PERSPECTIVE

A Literal Use of "Forest Health" Safeguards against Misuse and Misapplication

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"Forest Health" has become one of the most widely used terms in ecosystem management. Its popularity derives from powerful personal imagery, connecting the fragility of health with ecosystems. It addresses a need for an efficient term to describe the vitality of the world's forests, a usage we support. However, broad adoption has brought multiple usages, not all of which correspond to the term's literal meaning or convey such clarity of intent. Although "Forest Health" makes no reference to human expectations, these values are often inserted, suggesting a natural order is at risk if particular preferences are not met.

This disjunct arises when three overlapping but distinct concepts are conflated: pest management, sustainability, and ecosystem functioning. The term "pest" is intrinsically tied to human expectations, defined as an organism that interferes with our management objectives. When native bark beetles kill large numbers of trees in commercial plantations, they're pests. But if they do likewise in a wilderness area, they're not pests, even though some people might disapprove of their actions. If they kill trees in a national forest managed for multiple uses, they're pests in regard to some human values but not others.

"Sustainability" likewise refers to human objectives, specifically the degree of utilization that can be achieved without diminishing the resource below its steady production capacity, or degrading associated resources. The US Forest Service (2004) defines sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The Society of American Foresters (SAF) (Helms 1998) uses a similar definition, emphasizing a forest's ability to maintain its essential functions "in the context of human activity and use." Whether a particular degree of utilization is sustainable depends on multiple factors, including some species with which we have competing interests. Various human expectations can conflict, so "sustainability" should only be used in the context of specific needs, activities, or uses.

"Ecosystem functioning" is independent of human expectations, referring to the collective processes of resident species interacting with each other and the physical environment. Windstorms, wildfires, and insect outbreaks are among many natural disturbances that play essential roles in forest ecosystem function. They can release plant growth, alter nutrient cycling, and increase food resources, all key processes operating within normative limits of resiliency (Folke et al. 2004). A major lesson of the 1988 Yellowstone fires was that native ecosystems can recover quickly from seemingly catastrophic disturbances (Turner et al. 2003).

Current understanding of ecosystem dynamics suggests that factors compromising inherent processes and resilience should be emphasized when evaluating forest health. Understanding a system's limits requires knowledge of patterns, processes, interactions, and responses to external drivers. Some forces that threaten to drive ecosystem functioning beyond limits of resilience include climate change, invasive species, atmospheric pollution, soil erosion, and fragmentation. Not only are these external drivers significant threats by themselves, they also can alter ecosystem dynamics to cause native species to become emergent threats.

Edmunds et al. (2000) tabulated seven widely used definitions of "Forest Health." Five make no mention of human objectives, but rather emphasize two primary themes, ecosystem functioning and resilience. The other two, and that of SAF (Helms 1998), also include these themes, but superimpose terms such as "perceived" condition, "unusual levels of disease," and "land management objectives." However, those themes are already included within, and are more fitting to, definitions of pest management and sustainability. Kolb et al. (1994) described how the origins of "Forest Health" were rooted in concepts of "ecological integrity," but subsequent definitions were broadened to include human values.

Broadened definitions have recently become even more pervasive and are often used to drive policy. For example, the Healthy Forest Restoration Act (2003) emphasizes economic and other anthropocentric values while presenting a title that suggests otherwise. A supporting White House includes statements such as "Rather than renewing forests, these (catastrophic) fires destroy them," contrasting with most contemporary views on disturbance ecology, ecosystem functioning, and resilience (e.g., Turner et al. 2003, Folke et al. 2004).

Another source of misapplication arises because "Health" is most commonly associated with individuals (or collectively to populations), especially humans (Kolb et al. 1994). Policies that allowed treatable human diseases to go unchecked would be unconscionable. But extrapolating from that connotation to ecosystems is invalid. Disturbance may be required for functioning of an ecosystem as a whole, even while detrimental to some individual organisms. Furthermore, recovery from a disturbance can extend beyond the lives of individual community members. Also, the reduced abundance of one species often favors the increase of another. Hence, the presence of dying and decomposing trees is not necessarily indicative of an unhealthy ecosystem and often promotes a rich diversity of species and functional groups.

In contrast to naturally functioning ecosystems, agricultural and intensive forest production systems have specific management objectives, and their success can be defined accordingly. They can provide valuable environmental services and be sustainable, exert substantial environmental costs and be unsustainable, or show various combinations thereof, depending on how they're managed. However, they are not "healthy ecosystems" in the sense of functioning within the range of natural variability. That does not diminish their value. In fact, they would rightfully be deemed failures if allowed to behave

naturally, because their purpose is to provide essential human benefits at the expense of other ecological processes.

We identify three adverse effects of incorporating human expectations into terms, such as "Forest Health," that do not explicitly express them. First, this disjunct can be exploited to blur debates on government policies. For example, if one is free to espouse that an insect is inherently harmful to forest health without having to specify whose economics and expectations are being impaired, then advocating on behalf of vested interests can be replaced with a vague portrayal that "the environment" is being threatened. This can lead to policies and practices that detract from the values of others, or even become real threats to forest health. Second, failure to provide accurate modifiers for each context in which "Forest Health" is used causes misunderstanding (Kolb et al. 1994). Contradictions between what a term literally means and how it is employed generate distrust among the public, needed allies in safeguarding both ecosystem function and sustainable management. Third, revisionist usages create an ever-shifting boundary. For example, expansion of human structures into forest margins poses well-documented threats to forest ecosystems. But if we define "Forest Health" in anthropocentric terms, then the threat (habitat fragmentation) becomes the object of protection, and it falls to management agencies to interrupt those forest processes that incur cost, inconvenience, or danger to individuals choosing to live at the human–wildland interface.

A misrepresentation of our views might be used to argue that managing forests for multiple human values is somehow inferior to natural processes. To be clear, forest products and services are essential for our well-being, and judicious management can provide a combination of material, ecological, sociological, and spiritual values. But we oppose obscuring these goals within terms not denoting them.

We encourage the distinct-singular use "Forest Health" only when describing the extent to which ecosystem processes are functioning within natural historical variability. We recommend that appropriate modifiers, such as "Forest Health and Sustainable Management," be attached whenever the term is coupled with human expectations.

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