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Author: Lackey, Robert T.

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Interpreting Naturalness in Science and Policy

Naturalness in biology and natural resources can be defined in different ways—entire courses are taught on the topic, and entire books are devoted to it. This is not an esoteric issue when it comes to managing terrestrial and aquatic resources, because of implications for both biotic and human systems. Value judgments inevitably enter into decision making and policy, ultimately affecting how effort and resources are expended to produce goods and services that meet administrative, social, cultural, and economic goals. This occurs across all spatial and temporal scales.

In this Forum, Robert Lackey cautions that a scientific focus on "natural" constructs can lead to biases that negatively affect decision making and policy about natural resources. James Karr counters that a focus on "natural" can provide an important scientific context that leads to appropriate inferences for environmental protection and policy. Whether or not these articles help you make up your mind about this topic, they will stimulate you to think more consciously about it in the future.

—David L. Peterson

Robert T. Lackey[1], Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon 97331

Is Science Biased Toward Natural?

Most of us have academic backgrounds in science but such backgrounds rarely prepare us for "real world" natural resource management or policy issues. Science, an alluring comfort zone for most of us, is often an important element in delineating and assessing policy options, but many natural resource issues are controversial, divisive, and litigious. The science itself often becomes part of the policy debate.

In most natural resource issues—for example, managing recreational fisheries with changing climate that does not favor valued species, restoring much-reduced runs of salmon given a rapidly expanding human population, sustaining marine catches given the escalating demand for sea food, protecting at-risk species when little remains of their optimal habitat—science is important. Unfortunately, science is increasingly misused in policy analysis and decision making, even by scientists.

I argue that unless we are more vigilant guarding against the misuse of science in natural resource policy and management, we risk marginalizing the helpful role that science and scientists can play in resolving important, but divisive natural resource issues.

[1]Author to whom correspondence should be addressed. E-mail: Robert.Lackey@oregonstate.edu. The views and comments presented are those of the author and do not necessarily represent those of any organization.

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Precise definitions are important to delineating the proper role of science in policy analysis and decision making. I define *science* as information gathered in a rational, systematic, testable, and reproducible manner. It is not limited to the hypothesis testing frame of the classical scientific method, nor does it preclude disciplines such as astronomy and anthropology. Correspondingly, I define *scientist* as a person who gathers or interprets scientific information (i.e., science). Thus, not all individuals possessing scientific credentials are *working* as scientists even though they may be *identified* as scientists and hold scientific degrees.

An understandable impulse by those of us who work on natural resource issues, including scientists, is to insert our opinion of what we think *should* be the appropriate public policy goal or choice; in short, a tendency to express a personal policy preference. Policy preferences are formed by a mixture of personal values and what the facts are perceived to be. Of course, we often self-select to some disciplines (i.e., fisheries, wildlife, and forestry) because some of us value such environments or animals; thus in our professional lives we tend to be surrounded by others of like mind. It is easy to slip into the mode of "everyone I know thinks that restoring wild salmon is more important than providing hydropower" while failing to recognize that such a view is only one of many competing, often mutually exclusive policy preferences.

Personal policy preferences aside, science deals with the "fact" side of policy. We are usually admonished in university classes to separate our science from our personal policy preferences because policy debates are in large part clashes of conflicting values and competing alternatives. For deciding who wins and who loses (i.e., the political process), science is important, but it is only one element used to select from among competing policy alternatives.

It is often easy to identify when a scientist has shifted from the role of provider of scientific information to the role of advocate of personal policy preferences, but sometimes it is not. At times, even a conscientious scientist may unknowingly advocate a personal policy preference by conveying biased scientific information. For example, how common is the implied policy preference for "naturalness" embedded within what is ostensibly policy-neutral science?

As I read some of the *scientific* literature that comes across my desk, it appears that some scientists tacitly accept the view that natural and undisturbed is *inherently* preferable to altered and disturbed. Thus, it follows that native species are *inherently* more important than exotic species and, therefore, by implication, biological diversity should not be reduced. Knowing what species are native may be essential for testing certain scientific hypotheses, but conveying scientific information with such an *implied* preference is a form of policy advocacy. I offer three examples to illustrate.

First, consider the widely held notion of "ecological integrity." Ecological integrity is, by common definition, based on native species and, by implication, native ecosystems. In the narrowest, legalistic sense, the definition is purely scientific in that it states no implied policy preference. However, use of the word *integrity* connotes "goodness" or "desirability" to most who hear or read it. To the careless user of such scientific information, it easily follows that human activities (altering what is natural) are intrinsically bad or adverse.

I believe it is reasonable to conclude that to most people, if unaltered ecosystems are defined as inherently good (having the highest integrity) and the point of reference for the desired ecosystem condition, then human actions that alter ecosystems must be adverse. Selecting a policy option from among the viable choices is based on values and preferences; the science provided to inform such a choice should not presuppose what those societal values and preferences are.

Consider a second example, the several decades old notion of "ecosystem management" (or its latest incarnation, ecosystem-based management), the hallmark of many natural resource and regulatory agencies nowadays. Terms such as *degradation*, *health*, and *impoverishment* are frequently used in the scientific literature about ecosystem management and they imply that the appropriate or ideal target for ecosystems is a condition with little or no disturbance. By implication, the use of such terms implies that human disturbance results in some degree of *degradation*, something less than *healthy*, and a reduction in biotic *richness*. Thus, the line between science and values has been, if

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not completely erased, muddled beyond clear interpretation. The use of such normative concepts as degradation, health, and impoverishment have no place in the scientific literature.

In the scientific literature addressing notions of ecosystem management, the importance placed on the pedigree of the species present in an area also shows a common acceptance of the policy corollary that native species are more important than exotic species. Exotic species may be called *invasive*, but usually their status is less obviously stated. For example, exotic species are routinely excluded in measuring biological diversity. Why are native species more important (policy wise) than exotic species? Further, among exotic species, why are intentional introductions usually treated differently than unintentional introductions relative to biological diversity? Such choices are policy decisions; there is nothing in science that indicates that society will prefer one species over another.

Consider a third example, the scientific literature associated with ecological restoration and, specifically, to what goal or target should we restore. Should ecological restoration be aimed at recreating the ecological condition that existed at the beginning of the Holocene, just prior to 1492, or at the end of last week? The answer requires making a value judgment – a policy choice which is necessarily a political judgment – and it is not a scientifically derived decision. Scientists should assess the feasibility and ecological consequences of achieving each possible restoration target. Selecting from among the choices, however, is a societal enterprise.

In ecological restoration, individuals and society may value certain species more than others, or all species may be valued equally. Such determinations are societal preferences to be made by the public or its institutions, not by scientists working under the guise of technocrats providing policy-neutral facts. Further, whether society prefers "natural and undisturbed" ecosystems to "altered and disturbed" is purely a societal judgment. There is nothing inherent in science that makes either pristine or altered ecosystems inherently preferable from a policy standpoint, nor one restoration target more or less desirable than another.

Without a clear separation between providing policy-neutral science and advocating for personal policy preferences by providing policy-inculcated science, scientists risk being categorized as yet another policy advocacy group. As a group, we will be considered policy advocates who present our arguments in ways that sound like science, read like science, are presented by individuals who cloak themselves in the accouterments of science, but who are actually offering policy advocacy masquerading as science.

In a democracy, having widely available, accurate, understandable, and unbiased scientific information is central to the successful resolution of the typically contentious, divisive, and litigious natural resource policy issue. To allow science to be marginalized through misuse is a major loss to society and its decision making institutions. When performed appropriately and without a policy bias, science has much to offer society, decision makers, and individual citizens. The scientific enterprise also has much to lose by doing otherwise. Our personal bias for natural, no matter how understandable in its origin, has no place in the scientific enterprise.

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