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The Natural, the Clearcut, and the Future

Development of a new social consensus on the management of forest resources is proving to be much more challenging than most participants and onlookers imagined. The difficulties doubtless relate to our dependence on forests for so many goods and services, from fiber production to watershed protection and inspiration. Contributing issues include shifting societal values and objectives, the development of new knowledge, and major shifts in the economics and geography of the wood products industry. There is also the potential for influencing forest practices through the market place using green markets and certification of forest management practices.

Development of new information and its application in forest management are particularly difficult problems because the new information can alter basic premises and undermine assumptions. Commitment to the collection and use of new information (sometimes referred to as 'adaptive management') is a commitment to uncertain and changeable outcomes, explicitly recognizing that forest management programs are working hypotheses. Unfortunately, uncertainty and change are not something that major stakeholders in the debates over the management of forests want! Indeed, in many cases, major stakeholders appear married to old ideologies and beliefs—stuck with old icons!

In this paper I will discuss some of the new knowledge that is being created and its relation to icons of both environmentalists and the timber industry. The impact of changes in the forest products industry and, especially, green certification will also be considered. I conclude with a brief discussion of two critical issues facing society regarding management of forest lands: the degree to which we can develop an equitable balance among local, national, and global interests in management of forests; and the relative balance between approaches based on allocating lands to primary users or, approaches involving integration of ecological and economic objectives on all lands in the same landscape.

New Knowledge

We have learned a tremendous amount about natural forest ecosystems and landscapes in the last 30 years! Of course, we thought we knew quite a lot at mid-century when we designed our current intensive forest management practices and adopted the approach of forest simplification in pursuit of efficient wood production. We assumed that the resulting forest would have essentially comparable composition and functional capabilities—to the degree that we thought about that at all. Indeed, I think that almost all in the forest community assumed that what would be good for efficient wood production would be good for all other forest values.

Studies of natural, including old-growth, forests have clearly shown that their composition, functional capabilities, and structure are very different from those of plantations and other young stands that are intensively managed for wood production. Natural forest ecosystems have proven to be very rich in specialist organisms that do poorly or are absent from young managed forests although structural legacies from the old forests (such as large rotten logs) have sometimes allowed these species to persist in the first generation of a managed forest. Much of the natural forest biodiversity is composed of small organisms that are critical to ecosystem function, including hundreds of species of fungi, lichens, and invertebrates. The research on forest composition has made us realize that not all forest species are of equal concern—cutover areas may have high species diversity but the late-successional forests typically have the habitat specialists—and that old-growth forests are certainly not—as once described—biological deserts.

Knowledge of the functional capabilities of natural forests has been equally revolutionary. We have learned that old forests have high levels of productivity, even if very little of it appears in the form of additional merchantable wood. Old-growth forests of western North America have

shown themselves capable of sequestering immense amounts of carbon (which would otherwise be a part of the greenhouse gas, CO_2)—more than any other ecosystem in the world. Natural forests are highly conservative of nutrients, protective of soils, and extraordinary regulators of hydrologic regimes, including problematic events such as rain-on-snow floods.

Many of the specialized habitats and functional abilities of natural forests are related to their structural complexity. These forests—whether young, mature, or old—typically have a high diversity of individual structures: live trees of various species, sizes, and conditions; standing dead trees or snags of varied sizes and stages of decay; and logs and other coarse woody debris on forest floors and in adjacent streams and rivers. Just as important, natural forests display incredible spatial diversity in both the horizontal and vertical dimensions—they are anything but uniformly spaced stands of trees with simple, umbrella-like foliar canopies!

Recent ecosystem research has looked beyond short-term studies of stands to ecological responses over long time periods and at much larger spatial scales (landscapes as opposed to individual stands) with equally surprising consequences. Natural forest disturbances, such as wildfires and wind storms, are now recognized to leave behind large legacies of living organisms and biologically derived structures, such as logs and snags, which greatly enrich the composition, functional capabilities, and structure of the regenerating ecosystem. We now recognize the importance of assessing ecological effects of the extent and pattern of timber harvest at larger spatial scales because of the potential for forest fragmentation and cumulative effects.

The papers in this special issue are all about extending our knowledge of how composition, function, and structure vary in forests of different ages and with different management histories. Clearly, it is not a simple story, particularly when we are dealing with a first-generation of managed stands containing significant legacies from the previously unharvested natural forests!

Icons

In the light of much of this new ecological knowledge, both the environmental and wood products communities are burdened with icons that have largely outlived their usefulness in rational discussions of future forest policy. Hence, it is not surprising that this information has not been well received or fully embraced by these stakeholders since it challenges some cherished beliefs!

Naturalness

Naturalness is the great icon of the environmental community and, based upon this icon, preservation or protection of forest lands is the primary basis for conserving biological diversity. Unfortunately, it is increasingly clear that we cannot achieve the objective of protecting the bulk of forest biodiversity by relying on reserves. In the temperate zones (and probably the tropics as well) we are never going to preserve enough land at appropriate locations to achieve that goal. Consider the current target of placing 12% of the land base in British Columbia in parks and other preserves; if this is the total area where maintenance of biological diversity is a goal, it will be grossly inadequate to protect even a fraction of the genetic variability associated with forest ecosystems—even if the selected lands were optimally distributed from an ecological perspective. As another example, consider the situation with cavity-dependent vertebrates in the *Eucalyptus regnens* forests in the State of Victoria, Australia. Fifteen percent of these forests will be reserved in a single national park while the remainder will be harvested.

How successful are conservation strategies which eliminate 85 to 90% of the habitat and which similarly reduce populations of dependent species likely to be? Are such strategies likely to be successful in maintaining viable populations, let alone a significant percentage of the genetic diversity? The problem is exacerbated when residual populations are confined to one or a few reserves where they could be effectively eliminated by a single catastrophic event. Of course, doubling or tripling the preserved acreage (e.g. to 24 to 36% of the land base in British Columbia) would make a very substantial difference—but how likely is that given the human needs and desires?

A critical key to sustaining forest biodiversity has to be in the management of the matrix—the unreserved portion of the landscape—so that it also provides suitable habitat for a broad array of species. This is not a message that is well received by either hard-core environmentalists or utilitarians.

Who wants to worry about improved (i.e. more ecologically sensitive) silvicultural practices when there are pristine environments to be preserved or greater profits to be made! Who wants to have to work in perpetuity with their antagonists?!

Do not mistake my point here: biological preserves are essential as a *part* of local, regional, and global strategies to maintain biological diversity. And tree farms (forest properties intensively managed for wood production) are certainly going to be a part of our future. However, an equally important issue for society is how we are going to treat the matrix—the lands where we live and work and where we grow our crops of food and fiber. These lands must also be managed so as to provide habitat for a broad array of forest species for society to succeed in its goal of maintaining forest biodiversity.

Naturalness? There have been drastic revisions in views about the theoretical and practical merit of naturalness as a guide for management. Social scientists have re-examined the concept of naturalness (Cronin 1995) and find that naturalness is very much a human construct rather than a universal truth or value-free guide for policy or management.

On a more practical basis, what does naturalness mean on a globe where over half of the primary productivity is directed to the needs and desires of *Homo sapiens*? There are essentially no ecosystems on earth that are not being significantly modified by the activities of humans whether directly by manipulation or indirectly through modifications in the global atmosphere. Furthermore, this process of human modification has been underway for millennia, as it is increasingly clear that premodern humans typically had very significant impacts on their environments (e.g. Diamond 1992). In the 14th century the Americas may have had as many as 60 million human beings—most of whom survived by intensive agriculture (Jennings 1993). The isthmus of Panama was a savanna with as many as a million inhabitants prior to the arrival of Columbus; the "pristine" tropical rainforests of that country date from the ensuing depopulation, largely by diseases brought from the Old World.

Past disturbance regimes are equally limiting as a guide for future management. They instruct us about past circumstances and which species have survived. But who would argue that we should model our management interventions on a past that reflected a different ecosystem, different climate, and different regional and global context? You cannot go back to the past, only forward into the future.

Clearcutting

Many in the traditional forestry and wood products industries are equally burdened with an icon of their own—**clearcutting;** in fact, clearcutting is representative of a larger set of beliefs about current forest practices being modeled on natural disturbances. There has been a great reluctance to acknowledge the significant differences between the stand- and landscape-level impacts of fire or windstorm and current forest practices, including the effects of clearcutting and the extensive road systems required for management. These may be very efficient approaches to the production of wood. However, clearcutting is *not* like most natural disturbances in the intensity (e.g. levels of biological legacies) and uniformity of its impacts. The plantation model of stand structural development is *not* comparable to the development of most naturally regenerated stands—and for good reasons from the standpoint of timber production! In contrast with a natural model of stand structural development the plantation model does not recognize the importance of biological legacies, structural complexity in natural stands, and the extent and importance of structural development (particularly development of horizontal and vertical heterogeneity) in late-successional stands.

The refusal of utilitarians to acknowledge the reality that intensive timber management has major negative effects on many other forest values, including critical services such as hydrologic regulation, does not serve the social dialogue well. One is reminded of the debate over health effects of tobacco! Moreover, industry spokesmen end up defending specific practices such as clearcutting (e.g. Moore 1995) rather than developing new approaches which reduce the negative ecological impacts of timber management and making the important case for active management of forests.

Perhaps a quote from scientist and philospher Freeman Dyson is an appropriate conclusion to this section on icons: "The public dialogue of our era is mainly a debate between free-market economists and conservationists, conservationists trying

to preserve the past, free-market economists devaluing the future at a discount rate of seven percent per year. Neither side of the debate speaks for the future" (Dyson 1997).

Changing Wood Products Industry

Other challenges in the development of forest policies are the major changes which are occurring in the structure and geographic location of the wood products industry (Marchak 1995). Investments in forest production are shifting to regions in the southern hemisphere that offer outstanding opportunities for production of wood fiber in short-rotation plantations of conifers and *Eucalyptus*. The long-term competitiveness of producing low-value bulk-fiber in boreal forest regions has to be seriously questioned in the light of this development. Do we really believe that acreage is going to substitute for growth rates and other economies of intensive production in producing low-value fiber? Furthermore, as the costs of producing wood increase, as they inevitably will with the internalization of environmental costs, there are increased opportunities to develop alternative sources of bulk vegetable fibers.

How can resources and communities be protected in such circumstances? One way may be by emphasizing production of unique, value-added forest products and services.

Green Certification

Development of 'green' products and markets based on credible certification processes could be an important factor in influencing and empowering the wood products industry to move to improved environmental and social practices. The movement toward green markets and sustainable forestry (*sensu* forestry conducted according to a set of ecological and social principles) has progressed the farthest in Europe. However, both have potential to spread rapidly in other developed economies.

The objective of certification is to allow the consumer to identify products which have been produced in an environmentally and socially responsible fashion as assessed against internationally recognized standards and regularly audited by a credible third party. The Forest Stewardship Council has been a leader in development of such standards and of a certification process (Upton and Bass 1996). Projects have emerged that are focused specifically on the production of certified products for the international market (e.g. Arroyo et al. 1996).

Green certification offers a powerful tool for influencing forest land management and leveling the playing field so that forest management and wood production companies sensitive to ecological and social values are not placed at a competitive disadvantage with those companies that are not. There are many problems that remain to be worked out, however (e.g. Viana et al. 1996), and many opponents. Many publicly held corporations view certification involving independent third-party audits as a significant problem; this attitude is clearly changing in British Columbia but much less rapidly in the United States. Many environmentalists oppose certification of forest practices on public (especially federal) lands in the United States, feeling that it would legitimize forest harvest there; some state forest management operations have been certified, however. There is also the potential for the Forest Stewardship Council to marginalize itself by adopting more restrictive principles proposed by some of their hard-core environmental members; this outcome would be very unfortunate because it would likely result in the balkanization of certification with development of competing standards and labels, potentially reducing the effectiveness of the process in the market place.

Some Important Questions for Society

The preceding issues provide some of the context within which societies are going to have to decide two important questions: (1) How can we develop a balance among local, national, and global interests in the management of forests? and (2) What balance between the two alternatives of allocation and integration in the management of forests is appropriate? Clearly there are significant local concerns in the management of forest resources. Flexibility really is needed to address the unique social and economic circumstances of communities as well as to adjust management practices to the landscapes, forest conditions, and species of each region. What is not clear is how these local concerns are to be balanced with regional, national, and global interests related to both exploitive development by outside interests and environmental constraints on development. The national and regional approaches taken by the Forest Stewardship Council in developing

specific applications of their generalized principles and guidelines demonstrates one useful approach.

Allocation of land among uses continues to be proposed as a way to resolve conflicts over forest values. This has been the traditional approach to resolving major conflicts among forest stakeholders; interestingly both the environmentalists and the utilitarians have preferred this approach, differing only in the details of which forest acres (amount and location) are to be allocated to which use! Currently New Zealand is touted as a model of how allocation can be used as a solution to forest conflicts; certain lands (mostly exotic plantations) have been dedicated to intensive timber management while much of the native forest are reserved from timber harvest. Unfortunately, not all environmental impacts of harvest can be mitigated by preservation in other areas—most notably impacts on water quality and aquatic organisms. Also, the preserved lands are often "orphaned" with very little funding for their protection and management; this has been the case in New Zealand.

Integrated management of forests for a mix of ecologic and economic values is the alternative approach; such approaches are typically labeled new forestry, ecosystem management, and sustainable forestry. Reserves and intensively managed plantations are typically both part of a landscape plan based on ecosystem management. However, it is probably the emphasis on integrated management of a large area of matrix lands that distinguishes the integrated approach.

It is not at all clear at this point how societies will balance these two alternatives. There are many stakeholders, representing both environmental and utilitarian views, who are basically opposed to an integrated approach in a genuine belief that it will not be optimal for their goals; they probably do not want to have to deal with each other in perpetuity either, which is basically what integrated management entails! Integration can fit well with the interests of local communities, although it does not fit well with traditional economic approaches that are designed to maximize present net worth. Development of green markets may be able to influence perspectives on this issue as could an increased emphasis on unique, value-added forest products in contrast to production of low-value fiber.

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