Truth:* Logging often reduces species diversity in the short run, but many forests recover quickly. A study published this year in *Science* (Cannon et al. 1998) shows that commercially logged forests in Indonesia suffered a reduction in species diversity immediately after logging, but recovered within a few years to a level of diversity not significantly different from that in unlogged primary forests.
- *Myth:* Tropical forests are inevitably fragile.
- *Truth:* Nearly all tropical foresters can cite examples in which human activities such as logging and shifting cultivation have caused so much degradation that the forest was unable to recover, even after many decades. Moving from these anecdotal observations to a conclusion that all tropical forests are highly fragile is another sweeping generalization that contains a kernel of truth, and yet is untrue on the whole.

Many areas of moist tropical forest are in fact impressively resilient. This does not mean that human activities have no effect; such activities inevitably change forests in significant ways. What it

does mean is that many tropical forests are no more fragile than the majority of temperate forests. One responsibility of foresters is to follow practices that increase or at least do not reduce, ecosystem resilience. Many foresters in the Tropics, as in the Temperate Zone, have not done this job well. This is particularly true in the dry and semi-arid Tropics, where regeneration failure can lead to long-term degradation and even desertification.

- *Myth:* Effects of fragmentation are always negative.
- *Truth:* Forests become fragmented when humans clear sections of forest, thus leaving blocks of uncut forest surrounded by cleared or semicleared lands. The July–August 1998 issue of *Natural History* magazine includes a special report on the fragmented forest research project carried out in the Brazilian Amazon over the past 20 years by Thomas Lovejoy and his associates at the Smithsonian Institution (Laurance et al. 1998). This research has demonstrated conclusively that some species of plants and animals are affected negatively by forest fragmentation, whereas others benefit from it. I would point out that we don't need to consciously create fragments, even if we want to emphasize species that benefit from fragmentation. Plenty of fragments develop as a result of everyday human activities such as farming and road-building. However, an important conclusion from the research by Lovejoy and his colleagues is that biodiversity can be maintained in medium-sized fragments with the proper kind of management and monitoring. Certainly more research is needed to help figure out exactly how to do this—including defining what is meant by “medium-sized.”

Nonetheless, significant progress is being made.

Climate change

Having given a rather quick overview of the topic of deforestation, I'm now going to turn to climate change and the subject of carbon sequestration by tropical forests. I'll also suggest the degree to which forests might be helpful in mitigating climate change. Eventually I'll show how this is related to deforestation and to sustainable utilization of tropical forests.

Is the climate changing? We know that the average land surface temperature has increased 0.4–0.6°C during the 20th century. On the average, precipitation has increased in the middle-to-high latitudes, and decreased in the Tropics. Mean sea level has risen 15–20 cm. July 1998 was the hottest month ever recorded. And we have recorded eight of the 10 hottest years of the 20th century during the past decade. Although the data are not 100 percent conclusive, the prudent course is to act as though a change is underway.

Surprisingly, many people, particularly in the United States, are apparently not yet convinced that the climate is being warmed by the increasing concentrations of greenhouse gases that our automobiles and industrial processes are emitting into the atmosphere. Although the weight of evidence is sufficient to convince many scientists, the data are not 100 percent conclusive that anthropogenic climate warming is underway. Nevertheless, I would argue that we have no choice but to act as though it is. Failure to do whatever we can to minimize the effects of climate change, and to develop strategies and technologies for adapting to it, may condemn our children and grandchildren to a world in which huge amounts of existing resources are expended in an attempt to overcome the problems we left behind.

Forests are an important component of the carbon cycle. Tropical moist forests, in particular, are amazingly

efficient carbon-sequestration machines. Even the boreal forests and tundras that range across the northern tier of North America and Eurasia are surprisingly important sinks for atmospheric carbon.

Forests play a role in mitigating climate change. They store ~900 gigatons of carbon, compared to the approximately 750 gigatons stored in the atmosphere. Two-thirds of forest carbon is in soils. Industrial carbon emissions are ~7 gigatons per year, and this is expected to grow to ~10–15 gigatons per year by 2050. The estimated net emissions from forests range from –1.0 to +1.7 gigatons per year. Clearly, we need to maintain forests as reservoirs of carbon.

The Kyoto Protocol, developed in 1997 at the Congress of the Parties to the Framework Convention on Climate Change in Kyoto, Japan, recognizes the importance of forests as a storehouse of carbon. The protocol also encourages the development of incentives (possibly through mechanisms such as carbon markets) to reduce deforestation, improve reforestation after logging, and convert certain nonforest areas into forest plantations for the purpose of sequestering carbon. Although this may eventually work to the benefit of tropical forests and forestry, it also may lull the world into thinking that forests can accomplish more than they can. Even with the best possible management, it seems unlikely that forests can sequester more than 10–15 percent of industrial carbon emissions. Currently, the best estimate is that forests are *net emitters* of carbon, possibly emitting an amount equal to about 15 percent of industrial emissions. This is primarily the result of burning of vegetation in areas cleared for agriculture and other nonforest land uses.

Even if all deforestation could be stopped, and even if better forest management practices could be implemented worldwide, it's likely that the best we can expect is that forests might absorb perhaps 5 percent of

industrial carbon emissions. This implies that other means, chief among them a significant reduction in the use of fossil fuels by industrialized countries, are needed in order to absorb or offset the other 95 percent of industrial emissions. The United States in particular is going to have to participate more fully in this process than its citizens, at present, appear willing to do.

Sustainable utilization of tropical forests

Sustainable utilization relates directly to both carbon sequestration and the subject of tropical deforestation. During the past year or so, an active debate has developed regarding whether or not what has been referred to as “sustainable forest management” is a viable option for tropical forests. In this context, sustainable forest management refers to the long-term use of forests for the production of multiple outputs, including commercial timber.

One school of thought contends that the best strategy for protecting tropical forests is to allow loggers to remove the small number of commercially valuable trees (often no more than 10 per hectare, or 4 per acre), and then close the forest permanently (Bowles et al. 1998, Frumhoff and Losos 1998). I refer to this strategy as “log and lock away.” Proponents of this strategy argue that this will protect biodiversity better than sustainable forest management, because it will permit only a single harvest entry into the forest, after which the forest will be protected forever. With sustainable forest management, the forest will be re-entered periodically for logging, typically at intervals between 20 and 100 years. The length of the interval depends on conditions particular to each forest area.

I would argue that, although the “log and lock away” strategy is one option that should be considered when conditions warrant, it will work only under very special circumstances. In fact, no single strategy will be effective in all situations, and the full range of

options—preserved untouched, used as nontimber forest product (NTFP) reserves, treated with reduced-impact logging, designated for sustainable forest management, or logged and then locked away—should be considered.

Criteria that will affect the choice of management strategy, e.g., sustainable forest management versus preservation, for tropical forests include the following:

- Special values (e.g., high biodiversity).
- Pressure for conversion.
- Markets (timber, NTFPs).
- Enforcement capacity.
- Availability of skills needed for planning, engineering, management, and supervision.
- Policies, incentives, and institutions.
- Population size, growth, and distribution.
- Special factors, such as the presence of immigrants or refugees.

In forests with very high endemic biodiversity and low pressure for deforestation, any of the low-utilization options ought to work. These options include full preservation, designation as NTFP reserves, and the “log and lock away” strategy.

Where forests are under extreme pressure for conversion to other land uses, the only way to prevent this conversion is to demonstrate that forest management is an economically viable option. This can be done only through sustainable forest management, or some variant of it. Nearly all attempts to seal away forests that were under extreme pressure for conversion have been dismal failures.

One potential strategy for promoting sustainable forest management while at the same time substantially increasing sequestration of carbon is through the use of techniques that, in the aggregate, have become known as “reduced-impact logging.” As one example of this, I want

to summarize briefly CIFOR’s experience over the past 5 years with a carbon-sequestration project implementing reduced-impact logging in Sabah, Malaysia.

The carbon-sequestration project in Sabah was created in 1993 through the efforts of a “carbon brokerage,” COPEC, which is located in Los Angeles, California. This company arranges the sale of carbon from timber producers in developing countries to emitters of carbon, usually power-generation companies, in industrialized countries. The sale involves the following cooperators:

- New England Power Company: Carbon payments.
- Rakyat Berjaya (Sabah Foundation), German Technical Assistance Sabah Project: Forest management.
- Forest Research Institute of Malaysia, CIFOR, Rainforest Alliance: Environmental audits.
- CIFOR, University of Florida: Research.

The following is a summary of research comparing impacts of conventional logging versus reduced-impact logging on the Sabah project’s carbon sequestration:

- Phase I (1993–1995): 1,400 hectares, conventional; 1,440 hectares with reduced-impact logging.
- Phase II (1996–1998): 500 hectares per year, conventional; 500 hectares per year with reduced-impact logging.

An unusual aspect of this particular carbon-sequestration project is that the sequestration of carbon occurs through the adoption of reduced-impact logging practices by the timber concession holder. These practices increase the amount of carbon retained in the postlogging forest as compared to that retained with conventional logging.

At the time this project was initiated,

the amount of carbon that could be sequestered through reduced-impact logging as compared to conventional logging was not known. Therefore, CIFOR and the University of Florida were engaged to develop procedures for measuring carbon sequestration, and to compare the results for the reduced-impact logging operation with those for conventionally logged areas. To do this, relatively large treatment areas were included in the study. The research measured both above-ground and below-ground biomass on the study sites, with recognition that, on average, nearly two-thirds of forest carbon is in the soil. Procedures used in the reduced-impact logging treatments, but not in the conventional logging treatments, were the following (Pinard et al. 1995, Pinard and Putz 1996):

- Harvest planning with 100 percent stock maps at 1:5,000 scale.
- Cutting vines 1 year prior to logging.
- Using directional felling.
- Preplanning skid trails, and requiring tractors to stay on skid trails at all times.
- Minimizing earthwork, and installing cross-drains on skid trails.
- Avoiding steep slopes and wet areas.

Most of the reduced-impact logging practices implemented for this project have been used for many years in temperate forests. Others, such as the need for 100 percent stock maps and the practice of cutting vines in advance of logging, were developed through research undertaken in Malaysia and other tropical countries.

Although the reduced-impact logging practices are neither new nor revolutionary, they are uncommon in most parts of the Tropics, and skilled workers who know how to do them or understand why they are being asked to do them are seldom available. Therefore, the felling and skidding crews were trained, and a staff of “forest rangers” was created to plan the operations and provide direct

supervision of the contract logging crews. The person in charge of the reduced-impact logging operations is a Malaysian with a master’s degree in Forest Engineering from Virginia Polytechnic Institute and State University.

Postharvest results of the project include the following:

- The reduced-impact logging area has 100 metric tons per hectare more biomass, and 42 metric tons per hectare more carbon than the conventional area.
- Forty-one percent of residual trees (<60 cm dbh) was damaged by logging on the conventional treatment, compared to 15 percent damaged on the reduced-impact logging treatment.
- Seventeen percent of the conventionally logged area was in roads and skid trails, compared to only 6 percent of the area treated with reduced-impact logging.

The results of this effort to implement reduced-impact logging on a large scale have been substantial. The relatively simple improvements made in comparison to conventional logging have resulted in significant reductions in environmental impacts, as well as a major increase in the amount of carbon retained on the areas logged.

Results of the study have been projected with an empirical model developed for the study area by Michele Pinard, now at the University of Aberdeen in Scotland, as part of her PhD dissertation at the University of Florida (Pinard 1995). Logging reduces the total amount of carbon in the forest, because some carbon is exported to timber processing plants. The main purpose of reduced-impact logging as a carbon-sequestration strategy is to retain a significantly larger fraction of living trees and other vegetation after logging has been completed. These living plants retain carbon and, because of the “thinning effect” caused by removal of part of the forest canopy, are able to grow very rapidly after logging. Thus, they sequester carbon at a much faster rate

after reduced-impact logging than they do after conventional logging.

New England Power Company has agreed to purchase carbon from the reduced-impact logging area over a 40-year period. The carbon level in the area logged by reduced-impact means is projected to remain higher than it would have were the area logged by conventional means (Pinard 1995). The quantity purchased is the difference between these two values over the time period. Thus, the company purchased the additional carbon sequestered through reduced-impact logging. This carbon would have been lost to the atmosphere if the reduced-impact logging area had been logged conventionally.

The carbon purchased amounts to a total of 1,859 metric tons per hectare of treated forest, or an average of about 45 metric tons per hectare each year. This represents a 40 percent increase in carbon sequestered on the reduced-impact logging areas as compared to the conventionally logged sites.

I believe this project demonstrates the potential of sustainable forest management to contribute to the economic development of tropical countries, and at the same time help to mitigate the effects of climate change through atmospheric forcing by greenhouse gases. Sustainable forest management can help reduce tropical deforestation by providing an economic incentive to retain lands in forest. This requires that people living in and near the forests, not just the owners of timber companies, participate in the economic benefits (Sist et al. 1998).

Finally, reduced-impact logging is not the only practice that will improve carbon sequestration by forests. Extending rotations, reducing logging waste, and implementing soil-conservation practices all have important roles to play (Brown 1997). In addition, improving the efficiency of wood use will help conserve carbon (Winjum et al. 1998).

Concluding remarks

To summarize briefly, I've reviewed some recent trends in tropical deforestation and identified the important underlying causes of deforestation. I hope I've also managed to explode a few of the common myths that people in industrialized countries tend to hold about deforestation. Further, I've discussed the important role of forests in the carbon cycle, and reviewed the potential of carbon sequestration by forests to help mitigate climate change. I want to reiterate that, even under the best scenarios, forests will be able to sequester only a small fraction of annual carbon emissions. By far the most important and essential step is to reduce emissions of greenhouse gases by industrialized countries, particularly the United States.

I've also reviewed briefly the debate on sustainable management versus preservation of tropical forests, and suggested that no single overriding strategy is applicable to all forests at all times. Rather, we need to consider potential threats to forests, as well as the existence of markets and infrastructure, before deciding on whether, and how, forests should be managed.

Finally, I claim that the three topics of my presentation are closely interlinked. Ecologists are fond of saying "you can't do just *one* thing." This saying is meant to express the idea that human actions are inextricably part of the complex web of interactions that form the Earth's biosphere. It is perhaps more true in the Tropics than anywhere else today, because pressures on tropical forests from population growth, poverty, and land hunger are severe and will increase substantially in the coming decades. I don't offer any easy solutions, but I do believe that sustainable forest management will be part of any solution that addresses the needs of people in developing countries, as well as the global need for reduced deforestation and mitigation of climate change.

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Questions and answers

Question: Regarding low-impact logging, it's my understanding that with some tropical tree species—and I think teak is one of them, if you go in and take only teak trees out of the stand, you'll never get teak to grow back. The only way to get teak to come back is to cause a much greater impact to the area than taking the trees off can justify. If you use reduced-impact logging, will you have difficulties regenerating the commercial species that you want to get? Is this widespread in tropical forestry?

Dykstra: What you've said is true in some places, and teak is one of the species for which this is a problem. Fortunately, teak grows very well in plantations. And, except in Burma, nearly all commercial teak is grown in plantations now. Indonesia, for example, has 2 million hectares of teak plantations. Mahogany is another species for which it is very difficult to get regeneration unless you have a rather extreme treatment, which is essentially the same as clearcutting. You need to do a very thorough job of harvesting and a fair amount of soil disturbance. Mahogany grows in quite flat areas, so the amount of soil disturbance that's required to get mahogany back will not cause major erosion problems. In places like Indonesia, however, where dipterocarps are prevalent and slopes tend to be quite steep, reduced-impact logging is important, even if you have to do enrichment planting in order to get the species you want. With dipterocarps, regeneration is seldom difficult. You can't make a general overall rule, but have to think about what's needed for the species you're interested in.

Question: In developing countries where you have tropical forests surrounded by large populations trying to eke out a living by whatever means possible, have you ever seen the will or means used, whether guards or armies, whatever it

would take, to protect the forest? Or is it more a matter of establishing a policy, and then walking away from it?

Dykstra: This is a good question. As I mentioned, you have to consider various criteria before you can decide how a forest is to be managed. Most instances of preservation of forests haven't worked in the Tropics, because of population pressures on outlying areas. But various techniques have been put in place to try to overcome this. One technique involves the use of buffer areas. People are allowed to make extensive use of the forest, but are restricted from going into the core area, which is to be preserved. In general, these areas haven't worked very well. The only places that I'm familiar with, places with preserved forests that have worked well, are either areas that are very inaccessible, or areas that simply don't have anything worth going after. The population pressures and extreme poverty in most countries require that forests have some kind of use if they are going to be protected.

Question: You mentioned that global forests can take care of 15 percent of industrial carbon emissions. Is there a time frame for this estimate?

Dykstra: It depends on whether or not the amount of carbon emissions from the industrial world increase. That 10–15 percent from the industrial world is based on current emissions, which are somewhere around 7 gigatons carbon per year in all of the world—industrialized and developing countries. One estimate, recently, is that this may double by the year 2030. If that's true, then forests will be capable of sequestering a much smaller percentage than now. So, yes, there is a time element to this.

Question: Would you make the distinction between carbon sequestering and carbon storage? They are fundamentally related.

Dykstra: Sequestration is the locking away of new carbon taken from the atmosphere and storing it, whereas carbon storage refers to retention that has already been sequestered. Much of

the carbon being stored in the soil, for instance in the tundra, has been locked up for a very long time—as long as 10–20 thousand years, because much of the tundra is permafrost. In fact, if the climate begins to warm, one danger is that some of the permafrost may thaw and the amount of carbon being stored by tundra will decrease. Sequestration is the actual process of locking away carbon, whereas storage refers to what's already been put away.

Question: The nature of the wood products taken away from the forest is very important in terms of how long the carbon captured in the bole of a given tree is going to be stored. What is the nature of wood products that are being produced from the raw materials that are coming from the forests you've referenced today?

Dykstra: This issue is an important one. When you convert a forest into, for instance, lumber, it has a much longer carbon storage period than if you convert it into paper. There are no very good life cycle analyses that show these over the long term, as far as I am aware. It's certainly one of the things that is needed, and I know that a number of people are starting to work on life cycle analyses of various kinds of forest products. If we are to make decisions for the future, based at least partly on carbon storage, we need to have that kind of information.

Question: The fires in Indonesia and other places like Brazil got people's attention in the past year. Fire results in an instant carbon release. Do you think what we saw last year is going to be a recurring kind of thing? Or is it a very unusual circumstance?

Dykstra: I think the answer is both. It's going to recur because El Niños recur, and it was a very unusual event because it was associated with an unusually extreme El Niño occurrence. It's not clear what the trends will be. Some atmospheric scientists believe that El Niño occurrences are becoming more frequent. Certainly this last one, last year, was much more intense than most of the others that have occurred this century.

At least in Indonesia, most of the forests that burned last year were forests that also burned in the previous major El Niño event in 1983–1984. Very little burning occurred in primary forests. Partly that's because the primary forests in Indonesia are relatively remote. Most of the fires are started by people, i.e., they are not natural. Very often they are started by people burning as they do every year. In a normal year, however, the soils are wet and the forests are wet and the fires don't go very far. Last year was dry, and the fires took off. One of the motivations for using techniques like reduced-impact logging is that it reduces the amount of waste materials, i.e., woody residues, that are on the ground and that will burn if the forest gets dry.

Question: What is CIFOR's experience related to drier forest formations?

Dykstra: When CIFOR was created in 1993, our mandate was to work on problems related to tropical moist forests. Over time, our Board of Trustees has realized that many of the more severe problems involve the drier forests, because generally those forest areas have higher population densities, and the forests are more fragile. When you clear drier forests, it's much harder to get regeneration. In the event of fire, the forest is much more likely to burn. Recently, we have begun to increase our emphasis on drier forests. We are working in India, in parts of southern Africa, and in parts of Latin America, e.g., Bolivia, where drier forests occur. It's probably too early to draw conclusions, but, in general, where drier forests are under pressure from human populations, it's very important to involve those populations in the direct management of the forests if you are going to prevent the forests from being cleared.

Question: Have you been in Botswana?

Dykstra: Yes.

Question: Have you seen what the elephants are doing there?

Dykstra: Yes.

Question: Is this a major problem, or is it limited to a relatively small area?

Dykstra: Botswana is a country that has dry forests. And elephant populations have increased in many parts of Africa where the ban on the trade of ivory has been extremely effective in reducing poaching. One consequence of this is that there have been deprivations of the elephants in many forested areas. Elephants can be very destructive, especially in dry forests. At this point, no clear best strategy for dealing with the elephant populations exists, but probably it's going to require a culling of herds in order to keep the populations down to the point where they don't damage the forests.

Comment: The people I've talked to there don't want to admit this is happening.

Dykstra: Most foresters admit that it's happening, though people working with elephants may not.

Question: Dennis, would you say something about how you've tried to integrate the social science research with the more biological research that is often part of tropical forestry research programs?

Dykstra: One of the things we recognize at CIFOR is that deforestation doesn't just happen. It's caused by people, and if you work on deforestation issues you have to somehow think about the things that are causing people to clear forests. There are almost always incentives that drive human actions. Sometimes the incentives are things that are very difficult to deal with—such as extreme land hunger as a result of poverty and overpopulation. In general, you can make quite a lot of progress by understanding the motivations that drive people in their relationship to forests. With CIFOR, for instance, of the approximately 60 research staff, only about ten are foresters. A few are other kinds of biological scientists, such as ecologists, who don't consider themselves foresters. The rest are policy people, anthropologists, rural sociologists, and so on, because we recognize the importance of the people who live in and near tropical forests. Decisions they make drive the trends

with respect to deforestation.

Question: Is locking up carbon in the rainforest a viable way of changing harvest methods? And, if so, are there funds available to help with this?

Dykstra: Yes, it is a viable way. It's been successful in the project in Sabah. The Sabah Foundation has now adopted reduced-impact logging on all their operations as a result of this experience. The question of funding is a little more difficult. The Kyoto Protocol has opened the door for the development of carbon markets, and, if they do develop, then I think there will be funds available to promote reduced-impact logging, as well as other kinds of activities that result in carbon sequestration. We've just been approached by The Nature Conservancy, which has bid on and received a large timber concession in Papua New Guinea. The Conservancy wants to manage this under sustainable forest management practices, one of which is reduced-impact logging. To pay for this, The Nature Conservancy is proposing that a consortium of Japanese power companies essentially buy the carbon that will result from using reduced-impact logging as compared to conventional logging techniques used by many Japanese companies in Papua New Guinea. If this works out, it could open up sources of funding for this kind of activity on a fairly wide scale.

Question: Does your organization have an education mission, as well as a research mission? If so, whom do you educate, and who does it?

Dykstra: We have a relatively small education mission. It's basically training of scientists, and it's done primarily by cooperating with scientists from developing countries. Each of our research projects is coordinated by a CIFOR staff member and involves people from institutes in developing countries. By simply working with them, and seeing where their strengths and weaknesses lie, we are able to improve the state of the science done. We also work with a number of institutes to implement things like peer review of research articles. Many

forestry journals in tropical countries publish research results without ever doing peer review. We have an active program of working with editors, and doing editor training, in which we encourage people to adopt peer review as a strategy for these journals. We also help them with implementation. Thus, our education mission is relatively small, and involves mainly working with people rather than doing formal training.

Question: You didn't directly say so, but I had the feeling that you inferred that reduced-impact logging is more costly than conventional logging. Could you say a little about what you've found with regard to that?

Dykstra: In fact, reduced-impact logging is less costly than conventional logging. The difficulty is that it requires some initial investment. Before it's done, you have to do a good job of planning, and you have to do a good job of supervising the logging. In general, loggers will do whatever they can get away with. That's no different in Indonesia than it is in the United States. In addition, you need to develop ways to increase people's skills. Skilled loggers are in demand everywhere. Thus, in order to implement reduced-impact logging, you have to have a continual program of training loggers, so that people know what they are supposed to do, how to do it, and why. In the end, you can decrease costs by 15–30 percent compared to conventional logging. Those initial costs are an impediment for many companies in the Tropics without capable management and a desire to make these kinds of investments.

Question: You indicated the need to do mapping at a fairly intensive level, i.e., each individual tree at a level of 1:5,000. Could you say something about that?

Dykstra: People often are quite surprised by this, because in temperate countries, of course, you don't map the location of individual trees. The reason for doing this in tropical countries—and I'm referring to natural forests, not plantation forests—is that natural

forests typically have 7–10 trees of commercial size and species per hectare. That's not very many trees. If you don't know where those trees are before you start a logging operation, you get a terrible mess. Conventionally, what has happened is that cutting crews go out and wander through the forest. As soon as they find a commercial tree, they cut it down. And then they go away. Some time later—a week to a couple of months—a skidding crew, not knowing where the felling crew has been, comes in, starts up the bulldozer, and heads out through the forest. The crew plows down everything in the path until it runs into a tree that's been felled. Then the crew takes the tree back to a landing. This has two main effects. First, it does an extreme amount of damage to the soils, and to residual vegetation. Second, it results in a lot of lost, wasted timber. Inevitably, there are felled trees that are not found. In one of the studies that we did, 40 percent of the trees that were felled were not skidded, because the skidder operators didn't find them. This can be overcome by intensive stock mapping. It has a cost, and is expensive, but it pays off in saving wood that would have been lost. Ed Aulerich (Forest Engineering, Inc., Corvallis, Oregon) will bear me out on this. They use an even finer scale than our 1:5,000. It would be nice to do this with remote sensing, but, because labor is relatively inexpensive in the Tropics, it's cost-effective to do it by direct mapping.

Question: All this is done from ground surveys?

Dykstra: Yes.

Question: Would you comment on the situation in Brazil, where huge areas are used for agriculture?

Dykstra: The situation in Brazil is a very complicated one. In a presentation like this, you tend to simplify in order to move quickly, but the social situation and the economic situation in Brazil combine to make a very complicated situation for the Amazon. In the last few years, the Brazilian government has changed some of its policies. For

example, the subsidy on beef production, which encouraged people to clear forests and convert them to pasture, has now been changed. It'll be interesting to see what effect this has on the overall deforestation rate. Brazil is one of the places in which industrial logging can lead directly to deforestation, but it's usually industrial logging invited by people who want to clear the land. The logging is a mechanism, not actually the end product. What people want is pasture, and so they invite loggers in to clear the land. I've been involved for some years with a project in Brazil on the Tapajos National Forest near Santarem. This project started about 7 years ago. Until last year not a single tree was cut on the Tapajos, because nobody wanted to log it when they could get free timber from land that people wanted cleared. Why should they buy timber from the government on the national forest? Last year there was an economic situation that permitted this, and so some timber was finally sold.

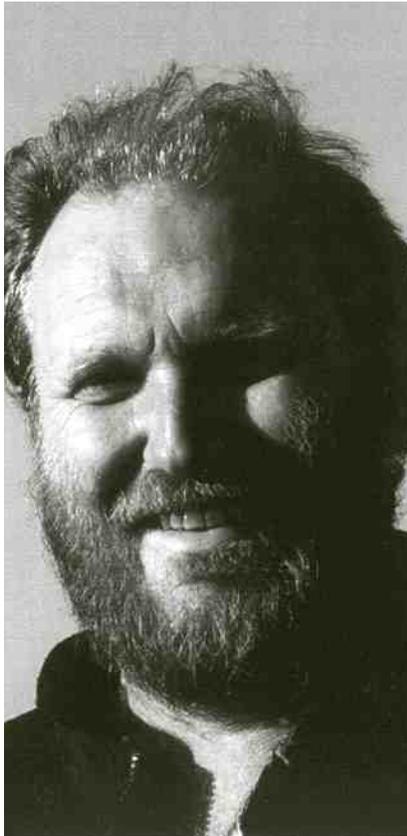
Question: You mentioned that Rainforest Alliance was involved in evaluation of the Sabah project. I'm wondering if the products being supplied are being certified, and if you see certification of forest products as a helpful thing.

Dykstra: The timber company in Sabah has not been certified by Smartwood or anyone else. In fact, as far as I know, they haven't applied for certification. In Malaysia, in general, certification has been discouraged actively by the government. Indonesia has taken exactly the opposite tact, and has encouraged certification. In fact, they are attempting to force it. The Minister of Forestry in Indonesia recently ruled that all timber companies that want to be listed on the Jakarta Stock Exchange have to be certified. In Indonesia, they believe that certification will help protect their market share. About 80 percent of their commercial timber products end up in the international market. That's a very high percentage, and it's much different

than most tropical countries. Worldwide, only about 8 percent of tropical timber is traded internationally.

In general, certification has been a positive development in tropical forests. It has made people pay attention to the possibility of actually managing forests. In the past, they've essentially mined the timber and forgotten about the forests. There is a change in mindset. Certification is not driven by any influence from the United States, because, in the United States, there's no difference in price between certified and noncertified timber. That's not true in Europe. In Germany, you get at least 15 percent more for your timber if it comes from a certified source, and, in some places, as much as 30 percent of a price increase. This difference is substantial. The disadvantage is that certification itself is an expensive process. Whether or not it will pay for itself in the long term is an unresolved question at the moment.

The Swedish Experience — Forest Certification, Biodiversity, and Forest Management



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Over the past decade, different stakeholders in forestry and society as a whole in Sweden have made dramatic changes in their attitudes toward forest biodiversity issues. As a consequence, practical forest management and planning have been reconsidered. Today, biodiversity maintenance and even restoration, along with timber and pulpwood production, are important management objectives. Moreover, society in general has become more willing to invest in set-asides of the few remaining remnants of forests with old-growth properties. The major reason for these changes has been a series of education campaigns for forestry staff on forest biology and conservation. The advent of Forest Stewardship Council (FSC) certification has probably contributed to the rate of change in both attitude and action as well.

The current Swedish forest policy defines the objective for biodiversity maintenance as follows: “all naturally occurring species should maintain viable populations” (SOU 1992). Given the country’s very long history of forest use and management (e.g., Wieslander 1936), this is an ambitious goal, and a difficult task. The combined efforts of private land owners, large forest companies, and the state in habitat management and tree retention at different spatial scales have become a “Swedish model” for reaching the biodiversity goal of sustainable forestry (Angelstam and Pettersson 1997). To what extent these ambitions will be reflected in a reduction in the number of endangered species (Berg et al. 1994) and future maintenance of viable populations of all naturally occurring species remains, however, to be seen.

In this paper I review the emerging solutions and problems of biodiversity maintenance in Sweden. After a brief introduction to Swedish landscapes and their history, I describe how stand considerations, new management methods, ecological landscape planning within a market-driven forest certification, and set-asides of forest reserves all contribute to biodiversity maintenance in Sweden. Finally, I discuss whether or not this “Swedish model” can reach the biodiversity maintenance goal stated by current forest policy, and the extent to which the model is generally applicable.

Swedish landscapes

Biogeography

Latitude and altitude are two basic abiotic factors affecting organismal and ecological biodiversity. Being latitudinally extended, Sweden has a vegetation period with a length that varies more than two-fold from the north (<100 days) to the south (>200 days). Both the Marine Limit, that level under which fine sediments rich in nutrients were deposited shortly after Sweden was totally glaciated about 10,000 years ago, and the distribution of lime-rich soils have a fundamental effect on potential natural vegetation and forest loss resulting from agricultural development. Further, prevailing southwesterly winds and higher altitudes in the northwest than in the east produce distinct gradients in climate and natural disturbance regimes.

Through effects on soils, nutrient accessibility, and climate, both altitude and latitude have profoundly shaped the distribution of natural vegetation types (Svenska Växtgeografiska Sällskapet 1965). Sweden forms a latitudinal gradient between the 55th

and 69th parallels. From south to north, the main potential natural Swedish vegetation types are the following (Figure 1):

- Broad-leaved nemoral deciduous forest (Jahn 1991) with *Fagus sylvatica*, *Quercus robur*, *Tilia cordata*, *Acer platanoides*, and *Fraxinus excelsior*.
- A hemiboreal transition with mixed deciduous and coniferous forest.
- A wide belt of boreal forest with *Pinus sylvestris*, *Picea abies*, *Betula* spp., and *Populus tremula*.
- Subalpine and alpine environments at higher altitudes in the northwest.

Human colonization of Sweden closely followed the retreating ice shield. However, the anthropogenic transformation of the landscape was considerably slower. Up until the Medieval, Sweden was settled up to the border between hemiboreal and south boreal forest in the interior, and far north along the coast of the Baltic Sea in the east (Jokipii 1987). Later, local forest use was intensified (Wieslander 1936). Starting about 150 years ago, large-scale logging was extended gradually into the interior of north Sweden (Angelstam 1997). Consequently, the deciduous forest in the nemoral zone in the south has a very long history of habitat loss and land-use change (>5,000 years; Berglund 1991), whereas the boreal and subalpine forests in the north have a much shorter land-use history (<200 years; Angelstam 1997, Esseen et al. 1997).

Forest protection and management

At present, the amount of forests which have been set aside in regional reserves and parks varies widely among regions (Nilsson and Götmark 1992, Angelstam and Andersson 1997). Although 44 percent of the subalpine coniferous forests is protected, less than 2 percent of the other northern forests and about 0.5 percent of the southern forests have been set aside for biodiversity maintenance purposes.

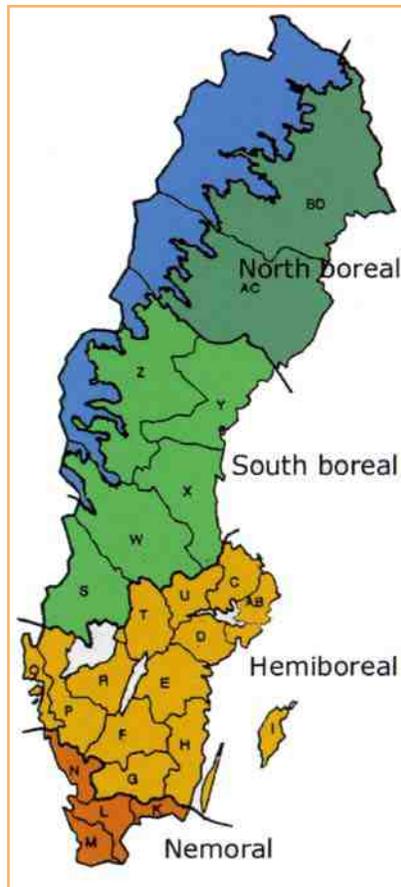


Figure 1. Sweden's major forest regions.

Hence, even within a small country like Sweden, the variation in the degree of anthropogenic transformation which has taken place among different regions is large. In southern Sweden, although the proportion of natural forest was reduced seriously in the nemoral forest zone by 1,000 years BP, a large proportion of the landscape was covered by wooded pastures and meadows with large trees, the presence of which provided refuge for forest-living species for several centuries. Today, therefore, a large part of many kinds of forest biodiversity in southern Sweden is connected with small remnants of the cultural landscape (Ellenberg 1996, Peterken 1996). In contrast, changes in the landscape are relatively recent in northern Sweden. Consequently, in the boreal forest regions which are regionally or locally remote, or which have a low potential for forest production, one can still find near-natural remnants; no entire, naturally dynamic landscapes occur

anymore (Syrjänen et al. 1994, Angelstam et al. 1997).

The biological and historical differences among regions require that a variety of biodiversity management models of landscapes be developed. Above the Marine Limit in the upland north, imitating the dynamics of the natural landscape is much more feasible than in the lowland south. There the main solution is to maintain the small remnants of near-natural or cultural habitats, left after a long history of land use (Bradshaw et al. 1994, Angelstam and Pettersson 1997). In southwest Sweden, sustaining ecosystems, which are affected by air-borne pollution, is an additional and serious problem (Brodin and Kessler 1992). Consequently, the Swedish experience is of general interest for those involved in forest biodiversity maintenance (Lämås and Fries 1995). This is true, both where the forest history is complex and forest ecosystems need restoration to maintain biodiversity, and where landscapes are still dominated by natural forest ecosystems and forests need to be managed and used in ways that do not threaten the existing biodiversity (Angelstam et al. 1997).

Biodiversity management tools across scales

Forestry operation considerations

The first rules for nature conservation in the managed forest landscape were from the 1950s. They included retention of trees and small remnants on sites with poor forest production, riparian forests and field margins, and deciduous trees near settlements, but only on state-owned land (Aminoff 1951). Scientific arguments for nature considerations became stronger by the 1970s (Ahlén et al. 1979). At the end of the 1980s, 2–3 percent of the total harvested volume of merchantable wood was left after clear-felling (Aldentun and Sondell 1991). A few years later, the level of retention across spatial scales from trees to landscapes had increased to 10–15 percent. The

main reason was a massive education campaign by forestry staff directed at authorities, corporate companies, and private forest owners (Persson 1990). Later a market-driven pressure speeded up this process somewhat (Angelstam and Pettersson 1997, Elliott 1999).

Management methods adaptation

Following the tradition of Arnborg (1945), Lundmark (1986) successfully advocated site-adapted forest management, whereby the local site and regional climate determined methods and selection of regeneration methods and tree species. Similarly, the habitat requirements of different species can be translated to the type and amount of habitat in forest landscapes (e.g., Lambeck 1997, Jansson and Angelstam 1999, Uliczka and Angelstam 1999). Because the location, composition, and structure of forest types of different disturbance regimes are determined by local and regional site differences, biodiversity management has become adapted to the site type (e.g., Rülcker et al. 1994, Fries et al. 1997, Angelstam 1998).

In boreal Sweden, the development of different practical forest management regimes promoting biodiversity has mainly been based on the natural distribution of three disturbance regimes found in natural boreal forest (Angelstam 1996, 1998). Selective cutting systems and set-asides are promoted in site types and forest systems with natural *Picea abies* gap-phase dynamics, whereas clearcuts with green tree retention are considered to be ecologically proper for sites with fire-adapted communities on mesic sites where stand-replacing fires are common. Finally, on dry sites where low-intensity fires have created multi-layered cohorts of *Pinus sylvestris*, clearcutting with repeated retention of both live and dead trees in successive management steps, partly in combination with prescribed burning, is recommended (Fries et al. 1997).

In southern Sweden (nemoral and hemiboreal forest; Figure 1) also, some

anthropogenic disturbance regimes, such as those found in the old cultural landscape, retained many aspects of natural ecosystems (Selander 1957) and the associated forest species. Cultural disturbances such as low-intensity forestry and traditional farming resulted in biodiversity being maintained and even increased compared to that of previously forested habitats. This represents a complex form of endangered landscape use with large areas to extract relatively few resources, little external input of energy and nutrients, and multiple use of several landscape components resulting in high species richness. However, as forestry and farming were intensified, biodiversity was reduced through loss of structural diversity from both the forest and farmland ends of the gradient (e.g., Tucker and Evans 1997). To maintain biodiversity in cultural landscapes, a practical solution would be to mimic those cultural disturbance regimes.

Landscape planning

In approximately 1990, a few scientists and forest managers began a cooperative effort to develop practical tools for managing biodiversity at the landscape level (Rülcker et al. 1994, Carlsson 1998). They attempted several approaches, and their application shows strong connections to the biological and historical complexity of the region, as well as to the ownership pattern (Angelstam and Pettersson 1997). For northern upland Sweden with boreal forest, where the land-use history is relatively short and land is owned mainly by large companies, the goal of planning is to imitate the natural disturbance dynamics of the different forest ecosystems. Given the site type, forest land is stratified with respect to different disturbance regimes with the potential wildfire dynamics as a guide. Remnants of the different types of forest dynamics are set aside and the long-term goal is to maintain sufficient habitat connectivity. In contrast to other parts Europe (e.g., Lucas 1991),

landscape design has not been used explicitly in forestry.

In Sweden, several large land owners have developed models for Ecological Landscape Planning (ELP), including multiple goals and spatiotemporal scales. Ecological Landscape Planning can be defined as a planning tool to systematically alleviate a decrease in the differences in the amounts of different habitat properties between past primeval or little-impacted forest landscapes on the one hand, and present-day, managed landscapes on the other. These habitat properties have been defined by species which are listed as endangered, and by some processes which have disappeared or changed as a consequence of the development of intensive forest management for timber and pulp only. The following eight activities have been defined in the Ecological Landscape Planning process:

- *Stratification of forests* into different biogeographic regions with their characteristic past disturbance dynamics, to which the fauna and flora have evolved, and into regions with different land-use histories.
- *Landscape analysis* to estimate the physiographic and historic potential of a particular landscape to host different habitats and properties (e.g., Angelstam 1997). In reality, landscapes of 5,000–50,000 hectares have been analyzed, and even less if the complexity of the area is high and the number of land owners is large. The range should also be determined by the size of an area that could hold viable populations of different species.
- *Description of present composition, structure, and processes* of the selected landscape. This includes inventories of so-called key-biotopes, wet forests, and red-listed species.
- *Analysis of components missing or insufficiently represented* in the actual landscape to maintain or restore biodiversity (Angelstam 1997).

- *Formulation of quantitative goals* for each property and scale. This step is the most difficult, and is treated in detail in Angelstam and Andersson (1997). In short, the landscape analysis is the basis for estimating the composition, structure, and processes in the original landscape. Knowledge about ecological thresholds is applied to these figures.
- *Choice of a strategy* for how to act in practical management. The strategy is mainly related to the type of ownership. In the north of Sweden, a few decision-makers affect a large part (>70 percent) of the landscape, whereas in the south of Sweden there are 10–1,000 decision-makers in a landscape (see Angelstam and Pettersson 1997).
- *Implementation of forest management.* The Swedish system defines different management regimes, ranging from no management to intensive management with nature considerations.
- *Control by monitoring* to allow short-term steering to attain long-term goals. To be effective, monitoring of biological systems must have a sound scientific basis, be diagnostic, help further understanding of the system, allow assessment of the stated policy objectives, and, finally, include feedback to the policy process and/or management to enable midcourse corrections.

Under continuous development, landscape planning is expected to become more complex as more ecological knowledge becomes available and as more goals (e.g., social, recreational, and tourism-related) are added. In practical forestry, the amount of work invested by foresters in ELP most probably will need to be increased along with the use of relevant basic information about different landscape components. With an increasing number of factors to be considered, the use of new types of

habitat maps, including geographic information systems and various decision-support systems, is crucial.

However, if these aspects are not dealt with adequately, ELP is of little value and could even be a way through which politically negotiated, poor biodiversity management methods and benchmarks could be implemented in the short term at the expense of long-term success in biodiversity management. This is particularly crucial in the contacts between the west and the east in northern Europe (Angelstam et al. 1997).

Forest certification chronology

From 1990, forest certification was initiated by NGOs to promote the development of sustainable forest management, as well as to provide a better market for products that meet certain standards. In an analysis of the development of forest certification programs in Indonesia, Canada, and Sweden, Elliott (1999) concludes that certification can be best understood as a policy instrument, which promotes and facilitates learning among actors, during both the development and implementation of standards. Hence, certification provides direct incentives for improved forest management. Moreover, the consensus-building among actors, such as NGOs, forest owners, indigenous people, and government, who have traditionally been in conflict with each other, can be significant. Being initiated by NGOs, forest certification has in some countries been seen as a threat to government forest departments or the forest industry.

Currently, forest certification in Sweden is based on the ideas of the Forest Stewardship Council, which states three goals for forest management: sustaining an economic wood production, forest ecosystem function, and social development (Upton and Bass 1995). Naturally, the success of this complex task depends on the ownership pattern and the skill,

interest, and economic potential of the owner, as well as of the condition of the forest system itself. In Sweden, the forest industry has been positive, whereas private land owners' associations and the national board of forestry have been negative or indifferent (Elliott 1999).

The process of developing a national FSC standard started in 1993 with a broad representation of different stakeholders from the forest industry, the forest owners' association, WWF-Sweden, and the Swedish Society for Nature Conservation (SSNC). The first proposal of a national standard was presented in May 1995. However, at the time the different forest stakeholders generally hesitated to agree, and the preliminary criteria contained mainly ecological aspects. During the following year, a certification company made field tests of the May 1995 criteria. Simultaneously, the forest industry considered alternatives for achieving the market's acceptance of the current ways of managing forests, and also sought to determine the level of market pressure for certification (Barklund 1996). The forest owners' association did not approve of FSC certification. Two important reasons were that they could not accept the limitations with respect to the forest management in the remaining near-natural subalpine forest, and consideration of indigenous Sami people's reindeer winter-feeding areas in northern Sweden. However, there was a small group of individuals in different stakeholder groups who refused to give up the idea of forest certification according to the FSC model.

In 1996, it became evident that large forest enterprises did respond to market pressure. Although the revision of the May 1995 FSC standard was still in progress in a new round of discussions, one of the most internationally active companies (STORA Forest) initiated a voluntary FSC certification of one forest management district (Rhodes et al. 1996). Although the assessment indicated some gaps in current management practices, it showed that forest

Table 1. Chronology of forest certification in Sweden (for details, see Elliott 1999).

Year	Type of owner
1992	Consultations by FSC in Sweden begin.
1994	WWF-Sweden forms a reference group to provide advice on the development of a Swedish forest certification standard.
1995	WWF and the Swedish Society for Nature Conservation present criteria for nature conservation in forests.
1996	First certification of a large company, STORA (Rhubes et al. 1996).
1997	First FSC and ISO 14001 certified forest company, Korsnäs AB (Brunberg and Johansson 1998).
1998	First association of large private land owners (Skogssällskapet certified).
1999	First association of small private land owners (LRF).

certification was feasible practically. In 1997, several large companies embarked on the certification process, and Korsnäs Forest became the first FSC and ISO 14001 certified forest company in the world (Brunberg and Johansson 1998). In January 1998, the FSC approved the Swedish national standard, and it became the first voluntarily negotiated national standard for forest certification. Even so, private land owners remained negative about FSC certification. In spring 1998, a group of private land owners with relatively large land holdings was assessed under the FSC standard and passed. Yet, the forest owners' association representing small land owners has not embarked widely on FSC certification. In practice, however, some of the guidelines recommended to their members (e.g., the forest owners' association, Södra, in southern Sweden) are similar to those supported in the FSC standard.

In Sweden, a clear latitudinal gradient exists in the proportion of privately owned forest from south (ca. 80 percent) to north (ca. 30 percent). In addition, the pattern in the size of holdings of the different ownership categories is clear. For corporate companies, 98 percent of the land holdings is over 400 hectares in area. In contrast, for privately owned forest, only 11 percent is over 400 hectares (Angelstam and Pettersson 1997). The interest in FSC certification is clearly related to regional differences in the pattern of ownership, which in turn are clearly related to the sensitivity of

different ownership types to an international market pressure. As a consequence, the large forest companies embarked on forest certification first, and the smaller companies followed later (Table 1).

This is probably because only sufficiently large forest owners have direct contact with the market and can perceive market pressure. That small, private land owners have reduced interest is not unexpected, because they may harvest and sell wood only a few times per decade.

Recently, a new competing forest certification alternative has appeared—the Pan European Forest Certification (PEFC), which is based on the Lisbon-declarations adopted in the Third Ministerial Conference on the protection of forests in Europe (Liaison Unit in Lisbon 1998). Currently (late autumn 1999), the Swedish Forest Owner's Associations and the private independent sawmills of Sweden have initiated a process to establish a Swedish PEFC scheme. The criteria have not yet been defined.

To conclude, forest certification has been an efficient tool for mutual learning among a wide range of stakeholders in the forest sector. It is, however, vital to stress the difference between certification of environmental management audit systems such as ISO 14001 and EMAS on the one hand, and environmental standards, or benchmarks, such as FSC on the other. Whereas the former implies a frame-

work that ensures that environmental issues can be dealt with in a consistent way, the latter sets the goals that should be reached (Brunberg and Johansson 1998). Another interesting benefit of certification is that, although public policies usually change slowly over decades, the private policies of forest product companies and retailers can adapt more rapidly to changing circumstances (Elliott 1999).

Analysis of gaps in forest protection

Although it appears possible to maintain viable populations of many of the naturally occurring species in combination with timber and pulpwood production in several of the forest types found in Sweden, this is not true for all species in all forest types (cf. Berg et al. 1994). The major reasons for this include lack of sufficient amounts of specific habitats (e.g., wet old-growth spruce forest) and habitat components (e.g., certain types of dead wood, deciduous trees, and old trees). Moreover, large areas of unmanaged forest are required for some species. Hence, forest reserves are an important component in the effort to maintain forest biodiversity.

A critical issue is how much forest reserve area is needed. Angelstam and Andersson (1997) present an estimate of the need for set-asides of forest reserves of Sweden's main forest types to maintain long-term viable populations of all occurring forest species, both in typical forests and in woodlands in cultural landscapes. They deduced the potential occurrence of 14 different forest types from the database of the National Forest Survey. Boreal forest types were deduced from the present site type distribution. Broad-leaved tree species, as well as cultural landscape woodlands, were used to determine the occurrence of nemoral and hemiboreal forest types.

Three aspects were considered in estimating the amount of the different forest types that need forest reserve status. First,

the disturbance regime of each forest type was summarized and analyzed to provide the extent to which different types of external and internal disturbances maintain their characteristic dynamics. Results of these analyses were then compared to potential achievements in the new, more nature-friendly forest management regimes based on the expert opinions of practitioners. These comparisons helped determine to what extent management can emulate the natural disturbance regime. If emulation appeared possible, then the need for protection was reduced. Finally, knowledge on the critical habitat loss threshold values of 70–90 percent for metapopulation persistence (e.g., Andrén 1994) was used to estimate the proportion of each forest type required for the long-term survival of species found in a given forest type.

The proposed forest-reserve needs thus represent only forest types that cannot be sustained by forest management methods employed within the framework of the Swedish model for biodiversity maintenance. The results of the

analysis for Sweden were divided into four biogeographic regions, viz. nemoral, hemiboreal, south boreal, and north boreal (Figure 1). Because of differences in the ability to emulate important disturbance regimes, and the mix of different Swedish forest types in different regions, the estimated long-term requirement for maintenance of all forest species ranged from 9 percent of the forest land in the north boreal to 16 percent in the nemoral region (Table 2). Data from the National Forest Survey were used in estimating the remaining amount of unprotected forests with old-growth characteristics—3 percent, or 700,000 hectares.

The gap between the long-term goal for forest protection and forests available to protect suggests both that it is urgent that the amount of protected forest be increased to encompass existing forests with a high conservation value, and that forest protection alone is insufficient to reach biodiversity maintenance goals. The long history of land-use change over the past 150 years

also calls for forest ecosystem restoration. Because of regional differences in the extent of past land-use changes, the need for restoration increases from the north boreal forest (3 percent) to the nemoral forest (11 percent). (For details see Table 2.) The clear trend in restoration needs is evident from the forest reserve situation in Europe. Although about 20 percent of the boreal forest in Europe is not or is little affected by human disturbance, corresponding figures for hemiboreal and nemoral forests are 2 and 0.2 percent, respectively (Hannah et al. 1995).

Future challenges

During the 1990s, a strong international trend in forest management has been towards having to satisfy several objectives in addition to wood production. In Sweden, the new challenge was to maintain forest biodiversity. As a consequence, forestry and society are currently making increasing investments in new types of management, which include retention of large volumes of timber, as well as set-asides of forest in reserves (Table 3). However, the relative contribution of these activities to the maintenance of biodiversity, as well as to our understanding of how large these investments need to be under various circumstances, is not fully known. The following questions are commonly raised:

- How much forest do we need to set aside in forest reserves?
- How much timber do we need to leave in the matrix surrounding the forest reserves?
- What can we do in different management steps to restore/re-create important features that are required to maintain biodiversity?

Table 2. Protected forests in Sweden, present state and future needs (from Angelstam and Andesson 1997).

	Northern boreal	Southern boreal	Hemi-boreal	Nemoral
Land area (km ²)	61,000	85,900	62,900	9,100
Forested area protected in 1997 (%)	1.6	0.4	0.7	0.6
Forested area in need of long-term protection (%):				
High conservation value	6	4	5	3
In need of restoration	3	4	5	11
Cultural landscape habitats	0	+	2	2
Total	9	8	12	16
Forested area in need of strict protection (%)*	3.5	3.3	2.9	1.9

*Forested area in need of strict protection equals the amount of short-term forest protection needs remaining after considering the positive effect of a complete compliance with the current biodiversity management practices, such as stand considerations and ecological landscape planning.

Table 3. The Swedish model of biodiversity management with land owners and scale of ownership.

Scale	Private land owners	Corporate companies	State
Tree retention in stands	X	X	
Landscape planning	(x)	X	(x)
Forest reserve set-aside			X

The need for syntheses and communication

Challenges

The Swedish experience during the 1990s indicates that attitudes can change rapidly in favor of completely

new management goals. However, ensuring long-term success, i.e., that all naturally occurring species survive long-term, is a grand commitment. To build on the success of new initiatives and eventually reach the long-term goal of maintaining viable populations of forest species in Europe's landscapes, the transfer of experiences between scientists and land managers must be satisfactory. However, it is difficult to create operational goals and demonstrate progress (Noss et al. 1997, Bunnell and Johnson 1998). Several challenges are as follows:

- **Vision:** Clear definition of the goal is essential. The biodiversity concept originated from concern about the loss of species, and the obvious short-term goal is to remove negative trends among authentic species. From this follows the long-term goal, or vision, to provide the conditions that will support viable populations.
- **Tools:** The tools that allow us to reach both short-term and long-term goals are required. These tools range from creating awareness and ensuring continuous capacity-building to the actual planning and management techniques.
- **Benchmarks:** How do we know when we have reached the goal? We need both techniques for monitoring our success in reaching short-term goals and quantitative benchmarks that can be documented.
- **Communication:** Finally, both the monitoring results and the benchmarks must be communicated and understood by the various actors in forest management.

In spite of these difficulties, the Swedish case shows that there is considerable knowledge in conservation biology, landscape ecology, planning, and practical management about what it takes to manage for biodiversity. However, this knowledge is not readily

available, because it does not exist or is scattered among individuals, companies, and agencies. Thus, compilations and syntheses are needed.

Although Europe acts as a unit in overall policy and general ideas on biodiversity, the status of and threats to biodiversity, as well as the ecology and management of forest environments in the various regions, are highly variable. This implies that usually no clear single vision nor regionally available simple tools exist for how to choose from the biodiversity management package containing set-asides in reserves, considerations in the managed forest, and forest restoration.

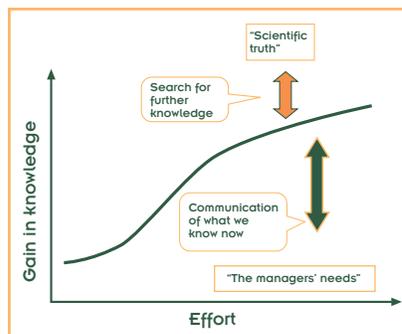


Figure 2. Gain-effort curve describing the relationship between effort in gaining new knowledge and gains in knowledge. We need to communicate what we know now, as well as continue to collect and analyze data in our search for new knowledge.

Further, there is no unified system for assessing to what extent the goal to maintain biodiversity has been reached in a particular region.

Because the debate on how to realize the goal to maintain biodiversity was addressed early on in Sweden, these experiences, both positive and negative, should be communicated to other regions. For scientists, the challenge is to collect more information about critical thresholds regarding the amount of habitat required for different species' groups to maintain viable populations. In addition, there is a need to develop, in cooperation with forest managers, knowledge and tools to aid the spatially explicit practical planning

for sufficient habitat connectivity when quantitative goals for different habitats have been formulated (Figure 2).

The Swedish model and staff reduction

At present, stand considerations, new management methods, ecological landscape planning within a market-driven forest certification, and set-asides of forest reserves all contribute to biodiversity maintenance. These activities form a "Swedish model" of biodiversity management in which all land ownership categories are contributing (Table 3). The challenge is to sustain these efforts long-term.

Available information suggests that long-term maintenance of viable populations of many species requires effective habitat restoration. Hence, the new proactive, site-adapted forest management steps, as well as established steps, need to be sustained for many decades. In regions with a long history of forest management and other kinds of land use, habitat restoration means establishing new stands by wise planning and silvicultural treatment of young forest stands. However, an intense rationalization to cut costs over the past 3 decades has led to a strong reduction in staff, in both forestry and other land-management organizations. For the forestry sector, the Swedish National Audit Office (1999) has noted that, although the forest policy is ambitious, the law itself is weak, and is insufficient to reach the goal of the policy. Because of this, the main instrument available is to provide advice and recommendations to forest owners. However, staff within the National Board of Forestry's field organization is being reduced. Moreover, this organization has very few staff members with a biological education.

Strategic regional planning of green infrastructures

Increased state funding to acquire remnants of near-natural forest and set them aside as reserves provides a major

challenge to purchase land in a strategic way that maximizes the capacity to maintain viable populations. A major limitation is the poor coverage of spatially explicit data describing different forest types with a sufficient thematic resolution across the landscape. In fact, only one of 22 counties has a complete digital land cover classification; such information is being developed in three additional counties. It is also important to create demonstration areas to illustrate problems and possibilities of how protection, sustainable management, and restoration of forest types can act in concert under different conditions. A working model for strategic planning of where to focus efforts to set aside forest land with present and future conservation values needs to be in place within about 5 years. It is also important that other actors, such as the municipality administrations, become aware of the need to build green infrastructures for maintaining forest biodiversity.

Monitoring systems

One of the major problems with biodiversity management is the required temporal and spatial perspective. Even though the economic and political time scale rarely exceeds 3–5 years, scientific knowledge can be measured by the decade, and the forest itself has a life span of at least an order of magnitude of 100 years or more. The risk that long-term benefits for biodiversity maintenance may be neglected because of immediate or short-term economic or political benefits is always present.

It is, therefore, crucial to evaluate the relative biological importance of different biodiversity management components, both short-term and long-term. No system covers all components of biodiversity across spatial scales. It is also crucial to ensure that the results of monitoring and assessment systems are understood by the different forest stakeholders. The following points describe a tentative logic by which managers and scientists can develop a biodiversity assessment system in an

iterative process involving both science and practice:

- Identify present-day problems with the implementation of forest biodiversity conservation policies in practical land-use management case studies.
- Derive a state-of-the-art practical assessment system to cover the components of forest biodiversity and management scales.
- Apply and refine the biodiversity assessment system in a range of test sites representing the ecological and economic spectrum in the region/country with respect to (1) the status of biodiversity in relation to the reference/benchmark and (2) the possibilities of applying iterative feedback between science and land-use practices.
- Develop pedagogic and practical management tools to reconcile the maintenance of forest biodiversity with economic activity.
- Communicate experiences from science and practice to policy-makers, academic institutions, and agencies.

Critical habitat loss

To assess the status of biodiversity, the results of the monitoring process must be compared to some kind of benchmark. Only in this way will we know when the long-term maintenance of viable populations and system function has been achieved. The amount of habitat loss, for different forest types and on different spatial scales, that causes populations of different species to go extinct is a critical question. To answer this question, the following activities, which aim at linking management regimes with biodiversity requirements into assessment systems, could be envisioned:

- Identify the range of management tools and regimes being used to maintain biodiversity.
- Stratify the forest into different disturbance regimes, as this is what species have evolved with. This will require an inventory of

the geographic distribution of different disturbance regimes to produce a stratification of the forest into groups with characteristic mixes of these regimes.

- Describe the historic spread of different kinds of anthropogenic impacts on the boreal forest (i.e., local use, exploitation, intensive management, and “new forestry”). This enables replicates of forest impact in regions with different disturbance regimes to be identified.
- Identify response variables that are affected by habitat loss. One approach is to identify “meta indicator species” grouped by both habitat requirements and biological life history traits. Ideally, groups of species with similar habitat requirements and similar life history traits, and which are sufficiently charismatic and/or interesting, can be used as pedagogic “messengers” to communicate results to managers and other stakeholders. In this way, analyses can be made with both traditional empirical data and by exploring, through modeling and simulation, the effects of different levels of habitat loss on species with certain combinations of life history traits.
- Identify the monitoring and assessment “currencies” that are relevant and possible to use to communicate the status of habitat loss across different spatial scales in landscapes with different ownership patterns and management regimes that are found (e.g., tenure system, corporate companies owning land, and private land owners).

Concluding remarks

During the 1990s, there has been a positive trend in the development and application of different biodiversity management tools in Sweden. This experience provides insight into the problems and possibilities of rapidly

changing the focus of forest management from timber and pulp-wood production toward biodiversity maintenance. The wide range of biology and land-management history makes Sweden an internationally interesting case study in which the combination of a long tradition of consensus decision-making and public debate has made many forest stakeholders learn new things in a short period of time. This development needs to continue for the long-term maintenance of forest biodiversity.

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Questions and answers

Question: It seems to me that your number one customer for your wood fiber is also your number one source of concern in environmental issues and in the air pollution problem. Are you getting cooperation with western Europe on this problem?

Angelstam: For a person from Britain who's never been to Scandinavia, the fact that acid rain could be a problem is unheard of. The reason is that, when you stand on 500 m of chalk, a type of ground that can act to buffer an enormous amount of acid compounds, acid rain is not problem. It has been very difficult to explain to people in western Europe that a very base-poor bedrock in Scandinavia is a major problem. The geology is completely different. Of course, we have the same problem with people to the east of us, because our "shit" goes to the northeast. So air pollution a big problem.

There have been a large number of workshops, and meetings, and scientific panels, and committees, and ministers meeting one another, but someone particularly involved with this told me not long ago that there are two main things that have really caused the decline in the rate of increase of pollution. One, the huge nuclear power plant program in France. And, two, the collapse of the old industry in eastern

Europe. These are unrelated to any efforts to actually decrease the amount of pollution, which is kind of sad.

Question: Have you had a chance to observe forestry on the West Coast of the United States during your visit? How do you compare some of the efforts here to what you're seeking to do?

Angelstam: This time I have not been able to be in the field much. But I've been to North America many times, and I've spent a lot time, in particular, in British Columbia and on Vancouver Island, and also here in Oregon. What strikes me is that your landscape is much more "black and white." You have intensively managed industrial forests. I remember I bought a book in Portland a few years ago titled *Clearcut* by the Sierra Club and Earth Island Press, which illustrated this very effectively.

On the other hand, you have state land and federal land, which is hardly managed at all, by comparison. [Laughter.] You have large national parks. Compared with Sweden, you have a very different situation here. From the point of view of forest certification, even though your industrial forests are much more intensively managed than ours, your "mean" is better, if you see what I mean. I come from a small country. This is a large country. And the ecological footprint of this country in the world is very big. Don't be offended now, but I don't think that I've ever been in a country that is so ignorant about the rest of the world. [Laughter and applause.] Don't take this personally. You are importing a lot of good from other countries, and you have a lot of resources yourself. But an important part of sustainable use is that it should be sustainable in a local sense. That sort of thing is a big problem. One has to think about this ethically and practically.

Question: What's the appeal for your private land owners to buy into what you're trying to do? Is it patriotism, or is your government willing to pay them?

Angelstam: The government pays them for set-asides in reserves. An independent person comes in to make an evaluation of the forests, and people get paid. However, the retention of trees during clearcutting is voluntary, and is largely caused by increased awareness about nature conservation issues.

Question: This is market-driven?

Angelstam: Yes.

Question: Does the industry get paid to do certified forestry?

Angelstam: No. This is when it comes to buying land. In Sweden, large corporate entities own the land, and this means they aren't willing to sell it, even if they are well paid, simply because it gives them, they think, more credit to say that they own forests that they don't manage. They voluntarily set them aside. And these are substantial areas.

Question: How about the forests that they do manage certifiably? Is the government giving tax relief?

Angelstam: No. It's completely commercial. The companies don't expect a better price. They try to avoid the risk of not being able to stay in business.

Question: You said that the two main goals of forestry in Sweden were to maintain high and valuable wood production and to maintain viable species populations. And, of course, part of the contention here in the United States is that we have people who disagree violently with one another over those two things. So, I'm wondering if there is some kind of national consensus that maintaining high and valuable wood production is an important output from your forests? Is there a general agreement to that?

Angelstam: Yes, absolutely. If you view Sweden as a company in terms of taxes, export income that originates from the forest industry is very important.

Question: I have two questions. First, what proportion of your 20,000 species are "micro" flora and fauna? And, second, in British Columbia there is some evidence that, in the full absence of disturbance, boreal forests will revert

to either stagnant bogs or ericaceous shrub patches. Did you see anything like that in Europe?

Angelstam: About species. There is a vast domination by cold and slimy ones! In fact, whereas you in the Pacific Northwest have been dealing a lot with vertebrates, it's really all the kinds of species that occur in different forest types that we're concerned with. I think the reason is that Carl Linnaeus, who invented the system of giving scientific names to species, created a lot of knowledge about our species. It's not common for people to find new species in Sweden. We know our species quite well. That's why we are concerned with them all. As to the second question, in the absence of disturbance, shade-tolerant species, our spruce, will take over in our forests.

Question: Early on, you mentioned that forestry took place on a collective basis. Why is that?

Angelstam: Simply because, at that time, people were working with horses and took the large trees first. There was a demand for sawn wood. Same as here.

Comment: Regarding your comment about our state and federal forest lands here, I just want to comment that, although our state forests are not a very big percentage of our overall forest land base, they are both intensively and well managed.

Angelstam: Oregon is a state?

Comment: Yes.

Angelstam: Sweden is a state. The United States is a federation. I was referring to federal land, then. It is very striking. This checkerboard of private land and public land is very different. Everything is relative.

Question: This certification process—how is that administered? Is it through a separate institution? Government?

Angelstam: No. It started out as an inventory of the different stakeholders that wanted to participate. Apart from the environmental organizations, they included the forest industry, the forest owners' associations of several types,

and trade unions. It is completely voluntary. They have put money into a pile and hired a secretary. The state has nothing to do with it. The forest company that wants to acquire a certificate goes to one of the assessment companies. There is one in San Francisco, a couple in Britain, one in Sweden. The company asks for an assessment according to the Swedish national standard.

Question: The forest owners' associations do not participate in certification?

Angelstam: The forest owners' associations have been very reluctant to join in this, but at the same time are issuing guidelines to their members that are almost identical to the national standard. I think it has to do with pride or something that they don't want to join in. But if you look at various individuals, there's quite a lot of variation in what people think. I believe that, in a few years, they will also join in, as long as there is market pressure.

Question: Yet they don't see the market pressure?

Angelstam: Not all of them. Which is quite natural. Most of them don't deal with this more than once every decade or so.

Comment: I'm struck by this system that looks like it's working, where you have relatively little government regulation, a market-driven certification process whereby large companies are responding to pressure to provide for some level of biodiversity. Here in the United States, it seems to be the opposite. We have a great deal of government regulation, and what seems to be very little market pressure. I think the average American doesn't know that there are some chains offering certified wood. If you were to talk to someone who is going to build a new home, or go downtown to buy a sheet of plywood, I suspect you would find little awareness and concern about how that wood was produced. I don't think the contrast with Sweden could be any greater. It would be nice to know which is more likely to be working in 100 years.

Angelstam: Of course, the Swedish forest industry has given questionnaires to people in Europe to find out what they think. The companies that sell things are the ones who worry. The publishing houses, the warehouses, and so on are those who demand it.

Question: Why do they demand it? If the people are not demanding it...?

Angelstam: Fear....

Comment: What do you think Greenpeace has been doing for years?

Angelstam: That's a good answer. Greenpeace has been very powerful in Germany, but not in informing the general public, I would say. In the Pacific Rim, Japan is the big consumer of wood. My friends in Australia remark that this kind of argument would never work on the Japanese market. Europeans are more sensitive to this. In Russia, people are low on the Maslow staircase. They are in need of food and warmth, and can't afford to do what they think.... It's very complicated. The solutions to sustainable development will be different in different places if it is to work.

Question: To what extent do the social values of relatively homogeneous countries contribute to this? We don't have quite the same pressure here to reflect cultural norms, and so revert to legislation and federal control. Does that play a role?

Angelstam: I can only speak as a citizen, and think it is very important. Sweden has not been at war since 1809, and it's really a very homogeneous population in terms of values. Values matter a lot. This Swedish approach, though still an ambition, is a will to do something. Only time will tell if it will succeed, because we don't know for how long you can maintain a system with a low abundance of dead wood and other old-growth legacies and yet expect species to come back, and return to a viable population. And we don't know to what extent it is market-driven. The future will tell.

Beginnings—Introduction: In Search of Nature*



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Uncommon Ground

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When I gave the annual Starker Lecture at Oregon State University in the fall of 1998, I spoke from a rough collection of notes that addressed the ongoing controversy that developed in the wake of the publication of a book I edited entitled *Uncommon Ground: Rethinking the Human Place in Nature*. The book consists of a number of essays by leading scholars in a wide array of disciplines ranging from environmental history to ecology to geography to landscape architecture to critical theory. All sought to grapple with the consequences of a key insight flowing from recent work in the humanities and social sciences: That the way we interact with the world around us is profoundly shaped by the ideas we carry inside our heads, ideas that extend even to the word “nature.” Although we take nature to be the least human and least artificial of categories, it in fact is a profoundly human idea, with a long history that shapes almost everything we do. The core premise of *Uncommon Ground* was that we will make better progress in pursuing environmentalist political agendas if we take seriously the ideas of nature that shape these agendas.

My own essay for the book was undoubtedly the most controversial of any we included. Entitled “The Trouble with Wilderness; or, Getting Back to the Wrong Nature,” I argued that even “wilderness,” the ultimate repository of pure, pristine, unaltered nature, is itself a human idea reflecting very human concerns. My chief goal in making this provocative claim was to demonstrate the value of recognizing the social constructions that are essential even to “natural” ideas like wilderness, as a way of furthering the larger arguments of the book as a whole. But I also wanted readers to reflect on some of the dangers that are potentially embedded in the idea of wilderness if we do not guard against them. The most important of these, I believe, is the radical dualism that places nature and humanity at opposite poles of an intrinsically antithetical relationship, so that whatever humanity does is, by definition, “unnatural.”

The idea of wilderness is powerfully tied to this dualism, and I worry that such an epistemology is a very problematic foundation for environmentalism as a whole. If one of the most important projects of environmentalism is to encourage more thoughtful, respectful, and sustainable uses of the Earth by human beings, then wilderness cannot by itself supply adequate guidance for how to achieve that goal. Wilderness is an essential goal of environmentalism, absolutely. We must protect and preserve nonhuman nature to the best of our abilities, but wilderness cannot be the defining goal. My critique of wilderness was a polemical intervention in ongoing debates about the philosophical grounding of environmental politics in modern America. It attracted a great deal of attention, by no means all of which is positive. I am still trying to fashion an adequate response to the debates it helped provoke, and my remarks for the Starker Lecture were a step in that direction. Unfortunately, that essay or book is still not written, and probably will not be for a while longer; by the time it is completed, it is likely to look quite different from what I actually said at the Starker Lecture.

For that reason, I have decided to reprint for this publication a part of *Uncommon Ground* that received much less attention than “The Trouble with Wilderness,” but which I actually regard as the stronger, more valuable essay. In the book’s introduction, I sought to explain the value of studying the social constructionist aspects of “nature.” Using examples drawn from the southern California landscape, I listed an eclectic set of “natures” that reveal some of the many paradoxes of the way we think about the world around us. My hope is that by reprinting this introduction as my contribution to the Starker Lecture publication series, readers will be encouraged to reflect on what “nature” means to us, and how it shapes the way we interact with the nonhuman environment.

—William Cronon

*It was
hard
not to
be preoccupied
by the fires.*

Night had already fallen by the time the jet started its approach into Orange County. As the lights of Los Angeles began to glow on the far horizon, I found myself gazing toward them with unaccustomed watchfulness and anxiety, searching for places that might be brighter, less orderly, more *flickering* than the rest. For several days we had been reading about the wild-fires that were ravaging the hillsides of southern California, and we had even considered canceling our gathering when it looked for a time as if the campus of the University of California at Irvine might lie in their path. The news of the past twenty-four hours had been good, however, so I and more than a dozen colleagues were now flying into the city with reasonable assurance that we would not get swept up in the holocaust. I nonetheless scanned the hillsides, and will never forget the lone mountaintop that still blazed on the city's margins. From afar it looked like nothing so much as a volcano, the flames massed into a single enormous blaze, which made it seem that an entire forest was burning at once. Seen from the comfortable seat of a Boeing 727, it looked otherworldly, as if a wayward band of giants had made camp for the night and were still heaping fuel on their fire. The orange light filled the valley below as our plane continued its descent, and I craned my neck backward for as long as I could to watch the flames leaping toward heaven. It is not often that one looks down from the sky to see a city or a mountain burning in the night.

I did not know it at the time, but we had come to California to ponder the meaning of those flames. It was October 1993, and the ostensible purpose of our meeting was the prosaic one of planning an academic seminar. Two years earlier I had been approached by Mark Rose, then director of the University of California's Humanities Research Institute in Irvine, about organizing a residential seminar that would explore contemporary environmental problems from a broadly humanistic interdisciplinary perspective. The offer he dangled before me proved irresistible: I could focus the seminar on any questions that seemed worthy of our attention, and I could collect whichever scholars seemed best suited to grapple with those questions. The institute would raise the funds to cover our expenses, and we would live together on the campus of the University of California at Irvine for the spring semester of 1994 to conduct our research. We would have only two primary responsibilities: we were to hold daylong weekly meetings at which we would struggle to advance our understanding of the questions we posed, and we were to produce a book at the end of our time together that would share with the rest of the world what we learned from each other. It was an extraordinary opportunity, one that would almost surely never come our way again, which is why I and virtually every scholar I approached leapt at the chance to participate.¹

Most of us had never met each other as we gathered in the smoke-filled air and the furnace-like heat of the Santa Ana winds for that first October meeting. True to our interdisciplinary mandate, we were an eclectic bunch, representing academic fields ranging from history to geography, from ecology to literary criticism, from landscape architecture to environmental studies, from critical theory to law. We had come together under the rubric "Reinventing Nature," and the task we had set ourselves was nothing less than to rethink the meaning of nature in the modern world. Lest this seem too grandiose, we took as our

point of departure two key insights that have emerged from the work of scholars and scientists over the past quarter century. Let me discuss them in turn.

First, recent scholarship has clearly demonstrated that the natural world is far more dynamic, far more changeable, and far more entangled with human history than popular beliefs about "the balance of nature" have typically acknowledged. Many popular ideas about the environment are premised on the conviction that nature is a stable, holistic, homeostatic community capable of preserving its natural balance more or less indefinitely if only humans can avoid "disturbing" it. This is in fact a deeply problematic assumption. The first generation of American ecologists, led at the start of the twentieth century by the Nebraska scientist Frederic Clements, believed that every ecosystem tended to develop toward a natural climax community much as an infant matures into an adult. This climax, according to Clements and his followers, was capable of perpetuating itself forever unless something interfered with its natural balance.

Popular ideas of the natural world still reflect a fairly naive version of this belief, even though professional ecologists began to abandon Clementsian ideas almost half a century ago. By the 1950s, as Michael Barbour explains in his essay for this volume [*Uncommon Ground*], scientists were realizing that natural systems are not nearly so balanced or predictable as the Clementsian climax would have us believe and that Clements's habit of talking about ecosystems as if they were organisms—holistic, organically integrated, with a life cycle much like that of a living animal or plant—was far more metaphorical than real.² Furthermore, the work of environmental historians has demonstrated that human beings have been manipulating ecosystems for as long as we have records of their passage. All of this calls into question the familiar modern habit of appealing to nonhuman nature as the objective measure against which human uses of nature should be

judged. Recognizing the dynamism of the natural world, in short, challenges one of the most important foundations of popular environmental thought. Part of our job in Irvine was to consider the ways in which such thinking might have to change to accommodate this first, key insight.

The second of our two starting insights was perhaps even more challenging to popular conceptions of nature, and it soon emerged as the central dilemma to which our research group kept returning. The work of literary scholars, anthropologists, cultural historians, and critical theorists over the past several decades has yielded abundant evidence that “nature” is not nearly so natural as it seems. Instead, it is a profoundly human construction. This is not to say that the nonhuman world is somehow unreal or a mere figment of our imaginations—far from it. But the way we describe and understand that world is so entangled with our own values and assumptions that the two can never be fully separated. What we mean when we use the word “nature” says as much about ourselves as about the things we label with that word.³ As the British literary critic Raymond Williams once famously remarked, “The idea of nature contains, though often unnoticed, an extraordinary amount of human history.”⁴

What happens to environmental politics, environmental ethics, and environmentalism in general once we acknowledge the deeply troubling truth that we can never know at first hand the world “out there”—the “nature” we seek to understand and protect—but instead must always encounter that world through the lens of our own ideas and imaginings? By “environmentalism” in this book we generally mean the broad cultural movement in the decades since World War II that has expressed growing concern about protecting nature and the environment against harms caused by human actions. Our emphasis throughout is primarily on environ-

mental ideas in American popular culture rather than on the more systematic thinking of those who have devoted their professional lives to understanding the environment (people whose ideas have in fact profoundly shaped our own thinking in writing this book). Popular concern about the environment often implicitly appeals to a kind of naive realism for its intellectual foundation, more or less assuming that we can pretty easily recognize nature when we see it and thereby make uncomplicated choices between natural things, which are good, and unnatural things, which are bad. Much of the moral authority that has made environmentalism so compelling as a popular movement flows from its appeal to nature as a stable external source of nonhuman values against which human actions can be judged without much ambiguity. If it now turns out that the nature to which we appeal as the source of our own values has in fact been contaminated or even invented by those values, this would seem to have serious implications for the moral and political authority people ascribe to their own environmental concerns.

Here, then, were the chief questions our seminar sought to tackle: How should popular conceptions of nature and the environment change in the face of these insights? What would a more historically and culturally minded way of understanding nature look like, which would take seriously not just the natural world but the human cultures that lend meaning and moral imperatives to that world? Can our concern for the environment survive our realization that its authority flows as much from human values as from anything in nature that might ground those values? And if the answer to this last question is yes—as surely it must be—then how can a more self-critical understanding of what we mean by nature enhance our efforts to protect the environment in ways that are both sustainable and humane?

Our own conviction in writing this book is that however threatening such questions might seem, they cannot be evaded. We know that by asking them, our essays may be perceived by some as hostile to environmentalism, part of a general backlash against the movement. And yet nothing could be further from the truth. Indeed, it is precisely because we sympathize so strongly with the environmentalist agenda—with the task of rethinking and reconstructing human relationships with the natural world to make them more just and accountable—that we believe these questions *must* be confronted. To ignore them is to proceed on intellectual foundations that may ultimately prove unsustainable. We believe that any movement that merits the most passionate support of its followers—as environmentalism surely does—also deserves their most thoughtful and soul-searching criticism. Troubling as such criticism can sometimes seem, its goal in the end must be to deepen and enrich our understanding of the problems we struggle to solve, by helping us see the unexamined, sometimes contradictory, assumptions at the core of our own beliefs—assumptions that can distract and defeat us if we embrace or act on them unthinkingly. Our goal in writing this book is to contribute to an ongoing dialogue among all who care about the environment. The outcome of that dialogue, we hope, will be a renewed environmentalism that will enter the twenty-first century more aware of its own history and cultural assumptions, and thereby renewed in its mission of protecting the natural world by helping people live more responsibly in it.

Stated so broadly, our central questions may strike the reader as being all too abstract and academic, the kind of impressive-sounding but ultimately irrelevant ivory-tower trivialities with which professors so often distract themselves while more practical folk get on with the real work of the world. From the beginning, the members of our group were conscious that our

project might be viewed in this way, and we worked hard not to fall into disembodied academic abstraction. In fact, one of our secondary agendas in this book has been to try to demonstrate the practical relevance for practical problem solving of humanistic disciplines that are rarely even consulted by policymakers and activists who devote themselves to environmental protection. People often appeal to the natural and social sciences in trying to understand environmental problems; we hope that after reading this book they will appeal to the humanities as well.

The challenge we faced was how to make this case as persuasively as possible. At that first October meeting, I repeatedly reminded my colleagues that we would be writing a book together and that it should speak not just to us or to our academic peers but to the much broader public—people who care about the environment and wish to understand why they relate to it as they do. As we cast about for ways to show such readers that the real-world problems of everyday life raise fascinating questions about the human place in nature and how people think of it, Donna Haraway proposed that we begin by discussing what she called “found objects”: texts, photographs, advertisements, paintings, anything that would exemplify as concretely and vividly as possible the ideas of nature we wished to explore. Each of us, she suggested, should bring in an image or a text that would force the group to think about nature in new and unexpected ways. The resulting gallery of “found objects” would give us a rich and wonderfully playful tool for launching our discussions and getting to know one another’s different perspectives at the same time.

Like so many of Donna’s contributions to the group, it was a brilliant proposal. When we regathered in Irvine three months later, we arrived with an odd collection of found objects that would shape our discussions for the rest of our time together. Some were as quirky as a box of Heritage O’s break-

fast cereal—manufactured by a Canadian company called Nature’s Path Foods, Inc.—or an advertisement for the computer game *SimCity 2000*, “the ultimate city simulator.” Others were as serious as a discussion of ecological sustainability in a scientific journal or a *New York Times* article on the problems faced by native peoples in the Amazon rain forest. Each provoked lively discussion, and a few became so central to our thinking that we kept returning to them throughout the semester.

Probably the group’s favorite found object was a collection of newspaper articles and tourist brochures that Richard White distributed on the Rocky Mountain Arsenal, in Denver, Colorado. Built during World War II and once a major Department of Defense manufacturing facility, the 17,000-acre site was used for nearly forty years to produce a long list of extraordinarily toxic substances: aldrin, dieldrin, atrazine, chlordane, mustard gas, phosgene, methyl parathion, napalm, and many others. Along the way, hundreds of millions of gallons of highly poisonous chemicals were deposited in landfills and waste basins on the site. As a result, the Rocky Mountain Arsenal is now among the worst toxic waste dumps in the United States. But that is not all it is. Partly because the site is so toxic that most people have avoided it for decades, it has emerged as one of the West’s most remarkable wildlife refuges. Its wildlife populations are more diverse and abundant than those anywhere else in the central Rockies, so the arsenal staff now devotes considerable energy not just to cleaning up toxic waste but to promoting environmental education at the site. More and more visitors come to the arsenal to enjoy its “natural” wonders, leading some to dub it the “Nation’s Most Ironic Nature Park.”⁵

The paradoxes of such a place are endlessly fascinating. Here we have one of the nation’s most polluted landscapes, which is also among its richest wildlife

preserves. In trying to figure out what to do with it, we face the dilemma of deciding whether to clean up its waste dumps even if doing so might endanger the creatures who now make their homes there. How do we choose between the animals that seem to be thriving at the arsenal and the people who fear that it threatens the value of their homes and the health of families? There is nothing natural, surely, about the arsenal’s toxicity—and yet that toxicity is itself one of the most important things supporting the wild nature for which the place is now celebrated. The familiar categories of environmentalist thinking don’t seem to work here, since we have no clear indication of what would be “natural” or “unnatural” to do in such a case. Instead, it leaves us with an all too familiar riddle: How can we act in an uncertain world where our familiar compass bearings don’t work as well as we once thought they did, and how must we change the way we think in order to reorient ourselves and act responsibly?

The ability to blur the boundaries between “natural” and “unnatural” is precisely what makes the Rocky Mountain Arsenal and other found objects so useful for encouraging us to question our assumptions about what nature means and how we should relate to it. In the pages that follow, we have gathered a number of our most provocative found objects into what we call “albums,” located at the end of each major part of the book. Our original found objects about the Rocky Mountain Arsenal, for instance, appear in an album following this introduction, so you can read for yourself about the site and think about the dilemmas and paradoxes it poses. Although the found objects in most of these albums are only rarely addressed in our individual essays, our hope is that you will soon perceive their direct relevance to the themes we discuss throughout the book. Indeed, once you have become accustomed to the quirky eclecticism of these texts and images, we hope you will begin

to collect others for yourself, for you will find, as we did, that they are all around us. Virtually every newspaper, magazine, and television newscast offers equally vivid examples, as do the landscapes and environments in which we make our homes. All can serve as grist for daily reflection about the many meanings of nature in our ordinary lives.

That was certainly what happened to us in Irvine. It is not too much to say that for many of us, southern California became the most vivid found object of all, continually echoing and reflecting the ideas we discussed in our weekly meetings. Just before we arrived, a 6.8 magnitude earthquake shook the area around Northridge, severely damaging many neighborhoods in the northern reaches of the Los Angeles Basin. Although its effects on Irvine were slight—the occasional aftershock adding just a smidgen of excitement to our otherwise calm existence—together with the October fires it became a symbol of the tenuously ambivalent relationship between nature and humanity in this vast California metropolis. Add to these “natural” problems the long-standing economic recession that California’s defense-dependent economy has suffered from the end of the Cold War, as well as the disaster that has overtaken the University of California system as a result of property tax reform and the ensuing fiscal crisis, and you get a recipe for deep malaise in a state whose residents often in the past seemed unaccustomed to that emotion. Those of us who came to the seminar from outside Los Angeles arrived to find a lot of soul-searching about whether the California dream might finally be over or might even have been an illusion in the first place.

My favorite symbol of this malaise was the handwritten cardboard sign my family and I saw on the back of a U-Haul trailer in Carlsbad, New Mexico, during our drive from Wisconsin to Irvine. It showed a crude map of California inside a

circle with a diagonal line slashed across it. Beneath this image were written these words:

THE CALIFORNIA DREAM:

EARTHQUAKES

FIRES

FLOODS

MUDSLIDES

RIOTS

RECESSION

CROWDING

TRAFFIC JAMS

SMOG

WE’RE GOING HOME TO TEXAS!

Since we too were pulling a U-Haul, we introduced ourselves to the family responsible for this sign and asked what part of California they were leaving. Their answer: Irvine.

This is a good story and an amusing found object, but it’s worth reading the sign once again to consider its evidence that the California dream is over. Its most noteworthy feature is the way it unhesitatingly mingles problems that seem completely natural with problems that seem completely human. Earthquakes, surely, can’t be blamed on anything but the natural movements of the San Andreas and its associated faults, while one would hardly be inclined to blame anyone but people for riots or traffic jams (though we might argue for quite a while about *which* people to hold responsible for such things). Often when we label a problem as “natural,” we imply that there’s not much we can do about it. It’s just the way things are, and we’d better get used to it. Although the engineers of southern California have devoted immense energy to designing structures capable of withstanding large earth movements, and although Californians for the most part seem inclined to trust the engineers’ assurances that these structures are safe, many people make their peace with the shaking earth by fatalistically accepting its inevitability. All one can do in the end is hope that when the Big One comes, the house that collapses won’t be one’s own. Earthquakes are natural and can be tolerated as such, at

least until an experience at the upper end of the Richter scale shakes one’s faith in fatalism.

But interesting problems lurk beneath the surface here. It is not at all clear, for instance, that even earthquakes are as natural as the previous paragraph would suggest. The Northridge quake affected different neighborhoods and structures in very different ways. Sometimes this was because of underlying strata and fault systems that concentrated the shaking motion in unexpected places like Santa Monica. But neither the underlying geology nor anything else in nature explains why some of the most severely damaged buildings were apartment complexes with unreinforced garages on their first floors. Such architecture is the product of economy and culture, not nature. Likewise, no feature of the natural environment can explain why some neighborhoods—Balboa Boulevard in Granada Hills, for instance—were able to rebuild so quickly following the quake, while others—Hollywood Boulevard near Western Avenue, for instance—became virtual ghost towns. These differences in the way the earthquake affected the built environment reflect underlying differences in the social environment, not the natural one.⁶ Most suggestive of all, perhaps, is the reminder that some of the worst effects of the quake occurred in places where people had consciously chosen to ignore key features of the local landscape. In the San Francisco quakes of 1906 and 1989, some of the most severe damage happened where people had built houses and highways on landfills in old wetlands. In the Northridge quake of 1994, no single effect was more disruptive to the lives of more people than the closing of the heavily trafficked Santa Monica Freeway. And yet the only place where that highway collapsed was a stretch of ground that bears the place-name La Cienaga—“swamp” in Spanish.⁷ Although it may be perfectly natural in an earthquake for wetlands to shake more violently than drier ground,

there is nothing natural—common though it may be—about building highways or houses in such places.

The cardboard sign on that U-Haul trailer did not specifically blame nature for its authors' flight from California. Instead, it mocked what it called the California Dream with a litany of disasters that for more than just this one family had turned the dream into a nightmare. The sign made no distinction between natural and unnatural hazards, and this surely says something important about the way people often think about the environment in general. Problems like smog, which represent the mingled effects of complex natural and human causes, are so diffuse in their origins and so normal a feature of life in the Los Angeles Basin that they might as well be natural. After a while they become second nature to us, and we do our best to ignore them. For someone who fears being trapped inside it, even a traffic jam or a riot can seem like a force of nature—vast and inescapable, something we can accept or flee but not change. Treating such things as normal and inevitable in effect naturalizes them, placing them beyond our control and excusing us from having to take responsibility for them, making it easier to pretend that they have little or nothing to do with our own actions.

Here one is reminded of another California nightmare listed on that sign: wildfires like the ones still burning as we gathered in Irvine for our first meeting that October. When we walked over to look at the apartments in which most of us would live, we tried not to think about the blackened, smoldering hillsides we couldn't help seeing on a horizon that was far too close for comfort. Several months later our resident ecologist, Michael Barbour, would take us on an extraordinary field trip to the site of the Laguna Canyon fire, which had burned nearly 14,000 acres and devastated dozens of homes before dying out less a mile from the Irvine campus. Such fires are,

of course, a natural feature of California's coastal chaparral ecosystems, which contain some of the most flammable vegetation on earth. Standing amid the ruins of once beautiful houses, surrounded by plants that were already sending up vigorous green shoots from the ashes, we could see all too easily why the buildings had gone up in smoke. Indeed, we were able to pinpoint the area where the next chaparral fire is almost certain to occur, given the age of the vegetation and the accumulated fuel load. It too will destroy many homes. If the rains cooperate in just the wrong way, such a fire will be followed by devastating mudslides like the ones we saw at Malibu, producing landscapes without so much as a blade of grass. At Malibu, the mud flowed down in knee-deep rivers through the posh beachhouses that blocked its path to the sea. California Dream indeed!

The irony is that the people who build in exposed locations like these—the locations most susceptible to the fire and mud—are often those with the greatest ability *not* to do so. Hillside real estate with ocean vistas commands prices in Los Angeles that only the wealthiest homeowners can afford. The engineering and architectural feats that permit houses to stand with elaborate props on slopes that would make even

a mountain goat think twice before ascending are nothing less than astonishing for anyone accustomed to living on flatter ground. To spend millions of dollars to live suspended in midair above fire-prone vegetation on soil with only the most tenuous commitment to remaining in place, all within a few dozen miles of the San Andreas Fault, would seem to make no sense at all. And yet even while standing in the ashes with scenes of devastation in all directions, one can easily see why people build here anyway. The views from these places are breathtaking. The sight of such a landscape each time you step out your front door is a reminder of what it means to be alive—even if that reminder ultimately kills you. Since World War II, roughly 75,000 upper-income homes have been built on hillside lots by people seeking a room with a view.⁸ They presumably have at least some inkling of the attendant dangers, though it is surprisingly easy to forget the quakes and the fires and the mud while gazing out on the intoxicating blue of the Pacific. Why do they do it? They put themselves and their families at risk for the simple reason that they want to be close to nature.

This is the chief paradox of southern California, the feature of its environment that makes it such a

Foundations of burned houses overlooking Laguna Canyon fire area. (Photograph by William Cronon)



perfect place for meditating on the complex and contradictory ideas of nature so typical of modernity. Many of the vices for which the region is most infamous—indeed, virtually every item on that U-Haul sign—are simply the mirror opposites of the virtues for which it once was, or still is, famous. Without the faults and the quakes, the landscape would never have acquired its astonishing physical relief, the mountains that climb so abruptly out of that stunning ocean. The slopes that offer such breathtaking views also tilt the shattered bedrock and unconsolidated soil well past their angle of repose, tempting them to head downslope at the least invitation. The vegetation keeps the sight lines open, without cluttering the horizon with trees, and is often the only thing holding the soil in place—but it is also very fond of burning. The glorious climate, with its endless sunny days, rarely provides the rainfall that might clear the air of smog, or the water this metropolis needs to quench its insatiable thirst. The automobiles that produce the smog and jam the highways are also the means for fulfilling the ultimate suburban dream, enabling their owners to put a great distance between workplace and home, and permitting them on weekends to head out to the beach or the freedom of the hills. The crowding is but an ironic measure of the city's success, for the people who come in pursuit of the dream are all too often seduced into thinking they can leave behind the very problems they bring with them. As for the riots, they are a grim reminder, like so many other features of this favored landscape, that the troubles we ignore always come back to haunt us. Not even going home to Texas—that land of droughts and floods and hurricanes and tornadoes, to say nothing of urban sprawl and racial strife and the boom-and-bust economy—will save us in the end.

What better place than southern California, in short, to explore the contradictory meanings of nature in

GIVE THE CANYONS A BREAK!
WILDERNESS AT WORK

WHAT WILL HAPPEN NEXT
Despite the lifeless appearance of the blackened hillsides, natural recovery is already underway. The remaining ash contains nutrients that will aid in the regeneration of the affected plant communities. Outlined below is the anticipated evolution of the landscape.

WHAT YOU CAN DO TO HELP!
Respect the wilderness. Please stay out of burned areas!
The fire has left the wilderness in a fragile state. Premature access could damage plants that are trying to come back after the fire, as well as further traumatize displaced animals.

Be patient!
All land managers are working together to reopen the canyons to public access as soon as possible.
Explore one of Orange County's other wilderness areas while the canyons heal.

1 The heat of the fire activates the germination of many native seeds. Other plants regenerate by root sprouting.

2 Some of the first plants to reappear on the blackened landscape will be colorful wildflowers, including poppies and lupines.

3 Over the next few years, the native shrubs (Toody California Sagebrush, Lemonadeberry, Blackcherry) will begin to reappear.

4 As various plant communities regenerate to pre-fire levels of diversity, associated wildlife (California Ground Squirrel, Coyote, White-Winged Woodpecker, Bobcat) will return.

Timeline: Before the Fire, 1 Year After Fire, 2 Years After Fire, 3 Years After Fire, 4 Years After Fire, 5 Years After Fire, 6 Years After Fire.

Also, look for: WOODS RANGOLIA FISH, CASPER WILDERNESS BARK, CHRYSLER NATIONAL FOREST, WILDERNESS TRAIL, CALIFORNIA WILDERNESS TRAIL.

Contact land managers for future access and volunteer information.
LAND MANAGER: [Name], [Phone], [Email], [Website]

“Give the Canyons a Break! Wilderness at Work.” (County of Orange, EMA/Parks & Recreation)

the modern world—not because southern California is unique but because it perfectly exemplifies so many tendencies of modern American culture. As our group proceeded with its work, we soon discovered that certain themes and motifs kept recurring in our discussions, each attached to some significant way of thinking about nature, and each also having important physical analogues in the landscapes around us. The individual essays in this book address these themes and motifs in far greater detail than this introduction can, but perhaps it would be useful here to

offer a quick guided tour of the several versions of nature that most concerned us. The list I offer is anything but comprehensive, but it certainly identifies some of the most important ways that contemporary Americans think about nature. Perhaps the most important lesson to remember while reading this list, as I noted at the beginning, is that none of these natures is natural: all are cultural constructions that reflect human judgments, human values, human choices. We *could* choose to think about nature differently, and it is surely worth pondering what would happen if we did.

To make this provocative claim is, of course, to fly in the face of what people commonly mean when they speak of “nature,” because one of the most important implications of that word is that the thing it describes is *not* of our own making. This is the view of nature the essays in this book most explicitly seek to critique. We might call it *nature as naive reality*. It is in fact one of the oldest meanings that the word “nature” carries in the English language: the sense that when we speak of the *nature* of something, we are describing its fundamental essence, what it really and truly *is*.⁹ Indispensable as the usage may be, it is dangerous for what it tempts us to assume: the very thing it seeks to label is too often obscured beneath the presumption of naturalness. When we refer to “the nature of *x*,” we usually imply that there is no further need to analyze or worry about that nature. We need not ask where it came from or on what contingencies it depends, for it is simply the way *x* is. Its meaning is transparent and uncomplicated, so we can take it for granted as a given: that is its nature.

A central tenet of modern humanistic scholarship is that everything we humans do—our speech, our work, our play, our social life, our ideas of ourselves and the natural world—exists in a context that is historically, geographically, and culturally particular, and cannot be understood apart from that context. If we wish really to make sense of a document like the Declaration of Independence, for instance, we dare not assume that the people who wrote it used words or conceived of the world precisely as we do. Unless we are willing to make the imaginative leap backward to immerse ourselves in the cultural universe of their time and place, we will make grievous errors in understanding what they meant. Moreover, we cannot assume that the people who subsequently read that document understood it as its authors did: the Declaration of Independence no doubt meant something very different

to Jefferson Davis and Abraham Lincoln in 1861 from what it meant to Thomas Jefferson in 1776 or to Martin Luther King, Jr., in 1963. And so we take on the immensely challenging burden of trying to understand the *changing* meanings and *different* cultural contexts that have characterized human life and thought in all their infinite particularity.

This is why humanists are often so suspicious of arguments that appeal to something called “human nature.” That term compresses such diverse and complex phenomena into such a flat, colorless cartoon that it erases most of the things scholars wish to understand. It assumes as an uncontested fact that humanity can be captured in a single, monolithic description, when the burden of proof for actually demonstrating such a claim would for all but the crudest assertions be so immense as to be practically impossible. The same can be said for the concept of nature itself. Our ways of thinking about the natural world are powerfully shaped by our time, our place, and our culture. When people use the word “nature” to refer to the whole of creation, they are echoing a long semantic history that tracks backward to the medieval church and even to classical antiquity, implying without much reflection that nature is One Thing with One Name, a monolith that can be described holistically in much the same way as God. Nature in Western culture is the product of a monotheistic religious tradition; it is often unrecognizable for people whose cultures have not taught them to worship a lone deity.¹⁰

This is not the place to offer a comprehensive history of nature in Western thought. For the purposes of this book, I simply wish to argue that the burden of proof should be with those who assert the universal nature of nature, for the evidence against such a view is enormous. Ideas of nature never exist outside a cultural context, and the meanings we assign to nature cannot help reflecting that context.

The main reason this gets us into trouble is that nature as essence, nature as naive reality, wants us to see nature as if it *had* no cultural context, as if it were everywhere and always the same. And so the very word we use to label this phenomenon encourages us to ignore the context that defines it. If we wish to understand why we think of nature as we do—for instance, even so basic a matter as why the object of this sentence is expressed as a singular noun—then we cannot afford to fall into the trap that this word has laid for us. If we wish to understand the values and motivations that shape our own actions toward the natural world, if we hope for an environmentalism capable of explaining why people use and abuse the earth as they do, then the nature we study must become less natural and more cultural.

The appeal to nature as naive reality is often linked to a second major cluster of ideas that surround this word: *nature as moral imperative*. One need not travel a very great distance in speaking of “the nature of *x*” to get from “this is the way *x* really *is*” to “this is [the] way *x* *ought* to be.” The great attraction of nature for those who wish to ground their moral vision in external reality is precisely its capacity to take disputed values and make them seem innate, essential, eternal, nonnegotiable. When we speak of “the natural way of doing things,” we implicitly suggest that there can be no other way, and that all alternatives, being unnatural, should have no claim on our sympathies. Nature in such arguments becomes a kind of trump card against which there can be no defense, at least not as long as our opponents share our values—and how could they not, if those values are as natural as we claim? Only a fool or an incorrigible sinner could fail to respond to so compelling a moral imperative. This habit of appealing to nature for moral authority is in large measure a product of the European Enlightenment. By no means all people in history have

sought to ground their beliefs in this particular way. Indeed, it would have been far more common in the past for people in Western traditions to cite God as the authority for their beliefs. The fact that so many now cite Nature instead (implicitly capitalizing it as they once might have capitalized God) suggests the extent to which Nature has become a secular deity in this post-romantic age.

Because the values that people attach to nature as moral imperative are so dependent on cultural context, it makes little sense to discuss this phenomenon in the abstract. Nature as moral imperative always implies a very particular vision of what ideal nature is supposed to be. For some modern Americans, ideal nature is clearly a pristine wilderness, as I argue elsewhere in this book. For others, as Kenneth Olwig notes in his essay, ideal nature is the pastoral countryside or the small town, while others still would celebrate the suburb or even the city as the natural home of humankind. It hardly needs saying that nothing in physical nature can help us adjudicate among these different visions, for in all cases nature merely serves as the mirror onto which societies project the ideal reflections they wish to see.

The Judeo-Christian tradition nonetheless has one core myth that is so deeply embedded in Western thought that it crops up almost anytime people speak of nature. It is so widespread in modern environmental thinking that it deserves to be labeled as a separate cluster of ideas in its own right: *nature as Eden*. Candace Slater, Carolyn Merchant, and Kenneth Olwig were responsible for introducing this concept to our seminar in Irvine, and their essays explore it in detail. It quickly became one of the most fertile topics we discussed. Candace in particular argued that a great many environmental controversies revolve around what she calls “Edenic narratives,” in which an original pristine nature is lost through some culpable human act that results in environmental degradation and moral jeopardy. The tale may be

one of paradise lost or paradise regained, but the role of the narrative is always to project onto actual physical nature one of the most powerful and value-laden fables in the Western intellectual tradition. The myth of Eden describes a perfect landscape, a place so benign and beautiful and good that the imperative to preserve or restore it could be questioned only by those who ally themselves with evil.

Nature as Eden encourages us to celebrate a particular landscape as the ultimate garden of the world. In her essay, Candace Slater demonstrates that the Amazon rain forest now plays this role for a great many people in the United States and Europe who have never actually seen that forest for themselves. Kenneth Olwig points to the ways in which Yosemite offered nineteenth-century Americans an ideal combination of pristine wilderness and pastoral garden, turning it into a nationalist symbol of paradise. And for many of us in the Reinventing Nature group, it also seemed that Eden, albeit a problematic Eden, existed right on our doorsteps, in Irvine and southern California generally. The awe-inspiring views of the Pacific that tempt wealthy homeowners into the path of the fires are only one manifestation of the love affair with nature that is so near the core of southern California culture. Los Angeles has fewer public parks per capita than most other American cities, but it possesses nearly eighty miles of beachfront unequaled by any other city in the world.¹¹ Marketed even in the late nineteenth century as the ultimate garden suburb, a city with no downtown but with houses in grassy yards everywhere, Los Angeles and its neighbors have long participated in the Edenic myth. As Reyner Banham has written, “Whatever man has done subsequently to the climate and environment of Southern California, it remains one of the ecological wonders of the habitable world. Given water to pour on its light and otherwise almost desert soil, it can be made to produce a reasonable facsimile

of Eden.”¹²

The city’s developers make their living by selling Eden, and they know their business well. The real estate section of the *Los Angeles Times* is unquestionably the largest and most colorful I have ever seen. Each Sunday brought a sheaf of promotional literature for the subdivisions whose explosive growth we could monitor every time we took a drive. The advertisements promised not only the social attractions of living in a planned community—the reassuring safety of gated entrances staffed round the clock by security guards, the convenience of nearby schools and shopping malls, the recreational opportunities of adjacent country clubs and golf courses—but also the *natural* attractions of a community whose planners really care, they tell us, about protecting the environment. Irvine bills itself as the largest planned community in the nation and has served as the prototype for many of its neighbors. Dove Canyon, on the eastern outskirts of Irvine, offers would-be buyers “the more perfect world you’ve promised yourself, and it’s time you made it your home.”¹³ The developers of Rancho Santa Margarita—“where the west begins. Again”—explain, “It all started years ago with a vast rancho rich in history and natural beauty. And then came a dream. To develop the land into a master-planned community while carefully protecting all that makes the land so wonderful and beautiful.” Even though this “may look like a vacation destination, it isn’t. It’s a hometown.”¹⁴ Just so are we able to regain paradise if only we can afford the down payment.

Like the original garden, these new Edens are not without their problems. Conflicts often erupt over the particular vision of nature—God’s or Satan’s—they are meant to express. While we were living in Irvine, an Edenic controversy swirled around a small bird called the gnatcatcher. It had been proposed as an endangered species so that environmentalists could

avail themselves of the federal courts to prevent further development of the bird's coastal sage scrub habitat—the very habitat most at risk to be turned into spanking new versions of Eden by the developers. In May 1994 a federal judge overturned the bird's listing under the Endangered Species Act, thereby throwing open the remaining chaparral to development. For the environmentalists this was tantamount to casting it into Satan's hands; for the developers it assured that the subdivided paradises of Orange County could continue to expand. As one environmentalist declared, "This is absolutely a step in the wrong direction, one that could have a devastating impact on the habitat protection program" of the entire Orange County landscape. Developers, on the other hand, celebrated the court's rejection of what they saw as environmentalist efforts "to illegitimately twist the Endangered Species Act into a tool for stopping development in general."¹⁵ The point here is not the particular merits of either argument but the fact that a single small animal has for peculiar legal and cultural reasons been made to bear the entire burden of defending or delimiting Eden. In the gnatcatcher case, both sides appealed to a common moral tradition—both employed Edenic language to defend their case—even though the natures they sought to protect on the coastal hills could hardly have been more different.

This is not unusual. Consider the case of the homeowners association in Laguna Niguel that decided after a closed meeting to resolve a long-standing dispute among its members by cutting down two hundred of the town's eucalyptus trees, most of them located in the middle of people's yards. What problem justified such drastic intervention? Residents living high up on the community's slopes were having their views of the ocean blocked by the fast-growing trees. They naturally felt that their quality of life and the value of their houses were

being jeopardized, since the premium prices they had paid for their properties had been predicated on the open view. Homeowners farther down the slope, on the other hand, not having the same views or property values to protect, just as naturally prized the trees for the cool shade they offered on the hot hill-sides. Feelings ran so high that the tree cutters were at one point threatened with a shotgun, and several homeowners wept openly as their trees came down. One woman who had lost fourteen eucalyptuses on her property said that before their removal, "it was like living in a park setting. I hope this is illegal what they have done, because if not, it's definitely immoral."¹⁶

Here again there is no clear right or wrong: both sides were merely defending their corner of Eden, trying to protect the nature they valued so highly. The violence of their disagreement testifies to how important our views of nature can be in defining who we think we are and the kinds of lives we wish to lead. In the United States, and especially in southern California, Eden is never far beneath the surface in shaping what we imagine to be the perfect home in the perfect natural setting. Ever since the Puritans arrived in Boston to build their fabled city on a hill to serve as a beacon for all the world, Americans have hankered after the Protestant mission of reforming an old world and a faded dream by starting over again. In this land of new beginnings, the place to which people most wish to return is inevitably some version or another of the original garden, the paradise that would have been ours if only we hadn't lost our way.

Nowhere in the United States are these impulses more powerfully expressed than in California. Continent's end has long been the final resting stop on the great frontier migration, the last best place for starting over. It would be hard to buy property in Orange County without being influenced by the real estate literature that promises paradise for the price of a mortgage.

And there is nothing necessarily wrong with this. Most of us, I suspect, have some notion of where we would most like to live if we could have the home of our heart's desire. Trouble surfaces only when, as so often happens, one person's Eden comes into conflict with another's, much as God's plans for paradise collided with Satan's. Then the Edenic myth becomes the vehicle for casting our adversaries into the heart of darkness, demonizing them as allies of the dark angel who so long ago seduced us into this, our present exile in a fallen world. Even those who do not subscribe to the Judeo-Christian imagery can fall victim to its moral dualism, because that is how Eden tempts us. It is a place of absolute good and absolute evil, of actions that are unambiguously right and wrong. When we project its polarized, black-and-white myth onto the ambiguous world of gray on gray that we actually inhabit, the power of its imagery sparks our passions but darkens our vision. It buys clarity at the expense of understanding by tempting us to reenact its most ancient of stories rather than listen for whether there might be some other tale to tell.

I initially introduced Eden as a special case of nature as moral imperative, but these disputes and the work of the real estate developers suggest that Eden can point in another direction as well: *nature as artifice, nature as self-conscious cultural construction*. What is so striking about the southern California landscape is the extent to which it has been transformed into a vision of nature utterly different from the ecosystems that once characterized the region. In this, it represents a more extreme example of the careful manipulation of natural systems that Anne Whiston Spirn describes Frederick Law Olmsted performing as he helped found the profession of landscape architecture. Olmsted sought to design *with* nature, and the paradox of his success is that many of his most important creations are no longer even recognized as such: people look at them now and see nature, not Olmsted. In less sensitive

hands than Olmsted's, artifice can triumph even more completely. Once we believe we know what nature *ought* to look like—once our vision of its ideal form becomes a moral or cultural imperative—we can remake it so completely that we become altogether indifferent or even hostile toward its prior condition. Taken far enough, the result can be a landscape in which nature and artifice, despite their apparent symbolic opposition, become indistinguishable because they finally merge into one another.

One might go so far as to say that the replacement of nature by self-conscious artifice is a key defining quality of the modern landscape. If so, Irvine is a near-perfect example of the genre. Like many planned communities in southern California, it takes its inspiration in part from that amazing planned environment in Anaheim to the north: Disneyland. There, Disney's imagineers succeeded in replicating on a very small plot of land a jungle, a Louisiana [sic] bayou, a desert, a coral reef, a miniaturized English countryside, even the most famous mountain in the Alps. The landscaping of Disneyland is rarely less than brilliant, with each different habitat and playground screened from its neighbors with carefully controlled sight lines, plantings, and sound baffles. The animals in these landscapes always perform perfectly on cue as the tourists pass by, because most are machines that reproduce the appearances of nature without its bothersome misbehaviors. The streets are constantly swept by uniformed attendants so that no litter ever lingers for long, and are also steam-cleaned each night to make sure they are ever immaculate. Social problems are carefully excluded from the theme park, along with the people who might inflict those problems on this land where fantasy and commercial profit reign supreme. It is in all ways an extraordinary place, a triumph of artifice over nature.

The same might be said of Orange

County itself. Here's how the California Office of Tourism sells the place to visitors:

It's a theme park—a seven-hundred-and-eighty-six square mile theme park—and the theme is “you can have anything you want.”

It's the most California-looking of the Californias: the most like the movies, the most like the stories, the most like the dream.

Orange County is Tomorrowland and Frontierland, merged and inseparable. 18th century mission. 1930s art colony. 1980s corporate headquarters....

The temperature today will be in the low 80's. There's a slight offshore breeze. Another just-like-yesterday day in paradise.

Come to Orange County. It's no place like home.¹⁷

Like Disneyland, Orange County is a place where planners, designers, and real estate developers have remade nature to make it conform to their own ideal. One has only to look at Ansel Adams's photographs of the first buildings at the University of California at Irvine to see how completely the landscape has been transformed. As recently as the late 1960s, the university sat virtually alone in a vast empty grassland, the dryness and openness of the vegetation visible in all directions. Today one has to walk to the edge of the campus to see any remnants of this grassland, which have been set aside as a nature preserve—a preserve that incidentally could easily serve as the corridor for bringing wildfire to this community if the Santa Ana winds should ever blow in the wrong direction on a day when the hills are burning. Elsewhere the original vegetation has given way to the succulent ice plant, the spicy-smelling eucalyptus, and all the other non-native plantings that have turned this semiarid land into a subtropical paradise. As Banham says, water is all it takes to build Eden in this place.

What most struck many of us after

living in Irvine for a time was not just the transformation of the local ecosystem but the way its idealized nature reflects underlying assumptions about order and community. It is a city where everything has been given its proper place so that nothing need ever interfere with anything else. Everything is well under control. The major city streets are carefully designed so that each block has only a single point of access, with the result that cars can travel at fifty-five miles per hour on streets that in any other city would be posted at least fifteen to twenty miles per hour lower. Traffic flow is almost as brilliantly managed here as in Disneyland: the bumper-to-bumper cars so characteristic of Los Angeles often disappear when freeways reach the margins of Irvine. The highway engineers have finally made their peace with U-turns, so much so that they become the chief device permitting high-speed movement on limited-access streets. Bike lanes are everywhere, often completely separated from cars on roads designed solely for two-wheeled vehicles. Parks wind their way along the major drainage channels, so those who wish to bike or stroll beside the cement-lined creeks can easily do so to take in the view.

The only problem is that all this meticulously arranged openness somehow never quite becomes *public*: private space rarely seems to become public place. One experiences the parkland of Irvine, like the freeways, privately, as an individual, without any real sense that one is doing so as the member of a community. The same is true of the ubiquitous shopping malls, the parks, even the UC-Irvine campus. Many of us in the seminar had the feeling months after our arrival that we were still trying to find Irvine: even now, I couldn't tell you where to locate the downtown—it was designed not to have one—nor could I give you directions for finding any but a small handful of places. For all the care lavished on this planned community—maybe even because of that care—it is

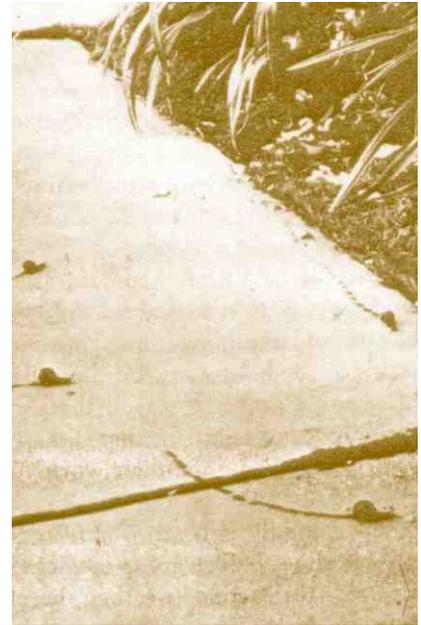
an extraordinarily difficult place to navigate. I once asked a woman at the checkout counter in my local supermarket how to get to another store less than a mile away. Even though she had lived in the city for several years, she just shook her head and said she wasn't sure. "I used to drive a cab," she remarked, "and I always tried to say no when they wanted me to pick up someone in Orange County. Nothing makes sense here. I'm still always getting lost." The curving streets are undoubtedly part of the problem, but so is the planner's impulse to keep everything neatly segregated from everything else. The local geography seems designed to reveal itself on a strictly need-to-know basis. One can search in vain to find an address on any of the major streets, a problem one typically solves by getting directions in advance, always starting from the nearest shopping mall. Like the walls and gates behind which so many people live here, this is perhaps just another way of protecting privacy. It certainly prevents one from having any clear sense of relationship to a larger community.

For me the most powerful symbol of this impressively planned, well-controlled, elegantly designed landscape was right in our own yard. I have never lived in a house with a more immaculate garden. There was no grass anywhere in sight, and nothing we needed to mow. Instead, the garden was filled with palms and ferns and mosses whose succulent leaves and deep green hues bespoke an unfailing supply of water. Each night, at odd intervals we could never predict in advance, a computer in our garage turned on the sprinklers and gave our lovely plants the drink they so needed after their long hot day in the California sun. The water which quenched their thirst (and our own) probably traveled hundreds of miles from the Owens Valley or the Colorado River to make our private backyard Eden possible—though it is a token of this strange land that I will

never know for sure which distant river was sacrificed to make our green space possible (and to be fair, the garden was maintained with gray water recycled from other uses). Despite the luxuriance and richness of the garden, we never raised a finger to take care of it. That work was done by Mexican American gardeners who arrived at discreetly chosen times when their activities would not disturb the calm of our pastoral retreat.

It was all so peaceful, so Edenic and natural, that one would surely have thought it would be easy to get used to. And yet somehow I never did. I admired the beauty and the ingenious contraptions that made it possible, and I was grateful for the hard work I did not have to do. But I never quite felt at home. For some perverse reason the garden memory that remains most vivid in my mind is of the snails that slithered across our walkway each night after the sprinklers had done their work. We could never see them as we made our way home in the evening, so almost every night we winced as their shells crunched loudly beneath our feet, forcing us to clean mashed snail slime from our shoes before going inside. (Worse still were the mornings, when I occasionally stepped on them barefoot while groping for the morning paper in the dark.) The snails were the one element of this garden that had somehow escaped automation and control, the one example of nature doing its own thing instead of what the planners had prescribed. Never mind that the snails could hardly have been native to the place and depended just as much as our succulent plants on the artificial rain that our computer delivered each night. Because they didn't fit the plan, they somehow seemed more natural.

I will return to those snails in a moment. Orange County is a place so constructed that it verges on becoming still another form of nature: *nature as virtual reality*. This was a theme that Katherine Hayles and Donna Haraway introduced to our discussions in



Snails on garden walkway, University Hills, Irvine, California. (Photograph by William Cronon)

Irvine, and I think we were all surprised by how influential the idea became for the rest of us. We live in a time when the proliferation of networked computers, the power of morphing and fractal geometry, the ever more persuasive illusions of Industrial Light and Magic, the anarchic world of the Internet, and so many other features of the electronic universe make it increasingly possible to inhabit a cultural space whose analogues in nature seem ever more tenuous. Katherine shared with our group numerous examples of computer simulations and graphics that came close to constructing an alternative reality. We speculated together about the possibility that computer viruses might serve as the models for new silicon-based life forms that would live out their lives in electronic space. Some computer scientists now believe that the most effective way to create artificial intelligence will be to devise small self-replicating programs capable of mutating and undergoing evolution inside our machines, the idea being that they will eventually develop the complexity, self-referentiality, and autonomy needed to produce a consciousness akin to our own. At first

glance the idea seemed bizarre to all of us, but the more we considered it, the more plausible it became.

The fascinating thing about virtual reality is that although it initially appears to be the least natural of human creations, the most disembodied and abstracted expression of modernity's alienation from nature, it can in fact serve as a powerful and rather troubling test of whether we really know what we're talking about when we speak of nature. One would think that the virtual would stand in pure opposition to the real, but when you put them next to each other this is not nearly so obvious. Yes, a person using computerized sensory apparatus to move through virtual space could hardly be more isolated from the surrounding environment. And yet the better the simulation, the more difficulty we begin to have in distinguishing it from the real. The more engaged we become with experiencing it, the more plausible it begins to seem as an alternative to the world we know—indeed, an alternative with real advantages. Even more than the planned landscape of Orange County, virtual reality seems to hold out the seductive promise of total control, an environment we can manipulate to our heart's content because it apparently offers no resistance to our fantasies. Some go so far as to imagine that it will ultimately enable us to escape the confines of our own bodies, so that the information in our neurons and synapses can be downloaded into a computer where our mind, our consciousness, our very being can shed its husk of flesh and finally enable us to fulfill the age-old dream of becoming, like the gods, immortal. This is not just science fiction; it is a plausible description of a future in which virtuality will become as real and natural to us as nature is today.

Many of us no doubt recoil from such a vision, but as the members of our group learned in Irvine, it is easier to recoil than to explain why we do so. Unnatural though they may seem,

virtual consciousness and virtual reality emulate many more features of the “natural” world than one might at first assume. Katherine Hayles takes up some of these issues in her essay for this book, and I will not try to reproduce the intricacies of her argument here. Instead, I will offer just two observations. First, the dream of complete control is no more assured in a virtual world than in this supposedly more natural one. Among the many surprising features of virtuality is the fact that the closer it comes to emulating real life, the more chaotic and unpredictable it seems to become. Programs designed to do one thing often turn out to do another, evolving in ways their original authors could not have anticipated. The more complex the systems become, the more they emulate the kinds of behaviors we so often see in nature. As in the real world, these often prove much harder to control, much more capable of taking us by surprise, than we could ever have imagined.

Just as strikingly, the real world we now inhabit already contains many elements in which the natural and the virtual mingle in such subtle ways that it can be surprisingly difficult to distinguish between them. This is among the lessons of Disneyland, in which plastic trees and mechanical animals mimic quite amazingly their counterparts in nature. Susan Davis took our group on a field trip to Sea World, where we watched Shamu™, the killer whale, perform its tricks—or rather its “behaviors,” as the Sea World staff insists on calling them—in a great tank of water with an enormous television screen standing behind to magnify the performance for the delighted audience. The images on the screen, backed by the resonant narration of James Earl Jones, were as important to the performance as the live animal and its trainers. Susan's essay in this book discusses the complex ways in which this corporate theme park manipulates visitors' experience of its creatures, raising the question of what is natural and what is virtual in such a place.

Sea World implicitly exemplifies one of the most powerful cultural constructions that shapes modern American attitudes toward nature: *nature as commodity*, a thing capable of being bought and sold in the marketplace quite apart from any autonomous values that may inhere in it. Market exchange and commodified relations with nature have been transforming the landscape of America, indeed, of the entire planet, for centuries. Few cultural conceptions have had greater ecological impact. Whether one looks at the destruction of the great herds of bison or flocks of passenger pigeons in the nineteenth century, the extirpation from North America of whole ecosystems like the tallgrass prairie, or the increasing assaults on biodiversity worldwide, the immense power of a political economy based on culturally commodified nature is everywhere apparent, producing an alienation from the natural world—and from the effects human actions have thereon—that is all too characteristic of modernity. Looking at the environment in this way comes so easily to members of modern Western cultures that it is virtually second nature. It is present in the trading pits of the Chicago Board of Trade, where all manner of natural resources become commodities, and it is no less present in places like Sea World, where nature itself—or rather, a particular *idea* of nature—is bought and sold as a consumable experience. The peculiar tendency of many cultures in the modern capitalist world to view nature in this way is yet another kind of virtual reality, a construction so comfortable that it seems utterly commonsensical, universal, and *natural* to those who inhabit it—no matter how problematic its consequences may be.

Jennifer Price gives another example of commodified nature in her essay on The Nature Company, which many members of our group visited in Orange County's famous South Coast Plaza shopping mall. Surrounded by some of the most upscale stores in

America, the [sic] Nature Company manages the neat trick of standing in apparent opposition to its glitzy surroundings by offering a calm woodsy space where shoppers can enjoy the pleasures of our national pastime—shopping—while still affirming their green values by purchasing recycled greeting cards, rustic bird feeders, ecologically educational toys, ambient environmental sound CDs, and hand-made crafts from the indigenous peoples of the rain forest. What the [sic] Nature Company sells is not so much nature as authenticity—or what passes for authenticity in a consumer culture. It reassures its customers that they can participate in consumerism with their values intact, go to the mall and still get back to nature. Standing in the midst of such a store, surrounded by its many beautiful objects and basking in the image of nature it wants to sell us, we can legitimately ask whether this might not be yet another kind of simulation, another form of virtual space.

But theme parks and shopping malls are by no means the only ways in which the virtual and the natural are converging in our time. It is well worth remembering that some of the most dramatic environmental problems we appear to be facing as we enter the twenty-first century exist mainly as simulated representations in complex computer models of natural systems. Our awareness of the ozone hole over the Antarctic, for instance, depends very much on the ability of machines to process large amounts of data to produce maps of atmospheric phenomena that we ourselves could never witness at first hand. No one has ever seen the ozone hole. However real the problem may be, our knowledge of it cannot help being virtual.

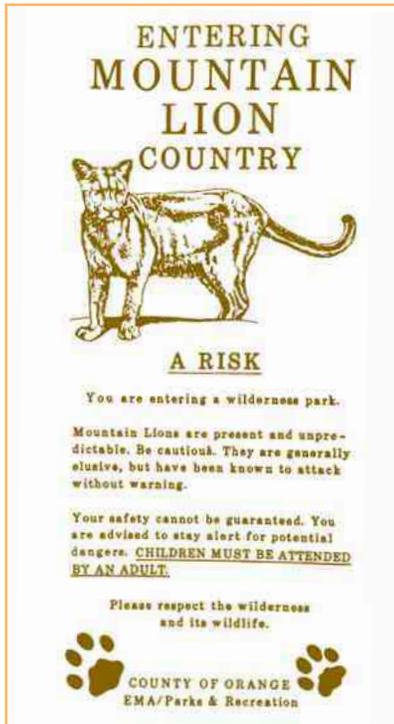
The same is even more true of the phenomenon called global warming, which many people now take to be an absolute fact of nature. Like the ozone hole, it too is probably real, but our knowledge of it could hardly be more simulated. The computer models on which we base our predictions of what

will happen as concentrations of greenhouse gases rise are in fact still so unsophisticated that they cannot even do an accurate job of predicting *past* climatic change, let alone change in the future. Load into them the data for 1900, and the weather they will predict for our present time bears little resemblance to what we are now experiencing. Given this rather awkward weakness in their software, the modelers have had to resort to a less troublesome forecasting technique. They run their programs forward in time, once using the data for today's mixture of atmospheric gases, and once with doubled levels of carbon dioxide. After the computer has done its job, they compare the two runs and describe what will happen when we double the carbon dioxide. The only trouble is that this description is of the simulated doubling of a modeled gas in a virtual atmosphere, all of which bears only the most hypothetical relationship to the future world, for which we of course have no empirical data whatsoever. The model's ability to predict the future is no more assured than its proven inability to predict the past.¹⁸ But because the phenomenon being predicted is so complex, because its consequences could be so catastrophic, and because we have no better way to investigate it, we have no choice but to rely on these flawed tools. In a very real sense, global warming is the ultimate example of a virtual crisis in virtual nature—which is far from saying that it is unreal. Instead, it is proof that the virtual and the natural can converge in surprising ways.

None of this is very reassuring for environmentalists and others who look to nature as the ultimate foundation for their moral vision. In the face of culturally constructed landscapes and increasingly virtual experiences of the world, many of us would not be at all unhappy if nature would reassert its own authority over all this human unreality. This may be one reason why environmentalists so often seem drawn to prophecies of ecological doom that

offer elaborate descriptions of the disasters that will soon occur because of our misdeeds against the earth. The genre is familiar enough to constitute yet another nature for our list. It is the nightmare inversion of Eden to which that eloquent U-Haul sign bore witness: *nature as demonic other, nature as avenging angel, nature as the return of the repressed*. It can range from something as trivial as those uncooperative snails in our Irvine garden, to natural disasters like earthquakes or floods, to the hypothetical horrors of global warming. At whatever scale we experience them, these things represent a nonhuman world that despite our best efforts we never quite succeed in fully controlling. Often we come close enough that we congratulate ourselves prematurely for our own triumph—and then are surprised when the long-silent fault or the hundred-year flood suddenly reveals our hubris. As one man wrote to *Time* magazine following the Northridge quake, "If Mother Nature has proved one thing, it is that she can be a real bitch."¹⁹

Even beyond the earthquake and the fires, California offered numerous examples of nature in apparent rebellion during our stay. Early in the year reports surfaced of a high school in nearby Westminster where 292 students had been infected with tuberculosis by a single classmate, twelve of them with drug-resistant forms that would respond slowly to treatment if they responded at all. A little later the newspapers announced that the first killer bees had finally made it to California, and offered dire predictions of what this would mean for people who would now have to worry about being stung by them.²⁰ More dramatically, in April a young woman jogging near her home in the Sierra Nevada foothills was stalked and pulled from the trail by a female mountain lion and then quickly mauled to death. The lioness was hunted down and shot, lest she kill again. The woman left behind two small children; the lion, a seven-week-old cub. It undoubtedly



“Entering Mountain Lion Country: A Risk.” (*County of Orange, EMA/Parks & Recreation*)

says something about people’s ideas of nature, perhaps even their ideas of human nature, that public appeals on behalf of these young orphans soon yielded \$9,000 for the two children...and \$21,000 for the cub.²¹

What is interesting about such events is not that they occur. After all, what could be more natural than a mountain lion killing its prey or a great fault relieving its pent-up strain? What is really intriguing is the meaning we assign to them, for we have an inveterate habit of turning them into moral fables. The snails in my Irvine garden become small gruesome symbols of the limits to human control. The earthquakes exemplify nature’s terrifying randomness—and also people’s hubris in pretending that rare, irregular events can safely be ignored simply because they cannot be predicted. The mountain lion can serve as a token of nature’s savagery—or as the innocent victim of human beings who in their efforts to live closer to nature unthinkingly invade the lion’s home. Every environmental disaster, all the way up to global

warming, stands as a potential indictment of the ignorant or culpable human actions that contributed to it.

The human inclination is to transform all such events into stories that carry a moral lesson. Nature as demonic other is Job’s whirlwind, the horror of random suffering that is all the more terrifying because it offers no discernible justification for the pain it inflicts on the innocent and the guilty alike. Nature as the avenging angel is the dark side of the Eden story, the punishment that follows in the wake of our having listened to Satan’s seductive advice. It is this story that makes us shake our heads so knowingly even as we sympathize with the families that lost their homes in the Laguna Canyon fire. *It’s too bad, we say, but they brought it on themselves by building there. What did they expect? After all, the fires are only natural.* We do this even though we ourselves have almost surely made similar bargains with nature, whether we live in the fault zone or the floodplain or the path of great storms. When we become victims, these things are never our fault, though it is easy enough for us to see how others have foolishly placed themselves in harm’s way.

People are drawn to nature as avenging angel for much the same reason that they are drawn to nature as Eden. It should by now be clear that the two are in fact opposite sides of the same moral coin. The one represents our vision of paradise: the good that is so utterly compelling that we feel no hesitation in claiming nature as our authority for embracing it. The other is our vision of hell: the place where those who transgress against nature will finally endure the pain and retribution they so justly deserve. There is a wonderfully attractive clarity in this way of thinking about nature, for it turns the non-human world into a moral universe whose parables and teachings are strikingly similar to those of a religion. We need such teachings, for they give meaning and value to our lives. To the extent that environmentalism serves as

a kind of secular religion for many people in the modern world, it is capable of doing great good if it can teach us the stories, as religions often try to do, that will help us to live better, more responsible lives.

And yet: we must never forget that these stories are *ours*, not nature’s. The natural world does not organize itself into parables. Only people do that, because this is our peculiarly human method for making the world make sense. And because people differ in their beliefs, because their visions of the true, the good, and the beautiful are not always the same, they inevitably differ as well in their understanding of what nature means and how it should be used—because nature is so often the place where we go searching for the fulfillment of our desires. This points to one final vision of nature that recurs everywhere in this book: *nature as contested terrain.*

Over and over again in these essays, we encounter the central paradox of this complex cultural construct. On the one hand, people in Western culture use the word “nature” to describe a universal reality, thereby implying that it is and must be common to all people. On the other hand, they also pour into that word all their most personal and culturally specific values: the essence of who they think they are, how and where they should live, what they believe to be good and beautiful, why people should act in certain ways. All these things are described as *natural*, even though everything we know about human history and culture flies in the face of that description. The result is a human world in which these many human visions of nature are always jostling against each other, each claiming to be universal and each soon making the unhappy discovery that even its nearest neighbors refuse to acknowledge that claim.

The history of environmentalism is fraught with this paradox. In his essay, Jeffrey Ellis explores the long-standing search by leading environ-

mental intellectuals for what he calls “the root cause,” which will trace all environmental problems back to a single source: overpopulation, capitalism, what have you. Their vehement disagreements have ironically stemmed from their shared wish to discover a universal explanation for what are almost surely multicausal phenomena. James Proctor analyzes recent debates about the future of old-growth forests in the Pacific Northwest and discovers adversaries whose different ethical systems lead them to very different visions of what the nature of the region should be. Giovanna Di Chiro describes the history of the environmental justice movement, detailing the many ways in which its struggles to achieve safer and healthier environments for women, workers, and people of color have been systematically ignored by most mainstream environmental organizations—precisely because these groups do not agree about what counts as a nature worth protecting. Richard White comes at the same problem from a very different angle by arguing that many twentieth-century Americans, including most who call themselves environmentalists, have forgotten what it means to know nature through work. As a result, they defend an ideal of nature that almost inevitably brings them into conflict with those who earn their living by working on the land.

In each of these instances, as in all the others I have discussed in this introduction, we see the many ways in which people disagree deeply about the meaning of nature. Perhaps the most important message of this book is that such disagreement is inevitable—one might even be tempted to say natural—given the universalizing tendencies that lie at the very core of this human construct called nature. The question “Whose nature?” again emerges as central. As soon as we project our values onto the world and begin to assert their primacy by calling them natural, we declare our unwillingness to consider alternative values that in all likelihood are no less

compelling for the people who hold them dear. Nature becomes our dogma, the wall we build around our own vision to protect it from competing views. And like all dogmas, it is the death of dialogue and self-criticism. This is its seductive power. This is the trap it has set for us.

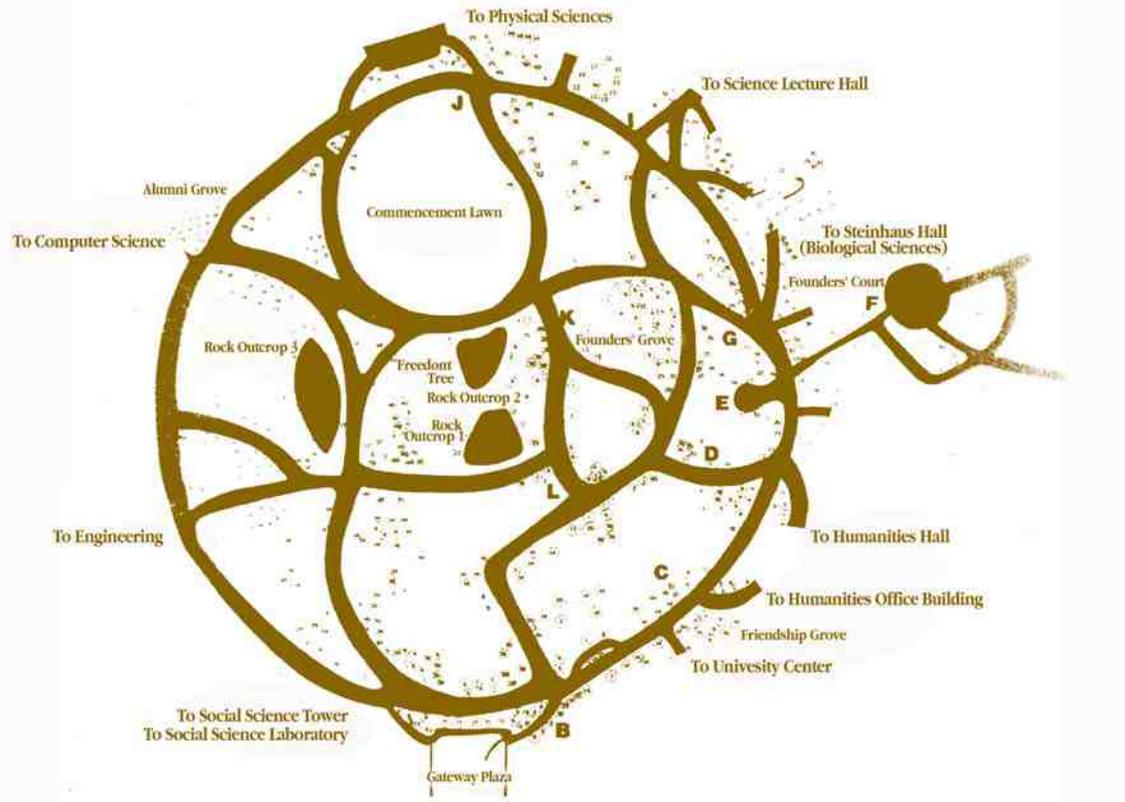
As we try to make sense of these many natures all claiming to be one, we would do well to stop hoping that any single one of them can ever finally triumph. Nature will *always* be contested terrain. We will never stop arguing about its meanings, because it is the very ground on which our debates must occur. This is *not* to say that all visions of nature are equally good, or that we can never persuade others that one of them is better, truer, fairer, more beautiful than another. It is simply to state that such persuasion will never occur if all we do is assert the naturalness of our own views. Tempting as it may be to play nature as a trump card in this way, it quickly becomes a self-defeating strategy: adversaries simply refuse to recognize each other’s trump and then go off to play by themselves. This can often feel quite satisfying, since it reinforces our dogma and makes it that much easier to berate our enemies and celebrate our own moral superiority. But it is surely not a very promising path for trying to understand our differences. Without such understanding, the prospect for solving environmental problems, to say nothing of working toward a juster world for all the peoples and creatures of the earth, would seem very grim indeed.

And where is nature in all this? Does the world consist of nothing more than people disagreeing with each other about the meanings of words and values? Surely not. As Robert Harrison eloquently argues in the final essay of this book, it is the radical *otherness* of nature with which we have constantly to contend. The fact that it lies forever beyond the borders of our linguistic universe—that it does not talk back to us in a language we can easily under-

stand—permits us to pretend that we know what it really is and to imagine we can capture its meaning with this very problematic word “nature.” And yet it is never so. Just when we think we have gotten our picture right, just when we think that Eden is once again ours, the alien other reasserts itself. The snails appear in the garden, the fires return to the chaparral, the ground quakes beneath our feet. The reality of nature is undeniable. The difficulty of capturing it with words—not even with the word “nature” itself—is in fact one of the most compelling proofs of its autonomy.

One last found object can perhaps speak for nature as a way of bringing this introduction to a close. The campus of the University of California at Irvine is built around a great circular green space called Aldrich Park. Like so many other features of Irvine, it is a carefully planned and constructed place. Its symbolic role on the campus is to offer a representation of nature—pastoral, parklike, Edenic—at the heart of the university. The planners’ self-conscious goal, as the university now describes it, was for the campus landscape “to be both educational and aesthetic,” so Aldrich Park has been planted as a kind of arboretum with dozens of different tree species representing natives from California as well as exotics from all over the world.²² If you like, you can pick up a map with every single tree marked and labeled to aid your botanizing. By examining where all these trees come from, and by thinking of the vast amount of human labor that has gone into rearranging this landscape, you will begin to understand just how artificial this natural green space really is.

The paths in the park have been carefully laid out to prevent people from traveling straight across it. They do so quite cleverly, inviting the walker in by means of a well-crafted optical illusion that makes it look as if they do go straight across; only after one is already committed to one’s route is one permitted to see that the lines that at first seemed



The park at the heart of the campus: an Irvine tree tour. (“UCI Tree Tour: A Natural History Walk in Aldrich Park,” University of California at Irvine, 1990)

straight are in fact curved and broken. This forces anyone who needs to get to the other side of campus to proceed via a series of curvilinear walkways that frustrate every attempt to get to one’s destination by the most efficient route. No doubt this is intended to remind visitors that mere efficiency is not the point of life. The planners who designed this landscape are encouraging us—nay, forcing us for our own good—to slow down, become more meditative, and enjoy a brief respite in nature’s greenery before getting back to work. I have to confess that I found these deceptive pathways rather irritating. Perhaps this irritation betokens my inability to shed my linear consciousness and appreciate nature in a more organic way, but I could not help seeing these paths as just one more example of the planners’ ubiquitous efforts to control and manipulate my experience of their world, forcing me to conform to their sense of the proper way to appreciate this natural area they had constructed

on my behalf. As a result, I usually ignored the designated walkways and tramped straight across the lawn.

Ironically, this obstinacy on my part meant that I did not get to the center of the park, where those curving paths were trying to lead me, until the very end of my time in Irvine. One morning, feeling frustrated by a problem I couldn’t seem to solve in my essay for this book, I headed out across the park with no particular destination in mind, wandering the paths more or less at random as I brooded about my question. Even this was probably not what the planners had intended, since I was so lost in thought that I did not much notice the landscape through which I was passing until I suddenly realized I had come to a place I had never been before.

At the center of Aldrich Park are two rock outcrops, helpfully designated on the campus map as “Rock Outcrop 1” and “Rock Outcrop 2.”

Strikingly set off from the rest of the lawn by their stony appearance and the exotic pines that are planted around them, they form a kind of sacred grove where the designers clearly intended us to linger. Some of the rocks have been arranged to form a circular sitting area, and a wind chime hangs from one of the trees. Make no mistake about it: like everything else in Irvine, this is a carefully designed simulacrum of the nature we are meant to appreciate here. As the university’s brochure explains, “Although the rock outcrops are natural features of the area, they were not always as prominent a part of the landscape. Initially they were partially buried, lichen-covered outcroppings. Additional area was exposed using fire hoses and high pressure jets of water to allow a larger area for planting succulents.”²³ African irises and various aloes have been the beneficiaries of this artifice.

But as I stopped before the outcrops and

realized that I had somehow never seen them before, it didn't matter to me that the succulents had been imported from afar and that, for all I knew, the rocks had been moved here by a bulldozer. The stone itself was strikingly beautiful, and it gave me the seat I needed to meditate on. So I sat down on Rock Outcrop 1 and stayed there for half an hour. The air was cool and the sky hazy, and as a bird called quietly from one of the pines, I found my mind moving back and forth between the thoughts in my own head and the landscape around me. Because the problem I was trying to solve had something to do with wildness, I ran my hand over the outcrop and meditated, as the planners no doubt intended I should do, about the meaning of the stone and my relationship to it. No epiphany occurred, and I certainly did not experience any mystical flash of enlightenment. Still, it was a beautiful moment in a lovely place, and I left with a much clearer sense of where I was going and what I wanted to say.

Rock Outcrop 1 could hardly be more cultural a construction. Exposed to view by powerful jets of water, planted with exotic species, cast in the form of a shrine, surrounded by a pastoral park, and embedded in a community whose every feature has been planned down to the smallest detail—what could be less natural? Furthermore, the meditative moment I experienced in the quiet of that glade was itself a culturally constructed act I had learned from a long line of romantic and pastoral poets: Henry David Thoreau and William Wordsworth had helped teach me what I was supposed to do and feel on that rock. After everything I have said here, I will not be so foolish as to assert that my feelings there were either natural or universal. My thoughts that morning were surely different from those of many other people I can imagine visiting the place. I'm sure, for instance, that the landscape architects who made it the centerpiece of their creation experience it very differently from me, no doubt

feeling a professional pride of authorship when they sit amid these trees and having a much more comprehensive sense of how the outcrop fits into their overall design for the campus: like so many other planners, they command the bird's-eye view. I suspect that the construction workers who labored to make this land seem natural feel a different kind of authorship in relation to it, especially since many of them probably do not regard this as the sort of place to which they themselves would make regular pilgrimages. The Mexican American gardeners who tend the aloes on these rocks surely have a far more physical relationship to this soil than I do, and probably have rather ambivalent feelings about privileged walkers like myself who can choose at any time we wish to enjoy a few moments of idle leisure amid their handiwork. Even the university people who regularly come here no doubt have very different ways of seeing it: I'm sure that members of the geology department, for instance, experience it in ways quite unlike the ways in which members of the English department experience it. It is easy enough to see that for students this secluded spot tends to serve as an evening rendezvous for lovers, whose admiration for the nature they find here is no doubt earthier than my own. What each of us finds here, in other words, is not One Universal Nature but the many different natures that our cultures and histories have taught us to look for and find.

And yet the rock remains, as do the trees and the birds, the wind and the sky. They are first and foremost themselves, despite the many meanings we discover in them. We may move them around and impose our designs upon them. We may do our best to make them bend to our wills. But in the end they remain inscrutable, artifacts of a world we did not make whose meaning for themselves we can never finally know. Acknowledging their autonomy and otherness does not spare us the task of trying to make human sense of

what they seem to tell us. It does not prevent us from making false assumptions about them, nor does it make any clearer what obligations we owe them. We will argue about such things forever, and the arguments will not vanish just because we appeal to nature to defend our case. But if we listen closely, we human beings can learn a great deal from the tales we tell of such a place. This silent rock, this nature about which we argue so much, is also among the most important things we have in common. That is why we care so much about it. It is, paradoxically, the uncommon ground we cannot help but share.

1. There was only one constraint on my freedom to identify would-be participants in the seminar: all but three had to be professors or graduate students in the University of California system. The purpose of the Humanities Research Institute (or HRI, as it is usually abbreviated) is to advance humanistic knowledge by building bridges between disciplines whose members may not ordinarily communicate with each other, and at the same time to link the campuses of the UC system by encouraging colleagues from different campuses to work together under the unusually intimate conditions of a residential seminar. Many universities have such institutes, but most do little more than provide financial support and office space where individual scholars can pursue their individual research projects in an individualistic way. HRI is unusual in bringing together scholars from radically different backgrounds to focus on common research questions over an extended period of time. It is an extraordinarily fertile and effective model, one that other universities would do well to emulate.

2. Clements would have described them not as "ecosystems" but as "superorganisms," a difference in vocabulary that is itself suggestive of the subsequent change in ecological thinking. See Ronald C. Tobey, *Saving the Prairies: The Life Cycle of the Founding School of American Plant Ecology, 1895-1955* (Berkeley: Univ. of California Press, 1981); Donald Worster, *Nature's Economy: A History of Ecological Ideas*, 2nd ed. (New York: Cambridge Univ. Press, 1994).

3. One small but crucial example of this labeling problem is contained in this very sentence: the word "nature" is always singular, suggesting that its referent is a unified holistic entity, whereas the *things* it describes are in fact plural, diverse, and perhaps not so holistic as they seem.

4. Raymond Williams, "Ideas of Nature," in Raymond Williams, *Problems in Materialism and Culture* (London: Verso, 1980), 67.

5. Urban Design Forum, "Rocky Mountain Arsenal: Refuge Design for the 21st Century"

(conference brochure dated November 15–16, 1991).

6. See Sonia Nazario, “Two Neighborhoods, Two Destinies,” *Los Angeles Times*, May 2, 1994, A14–15. The subtitles of Nazario’s article are highly suggestive for the point I am trying to make: “Where Life Was Hopeful, Determination Is Winning Out” and “Where There Was Struggle, Now There Are Death Throes.”

7. I borrow this striking observation from an anonymous article entitled “Disassembling California,” *New Yorker*, Jan. 31, 1994; given the subject and the style, its author is almost certainly John McPhee.

8. Mike Davis, “Building Homes amid a Landscape of Fire Ecology,” *Los Angeles Times*, Nov. 14, 1993, M1, M3.

9. *Oxford English Dictionary*. See also Williams, “Ideas of Nature”; Raymond Williams, *Keywords: A Vocabulary of Culture and Society* (New York: Oxford Univ. Press, 1976).

10. For a brilliant brief explication of these arguments, see Williams, “Ideas of Nature.”

11. Mike Davis noted Los Angeles’s paucity of public parks while leading our group on a day-long field trip through the city.

12. Reyner Banham, *Los Angeles: The Architecture of Four Ecologies* (New York: Penguin, 1971), 31.

13. “Welcome to Dove Canyon: A More Perfect World,” Advertising Supplement, *Los Angeles Times*, May 14, 1994, V3.

14. “Welcome to Rancho Santa Margarita,” Advertising Supplement, *Los Angeles Times*, April 9, 1994, FF1–FF2, FF10.

15. Rebecca Trounson and Mark I. Pinsky, “Gnatcatcher Taken off Threatened Species List,” *Los Angeles Times*, May 3, 1994, A1, A20.

16. Frank Messina, “Laguna Niguel Trees Felled, Tempers Rise,” *Los Angeles Times*, April 14, 1994, A1, A22.

17. From *The Californias*, a 144-page tourist brochure put out by the California Office of Tourism, quoted by Edward W. Soja, “Inside Expolis: Scenes from Orange County,” in Michael Sorkin, ed., *Variations on a Theme Park: The New American City and the End of Public Space* (New York: Hill and Wang, 1992), 94.

18. For an accessible, albeit polemical, critique of these computer modeling techniques, see Patrick J. Michaels, *Sound and Fury: The Science and Politics of Global Warming* (Washington, D.C.: Cato Institute, 1992).

19. Jeff Outcalt, letter to the editor, *Time*, Feb. 21, 1994, 7.

20. Tom Gorman, “Killer Bees’ About to Join Facts of Life in Southland,” *Los Angeles Times*, March 13, 1994, A1, A32.

21. “The Children? Or the Cub?” editorial, *New York Times*, May 29, 1994.

22. “UCI Tree Tour: A Natural History Walk in

Aldrich Park” (Irvine: Univ. of California at Irvine, 1990).

23. Ibid.

Questions and answers

Question: In many traditions, wilderness was the place where you escaped bondage, the bondage of the rat race, the system that you were caught up within. It was not that place where you could have a good time, but where you could get centered, come back from, and call for justice. That was the Jewish tradition, the Christian tradition, the vision quest in the wilderness.... The reason we want to protect wilderness now is because the system is taking over every place.

Cronon: What system?

Comment: The whole technological, commercial system is making every place a commodity. Every place is for development. That’s the system that we are, in a sense, in bondage to. We need places to go to escape that bondage. The wilderness experience will allow us to escape the bondage of the busy world....

Cronon: I don’t disagree with you, and I’m grateful that you’ve pointed out the prophetic tradition that wilderness is attached to. I agree with you that wilderness is to be protected, not just for biological reasons, for endangered species, but also to protect the moral experience that you just described—the retreat into the wilderness which is part of that mosaic tradition. Yet, there is a risk in what you just said that wilderness can become a golden calf, that it can become an idol. This is because, in fact, the experience of purchasing the wilderness, buying your equipment, going through the catalogs, buying your plane tickets, heading up into the north part of Alaska, having your two-week break from your 50-week work year, that’s also a commodified relationship. That’s just as much a part of the system that you’re critiquing. I don’t disagree at all with the

prophetic point you make. All I would say is that we need to be careful not to uniquely privilege the wilderness as recreational space, as we formally define it, as the only location or space where that kind of experience can occur. It’s possible, with the right moral stance, to go into one’s backyard and have a mystical experience of wandering in the desert, depending on the frame that’s inside one’s head as one does that.

Question: If you were to drop the word “nature” from the English language, and you wanted to capture “the whole” versus the human and nonhuman, what terms would you use?

Cronon: Actually, I’m not a person who believes in cleaning up the language. The ambiguities and paradoxes and complexity in the word “nature” are things that I cherish. To me, the very fact that the word is so unstable—that it can mean everything, and everything we are not—actually describes the human condition. It is true, and surely we all agree that we can never be outside of nature, we’re part of the All, everything we do affects everything. On the other hand, I hope I’ve persuaded you that we also have this odd linguistic cultural space in which we judge ourselves differently than we judge anything else. And, because we think of ourselves in that way, because we imagine ourselves to be exercising a kind of moral agency and hold ourselves accountable because of that, we also are kind of outside of nature. We blame ourselves for things we do in nature in ways we don’t blame anything else.

The word “nature” is good at capturing the paradox of what it means to be human. I am not a believer in getting rid of the word “wilderness” and talking in terms of “bioreserves.” They’re much cleaner. You can count up the species. You can work out the coefficients of the level of biodiversity. I’m not a fan. I served on the board of the Connecticut Nature Conservancy for a

number of years in the 1980s, and was very troubled by the effort to get rid of Nature Conservancy properties that were not sufficiently biodiverse, despite the thousands of hours of labor and the love that had gone into setting aside those lands that people thought celebrated something they cared about in their local place. I like ambiguity. I like complicated language. I believe in serving wilderness. I'm not asking you to stop using the word "wilderness." Rather, I'm asking you to use it with a rich, complicated understanding of just how difficult the word is, and all the things that are attached to it. (Sorry for the speech. I don't like new words very much....)

Question: Would you comment on E. O. Wilson's book, *Consilience*, and the worry that a postmodern deconstructionist view is inclined to give all opinions equal standing, to adopt a kind of relativist view in which anything goes, in which there is no common ground on which to stand and defend anything?

Cronon: Oddly, the book *Uncommon Ground* that I edited, and my essay in particular, have often been critiqued as postmodern deconstructionist. Deconstructionist is not a word that I would ever attach to myself. What I am is a historicist, not a deconstructionist, and what it means to be a historicist is to say that everything has to be situated in time, and, for that matter, in place. You have to recognize the particularities of lived human reality. I celebrate science, and I am a great fan of all that we have learned from the great struggle. The self criticism that I have been describing here is what science ultimately is all about. Science takes nothing at face value. Oddly, postmodernism and science share a radically critical view of knowledge, a view in which everything has to be proven, everything has to be figured out along the way.

My anxiety about Wilson with regard to *Consilience* is that the consilience

that he advocates runs the risk of being unitary and hegemonic in its ultimate imposition of one view that brings together all the disparate views that are part of reality and makes them fit one unitary picture in which all the pieces fit together. That is, in fact, the Enlightenment view—that's the dream of the 18th century. The pursuit of that dream has brought us wonders both technological and scientific. But as a vehicle for understanding humanity, it runs some great risks. These risks go back to the point I offered in the middle of my thesis, which is, because we inhabit different places—we have different wealth, we have different gendered identities, we have different racial backgrounds, all those things, no unitary view can ever capture the rich complexity of the human experience. The only way we do justice to human history is to recognize just how polyglot that history is, just how complicated that history is. To say that is not to give up the vision of a unified view, if unified in this case means, not that everybody is the same, but rather that we're part of a common shared past. To understand that common shared past, we have to be willing to live with real complexity, real contradiction.

The paradox of doing history, which means one of the wonders of doing history, is that you can have radically opposed points of view which could not be more contradictory to one another, and they're both correct views of a portion of the past. The South's defense of slavery in the 19th century, as abhorrent as I hope it was to all of us, is that it nonetheless expressed certain truths about a set of human ways of thinking about the world. If we don't seek to understand where that point of view came from, what it was like to be a believer in slavery in the 19th century, we will never understand how slavery worked, what it meant to be a slave-owner, how one could justify an abhorrent system in which human beings owned other human beings. We can say

that it's a self-contradictory system, or that it's morally abhorrent, that we should just ignore it, but we won't understand it if we do that.

The most extreme example of this is Auschwitz, and the great tension for a historian is that we have to do two things when we stand in the face of the death camps in Nazi Germany. On the one hand, we have to resist everything that they stand for. We have to declare them abhorrent to any vision of humanity that I would ever be willing to celebrate. On the other hand, we have to ask, "Where did they come from? How on earth did people bring themselves to build factories that were designed to consume other human lives as their most important raw material?" It takes a very complicated act of historical will to, in effect, briefly hold in abeyance one's impulse to just reject out of hand the architects of Auschwitz, and say, "What frame of mind could have produced that thing?" My own belief is that we come to that understanding by living with contradiction. And one of my main worries about E. O. Wilson is that I think he's uneasy with that kind of contradiction. I don't think we can get to the complicated humanist truth I'm talking about here without being willing to really jostle hard against competing viewpoints.

Question: I need to admit that I'm a recovering biocentrist. And I've come to believe in humanism to a large extent. But, as a biologist, I love all the critters that are out there. That brings me to a strange point. When we consider humans in the landscape and sustainable livelihood, we need to accept a lot of alteration of landscape. And, given that in the United States, if we allow that to continue, the loss of a lot of species....

Cronon: I could not agree more with that. It seems to me that environmentalism has two projects that are equally important, and we must never let one trump the other. One is the sustainability problem—how do we build a

sustainable human society? The danger in sustainability, left on its own, is that it's too utilitarian in its premises. Thus, nature exists for our use, to exploit for our own benefit. As long as we do that exploiting so that nature can go on forever, it's OK. The other part of environmentalism is the project, at the core of our moral being, of deeply honoring the other that is not human, and recognizing the absolute right to exist, and the wonder of that autonomous realm out there that we did not create, and that our very presence threatens if we're not extraordinarily careful. One problem is keeping both these poles alive. The biologists, the biocentrists that you described at the beginning, are better at recognizing the second of these two projects, perhaps, than the first. The engineers, the people who are trying to design sustainable systems, are often better at the first than the second. We need them both.

The distinction that I make that very few people notice is the distinction between wilderness and wildness. For me a source of solace, in the same contradiction that worries you, is that wildness strikes me as being everywhere, all around us. If we do not work hard to keep that which is wild immediately next door to us always conscious to us, protecting it and sustaining it, we can't save the Big Wilderness either. The classic example of wildness is migratory birds. Central Park is a crucial part of the flyway of the eastern seaboard of North America. If we can't save the wetlands that surround Manhattan Island—and it's hard to imagine a more corrupted landscape from a biocentric view of the planet—then the Canadian Arctic will not have the species in it that are crucial to any vision of what the Big Wilderness should be. In that sense, the Wildlands Project's work on protecting migratory corridors is very important. But it still articulates the separation between people and nature, whereas my goal would be that the people who wander through Central

Park every day, enjoying their strolls, remember that they're witnessing a part of Canada while they're there. And I don't think they typically do this. I don't think they recognize that, while they're looking at Frederick Olmsted's 19th-century incarnation of what an organic romantic nature was supposed to look like, they are part of a landscape linked to landscapes thousands of miles south in the Tropics and thousands of miles north in the North Country.

I think, if we can be successful in drawing those pieces together and showing their interconnections, the contradiction that worries you becomes less of a problem. The automobile that you came here in, the lights that you are seeing me with, the electricity that's producing the sound waves that you're hearing me with are all threatening to consume the Arctic Wildlife Refuge. If you want to save the Arctic Wildlife Refuge, this is the problem—right here. It's not separate from right here. We can set it aside. And I hope that we will set it aside. I hope that we will save it. But we won't be able to do so by living these lives. We've got to connect them.

Comment: It's the salmon here, not the Arctic.

Cronon: Yes. It is salmon.

Question: A lot of history comments on the possibilities, the universalizing claims, but notes that many historical claims, particularly about wilderness, are very local to western European and American history. What does that imply about the messiness of global environmental politics as we move into 21st century, where many of the conflicts we face cross cultural boundaries but do not share the traditions just described?

Cronon: That's a great question, and yet I have to say that the question answers itself. What I mean by that is, just as I said, that we will not save the Arctic Wildlife Refuge if we are not attentive to the ways in which our

consumption of petrochemicals is implicated in any land we save in that way. In the same way, we're not going to save the Brazilian rain-forest. We're not going to save tropical areas threatened with exploitation if we don't recognize that those places are embedded in cultural systems that are not completely congruent with the cultural systems with which we frame our questions. It's very clear that, if American and European environmentalists descend on the Tropics and bring notions of wilderness from Europe and America, notions that have no place for the people to inhabit the wilderness, then that one goes nowhere.

That's not news to anyone who's worried about development issues, or about the ways in which we're to preserve the elephants, and the relationship of the elephants to poachers, and whether poachers or hunters are a good or a bad thing relative to the project of saving elephants. Those are really complicated questions. But we will never answer these questions without grappling with the cultural underpinnings that go with them. Global environmental issues will not be solved if we start from a unitary consilience point of view in which a single vision of science offers the good, the true, and the beautiful. We've got to be prepared to sit down at tables and hear people with radically different points of view talk about what they do and do not love in their local landscape, what they do and do not love in their lives and want to change, and then begin the difficult negotiating process of trying to figure things out. We need to say, "You need those things, your vision of the future looks like this, but we also need to protect the forests that surround you, or the ecosystems that are crucial. We need, not just our vision of what we want to protect on the Earth, but also your vision of the future of your nation, or the local place that you inhabit...."

I don't have a magic solution here. The magic, if there is any, comes from con-

versation. And from small democratic negotiation, rather from imposed structures that may temporarily seem to solve problems by using usually massive state power as the vehicle for imposing particular kinds of behaviors on human beings. In the long run, very little in human history suggests that that kind of imposed solution is sustainable.

Question: I was looking at a magazine rack the other day, and saw the new Sierra Club magazine with “3 million acres of wilderness discovered in Utah” on the cover. And I’m thinking how there must be thousands of people seeing this. How does that formulation of wilderness help, hurt, hinder the arguments about humanist environmentalism that you are offering here?

Cronon: To me it seems completely consistent with everything I’ve said in the sense that they didn’t say 3 million acres of wilderness constructed in Utah. One could say that. The point is not to say that what’s wild about those places was constructed, but rather that the decision to draw boundaries around it, and to fight over it, and to have political arguments about how it should be protected, if at all, is a deeply human historical project. This decision is what the process of creating wilderness is all about. To the extent that wilderness is a legal definition, a construct in this culture that is backed up by a 1964 law and its subsequent amendments, that law, in fact, “discovers” wilderness in locations where our political process generates that definition. That’s not to say that there wasn’t anything there to begin with.

To me, the most striking example of this is not the 1964 Wilderness Act, but its successor in the early 1970s, the Eastern Wilderness Act, which takes vast acreages of cutover land, land that had been logged 2–3 times, and converts them into wilderness. This law designates lands that are, in effect, second-growth, third-growth forests, and, by drawing boundaries around them, begins a process of wilderness restora-

tion. These lands surely do not merit that very peculiar word, “untrammelled,” that appears in the 1964 act. But, in another way, that act of setting aside attractive land and calling it wilderness, nurturing it to the state that we recognize as wilderness, fits what I’m describing perfectly. If you believe with me that no place is ever outside of time, that no place is ever static, that all places now are connected to human history as well as to natural history, then saying that you can take areas that clearly were not “untrammelled” and designate them as wilderness, and treat them in a way that makes them seem wilder and wilder over time, starting in the early 1970s, is completely consistent with what I’ve said here. I would be troubled if the consequences of doing that would still be to reapply this deep dualism between that which is us and that which is not, which to me is the moral problem that’s woven into it. I’ve got no problem with discovering wilderness in the way you just described.

Question: I’m from Japan, and the dualism between that which is wilderness and that which is not is less present in Japanese culture, and probably other Asian cultures as well, than here. Given that this dualism seems to be peculiarly American in its articulation of wilderness, it seems that the Japanese are not much better, or even worse, at managing their land than the Americans are. What does one do with that?

Cronon: I agree. It’s not that wilderness is uniquely American, although wilderness has a very interesting place in American culture, one not shared even by Canada. There are analogs for the way we think about wilderness in most of the countries of the British Empire, interestingly enough—not so much South Africa, but certainly Australia, New Zealand, Canada in a different way. The Far North is very different from the West in Canadian culture, compared to US culture. It’s worth thinking about that. I hope you didn’t hear me say that the dualism is

all bad. One of the great legacies of the sublime and of wilderness in American culture is that, however historically constructed that notion of wilderness might be, it has served as a very interesting baseline culturally, in the way the science of ecology has evolved, in the way conservation has evolved as political movements, which led to all sorts of interesting consequences. The fact that Americans have chosen to stand in wilderness as the location for critiquing the environmental irresponsibility of certain places that they inhabit has not been without all sorts of useful and valuable political benefits for the way the culture operates.

My guess is that Japan has a complicated relationship to conservation. For example, Japan’s relationship to its forests is a very different one than China’s. And there’s a complicated class history behind Japanese forests, which is different from the history of forests in Germany or the history of forests in the United States. One needs to understand that context to understand why the Japanese have a different relationship to their land than do people in the United States. I would return to my starting premise that, if people in any culture are to make progress in thinking about what a sustainable relationship to their land might be, then they have to do it by grappling with their own history and the relationship of that history to other histories as well. I do think there are cultural resources in Japan, just as there are here, that are immensely valuable and important in thinking about what a sustainable human future on the land might be.

Question: It seems to me that this civilization is sustained by and based on engineering and scientific content, on things that are invariably true (e.g., $2 + 2 = 4$). And, in fact, in engineering and science, the whole construct is to keep emotion out. Your construct of wilderness, as I understand it, is entirely emotional. And, if this is true, if wilderness is really an emotional con-

struct, and if our entire civilization is based on a construct that rejects emotion, then how are we ever going to bring the two together?

Cronon: My trouble is that I have to resist all the premises in the question. Although I don't disagree with you that science in particular has aspired to a vision of reality that is always and everywhere true, science in a Newtonian rather than quantum physical world, I think it is true that science in the Enlightenment vision, in the Francis Bacon vision, has been a project that sought to have consilience claims in which no matter where you stand, the claims you make about reality are going to be consistent. That's the universalizing impulse that's woven into science. I don't think that that's a terribly accurate depiction of the way that scientists relate to their own work. I think there is a huge amount of emotional, human energy that underpins the extraordinary project of trying to understand the world in the way that science has sought to do. And, as someone who celebrates that project, and has learned an

immense amount about the world from what scientists do, I would never want to say that was a "bad" thing to do. But I don't think it's an unemotional thing to do.

I think that the emotional lives of scientists are interwoven with their rational lives, as are the emotional and rational lives of foresters, of Earth First! defenders of wilderness. We are whole human beings, and we may pretend, when writing a scientific monograph, that there's not a shred of emotion present in our work. But you cannot read, for example, James Watson's *Double Helix*, and not see that there's an extraordinary amount of ego, and emotion, and ambition, and a vision of progress underpinned by the values that we celebrate in any scientific endeavor. Science and engineering have deeply embraced this thing called "progress." There's nothing rational about progress as a source of faith in an improved vision of the human future. To say that is not to critique progress. That's not what I'm saying here. What I'm saying is that progress is not value-neutral.

The way we define progress is deeply interwoven with what we think the good, the true, and the beautiful may be. No engineer in particular can do her work without a vision of the good, the true, and the beautiful. This vision is defining the direction toward which you are pointing the scientific insights that you're putting to an applied purpose, toward some end, which was chosen for you, not by science, but by your values. So, what you heard me defend here was not emotion, but values. And values are not defined by the universe. I would say that values are intrinsically human, that they are not natural. Values happen when we project consciousness forward toward some end, and create an object of desire in the future that becomes a source of direction for our lives. Scientists are as tied to that as any other human being. So I would claim.