

FORUM

DOI: 10.1007/s00267-002-2812-6

Understandings of Environmental Quality: Ambiguities and Values Held by Environmental Professionals

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ABSTRACT / The terms used to describe and negotiate environmental quality are both ambiguous and value-laden. Stakeholders intimately and actively involved in the management of

forested lands were interviewed and found to use ambiguous, tautological, and value-laden definitions of terms such as health, biodiversity, sustainability, and naturalness. This confusing language hinders public participation efforts and produces calls to regulate and remove discretion from environmental professionals. Our data come from in-depth interviews with environmental management professionals and other stakeholders heavily vested in negotiating the fate of forested lands. We contend that environmental science and management will be more effective if its practitioners embrace and make explicit these ambiguous and evaluative qualities rather than ignore and disguise them.

The philosophy guiding this journal states: "As the principal user of the realm of nature, humanity has a major responsibility to ensure that its impacts on the environment are benign rather than catastrophic." The "impacts" that are defined, studied, and reported on these pages have the power to shape public discourse about the management and thus the future of our environment. As stewards of environmental knowledge, the editors and contributors to *Environmental Management* and related publications have an ethical obligation to acknowledge and examine the role that their knowledge plays in defining, negotiating, and ultimately shaping environmental quality. This paper addresses several of the challenges to meeting these obligations. Specifically, we set out to document that scientific terms used by environmental professionals are both ambiguous and value-laden when applied in the context of environmental management.

Terms such as health, sustainability, productivity, biodiversity, air and water quality, and ecological integrity exist at the interface between environmental science, policy, and management. These interface constructs are both descriptive and prescriptive, they tell us what *is* and they tell us what *ought* to be. Scientists use them to describe environmental conditions. Policymakers use them to set management goals. Managers

use them to target and evaluate outcomes. The public uses them to form and discuss expectations. These terms provide the language used to envision, negotiate, and manage environmental conditions (Eden 1996, Dunlap, 1988, Fischer 2000, Fitzsimmons, 1999, Norton 1998, Peterson 1997).

It is important to recognize the values imbedded in these interface terms because doing so allows us to recognize how our science can be used to advance competing political agendas. People are empowered or disadvantaged depending upon whether they have a scientific language with which to express their agendas. For example, environmental science prior to the 1960s developed concepts and understandings that served the management agenda of minimizing waste and maximizing efficiency. During and after the 1960s, however, the language and logic of ecology empowered a management agenda that emphasized nutrient cycles, carrying capacity, and biodiversity (e.g., Dunlap 1988, Worster 1994, Sagoff 1988). That is, the science of ecology provided a new language with which to envision and evaluate environmental quality and reconceptualize the goals of environmental management.

It is important that we also recognize the ambiguity of these interface terms. Ambiguity in the language used to define and negotiate environmental quality is problematic. Public participation in environmental planning is trivialized if different terms mean the same thing and similar terms mean different things. This ambiguity leaves the public understandably skeptical of environmental professionals.

KEY WORDS: Ecological buzzwords; Public perceptions; Communication; Forest planning; Normative knowledge

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The intent of this case study is to document the ambiguity and value-laden qualities of environmental terms used to describe forest environmental quality. We do this by interviewing people informed about forested environments and analyzing the ambiguity and values embedded in the language and logic these stakeholders use to define and discuss the environmental quality of forests.

Literature Review

Ambiguous Constructs

Ecological scientists, like other scientists, constantly operationalize, test, and redefine their constructs. Several hundred years ago the scientific literature was rife with debate about the definition and classification of species [e.g., Linnaeus versus Buffon (Worster 1994)]. Community, energy flow, and ecosystem were all topics of heated debate in the early and mid-part of the 20th century. As we will illustrate through this literature review, debates continue in the scientific literature. Theoretical, empirical, logical, and emotional arguments defend and critique competing definitions of biodiversity, ecological integrity, environmental health, sustainability, and other measures of environmental quality.

Health. Many competing definitions of forest and ecosystem health exist. Forest health has been defined, clearly with an economic motivation, as the degree to which commercially valuable trees are threatened by risk factors such as insect, disease, and fire (e.g., USDA Forest Service 2001). Similarly, ecosystem health has been defined as the system's ability to provide a steady flow of goods and services to meet human needs (Rapport and others 1998). And with considerably less economic focus, health has been defined as the ability of an ecosystem to maintain its functional, structural, or historic components (Mageau and others 1995, Ross and others 1997). Some definitions of health use terms such as "homeostasis," "diversity," "complexity," "stability," "resilience," and "balance" (Costanza 1992), while others argue that these qualities do not exist, contending that health is not a useful concept for characterizing open and dynamic systems such as ecosystems (Fitzsimmons 1999, Suter 1993, Wicklum and Davies 1995).

Natural. Nature, natural, and naturalness are among the most contested terms in the English language (Everndon 1992, Glacken 1967). Because so many different definitions exist, it has been argued that nature and naturalness are too subjective to serve as meaningful land management goals (Hull and Robertson 2000,

Schrader-Frechette and McCoy 1993). Paleocology and environmental history document that nature is constantly changing and many different and possible natural conditions exist—from the rocks and ice that dominated Earth some 5 billion years ago to the birth of organic life some billion years later to the warmth and lushness of the Jurassic era to the ice ages of several thousand years ago. Angermeler (2000) summarizes some of the debate over developing a scientific definition of naturalness. He defines naturalness not as an all-or-nothing quality, but as the degree of change along four dimensions: (1) the degree that conditions change outside the range of natural variability, (2) the duration the change is expected to last with and without inputs of cultural energy, (3) the spatial extent over which the change occurs, and (4) the abruptness with which the change occurs [see Anderson (1991) and Povilius (2000) for related but competing definitions].

Sustainability. Most definitions of environmental sustainability are similar in that they appeal to intergenerational equity for justification; that is, we have needs to meet today but we must respect that others will have needs to meet in the future. However, the definitions often do not agree on what will be sustained, for how long, and for whom. Sustainable forestry, for example, typically refers to concerns about the sustained yield of merchantable timber from forested lands (Salwasser 1990). Other definitions focus on sustaining environmental capital so as to ensure the continued ability to produce not just timber, but recreation, water, or other as yet undefined goods and services that future generations may desire (Noss 1995). Another definition emphasizes the sustainability of small towns, economies, cultures, and lifestyles that depend upon distributed, rural, agricultural, extractive industries, i.e., the Jeffersonian ideal of an agricultural democracy (Burkhardt 1989, Gale and Cordray 1994). Less anthropocentric definitions emphasize sustaining all biological entities regardless of their utilitarian values (Callicott and Mumford 1997, Noss 1995). Not surprisingly, sustainable development, the predominant buzzword in global environmental discourse, has been described by numerous authors as an ambiguous contradiction of terms (Lele and Norgaard 1996, Peterson 1997).

Integrity and biological diversity. Integrity is often defined as an environmental condition that exhibits little or no human influence, maintaining the structure, function, and species composition present, prior to, and independent of human intervention [i.e., integrity is closely associated with ideas of naturalness, particularly the notion of pristine wilderness (Angermeler and Karr 1994, Callicott and others 1999)]. Regier (1993) provides a rare exception, defining integrity as compat-

ible with human settlement (including not only "primitive" but also modern societies). Species composition and biodiversity are key parts of most definitions of integrity. While biodiversity is a term that evokes nearly unanimous support as an indicator of environmental quality, there remains considerable debate about its justification and definition (Takacs 1996). There also exist unresolved disputes over the connections between biodiversity, stability, resilience, fragility, integrity, health, and other ecological quality constructs (Westra and Lemons 1995). Biodiversity is often defined as the diversity and distribution of native species present at some presettlement time, but it can be extended to smaller units of nature such as diversity of genetic material within a species or to larger units of nature such as diversity of ecosystem structures and functions (Heywood 1995, Noss 1995). There seems some agreement that integrity is the "highest order" construct of environmental quality—an ecosystem with integrity is necessarily healthy, sustainable, and relatively biodiverse, when compared to a system with less integrity. There also seems general agreement that human intervention can produce healthy and sustainable ecosystems, but that such systems are less likely to have integrity.

Based on this review, we see that environmental quality is often defined in terms whose definitions are interwoven, complex and sometimes tautological: a sustainable system is healthy, a healthy system is diverse, a diverse system is natural, naturalness is sustainable. Integrity represents the highest level of environmental quality, but its characterization of humans as *apart from* nature rather than as a *part of* nature make it a difficult goal for environments that are actively managed to produce goods and services.

Embedded Values

Applied environmental sciences, like medical sciences, are, for the most part, goal driven (Eden 1996, Robertson and Hull 2001, Sagoff 1985, 1988, Schrader-Frechette and McCoy 1993, Worster 1994). They seek to improve or reduce damage to valued units of nature such as ecosystems, species, humans, crops, and communities. Forest ecologists, for example, study forest dynamics with an eye towards improving the efficiencies of timber production. Conservation biologists, as another example, study habitats so as to enable species protection. For both of these sciences there exists a purpose behind the research that emerges in stark relief when one compares the topics and justifications of articles published in their leading journals

(e.g., *Forest Science* and *Conservation Biology*). The terms used by these scientists reflect their purposes.

Numerous studies document the values embedded in ecological constructs. For example, Lele and Norgard (1996) show how sustainability cannot be defined without imposing values. Takacs (1996) examines the history of biodiversity and shows that in many applications it merely cloaks romantic values associated with wilderness appreciation. Scarce (1999) shows how salmon biology tends to serve the interest of scientists' affiliation (i.e., hydroelectric industry or US Fish and Wildlife Service). Shrader-Frechette (1995) critiques the partially disguised and poorly defended ethical assumptions embedded in definitions of ecological integrity. Hull and Robertson (2000) examine the values embedded in health, integrity, and naturalness. Worster (1994) provides a very readable history of ecology, showing how ecological theories and constructs have been accepted, rejected, and modified in response to changing cultural influences and expectations.

Before analyzing the values evidenced in our interviews, we developed a framework for organizing people's values. It is based on public interviews and surveys by Kempton and others (1995) and on basic environmental ethics texts (e.g., Botzler and Armstrong 1998, Hargrove 1989, Rolston 1988). Five basic value systems were identified, each with their own implications for definition and management of environmental quality: biocentric, ecocentric, utilitarian, aesthetic, and spiritual.

Biocentric and ecocentric perspectives grant moral standing or rights to nonhuman units of nature. From a *biocentric* perspective individual organisms hold rights that must be respected. These rights are intrinsic or granted because the organism is conscious, feeling, and/or purposeful. A range of rights can be granted, including the right to life, freedom, and pain-free existence. Obviously, there is ample room for negotiation about the types of organisms that qualify for rights and which rights they deserve. Environmental quality defined from a biorights perspective focuses on the well-being of organisms (i.e., their health, happiness, pain). The *ecocentric* perspective is slightly broader. Rights are granted to systems of nature larger than the individual organism, such as species, communities, populations, ecosystems, and biomes. Environmental quality defined from an ecocentric perspective focuses on the integrity, stability, and existence of these larger units of nature.

Anthropocentric values for environmental quality focus on concerns that revolve around human welfare and comfort. Human rights and concerns dominate the rights of nature. *Utilitarian* values emphasize those pieces of nature that directly serve humans

as economic resources or commodities (water, wood, game species of wildlife, recreation, etc.). Enlightened self-interest values are closely related. It is in society's self-interest to minimize environmental conditions that adversely impact human health and economic productivity. Enlightened self-interest values extend to ecosystem services on which society depends and currently uses free of charge, such as water and air purification, oxygen production, soil generation, and protection from ozone. Environmental quality defined from these anthropocentric perspectives emphasizes the production of valued ecosystem services and the maximization of human health and comfort now and into the future.

Somewhat less tangible anthropocentric values for the environment derive from the *aesthetic* qualities of nature and the experiences they produce. Nature's vastness and unpredictability provide experiences that are not just scenic but also inspire insights into the human condition. By experiencing and studying nature, some people profess to learn lessons about life's true values and real meanings. These often romantically inspired values are deeply embedded in North American culture and reflected in the writings and deeds of environmental icons such as Henry David Thoreau, John Muir, and Aldo Leopold, and Edward Abbey. Environmental quality motivated by these values becomes defined in terms of scenic beauty and outstanding opportunities for seclusion, solitude, and primitive experiences.

Considerably less tangible, but still anthropocentric, are *spiritual* reasons to value the environment. The major world religions speak about a god's creation or relationship with nature. There is active debate about the type of environmental ethic that organized religions do or should promote (Oelschlaeger 1994). Kempton and others (1995) found that a majority of people used religious arguments to justify a more cautious and caring land ethic (i.e., to "care for God's Creation"). A related and equally popular value for nature is the heightened sensitivity, self-awareness, or connectivity to spiritual insight provided by nature-based experiences. Recreationists frequently report finding god in nature or being more aware of their spirituality when they experience vast, wild places that make them feel small and humble. There are many definitions of environmental quality that result from this perspective, ranging from protecting/preserving "God's Creation" to minimizing any interventions that would interfere with nature serving as a conductor of divinity.

Methods

We asked people to define and explain environmental quality. We intentionally kept our initial questions vague so as to let participants introduce the terms they deemed relevant. Once introduced, we asked specific questions designed to elicit detailed definitions of and values for each term.

Participants

We identified (first from our own contacts and then through snow-balling) 44 persons intimately involved in various aspects of forestry in the southwest Virginia portion of the Southern Appalachian Ecosystem. We purposely sought to represent a broad range of values, concerns, and understandings of the environment held by people within the forestry community and present in discussions about forest management. By interviewing people from different interest groups, we hoped to hear a diversity of perspectives and agendas. Eleven participants were or had been associated with the USDA Forest Service. Ten people were leaders or very active members in environmental organizations influencing forest management and planning. Eight people specialized in offering advice to forest landowners—three extension foresters, three independent consulting foresters, and two industrial foresters. Four people earned their living harvesting/logging trees. Five people were scientists and professors employed by or retired from two major universities. We interviewed six additional people because they owned forested land. However, during the interviews we learned that at least half of the 44 respondents owned forested land of some type.

We were particularly interested in how the language of environmental quality shapes public negotiations, so almost half of our participants were selected because of their involvement in the on-going planning process of a national forest. Ten of the Forest Service personnel and 12 other interviewees (scientists and environmental organization leaders) were heavily involved in various aspects of the Forest Service planning process.

Procedure

Based upon our ongoing work on this subject and detailed discussions with natural resource professionals, we developed a semistructured interview guide designed to reveal assumptions and understandings about the environment. The interview began with general questions about the person's involvement with natural resource management. The next question asked people how they defined and understood the environmental quality of specific forested settings with which they were familiar. In

their responses, people mentioned a variety of terms, including soil quality, productivity, sustainability, biodiversity, naturalness, and forest/ecological health. We then asked that they explain the reasoning behind their definitions. We probed with specific questions about each term, forcing interviewees to define how their particular definition of environmental quality produced environmental quality and to explain why it mattered or why it was valued. Finally, we asked questions about how nature works and whether human management could improve upon the environmental quality nature produces.

Interviews lasted 20–90 min. All but one interview was tape recorded, and each of these was transcribed verbatim as its own document and imported into QSR NUD*IST (1997), a qualitative data analysis computer software program that we used to organize our analysis. Approximately 238,000 words were transcribed to form the database for this study.

Analysis of the interview data sought to identify discursive themes and patterns. The analytical process was iterative. Theme identification evolved through repeated analysis of the original transcripts. A coding scheme for the interview data was developed and refined over several months. The interviews were coded into NUD*IST, a program that facilitates organizing and summarizing textual units into a structure such as that presented below. Intermediate results were presented to forestry professionals and also mailed to half the participants as a member check. Responses to these presentations were used to modify our organization and understanding of the discursive themes. While our method of data collection and analysis are guided by the work of numerous discourse scholars, a valuable reference text is the work of social psychologists Potter and Wetherell (1987). Publications with similar purpose and methods include Peterson's (1997) work on sustainable development, Takacs' (1996) work on biodiversity, and Scarce's (1999) work on salmon.

We use quotes from the interviews and provide related insights from the literature. Direct quotes from the interviews are denoted with quotation marks. The lengthier quotes are attributed to a specific respondent (i.e., Environmentalist 1, Landowner 3, etc.). Where an ellipsis occurs in a direct quote, it is because the respondent paused, repeated a word, or stuttered. Deletions, insertions, or the addition of emphasis to the text are noted with brackets (i.e., [insertion]).

Results

Ambiguous Definitions of Environmental Quality

While most respondents for this study are respected and accomplished environmental experts with consid-

erable first-hand experience managing forests, they nevertheless had difficulty answering our query: "What is good environmental quality of a forest?" After some general discussion each respondent introduced one or more interface terms such as health, naturalness, biodiversity, productivity and sustainability. These terms were typically used interchangeably and tautologically. For example, "... This sort of helps define ... what I would define as a natural system. The, especially when you get to larger scales, the natural systems, the environmental quality, and ... health of a system that can sustain itself, I think is ... is dependent upon diversity [Forest advisor 2].

The interviewees struggled when asked to define their terms more precisely. One of our primary conclusions is that enormous ambiguity and tautology exists in the ways people use terms to describe environmental quality. The same term means many different things and different terms are used to define similar environmental conditions. Readers may dismiss this finding as irrelevant, arguing that precise language should be expected only in a scientific context, such as in journal publications. However, the formal context of our interviews (where researchers from a university were asking questions about terms central to participants' professional expertise) seems as plausible or appropriate as other contexts to evoke precise, reasoned, and professional responses. We argue that there is no reason to expect less precision in our interviews than would be found in equally (and often less) formal public participation efforts in which environmental experts influence environmental decision-making.

Health. When people mentioned "health" as a way to define environmental quality, we then asked them to define the concept in more detail. Many definitions were offered. Some definitions focused on the productivity and merchantability of trees using terms such as "vigorous," "growing," "reproducing," and "producing fiber." Similar definitions focused on minimizing threats to tree productivity from "pest," "disease," "parasites," and other stressors that "degraded" tree health. Other definitions applied a broader geographical and temporal scale, focusing not just on trees but also on larger units of nature such as "ecosystems" and "forests." Health was defined as the system's "resilience." Healthy forests and ecosystems could "spring back" or "snap back fairly quickly" from disturbances such as "insects, disease, fire, wind storms, ice," "hurricane or a flood" because they are "stable" and "have a better chance of long-term viability." Health also was associated with a system's "diversity." Healthy forests and ecosystems had "all their pieces," "all forms of nature were there."

A healthy condition also was defined as a "natural" condition. It is the "normal" or "historic" condition that would exist "without any human intervention." Such a condition had "native" species, and is characterized by "old growth" and "climax" conditions. Finally, health was associated with "clean water" and "clean air." "Clean" reflected anthropocentric concerns about drinking water (i.e., factors that "pollute your wells"). "Clean" also reflected ecocentric concerns such as the impact of air and water on the whole "terrestrial system, diversity, variety of life . . . productivity and . . . the health of the elements and components in the system that's dependent upon that water."

Thus, definitions of health generated by our questions reflected the full range of definitions found in the literature and were tautological in that health was defined using other interface terms (e.g., naturalness, water quality, diversity, productivity, sustainability).

Natural. When our respondents mentioned "nature," "natural," or "naturalness" as a way to define environmental quality, we asked them to define their intended meaning in more detail. Some definitions of natural conditions referenced "normal" conditions or conditions that "belong" and are "supposed to be." By refusing or being unable to be more specific, respondents merely made a rhetorical switch of one ambiguous term for another—normal for natural. Other definitions tautologically defined naturalness as the characteristic of places where there occur "natural" disturbances (e.g., "fire," "insects," "disease") and "natural" processes ("water," "nitrogen," "energy," "life," "food chain").

Very few definitions of naturalness employed the pristine myth. Terms such as "pristine," "virgin," "original," and "authentic" were used infrequently (4, 2, 3, and 0 times, respectively). Most people seemed to recognize that humans had heavily modified the forest. A few people commented about the impacts of Native Americans, but suggested that these impacts were minor and acceptable. Somewhat more common, but still infrequently mentioned, naturalness was defined as a condition unconstrained by human activities, management, and/or manipulation (e.g., "trees living on their own"). "Wild" was used to describe this condition of nature that is relatively free from current human control. A forest previously manipulated by humans could regain its wildness if people left it alone. For most respondents naturalness also implied limited perceptual "evidence of humans" currently controlling or present in the landscape. A natural place is characterized by the absence of contemporary humans, their anthropogenic structures, sounds, smells, and regimes. Naturalness also implies the absence of ecological pro-

cesses humans have set in motion (e.g., "free of exotics"), as well as the absence of humans living in the landscape. Following this reasoning, naturalness was most frequently defined by referencing the antonym "artificial."

Many elaborate reasons were offered to explain why naturalness promotes environmental quality. Even though the reasons are presented below as distinct categories, people typically used multiple reasons in their explanation for why nature knows best. Some people explained that a supernatural force created nature and that "God," "Gaia," or "Mother Nature" set in motion a perfect system. Some people explained that natural conditions possess high environmental quality because species and systems of nature produced by "evolution" are assumed right or "best" for an area. "Natural selection" has "improved" them. These natural conditions were necessarily of high quality because they had survived the "test" of time.

About half of our sample group argued that natural conditions were likely better than human-produced conditions because history had shown that human technology often does more harm than good. They argued that the environment is "incredibly complex," that humans "lack . . . control over natural influences" dominating environmental change, and that "unpredictability" of disturbance and evolutionary events makes forecasting future conditions difficult or impossible. Others suggested that nature was "balanced" or in "harmony" and that there exists an "equilibrium" in nature due to "forces" that "heal," "improve," and guide nature. It was suggested that an ecosystem functioned like an organism with "self-perpetuating," "self-maintaining" processes that allow it to "heal itself." Interviewees explained that nature's balance results from the interconnections among environmental factors, species, populations, ecosystems, and eventually the biosphere. That is, the complex interconnections in the "web" of life produce some force that holds things together and creates a semblance of balance.

Our questions generated definitions of nature and naturalness that reflect the full range of definitions found in the literature. Furthermore, naturalness was tautologically defined using other interface constructs (e.g., health, diversity, resilience).

Biodiversity. The people we interviewed also mentioned "diversity" or "variety of life" as a way to define environmental quality. When they did so we asked them to define these ideas in more detail. Many definitions were offered. Some definitions focused on the "variety of species" or "species richness," primarily focusing on plant and animal species. Other definitions of diversity focused on the temporal and spatial distribution of

living material in the ecosystem. In particular these definitions focused on trees as the dominant species. Greater "age-class" variety, for example, was desired by some. Conversely, stands of uniformly old or young trees located in large contiguous areas were bad. Humans could manage this type of diversity through forest silviculture. Another definition of diversity focused on the variety in forest "structure." Environmental quality was higher in forests that had variety in vertical structure (i.e., "five-layer canopy," lots of "under story" and "layers in the forest" as well as "big trees"). Interestingly, biodiversity was not defined as being healthy, natural, or sustainable. However, the reverse did occur (i.e., people defined health, naturalness, and sustainability as conditions possessing biodiversity). We conclude that biodiversity is viewed by our participants as a more specific term. Nonetheless, there remains multiple definitions and ample ambiguity.

Productivity and sustainability. People also mentioned forest productivity and sustainability. The detailed definitions offered by respondents for these two terms were similar enough that we lumped them together into a single category. Most definitions emphasize the ability of the forest to sustain a production of goods and services valued by humans. High environmental quality was defined as a condition that could produce a high degree of commodity benefits for a long time. Some definitions focused specifically on resources such as "timber," "wildlife," and "water," but other definitions focused on the underlying "regenerative capacity" of the ecosystem or the long-term "productivity of the soil." "Health," "diversity," and even "naturalness" were used to describe the conditions that would ensure sustainability, making it very difficult to define sustainability independently of these other constructs. As such, sustainability and productivity, just like the others, are defined tautologically with the other terms.

Water quality. Water quality, more than air or soil quality, was frequently and specifically mentioned as a way to define environmental quality. It, too, had multiple definitions. High water quality could be "clear" water, "clean" water, "normally occurring" water, or water free of "erosion" and "siltation," making this definition almost as vague as the others. Likewise, this construct was used interchangeably with other terms: healthy, sustainable, diverse forests had good water quality.

Other interface constructs. Other terms such as "native" and "exotic" were mentioned frequently but usually within the context of explaining one of the other constructs, hence we folded them into those definitions. Ecological integrity, to our surprise, was explicitly identified only once and was defined as a forest possessing

"the full complement of structures and components functioning as they should in a healthy manner." Given that integrity is a term increasingly found in the theoretical literature, we had thought it might be more prevalent in our discussions with environmental practitioners.

Values Imbedded in Definitions of Environmental Quality

The following lengthy quote provides a striking example of how different values create different definitions of environmental quality and how these imbedded values are believed by some to confuse and derail negotiations about forest environmental quality. A self-described "tree-hugging" environmental activist argued that the environmental qualities of two nearly identical forest sites—one cleared by burning, the other cleared by a timber harvest—were interpreted as possessing different environmental qualities because one site was evaluated economically and the other one ecocentrically. He explained that forestry professionals with utilitarian values had described the burned forest as "destroyed" because the burned trees were "wasted." He said these same professionals described the nearby timbered forest as "regenerating" and of acceptable environmental quality. In contrast, the interviewee, who valued forests for aesthetic and ecocentric reasons, believed the burned forest had higher environmental quality than the logged area because the fire recycled rather than removed nutrients and because soil was not compressed by harvesting equipment. This person astutely noted that these different assessments of environmental quality for essentially the same piece of land were the result of different values:

You can ride up there on [interstate] 64 up on Afton mountain and if you [are] headed east there is 400 acres up there that got hit [by a fire.] [Delete two lines.] And that area looks so much nicer than the area right across on the . . . I guess the western side of I64. . . [where] they just logged the hell out of it. [Delete 5 lines.] [They] told us those 400 acres were *destroyed*, but yet if you have those same foresters they'll look down on those clear-cuts and say that's a *regenerating* forest. And aesthetically the burned area is much more aesthetically pleasing and biologically it is much more intact because the biomass hasn't been removed, the soils aren't compacted, the salamanders haven't been smashed, the snakes are still there. Sure you'll get turtles that will die but turtles have been around fire probably a lot longer than humans have been around fire. They can deal with it. They've dealt with it for millions of years. They can deal with it for millions more if we could leave them alone. Again, [how] all this ties in is that a forester says that area of the fire *destroyed* that area because he wants to get in and log it. And then that area that he gets in and logs, that's reforestation he's doing there. *Reforestation* with a chain-saw [Public Informant 9, emphasis added in italics].

In this section we document the values embedded in various definitions of environmental quality. After asking people to define environmental quality we asked them to tell us why it mattered that the environment possessed the qualities they just described. The purpose behind this question was to expose the values, reasons, and agendas that lie behind the use of each definition. Regardless of the difficulty people had defining environmental quality, they clearly placed high value on it. All respondents assumed that promoting or protecting environmental quality was good, while degrading environmental quality was bad. However, they differed in how they defined environmental quality and why they cared about it. We categorized people's reasons for valuing environmental quality following the scheme used by Kempton and others (1995) introduced in the literature review.

Biocentric and ecocentric values. Biocentric values include the rights (to life, to pain-free existence, etc.) of each living organism, while ecocentric values apply to the rights of collectives of living things (i.e., species and ecosystems). Despite a very vocal animal rights lobby at the national and global levels, not one of our respondents explicitly argued for granting rights to individual living organisms. One person came close, arguing the need to protect "... all other living creatures in the world besides ourselves," but even this person was not explicit about granting rights to individual organisms. However, the ecocentric value system was mentioned frequently. Interviewees attributed value to environmental systems that do not "directly support" or improve the quality of life of humans. People argued that there is "value in a system even if it's not directly supporting what I'm doing," that it is good for "all of nature to survive," desirable to "protect" species from "extinction," and to minimize harm to "whatever used to live there." Several people specifically expressed frustration with management strategies focused solely on generating hunting revenues from game species such as "bear or deer or turkey" at the expense of nongame species. Ecocentric values were associated with definitions of environmental quality found in health, naturalness, and biodiversity. Even the definition of forest productivity that emphasized sustaining the "regenerative capacity" of the ecosystem was justified at least once using ecocentric arguments concerned with the ability of all species, not just timber species, to survive.

Anthropocentric more than ecocentric or biocentric values dominated peoples' justifications for environmental quality. Values ranged from the income generated by timber to less quantifiable and more diffuse "ecosystem services." Also mentioned were the many aesthetic, spiritual, and recreational benefits people

derive from nature, regardless of whether these benefits can be assigned economic value.

Enlightened self-interest. All respondents seemed to value the flow of ecosystem services on which human life depends, explaining that it is in our own self-interest to sustain "our life support system." In addition to specific examples ("breathable air," "drinkable" water, and prevention of "fire, floods, and landslides") some justifications noted that "the long-term survival of our species" was inextricably linked to environmental quality. For example, there was the "need to keep young trees growing" for the "oxygen" that they "give off." Several justifications specifically noted links between environmental quality and human health by noting that if we degrade environmental quality we might "end up hurting ourselves." Enlightened self-interest values were associated with all of the interface constructs. That is, definitions of health, naturalness, biodiversity, sustainability-productivity, and water quality were justified using enlightened self-interest reasons.

Utilitarian. Most respondents mentioned general and specific economic values that flow from nature. The language of multiple use was quickly and confidently introduced to describe why environmental quality mattered: "wood," "water," "range," "recreation," "wildlife" for "hunting," and "forage." These resources were valued because they were directly or indirectly consumed by humans and, more specifically, because they provided "money in your pocket." A few justifications reasoned that it was "wasteful" not to take full advantage of the resources nature provides: "just like your vegetables in your garden, if you don't pick your tomatoes when they're ripe, they rot, and they go to waste, same thing with the trees." Not all utilitarian values were focused on the current generation or on economic returns. Several justifications explicitly mentioned the "duty" to future generations to keep "the environment in at least as good a shape as there is now." The "educational" value of high environmental quality was also noted, both as a source for scientific study and as a learning experience for young people.

Utilitarian arguments used by our interviewees were associated with all the interface terms, but especially productivity and sustainability. Valued environmental qualities were those that sustained the economic producing potential of the land. We found numerous instances where people expressed explicit concern about maintaining soil and water quality for this very reason. Management practices that erode soil or pollute water were unacceptable because they degrade the ability to generate income from working the land. Likewise, events such as forest fires or insect and disease out-

breaks were all viewed negatively from the standpoint that they damage the economic value of the forests.

Aesthetic, spiritual, recreational values for nature. Many of the people we interviewed justified their definition of environmental quality by telling us that high-quality environments create high-quality amenity experiences. American society has a long tradition of valuing natural-appearing landscapes and wild, primitive, nature-based experiences. People value the "scenery" and "recreation," but also value the "contrast" to civilization and the respite from "stresses" of urban living where one can "relax, or get out of the hustle bustle." Natural environments were also valued as a "place of power" where one finds spiritual fulfillment and moral lessons: a place to repair the "hole in people" caused by modernity's production-consumption culture.

Aesthetic, spiritual, and recreational values were associated with all definitions of environmental quality, but those conditions that minimized human intervention were more highly valued for these reasons. Some human modification or "development" degrades scenic vistas and wild experiences, and human crowding degrades primitive experiences and solitude. Likewise, "manicured" and "manipulated" settings and built structures that "keep bringing you back to society" hinder the escapist/contrast recreation opportunities that some people value.

Several conclusions can be drawn from our analysis of the reasons people used to justify their definitions of environmental quality. First, an individual typically expressed multiple values. For example, someone explaining the utilitarian benefits of a managed nature in one part of the interview might later justify environmental quality using ecocentric values. A second important conclusion is that most environmental quality terms were justified using multiple values. Different people valued the same environmental quality for different reasons, often expecting different outcomes. Health provides an example. Health valued for utilitarian reasons emphasized environmental conditions that minimized threats (e.g., fire and insect) to trees that would decrease merchantability. Health valued for enlightened self-interest reasons emphasized environmental conditions that ensured long-term reproductive capacity of ecosystem services. Health valued for ecocentric reasons emphasized environmental conditions that provided diverse and available habitat for wildlife. Finally, health valued for aesthetic reasons emphasized environmental conditions that have big, old trees. We conclude from these findings that different values may produce different desire outcomes for the same term. Stated in different words, the values motivating the definition matter almost as much as the definition in

determining the precise characteristics of environmental quality implied by the term.

Discussion and Implications

Environmental decision-making is a tournament of competing agendas. Some values and beliefs are held up and exalted, others are dismissed and ignored, and still others are implicit and unnoticed. Stakeholders compete in this contest of meaning and interpretation to advance their agendas through the science they advocate, through the terms they use to define environmental quality, and through the management goals they champion. To compete successfully in this tournament, participants must recognize the values and ambiguities of the language used to discuss and describe nature. Of particular importance are the terms used to describe ecological conditions because they may become the goals for policies and management.

Our results demonstrate that terms used to describe and negotiate environmental quality are both ambiguous and value-laden. We base this conclusion on two sources of evidence: (1) competing definitions are being debated in the scientific and professional literature and (2) experts intimately and actively involved in environmental management on forested lands provide ambiguous and tautological definitions of these terms. The same term (e.g., health) is defined such that it can describe and prescribe many different environmental conditions. There is so much ambiguity within each environmental quality buzzword that people championing the same term could value it for very different reasons and expect very different management outcomes.

Implications of Ambiguity

The ambiguous definitions of environmental quality may deceive and obscure negotiations. Peterson (1995), for example, found paralyzing conflict between environmental regulators and the landowners being regulated. The conflict was attributable, in part, to differences between the groups' definitions and values of soil quality. They agreed on the need to protect soil quality but differed in precisely what quality they would protect and in why they would protect it.

During the course of our study we attended many public meetings being conducted as part of US Forest Service planning efforts. An instance during one such meeting illustrates how problems with language can derail environmental negotiations. At the beginning of the meeting the facilitator wrote on a board eight issues that summarized the "common ground" that had been identified over the previous months of planning: "pro-

vide clean water; help threatened and endangered species; conserve biodiversity; maintain scenic quality; protect Appalachian Trail and Blue Ridge Parkway experiences; provide for a variety of recreation opportunities; promote forest health; [and] continue multiple use." The facilitator reviewed these goals and made several observations relevant to this study. It was explained that at least two very different definitions of biodiversity had been discussed: (1) the diversity of species such as deer and grouse that can tolerate disturbances and (2) the diversity of species such as salamanders and migratory songbirds that cannot tolerate disturbances. It was stated that no consensus existed regarding which definition to adopt. The speaker proceeded to describe the near universal acceptance of forest health as a goal, but admitted that "nobody knows what it means." None of the attendees objected to these conclusions. Moreover, no subsequent discussion about these two environmental qualities occurred that night. Instead, the meeting focused on how the Forest Service plan should respond to the other issues. Thus, health and biodiversity were essentially removed from negotiation because stakeholders lacked a sufficient language to talk about them. One of the leaders of an environmental group active in the planning process expressed his frustration with this situation during a private interview:

The most vexing is the term forest health. When they started the forest planning process, they had this process by which we had these meetings with all these diverse publics and we talked in broad, sweeping generalities. No one talked about anything specific in these meetings. They [the Forest Service] were looking for where the common ground in all the forest stakeholders were, and one of the few things that everyone could agree is that everyone wanted a healthy forest It just meant completely different things to different people [Environmental organization leader 1].

Other people involved in the Forest Service planning effort were even more explicit regarding their concerns about ambiguity because they feared that public participation was made meaningless by it. In essence, these people worried that whoever implemented the plan might not interpret the terms with the same intent as the plan's negotiators. Forest Service personnel recognize this challenge when they defined management prescriptions for particular pieces of the forest:

In some cases yes, there needs to be some standardization. Of course nobody trusts the Forest Service. I shouldn't say nobody. It's just so mind-boggling, because you're dealing with your committee of scientists, you're dealing with all these upper levels in this whole grand scheme of things and we try to apply that stuff down on the ground, go to a public meeting, it's very difficult to try to get everybody talking

the same language. Pick any of these prescriptions at random, set up . . . [a meeting among two active public stakeholders], the local landowners, the adjacent landowners and you would get a different interpretation on what . . . [the management prescriptions] mean. We are getting down to arguing about words, because a word can change the flavor of an entire prescription [Forest Service informant 3].

Because of these concerns about ambiguity several of our interview participants (both within and outside the Forest Service) advocated *removing* "as much discretion as possible" from those charged with implementing the plan. These participants specifically advocated tightening and controlling the language that defined environmental quality.

I can read a term and think it means one thing and somebody else will look at it and think it means something else. . . . If the language doesn't say precisely what they [Forest Service] can do and what they are restricted from doing, then my experience has been that they will do things that you didn't think they were going to be doing because you interpreted something one way and they're going to interpret it something entirely another way . . . [delete several lines that provided an example]. That's why I'm saying we need to take as much discretion away from that agency as possible to make it very clear to them and the public what indeed they are going to do out here [Environmental organization leader 10].

Obviously, for some people, the ambiguity in these terms makes suspect the decisions made by environmental professionals. A possible response to a loss of confidence or trust in a profession or agency is to restrict its discretion. For example, regulations that greatly restrict or entirely prohibit the practice of forestry have been imposed as the public loses confidence in the forestry profession's ability and commitment to maintain forest quality (Martus et al. 1995).

Implications of Values in Definitions of Environmental Quality

Two major issues deserve discussion: (1) values exist in the technical language used to define environmental quality, despite persistent claims that scientific knowledge is value-neutral and objective; and (2) these values are both appropriate and necessary. Our finding of values imbedded in the language of environmental quality is consistent with claims made by scholars who have long argued that applied ecological science is necessarily normative (Eden 1996, Sagoff 1985, 1988, Scharader-Frechette and McCoy 1993, Worster 1994). Rather than challenge these claims of normativity, or attempt to purge their language of values, environmental professionals should admit that these values exist and act accordingly (Norton 1998). Environmental professionals are in a powerful position because their status as experts gives them extra influence over the language

used to describe and negotiate environmental quality. Controlling the language gives them the power to shape environmental negotiations by limiting the ideas that are considered legitimate and open for consideration (Peterson 1997).

Again, USDA Forest Service planning provides an example. Some stakeholders in our study implied that the Forest Service exercised unfair power in the forest planning process by controlling the language of environmental quality. The professional and scientific (technocratic) approach to Forest Service planning tends to dismiss some people's understandings of the forest because they are deemed to be "emotional" and "nonscientific." If the public introduces concerns that the Forest Service cannot translate into its language of "objective" environmental qualities and multiple uses, then the Forest Service rejects those concerns. Issues that are not "technical" are considered "opinions" beyond or outside the scope of issues that the planning effort can or should deal with. Without the power of a recognized language, people cannot have their issues heard, let alone have them included in the negotiations.

Our suggestion that values are both appropriate and necessary merits further discussion. To be effective, terms that exist at the interface between science and policy cannot be free of social value or contextual relevance. To function in their prescriptive roles they must reflect the values, norms, and goals of the society for which the environment is being managed. If a term fails to reflect the environmental qualities society understands and cares about, it is likely to be ignored or ineffective in influencing environmental decisions, regardless of how scientifically precise, reliable, and theoretically rigorous a measure might be. Forest management decisions, for example, are decisions that require landowners and vested stakeholders to make trade-offs among a variety of potential benefits and costs such as short- and long-term economic return on investment, regional water quality, habitat for hunting, intrinsic rights of wildlife, biodiversity, and the like. To be effective in informing these trade-offs, the terms describing forest conditions must correspond to conditions valued by stakeholders and motivating negotiations about land use. There exists a growing literature directed towards environmental management and science arguing for a more open and explicitly normative language (e.g., Bergquist and Bergquist 1999, Fischer 2000, Norton 1998, Robertson and Hull 2001)

The challenge, then, to environmental science and management, is to develop constructs that are not just descriptively precise (hence powerful scientifically at describing situations) but also evaluatively thick (hence

powerful politically at making decisions that involve trading off one value for another). Scientists and managers receive a great deal of assistance defining environmental qualities that serve *anthropocentric* values (Sagoff 1985). Social, political, and economic systems identify environmental qualities such as drinkable water, profitable timber, carbon storage, scenic beauty, and huntable species that are valued by society. Environmental sciences then produce knowledge that allows managers to describe and control the environment in ways that maximize and sustain production of these qualities. In contrast, environmental scientists and managers face a more difficult challenge defining environmental qualities that serve *ecocentric* values. Stated crudely, environmental professionals rather than the social-economic-political process define the qualities of nature that matter. These environmental professionals are put in a position where they must speak for nature. As experts about the environment, scientists and managers are expected to help society both identify and define the environmental qualities that have rights deserving protection. It is typically the language and logic of ecology that is used to select these qualities, not the language or logic of economics or politics. Sagoff (1985) calls this the "two tasks of ecology." Environmental professionals have a dual role: they identify the ecologically significant units and develop the means to describe and control the qualities of those units. For definitions of environmental quality that reflect utilitarian values, scientists and managers receive feedback from social-political-economic systems as to whether their measures and theories about environmental quality are targeting valued social needs. That feedback loop is weaker for the ecocentrically-motivated definitions. While there are members of the public who try to speak for the environment, they have considerably less power than do environmental professionals at developing the language of nature. This dual role of environmental science and management creates important ethical responsibilities. Executing these responsibilities is especially challenging because the sciences and scientists are generally unwilling to even acknowledge the value-laden, prescriptive component of their language let alone actively engage in a process that makes these values explicit.

Not only should environmental professionals strive to make the values more explicit to and representative of stakeholders, they also should be sensitive to the possibility that values hidden in the terms they develop hinder and paralyze participation in negotiations about environmental quality. It is common in professional environmental management journals to find pleas that the public be educated because, presumably, once ed-

ucated, the public will more likely agree with the conclusions of the professionals. The professional forest management literature is full of suggestions that links "good" forest management with "scientific" forest management. Environmental professionals rarely question the ability of science to guide environmental management. Suppose, however, that it is not ignorance of science that the professional environmental community is battling, but rather that the public holds different values than environmental professionals and current environmental science lacks a language to describe the environmental qualities that protect these values.

What environmental professionals may intend as education, others may perceive as propaganda—not because these nonprofessionals are uninformed or uneducated about environmental quality, but rather because they do not share the values that underlie many of the definitions of environmental quality used by professionals and scientists. Repeating the message that environmental management (e.g., forestry) does not harm or even enhances environmental quality may be useless in changing public opinion if this opinion is based on definitions of environmental quality motivated by values different than those held by the public. Failure to recognize and respect these different values may only further alienate those opposed to traditional environmental practices and make the public increasingly suspicious of environmental professionals.

Conclusion

A sustainable society depends upon that society's ability to negotiate and achieve a sustainable environmental quality. Achieving sustainable environmental quality is as much about setting goals as it is about allocating resources and implementing the management to achieve these goals. The definitions of environmental quality are critical because these definitions serve as the standards, goals, and visions of desired future conditions. But, as we have illustrated here, definitions of environmental quality are ambiguous and value-laden. Scholars are beginning to propose methods by which public understandings of environmental quality and the discourse of environmental management might be improved through more democratic processes of participatory enquiry, citizen science, and collaborative decision making (e.g., Fischer 2000, Irwin 1995, Lee 1993). We contend that environmental science and management will be more effective if its practitioners embrace and make explicit this ambiguity and normativity rather than ignore and disguise it.

Acknowledgments

This project was sponsored by the USDA Forest Service North Central Experiment Station.

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