

Public Understandings of Environmental Quality: A Case Study of
Private Forest Land Management in Southwest Virginia

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(ABSTRACT)

Environmental quality is a construct that has currency at the interface between science and policy—it is used both to describe current conditions *as well as* prescribe desired future conditions. However, environmental quality has a multiplicity of definitions, owing to: a) the fact that there are a number of terms (or “sub constructs”) taken to be synonymous with environmental quality (i.e. environmental health, sustainability, biodiversity, integrity, and the like), and b) the fact that each of these sub constructs, in turn, have multiple meanings. Many in the field of natural sciences have been working on this problem of ambiguity—attempting to develop precise and powerful definitions. Still others argue that environmental quality is a concept open to societal negotiation (in addition to scientific discovery). In this thesis, I argue that environmental quality can be understood and discussed by examining understandings of Nature and evaluations for Nature that seem to contribute to the ambiguity of meanings and outcomes for environmental quality.

To reach these conclusions, I interviewed 24 stakeholders who represented a broad range of concerns about and interests in environmental quality on private forest land in Southwest Virginia. I reviewed nearly 300 pages of interview text, looking for emerging themes and structures from their hour-long (on average) discussions of environmental quality. I found that among these 24 stakeholders, there were indeed, many ways of

defining environmental quality (i.e. health, biodiversity, site productivity, et cetera). Additionally, I found that these different definitions for environmental quality seem to correlate with different understandings of Nature (what is Nature like?) and different values for Nature (how should Nature be used?) I conclude by discussing these implications, using examples from forestry outreach and extension.

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Chapter 1: INTRODUCTION

At the interface between ecological science and environmental policy exist numerous constructs used to describe environmental quality (concepts such as integrity, stability, sustainability, productivity, and health) (Callicott, Crowder, & Mumford, 1999; Goldstein, 1999). These interface constructs are of interest here because 1) they direct scientific inquiry that describes environmental conditions, 2) they are used to set policy goals and evaluate management outcomes, 3) they inform and reflect public perceptions and expectations of environmental quality, and 4) they are ambiguous and thus open to multiple definitions. These interface constructs should be of interest to scientists, policy makers, managers, and other stakeholders because the terms are both descriptive (scientific) and prescriptive (normative). They are used to describe what *is* and to negotiate what *ought* to be. The values inherent in these constructs may unknowingly bias policy deliberations when they are used to define “Nature” or “environment” or “quality” in ways that privilege some stakeholders while discouraging and eliminating other positions from consideration. Likewise, the ambiguous definitions of these terms may deceive or obscure negotiations because seemingly similar terms describe dramatically different environmental conditions and seemingly different terms describe remarkably similar conditions.

Purpose

The purpose of this thesis is to examine how the language of environmental quality is currently being used in the management of private forestlands in Southwest Virginia. To accomplish this purpose the author interviewed stakeholders vested in the management of private forested lands and organized these discussions around the definitions, explanations, and indicators people used to discuss and explain environmental quality. More specifically, the purpose of this project is to: (1) unpack, examine and illustrate the myriad implications and definitions embedded in different terms used to describe forest quality; (2) uncover some of the rhetorical devices people use to explain their normative

positions and justify their definitions of environmental quality; and (3) make explicit the physical indicators people use to perceptually identify environmental quality on the ground.

I expect to find a great deal of ambiguity in peoples' definitions and explanations of environmental quality, but I do not propose that this ambiguity can or should be eliminated. I believe it futile to search for a single descriptive definition of environmental quality for use in the education, extension, science, and policy of forests. There is not one Nature or one guiding scientific understanding of Nature that can provide an irrefutable, descriptive definition of environmental quality that applies to all situations. Rather, there exist multiple, equally reasonable, environmental outcomes that can be described and prescribed—thus the appropriateness of a definition/prescription depends upon the context. It is assumed that forest owners and land management professionals will operate effectively within the context of ambiguity if they better understand the extent and causes of the ambiguity. In fact, Peterson (1997) argues that the ambiguity encourages needed discourse because the ambiguity, if recognized, forces negotiators to define what they mean and how the terms apply in each unique setting.

Nor do I suggest that the values and normativity of these interface constructs can be discarded or replaced with neutral objectivity. Science, especially applied sciences such as forestry, is inherently normative. The terms used to describe Nature reflect the purpose for which Nature is being described. Rather than ignoring or subverting the normative, prescriptive qualities of these terms, I believe that these values need to become explicit. In the literature review, I argue that definitions of forest environmental quality will be more powerful for natural resource management if they are both descriptively precise and normatively comprehensive.

Literature Review

Literature from the fields of environmental ethics and management, ecological theory and practice, and from professional and land management organizations have been reviewed

to identify some of the concepts used to describe and discuss environmental quality. The following review describes some of these issues in an attempt to develop an organizational framework by which definitions of environmental quality are explained and understood.

Forestry as a Case Study

The management of private forestland provides a particularly rich setting within which to explore issues related to defining environmental quality. Surveys of private forest landowners (who in states like Virginia own over 70% of the forested land base) (Birch, 1996) show a high and increasing level of concern about environmental quality. Private forest landowners (PFLs) are motivated by increasingly varied, complex, and often competing management objectives. Scenery, naturalness, and solitude are now more popular management goals than timber production and game management (Birch, 1996). Additionally, decreasing size of ownership and increasing numbers of owners suggest there is a greater diversity of people involved in forestry and hence a greater diversity of explanations, perceptions, and definitions of forest environmental quality (DeCoster, 1998). Forestry needs to articulate a language of environmental quality, a way of explaining and understanding forest management that makes forestry relevant and effective to this diverse audience. The general public (including previous, current, and future PFLs) may demand forest conditions that the science of professional forestry does not currently describe. Educational programs intended to influence landowner management and/or shape public opinion about forestry may be misguided or ineffective if the language confuses or misrepresents key ideas. And, natural resource policy debates may be less effective and more biased if the varied explanations for forest quality are hidden or ignored.

Many in professional forestry look to forest and environmental sciences to define these terms and construct this language (Eden, 1996; Nelson, 1999; Smallwood, Beyea, & Morrison, 1999). Calls for public education on the scientific principles of “sound” forestry are regularly made in the trade journals and echoed repeatedly in the forestry

community. Outreach programs are devised to remedy limited knowledge of the recipients (Jones, Luloff, & Finley, 1995). Letters written by forestry special interests (e.g. the Society of American Foresters) to the current policy-makers consistently defer to ecological science as justification for their preferred outcomes for management of public forests. And, more subtly, laws, regulations, best management practices, and policies are full of terms that empower science by giving it the authority to define environmental quality:

- Local forestry regulatory and extension agencies work toward the goal of protecting and developing healthy, sustainable forest resources (Virginia Department of Forestry, 2001).
- Private forest industry supports the goals of forest health and sustainable forestry (Weyerhaeuser, 2001).
- In legislation introduced by the 106th Congress, public forest management is directed to “assure the health, sustainability, and productivity of the lands’ ecosystems; consistent with this objective, to ... establish a full range and diversity of natural habitats of native species in a dynamic manner over the landscape” (S.1320 § 102).
- The current Forest Service planning rule as required by the National Forest Management Act of 1976, attempts to “integrate[] science more effectively into the planning and management of national forests” to achieve the overarching goal of “sustainability” (Federal Register, November 9,2000; page 67,514).

But claims supporting science as the sole basis for this language deserve scrutiny given the diverse array of individual perceptions and understandings of forest environmental quality. Because interface terms are inherently prescriptive and hence normative, the sciences must be recognized as only one of the many stakeholders deserving voice in crafting normative positions.

The Prescriptive and Descriptive Qualities of Interface Constructs

The power of language to shape conservation goals is attracting the attention of scholars, policy makers and the public. The language used to negotiate desired future conditions of forests often evolves from or is grounded in ecological science. However, the

language ends up being used in prescriptive contexts of setting goals for management and defining desired future conditions of Nature. Thus these interface constructs often serve double duty: they are **both** descriptive **and** prescriptive, they tell us what is and they tell us what ought to be. However, ecological and forest sciences are generally unwilling to even acknowledge the normative, prescriptive component of their language let alone actively engage in a process that makes these values explicit. Yet philosophers of science and students of environmental management are advocating just that (Eden, 1996; Fuller, 1993; Norton, 1998; Sagoff, 1988). They propose that these sciences develop a language of ecology that is explicitly both prescriptive and descriptive.

The challenge, then, to ecological and forestry science, is to develop constructs that are not just descriptively precise (hence powerful scientifically at describing situations) but also evaluatively rich (hence powerful politically at making decisions that involve trading off one value for another). Forest management decisions are decisions about socially valued environmental conditions. They are decisions that require a landowner and vested stakeholders to make trade-offs among a variety of potential benefits and costs (i.e., short and long term economic return on investment, regional water quality, habitat for hunting, intrinsic rights of wildlife, neighborhood solitude and aesthetics). To be effective in informing these trade-offs, the terms describing forest conditions must correspond to conditions valued by stakeholders and motivate negotiations and decisions about land use. In other words, they must reflect the values, norms, and goals of the society for which the environment is being managed. They must reflect the qualities of the environment that society cares about and is willing to allocate its limited resources to maintain. Regardless of how descriptively precise, reliable, and scientifically rigorous a measure might be, it is likely to be ignored or ineffective at influencing management decisions if it fails to reflect environmental qualities society understands and cares about (Bergquist & Bergquist, 1999; Norton, 1998; Rapport et al., 1998).

Site index, basal area, mean annual increment, and sustained yield are examples of environmental quality constructs used in forestry that contain both prescriptively and descriptively meaningful information. A great deal of effort is devoted by forest

biometricians to make them descriptively precise, accurate, and convenient. But, they have currency and power in many circles of forest management only because forest economists have made them prescriptively relevant by relating these measures to economic *value* available from sale of fiber. While there is a wealth of measures that *describe* forest conditions of economic *value* there is a paucity of measures that describe other potential benefits and costs of forest management. As a result of this bias in language, negotiations about forest management are necessarily biased towards those few forest qualities that can be measured, and about which we have a language to discuss. Hays (1987) describes examples of how the scientific, descriptive language of environmental management has changed over the last few decades to reflect new normative, prescriptive concerns such as water quality, wildness, and forest health.

Peterson (1997) provides a particularly insightful critique of language used to shape land use policy. Using multiple case studies of “sustainable development” she identified two distinctive and contrasting forms of discourse: technological and creative. Technological discourse is the descriptive aspect, from whence the language of environmental quality originated—grounded in ecological science. Technological discourse favors numerically derived results, broad in their generalizability and precise in their predictive and explanatory power. It attempts to provide explanation for what is without regard to what should be—values are stripped from the language (or buried so deep they cannot be seen) in order to favor objectivity. Finally, technological discourse tends to describe Nature reductionistically—the whole can best be understood by simultaneously describing the parts. Creative discourse, on the other hand, is used to ask what environmental quality ought to be. Going beyond and sometimes diminishing the descriptive characteristics of ecological science, creative discourse seeks to widen the realm of alternatives. Qualitative results, context, and other non-traditional information are given standing alongside of empirical description and explanation. Multiple ways of explaining reality are allowed to coexist, and values such as spiritual values and aesthetic values are accepted—abandoning the traditionally supposed objectivity of Nature. Finally, Nature is talked about holistically, emphasizing interconnectedness.

The interplay between the technological, descriptive discourse and the creative, prescriptive discourse is very apparent in the language and discussions surrounding the idea of environmental quality. Forestry, as indicated earlier, tends to emphasize technological discourse. I follow Eden (1996), Norton (1998), Fuller (1993), Peterson (1997), and Sagoff (1988) and others and attempt to discuss environmental quality using both prescriptive and descriptive discourse simultaneously. As such, the next section is a review, not only of descriptive characterizations of environmental quality, but also of the prescriptive implications evidenced in the rhetorical explanations and justifications for particular definitions of environmental quality.

Environmental Quality's Constructs

Ecological scientists, like any scientists, constantly operationalize, test, and redefine their constructs. At the turn of the last century the scientific journals debated the definition and classification of species taxa. Community, energy flow, and ecosystem became the topic of heated debate in the early and mid-part of this century (e.g. Clements, Gleason, Odum, etc.). Presently the journals are full of theoretical, empirical, logical, and emotional arguments for competing definitions of environmental quality. I will review some of the current debate by focusing on four terms: health, sustainability, biodiversity, and integrity. More specifically, I will (1) differentiate these specific terms from the wide variety of words and phrases used to describe various aspects of environmental quality (see Table 1), (2) show how each of these four terms are (sometimes tautologically) used to describe and define the other three in the scientific literature regarding environmental quality, and (3) describe how these terms are applied specifically to forestry.

Table 1. EXAMPLES OF CONSERVATION CONSTRUCTS

Abundant (plentiful)	Environmental Restoration
Adaptive Management	Exotic (alien, noxious, invasive) Species
Air Quality	Fragmentation
Authentic (old, original, pristine)	Focal Species
Conditions	Health
Baseline	Historic Range of Variability
Best Management Practices	Indicator Species
Biodiversity	Integrity
Biogeography	Interconnected Web
Biological Diversity	Keystone Species
Biological Integrity	Landscape Ecology
Climate Change	Native Species
Climax	Natural (undisturbed, not managed)
Continuous (not fragmented)	Natural Processes
Corridor	Nutrient Cycle
Critical Habitat	Productive
Cumulative Effects	Reforestation
Ecological Diversity	Resilience (resilient to change)
Ecological Integrity	Resistant (to change)
Ecological Rehabilitation	Regulated (managed)
Ecological Restoration	Scientific Management
Ecological Services	Soil Stability (to erosion)
Ecological Sustainability	Stable
Ecosystem Functions	Sustainable Development
Ecosystem Management	Sustainable Resources
Ecosystem Processes	Wild (untrammelled)
Endangered (threatened, rare) Species	Water Quality
Environmental Rehabilitation	

Health

Within the last decade the concepts of forest and ecosystem health have received a great deal of attention. Many definitions of health are based on an analogy to human health. To what extent the human health analogy may be appropriately applied is the focus of the considerable scholarly debate. Some argue that the health analogy should be applied only loosely (if at all); the term health assumes inherent ecosystem qualities that are unsubstantiated by scientific evidence (Suter, 1993; Wicklum & Davies, 1995). These critics of the analogy argue that health implies that ecosystem and forests are physical superorganisms (e.g., as advanced most notably by Clements), ideas that have very little (if any) scientific standing in the field of ecology today. On the contrary, ecological scientists now accept the arbitrary, subjective, and historical nature of units of Nature such as “ecosystem” as descriptive concepts rather than an objective reality (Chapman, 1992). Additionally, the critics argue, the structure of ecosystems and forests (open and dynamic) don’t match the structure of individual organisms (closed and relatively stable), and thus concepts like stable vital signs (e.g. temperature and heart rate in humans), which accompany a health metaphor, have little or no applicability in ecosystem or forest health.

On the other hand, many are impressed with the prescriptive power of health as a metaphor; hence the metaphor of “clinical ecology” has emerged (Rapport, 1995). While they acknowledge that the match between individual organism health and ecosystem health may not be exact (Rapport, 1995), they support the use of the health metaphor, which they argue can help to bridge the communications gap between scientists and non-scientists (Ehrenfeld, 1992; Norton, 1998; Rapport, 1995). Though vital signs may convey health more clearly for an organism than a forest ecosystem, ecosystems can and do exhibit resilience, self-maintenance and self-regulating properties on at least some levels of organization and scale (Wu & Loucks, 1995).

There exist many ways to define forests and ecosystems (Callicott et al., 1999; Kolb, Wagner, & Covington, 1995; Laughlin et al., 1993; USDA-Forest-Service, 1996). Forest health, for example, defined from a single product, utilitarian perspective refers to the degree to which commercially valuable trees are threatened by risk factors such as insect, disease, and fire. From a more holistic ecosystem perspective forest health often refers to maintenance of some functional, structural, or historic components of the ecosystem (Ross, Eyles, Cole, & Iannantuono, 1997). From this second (ecosystem perspective) health can refer to the preservation of “key ecological components” (Rapport et al., 1998), the maintenance of “homeostasis,” “diversity,” “complexity,” “stability,” “resilience,” and “balance” (Costanza, 1992) and “the ability of the system to maintain its structure (organization) and function (vigor) over time in the face of external stress” (Mageau, Costanza, & Ulanowicz, 1995). Finally, these two perspectives have been synthesized into definitions of forest health that emphasize both ecosystem “complexity” and provision “for human needs” (Laughlin et al., 1993).

Sustainability

The concept of sustainability, like the concept of health, has garnered acceptance in political and scientific communities (Callicott & Mumford, 1997; Chapman, 1992; Lele & Norgaard, 1996; Noss, 1995). And, as illustrated with health, there are multiple definitions. All of the definitions reviewed here acknowledge the need for intergenerational and intragenerational equity—we have needs to meet today, as others will have needs to meet in the future (Cairns, 1998; Callicott & Mumford, 1997; Chapman, 1992; Lele & Norgaard, 1996; Norton, 1995b; Noss, 1995; Salwasser, 1990). However, the descriptive definitions of sustainability differ from one another depending upon prescriptive concerns about what will be sustained, for how long, and for whom (Lele & Norgaard, 1996; Peterson, 1997; Sagoff, 1995).

Sustainable forestry typically refers to concerns about the sustained yield of economic resources, in particular timber, famously articulated by Gifford Pinchot in his statement: “the greatest good, for the greatest number, for the longest time” or even before that with

Marsh's (1864) concerns about the sustained benefit of humanity. These definitions are clearly anthropocentric, focusing on resources that have economic value or benefit to humanity (Noss, 1995). Broader interpretations focus on the sustainability of capital, whether in the form of natural capital such as the ability to produce timber and water or economic capital's ability to produce goods and services (Norton, 1995b). Another interpretation of sustainability often exposed by the forestry and agricultural professions is the sustainability of small towns, economies, cultures, and lifestyles dependent upon distributed, rural, agricultural, extractive industries—i.e., the Jeffersonian ideal of an agricultural democracy (Burkhardt, 1989). Alternatively, a less anthropocentric definition of sustainability emphasizes the intrinsic values of biological entities and the need for *ecological* sustainability (Callicott & Mumford, 1997; Noss, 1995). Debate over sustainability's various definitions often reflects concerns about humanity's ability to solve future problems. Cairns (1998), Burkhardt (1989), and others suggest that most definitions of sustainability implicitly or explicitly assume some level of faith (or lack of faith) in technology to create solutions to environmental problems.

There are many local, regional, national and global efforts afoot to attempt to clarify and operationalize sustainability by creating indicators for sustainability (e.g., Sustainable Seattle—www.sustainableseattle.org). Gale & Cordray (1994) have identified and described no less than nine different sustainability approaches that can be applied to the management of National Forests (Gale & Cordray, 1991). And finally, the flourishing discussions, negotiations, and formulations of standard criteria that certified (sustainable) forest products must satisfy is further evidence of the currency and importance that the term sustainability wields in forestry today (e.g. internationally certified sustainable forestry—www.fscus.org; American Forest and Pulpwood Association's Sustainable Forestry Initiative—www.afandpa.org/forestry/forestry.html).

Biological Diversity and Integrity

Other commonly discussed terms for environmental quality include biological diversity (hereafter referred to as biodiversity) and biological integrity. As is illustrated with other

constructs of environmental quality, these constructs have multiple prescriptive and descriptive definitions. Callicott et al. (1999) examine a large number of these constructs and concludes that both integrity and biodiversity are often defined from a biocentric perspective, placing some emphasis on the rights of Nature to exist rather than just emphasizing the flow of ecosystem goods and services that support human society. Crossley (1996) and DeLeo & Levin (1997) on the other hand, offer definitions of integrity that explicitly emphasize the flow of ecosystem goods and services valued by humans. The following section is a review of these constructs, and how they have been used to describe environmental quality.

Integrity is defined by some in a way that excludes or least significantly limits the inclusion of human influence in ecological systems (Callicott et al., 1999; Karr, 1995; Noss, 1995; Rapport et al., 1998). An ecosystem has integrity if it exhibits little or no human influence, maintaining the structure, function and species composition present prior to or independent of human intervention. As such, the common benchmark for judging integrity is pre-European settlement (Angermeier & Karr, 1994). Species composition and biodiversity are key parts of these definitions. Biodiversity, as it is often defined, represents the condition of native species diversity present at some pre-settlement time. But the descriptive concept of biodiversity can be extended to smaller units of Nature to include genetic diversity or to larger units of Nature to include structure and function of ecosystems (Noss, 1995). The unit of Nature selected for description often reflects the normative, prescriptive interests of the person or organization doing the defining. Concerns about diversity of ecosystem function and structure may reflect the agendas of those wanting to maintain the capacity of an ecosystem to produce economically valuable goods and services. Concerns about the composition of species diversity relative to pre-settlement times may reflect the agendas of those granting rights to Nature or valuing the aesthetic, spiritual, and moral values produced by a dehumanized Nature.

Another example can be found in the distinction between “native” and “exotic” species. Native species sometimes seem implicitly or unquestionably more valued than exotics

and species. Diversity produced through artificial means thus fails to produce ecological integrity. Often the reasoning behind these values is grounded in normative positions regarding the appropriateness of human involvement and concerns about a lack of historical precedent (Hull & Robertson, 2000; Kendle & Rose, 2000; Noss, 1990). While biodiversity is a term that evokes nearly unanimous support as a “feel good” indicator of environmental quality (Takacs, 1996), there remains debate about both its prescriptive and descriptive qualities. There also exists considerable debate over the connections between biodiversity, stability, resilience, fragility, integrity health and other ecological quality constructs (Guterman, 2000).

There is general agreement that integrity is the highest order construct of environmental quality—the authors reviewed here all mention that an ecosystem with integrity is necessarily healthy, and sustainable, and relatively biodiverse, when compared to a system with less integrity. There is also general agreement that healthy and sustainable systems may not necessarily have integrity. That is, there seems to be some agreement that through (wise, scientific, sensitive) management humans can produce healthy and sustainable ecosystems that don't have integrity. For this reason integrity is often used as a complement to the concept of health—integrity is applicable to situations that minimize human involvement, while areas with human settlement and management should strive to promote health (Karr, 1995; Rapport et al., 1998).

The concept of ecological integrity rarely surfaces in published discussions of forest management, perhaps reflecting the perceived incompatibility between human influence (management) and ecological integrity. On the other hand, biodiversity is frequently used with positive connotations as a way to describe forest conditions and prescribe forest management goals. In fact, the outcome of biodiversity is often used to justify management actions: clearcutting is said to increase habitat diversity for wildlife and thus biodiversity, streamside buffers increase the overall biodiversity, and so on. Some have even suggested that forest biodiversity should be preeminent as a forest management concern (Noss, 1999).

From this review of how environmental quality constructs are defined and used prescriptively and descriptively in natural resource management the reader can see their interwoven, complex and sometimes tautological Nature begin to emerge. Healthy is sustainable, self-sustaining is healthy. Biodiversity can indicate health and integrity, resilience and stability. Integrity is the highest order—in other words, it represents the highest level of environmental quality—but its characterization of humans as apart from Nature rather than a part of Nature make it a difficult goal for forestry that necessarily actively manages forests for fiber and other products. These different descriptive definitions often reflect different prescriptive values for Nature, though rarely explicitly. The following section explores the understandings and explanations of Nature often used to defend and justify definitions of environmental quality. This section intends to illustrate that, despite some claims of scientific objectivity to the contrary, the terms used to describe and negotiate Nature reflect deeper seated values and concerns of those doing the describing and negotiating.

Understandings of Nature that Influence Environmental Quality

In the previous section, I presented different constructs used to describe and define environmental quality. In this section, I discuss how and why these different descriptions and definitions are justified and explained. More specifically, I seek to answer the following questions: How do people suppose that Nature works? Do these suppositions influence their desired outcomes for environmental quality? (i.e. why they offer one definition of environmental quality over another). And, for what purposes should Nature be used? There exist many answers to these questions that reflect different understandings and valuations of Nature. These understandings and valuations surface as rhetorical devices people use to justify and explain their preferences for one environmental condition over another. Before going much further in specific discussion of what these understandings and valuations might be, it is necessary to demonstrate that different definitions of environmental quality and different expectations for the management of Nature do, in fact, result from different understandings of how Nature

works and from different valuations for how Nature should be used. Five brief examples are presented:

Management Implications of Four Lay Understandings Nature

Thompson, Ellis, & Wildavsky (1990) identify and describe four conceptual models that people use to explain and understand Nature. These models differ in their explanations of how Nature works. Most importantly for our purposes, these models also differ in their implications for how land should be managed. In the “Nature capricious” model, Nature is known as random. Disturbance can happen in any direction at any time. Humans are unlikely to understand or control these forces. Managers, therefore, must learn to cope with change and erratic events. The “Nature perverse/tolerant” model is a competing model of Nature. Here, Nature is stable enough to absorb some changes humans might cause, but it is still vulnerable to collapse or cataclysmic change if humans push too far. Management must therefore identify the limits to which Nature can be pushed (i.e., the sustained yield of a population) in order to minimize the chance of cataclysmic change. In the model of “benign Nature,” Nature provides a stable equilibrium. Nature returns to a stable state no matter how hard humans disturb the system. Managers can therefore adopt a laissez-faire attitude, because Nature will ultimately repair itself no matter how much it has been disturbed. “Nature ephemeral” is almost the exact opposite model of Nature. Ecosystems are “terrifyingly unforgiving” and fragile. Even small changes caused by human management may trigger collapse. Managers must treat ecosystems with great care and caution, their goal being to minimize human intervention in natural processes.

Law and Understandings of Nature

Wiener (1996) examines public understandings of Nature similar to the four models presented in the first case and suggests how these different understandings have shaped U.S. environmental policy. Weiner contends, for example, that in the first centuries of

the Union, Nature was commonly understood to be vast, stable, and resilient. U.S. policy encouraged the distribution and exploitation of land and its abundant resources. These understandings changed during the late 19th and early 20th century when Nature became viewed as stable but fragile and potentially degraded or made scarce through overuse. Accordingly, land use policies changed to conserve Nature, minimize waste, and practice sustained yield management. When Nature became viewed as possessing rights and being valued for its spiritual and aesthetic qualities, policy sought to preserve special units of Nature such as species and wilderness.

Hunting Preferences and Two Models of Nature

This third case study illustrates how understandings of Nature influence a specific environmental management strategy—hunting. Dizard (1994) studied public responses to management alternatives for the Quabbin Reservoir in Massachusetts (water supply for the city of Boston) and found differing “ideas of Nature” to be at the heart of a controversy regarding “active management” versus “natural regulation.” The reservoir managers believed that over-grazing by a protected and growing deer herd was preventing forest regeneration and thereby threatening the soil stability, water quality, and water retention capabilities of the reservoir. Dizard found, among other things, that many of the people opposed to active management (in the form of a deer hunt) used a “balance of Nature” argument to justify their preference for natural regulation. These people argued that Nature knew best and that forces such as “survival of the fittest” would balance the herd population at the proper (i.e., natural) level for the habitat. Others involved in the controversy (and Dizard himself) dismiss the balanced Nature argument as romantic idealism and a view of Nature that is inappropriate for the dynamic and humanized environment of the Quabbin watershed where previous environmental manipulations by humans (e.g., removal of predators, cultivation of species) are the “real” source of the current “problems.”

Management Preferences for Global Climate Change

In this case, Kempton, Boster, & Hartley (1995) interviewed and polled a diverse sample of Americans about their perceptions of environmental problems such as global warming and found that their understandings of how Nature worked influenced what they considered to be acceptable and appropriate approaches to environmental management. Respondents who understood Nature to be robust, dynamic, and safely manipulated by humans favored policies of adaptation and progress—that is, policies that applied human technology to improve or repair environmental situations. Those respondents who understood Nature to be frail and balanced, and who worried that human technologies were limited, favored policies of preservation and looking back in time towards what worked without human intervention—that is, removing human technology and influence and letting Nature take its course.

Kempton et al. (1995) *also* found that the models of Nature held by lay people were not the same as those held by people with expertise in environmental management (e.g., natural resource professionals). Lay people were more likely to believe in a balanced Nature, while experts perceived it as more erratic and dynamic. Lay people tended to believe Nature was frail and likely to fail domino style as if a chain reaction, whereas experts saw Nature as resilient, with redundant systems. Finally, lay people had less faith in human technology, generally being concerned that it could do more harm than good. In contrast, experts believed that Nature, while incredibly complex, could be understood and ultimately controlled with the knowledge that comes with time and study.

Changing Scientific Definitions of Environmental Quality

Historians of ecology (Barbar, 1995; Bocking, 1994; Botkin, 1990; Christensen, 1989; Sagoff, 1988; Shrader-Frechette, 1995; Worster, 1995) have extensively documented the changing understandings of Nature that have dominated the theories and methods of ecological science. For example, we are now well familiar with the shift in ecology from a paradigm based on the Clementsian view of ecosystems as supra-organisms that have

homeostatic properties and balance to the Gleasonian paradigm of ecosystems as random collections of individuals. This paradigmatic shift has produced dramatically different ecological theories and management prescriptions. A recent paper by (Callicott et al., 1999) illustrates a contemporary paradigmatic divide. Two contemporary schools of thought—compositionalism and functionalism—are based on different understandings of Nature, have fundamentally different assumptions about the role of humans in Nature, and are used to support dramatically different management decisions and agendas.

On one hand, “*Compositionalists* perceive the world through the lens of evolutionary ecology, an essentially entity-oriented, biological approach to ecology that begins with organisms aggregated into populations” (Callicott et al., 1999, p. 23). Humans are considered to be distinct from Nature and thus environmental quality is best when human modification is least. Conservation decisions based the compositionalist school emphasize the conservation of species and historically natural conditions (e.g., ecological restoration, biological integrity, native species). In contrast, “*Functionalists* perceive the world through the lens of ecosystem ecology, an essentially process-oriented, thermodynamical approach to ecology that begins with solar energy coursing through a physical system that includes but is not limited to the biota (Odum 1968)” (Callicott et al., 1999, p. 23). Humans are embedded within and not easily distinguished from Nature, and human management can improve, or at least not degrade, environmental quality. Conservation decisions based on the functionalist school emphasize efforts to provide sustainable ecosystem services and processes (e.g., ecosystem health and sustainable development).

The Explanations and Valuations Behind Environmental Quality

Below is a more detailed discussion of six issues that help distinguish and illustrate the different explanations and valuations people use to justify and defend their definitions of environmental quality and expectations for environmental management. These issues are: (1) human-Nature dichotomy, (2) Nature as balanced or dynamic, (3) Nature as a moral guide in the face of hubris, (4) Nature as evolutionary content or ecosystem

process, (5) Nature as complex and multi-scalar , and (6) Nature having multiple values. Peoples' understandings and values for Nature are subtle and ambiguous. These six issues provide conceptual landmarks that help guide the way in the ambiguous terrain of public understanding of Nature. They provide a structure I will use to guide the analysis in subsequent sections of this report. They help unpack, untangle, and understand how people speak about and understand environmental quality.

The Human-Nature Dichotomy

The Nature – culture dichotomy may not be a universal structure of the human mind, as Claude Levi – Strauss suggested, but it is so deeply ingrained in our everyday language that anyone trying to work around that dichotomy sounds at best idiosyncratic and at worst mystical (Ingerson, 1994, p. 44).

I include this quote to remind the readers (and the author) of the difficulty in thinking and speaking about Nature. Nature is one of the most complex words in the English language. It is notoriously difficult to discuss or use critically. Yet as I already suggested, and in this section attempt to illustrate, people's understandings and expectations about Nature shape how they define acceptable environmental quality and what they expect of environmental management. But what does it mean for something to be natural? Are humans and their actions natural? Is something natural better than something human-made, or visa versa? There are, of course, conflicting and disputed answers to these questions that have been the topic of considerable scholarly debate (Coates, 1998; Cronon, 1995; Evernden, 1992; Glacken, 1967; Hull & Robertson, 2000; Proctor, 1998; Worster, 1995).

Defining Nature and what constitutes naturalness turns out to be an almost impossible task. Angermeier (2000) offers one of the most thoughtful analyses from the perspective of biological conservation science. He suggests that the naturalness of ecosystems can be evaluated along four dimensions: (1) the degree of change caused by human intervention, (2) the extent to which the new conditions has been sustained over time (i.e., by import of

energy), (3) the spatial extent of the change, and (4) the abruptness, in ecological and geological time, of the change.

No single criterion is infallible in distinguishing natural and anthropogenic conditions. Tidal waves can cause large-scale, sudden, and dramatic ecological changes, but they exercise no sustained control over the changes. Beaver dams can cause sudden, dramatic, and sustained changes in a stream, but the effects are small in scale relative to most human dams. Although all human modifications to ecosystems are unnatural, my criteria would show that some are less natural than others (e.g., building cities versus herding free-ranging livestock) (Angermeier, 2000, p. 375).

Naturalness has also been defined from the perspectives of social science. This literature suggests that people are able to recognize a range of landscape conditions that count as natural. Mausner (1996) found that people effectively use five different construals (or schema) of naturalness: “totally natural,” “civilized natural,” “semi-natural,” “quasi-natural,” and “non-natural.” But, Purcell, Lamb, Peron, & Falchero (1994) found that people are more likely to agree on the naturalness of landscapes at the extremes of the continuum (e.g., forests vs. city street scenes) than on landscapes in the middle (e.g., agriculture and canals). Magill (1994) has suggested that people often misinterpret landscape features as “natural” when in fact they are, in fact, “man made”. For example, he found that some people believe forest clearings result from non-human causes when in fact they are the result of deliberate management practices. Historical ecology and environmental history are full of examples of landscapes that once were thought to be pristine but are now known to be the product of extensive and intensive management (Crumley, 1994; Fried & Huntsinger, 1998; McCann, 1999). Other studies have found naturalness to be associated in people’s minds with the relative absence of humans, the temporal or symbolic distance from contemporary culture of human caused landscape changes, and the opportunities for solitude and primitive experiences (Driver, Brown, Stankey, & Gregoire, 1987; Hull, Robertson, & Kendra, 2000a; MacNaghten, Brown, & Reicher, 1992).

Nature as Balanced or Dynamic

The notion of a balanced Nature implies that self-regulating properties maintain a balance and that an optimal or ideal condition of Nature occurs at this balanced condition. The Clementsian model of ecosystems as supra-organisms, for example, explained natural forces as ordered and harmonious, and looked for ecological systems to return to some equilibrium state in response to disturbance (Wu & Loucks, 1995). Worster (1995) describes how ecological science has shifted away from this understanding of Nature as balanced to an understanding of Nature as dynamic and historic. This shift, he suggests, is in response to broader cultural changes. In the early part of the twentieth century, cultural feelings of “national equilibrium” manifested themselves in the popular ecological theories (Ehrenfeld, 1992). A changing cultural worldview, including political upheaval during the middle part of the last century, was partly responsible for encouraging ecologists to reconsider traditional, status quo understandings and replace them with understandings reflecting chaos, change, and pluralism (Worster, 1995).

Regardless of the cause, contemporary ecology now builds theoretical models of Nature that include change and disturbance (i.e., dynamic equilibrium). This new ecology metaphor (non-equilibrium, dynamic, disturbance, chaos ecology) tells us that there is no single best, original, authentic, or correct Nature, no one natural state, no ecologically optimum environmental conditions. Rather, Nature has a history, there are many possible Natures that have and could exist, and which one should exist is open to discussion (Botkin, 1990; Pickett, Parker, & Fiedler, 1992; Zimmerer, 1994; Zimmerer & Young, 1998). Despite this recent interest with chaos and dynamism in ecology there may still exist some balance in the form of “meta-scale” properties such as hierarchical patch dynamics that have stabilizing mechanisms and resist disturbance and change on a large scale (Koetsier, Dey, Mladenka, & Check, 1990). Yet, contemporary ecology has moved away from the looking for balance toward explaining change (Wu & Loucks, 1995).

How might the understanding of a balanced Nature or a dynamic, stochastic Nature influence definitions of environmental quality and expectations of management? I

suggest that if an individual perceives Nature to be balanced, then Nature provides a guideline that should be copied. Nature becomes best when humans are removed from the system. On the other hand, if an individual perceives Nature to be dynamic, chaotic, and perhaps even arbitrary, then Nature proves to be an adversary that should be conquered or something random that needs to be controlled and improved. Moreover, if the direction of change is arbitrary then no one condition of Nature is any better or worse than another and human management can produce just as good, or better, conditions (Dubos, 1980).

Nature as a Defense Against Hubris: Faith in Technology

Uncertainty about human resourcefulness and technology also influences definitions of environmental quality and preferences for environmental management. Faith in technology can be used to justify extensive human manipulation and management of Nature because one has confidence that technology can fix any ecological harm that these alterations may have caused. On the other hand, minimal faith in technology can be used to justify policies that minimize human impact and instead follow Nature's path. An array of facts can be presented for either side of this argument. Ultimately it is a matter of faith. No one can know, in advance, if human ingenuity will be able to sustain the supply of natural resources on which human culture depends (Costanza, 2000; Lewis, 1995).

Nature as Evolutionary Content or Ecosystem Function

Callicott et al. (1999) reviewed above in the fifth case study contrasts two schools of ecological thought: compositionists and functionalists. Each school produces different definitions of environmental quality and different implications for environmental management. For example, concerns about evolutionary content place priority on maintaining species or assemblages of species as they evolved. Preferred environmental conditions are those with species in the relative abundances that would be present absent

human influence. Concerns about ecosystem function, in contrast, place more emphasis on the functions of the system than on the parts that do the functioning. For example, it places more emphasis on the ability to cycle nutrients and energy and less about which species do the cycling. Clearly, these two ecological schools are not distinct but represent extremes along a continuum on which ecological scientists find themselves. According to Callicott et al. (1999) most conservationists lie somewhere toward the middle of this continuum, “moving back and forth in emphasis depending on circumstances” (p. 24). The debate over which school (compositionism vs. functionalism or some combination of both) is the correct way of knowing and valuing Nature is evidenced in the rebuttals and rejoinders that followed publication of the 1999 article (Callicott, Crowder, & Mumford, 2000; Hunter, 2000; Willers, 2000).

Again, one can see how understandings and expectations of Nature influence and are influenced by the human-Nature dichotomy. The individual who sees humans apart from Nature emphasizes Nature’s plan as it has unfolded—i.e. evolutionary processes. The individual who sees humans as a part of Nature is less concerned with how the system got there, placing emphasis instead on understanding how it works (systems and processes) so that it can be made to continue in a beneficial way (orderly and predictable) for humans. For example, species that thrive with anthropogenic influences can replace species that do not, as long as ecosystem processes and functions are maintained to provide desired services.

Nature at Different Temporal, Spatial, and Organizational Scales

Nature is infinitely complex. Because Nature can be conceptually organized at many scales, multiple definitions of Nature exist, with no one definition more correct or objective than another (Levin, 1992; Norton, 1995a; Norton, 1998; Ross et al., 1997). These many ways of organizing Nature can produce different definitions of environmental quality. The organizational scale that one uses to perceive and understand Nature are by no means monolithic or widely accepted. In fact, the question of “which

scale?” is commonly raised in the search for solutions to environmental problems (Harwell, Gentile, Norton, & Cooper, 1994; Norton, 1995a; Norton & Hannon, 1997).

I have identified at least three different scales: temporal, geographic and organizational unit. The first scale, temporal, is the time frame one chooses to look at a particular environmental quality “event.” One can look at an environmental quality “event” in reference to metabolic processes, this coming winter, the coming ten year management period, the history and future of a centuries old forest, or the process of evolution—each temporal scale producing a different definition of environmental quality. On one hand, the “plans” of Nature are unveiled over long times, geologic and evolutionary. On the other hand, if humans are attempting to impose their own plans on the physical environment, it may be best to adopt a shorter, human time scale, so as to improve the manageability of Nature’s variability.

The emergence of temporal scale is especially poignant in debates over faith in technology. High faith in technology must necessarily have a “short-sighted” approach, technophiles must look to solve immediate problems with technology, rather than worrying about future problems. The “we’ll cross that bridge when we come to it” axiom comes to mind—our technology will solve future problems when they arise. In contrast, technophobes seem more likely to believe that time will prove Nature right. Eventually, over a larger temporal scale, technology will fail. Nature is too complex and chaotic to be controlled and the eventual result will be some cascading series of failed engineered solutions.

The spatial area over which the environmental quality “event” occurs is another type of scale that affects definitions and understandings of environmental quality. Does the event being examined / manipulated occur in a specific landowner’s forty acre woodlot, throughout a particular ranger district in a National Forest, or along the entire Appalachian mountain chain? Environmental quality concerns at the larger spatial scale would concern species migration, water flow and weather patterns. Environmental

quality concerns at a smaller spatial scale might concern species composition and soil stability.

Variability is greater at larger spatial and temporal scales (Harwell et al., 1994). For example, geographic scale emerges in debates over the inherent balance or dynamism to Nature. The geographic scale one chooses to conceptualize Nature influences whether one sees balance or chaos. Contemporary ecology tells us that change is the norm on smaller scales, but hints at the possibility of a meta-scale balance at larger spatial and longer temporal scales, as reviewed above. Over the smallest geographic scales, arguments employing a balanced Nature are hard to defend with contemporary ecology but one might be able to defensibly interpret order and balance if one looked at Nature from a “meta”-geographic scale (Wu & Loucks, 1995).

The organizational unit selected as the focus of attention is the third type of scale to affect definitions of environmental quality (Ruggiero, Hayward, & Squires, 1994). As evidenced in the compositionalist-functionalist distinction above, one can focus on ecological processes (e.g., nutrient cycles) or one can focus on ecological content (species compositions). The units one deems to be ecologically significant shape the theories, methods, and purposes of environmental quality measures. The choice of organizational unit can reflect the human-Nature dichotomy. For example, if environmental quality is defined in terms of serving human needs, then the maintenance and enhancement of ecological processes such as fiber production and water filtration / purification become the focus of theory and measurement. If environmental quality is defined as being or mimicking Nature, then ecological content such as native species and authentic conditions becomes the focus of theory and measurement.

Nature as a Source of Value

Humans value Nature for many reasons, and different reasons produce different definitions of environmental quality and different expectations of environmental management. There are many qualities that can be valued. Emphasizing an organism's

right to life produces a different set of concerns than emphasizing society's demand for cheap fiber. Below is the description of a framework for organizing people's values for Nature, based on public interviews and surveys by (Kempton et al., 1995). Five basic value systems will be reviewed, each with their own implications for environmental quality: biocentric, ecocentric, utilitarian, aesthetic, and spiritual.

A "biorights" perspective grants moral standing or "rights" to nonhuman life. From a biocentric perspective, individual organisms hold rights because they are conscious, feeling, and purposeful (make decisions). A range of rights can be granted organisms, including the right to life, happiness, pain-free existence, free range, and voting. Obviously there is ample room to decide the types of organisms that qualify for rights and which rights they deserve. Environmental quality within this perspective focuses on the well-being of organism (i.e., their health, happiness, pain). From a slightly broader ecocentric perspective rights are granted to systems of Nature larger than the individual organism, such as species, communities, populations, ecosystems, and biomes. Environmental quality defined within this perspective focuses on the well-being of these units (i.e., integrity, stability, freedom, existence).

Anthropocentric values for Nature focus on concerns that revolve around human welfare and comfort, ranging from the utilitarian (economic utility and enlightened self-interest) to the romantic (spiritual and aesthetic). Human rights and concerns dominate the rights of Nature. Utilitarian values emphasize those pieces of Nature that serve humans as economic resources or commodities (water, wood, game species of wildlife, recreation, etc.). A closely related value emphasizes environmental effects on human health. Environmental changes producing conditions that threaten human health are hence evaluated negatively. Also valued are the more indirect goods and services ecosystems provide such as water and air purification, oxygen production, soil generation, and protection from ozone. Costanza et al. (1997) estimate that functioning ecosystem services are worth at least \$33 trillion annually, several times the global gross national product. Environmental quality defined from these perspectives emphasizes the production of these resources and services, and the maximization of human health and

comfort. Value also can be placed on the ability to produce these goods and services in the future. Concerns about intergenerational equity motivate current generations to provide future generations with the ability to produce resources, and thus environmental quality becomes defined in terms of the sustained yield of these resources and ecological processes.

Somewhat less tangible anthropocentric values of Nature emphasize the aesthetic qualities of Nature and the experiences they produce. Nature's vastness and unpredictability provides experiences that are unavailable through human made art. Likewise, these experiences inspire some people to find insights into a natural law or moral code of behavior. That is, by experiencing and studying wild Nature humans learn lessons about "true" values and "real" meaning. 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 Edward Abbey (Oelschlaeger, 1991). Environmental quality becomes defined in terms of providing visual resources or outstanding opportunities for seclusion, solitude, and primitive experiences.

Considerably less tangible, but still anthropocentric, are religious or spiritual reasons to value the environment. The major world religions speak about a God's creation or relationship with Nature (Botzler & Armstrong, 1998). There is active debate about the type of environmental ethic organized religion does or should promote. Kempton et al. (1995) found that the majority of the lay people used religious arguments to justify a more cautious and caring land ethic (i.e., "care for God's creation"). A related and equally popular value for Nature is the heightened sensitivity, self-awareness or connectivity to spiritual insight. Often recreationists report finding God in Nature or being more aware of their spirituality when they are vast, wild places that make them feel small and humble in comparison. There are many definitions of environmental quality that result from this perspective, ranging from protecting/preserving God's creation to improving and cultivating ("subdue" and "till") what God gave humans (Oelschlaeger, 1994; Passmore, 1980).

Indicators of Environmental Quality

In the previous sections I have examined the constructs used to define environmental quality and the rhetorical devices used to explain and justify these definitions. Here the focus is on the physical indicators of environmental quality, a topic that is increasingly attracting the attention of both science and policy analysts.

“Indicators are designed to inform us quickly and easily about something of interest. They communicate information about conditions, and, over time, about changes and trends. Like economic indicators, environmental indicators are needed because it is not possible to measure everything.” (National Academy Press, 2000, p. 1)

Indicators condense information into a useful form. They provide a means to make sense out of an infinitely complex “environment.” Interested stakeholders must carefully negotiate indicators because indicators become the means of choosing and describing acceptable environmental quality. They are monitored to provide feedback about progress towards goals and thus make accountable the managers, policy makers, and others with responsibility for environmental conditions. Indicators can be used to allocate resources, to trigger management actions, and guide policy deliberations. In short, “indicators” are becoming the popular means to define, operationalize, and understand environmental quality see (Bergquist & Bergquist, 1999; Forest Stewardship Council, 2000; National Academy Press, 2000).

The focus here is on a narrow slice of the broader agenda for indicators—the use of indicators to provide immediate and perceptual feedback to stakeholders about environmental conditions. That is, I focus on how stakeholders recognize environmental quality on-the-ground. Nassauer, (1992:p. 240) argues: “If we can see that the landscape is not healthy, we might do something about it.... But we are unlikely to do that if we can’t see it (Nassauer, 1992).” Thus, these immediate and perceptual indicators are the

vehicles by which the visual landscape communicates ecological qualities and land stewardship ethics (Nassauer, 1988, 1992, 1995, 1997).

While there exists an emerging and already substantial literature on indicators, generally, there is an extremely limited literature on these physical, perceptual indicators that managers, landowners, and professionals use to evaluate the environmental conditions when on the ground. Abstract qualities such as biodiversity, ecosystem health and the like require sophisticated theory, technique, and analyses not available to all but the most highly trained scientists. Often they cannot be determined on-site but require synthesis and analysis.

Relatively accessible techniques are available for assessing the amount of timber and the fiber-productivity of the site, but determining sustained yield requires more information and remains controversial. There has been considerable study of perceptual indicators of forest scenic quality, but these assessments typically target a rather romantic vision of dehumanized Nature as the ideal for environmental quality. These perceptual indicators of forest scenic quality have an affective, non-cognitive aesthetic as their source (Gobster, 1996), although Orians in Takacs (1996) argues that humans do have an evolved innate ability to evaluate and appreciate biodiverse landscapes, irrespective of learned ecological information. Regardless, if environmental quality is to be successfully negotiated, perceptual indicators used to assess the visual landscape must correlate with the information on ecological conditions and consequences (Hull, Robertson, Buhyoff, & Kendra, 2000b; Takacs, 1996; Thayer, 1994). As such, with new ecological information that describes the natural world as more stochastic than deterministic (Botkin, 1990; Takacs, 1996), these Romantic perceptual indicators that emphasize stable and dehumanized landscapes will (must) be jettisoned in favor of new perceptual indicators.

Nassauer (1995) notes that meaningful perceptual indicators of environmental quality are the “cues-to-care” that “frame” messy but ecologically healthy landscape patterns. These *cues* that the public recognizes as *care* suggest environmental quality. Cues-to-care provide a “language” of landscape form that the public can “read,” and one that the

public reads to mean *good management*. Nassauer (1992, 1995, 1997) identified physical indicators of care in rural landscapes such as clean, mowed landscapes, lack of weeds and erosion, contour plowing, windbreaks, trimmed shrubs, plants in rows, fences, and wildlife feeders. These management interventions signal that the landscape is being tended and cared for by managers. Nassauer (1992) describes applying this aesthetic of care to the USDA's Conservation Reserve Program wherein millions of formally cultivated acres are now planted with perennial cover to provide wildlife habitat and soil stability. Many local residents originally saw the acreage removed from agriculture as ugly, weedy, and neglected. Adding cues-to-care to the landscape changed the appearance of a messy, abandoned and ugly landscape into one that is socially acceptable.

Hull et al. (2000a) studied lay people living in and around a National Forest, asking them to explain why the "health" of the forest mattered to them as well as to describe "how they would know it when they saw it." People were verbose in their explanations of why forest health mattered but struggled with their answers to the question about describing it. They offered a few general site qualities such as "big trees" and "no erosion" and a few indirect measures that they suggest represent Nassauer's "cues-to care" (i.e., evidence of management, litter picked up, signs describing management intentions). Overall the respondents were dissatisfied with their lack of ability to assess the environmental conditions about which they felt strongly. Hull et al. (2000a) speculated that negative reaction of many people to timber harvesting (especially clearcutting) resulted from people's insecurity in knowing how to assess environmental quality and worrying that any large-scale change caused by humans might therefore be a bad change.

As seen in the existent literature on indicators, how people identify environmental quality is important in terms of successfully negotiating and defining environmental quality. Additionally, there is a likelihood that the constructs used to define environmental quality, the understandings of and values for Nature, and the perceptual identifiers of environmental quality are linked, though extricable only with difficulty. In the next section, I outline how I sought to extricate these manifold perceptual nuances in

environmental quality by interviewing PFL stakeholders here in Southwest Virginia, and then analyzing their conversations.

Chapter 2: METHODS

Overview

Because of the ambiguity in ecological constructs (reviewed earlier) there is reason to believe that quantitative research may not disclose the full range of participants' understandings of environmental quality. Thus, this research uses a qualitative and inductive method. The intent and rigor of this study follow in the research tradition set forth by the scholars that study alternative understandings (i.e., social constructions) of Nature such as Ross et al.'s (1997) work on "health," Peterson's (1997) work on "sustainable development," Takacs' (1996) work on "biodiversity," (Lele & Norgaard's (1996) work on "sustainability," Cronon's (1995) work on "wilderness/Nature," and Scarce's (1999) work on "salmon." While these methods of data collection and analysis are guided by the work of discourse scholars in a number of disciplinary fields, a valuable reference text is the work of social psychologists (Potter & Wetherell, 1987).

Setting

I chose to study PFLs because my professional affiliation in the Department of Forestry at Virginia Tech made this group interesting and relevant. I focused my attention on people with vested interests in the management of private forestlands so that the respondents would be speaking about something they knew, cared about, and were actively involved with. I expected a diverse range of opinions because forest management often finds its way into the news and the courts due to conflicting expectations about what is appropriate. It is assumed that some of this conflict is attributable to the different, multiple, and often competing, values and understandings of environmental quality held by vested stakeholders. The focus is on several counties in southwestern Virginia because they were familiar and convenient.

Interview Participants

The author conducted 24 individual, semi-structured interviews with interested participants involved in the management of area non-industrial private forestland. While it would be difficult to represent every possible interest in private forestland, I identified five stakeholder groups. I hoped the groups would respond with a broad range of opinions: forest advisors (consulting, extension and industry foresters), forest scientists, forest landowners, loggers, and members of forestry non-governmental organizations (NGO's) that are critical of current forest management in Southwest Virginia. (This final group the author calls "environmentalists," though I realize the ambiguity and normativity inherent in this term.) The author interviewed four to six individuals from each group. Participants were identified from personal and professional contacts and then these people provided additional contacts that allowed the sample to "snowball." Thus, the sample was purposive: I used my contacts to identify people in each of the above categories so that I could speak to as wide a range of vested stakeholders as possible.

Admittedly, the groups are not mutually exclusive, are somewhat arbitrary, and people within each category are not necessarily more similar to one another than they are to people in other categories. Nonetheless, the five categories represent the range of people and organizations typically present in discussions about private forest management. Even though the participants may not be statistically representative of the larger community interested in private forests, they are actively involved in forestry and therefore provide an illustrative case study that can help forestry and others understand related populations. The most serious limitation of this study is not the restricted sample, but is that I forced people to discuss "environmental quality." I tried not to direct the discussion about this term but I did legitimize it by introducing it into the discussion. Despite these cautions, I believe these results offer lessons that generalize beyond the particulars of this study. This is an examination of one specific case of the social discourse that defines natural areas management (not just traditional forest management, but broader issues such as predator reintroduction, exotic species removal, and fire management) and the results

provide insight into how these and other management alternatives are understood and discussed.

Interview Method

In the early months of 2000, a semi-structured interview guide emerged from discussions with a few interested stakeholders in the management of private forestland and among members of the research team (Dr. R. Bruce Hull, David Robertson, Erin Seekamp, and the author). In March of 2000, I began the interview process. As the research team's understandings of the nuances of environmental quality developed I found it necessary to make some minor modifications to the interview guide. A copy of the final interview guide can be found in Appendix A.

Each interview followed a similar format, although there were differences in venue and personality. After initial contact via telephone or e-mail explaining the study and requesting participation, a time, date and place (of convenience to the participants) was determined. Before conducting the interview, I explained the format of the interview, assured confidentiality, and requested permission to audiotape the conversation. No respondent refused permission to be recorded, and all were interested in both the format of the interview and the expected results. Interviews lasted from 20 to 90 minutes. After each interview, notes and impressions were transcribed for further analysis.

Analysis

Each taped interview was transcribed verbatim as its own document to avoid misinterpretation of individual participants' understandings of environmental quality. The documents, ranging from fewer than ten pages to more than twenty pages of single spaced, ten-point font, were imported into QSR NUD*IST (Qualitative-Solutions-&-Research-Pty-Ltd, 1997), a qualitative data analysis computer software program. In total, approximately 143,000 words were transcribed to form the database for this study.

Before coding the interviews the research team created an initial coding scheme or so called index tree (NUD*IST) to organize prominent themes as they emerged from the interviews and the literature. This scheme had four major categories: (1) values for environmental quality (why did environmental quality matter?), (2) indicators of environmental quality (how was environmental quality recognized?), (3) definitions of environmental quality (what is environmental quality?), and (4) understandings / mechanisms of Nature that influence environmental quality (why and how did quality occur?). Within each of these major categories were distinct sub-categories (i.e., under values were categories such as economic gain, enlightened self interest, biorights; under understandings / mechanisms were categories such as temporal scale, balance, exotic species, etc.).

This coding scheme was then used to organize the textual interview data. I took sections of text that represented one coherent thought and then assigned it to a coding category based on the content of that thought. These textual units (words, lines, sentences, paragraphs, etc) could be coded into multiple categories. For example, a section of text that contained musings about the “economic value” of “health” would be coded as both “health” (under definitions of environmental quality) and as “economic value” (under values for environmental quality) and as referring to the value “enlightened self-interest.” Additionally, NUD*IST afforded an opportunity to create new categories **during** the coding process. When I found a section of text that referred to some aspect of environmental quality not captured in the current coding scheme, a new category was added. Then, as these additional themes emerged, I returned to previously coded interviews in search of these emergent themes. As such, each interview was coded (at least) several times.

Discovering as many possible themes present in the interview texts was the priority during this portion of the analysis. In addition to an iterative coding process described above, the research team also cross-coded interviews. During the cross-coding, each of the three research team members coded interviews independently and then met (repeatedly) to discuss how the other members had coded the same interviews. The

purpose of the meetings was threefold. First, the team developed a shared understanding of the coding process. Secondly, these meetings facilitated the negotiation of emergent themes from the data. Finally, these meetings gave an opportunity to reflect on evolving understandings of environmental quality in such a way as to facilitate the later writing of the results section. A copy of the final coding scheme is included in Appendix B. This triangulation of the data analysis (meetings, coding scheme revisions, and recoding the interview texts) continued into August of 2000.

The reported results represent the collapsing and merging of coding scheme categories into larger, more interpretable wholes. During this phase of the analysis I used this collapsed, reorganized coding scheme to generate the results reported here. Using NUD*IST, I was able to generate reports of the textual data according to coding category. Also with NUD*IST, I could view all of the quotes coded as “health,” “balanced Nature,” or “geographic scale” together. Viewing all of the quotes together gave me an opportunity to reflect on these emerging understandings and facilitated the writing of a narrative. This narrative writing process was similarly iterative, I returned to the organized, coded data in NUD*IST countless times to produce the story told in the Results section below—a story written from the synthesis of 275 pages of interview text.

The rigor of this coding scheme and the interpretation of results depends on the research team’s ability to accurately capture and interpret a speaker’s intent. There were not enough resources for each member of the research team to independently code each interview; hence I do not present a quantitative measure of inter-coder reliability. Instead, the team focused resources on negotiating the coding categories and interpreting the multiple quotes coded into each category. This was an involved triangulation process that involved reviewing the descriptive categories in the emerging document, and then returning to the raw quotes and the original interviews to confirm the interpretations. The strategy used to organize these definitions was both inductive and deductive. It was driven by the data as well as imposed by issues raised in the literature review of ecological constructs. I believe the analysis was exhaustive and represents the range of

understandings of forested environmental quality—explained by the people interviewed as perceived, defined, and interpreted by the author and the other research team members.

Notes on the Quotes—A few Important Points

Finally, having discussed the analysis process and the rigor of this analysis, I make some final notes to clarify the reading of the direct quotes in the following Results section. When possible, I report how many people were coded as describing the same environmental qualities or using the same rationales to defend a definition. When I discuss these emergent themes of environmental quality, I indicate how many respondents (out of 24 total) responded in similar fashion. This information provides some indications of the strength of concern relevant to each category. Additionally, all direct quotes are attributed to an anonymous respondent according to stakeholder group (i.e. Environmentalist 1, Landowner 3, etc). While reading the results, the reader may wish to refer to Appendix C for descriptions of the respondents' interests and involvements in forestry, although their anonymity is preserved. The numbers next to the responding stakeholder represent line numbers—where in the interview these quotes emerged. Where a blank occurs in a direct quote (i.e. “ ... “) it is because the respondent paused or repeated a word, or stuttered—any deletion, insertion, or addition of emphasis to the text is duly noted. Finally, it is important to point out that the words used in quotes within a paragraph are words uttered by respondents, but not so unique to be attributed to any one particular respondent.

Chapter 3: RESULTS AND DISCUSSION

Defining Environmental Quality

This section organizes the definitions of environmental quality used by the interview participants to answer the semi-structured questions. Respondents experienced difficulty with the task of defining and explaining good forest environmental quality and I attempt to illustrate these difficulties as well as the ambiguous and tautological quality of most definitions. Because the respondents differed in why they cared about environmental quality and what they believed was necessary to achieve environmental quality I want to dwell less on the definitions the respondents offered and more on the explanations used to defend and explain the definitions of environmental quality. It is these values and explanations, I believe, that better illustrate how people talk, think about, and understand environmental quality. Before I turn to those topics, however, I do want to briefly review and comment on the range of definitions associated with key constructs or definitions of environmental quality in use today.

Many of the respondents had never specifically thought about the term “environmental quality.” This was evident in their responses to the question “How do you define good environmental quality on your land?” (Appendix A). Many people came out and told me that environmental quality was difficult or impossible to define. Some talked about environmental quality as a philosophy, others described it as a feeling, some talked about conditions of the land, and others talked about its intuitive characteristics:

“ ... So quality ... the problem with quality is that it doesn't lend itself to definition. There isn't one. There's just examples of it. If we wanted to really talk about quality in forestry, we need to go there, and we feel it. We'll feel it ... we'll have this preintellectual sense of it, and then maybe we talk about it in the past tense ... ”
[Environmentalist 1, 398-403]

When, in the course of the interview, the respondents were given time to think about and discuss environmental quality, they began to use constructs such as health, naturalness,

biodiversity, productivity and sustainability, terms that I examine in more detail below. Still, their use of these constructs rarely helped them articulate a specific definition of environmental quality. Take for example:

“ ... Well, you know ... something that’s stable’s [sic] make us all feel better, you know, if your cash flow’s stable, it’s more enduring, it’s more, to use an overused word, ... it’s more **sustainable**, it’s ... more predictable, something that’s ... stable ... **healthy** again, something that ... something with a high level of **health** to me is ... kind of, circuitous thought here actually, but something that is **healthy** to me has a high level of **diversity** and species richness and thus illustrates a lot of **health** ... ” [Forest advisor 1, 235-242; emphasis added]

“ ... 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 ... dependent upon **diversity**, [deleted 12 lines in the same vein] ... without **diversity** to provide for variety of **energy exchange and support** within that system, that system can not **sustain** itself ... ” [Forest advisor 2, 243-246, 256-257; emphasis added]

Thus, using these constructs often led to no more success in describing environmental quality than did expressing general feelings about environmental quality. The purpose in sharing these quotes is not to embarrass the respondents but to illustrate how respected environmental professionals, who successfully and regularly advise on the management of forested lands, struggle with the language used to discuss the environmental condition of the land.

Regardless of the difficulty the respondents experienced with defining environmental quality both as a general term and by way of its constructs, it is clearly something on which they place high value, and something that everyone tried earnestly to define. As will be discussed in the next section, people spoke with passion about why environmental quality mattered and why they wanted to protect and achieve it. Before discussing those values, and in the text immediately following, is organized the range of definitions

provided for the constructs of environmental quality. To organize these definitions required an enormous amount of sifting through, “teasing” apart and adding structure to what emerged in raw form as rambling, tautological, and ambiguous language. The structure created here is meant to illustrate the definitions that exist within each construct, and the wide range between and among the different constructs that were offered as definitions of environmental quality. This structure, an artifact of the analysis, should not be taken as an implication that the respondents were able to discuss these constructs in isolation of other constructs. On the contrary, most respondents were unable to discuss these constructs individually, as is shown above.

Health

Because “forest health” has such currency in contemporary environmental science discourse, I planned to specifically ask respondents, at the conclusion of the interview, about “forest health,” just to make sure everyone was given a chance to comment on it. However, the majority of respondents (20 out of 24) volunteered the term when I asked them, in an open – ended question, to define forest environmental quality. Even though most everyone mentioned the term without prompting, some of these specifically noted that it was a vexing construct, a “non–term,” because it means so many different things. When pressed be more precise about what it meant, the participants provided a variety of vague and often circular definitions. Any one, combination, or all of the following definitions emerged in reference to the term “health”:

1. Health as a (the) normative, natural, dehumanized condition;

“ ... Well, I think ... that’s kind of what I think of in terms of health ... if it varies from the norm of the whole population a great deal, then [it] may be unhealthy ... ”
[Scientist 1, 168-170]

“ ... A healthy system is one in which the successional dynamics occur around some sort of a normative number ... ” [Scientist 4, 505-507]

This normative state, in turn, is defined and described by natural conditions. These natural conditions may be the absence of humans, for example, normal baselines based on dehumanized or historical conditions, such as pre-European settlement or pre-anthropogenic influence:

“ ... A normal condition is a historical condition ... I think, or that’s the best way I can explain it ... ” [Scientist 1, 400-401]

“ ... [Y]ou can observe what has naturally occurred without any human intervention ... and we can go to other areas where we have messed with and see how we’re doing ... how does it compare? ... ” [Landowner 3, 276-279]

A system without human influence or anthropogenic caused stress is, to some, a healthy system.

“ ... But then ... if the ecosystem is pushed beyond its **normal limits**, then it may go into some new equilibrium state [deleted 1 line] ... And so the question is ... that new equilibrium state **as good** as the previous equilibrium state, **and generally when humans are involved and there’s anthropogenic effects, it isn’t** ... ” [Scientist 4, 127-134]

“ ... In the areas that **man** couldn’t get to, physically couldn’t get to, there is clean water ... five to seven layer canopies, hundreds of species in the forest floor, so essentially proving my point that my definition of ... high environmental quality ... [a] stable, **healthy**, complex ecosystem ... the less [that] **man** has to do with it, the greater potential for it to exist, ok? ... ” [Forest advisor 1, 331-335]

2. The concept that health links to diversity in general, and biological diversity specifically;

“ ... [B]ut ... yeah ... I just fully believe that a ... you know, a healthy system is a diverse system, and I try and ... incorporate that ... whenever I can, into my ... you know, talking with my landowners ... ” [Forest advisor 3, 144-146]

“ ... Well, biodiverse is ... my bottom line for ... a healthy forest, is one that is ... biodiverse meaning all forms of Nature are there, and coexist ... naturally ... ”
[Environmentalist 2, 365-367]

3. The concept that health is the absence of stress and disease; wellness versus sickness.

This definition requires specifying which qualities of the forest are valued and thus should not be “degraded” by the stressor. In the case of parasites and disease, merchantable trees are valued. Many of the same entities that are viewed negatively as parasites in this context can be viewed positively as nutrients recyclers in other contexts using other definitions.

“ ... [I]f [the forest i]s pretty much ... free of any kind of ... parasites ... disease and whatever, then that’s my determination of whether the forest’s healthy or not ...”
[Logger 3, 265-267]

4. The concept of vigor and growth, typically as evidenced by the rate of growth in trees.

As with the previous definition of health, this one implicitly values one species over others, likely because of the economic values associated with merchantable fiber;

“ ... [T]hese trees are 7 years old and growing like weeds out here, and they’re healthy ... ” [Landowner 1, 349-350]

“ ... A healthy forest would be one not necessarily ... all with a considerable amount of species, because we have a lot of ... natural ... what would be called monocultures here, specifically yellow poplar ... oak and white pine forests, but a stand that is free from insect disease problems, and is ... **having a good growth rate as far as annual radial growth ...** ” [Forest advisor 5, 92-97, emphasis added]

“ ... [M]y determination, or my ... definition of forest health, is, may well be ... a different [definition] than the

next person, but I look at forest health as if it's thriving, if it's growing, if it's producing fiber ... ” [Logger 3, 262-265]

5. The concept of resilience to disturbance, or ease and speed of recovery from disturbances;

“ ... Well health is, I would measure for health ... for environmental, for natural systems in terms of resilience. ... And that is the ability to spring back from displacements of some sort ... a healthy system is a very resilient system, if you give it a shove ... like a hurricane or a flood or something like that, fire, it can snap back fairly quickly ... ” [Scientist 4, 333-338]

“ ... And so, I guess ... ultimately what I'm portraying is, is that I feel better when forests are stable and forests are healthy because they have a better chance of long term viability and sustainability, they're not at risk for all kinds of things ... natural disasters, man-induced management, such as harvesting ... ” [Forest advisor 1, 257-261]

6. The presence and production of clean air and clean water;

“ ... Well maybe if you don't have a ... healthy, forest with ... a lot of undergrowth and things like this, if you have a lot of barren area, you're going to get a water runoff, and that's eventually going to pollute your wells, so if you don't have a good water shed, then you know, the quality of your water's not going to be real good ... ” [Landowner 2, 283-287]

“ ... Water quality to me means ... clean water, water that ... well similar ... to a forest ... terrestrial system, diversity, variety of life ... productivity and ... the health of the elements and components in the system that's dependent upon that water. Declining, poor health ... monoculture like situation, I would ... call low water quality ... ” [Forest advisor 2, 331-335]

There are a few concluding remarks to be made about the construct health, and how it emerged from the respondents in the study. Naturalness (and the normative state) and biodiversity (1 and 2 on the list above) were used by respondents to define health, while

also being offered as ways to define environmental quality, suggesting the ambiguity and interchangeability of these terms. While these constructs of environmental quality are isolated here for the sake of exposition, they are sometimes used interchangeably and often tautologically.

It is also interesting to note that several respondents objected to the use of “health” as a construct of environmental quality. They came out and said that forest health was **not** synonymous with environmental quality. They did so because they believe that forest health is entirely relative; health depends upon the ability of the forest to meet the objective of the forest’s owners. In contrast, environmental quality answers to broader social and environmental concerns.

“ ... Environmental quality relates directly to human health and survival ... forest health does not. It’s ... a set of standards we put on a ... forest ... or that system ... whether it’s healthy or unhealthy is related to some objective that we have for that particular piece of space ... ” [Scientist 1, 524-529]

“ ... [I]f I wanted to grow pine trees, and ... I had a plantation that was full of red maple, it wouldn’t be a very healthy forest, to me ... ok? If I wanted to grow old growth timber and have it ... have a ... lot of dead snags around for bird perches and wildlife habitat, and I had a twenty five year old forest that was vigorously growing, it wouldn’t be very healthy to me ... ” [Scientist 2, 296-302]

Despite these notable exceptions, most respondents used forest health interchangeably with or as a way to define environmental quality.

Natural

Naturalness was another construct used to describe and discuss environmental quality. I did not specifically prompt the respondents to talk about naturalness. Still, half (12 of 24) of the respondents used the term natural to describe and define environmental quality.

Any one, combination, or all of the following definitions of natural and naturalness seemed to be used in peoples' discussions about environmental quality:

1. Nature knows best, it has a good of it's own and a will of its own.

Some people believe that using "natural" as a benchmark for environmental quality creates a definition of environmental quality independent of human agency and values. That is, by looking to dehumanized Nature for indicators of environmental quality, people believe they can let Nature tell society what is good for Nature. Nature has agency; it "knows" what is best for itself. In the next section (on understandings of environmental quality), there is detailed discussion on people's explanations of how Nature knows what is correct. In brief, the most frequently offered rationale for trusting Nature is that Nature is self-replicating, self-healing, and possesses an (at least meta) balance. Because it has this balance, Nature maintains or strives for a balanced condition, which in turn defines high environmental quality.

"... Mother Nature was built to [where] she will ... if we'll leave her alone, she comes back and she ... cures a lot of the problems and stuff ..." [Environmentalist 3, 177-179]

"... Mother Nature sets up a design in ... all of our forests. They's [sic] all types of trees that grows ... and she's put them there on account of the climate, the water, the ... surroundings ... the earth ... that's ... the soil and all, and she's put them there and they develop and they do good ..." [Environmentalist 3, 550-555]

2. Natural conditions are of high environmental quality because they are non-human; human wrought change degrades environmental quality.

Some respondents defined Nature and naturalness as the absence of humans or human wrought change. "Man-induced" impacts (i.e., acid rain, smog, impacts from heavy machinery) degrade environmental quality. On the other hand, natural disasters like fire, wind-throw and "natural" pathogens would not represent a decline in environmental

quality, even if the damage and destruction to valued qualities of the forest were of greater magnitude than change wrought by humans.

“ ... Environmental quality, personal bias coming in, the highest level of environmental quality to me, looking at it on a continuum would be ... a natural stand that has very, very small influence by man ... ” [Forest advisor 1, 100-103]

“ ... That's how I figure if we're doing a good job ... [deleted half a line for clarity] if we're keeping things in balance or not, is how does it compare to an area that has **not** been messed with? ... ” [Landowner 3, 280-283, emphasis added]

3. Natural is good because human technology is limited

Some people associated natural conditions with environmental quality because they questioned the ability of humans to control forest systems. Human technology is limited much more than people realize and we need to recognize how dependent we are on Nature. The degree of faith one has in technology to solve environmental problems is another one of the major rhetorical devices people used to explain their definitions of environmental quality and is developed in more detail in the next section of this thesis.

“ ... I go to the woods, that's what I'm looking for, you know, I just like to know that ... man can't do this ... [laughs] ... you know, man can't make that tree, he can strive all he wants, but he can't make that tree grow ... you know, he might think he can ... ” [Environmentalist 4, 189-192]

“...[A]nd we're going to ... think that we can create things that aren't ... ours to create ... and a natural ... environment, man can't do. He can't ... he just can't duplicate it, he's not God, and for him to be arrogant enough to think that he can make something natural ... it's so ... silly [laughs] ... because you can't, he can't ... he could ... chop that tree down if he wanted to, but he couldn't make the moss grow on it, he couldn't create the rain ... that ... moistens the little lichens and ferns and

things on the ground that ... he can't do that, you know?
... ” [Environmentalist 4, 242-250]

“ ... Because here was this huge effort to try and deliver ecosystem services within a contained unit, that's why they called it 'Biosphere Two', and they couldn't do it, so that means we don't know enough about how the system works to replicate it, so we'd better not screw up what's there!
... ” [Scientist 4, 424-428]

Interviewer: “[W]hy do natural processes in natural systems matter in terms of environmental quality?...or why do you care about natural systems?”

“ ... Because I don't think, with all of ... with all the research and all the science and all the knowledge that's there, I definitely don't have the answers and the ability to sustain something and ... I don't know that ... the forestry community or mankind as a whole, or however you want to put that, can do that ... in terms of an entire system ... ”
[Forest advisor 2, 119-127]

Biodiversity

Half of the respondents (12 of 24) introduced “biodiversity” when asked to define environmental quality. They were not prompted to do so. Any one, combination, or all of the following definitions of biodiversity seemed to be used in peoples' discussions about environmental quality:

1. Biodiversity was defined as a variety of species;

“ ... a difference or a variety of ... species ... ” [Forest advisor 2, 225-230]

“ ... Well, I ... what I mean is that ... you have a respectable number of species in the place, and that means the diversity in the tree species that are there, it means the diversity in understory, it means the diversity in the kinds of birds that are nesting there ... ” [Scientist 3, 176-182]

2. Biodiversity defined as a variety of age classes;

“ ... [F]or example, I wouldn't want all the forests to be of the same age, as much as I wouldn't want them all to have exactly the same species composition ... ” [Scientist 2, 275-278]

3. Biodiversity as a variety of physical structure;

“ ... But the quality comes from having ... those big trees, and having a fair amount of understory. So that you get the feeling there are layers in the forest. It's not a parkland, and it's not just a, what I call second growth. It has some maturity, and it has some understory ... ” [Scientist 3, 85-89]

Site Productivity

Site productivity emerged as a very different construct used to describe environmental quality. It was offered by one third of the respondents (8 of 24). It describes a more robust Nature, one requiring direct and intended human involvement to achieve environmental quality. To these respondents, an area of high environmental quality was defined as being able to produce a relatively high degree of commodity benefits:

“ ... [Y]ou're better off maximizing that [forest] resource to be productive, and ... I would think that that ... in that sense to me, is contributing to our quality of life, which could be one definition of environmental quality ... ”
[Forest advisor 4, 78-81]

The definition of site productivity is thus very similar to the definitions of health related to tree vigor and speed of growth. It is important to note that only two respondents defined environmental quality **only** in terms of site productivity. The other six of the eight respondents who did use site productivity initially to define and describe environmental quality **were** quick to point out the need for site productivity to be balanced with the concerns for health, naturalness and biodiversity.

Sustainability and Sustainable Timber Production

Sustainability seems to offer a middle ground between the specific goal-oriented definitions of environmental quality such as site productivity and timber production at one extreme and the more general definitions of naturalness, health and biodiversity. As such, this construct is probably the most difficult to discuss here in isolation of the other constructs of environmental quality. It was offered as synonymous with environmental quality, but its definition gets the reader no further to an understanding of environmental quality. It encompasses **all** of the constructs offered to specify environmental quality. Fifteen of 24 respondents specifically used the term sustainability or sustainable timber production in attempting to discuss and describe environmental quality.

Sustainability was defined as being able to balance the concerns for health, naturalness, and biodiversity with concerns for site productivity.

“ ... [W]e believe that with moderate human intervention you can still maintain that growing healthy balance, diversified forest, but you can also get money. And that you can harvest without destroying the land ... you can take a couple of trees out of an area without destroying the stream that you’re going across or you can take things out and still keep your land in good shape ... ” [Landowner 3, 231-238]

“ ... The way ... what I’m showing you, I think is showing that ... the ... environmentally correct way to practice forestry. To be able to harvest trees on a continuous basis and still keep your woods basically intact in supporting wildlife, clean air and clean water et cetera. ... You know, that’s everything taken together ... ” [Logger 2, 8-12]

These respondents and the other respondents that mentioned and talked about sustainability consistently brought the issue of future generations and the future in their definitions of sustainability. There will be a discussion of temporal scale in greater detail below.

Water Quality

All of the respondents (24 of 24) mentioned the importance of maintaining water quality without any prompts from the interviewer and it was usually mentioned very early in the interview. Despite its common and quick usage the term is still ambiguous, with people mentioning many different qualities the water may possess (i.e. clear water, clean water, normally occurring water conditions, etc.), making this definition almost as vague as the others.

“ ... [F]rom my perspective, to me the environmental quality first means water quality ... ” [Landowner 3, 20-21]

“ ... [How do you define] [g]ood environmental quality? ... well of course, with the clean water law, that’s kind of the first thing we’re looking at is water quality ... ” [Forest advisor 3, 1-5]

“ ... I guess [environmental quality] primarily ... revolves around how much water ... quality potential ... that is a ... that’s the main factor is water quality ... ” [Logger 3, 7-8]

Understandings of Nature and Explanations of Environmental Quality

After asking respondents to define environmental quality they were asked to explain their reasoning behind their definitions (Appendix A). As suggested in the literature review, there exist multiple and conflicting understandings, explanations and values of Nature that shape definitions of environmental quality and expectations of environmental management. Following from issues raised in the literature review I organized people’s explanations into the following categories: (1) Nature exists, (2) Nature knows best how it should be managed; (3) Nature does not know best and needs human management; (4) Nature exists at different scales; and (5) Nature is valued for different reasons.

Very few participants found little or no utility in “Nature” as a concept to describe the environment, they used it to mean different things and for different reasons, but they were

comfortable using it in the discourse of environmental quality. As mentioned in the literature review, the human-Nature dichotomy often dominates discussion and understanding of land and natural resource management. This proved to be the case with the interview participants, who reasoned either that Nature knows best (category two) or Nature does not know best (category three). Occasionally a person would present arguments in both categories. Much of the following section is devoted to organizing and illustrating the different explanations offered for why Nature does or does not know best. Many of the explanations focus on the extent to which Nature is balanced. What also emerged, as the literature suggested, was that definitions of environmental quality and expectations of management varied depending upon what spatial, temporal, or organizational scales people assumed and used in their discussions. Finally, I show that values and normative positions were embedded in everyone's definitions of environmental quality. Often the values were not made explicit in these definitions but became obvious later in the interview and after analysis of the reasons and explanations people offered in defense of their definitions.

Nature Exists

The place to start this discussion is with the fundamental question of whether Nature, as an idea or a physical reality, exists and is meaningful. Most (23 of 24) interview participants accepted that Nature exists and has meaning in a discourse about environmental quality. They used "Nature" or one of its many synonyms (e.g., natural, naturalness, wild, authentic, original) to describe conditions of the forest. People who believed that Nature can or should serve as a guide for management obviously recognize its autonomy and existence because they believe it can serve as a guide. Likewise, people who explained that Nature should not guide management because it was random or unsympathetic to human needs implied by their arguments that Nature existed, they just believed that it does not have the necessary qualities to guide environmental policy and management. As is evidenced in the following quote, one of the participants specifically argued against Nature as a meaningful concept. He is reacting to Nature defined as being free of human influence and argues that it is illogical to distinguish the

change wrought by humans from the change wrought by other species because all organisms change their environment as a consequence of having lived. That is, change is “natural,” so there is no logical distinction to be made between changes wrought by humans or others.

“ ... I don’t think there are any quote natural systems anyway ... I think again that’s a ... like a forest health thing. What’s natural and what’s not ... again in the United States, there’s huge debates over what a natural forest looks like, and what it should look like ... [deleted five lines] and ... so, I don’t think that the use of the term natural forest is a ... is any better than [the term] forest health. Because it doesn’t exist. Organisms have been altering their environment forever ... ” [Scientist 2, 525 - 534]

Nature Knows Best

Eight of twenty-four respondents explained that environmental quality can be produced by mimicking Nature or letting it take its course. For example:

“ ... In my value system, Nature is as close to perfection as is possible ... ” [Landowner 3, 450-451]

“ ... environmental quality, personal bias coming in, the highest level of environmental quality to me, looking at it on a continuum would be ... a natural stand that has very, very small influence by man ... ” [Forest advisor 1, 100-103]

“ ... No, I think in all instances Nature does a better job than we do ... [laughs] we might convince ourselves, or talk ourselves into, or justify with science that what we are doing is improving on Mother Nature, but no, I hardly think ... that you can improve on it ... ” [Forest advisor 3, 1065-1068]

The range of explanations for why Nature knows best is considerable. Thus, this section is more complicated than the others. Four somewhat distinct rationales were used to defend why Nature knows best. Each of these will be discussed below:

1. Nature can serve as a guide because evolution and natural selection have produced viable conditions;
2. Nature can serve as a guide because a supernatural power created it; humans cannot improve upon God's creations;
3. Nature offers a safe, conservative, tried and tested guide; technology causes more problems than it solves and hubris is dangerous;
4. Nature can serve as a guide because there exists a balance to Nature. The ecological conditions that exist at this balanced state or the processes that produce this balance are objectively best for Nature. The explanations offered under this point are further categorized as follows:
 - a. *Nature is a supra-organism; it has a purpose;*
 - b. *Nature is interconnected;*
 - c. *Scale affects perceptions of balance;*

Nature Can Serve as a Guide Because Evolution and Natural Selection Have Produced Viable Conditions

According to some respondents the processes of evolution produce conditions that are right for a setting. Species and systems of Nature survive the test of time through evolutionary processes such as natural selection. These conditions are assumed right or “best” for an area because they survived the test of time. The counter example to this argument was more popular. People argued that exotic species are bad or wrong for the area because they did not evolve there. This preference for naturally evolved species follows the compositionalist school of ecology outlined in (Callicott et al., 1999), which gives priority to “historically evolved” species and conditions within ecosystems. In the following quote, the respondent provides a typical explanation that “what was here” is assumed to be better than what was imported:

“ ... Why are [native species] important? ... Because they're natural, because they were **what was here** before you so rudely interrupted them ... ” [Environmentalist 4, 399-405, emphasis added]

Another respondent indicated that evidence of Nature doing “something right” is that forests are “self-perpetuating..” Humans should step back and try to let “long term evolutionary processes” continue:

“ ... If [the forest ha]s been there for 500 or 1000 years, it must be doing something right ... something’s going on there, certainly complex, certainly self-perpetuating, it is still mortal, you know eventually it will pass away, but what will it become next? ... [deleted 6 lines] We’ve got to start thinking about forests in terms of longer scales of time than our own lives and our own immediate needs for consumption. And if we do that, that will probably be the best management strategy we could employ to insure the continuation of long term evolutionary processes that are already underway in these forests ... ” [Environmentalist 1, 1001-1017]

In the following quote a scientist argues against using a previous point in time as the benchmark for defining good environmental quality because he recognizes Nature as changing and dynamic. Instead, he suggests that managers seek to reproduce the conditions evolution “would” have produced had humans not intervened. That is, he suggests, albeit indirectly, that evolution produces acceptable environmental quality.

“ ... I don’t think you want to set the ecological clock to some past time machine condition, you want to set the ecological clock to where it would be if everything had gone on normal ... ” [Scientist 4, 590-593]

Nature Can Serve as a Guide Because a Supernatural Power Created it—Humans Cannot Improve Upon God’s Creations

Some believe that God created the Earth and that humanity’s purpose on Earth is “to tend and to keep” God’s creation (Oelschlaeger, 1994; Passmore, 1980). To strive to improve Nature, then, could be interpreted as hubris, or worse, blasphemy because it places humans above God. Some of the respondents believe that humans cannot improve upon what God created:

“ ... We’ve tried to force our way upon what Mother Nature, or the Lord, the Creator ... the way the cycles that He set for this earth and stuff, and we’ve always tried to enforce our ways upon the different things, and it’s never worked, and I don’t think it ever will work ... ”
[Environmentalist 3, 172-175]

“ ... So it’s inconceivable of me to think that I can improve on that [Nature] ... it’s like asking somebody if they could give God some pointers in how to do His or Her job better ... ” [Landowner 3, 452-454]

Nature Offers a Safe, Conservative, Tried and Tested Guide—Technology Causes More Problems Than it Solves and Hubris Is Dangerous

Some respondents (7 of 24) placed little faith in the ability of technology to solve environmental problems. Nature and natural processes must be respected because human technology is limited. Nature is too complex and too dynamic, making it unknowable and uncontrollable by human ingenuity. Moreover, it is better to proceed cautiously because the consequences of failure are horrific.

“ ... We tend to think, you know, this little band-aid on this problem now, you know, we’ve solved the problem, and history has borne out over and over and over again, that that’s not true [deleted 2 lines] ... I ... generally tend to be one that would rather watch, and study the processes of Nature to see how ... things are done naturally and try and mimic that, yeah, and maybe help things along ... ” [Forest advisor 3, 1069-1077]

Interviewer: “... Why do you care about natural systems?”

“ ... Because I don’t think, with all of ... with all the research and all the science and all the knowledge that’s there, I definitely don’t have the answers and the ability to sustain something and ... I don’t know that ... the forestry community or mankind as a whole, or however you want to put that can do that ... in terms of an entire system ... ”
[Forest advisor 2, 120-127]

Nature Can Serve as a Guide Because There Exists a Balance to Nature

As the literature suggests, the degree to which Nature is balanced or dynamic is a widely shared organizing principle by which Nature is understood. Nearly all of the respondents (17 of 24) mentioned that Nature is dynamic, balanced, or resilient; and some people described Nature as possessing all three qualities. Sixteen of the respondents explained that Nature possessed some degree of resilience. However, not all of these 16 felt the resilience justified a “Nature knows best” approach to forest management. They reasoned that balance or resilience occurs over a large temporal or spatial scale and that variability and disturbance more aptly characterize the conditions at any particular site; thus Nature could not guide management for a specific site. However, all 8 of the respondents who felt that Nature knows best justified this belief by alluding to or mentioning outright homeostatic and balancing properties that enabled Nature to be resilient and/or self-healing. Several people were unable to go beyond a vague statement of faith in Nature’s balance and resilience. But some people articulated more specific mechanisms behind the balance and/or provided rationale for why Nature is balanced. These more specific explanations are organized around the following 3 points:

- 1. Nature is a supra-organism; it has a purpose;*
- 2. Nature is interconnected;*
- 3. Scale affects perceptions of balance;*

Nature is a Supra-Organism—it Has a Purpose

The belief that Nature acts like an organism, with self-regulating and self-organizing processes was the most common understanding of how Nature works, and the most common explanation for why Nature knows best. It has a rich tradition and can be found in the Clementsian ecological theories that attribute supra-organismic qualities to ecosystems (Worster, 1995). One respondent went so far as to describe an intentional, willful Nature, a Nature with a plan for the future and will to accomplish it. He explained that “Mother Nature” usually has reasons for the things that it does, even violent and seemingly chaotic sources of disturbance:

“ ... Mother Nature was built to [where] she will ... if we'll leave her alone, she comes back and she ... cures a lot of the problems and stuff ... ” [177-178, Environmentalist 3]

And then later in the interview:

“ ... Because Mother Nature has a way of taking out what she don't need and ... putting back extra where she does need ... ” [Environmentalist 3, 351-354]

Nature is Interconnected

Other respondents explained that balance results from the interconnections among environmental factors, species, populations, ecosystems, and eventually the biosphere. That is, the “web” of life holds things in balance.

“ ... Ultimately ... everything's a part of ... a bigger system, and ... directly it's influencing whatever system is influencing somebody, some animal, some other surrounding systems, so I ... see value in those ... as functioning systems, even though I may not understand exactly what they do for me ... ” [Forest advisor 2, 513-517]

“ ... Let's say you have an insect problem but ... so in the meantime, you ... decide to ... meddle in the insect problem and spray them with ... pesticide, and in the meantime you kill off a bunch of the good bugs and upset the balance and so now you've really got a problem.” [Forest advisor 1, 197-201]

Scale Affects Perceptions of Balance

There are many different ways in which a balance in Nature (or lack thereof) can be perceived. The most restrictive understanding of balance, referred to here as a static balance, occurs at a relatively small spatial scale. A static, balanced state of Nature is assumed to exist for each point in the forest. That is, every acre or stand has a specific ideal, balanced state defined by the forces of evolution, succession, and other environmental conditions and processes that produce balance. If disturbed from that state

(within the bounds of resilience), then the ideal conditions will eventually reoccur. The length of time it takes to rebound depends upon the degree of disruption but it is typically defined in human time (several to dozens of human generations) rather than geological time (tens of millions of years). The least restrictive understanding of balance, referred to here as dynamic equilibrium, has larger spatial and longer temporal scales. Over the area of a forest, an ecosystem, or a biome, a set of specific conditions (i.e., climax) are expected to occur, but where they occur, on which acre, is dependent on chance factors such as wind and ice disturbance, wind direction during pollination, migration of seeds by animals, and the like. There are even looser understandings beyond dynamic equilibrium, however, at these points, any understanding of balance is forsaken—Nature is understood to be dynamic, or even arbitrary and capricious. Scale is discussed in more detail later in this thesis.

Nature Does Not Know Best

Nature's role as a guide for environmental management and policy, or as a benchmark against which environmental quality should be judged was dismissed using one of the following four reasons discussed in more detail below:

- 1. Nature does not exist and thus cannot serve as a guide;**
- 2. Nature cannot serve as a guide because humans require a different flow of goods and services;**
- 3. Nature is resilient and human manipulation will not hurt it, so we might as well manage Nature for our benefit;**
- 4. Human management can improve upon what Nature does and should not be limited by it;**
- 5. Nature cannot serve as a guide because it is random;**

Nature Does Not Exist and Thus Cannot Serve as a Guide

Obviously if one believes Nature does not exist, then it cannot serve as a guide for management. The discussion about whether Nature exists as an idea or as reality was presented above.

Nature Cannot Serve as a Guide Because Humans Require a Different Flow of Goods and Services Than Nature Provides

Natural systems may produce what is best for Nature but they do not produce the resources and processes that maximize human well-being. Management manipulates and maximizes the abilities of Nature to produce goods and services valued by humans. Humans are the “top dog species” and thus have the right to manipulate Nature. Natural resource management decisions should be based on what produces the most equitable distribution of resources and well-being for humans.

“ ... I’m not ... a ... biocentrist if you will. A biocentrist would say that there’s an inherent value to Nature itself and a right and wrong ... with regard to the natural world, and I think that that’s silly. Quite frankly ... we are the top dog species, we decide what we want in our environment. Every species ever on the face of the globe has altered its environment to suit its own needs, and that’s what we do as humans, and there is no intrinsic value to Nature ... ”
[Scientist 2, 524-530]

“ ... What’s here through Nature is what’s evolved to perpetuate itself without respect for the well-being of human kind, so we could take our needs and superimpose them over the capabilities of the natural system to produce what we need out of it ... ” [Forest advisor 6, 323-326]

A related justification for manipulating Nature notes that life is hard and that survival takes work. It is a competitive world, and humans, like any other species, need to compete for their continued existence. Nature is not nurturing. Rather it is harsh and unforgiving and if we don’t manipulate it, it will manipulate us:

“ ... Life exists on this earth not because of Nature, but in spite of it, and now for the first time in the five billion years this planet has been in existence, there’s a species in

existence on this Earth that can change that, and for the better, and that's us. Unfortunately, a lot of us change it for the worse ... well that's ... what we've got to stop. But this bit about, this bullshit ... about ... if that's the way it is in Nature, that's the perfect way—nothing could be farther from the truth ... ” [Logger 2, 391-398]

“ ... Well, I think ... there's definitely a ... segment of population that [believes] ... the only way you're going to have a quality environment is there aren't any people in it ... and ... that's ... misanthropic, to say the least. I ... there's a segment that believes that any kind of manipulation on the forest is ruining Nature's scheme and if you leave it alone, everything's going to grow into this beautiful, vast, lush, area that you can just walk under trees for miles and miles and miles, not realizing that Nature on its own is just purely ruthless ... ” [Forest advisor 4, 330-338]

Nature is Resilient and Human Manipulation Will Not Hurt it—We Might as Well Manage Nature for our Benefit

Some respondents explicitly discounted Nature's frailty as a reason to not actively manage the forest. Kempton et al. (1995) found that some people interpreted the metaphors of a food chain or a web of life to imply that changing one chain or breaking one strand of the web would produce a falling domino-effect leading inevitably to environmental destruction. Some of the participants discounted that understanding of Nature.

“ ... Absolutely, absolutely ... this bit about, you know, every species is ... essential to the life cycle, what horse shit! Species have been going extinct ever since the ... life arose on earth ... ” [Logger 2, 447-449]

“ ... I don't like for things to become extinct. I think that's a problem, however, [deleted 5 lines] ... I don't think that the world's gonna [sic] end because a couple of little critters in minute niches of the environment have become extinct is really that big a problem ... ” [Forest advisor 6, 266-274]

Earlier, I illustrated how Nature's tendency to be resilient was used by some to justify no management (because Nature is in balance and knows best). However, Nature's resilience was also used to justify active management. Some respondents took the position that Nature's resilience is "proof" that humans can manipulate Nature without worrying about the consequences. Nature responds well to manipulation, it is stable and resilient. For example, the fact that forests have and will renew themselves was taken as evidence that harvesting should be conducted (on a regular basis).

"... It's proof that ... clearcuts will come back to be valuable timber, to me ... people say that ... it's ruint,[sic] [but] the mountains is all still there, they ain't [sic] eroded down the James River, or the Jackson River [deleted 2 lines] ... so it, I mean it, things come back ... you know ... and they renew themselves ... " [Logger 1, 639-648]

"... And, I don't know whether I'd live to see it or not, but in 20, 25 years, see, it'd be timbered back over and they'd be some more coming on, and you could log it again, you'd always have a good, pretty good, pretty decent timber come on that way ... " [Landowner 6, 144-148]

Human Management Can Improve Upon What Nature Does and Should Not be Limited by it

Some people believe that humans can improve upon Nature by manipulating, improving, and creating the building blocks of life. Human management can improve environmental quality over and above what is produced by Nature. They argue, following Dubos (1980), that there exist unrealized potentialities and wonders awaiting human discovery and creation. Ideas such as "naturalness" are seen, therefore, as hindrances because they direct people's attention backwards, towards the past, when natural conditions supposedly existed. Humans instead should be looking to the future, towards as yet undiscovered environmental conditions. This logic is used to justify active management of Nature. Obviously it requires considerable faith be placed in human ingenuity and technology.

“ ... I think, engineering wise, there are things you can do for the forest, that the forest can't do for itself ... I think ... fencing in these roundleaf birches over in Sugar Grove ... because they could not propagate themselves, or were not propagating themselves then ... fence them in, and make sure the deer don't get them [deleted half a line for clarity] ... trees would have to ... brush would have to have a brain and be able ... [to] move around and take ... complete good care of itself, don't you think? I mean, I think that's what we are partially here for, is to straighten out what we can with the forest ... ” [Landowner 2, 663-672]

“ ... That new forest, if you let it go promiscuous, it's not going to work. Nature will crowd it and eventually [it] will do what you want, but not in the appropriate time space [deleted two lines] ... and you've got to recognize that and you [humans] have to do something to help that tree out ... ” [Landowner 1, 515-521]

“ ... But humans can control the balance ... humans can ... create ... a balance in Nature, and we do it, like ... let's take our deer hunting laws, we harvest so ... many deer each year, sell so many hunting licenses, we keep the deer population relatively constant. With turkey, with bear, et cetera, we do it right ... we're creating the balance, not Nature ... ” [Logger 2, 438-443]

Nature Cannot Serve as a Guide Because it is Random and Dynamic—Any One of These Possible Conditions is as Good as Another

Many (11 of 24) of the respondents explained that Nature is dynamic and often disturbed. Most states of Nature are consequences of random events and accidents of history. The environmental conditions of a specific place are sensitive to its initial conditions and to the conditions of adjacent systems, both of which are subjected to random events that can dramatically alter environmental conditions found today or in the future (Botkin, 1990; Pickett et al., 1992; Shrader-Frechette, 1995). Wind, ice, fire, drought, hyper-active wildlife, and human action are just a few of the many factors that can set an ecosystem along a new trajectory of change and evolution. Balanced, stable, and permanent states of Nature do not exist. Thus, there is no basis for picking one of these many possible

trajectories of change and evolution to serve as the undisputed definition of what is natural or proper or of good environmental quality.

“ ... Virtually every natural system is subject to disturbance, whether it be fire, storms, volcanoes, all these things, disturb natural systems ... ” [Forest advisor 6, 331-333]

“ ... The balance of Nature? There is no such thing ... and I ... observed this in the Amazon rainforest for the fifteen years I was there. The balance of Nature is a series of wild fluctuations ... ” [Logger 2, 404-406]

Different Natures—Different Environmental Qualities

From the previous discussion of the understandings of Nature used to explain environmental quality, one can see that Nature is known to exist (or not exist) in many different ways. It can be argued that these different ways of understanding Nature and explaining environmental quality are related to the different constructs used to define environmental quality. A Nature known to be random and dynamic might reflect quality when humans create order to this chaos. On the other hand, a Nature known to be balanced and having a purpose might reflect quality when it has the full array of native species (biodiversity) and is relatively free of human manipulation. Later on in the implications section, these possibilities are explored in greater depth.

Values for Nature

After asking respondents to define and explain environmental quality I asked them to tell me why it mattered that the environment have the qualities they described (Appendix A). In response to these questions, respondents made more explicit the personal values they used to define and justify environmental quality. In this section I attempt to answer two questions that will round out the discussion of environmental quality: (1) What values did the respondents say they held for Nature? and (2) What are the implications of these different values (value systems) for defining environmental quality?

Biocentric and Ecocentric Values

As discussed in the literature review, biocentric values include the rights (to life, to pain free existence, to free range, etc) of each living organism, while ecocentric values were rights ascribed to collectives of living things (i.e., the rights of species and ecosystems to exist). None of the respondents came out and explicitly argued for granting rights to individual living organisms, or advocating related biocentric values. The closest to a biocentric value system any of the respondents came is illustrated in the following quote. This respondent **is** talking about the “rights” of nonhuman “entities,” though this respondent does not explicitly state whether or not these rights should be ascribed to individual organisms:

“ ... I think that we’re going to have to start looking at land as something that has intrinsic value of its own and rights. So until land has rights and the things that live on the land, nonhuman entities, have rights, we’re not going to resolve this issue ... ” [Environmentalist 1, 219-223]

Though the biocentric value system was not very evident in the discussions, the ecocentric value system was mentioned by a third of the respondents (8 of 24). An illustration of it is in the following quote that attributes value to environmental systems that do not “directly support” or improve the quality of life of humans:

“ ... There’s ... a variety of reasons for wanting to keep systems that are here ... all of [those] ... human dimensions we mentioned before about ... using those as a resource to live ... but I feel that there’s ... value in ... a system even if it’s not directly supporting what I’m doing ... ” [Forest advisor 2, 485-489]

One might expect biocentric values to be associated with definitions of environmental quality that protect the welfare of individual plants and animals, their freedom from pain and hunger, their freedom from human control. Biocentrically motivated environmental management practices should help or do no harm to individual creatures. No respondents specifically mentioned these or related concerns. There was evidence, however, of

environmental quality motivated by ecocentric values. For example, people expressed concerns about the vitality or integrity of ecologically significant units such as species and ecosystems. Ecocentrically motivated management practices are those that do not endanger these units, but “allow all of Nature to survive.” Some participants did speak about the need to “protect” species from “extinction,” expressed disappointment over habitat destruction that harmed “whatever used to live there,” and were frustrated with management strategies that were focused solely on generating hunting revenues from game-species such as “bear or deer or turkey” at the expense of non-game species.

Anthropocentric Values

As discussed in the literature review, anthropocentric values range from economically measurable values such as board feet of timber to less quantifiable and more diffuse “ecosystem services.” They also include the many aesthetic, spiritual, and recreational benefits people derive from Nature (whether or not these benefits can be assigned economic value). Respondents mentioned all of these values; some examples of them and of their implications for environmental management are presented next.

Enlightened Self-Interest

All respondents seemed to value Nature for the flow of ecosystem services on which all life depends, and which it is in their own self-interest to sustain. People emphasized the importance of maintaining breathable air and drinkable water as ecosystem services because they are responsible for maintaining human (and other biological) life on the planet Earth. In addition to these specific examples (air and water) people expressed a more general concern that human survival was inextricably linked to environmental quality:

“ ... My concern with our improving or changing Nature would be to ask the question ... at what point does that become detrimental to the long term survival of our species? ... ” [Environmentalist 1, 1030-1033]

The use of Aldo Leopold's "rules of intelligent tinkering" also typifies the enlightened self-interest thinking of respondents. We need to "keep all the parts" because one day we might find we need them:

"... And I think part of the responsibility is to maintain everything that's there ... what the hell ... Aldo Leopold I think probably said it very well when he said ... one of the rules of intelligent tinkering is to keep all of the parts, and that's pretty much where I come off on that ..." [Forest advisor 6, 285-288]

Enlightened self-interest values were associated with definitions of environmental quality that emphasized the continued flow of goods and services on which humans depend. Acceptable environmental management practices would be those that don't jeopardize this flow. The definitions respondents provided of "sustainability" and "biodiversity" reflect these concerns, as do respondents' anxiety over the "unreliable delivery of ecosystem services," and the "need to keep young trees growing" for the "oxygen" that they "give off."

Utilitarian

Many respondents mentioned general and specific economic values that flow from Nature. Not just timber, real estate income, and grazing but also wildlife for hunting:

"... Look at the millions and millions of dollars that are spent each year ... in hunting ... that's one thing ... from an economic standpoint, if you've got vast acreages of land that's ... being managed, or at least has ample wildlife populations then that's ... potential for you to lease that land out ... for hunting rights and stuff, and you know ... that's money in your pocket ..." [Logger 3, 233-238]

Associated with this value system is the understanding that Nature's resources can and should be used—humans are being wasteful if they don't take full advantage of the benefits Nature provides:

“ ... If you’ve got a forest that’s worth X amount of dollars ... and you don’t harvest it when it’s supposed to be ... it’s not a very good [market] ... out here for wooden culverts ... which would be the hollow trees [laughs] or rotten timber. You can’t sell it. You lose your money ... and if it’s a ... cash crop, you’d better harvest it when it’s ready, if it goes too far, you lose money, just like ... your vegetables in your garden, if you don’t pick your tomatoes when they’re ripe, they rot, and that ... go to waste, same thing with the trees ... ” [Logger 1, 165-174]

“ ... As the dominant species on this planet, we have an obligation to maintain clean air and water, but at the same time, we shouldn’t refrain from optimizing the use of certain areas. For instance, to me it’s a waste to let [a mature forest stand] be bug infested and decay and burn and go through it’s natural cycle, you know come back in maple, or hemlock or whatever species succeeds it, [deleted half a line] ... where you could take that wood and produce a product that we need, and use ... ” [Forest advisor 4, 174-184]

All of the twenty-four respondents were comfortable to one degree or another with deriving economic benefits from Nature. However, there was debate over how this should be done, whether to maximize immediate benefits, or to maximize the time frame over which utilitarian values would be realized. Generally, the optimum situation was somewhere in between these two options:

“ ... The objective of this business ... is to be able to live off it continuously, so ... the initial cut ... that I’m doing now ... the trees that were ready to cut when I bought the property, basically gives me my investment in the property back ... ok, then ... following that up with the TSI [timber stand improvement], we’ll now be able to harvest every 10-15 years forever ... ” [Logger 2, 34-39]

Utilitarian values were associated with definitions of environmental quality that sustained the economic producing potential of the land. There were instances where people expressed explicit concern about maintaining soil and water quality for this very reason. Management practices that erode soil or pollute water are unacceptable because they degrade the ability to generate income from working the land:

“ ... Well ... there’s a lot of ... our good growing dirt are in the woods, so if you don’t get them [sic] water bars in there properly and it rains, actually you’ve lost your topsoil [deleted 2 lines] ... [and] if you was [sic] trying to grow trees, and you didn’t have any good water bars in, and get all that stuff seeded properly, you’d actually lose your topsoil, which actually feeds your trees. Your trees [are] not going to grow as good ... ” [Logger 3, 221-230]

Likewise events such as forest fires, insect and disease outbreaks are all viewed negatively from the standpoint that they damage the economic value of the forests. Acceptable management actions would be those that minimize the threat to economic productivity or value of forests.

Aesthetic, Spiritual, Recreational Values for Nature

A majority of the respondents (16 of 24) indicated that they valued Nature for the experiences it provides. As suggested in the literature review, American society has a long tradition of valuing natural-appearing landscapes and wild, primitive, Nature-based experiences. Several respondents explicitly mentioned that Nature provides valuable contrast to civilization and a needed respite from the stresses of urban living, a place to find spiritual fulfillment as well as moral lessons:

“ ... I think that ... part of our societal problems are due to [the fact that] folks are so far removed from the environment, you know, on a daily basis. They come out of their house, they walk down their sidewalk, they get into ... you know, air-conditioned house into the air-conditioned car, they go to work, they come, their kids are in daycare, you know, they have these little patchwork, little lawn, you know, up in suburbia and stuff, and you know, who knows if they’re even noticing the change of seasons at all, you know, until it starts snowing and there’s mud on their boots, you know, that kind of thing. And ... I think that leaves a hole in people, I think that’s why there’s more and more folks buying their little plots of land, retiring to the country, wanting to ... you know, go out into

the wilderness, or go hiking ... or kayaking, or whatever ... ” [Forest advisor 3, 557-568]

“ ... I’ve visited a lot of forests [deleted 2 lines] ... throughout my life, if ... I’m trying to, trying to relax, or get out of the hustle bustle, or I’m really upset about ... something in my personal life, death or destruction or something like that, I seek out places of power ... [I’m] certain being in forestry that you’ve been in the forest in various places and that [deleted 1 line] ... in your travels, that every now and then, you come across a special place. You recognize it, you feel it, you get goose-bumps ... and you ... revel in it, you know. You just, you can sit there and absorb that power, and that ... conscious feeling of power [deleted 16 lines] ... So, there’s this ... kind of innate ... power and respect and understanding for high levels of environmental quality, that pristine place, that place of power, that place of species richness and diversity, you know. [The f]irst time you take a ... hike into a ... massive mixed mesophytic forest with bluebells up to your knees and water running down over the moss, and you know, you can’t help but stop, you know, you can’t help but stay at that place longer than what you should, you know, whether you’re working or recreating or whatever, you’re just ... transfixed there. So, losing those places, or losing that high level of environmental quality in a lot of places ... I think we would lose a lot of people’s place to reenergize, you know, place to deal with the problems ... ” [Forest advisor 1, 361-401]

Aesthetic, spiritual, and recreational values were associated with definitions of environmental quality that promote these experiences in and with Nature. Human “development” that degrades scenic vistas and wild experiences should be minimized as should human crowding that degrades primitive experiences and solitude. The aesthetic, spiritual, and recreational experiences are ruined by “manicured” settings and built structures that “keep bringing you back to society.”

There exist infinitely different scales at which Nature can be known or described

Many of the different definitions and understandings of environmental quality seem attributable to respondents' implicit or explicit use of different scales. Angermeier (2000), Norton (1995a) and others argue that scale is one of the more fundamental lenses through which Nature and environmental quality are organized and understood. The respondents identified different spatial, temporal, and organizational (i.e., unit of analysis) scales that produce dramatically different definitions of environmental quality and expectations of environmental management. The following section gives direct and indirect evidence for the importance of scale when discussing / perceiving Nature and environmental quality.

Direct Evidence for Scale

Few respondents (4 of 24) directly mentioned the importance of scale. These respondents explained that different temporal, spatial and organizational scales produce different understandings of Nature and environmental quality:

“ ... The most important quality is whether the system is self-maintaining ... And the problem with that is ... the system that's too small is unlikely to be self-maintaining, like a little patch of one acre ... almost clearly not going to be self-maintaining. So the minute you say self-maintaining, you increase the spatial scale and the temporal scale, because you can't tell whether [a little patch of one acre i]s self maintaining by looking at it for a week ... ”
[Scientist 4, 47-54]

This quote illustrates how spatial and temporal scale (in this particular example, the spatial scale and temporal scale are both small—one acre, one week) affects quality. According to this respondent, environmental quality is related to “whether the system is self-maintaining.” And, to know whether something is self-maintaining requires examining it over a time span longer than a week and a geographic scale larger than an acre. The implication is that a larger temporal and spatial scale will provide a different “picture” of environmental quality than a smaller temporal and spatial scale. Another respondent made a similar point in one of the rare explicit references to scale:

“ ... You can look at microsystems, or small site systems that in the short term don’t appear to be sustainable, but they are actually a small part of a landscape or a regional system ... so scale is very important ... ” [Forest advisor 2, 106-109]

Later in the interview the same respondent used scale to differentiate between the health of a forest and the health of a tree. Both definitions of environmental quality use the idea of “health,” but they refer to the health of things that exist at different scales.

“ ... I think a lot of the questions need to be looked at on level of scale [deleted half a line] ... you may say that ... that oak tree is in decline, it’s been defoliated by gypsy moths for two years, and it’s got some root rot, and some other things have set in ... and that tree’s not healthy. That’s ... a micro–scale. If you look on a ... forest stand level scale, that ... one tree may not be pulling down the health quote unquote of the whole stand ... if that whole stand has been impacted that way [deleted one line] ... that may or may not be unhealthy on an ecosystem level ... a regional level ... and so on and so forth, up the line ... ” [Forest advisor 2, 448-459]

The preceding discussion focuses on temporal and spatial scale but also illustrates how organizational scale (a tree versus a forest) shapes understandings of environmental quality. Organizational scale was explicitly used in the following quote. As one increases the organizational scale (from microscopic to biosphere) one sees “new attributes that weren’t visible at the lower levels”:

“ ... As you move from sub-cellular to cellular to individual, or to tissue ... to individual, population, community and ecosystem, at each level there are new attributes that weren’t visible at the lower levels ... ” [Scientist 4, 723-726]

Indirect Evidence of Scale

Why did only three respondents explicitly mentioned something that seems so fundamental to the definition and understanding of environmental quality? Upon closer

examination of the interviews nearly all of the respondents implicitly used scale to couch and explain their definitions of environmental quality. It seems that people's explanations of environmental quality (about which I had asked them to speak) were so scale dependent that it was difficult for them to describe or explain it without qualifying the temporal, geographic, and organizational scales they were using. Several illustrations follow.

Temporal scale was used to distinguish between forests that were here "ten thousand years ago," forests that "will be here ten thousand years from now," and a forest that will be here "ten years down the road." Following a clearcut or other disturbance, the environmental quality conditions that "happen in hundreds of years time" are contrasted to conditions that will occur in "ten, twenty, thirty years down the road." Likewise, the "ancient forest" whose environmental quality is expected to get better over time is conceptually different from the forest that is on a "pulpwood rotation" or a "saw log rotation." The environmental qualities of an ancient forest and a pulpwood plantation are understood to be different **because** of the time scale used. Good environmental quality can exist within each of these different time scales. That is, the environmental conditions deemed acceptable depend upon whether one is talking about a day, a year, a harvest rotation or a millennium. Finally, it is important to point out that the respondents fluctuated during the interview in the temporal scale they were using. Respondents would shift from talking about environmental quality in terms of "my lifespan, or my children's lifespan," to shorter or longer time scales.

Respondents also indirectly referenced geographic scale, and how it affects understandings of the forest environmental quality. Changes that occurred (i.e., due to silvicultural or ice damage) "on a broad enough scale" would create unacceptable environmental quality whereas the same events occurring over a smaller geographic scale would be acceptable. Several respondents talked about "cumulative impacts" that showed up "a little bit here, a little bit there, forty acres here, one hundred acres there" implying, as (Angermeier, 2000) suggests, the geographical scale over which a change occurs matters. Again, respondents fluctuated during an interview in the geographic

scale they used to discuss environmental quality. One particular respondent started talking about “silt that washes off of [this] roadway” and how it could be a problem because it “eventually dumps into the Chesapeake Bay.” In matter of a few sentences, the discussion of environmental quality saw a dramatic increase in spatial scale—from the road we were walking on, to a watershed that encompasses several states. Silt on a road is different from silt that washes into the bay; “a little bit here” is different from “cumulative impacts.”

Finally, many of the respondents used organizational scale to reference their discussions of environmental quality. Nature has many ecologically significant units, including cells, organisms, populations, species, ecosystem, energy flows, nutrient cycles, diversities, etc. The level of organization one adopts determines how environmental quality will be defined and explained. For example, definitions of forest and environmental quality depend upon whether a respondent is focusing on individual species (“trees” or even more specifically “pines”), collectives of species (e.g., “ecosystems” or “biodiversity”), or collectives of collectives (e.g., all of the forests in the “biosphere”). Likewise, environmental quality is understood and defined differently if the focus is on processes (“nutrient” cycle, “food chain,” “energy” flow, “erosion” rate) rather than on content (“species,” “exotic species,” specific species of trees, wildlife habitat such “grouse”, or cumulatively “biodiversity”). This latter distinction follows the Callicott et al. (1999) functionalist-compositionalist distinction.

Obviously, environmental quality descriptions and understandings depend upon scale. This dependency is apparent, in one form or another, in every respondent’s descriptions and explanations of environmental quality. People differed from one another in the scales they used and they used different scales within the same interview. Scale is thus critical to understanding or confusing discussions of environmental quality. It is anticipated that scale will also influence the physical indicators that respondents use to identify environmental quality (discussed below).

Indicators of Environmental Quality

If we think of environmental quality as a building, we might suppose that the underlying mechanisms and values reviewed earlier would serve as the foundation, the constructs of environmental quality would be the internal structure, and the indicators would serve as the façade—the windows, paint, signs, etc. Intuitively, it stands that people who know very little about the structure of the building, and even less about its foundation, would still be able to identify, recognize and talk about the building’s appearance. This was sometimes but not always the case. I asked people to tell me what good environmental quality looks like (Appendix A). About two-thirds of respondents were quite confident in their ability to visually assess environmental quality. The other third had trouble identifying specific indicators, and described very general or intuitive feelings they use to judge a forest’s environmental quality. This section reviews the range of indicators used to recognize the ecological content and condition of a forested landscape. This range of responses is organized around the following categories of indicators:

- 1. Direct indicators—water, air and vegetation**
- 2. Indirect indicators—cues to care**
- 3. Intuitive indicators—feelings of environmental quality**

This section concludes with a discussion of the different indicators respondents used to identify different environmental quality conditions (i.e., different indicators were associated with different constructs of environmental quality).

Direct Indicators—Water, Air and Vegetation

Respondents used visual assessments of streams, banks, and streambeds, surrounding vegetation, and absence or presence of domestic grazing animals to identify water quality. Environmental quality, and more specifically water quality, received a favorable evaluation if the stream “was running clear,” if there wasn’t “excessive siltation of the creek,” if the “banks” looked “stable,” and if there was “plant life along side” of these banks. Other indicators of water quality included “what the bottom looks like,” the

“insect diversity ... [of] a creek,” and whether or not there were “cows getting in the creek.” Likewise, for air quality, respondents used indicators such as visual clarity (how far “I can look out and see”) and the evidence of acid deposition (“not seeing a lot of diseased trees, like you do up on the high country ... dying probably from acid rain”). The condition of the air and water, in turn, was then used to assess overall environmental quality—as reviewed in the section on defining environmental quality.

Characteristics of the vegetation, mostly of the dominant tree species, were also offered as direct indicators of environmental quality. Generally speaking, environmental quality was indicated by “big trees, and having a fair amount of understory,” “seeing young trees come back,” “straight trees—good boles,” seeing “diversity in the tree species that are there ... diversity in understory ... diversity in the kinds of birds that are nesting there,” and evidence that the forest was relatively free of damage from “wind,” “ice,” “fire,” “insects,” and “disease.” The presence of cattle seemed to indicate lower environmental quality: “see[ing] cattle in the woods all the time” lowered quality.

Indirect Indicators—Cues to Care

Indirect indicators of environmental quality are provided by evidence of deliberate, careful management. Indirect indicators evaluate the quality of management rather than the quality of the environment. Good management is interpreted to imply good environmental quality. If people are tending rather than neglecting the land then it is assumed their attention will produce good environmental quality. Nassauer (1992) refers to these indirect indicators as “cues-to-care.” Respondents mentioned that poor environmental quality was evidenced by sloppy or absent management as indicated by “trash,” “litter,” abandoned “carcass[es] of the old ... culvert[s],” and “old sludge ponds” filled with “oil and gasoline.” These cues indicated that the no one cared enough about the land to clean it up so that it likely had low environmental quality. A scientist explained that evidence of care produces aesthetic pleasure:

“ ... A forest land that is wasted, and in my mind a land that’s wasted has no productive use, that nobody is paying attention to it, nobody cares about it, to me is...is not aesthetically pleasing ... for example, if somebody made an investment in plantation establishment, but didn’t care for that land, then I wouldn’t find it particularly aesthetically pleasing ... ” [Scientist 2, 98-106]

Some respondents, especially forest advisors, mentioned that the existence of a written management plan provided indirect evidence of environmental quality. These forest advisors wouldn’t even need to see the land, they would be able to evaluate environmental quality by looking at the management plan. High priority was placed on informed planning—human action in the forest is more likely to harm environmental quality if it is not planned:

“ ... They [landowners] need the first two steps [written planning and inventory] so that ... they don’t screw something up unknowingly, I think that’s ... what I’ve seen more often than not in forest industry and private landowners that ... the sad situations that I see are ... almost 100 percent created by lack of a plan or lack of knowledge ... ” [Forest Advisor 1, 81-85]

Best Management Practices (BMPs) also indicate high environmental quality. Following BMPs suggests that careful and appropriate management was occurring. Over one-third of the respondents (9 of 24) mentioned that properly functioning water bars, streamside management zones, and correctly located stream crossings and skid trails indicated that the area had high environmental quality and that management actions such as a forest harvesting operation would not degrade environmental quality if these BMPs were in place:

“ ... If you could see that things was being done to ... well the BMPs that I mentioned before, if you went on a prior job and seen [sic] that there was water bars put in and skid roads, and there was no dirt down the stream from you or from the previous logger, you would know that the water quality from the forest management was being done ... ” [Logger 4, 62-68]

Care was also evidenced by the tree selection process in harvesting operations. Six of the twenty-four respondents mentioned that they would favorably evaluate the environmental quality of a silvicultural action if they saw that the manager was carefully and thoughtfully “taking the trees that are sick or dying or lower quality and leaving the best” in order to sustain “future productivity”.

Intuitive Indicators—Feelings of Environmental Quality

Not everyone was confident in his or her ability to evaluate environmental quality. Even some people that were very articulate at describing why environmental quality mattered struggled describing the conditions they would use to recognize it when they saw it. For example, in the following quote, the respondent is musing to him / herself, whether or not seeing dead or dying trees would necessarily indicate poor environmental quality:

Interviewer: “...What are some indicators, or how accessible is it...can you just look out and know that you have a functioning forest?”

“ ... That is hard ... well healthy trees ... well, all of them healthy? That is tough ... some of them have to die ... yeah, because you have...that is hard ... hmmmmm ... I guess I would think of it in terms of something that appears to be in balance ... ” [Landowner 3, 160-168]

This respondent encountered difficulty giving actual direct or indirect indicators of environmental quality and resorted to the more vague and somewhat tautological descriptor of “balance.” Roughly a third of the respondents (8 of 24) found themselves in the same position, suggesting that it was difficult for them to link the visual, on-the-ground indicators with ecological quality. Some of these people explained that the indicators were intuitive, based perhaps, on some subconscious assessment of many indicators experienced through working and living on the land: you “live somewhere and get to know the forest, or the area” or “you know it when you see it.” Similar responses describe environmental quality as “intuitive,” or as “feelings.” Obviously it was difficult for certain respondents to be explicit and “sit ... here ... with a piece of paper ... and say

... the environmental quality was ... x, y, and z.” Rather, they relied on an “internal guttural [sic] feelings” or the “sense of rightness,” “awe,” “interconnectedness,” “peace,” and “wonder” that they associate with environmental quality.

Different Indicators for Different Environmental Quality Constructs

As was shown above, different definitions or constructs of environmental quality exist. These different definitions are associated with different indicators. For example, an environmentalist who emphasized biodiversity throughout the interview explained that he used the presence of “many different fern plants” as a perceptual indicator of environmental quality. Another respondent, a logger, used presence of merchantable tree species as indicators of site productivity:

“ ... Well, if I looked in there and there was nice big red oak, and poplar, you know, or hard maple ... desirable species [for timber], you’d know it was an environmental forest, but if you looked in there, and it was all ... old scrub pine ... or ... dogwood, or redbud ... that’s not ... you know, that’s just a weed tree to me ... ” [Logger 1, 291-296]

As a third example, another respondent, an environmentalist who used naturalness as the definition of high environmental quality, used the absence of humans (and their “factories,” “farms,” “chemical runoff,” and “pollution” to indicate environmental quality.

I speculate that this range of indicators reflects not only differences in defining environmental quality, but also reflects the differences in understandings of Nature and values for Nature described in previous sections. I anticipate that this complexity has implications for stakeholders concerned with environmental quality. In the conclusion of this thesis, below, there is a discussion of some of the specific implications that this complexity holds for the public education of forestry conditions, scientific justifications for natural resource management, and extension and outreach forestry to private forest landowners. I call for and outline “public ecology”—an explicit negotiation of the

definitions, indicators, and underlying values and understandings of environmental quality, which I feel will allow PFL stakeholders to more successfully navigate the ambiguous—forest environmental quality.

Chapter 4: CONCLUSIONS AND IMPLICATIONS

Achieving environmental quality is as much about setting a goal for environmental conditions as it is about allocating resources and implementing the management to achieve that goal. Defining acceptable environmental conditions is the first step towards achieving environmental quality because these definitions serve as the standards, goals, or visions of desired future conditions. But, as is illustrated here, the definition of environmental quality is, at best, ambiguous. The establishment of a consensus as to which environmental conditions are preferable and acceptable is fraught with obstacles of (mis)communication and (mis)perception. Describing this ambiguity and then mapping a route to the source(s) of this (mis)communication and (mis) perception can facilitate the definition (and thus the achievement) of good environmental quality.

Ambiguity exists

The ambiguity of environmental quality constructs surfaces both in the review of environmental literature **and** in the language of 24 concerned individuals. The singular terms “forest health,” “site productivity,” “biodiversity,” and “naturalness,” for example, have a multiplicity of definitions. These terms are often used interchangeably as if they mean the same thing and are used tautologically to define one another. The same terms also were used to represent very different environmental conditions (e.g., “health” was used to describe a heavily managed stand of young trees as well as a never managed stand of very old trees). The potential for confusion and conflict exist when the same term can describe different conditions and different terms can describe the same condition.

Diverse Understandings of Nature

The research conducted in this thesis goes a step beyond identifying the ambiguity. Not satisfied with merely presenting a case for its existence, I sought to understand **why** it

exists. One can conclude that ambiguous definitions of environmental quality result from different beliefs and expectations about how Nature works and how it should be valued. More specifically, three key factors seem to contribute to the ambiguity: different understandings of the role of Nature in guiding management, different expectations about how Nature should be used and valued, and different understandings of scale. Each of these understandings or explanations of how Nature works produces different definitions of environmental quality and different expectations of how Nature should be managed.

For example, beliefs about Nature's balance seem to influence what is considered an appropriate role of humans in Nature. Some respondents argued that deliberate human intervention is necessary because Nature is not balanced, and only through deliberate human management of Nature can there be consistency, stability, and sustainability. That is, Nature is assumed dynamic and scientifically guided management is assumed capable of evening out the bumps, glitches, and randomness of Nature to produce a steady flow of both environmental quality and desired resources. Other respondents who didn't necessarily comment on Nature's balance, explained that Nature when left alone has many inadequacies; humans must intervene where Nature comes up short. In contrast, the belief that Nature is balanced was used to justify arguments that human manipulation of the environment necessarily degrades environmental quality. Nature, self-replicating, and willful, provides the ideal for environmental quality. Nature attains this ideal environmental quality when humans do not interfere. However, recognizing human dependency on Nature, many respondents who believe in Nature's balance were willing to accept human manipulation provided it carefully mimicked natural processes and mechanisms.

Brunson's (1993) study reported similar findings. He found that naturally (nonhuman) caused change was generally more acceptable than human (intentionally) caused change. Thus, when a cause of an environmental condition is perceived to be outside of human influence the resulting condition is more natural, which often makes it more acceptable. "Wind damage in an old growth stand is inevitable, and therefore acceptable. Wind

damage alongside a clearcut is preventable (by not cutting, if by not other means) and is therefore less acceptable” (Brunson, 1993, p. 118).

The possibility that these different explanations of Nature correlate with differing acceptable characteristics of environmental quality is not limited to the role of human influence. The importance of biodiversity vs. single species management, and the emphasis on disease-free health and vigor vs. “natural” health also correlate with these explanations and evaluations of Nature. For example, a high priority placed on native species diversity align with understandings that Nature knows best, while understandings that Nature may not know best may result in suppositions that “there is no scientific value for diversity,” as illustrated above.

Different definitions of environmental quality and different expectations for management also result from people placing different values on Nature. Ecocentric, aesthetic, and spiritual values were used to explain definitions of environmental quality that limited or precluded human manipulation. Utilitarian values were used to support definitions of environmental quality that encouraged human manipulation of the environment—humans should carefully manage Nature, lest marketable resources be wasted. Enlightened self-interest values, on the other hand, correlated with definitions of environmental quality that took a more reserved approach to human manipulation—emphasizing the sustained benefits to humans over more immediate and explicitly marketable benefits. For example, health defined within an ecocentric value system is characterized as having “old-growth” or “natural” components, whereas health defined within an utilitarian perspective is characterized as having vigorous growth, and absence of disease. A third definition of health based on and defended with enlightened self-interest values might emphasize the multiplicity of long term, non-market values to humans such as clean air, clean water, and soil stabilization.

Finally, different definitions of environmental quality and different expectations for management result when people use different scales used to explain environmental conditions. Changes to the forest that occur over shorter time frames and smaller areas

are often of less concern than changes that occur over large areas and last for extended periods of time. For example, a monoculture pine stand on 100 acres is of less concern to advocates of biodiversity than is the regional replacement of mixed deciduous forests with pine plantations. Similarly, there is more concern over environmental changes that are indefinite or permanent (i.e. extinction or land use changes) than changes that are temporary (the harvest of a forest that will be allowed to regenerate).

Complexity and Ambiguity of Environmental Quality

That there is a link between beliefs and convictions about the natural world and how acceptable environmental conditions are defined is the good news. Less assuring, is that despite the application of an organizing framework (for expository reasons), contradictions were abundant throughout the interviews—not only between different respondents (which is intuitive, if not obvious) but also within individual respondents. In other words, respondents do not have just one, stable mental picture of the world that they use to decide on acceptable future environmental conditions. Rather, I observed that respondents have a dynamic mental picture of the physical world, and as this oscillates, so do their desired environmental conditions.

Take for example, respondents who defined environmental quality in terms of naturalness, biodiversity, and the absence of human intervention in one section of the interview and then later in the interview expressed tolerance for timber production and silvicultural operations. One respondent who spent the bulk of the interview discussing the importance of naturalness as a definition of good environmental quality also offered a positive assessment of “row-cropped” pine plantations. Another respondent who defined good environmental quality as a condition having “very, very little influence of man” (Forest advisor 1, quoted above in the section on natural) also argued that there should not be a distinction between humans and Nature, but rather that humans and Nature are indistinguishable:

“ ... Human influence ... well, I’m not ... I am not a ... not one of the environmentalists that feel that man is apart from the ecosystem, ok, definitely ... definitely on the side of man is part of the ecosystem ... ” [Forest advisor 1, 295-297]

As was stressed earlier, these contradictions are not included to make light of the respondents’ struggles, but rather to highlight these intrapersonal differences and contradictions in environmental quality. While there is not room here to include all of the many contradictions that emerged, these few are included as evidence that people oscillated in their pronouncements of environmental quality. This oscillation further supports the suggestion that different explanations and evaluations for Nature underlie the ambiguity in definitions of environmental quality and expectations of how forests should be managed. In these examples, respondents were “drawing from” one understanding of Nature, and they were outlining their preferred environmental quality accordingly—absence of human influence, for example. However, in the course of an hour-long interview, respondents’ pronouncements of environmental quality oscillated—significantly, as is illustrated above. These beliefs and convictions about Nature are neither rigid nor mutually exclusive—there is a possibility that there may be unexpected reshufflings in a respondent’s explanations and evaluations for Nature.

Putting Our Awareness of this Ambiguity to Good Use

The idea that understandings and values about Nature correlate with and influence definitions of environmental quality and expectations of environmental management is relevant to those concerned with natural resource management and policy. If one knows why the singular terms used to bespeak environmental quality have a multiplicity of definitions, then negotiations about desired environmental conditions might be more substantive. For example, opening negotiations with explicit discussions about the ambiguity, understandings, and values for Nature may help the negotiations avoid becoming “stuck” in debates about terminologies. As a further example, suppose two individuals discuss forest health—one derives their definition of forest health from an understanding of a balanced Nature, while the other derives it from an understanding of a

chaotic and meaningless Nature. If they attempt to discuss forest health without acknowledging or admitting that they understand Nature differently (the current scenario), they will spend their time arguing about terminology. On the other hand, they may be able to discuss forest health more effectively if they concurrently discuss their understandings and values for Nature which I claim encourages (and perhaps drives) breakdowns in discussion from ambiguity of terminology. Rather than dismissing, ignoring, or burying these beliefs and convictions, they can be made the central aspect of a frank, inclusive negotiation. In other words, if environmental management can foster discussions that elucidate the relationships between the many mental pictures of the world and the possibilities for the future of the existent, physical world, the negotiation of environmental quality may be better served than by the current quagmire of terminology in which we are caught.

Bracing for Negative Consequences

The possibility of improved environmental quality negotiations is just one possibility, however. Other possibilities can be imagined, once one acknowledges the understandings and values influence definitions of environmental quality. On the negative side, you can imagine a possibility in which stakeholders concerned with environmental quality become more closed to debate—once they are aware that there exist many correct definitions of environmental quality. Rather than engaging in negotiations about the future condition of the environment it is possible that these participants may cling all the more fiercely to their own beliefs, merely agreeing to disagree. Where one might optimistically envision a situation in which stakeholders effectively negotiate their desired future world based on their understandings and convictions, one should accept that the possibility that these understandings may reinforce environmental dissensus.

Likewise, there is a possibility that the awareness of ambiguity may slow the process of achieving environmental quality. In a technocracy, the privileged technocrat defines environmental quality, and then sets about achieving it, needing approval from no one

save the other technocrats. With a move away from technocracy, the potential for increasing delays looms large—with more people working to establish desired future conditions, consensus can be lengthy. Though I have optimistically described the potential for participatory and inclusive negotiations to reduce the time it takes to achieve environmental quality (via a circumvention of ambiguity and multiplicity in the language of environmental quality) I also accept that this may have the opposite effect.

Making These Findings Managerially Relevant

One need only look to the pages of what is arguably forestry's premier professional journal, the *Journal of Forestry*, to find "hot button topics" facing forest and other natural resource managers. Forestry consistently makes many claims regarding the needs for: better outreach to an "uninformed public" on the ways and benefits of forestry, better extension to private forest landowners (ostensibly to improve and maintain the flow of forest products in an increasingly fragmented private forest base), and shoring up science's role in the definition of good environmental quality in order to better achieve it. In this final section, I address the implications of this research on all three of these claims.

Public Outreach

Some authors have become increasingly critical of the role that science plays in negotiations of environmental quality. They argue that there is not a single, best, or scientific way of describing or understanding environmental quality (Callicott, 1992; Cronon, 1995; Peterson, 1997; Worster, 1995). Rather there exist many qualities, all of them value-laden. Scientists and non-scientist stakeholders both have a meaningful role to play in the identification and definition of these qualities. Science alone cannot, and many argue should not, define these qualities independently of the values and expectations society places on Nature.

Professional Forestry claims that the “uninformed public” needs to be educated about the benefits and necessity of good, scientific, forest management. As mentioned in the introduction, the professional literature is full of suggestions that link good forest management with scientific forest management. The ability of science to defend and guide forestry is rarely questioned by professional Forestry. Instead, Forestry need only disseminate these scientific understandings to the lay public and convince them that Forestry knows how to implement these understandings. However, suppose that it is not ignorance that the forestry community is battling, but rather, very different understandings, expectations, and values for Nature. What forestry professionals may intend as education, others may (mis)perceive as prattling by an industry driven juggernaut—not because they are uninformed or uneducated, but rather, lack the same foundational understandings of the role of humans and Nature that underlie many of the definitions of environmental quality used by forest science. Repetition of an educational message that forestry does not harm or even enhances environmental quality may be useless in changing “uninformed” opinion if these “uninformed” opinions are not based on misinformation but on **equally valid**, alternative understandings of Nature, forests, and environmental quality. Failure to account for these differences may only further alienate and reaffirm the positions and beliefs of the “opposition.” This includes, but is not limited to, the use of scientific arguments regarding: (1) the adequacy of environmental regulations and the ability of forestry to adhere to these regulations, (2) the role of forest harvesting in regeneration, fire prevention, and biodiversity enhancement, and (3) the likelihood that status quo forestry can be maintained into perpetuity.

In fact, there exists the possibility that some of the implications of this research could be used against the forestry community. Arguments can be mounted suggesting that current “scientific” justification (and education) of forest management is based as much, if not more, on subjective understandings and values than on objective “truth.” But if this research exposes these weaknesses in this united front that forestry approaches the public with, it also suggests ways in which forestry might strengthen its educational message.

For starters, forestry outreach can be explicit about its foundational understandings—namely that human ingenuity can improve upon Nature’s unimproved state. If the recipient of outreach acknowledges the assumptions associated with this understanding, there is little room for disagreement over the current state and trajectory of forest science. Scientific forest management **is** producing more (forest goods and services) for humans than is possible than a Nature closely mimicked or left alone. Conversely, if forestry starts from an assumption that Nature knows best or that human technology is limited, then it can promote management methods that more closely imitate a Nature without human intervention. To some extent, forestry may be moving in this direction, for example, with smaller clearcuts, patch clearcuts, uneven aged management, and harvesting strategies that mimic “natural” disturbances. In order to reach out to the public on the issue of understandings of Nature, forestry can try to bring the public to the same understandings of Nature, or they can realign their understandings of Nature and accept a scientific paradigm that is more welcoming and catering to differing understandings of Nature.

Additionally, forestry can craft arguments that appeal, not to just science, but to the common ground that it shares with the public concerning values. The diverse values for forests cannot be disputed—society depends on and enjoys many goods and services that our forests provide. Defense of forest management might be better constructed on the demand for economically **and** non-economically valued forest goods and services—both today and into the future. I argue that forestry can better reach the public with this approach, provided it is willing to readjust its position and absorb costs of opportunities forgone or postponed if society decides it wants to trade benefits today for benefits tomorrow (in the interests of maintaining or improving upon the current values of forestry).

Extension

The same suggestions hold true for forestry extension to private forest landowners. Landowners may not be interested in the forest management advocated by forest

extension, not because they don't have enough information, but because they may have different (equally valid) understandings of Nature, forests, and environmental quality than extension foresters. Repeating a message that demand for fiber is increasing or sound forest practices protect environmental quality may be ineffective when the different preferences for management are not due to misinformation or ignorance but rather due to different understandings and values for Nature. A scientific message promoting intensive forest management may not "soften" the minds of private forest landowners concerned with mimicking "Nature's" forestry. Likewise, an economic message promoting intensive forest management may not "soften" the minds of private forest landowners concerned with the aesthetic values of forestry. Instead, forestry extension may be more effective with a message that places less emphasis on redundancy (public relations type messages, easily dismissed if deemed inappropriate) and more on requiring serious thought about one's foundational understandings and evaluations for Nature.

The fact that single tree selection "horse-logging" on private forest lands still exists, and is being promoted by groups often critical of forest management (see Appalachian Voices—www.appvoices.org/, Healing Harvest Forest Foundation—<http://community.roanoke.com/groups-hhff>) further illustrates these implications offered above. While current forest science may disparage single tree selection "horse-logging" on the grounds that it does not take full advantage of scientific and technological gains (i.e. forest harvesting systems advances, genetically improved stock, and maximizing the annual growth rate) private forest owners may be accepting, on the basis that it follows Nature's blueprint more closely. Where forest economics may be critical of single tree selection "horse-logging" on the grounds that it is more expensive in time and money, private forest owners may be accepting, on the basis of the aesthetic and romantic values (i.e. the practice of a traditional "woodcraft"). Private forest landowners might be more receptive to a forest management message that seems (to them) consistent with their understandings of good environmental quality.

Conclusion

Forestry is attempting to end the “cold war” of (mis)communications and (mis)perceptions between foresters and environmentalists (Heissenbuttel, 2001). Issues that influence the management of private forestlands demonstrate that these miscommunications and misperceptions are very complex (i.e. it is difficult, perhaps wrong, to categorize into generalized, and sometimes misrepresented groups). The demand for and debate over good forest environmental quality should not be viewed problematically, or ignored, but rather, should be seen as an opportunity for us (society) to achieve the future we want. These findings suggest that forestry and others examine the sources of their (mis)communication and (mis) perception, in the interests of maintaining both forest management and environmental quality.

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Appendix A: INTERVIEW GUIDE

1. Describe how you became involved and concerned with forestry.

Please describe some of the your forestry related activities and how they influence the environmental quality of (your forest) (privately owned forest of a client) (how might an NGO answer this?); [Let them talk]

2. How do you define "Good ENVIRONMENTAL QUALITY" on your land [on private forest land where you have worked]? What makes it acceptable or unacceptable? Why does it matter? **Repeat till exhausted**

- A. What exactly is x? Or what exactly do you mean by x? [i.e., biodiversity, sustainability, management, cutting, soil stability...]? (**define it**)

Can you suggest and explain **one example** on your (private) land where x is found? (Can you suggest and explain one example where you helped produce x) (be sure to **explain** why/how)

How do you recognize or identify x on the ground (on your property, on a job you supervised,..) (how is it measured)?

- B. How does x produce/relate to EQ? How do you explain the link between x and EQ? (**mechanism or process behind it: what is the role of humans, scale, balance, etc.**)

Can there be acceptable EQ without x? How?

- C. Why does (x) matter? Why do you care about it? (**value system**)

- 3) What is forest health and how does it differ from EQ?

- 4) Can you suggest **other** understandings of EQ that **other** folks might have? What is right or wrong about these definitions, if anything? Why do you think these people use different definitions than yours?

- 5) What is the relationship between private property rights and environmental quality? Under what conditions does the government have the right to regulate how people use their forest in order to protect EQ?

- 6) Can humans improve EQ beyond what Nature does for itself? Explain

- 7) Is there additional/better information about EQ you could use to do your job (manage you forest) ? What would you like to know more about? Why? How should it be made available?

Appendix B: VERSION OF CODING SCHEME

“FREE NODES”

Problems Defining Environmental Quality
Human – Nature Dichotomy
Complete Utilization
Overpopulation
Other People’s EQ Understandings
Other People’s EQ Misunderstandings
Economy over EQ
Can Humans Improve upon Nature
Additional – Better Information Needed

“INDEX TREE ROOTS”

AFFILIATION OF INFORMANT

- 1 USFS
- 2 Environmental NGO
- 3 Land Owner
- 4 Logger
- 5 Forestry Consultant
- 6 Scientist

VALUES

- 1 Utility, Economic Resource
- 2 Uncertainty and Indeterminacy of Information
- 3 Enlightened Self-Interest
- 4 Spiritual
- 5 Aesthetic
- 6 Recreation
- 7 Ecocentric
- 8 Low Faith in Technology
- 9 Community Image and Identity
- 10 Living Simply
- 11 Human Health
- 12 Education and Scientific Study

MECHANISMS

- 1 Geographic Scale
- 2 Time
- 2 1 Age: Ancient, Old Growth
- 2 2 Other
- 3 Exotic species
- 4 Reproduction & Regeneration
- 5 Migration

- 6 Scarce Resources
- 7 Natural (no human influence)
- 8 Active, Intensive Human Management
- 9 Some Human Impact OK
- 10 Balanced
- 11 Dynamic, Disturbance, Change
- 12 Resilience, Self-healing Ability of Forest
- 13 Diverse Species
- 14 Structural Diversity
- 15 Abundant Species
- 16 Nutrient Cycling
- 17 Flow of Energy
- 18 Societal Malaise

INDICATORS

- 1 Indirect
- 2 General Human Presence
- 3 Historic Reference Condition
- 4 Stream Quality
 - 4 1 Clear Water
 - 4 2 Stream Banks
- 5 Erosion
- 6 Species
 - 6 1 Non-game
 - 6 2 T&E Species
 - 6 3 Charismatic Species
 - 6 4 Sensitive Indicator Species
 - 6 5 Tree Species
 - 6 6 Exotic Species
 - 6 7 Invasive Species
- 7 Roads
- 8 Diversity
 - 8 1 Abundant Species
 - 8 2 Structural Diversity
 - 8 3 Age – Time
 - 8 4 Species
- 9 Nothing Specific – Can't Tell
- 10 Trees, Vegetation
 - 10 1 Large Trees
 - 10 2 Junk Species
 - 10 3 Favored Species
 - 10 4 Other
 - 10 5 Rare
- 11 Chemical Application
- 12 Fire
- 13 Insects

- 14 Disease
- 15 Reforestation
- 15 1 Plantations
- 15 2 Natural
- 16 Grazing
- 17 Silvicultural Tree Removal
- 18 Large Scale Projects (dams, etc.)
- 19 Specific Place
- 20 Management Prescription from Plan
- 21 Climax Stage of Succession
- 22 Waste
- 23 Sprawl, Housing
- 24 Wilderness Designation
- 25 Clean Air and Water
- 26 Acid Rain
- 27 Large Scale Die-back

EQ CONSTRUCTS

- 1 General EQ
- 2 Biodiversity
- 3 Health
- 4 Sustainable Timber
- 5 Sustainability: General
- 6 Natural
- 7 Habitat
- 8 Soil Quality
- 9 Air Quality
- 10 Site Productivity
- 11 Integrity
- 12 Water Quality

Appendix C: DESCRIPTION OF RESPONDENTS

Environmentalist 1: This respondent is male, middle-aged, and works as a school teacher. Previously, this respondent worked in forest industry, but outside the local region.

Environmentalist 2: This respondent is male, middle-aged, and works full time for an environmental organization. This respondent lives on a small farm.

Environmentalist 3: This respondent is male, retired. He volunteers for a small organization especially concerned with water quality in an area of the state that has been heavily mined for coal.

Environmentalist 4: This respondent is female, middle-aged, and works as a blue-collar professional. She lives on forested lands.

Forest advisor 1: This respondent is male, late thirties to early forties, and works full time for a consulting forestry company.

Forest advisor 2: This respondent is male, early to mid thirties, and works full time for the same forestry company as Forest advisor 1.

Forest advisor 3: This respondent is female, mid thirties, and works full time for a public forestry organization (public being federal, state, or local government).

Forest advisor 4: This respondent is male, mid thirties, and works full time for an industrial forestry company as an outreach forester / landowner assistance forester.

Forest advisor 5: This respondent is male, middle aged, and works full time for a public forestry organization.

Forest advisor 6: This respondent is male, middle aged, and works as a private consulting forester that he established over the past several years. Prior to establishing his consulting business, this respondent worked for many years for a public forestry organization.

Landowner 1: This respondent is male, retired, and works full time as the owner / operator of a Christmas tree farm.. He lives and practices forestry on several hundred acres of rural, mountainous forest land.

Landowner 2: These respondents are a married couple, middle aged, who live on a small forested tract. The husband owns and works at financial company. They are avid trail (horse) riders.

Landowner 3: These respondents are a married couple, middle-aged, who live and work full time on a fairly large forest farm. The husband has been active in forestry outreach on a personal and professional level.

Landowner 4: This respondent is male, retired, and owns a forested property. He was active in local government and owned a construction related company.

Landowner 5: This respondent is male, retired, who owns forested property in conjunction with his farm. This respondent is also an avid horse rider.

Landowner 6: This respondent is male, middle-aged yet retired. He owns and lives on less than 100 acres.

Logger 1: This respondent is male, middle-aged, and owns and operates a large mechanized logging operation.

Logger 2: This respondent is male, and nearing retirement age. This respondent owns many forested acres.

Logger 3: This respondent is male, middle-aged, and owns and operates a large mechanized logging operation.

Logger 4: This respondent is male, on the young side of middle-aged, and owns a medium sized logging operation, that he has established over the last 10 years.

Scientist 1: This respondent is male, and is a retired yet professionally active forestry professor. He owns or co-owns forested land.

Scientist 2: This respondent is male, middle-aged and works as a professor of forestry.

Scientist 3: This respondent is male, retired, and was formerly a professor of biology. He owns forested land.

Scientist 4: This respondent is male, nearing retirement age, and is currently a professor emeritus of biology.

VITA

David Richert was born April 20, 1975 in Montgomery, New York. He graduated from high school in June 1993 and enrolled in the forestry program at Virginia Tech the following fall. During his undergraduate study, he spent 16 months as a co-op student, working for Champion International (now International Paper) in Roanoke Rapids, North Carolina. Additionally, he studied forestry as an international exchange student at the University of Melbourne, in Australia for one year. He earned his Bachelor of Science in Forest Resource Management from Virginia Tech in May of 1998, and spent the following summer working as a wilderness ranger for the U.S. Forest Service in Meeker, Colorado. He will receive his Master of Science in Forestry with a concentration in Recreation in May of 2001. Upon graduation, David anticipates finding a position that focuses on human dimensions issues of natural resource management.