Natural: A Benchmark, Not a Bias

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Natural: A Benchmark, Not a Bias

"Scientists who seek nothing but truth in their investigations are often ignored or, worse, defamed by those whose economic or political agendas are threatened."—Larson (2009)

Modern society faces numerous challenges. Public policy, one of the most important means to meet those challenges, requires integration of knowledge and experience to reduce risk to society and protect human interests through and beyond the 21st century. Failure to accomplish this integration could be devastating.

I expect that most scholars, citizens, and policymakers would agree with the prevous paragraph. But, particularly in arenas where heated disagreements are possible (that is, nearly everything), crafting policies in the public interest is hardly straightforward. With regard to natural resource policy, why has policymaking seemed to grow increasingly contentious, even litigious? Why do some people argue that "natural" is a bias, instead of a simple descriptor? I contend that focusing on the "natural," including concepts such as biological integrity and health, provides evidence-supported benchmarks for understanding the consequences of natural resource policy options. Such benchmarks are essential for choosing policy options that are in line with today's laws. Further, in defining benchmarks of "natural," I find that scientific evidence supports maintaining or restoring native species. Finally, I believe that efforts to exclude natural scientists who support natural benchmarks from discussions of policy, under the guise of avoiding biased "personal policy preferences," is shortsighted and counter to the public interest.

Let me illustrate. More than half a century ago, scientists and engineers determined that containment vessels were needed to sequester the accumulating radioactive and hazardous chemical wastes at the Department of Energy's Hanford Site near Richland, Washington. Their designs called for double-walled tanks constructed from steel without welds. Tanks meeting those specifications were expensive, so policymakers planned for single-walled tanks with bottoms welded to the rest of the tank. Because the policymakers at the time disregarded the advice of scientists and engineers, about half the original single-walled tanks have leaked some 1 million gallons of waste into the surrounding soil and groundwater, and the toxic plume is still moving toward the nearby Columbia River. The money saved by that policy decision is pocket change when compared with the tens of billions of dollars already, and projected to be, spent on cleanup over past and coming decades—including money spent after the 1960s to build new, double-walled tanks after the old ones were found leaking. The public and worker health consequences and the loss of natural resource values cannot be calculated.

Near the mouth of the Columbia River, Portland, Oregon, faces a different "cleanup" challenge (Larson 2009). For decades, the Bull Run watershed in Mount Hood National Forest was protected from logging by federal regulation. Then, in the 1950s, in an attempt to prevent large crown fires, a district forester moved to permit logging; helping to drive that decision was the prospect of $1 million in revenue from projected annual

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timber sales. Scientists and citizens opposed the logging on scientific grounds: timber harvests and road building would destabilize soils and degrade water resources, among other things. But their insight was lost amid the economic and political arguments for logging. Decades afterward, in the 1990s, unusually heavy rains sent eroded soil and other debris from logged areas and roads within the watershed into Portland's reservoirs, forcing the city to shut down its water supply system temporarily. By the time congressional action to rescind the permit to log came towards the end of that decade, it was too late. The legacy of this past logging lives on in near-yearly shutdowns of the water system, forcing the city to use groundwater of marginal quality or to install an expensive filtration system. Yet for decades, water filtration was provided by the protected watershed at no cost to society.

These two examples demonstrate the very real natural resource, social, and economic consequences of dismissing scientific facts in favor of value judgments as the primary guide for choosing among policy options. So why were these natural resource policy decisions not litigated?

They were not litigated because the laws that now codify a public consensus that natural resources need protection—as much to benefit civilization as for the resources' own sake—did not exist. Instead, decisions were made in the halls of political power, and fundamental technical and scientific issues were too often brushed aside. Such a process is less likely to happen now because a suite of landmark laws were passed during the second half of the 20th century, giving us, among others, the Clean Water Act, Clean Air Act, Endangered Species Act, National Environmental Policy Act, and Marine Mammal Protection Act. The intent of these laws was to protect human and nonhuman living systems and to protect society from natural resource degradation: early in the 20th century, visible soil erosion and depletion were widespread and accelerating; wetlands were being filled in; migratory birds, including waterfowl, were being heavily hunted, sometimes to extinction; water resources were in decline; and old-growth forests were being liquidated.

In short, only in the last 30 or 40 years have we had laws under which various interest groups can litigate. These laws provide a foundation for all who wish to rein in resource policy decisions that seem intent on preserving 19th- and early 20th-century patterns of resource harvest and development, decisions that place a higher value on extracting from the "natural" than on protecting it for present and future generations. These laws underpin efforts to keep the benefits of resource exploitation, especially money, from flowing toward private parties while the consequences—like the contamination at Hanford and water supply in Portland—are absorbed by the public. The same laws also provide an opportunity for the proponents of increasing harvest or expanding development to argue in favor of such activity.

Yet I have often seen scientists whose research supports protection of certain resources accused of being biased. Terms and concepts such as biological or ecological "integrity" seem particularly irritating to a number of authors, to some because they feel that such terms should not be applied to nonhuman systems, to others because they feel that the terms imply a bias towards goodness or desirability. But Webster's dictionary defines the word *integrity* as simply "an unimpaired condition" or "the state of being whole or undivided" (Merriam-Webster 2004). In ecological contexts, neither the word nor the condition prescribes a specific goal for every place on Earth but, rather, a benchmark against which society can compare and evaluate places' current condition. The concept of integrity serves as a standard, a yardstick, much as normal human body temperature serves as one benchmark of a person's health. The benchmark provides a foundation for an informed judgment about resource status and trends.

And part of coming to an informed judgment about resource status and trends is consideration of the respective roles of native and nonnative species in a given living system. That nonnatives—not all of which are invasive—seem to be denigrated in the scientific literature on ecosystem management stems not from some ecologists' personal preference for natives but, rather, from the substantial negative consequences for local ecosystems and human economies that many nonnative species have. Consider just a short list of nonnative species with massive ecological and economic effects: purple loosestrife, kudzu, zebra mussels, shipworms, Dutch elm disease, feral pigs, starlings, brown tree snakes, green crabs, gypsy moths, and the microscopic parasite that causes whirling disease in trout. Recent evaluations show that nonnative species pose a threat to about 40% of species in

the United States listed as threatened or endangered under the Endangered Species Act—which, among other reasons, makes nonnative species important under the law. Moreover, the annual economic damage caused by nonnative species is estimated at about $120 billion (Pimentel et al. 2005). It ignores these and other facts to suggest that native and nonnative species should be considered equivalent in policy discussions.

Furthermore, understanding nature, natural systems, and natural science has a particular role to play this century. Four converging trends—human population growth, consumption growing even faster than population, the spread of environmental degradation, and an ever-widening gap between rich and poor throughout the world—have created a perfect storm of challenges for civilization's policymaking processes. How do we navigate this storm to overcome the spreading threats to human civilization?

Society is coming to recognize three truths:

1. Human success over the last 10,000 years derives from our ability to take from Earth's ecosystems, our natural resource base and the foundation upon which human social and economic systems depend (Figure 1).
2. Depletion of Earth's living systems (Chu and Karr 2001, Karr 2008) at local, regional, and global scales demonstrates that the way civilization has operated over the past 10,000 years has failed to sustain those systems, failed to sustain the foundation of our economies. From loss of soils to the loss of human languages, human actions are changing the face of the Earth (Figure 2). Arguably, halting or reversing continued losses in human and nonhuman living systems is the greatest challenge faced by 21st-century society.
3. Success in overcoming these trends depends on our ability to engage all knowledgeable scientists, scholars, and others and to integrate their knowledge into policymaking.

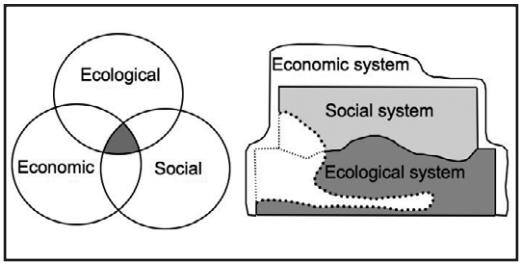

Figure 1. Relationships among the Earth's ecological, social, and economic systems are often depicted by a Venn diagram (left). A more appropriate depiction of those relationships is a layer cake. Human economies (the icing) are eroding the underlying social and ecological systems, threatening the foundation and the sustainability of all three systems. (Modified from Karr 2008.)

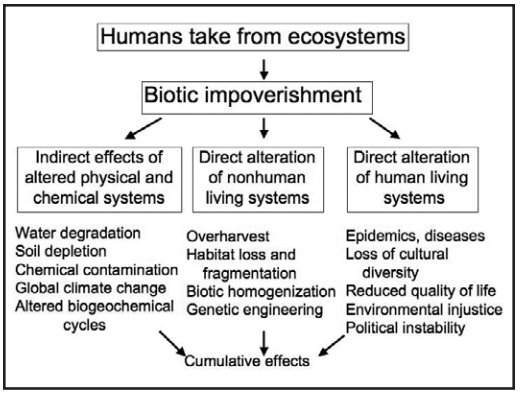

Figure 2. The many faces of biotic impoverishment. (Modified from Karr 2008.)

When it comes to policy discussions concerning natural systems and natural resources, we should not pretend that natural resource decisions taken by humans are not constrained by the need to sustain Earth's living systems.

An expanding body of law in the United States and other nations, as well as international agreements, explicitly calls for the protection of living systems and uses phrases such as biological or ecological integrity: the U.S. Water Pollution Control Act, now the Clean Water Act (1972); Great Lakes Water Quality Agreement (1972); Canadian National Park Act (1988); Kissimmee River (Florida) Restoration Project (1989); National Wildlife Refuge System Improvement Act (1997); National Parks Omnibus Management Act (1998); European Water Framework Directive (2001). These laws have recognized that protecting biological or ecological integrity involves protecting living systems' capacity to regenerate, reproduce, adapt, and evolve; that protecting living systems' integrity protects the temporal and spatial dynamics of ecosystems, including the diverse factors that are valued by and valuable to human society.

I suggest that the role of science in policy is not to advance one set of human values over another but to present policy-relevant evidence as an aid to

selecting policy options that comply with the law. If ecologists' or other scientists' evidence points toward the importance of "natural" states of being to understand and protect human well-being, then a statement supporting a policy choice that favors the "natural" expresses not a bias but a conclusion, a professional judgment, drawn on the basis of evidence. Resource scientists will not always agree with one another, but to exclude the entire group from policy discussions on the grounds that they are, by definition, biased would seem highly unlikely to serve society's needs.

Natural resource scientists, indeed all scientists, should participate in debates about policy alternatives for other reasons as well (Karr 2006). Their training and analytical expertise, coupled with detailed knowledge in particular fields of study, equip them to understand and explain scientific conclusions and to describe how that information is relevant to specific situations and policies. Scientists have benefited from public dollars provided by government to support their education and research. The public has a right to expect some public good from action based on scientific findings, but the public cannot benefit if scientists cannot discuss their findings in policy contexts. Finally, the training that scientists receive—to be curious; to be skeptical; to question scientific theories, assumptions, and conventions—also equips them to question the assumptions of public policy, law, and the implementation of law, especially when that implementation violates both the underlying science and the law.

Thus, in weighing the science-policy-preference debate, perhaps we should ask ourselves questions like the following: Should legal counsel be excluded from discussions of the law in relation to proposed policy decisions? Should physicians be excluded from discussions of the human health effects of policy decisions? Should engineers and architects be excluded from planning for new buildings or retrofitting old buildings to withstand earthquakes? Do we really believe that natural resource scientists should be sidelined because some continue to argue that any evidence in support of the "natural" is biased?

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