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# Learning To Play By Nature's Rules

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## Abstract

*Many countries are applying new, ecosystem-based approaches in management of lands and natural resources. In the United States, policies and practices of "ecosystem management" are significantly changing management of public forests and rangelands. The changes originate from public dissatisfaction with land-management planning and practices, and from growing concern for the health, diversity, and sustainability of forest and rangeland ecosystems. Ecosystem management emphasizes ecological processes and strives to work with, rather than against, the natural dynamics that shape and sustain ecological systems. It takes a big-picture perspective on land and resources management, and furthers understanding of ecological systems and management effects through an adaptive-management approach. Ecosystem management recognizes people as integral components of ecosystems, and strives to be responsive to the lives, livelihoods, and cultural values of people who have a stake in the outcome of management. Ecosystem management calls for better understanding of how ecosystems work, innovative management approaches, and a generous dose of humility.*

## INTRODUCTION

Many countries are formulating new policies for managing lands and natural resources. In the United States the movement began in the USDA Forest Service with an initiative, called "New Perspectives," that quickly evolved into the policies now espoused by numerous agencies as "Ecosystem Management" (Kessler et al. 1992, Kessler and Salwasser 1995). In Canada, ecologically sound and socially acceptable management is a key theme of the Canadian Forests Accord adopted by government, industry, aboriginal groups, and other sectors in 1992 (Canadian Council of Forest Ministers 1992). Similar developments may be observed in Europe, India, and elsewhere (Government of India 1988, National Board of Forestry Sweden 1990).

Although the details and terminology may vary, everywhere the new policies reflect a common purpose. That purpose is to sustain healthy and productive ecosystems that meet the diverse economic, cultural, and ecological needs of people today while not diminishing the ability of future generations to meet their own needs (Maini 1992).

## DEALING WITH COMPLEXITY

Why is it that in so many places, people are re-thinking the management of their lands and natural resources? The simple answer is this: forest and rangeland management has gotten so complex today that problems can no longer be resolved by the "fixes" offered by traditional approaches. Issues of human health, economic health, political stability, and social equity are inextricably linked with the ecologically

sound and sustainable management of lands and natural resources (Kaplan 1994).

But that simple answer is somewhat misleading. The truth is that management of forests and rangelands has always been an extremely complex proposition, if for no other reason than that these ecosystems are inherently complex and full of uncertainty. Add to that the complications pertaining to people's relationships with lands and resources, and management becomes a "messy" proposition indeed.

In managing lands for production purposes, our approach has been to dismiss or ignore these complexities; to treat them as "complications" that exist outside the purview of science-based management. This approach reflects the mechanistic view of nature that has shaped science and management in the natural-resources disciplines (Botkin 1990). For professionals in forestry, wildlife management, fisheries, and rangeland management, a key role has been to identify limitations on production and to try to remove these limitations through science and technology (Behan 1990). This production-oriented view explains why such terms as timber volume, wildlife habitat capability, animal-unit-months of grazing, recreation user-days, and other measures of potential "outputs" have dominated the lexicons of the natural-resources disciplines. It also accounts for the emphasis on resource stocks and flows, and the lack of attention to the states and conditions of lands and resources (Brooks and Grant 1992).

The habit of over-simplifying land and resources relationships, and of trying to treat problems with technical fixes, has gotten resource managers into serious difficulties in recent years. Indeed, it is these difficulties that have triggered

the search for new and more effective approaches for dealing with lands, natural resources, and people; the approaches we now refer to as ecosystem management. Some of the difficulties are of socio-cultural origins, deriving from people's relationships to lands, resources, and one another. Others are of ecological origins, deriving from the treatment of forests and rangelands more like croplands than as complex ecological systems (National Research Council 1990).

### PEOPLE'S RELATIONSHIPS TO LAND AND RESOURCES

The views and values that societies have for lands and natural resources are often quite different, and more diverse, than those emphasized in the resource-management disciplines. In the multiple-use approach that has dominated public-land management for several decades, forests and rangelands are viewed primarily as places capable of yielding outputs to support the resource-dependent industries such as timber, livestock production, fisheries, and outdoor recreation (Behan 1990). People's linkages to the land, rather than being direct, are seen through the resource-based industries that make available products, jobs, and related income. As important as these relationships are, they do not fully represent the complex connections of people to lands and natural resources. Relationships also include people's subsistence and recreational activities, their lifestyles and livelihoods, their historical roots, their family and community traditions, their environmental ethics; in short, their sense of self and of place (Kessler 1994).

The USDA Forest Service learned the shortcomings of the output-driven approach in painful fashion. Following passage of the National Forest Management Act (1976), the agency began an ambitious effort to develop comprehensive land and resource management plans for all the national forests and grasslands (Wilkinson and Anderson 1987). The process featured a strong public involvement component, as required by the National Environmental Policy Act (1969). Forest Service planners tried to represent public concerns by generalizing them as "competing interests" in the multiple uses of national forest lands (Congressional Research Service 1993).

When the plans were completed, many of them were rejected by the people who supposedly had provided input into their development. What went wrong? Although a great many issues were raised in plan appeals, throughout them ran a common thread. While emphasizing output yields from the forests and rangelands, the plans neglected many of the things that people really cared about. People's concerns tend to be highly personal in nature, having to do with the condition of specific places within a national forest or grassland. At stake are the settings, sites, and experiences that have special meaning to individuals, families, and communities.

An ecosystem-management approach rejects the homogeneous approach that seeks to manage forests and rangelands everywhere for the same basic mix of resource outputs. Instead, each forest or rangeland is recognized as a unique setting ecologically, culturally, and economically. Management must be tailored for each situation in partnership with the people who have a stake in the outcome. Ecosystem

management requires an understanding of how people's lives, livelihoods, and cultural identities are woven within the fabric of a given ecosystem. Such understandings allow development of management approaches that work with, rather than against, the cultural values and economic interests of people who comprise the community of interests for that forest or rangeland area.

### ECOSYSTEM HEALTH AND SUSTAINABILITY

The scientific community as well is questioning the mechanistic views that have shaped natural-resources management and research. In light of serious ecological problems, there is a growing voice for approaches that recognize the inherent complexity and uncertainty of forest and rangeland ecosystems.

The ideal of forest management, as portrayed in magazine ads of previous decades, featured fully-stocked stands of vigorous young trees, neatly arranged within beautifully regulated forest landscapes. Typically, these images included dams, reservoirs, and other images of human engineering and the "taming" of nature. The ideal of the managed forest was clean and waste-free, with all its productive capacity directed to human uses. Fundamental to this vision was the notion of humans in control of nature. It turns out, however, that such picture-perfect forest management exists only in magazine ads, or in exceptional situations where massive inputs and expense make such a picture possible (for example, on intensively managed private lands). Elsewhere, for example on the public lands, the picture cannot be realized because things happen to disrupt even the most sophisticated plans and projections. These disruptions include fires, floods, hurricanes, windstorms, insect outbreaks, and other natural catastrophes.

Increasingly, we realize that the real catastrophe is not the processes themselves, but rather the failure of land-use planning and management to consider these dynamic processes and events as integral parts of natural ecosystems and landscapes (Botkin 1990). The rationale behind the massive fire, flood, and pest-control programs of the current century was that these destructive forces could, and should, be controlled or eliminated. In hindsight, however, control programs do not really eliminate these disturbances. Rather, they tend to lengthen the period between events, so that when disturbances do occur they are more difficult to control and are more severe in their effects.

Why have we treated these important dynamics as externalities instead of building knowledge of them into our planning and management? It is largely a problem of scale. Resource planning and management have tended to focus at the level of forest stands and rangeland sites; scales where we felt that predictability and control were more attainable. Those scales alone, however, provide a distorted picture of ecological pattern and process (Turner et al. 1993).

A different understanding emerges when forests and rangelands are viewed from a big-picture perspective. What appear to be destructive events from a site or stand perspective may be seen instead as ecologically vital processes when viewed from the larger perspective. These disturbances com-

prise the renewal processes by which nature sustains vigor, resilience, and adaptability of the systems in the long term (Society of American Foresters 1993). Ecosystem management assumes that there is some range of conditions that defines an ecosystem's ecological sustainability; and that for long periods ecosystems have and can maintain themselves within that range. Being within this range means that biological diversity is intact and the system is resilient to short-term stresses; in other words, the system is basically "healthy."

There is growing evidence that many North American ecosystems have drifted outside the range of ecological sustainability, as indicated by degraded rangelands and the "forest health crises" that are getting so much attention today (U.S. General Accounting Office 1988, National Research Council 1994). The Blue Mountains of Oregon and Washington, for example, are experiencing a forest health crisis of immense proportions. The changes are believed to have been triggered by exclusion of fire from the system, followed by additional stresses from drought, insects, and diseases (Wickman 1992). Understanding these dynamics, and how the health of the systems might be restored, are major aspects of the ecosystem management approach underway in the Blue Mountains (Jensen and Bourgeron 1993).

#### BUILDING THE KNOWLEDGE BASE

The basic idea of ecosystem management is simple: we must seek to understand the processes by which nature sustains a particular ecosystem in a healthy, diverse, and productive condition. And, we must design our management approaches to work with, rather than against, these natural processes (Jensen and Everett 1993). Easier said than done, however, given that our understanding of ecosystem dynamics is in its infancy. How can we implement ecosystem management when the research has not been done to support it?

This is a troublesome question, but in fact managers cannot delay acting until scientists complete a wide array of studies on ecosystem structure and dynamics. What's required instead is a new way of looking at land-use management: as operational-scale experiments for testing our assumptions and hypotheses about ecosystem response to management. This concept, termed adaptive management, views the implementation of any land-use plan as an important opportunity to "learn by doing," for the purpose of continually testing, adjusting, and refining management to meet desired outcomes (Walters and Holling 1990). Adaptive management calls for new relationships between scientists and managers. Traditionally working in separate spheres and often with divergent agendas, the two must collaborate closely so that we can learn from the management experience as well as from experiments.

#### PEOPLE AS PART OF ECOSYSTEMS

One of the key concepts of ecosystem management is the recognition that ecological concerns and human concerns are closely intertwined, and cannot meaningfully be addressed in isolation from one another. This theme is reflected in the new

synthesis disciplines that have emerged in recent years, such as conservation biology, landscape ecology, restoration ecology, and ecological economics. Increasingly, the old arguments about "what's right for people" versus "what's right for nature" are seen to be a false dichotomy. Health and prosperity of human societies depend on the health, productivity, and sustainability of the ecosystems that provide needed products and services. The old debates distract us from the real challenge, which is to reconcile ecology and economics.

A key assumption of the industrial age has been that economic growth, the key to human prosperity, is limited only by the ability of science and technology to make the land yield its resources to supply human needs. The belief that humans can "tinker with nature and improve it" (Botkin 1990) has been a prominent theme in the sciences supporting agriculture and natural-resources management. Increasingly, however, there is recognition that resource supplies, after all, may not pose the most important limitations on future growth. Instead, the limits may be the ability of Earth's ecological systems to tolerate the stresses being placed upon them by human activities. Although as yet unexplained scientifically, the widespread decline of amphibian species may be a sort of "coal miner's canary" that warns of a deteriorating global environment.

Given these environmental urgencies, we can no longer treat as separate concerns the development of resources, protection of the environment, and the social and economic wellbeing of human communities. Ecosystem management recognizes all these concerns as within the purview of land and resources management, and attempts to reconcile them in a manner consistent with the finite and fragile nature of ecological systems.

#### SUSTAINING FORESTS AND PEOPLE IN INDIA: AN EXAMPLE

These proceedings include several examples of how ecosystem management is being implemented in forest and rangeland ecosystems of the United States. Therefore, I will close with an example from afar: forests and rural people in India.

India's new forest policy of 1988 reflected a remarkable turnabout in thinking that had prevailed in Indian forest management since early colonial days (Government of India 1988). It was a policy of no new plantations, and further called for the protection and restoration of India's remaining native forests. "The principal aim of Forest Policy must be to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all lifeforms, human, animal, and plant. The derivation of direct economic benefit must be subordinated to this principal aim" (Government of India 1988, Section 2.2).

This move took many outsiders by surprise. A common response was "how can a poor country like India afford such a policy?" A closer look revealed that India's move, rather than being a luxury, was something it could ill afford *not* to do. One of India's greatest problems is providing for the day-

to-day survival needs of rural peoples, many of whom live in the remaining forest areas. People have for countless generations obtained their food, fodder, fuelwood, building materials, medicines, and other materials in India's forests. For people who have the cultural knowledge and traditional skills, diverse native forests are a veritable larder that makes survival possible. Although plantations provide jobs and income for some, their ability to support tribal peoples is limited. And hence India's emphasis on sustaining the native forests that are the foundation of people's livelihoods, cultural histories, and community identities.

## IN CONCLUSION

The changing approaches to land and resources management, in the U.S. and elsewhere, reflect the growing perception that we are fast reaching the limits of our life-support systems. Whereas "growth" has been the by-word of resources management, "sustainability" is gaining in prominence and urgency. Society's priorities appear to be shifting from economic growth to sustainable economies, from increased resource production to more effective resource production and use, and from sustained yields to sustainable ecological systems.

Ecosystem-management thinking leads us away from policies and practices aimed at "outsmarting nature" to bring ecosystems under human control. Instead, ecosystem management emphasizes the need to understand and appreciate how nature works to sustain healthy and productive systems, so that we can tailor management to work with, rather than against, those processes.

Does ecosystem management require better science and technology? Of course. But that science and technology must be tempered by a generous dose of humility. We must learn to play by nature's rules.

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