Intensive Forest Management And Environmental Issues

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Abstract: There is much confusion about environmental consequences of intensive forest management. Even its advocates are apologetic and admit adverse effects of intensive management on long-term sustainability and biodiversity. They need not be: on the global scale, intensive management is the most powerful and practical way to preserve the environment. It is true that preserving biodiversity at a given point is incompatible with the cutting of trees and the destruction of other organisms to satisfy growing human needs and wants. Neither integrated holistic science, nor knowledge of complex interactions and linkages, monitorings and surveys can make the impossible possible. Contradictory goals cannot be satisfied at the same time and at the same place, but they can at different places. Spatial separation of biodiversity management from productive forestry removes the contradiction and resolves the issue of where to maintain biodiversity: on all the land except that needed to satisfy human needs for wood products. This solution–zoning, reverses the conflict and makes intensive management for wood products a prerequisite for the existence of undisturbed forests. By controlling weeds and other competitors in productive monocultures, we are saving biodiversity elsewhere. The more wood products that we can extract, on a sustainable basis, from a part of the land, the more land–over 96% the world's forest area–can be devoted to biodiversity preservation. Also, we should not worry about the state of the land allotted to intensive forest management. The fact that this land is capable of sustainable, actually increasing, productivity is the best testimony that the intricate functioning of complex ecosystem processes is in perfect shape. It is hard to imagine that a decaying forest with impaired functioning would put forth much growth. The best indicator of ecosystem health is the easily measurable growth of trees, which naturally integrates all known and still unknown ecosystem functions and processes. Contrary to a common opinion, species diversity is not related to ecosystem stability. Tropical forests are a good example. The two best known facts about tropical ecosystems are that they incredibly rich in number of species and that they are fragile. It is curious that we are told about vulnerability of tropical forests by the same people who profess the belief that diversity increases stability. The stability of northern forests with their low species diversity also puts in doubt the traditional association of diversity and stability. To conclude, intensive forest management is safe on the local scale and indispensable for environmental preservation on the global scale.

Keywords: biodiversity, competition, ecosystem functioning, ecosystem stability preservation, zoning.

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GLOBAL VIEW:

INTENSIVE MANAGEMENT AS THE WAY TO PRESERVE THE ENVIRONMENT

Two goals

Unlike anthropocentric forestry of the past, at present forest management pursues two goals at once: (1) preserving the environment, and (2) meeting current and future needs of an increasing human population in wood products. All the diversity of forest management is made of various combinations of these two goals.

To indicate a wider scope of the contemporary attitude to management and the break with the exploitative past, forest management dissolves in or yields its place to ecosystem management (synonyms: environmental, nature-oriented, and biodiversity management). The U.S. Forest Service defines ecosystem management as "the use of an ecological approach that blends social, physical, economic, and biological needs and values to assure productive, healthy ecosystems" (Kaufman et al. 1994, p.16). Sensing the unresolvable conflict between economics and preservation, Thomas (2000, p.13), then Chief of the Forest Service, stumped it out by asserting that human needs are something dispensable: "it should be crystal clear that retaining biodiversity is the overriding mission of national forest management" (To make our life possible, Chief Thomas (1993) also said, "I promise you that I can justify anything you want to do by saying it is ecosystem management").

The preserving side of ecosystem management means keeping biodiversity intact. Biodiversity is not just the number of species or even organisms. Edward Wilson (1994, p. 359) who introduced this term defines biodiversity as "the totality of hereditary variation in life forms, across all levels of biological organization, from genes and chromosomes within individual species to the array of species themselves and finally, at the highest level, the living communities of ecosystems such as forests and lakes." Because each organism is unique, to maintain "the totality of hereditary variation" we must preserve each and every individual. If any of them die, it diminishes biodiversity and, as a result, hurts each of us. "Every scrap of biological diversity is priceless, to be learned and cherished, and never to be surrendered without a struggle" (Wilson 1992, p.32).

The second goal is extraction of timber for human consumption. However gentle it could be, tree harvesting unavoidably degrades intricate functioning of complex ecosystem processes. Cutting trees simply kills them and many organisms they support. It appears that the two goals are contradictory: it is not possible to both preserve biodiversity and destroy organisms to satisfy growing human needs and wants. Neither integrated holistic science, nor knowledge of complex interactions and linkages, monitorings and surveys can make the impossible possible. Much confusion around ecosystem management results from ignoring the contradiction between its goals.

Solution: spatial separation

Contradictory goals cannot be satisfied at the same time and at the same place, but they can at different places. Spatial separation of biodiversity management from productive forestry removes the contradiction and resolves the issue of where to maintain biodiversity: on all the land except that needed to satisfy human needs for wood products. This solution–zoning, reverses the conflict and makes intensive management for wood products a prerequisite for the existence of undisturbed forests. The more wood products can we extract, on a sustainable basis, from a part of the land, the more land can be devoted to preservation and maintenance of biodiversity. It is estimated that plantation management on less than 10% of the world's forest area (which includes internal set-asides such as riparian buffer zones) could provide a supply adequate to meet major timber and fiber needs (Sedjo and Botkin1997). If we manage to double wood production per unit area, that area can be halved to less than 5% of the total forest area. By reducing the biodiversity of weeds and other competitors in productive monocultures, we are saving biodiversity elsewhere. On the global scale, intensive management is the most powerful and practical way to preserve the environment.

Biodiversity and environmental destruction

Uncritical devotion to biodiversity and the insistence on preservation anywhere can be environmentally destructive. If the judge who stopped tree harvesting in the Pacific Northwest looked deeper, he should prohibit house construction and printing newspapers. What happens after we succeed in preventing harvesting of the spotted owl habitats? Until we reduce our consumption, other places must be degraded to satisfy the increasing demand for paper and timber. Some of these places, such as tropical forests, are known to be more fragile than the Pacific Northwest forests. The damage is amplified by the fact that tropical timber is scattered; according to the Food and Agriculture Organization of the United Nations, they produce only between 5 and 35 cubic meters per hectare of merchantable wood (Dekker-Robertson 1997). It requires ransacking 10 or more hectares to get the amount of wood produced by one hectare in the US. Bulldozing a road in tropical forests to transport timber causes much disturbance because of highly erodible soils and heavy rains. These roads are often used by squatters who colonize the area and clear the remaining forest for agriculture.

LOCAL VIEW: SHOULD INTENSIVELY MANAGED STAND BE BIODIVERSE?

Without our help, the seedlings we plant will be wiped out by weeds. We do not grow trees, they grow themselves. Our duty is to protect them from various adversities, first of all from competitors. Yet, this requisite activity has recently become suspect because, as a component of biodiversity, weeds are supposed to be good. As Aldo Leopold (1966, p.176-177) put it: "Harmony with land is like harmony with a friend; you cannot cherish his right hand and chop off the left. ... If the land mechanism as a whole is good, then every part is good, whether we understand it or not."

Among the many benefits ascribed to biodiversity is higher productivity of forests composed of many species and age classes. It is also claimed that biodiversity enhances beauty of forests and makes their dynamics more stable. In addition, there are ethical reasons to maintain biodiversity and reject the exploitive anthropocentrism. Since we all are interested in higher productivity, beauty, and stability of forests, these claims have huge implications for forest management. If biodiversity is so good, it is silly to spray weeds and plant monocultures. Yet, biodiversity prescriptions are so much at variance with our experience that we need to assess their validity before embracing this new paradigm shift of massive proportions.

Species diversity and productivity

There are two opposite answers to the question whether species diversity increases productivity: theoretical and empirical. It seems reasonable to expect higher productivity in forests composed of many trees species. Genetic diversity secures fuller utilization of resources in various niches of a given ecosystem. Diverse stands containing both tolerant and intolerant species of different ages are likely to be denser than simple monocultures of less tolerant species, common in commercial plantations.

It was demonstrated experimentally that in the communities of herbaceous plants biomass production increases with species diversity (Tilman et al. 2001). These authors state resolutely that "even the best-chosen monocultures cannot achieve greater productivity or carbon stores than higher-diversity sites" (p.843). Ruijven and Berendse (2005) expose processes supporting this conclusion. In addition to the higher input of nitrogen by nitrogen-fixing legumes, increased nutrient use efficiency and complementary nutrient uptake in space and time are important underlying mechanisms leading to high productivity at high species diversity. It remains puzzling why farmers throughout the world are so persistent in growing monocultures.

However sensible the theory associating diversity and productivity appears to be, it conflicts with forestry experience. Artificial monocultures of trees are by far more productive than natural biodiverse forests. Otherwise, foresters would not spend much of their efforts to reduce the diversity to a single species. The relationship advocated by Tilman et al. (2001) has a more narrow scope and limited applicability than they claim. It does not account for diversity of growth strategies. Specifically, it ignores the difference in the allocation of photosynthates between growth and other activities such as reproduction, a large variability of growth potential of among species, and the two-sided effect of density on growth.

Dominant tree species differ from other plants in much greater allocation of resources to growth as opposed to adjustment to deficiency of light. Some tree species (usually one per forest type) are known for their outstanding ability to accumulate prodigious amounts of dead wood in the structure (stem and branches) that supports foliage. Examples are Douglass-fir (*Pseudotsuga menziesii* (Mirb.) Franco) in humid areas of the US northwestern states, loblolly pine in the southeastern states, Monterey pine (*Pinus radiata* D.Don) in New Zealand, Scotch pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies* (L.) Karst.) in Europe, and eucalyptuses (*Eucalyptus* spp) in warm climates of the world. A magnificent pure 45-m tall Douglass-fir stand in southern France that I visited in 1996 was about three times taller and many times more productive than the adjacent forest composed of many indigenous species (to avoid the embarrassing contrast, French nature-oriented foresters decided to clear-cut that still young stand of a foreign species).

Stand productivity is a telling summary of all processes going on in the woods. Some ecologists play down this unifying characteristic and instead focus on ecosystem structure and functioning, which includes innumerable and poorly known biochemical and ecophysiological processes with all their interactions. The very number of these functions and processes makes it certain that we will never learn all of them. Fortunately, this is not necessary because high sustained yield means efficient sustained functioning of all of the involved processes. It is hard to imagine that a diseased and decaying forest with impaired functioning would put forth much growth. The best indicator of the nebulous ecosystem structure and functioning is easily measurable growth of trees, which naturally integrates all ecosystem functions and processes including those still unknown to us. And, according to this indicator, as ecosystems monocultures with their superior productivity function well, better than undisturbed stands.

The problem of species composition has a simple solution. The presented arguments suggest that, after centuries of attempts to prove superiority of mixed and uneven-aged forests, it is time to acknowledge that in forestry, just as in agriculture, monocultures are more productive, practical, and profitable than complex stands.

Diversity and stability of forests

Although there is little evidence that forest plantations suffer from instability more than natural forests full of diseased and dying trees, it is instructive to summarize the wandering of ecological opinion on this matter. From the origin of their discipline, ecologists ascribed everything good to pristine environments and believed that diversity (number of species) enhanced ecosystem stability as it does their productivity. It was assumed that simple communities were more often subject to destructive oscillations in populations, and more vulnerable to invasions (Odum 1953, MacArthur 1955, Elton 1958). Later this view was challenged, particularly by May (1973) who proved mathematically that diversity tends to destabilize community dynamics. "Despite such repudiations, however, the diversity-stability theory has been, by far, the most basic and the most persuasive of the utilitarian arguments for environmental protection, perhaps because it is something that people like and want to believe ... Merely on the grounds of its repetition over several decades, by the late 1960's the diversity-stability hypothesis achieved the status of a proposed truth" (Shrader-Frechette and McCoy 1993, p. 4).

The following simple thought experiment may help to get a feeling for the uncertainty inherent in the diversity-stability relationship. When only one species exists on a given site, no disturbance from biological factors is expected; the minimum diversity guarantees a perfect stability. Adding the second, competing species would introduce instability until, according to the principle of competitive exclusion, one species survives. It does not promote stability if the second species is a pest such as the bark beetle. Clearly, the increase in diversity from one to two species does not contribute to stability. The third species may, especially if it eliminates the second. For example, the introduction of a parasitic wasp to control the beetle population at its highest and most destructive densities would make the system more stable. Thus, unlike the second species, the third one might confer a measure of stability. If the fourth species would torment and neutralize the wasp, then its influence would again be destabilizing. In diverse habitats, several species may reach an equilibrium if conditions remain stable, which is rarely the case. When the quickly multiplying interactions among species and variable environment are considered, it is easy to understand that, in general, the relationship between diversity and stability is likely to be indeterminate and chancy.

Observations of diversity and stability confined to a given site in a given year vary much and are not very convincing. More trustworthy is evidence pertaining to large regions such as the tropics. The two best known facts about tropical ecosystems are that they are incredibly rich in number of species and that they are fragile. If we want to hold biodiversity as an unmixed blessing, it is better not to put these two facts together. Interestingly, we are told about vulnerability of tropical forests by the same people who profess the belief that diversity increases stability. The stability of northern forests with their low species diversity also puts in doubt the traditional association of diversity and stability. Neither of these characteristics has invariable connection with productivity. Harper (1977, p.19) reports a case when the mixture of "two species moves towards dominance by the species that produces the smaller standing crop!"

Diverse forest stands are considered to be less susceptible to disturbance from wind, fire, fungi, and insects than simple stands. It is interesting that the same stability results from reduction of density: in dense stands trees suffer from elements and diseases much more than sturdier trees from more open stands. The mortality of trees in managed forest plantations of one species, where density is controlled by thinning, is negligible. It may be that susceptibility to disturbance is caused by high stand density, which is known to weaken trees, rather than the lack of diversity.

Mathematics clarifies the continuing uncertainty of the discussed relationship: diversity is not connected with stability: "In the most familiar models of population dynamics, diversity translates into how many nonzero terms there are in a certain matrix. But stability is a matter of the matrix invariants (i.e., the eigenvalues and eigenvectors of that matrix), and hence a matrix with lots of zeros (low diversity) can be far more stable than an apparently much more diverse (complex) one; diversity is an artifact of choice of coordinates, while stability is independent of coordinates" (Rosen 1999, p.43).

Are forest plantations sustainable?

There is fear that in the long run intensive wood extraction from plantations would exhaust the soil, and stands would lose their productivity. This fear is more justified for agriculture, which, with its annual harvests, is much more intensive than forestry. Yet, after millennia of exploitation our fields yield more than ever. Wood consists mostly of carbon compounds, and their supplies in the form of atmospheric carbon dioxide are inexhaustible and growing. Other elements of the wood are replenished naturally by atmospheric deposits or by fertilization.

In his review of long-term productivity, Evans (1999) showed that plantations do not lose productivity over successive rotations. Actually, silvicultural and genetic improvements actually result in substantial and long term gains. During the last decades, the annual yield increase on intensively managed plantations has been around 3%, higher than for most agricultural crops (Binkley et al. 2005).

Diversity and aesthetics

Beauty is a subjective criterion; it is in the eyes of the beholder. For some, uniform well-spaced pure stands of stately pines or oaks are more attractive than the clutter of a diverse stand. There are reasons to believe that such a choice is not uncommon. Actions speak louder than words about people's environmental preferences. By far the most common kind of environmental management is maintenance of lawns by private homeowners. It consists in the eradication of the natural diversity of freely grown vegetation (so-called weeds). Apparently, people consider the monocultures of grass, mutilated by close cut, as an epitome of environmental beauty. This fact does not deny that richness of species may, too, be attractive. The point is that our aesthetic preferences are more diverse than the advocates of biodiversity suppose.

Images that are stronger than facts

The grave mistake of scientists is to believe that facts and logic speak for themselves. The facts cited above are well-known; yet, the belief in the goodness of undisturbed nature is as strong as ever. Two images are famous for propagating this belief. One is: "To keep every cog and wheel is the first precaution of intelligent tinkering." (Leopold 1966, p.177). The second is the analogy between species and airplane rivets:

> Suppose you saw a group of people prying rivets out of the wing of an airplane you were about to board. Imagine, also, that you didn't know the exact details of the airplane's construction, but were aware that the loss of some rivets wouldn't necessarily cause the wing to fail. Would this make you relaxed about the prospect of flying in that airplane? ... Needless to say, the treatment of that imaginary wing bears considerable resemblance to the present treatment of the life-support systems of Spaceship Earth ... except that we have no option as to whether or not we'll fly on her! ... the vast majority of Homo sapiens goes merrily on its way ... popping off rivets without the vaguest notion of the probable consequences of such behavior. But we can, at least, be sure that those consequences will not be pleasant. (Ehrlich, A. and P. 1979).

The problem with both images is that actually reduction of biodiversity is imperative for our existence. When the plane falls, it is destroyed together with its passengers. When some cogs and wheels are missing, the engine is as dead. But what happens when we remove not just a few but all the rivets of native plants, together with the animals depending on them, and replace them by a single introduced species? To Leopold and the Ehrlichs, it would be a complete disaster obliterating the intricate web of complex interactions with all their life-support functions. Actually, we will get fields of wheat or rice that truly support life of millions of humans, including the creators of deceptive images.

Interconnectedness of life

What is referred to as "ecological laws" usually means that everything is connected with everything else. This is why all of biodiversity is indispensable; it is indivisible like a living organism. There are many stories about the unpredictable and often calamitous consequences of the removal or introduction of a species. The most influential of these stories, told by Darwin, is about humble bees, which, he believed, was the only species in England capable of pollinating red clover. The number of bees depends on the number of field mice, which destroy bee's combs and nests. In its turn, the abundance of mice is controlled by cats. This story illustrates so neatly the interconnectedness in nature that merited a rare, in Darwin's writings, exclamation point: "Hence it is quite credible that the presence of a feline animal in large number in a district might determine, through the intervention first of mice and then of bees, the frequency of certain flowers in that district!" (Darwin 1859, p.74).

Extending this reasoning, it was suggested that some ecological knowledge would make the life of English women happier (Egerton 1973). A large proportion of cats belonged to spinsters who kept them for company; the women remained unmarried because eligible men served in the navy where they ate dried beef that came from cattle, which grazed in the clover fields pollinated by humble bees. By keeping their cats confined, the women could bring the men home and the British Empire down long before it did, because as the mice increased, the number of bees, clover, cattle, and sailors would all dwindle.

If indeed everything was interconnected, the loss of a species would destroy an ecosystem. Facts show something else: while an organism disintegrates or becomes dysfunctional with the loss of a single limb, the eradication of competing vegetation is a prerequisite for growing agricultural crops and forest plantations. Nature is not so much a coordinated system, a superorganism, as a collection of loosely connected components, many of which are redundant or accidental (Zeide 2001). Unlike organisms, in which resources are distributed and members grow according to a genetically coded blueprint, no central control exists in ecosystems. Each part of an organism benefits the others and they usually survive or die together. In contrast, many components of an ecosystem thrive at the expense of others. Each biotic part of an ecosystem, an organism, is much more complex than the ecosystem itself. The reverse is true for the organism: its parts are simpler than the whole. The belief that "everything is connected with everything" makes ecology similar to astrology and as plausible. This belief is as valid as its opposite "everything is independent from everything else." Real communities of plants and animals are in between these opposites.

Checking the validity of Darwin's story illustrates the limits of one-sided "ecological laws" and environmental determinism. It was found that one of the two species of red clover is self-pollinated while the other is pollinated by common honey bees, in addition to humble bees (Egerton 1973). Field mice only infrequently bother humble bees and even less so honey bees. In reality, kingdoms and empires are lost for the want of a nail less frequently than in fairy tales.

Is species coexistence mutually beneficial?

The interconnectedness of life may go beyond the good of an abstract community and benefit each member as well. Being indispensable to the functioning of the whole, each species is useful to any other. Even foresters, traditionally imbued with the notion of competition, have recently started changing their minds. As reported in a leading journal of science, Nature (Read 1997, p. 518), foresters discovered that the disadvantaged fir seedlings vegetating "in the gloom of the forest floor" are "subsidized by fully illuminated overstorey plants, through pathways provided by their fungal symbionts." In the commentary entitled "The Ties That Bind" (Read 1997), it is announced that this "wood-wide web" "would be expected to reduce dominance of aggressive species, so promoting coexistence and greater biodiversity."

Actually, this study did not document that illuminated trees voluntarily donated their lifeblood to disadvantaged neighbors as implied by the Nature's commentary. Until such proof is found, the presumed "donation" is as valid as the claim that we willingly feed mosquitos or gadflies. Read (1997) mistook elementary parasitism for altruism.

Superior ethics

Beyond biological and utilitarian reasons, there are higher, ethical considerations for preserving life in its entirety. Even if it was sanctioned in ancient books, our exploitative domination over other species is unfair and unjust. The underlying belief in the superiority of humans is similar to racism and is as outrageous. It is time to discard the outmoded anthropocentrism in favor of ecocentrism, which proclaims that all entities (including humans) should have the freedom to unfold in their own way, fully realize their inherent potential, unhindered by human domination. Ecocentrism enhances and expands upon the most cherished values: unselfishness, justice, and equality. It picks up the torch of moral righteousness dropped with the collapse of communism.

To assess the validity of ecocentrism, consider its two main propositions: (1) all species and organisms have inherent value and various rights of which the right to exist is paramount; and (2) as the only species capable of formulating and recognizing these rights, we, humans, have the obligation to respect them. These two propositions are contradictory. To exercise our right to exist, we have to eat, which means killing or exploiting other organisms–the actions prohibited to us by the second proposition.

In its diluted form, ecocentrism recognizes the rights of species rather than individual members. As any equivocal position, it brings too many awkward questions. Is it ethical to love an abstract species and to kill tangible individuals? What proportion of a target species can be consumed without transgressing ecocentrism? Whatever answers are given to these questions, diluted ecocentrism sounds more like hypocrisy than ethical teaching. The only viable position for us is anthropocentrism. It does include care and responsibility for other creatures, except fleas, ascarides, and the like. By putting out much smoke, torches of moral righteousness are often dirty, and, in addition to physical pollution, they obscure judgement.

CONCEPTUAL VIEW: WHAT IS BIODIVERSITY?

Is it possible to define biodiversity?

To use biodiversity in management, we have to know what it is. Here is the problem: despite many attempts, there is no satisfactory definition of biodiversity. We can easily understand why. Any definition pigeonholes and restricts the defined term. Biodiversity defies any restriction. It includes much more than number of species or even organisms. In addition to total hereditary variation of all species, their environments with all of their complex interrelations, extraterrestrial factors such as sunlight cannot be excluded either. In short, biodiversity embraces everything. Equating biodiversity with everything is not a polemic exaggeration. Wilson (1997, p. 1) himself acknowledged as much: "Biologists are inclined to agree that it [biodiversity] is, in one sense, everything" (this "one sense" is the only one Wilson discusses). Two conclusions can be drawn from this analysis. First, we should not worry about biodiversity because, being everything, it cannot be lost. It could only change form. When one species disappears, others thrive. Second, biodiversity cannot be defined in principle. Despite this

obscurity, "it should be crystal clear that retaining biodiversity is the overriding mission of national forest management" (Thomas 2000, p.13).
If we are able to discuss biodiversity at all, it is only because usually we mean a more tangible species and individual diversity. Even so, there is no way to decide whether an ecosystem with a hundred species of the same genus is more diverse than that with a smaller number of species belonging to different genera or family. Will species diversity increase if we trade fifty out of the hundred species for ten of another order? If not, what about ten species of different phylum or class? Is it legitimate to prefer ten mammal species for a thousand of insect species? Should we sacrifice 730 ticks to save one fawn they feed on? To answer such questions we have to assign some worth or utility to each species, which goes against the concept of species intrinsic value. Still, not only forest management but our existence requires assessment of species utility, at least its sign, positive or negative.

Two sides of biodiversity

Besides philosophical issues with the all-encompassing nature of biodiversity, from our, human viewpoint it would be dangerous to combine into a single beneficial whole something intrinsically heterogeneous: species and individuals that–for us–are useful and harmful. Genetic diversity of useful species is valuable but biodiversity that combines both groups is meaningless. Biodiversity is beneficial as a whole only when it is dead. All oxygen, oil, coal, and many soil nutrients are remnants of the departed organisms. While alive, they are less willing to sacrifice their livelihood for us.

If we are serious about maintaining biodiversity, we should avoid killing blood-sucking insects, taking medicine intended to exterminate bacteria, eating meat and vegetables, and even breathing because every minute our immune system destroys billions of the inhaled microbes. It is true that biodiversity is our greatest treasure; equally true, it is our greatest enemy. Forest management as well as life of any organism is a constant struggle to separate the good side of nature from its bad side. We owe our existence to the success of this separation. By unnatural lumping together harmful and useful species, the biodiversity movement misleads and disarms us.

Methodologically, the concept of biodiversity commits two opposite errors. First, it ignores the real duality of useful and harmful species. Second, it creates a dubious duality of anthropocentrism and ecocentrism. This duality is false because it presumes an equal existential status of the opposites. This is not so; while anthropocentrism is natural and real, ecocentrism is a far-fetching figment.

LESSONS FOR MANAGEMENT

The analysis of the biological, aesthetical, and ethical reasons to maintain biodiversity shows that there is nothing wrong with the traditional monocultures of superior species. This simple and efficient system of management has been tested for centuries throughout the world. Besides experience, it is a self-evident truth of ecology that interspecific competition is one of the deadliest factors of tree existence. Therefore, minimization of biodiversity and interspecific competition on the land allotted to forestry is a necessary condition for its success.

Far from being environmentally destructive, pure even-aged forest stands is the best way to satisfy our needs in wood products and preserve the environment at the same time. Superior growth of planted forests proves that their functioning is degraded. We, foresters, are true environmentalists because by intensive and sustainable management on a part of the land we make it possible to keep the rest in a pristine state. Many possibilities are available between these extremes but mixing management with curtailed preservation on the same area would detract from both financial returns and environmental quality.

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