

The Re-Birth of Environmentalism as Pragmatic, Adaptive Management

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"To preserve any land in a wild condition is, of course, a reversal of the economic tendency, but that fact alone should not condemn the proposal. A study of the history of land utilization shows that good use is largely a matter of good balance—of wise adjustment between opposing tendencies. (Aldo Leopold, "Wilderness as a Form of Land Use" (1925)

"We know almost as little about the ecological mechanism of these United States as a hen knows about the cosmic chemistry which controls her life and her productivity." (Leopold, "Whither 1935?—A Review of the American Game Policy, 1935).

"The cowman who cleans his range of wolves does not realize that he is taking over the wolf's job of trimming the herd to fit the range; he has not yet learned to think like a mountain. Hence we have dustbowls and rivers washing the future into the sea" Leopold, A Sand County Almanac (1949)

"We conservationists ... have many ideas as to what needs to be done, and these ideas quite naturally conflict. We are in danger of pounding the table about them, instead of going out on the land and giving them a trial. The only really new thing which this game policy suggests is that we quit arguing over abstract ideas and instead go out and try them." Leopold, "The American Game Policy in a Nutshell" (1930)

Introduction:

The Rhetorical Legacy of Early Conservation and the Age of Ideology

If you have visited an environmental website lately—practically ANY environmental website, that is--you are well aware that we are gathered here, at best, for a memorial service. The death of environmentalism has been announced, the obits have been written and published on websites and in print—environmentalism's wake has been held. An odd wake it was, as some celebrated the life of the movement, or even protested that the reports were exaggerated, even as the Limbaugh's and the right-wing bloggers celebrated its proclaimed death. According to Shellenberger and Nordhaus, those of us who are here to discuss environmentalism and its future are just family members who continue for awhile to speak in the present tense of their lost loved-one.¹ All that remains for environmental pundits like us, apparently, is to turn to history, and try to understand

¹ Michael Shellenberger and Ted Nordhaus, "The Death of Environmentalism," Essay released at the Meeting of the Environmental Grantmakers Association, October, 2004. <http://www.grist.org/news/maindish/2005/01/13/doe-reprint/>.

how a once-rich and powerful movement could go moribund, even as our environment suffers insult after insult before our eyes.

In this presentation, I offer an alternative account of this death by re-identifying the corpse, and by telling a story whereby the death sets the stage for a rebirth in the form of a new generation of environmental thinking, what I am calling the Age of Adaptive Management, and to a new way of talking about and thinking about "environmental" problems and the values they threaten. What died, I hope, is not the sentiment that favors protecting our natural landmarks, biological diversity, and systems productive of vital resources. No, what ended was not the life of the environmental viewpoint or activity of committed environmentalists. What died was what I call "The Age of Ideology" in environmentalism. My purpose today is to sketch the broad outlines of the new Age, by celebrating the re-birth of environmental concern as a commitment to learning by doing.

In my new book, Sustainability: A Philosophy of Adaptive Ecosystem Management, I tell again the oft-told story of the amateur spiritualist John Muir, up against the economic utilitarian, Gifford Pinchot, but I offer perhaps a new twist on the story.² While not disparaging the inspired rhetoric of the early years of conservation, I show how its legacy—and the value categories it forced upon us—has been the "Age of Ideological Environmentalism," which has led to a polarization with respect to environmental goals and environmental values, and to a hopelessly maladapted approach to integrating facts, values, and action in the search for rational environmental policy. With Muir damning the dam at Hetch Hetchy and decrying economic activity in the National Forest Reserves as evil incarnate, and with Pinchot speaking the Gospel of

² Bryan G. Norton, Sustainability: A Philosophy of Adaptive Ecosystem Management (Chicago: University of Chicago Press, 2005).

Conservation—the language we use to discuss environmental values and goals has been fractured every since. These fractured languages, and the unverifiable theories that they rest upon, enforce the hold ideology has on environmental discourse. For understandable historical reasons, the early rhetoric and value categories created in these debates, have bequeathed to us a formulation of environmental problems as all-or-nothing, zero-sum games, where nature or humans are sure to be losers. These formulations, based on highly questionable normative assumptions embodied in the "original positions" of the two wings of the movement, have ossified within the language of environmental discourse, led to the ill formulation of problems, and makes any concerted environmental actions in any direction impossible. Communication and cooperation have become impossible due to this linguistic and rhetorical quirk of conservation history.

So, in my book I propose a new way to talk and write about environmental problems, a new language that can be embedded within an activist process of adaptive management. My attempt centers on a conscious and detailed attempt to rehabilitate the concept of sustainable development. I cannot of course summarize my 600-page book today, but I do want to emphasize one of its main themes here. I believe that the current manifestations of the rhetoric of nonanthropocentric environmentalism—those who claim that elements of our environment have values intrinsic to them, and independent of us-- and of the free marketeers--who pursue the rhetoric of consumptive opportunity and the maximization of consumer benefits--are equally *ideological*. They depend upon ontological commitments that cannot be justified by empirical test, which is what I mean by calling them "ideological." They are a priori commitments that bring with them both

their own language and a destructively polarized formulation of problems that prevents productive discourse about how to solve them.

I will begin my sketch of adaptive management by emphasizing one important aspect of the thoughts and actions of Aldo Leopold—his pragmatic commitment to experimentalism in management. I believe that Leopold was the first adaptive manager—that he identified and developed the essentials of a post-ideological approach, guided by Darwinian analogies, to environmental decision making and management, even though the phrase, "adaptive management," was only invented decades later, by C.S. Holling. By emphasizing this aspect of Leopold's thought—which involves a (1) temporally sensitive, multiscale interpretation of "Thinking Like a Mountain," and (2) Leopold's activism and experimentalism, I think I can show that Leopold deserves, despite the tardiness of the label, to be called the "first adaptive manager."

In the book, I provide additional evidence for my hypothesis, first stated in 1988, that Leopold was deeply influenced by Arthur Twining Hadley, who was President of Yale University when Leopold studied there.³ From Hadley, Leopold picked up a form of Darwinian naturalism regarding both science and ethics, and defined the truth, following Hadley's pragmatist definition, as "that which prevails in the long run!" which is an almost-direct quotation from an important paper, published by Hadley the year Leopold graduated from Yale. This influence, when embedded within Leopold's commitment to activism, led him to avoid any distinction between the right and the true: there is only one way to settle disagreements, whether they be about scientific unknowns

³ See my "The Constancy of Aldo Leopold's Land Ethic," Conservation Biology 1988: (reprinted in A. Light and E. Katz, Environmental Pragmatism (New York and London: Routledge Publishers, 199x. For additional arguments, see my Sustainability, Sections 2.3 and 2.4.

or value assertions, and that is the method of experience, experience that accumulates gradually across time. Leopold, the manager, was not a positivist;⁴ he was an activist who respected the role of experiential learning across time as the only response both to uncertainty in science and in response to confusion and disagreements about value.

Leopold was a post-positivist, a scientist who embedded science in management, practicing what we today call "post-normal," or "mission-oriented" science before his time.⁵ He was also an experimentalist with respect to ethics, insisting that conservation goals be tested in practice, not just argued in theory (epigram).

Here, in Part I, I will summarize my reasons for thinking that ideological environmentalism, and the value theories that support the polarized ideologies essential to it, are bankrupt; I hope they are also dead, kaput. Then, in Part II I will take a look at the bigger picture in resource evaluation, challenging the reader to question the usual assumptions about the nature of environmental problems, arguing that a pluralistic understanding of environmental values is more realistic, and also more functional. In Part III, I present an overview of the approach to adaptive management that emerges if one rejects positivist science and if one rejects, simultaneously, the ideological commitments to a priori ontological positions about the nature of environmental value. Once a pluralistic value system is articulated, and problem formulation is freed from

⁴ But see, J.B. Callicott, In Defense of the Land Ethic, State University of New York Press: Albany, 1989, p. 165 for a direct denial of this key aspect of Leopold's thinking. Callicott says, attributing to Leopold the view that "nature, in the broadest sense of the word, from atoms to galaxies and from elemental matter to the most complex life forms is value free, axiologically neutral." In my view, Callicott and his followers, having neglected to pick up on Leopold's pragmatic roots, have miscast Leopold as a non-anthropocentric ideologue; in fact he was an experimentalist, who tried out different ethics, wondering about their effects in practice. He submitted goals as well as instrumental means to experiential tests.

⁵ Sylvio Funtcowitz and J. Ravetz, ; "Science for the Post-Normal Age,"

dogmatism about the one right way to characterize environmental value, it is possible to formulate environmental problems so that we can move toward cooperation and compromise.

Part I: Environmental Ethics and Environmental Economics: The Foundations of Ideology

Environmental ethics and environmental economics, at least insofar as we understand them as sub-disciplines of philosophy/ethics and of mainstream economics, emerged in the 1970s as academic sub-fields devoted to understanding the ethical and economic relationships between the human and nonhuman worlds.⁶ What emerged, however, was that these subfields came to embody the rhetorical positions of Muir and Pinchot. The assumptions and commitments made by the practitioners of environmental ethics and environmental economics, exemplifying the ideological thinking just now mentioned. The two disciplines have followed Muir and Pinchot into the same blinding rhetoric: humans and nature are in a struggle; Pinchot opted to protect and enrich humans, with regard only for sustaining consumption, Muir threatened to sign up on the side of the bears in the war of humans against nature.⁷ In this section, I will caricature the two ideological approaches to environmental value, briefly surveying where the ongoing battle between environmental ethicists and environmental economists stands.

Most writing on environmental ethics concerns the dichotomy between humans and nonhumans, and much of the work in the field has been motivated by the effort to

⁶ Bryan Norton and Ben Minteer, "From Environmental Ethics to Environmental Public Philosophy: Ethicists and Economists, 1973-Future," in T. Tietenberg and Henk Folmer, *The International Yearbook of Environmental and Resource Economics*, 2002/2003: 373-407.

⁷ John Muir, *A Thousand-Mile Walk to the Gulf of Mexico* p. xyz.

escape "anthropocentrism" with respect to environmental values. Resulting debates about whether to extend "moral considerability" to various elements of nonhuman nature have been inconclusive, to say the least, and writings in this vein have had no discernible impact on the development of sustainability theory or on public policy more generally.⁸

Discussions in the field of environmental ethics, which emerged as a separate sub-field of ethics in the early 1970s, have, as just noted, turned on defining and explaining key dichotomies.⁹ This trend originated in the publication in 1967 by the historian Lynn White, Jr., of an influential essay, "The Historical Roots of Our Ecologic Crisis." White declared that Christianity "is the most anthropocentric religion the world has seen," setting the stage for a spate of responses by ethicists who questioned the longstanding ethical divide between humans and nonhumans.¹⁰ Environmental ethicists have, accordingly, focused on the dualisms of Modernism: humans vs. nonhumans, moral exclusivism - the view that all and only humans have intrinsic value, and the underlying dichotomy between matter and spirit. From 1970 until the early 1990s, these dichotomous formulations dominated environmental ethics because the question of where to draw THE LINE between those beings that are morally considerable and those that are morally irrelevant seemed so seminal a question that the field could not proceed without some resolution of it, and yet discussions of "intrinsic" or "inherent" value shed little light on practical questions about what to do.

⁸ Christopher D. Stone, UC Davis paper--

⁹ Norton, Sustainability, Chapter 5.

¹⁰ Lynn White, Jr., "The Historical Roots of our Ecologic Crisis," Science. For a detailed account of the impact of White's paper on the history of environmental ethics, see Norton (2005, Section 5.3). As examples of the trend see, for example, Routley, "Do We Need a New, an Environmental Ethic?" : Holmes Rolston, III, " " Ethics

Worse, emphasis on these dichotomies created an unresolvable conflict with environmental economists, blocking any integration of philosophical and economic discourse.¹¹ Because economists insist that all values are values of human beings (consumers), they are in ontological disagreement with environmental ethicists, who wish to shift the line of moral consideration to include nonhumans and their interests. It is difficult to see what would resolve this disagreement.

Meanwhile, preoccupied with this debate, philosophers have not been major players in the evolution of sustainable development, and debates about the nature and measurement of environmental value have been staged at the edges of mainstream environmental economics and of the emerging competitor, ecological economics, both of which count human values only and, currently at least, favor economic evaluation of nature's services as the main means of characterizing and measuring environmental values. Environmental ethicists, rejecting the anthropocentrism apparently involved in using economic methods, at all, have argued indiscriminately against all attempts to assess the economic and instrumental uses of the material world for the satisfaction of human needs and demands. Thus, by objecting to the economic framework of analysis (because it is anthropocentric), environmental ethicists have been at cross purposes with both sides in the debate about how to define sustainable development, and have been relegated to the sidelines of the real action in articulating the goals of sustainable development.

By the 1990s, a few philosophers began to see that this unfortunate stalemate between economic approaches and environmental philosophy rested mainly on

¹¹ Norton and Minteer, "From Environmental Ethics" and Norton, Sustainability.

ideological commitments and a priori theories, theories that for non-empirical reasons attempt to force all environmental value into a single valuational currency. As noted above, no empirical evidence can be brought to bear upon whether nature has intrinsic value;¹² and commitments to valuing objects as consumable items with a price are likewise based on a priori assumptions. Worse, the categorical nature of the debate has encouraged all-or-nothing answers to complex management problems, and a conceptual polarization that leads to direct oppositions and an inability to frame questions as open to compromise.

If one instead adopts pluralism, accepting the fact that humans value nature in many ways, and considers these values to range along a continuum from purely selfish uses to spiritual and less instrumental uses, it is unclear—and not really very important—where to “separate” value into “human” and “nonhuman”.¹³ If we think of natural objects as having many kinds of value, arguments about why we should protect nature slide into the background and the focus moves to protecting as many of the values of nature as possible, for the longest time that is foreseeable. Leopold, Rachel Carson, and all of the great second-generation conservationists have believed that protecting nature is protecting the future of mankind, and that protecting the future requires protecting nature. By defining humans as ecological beings, it was obvious to them that the destruction of

¹² As is explicitly acknowledged by JBC, who has recently stated:

¹³ For a discussion of monism versus pluralism, see Christopher D. Stone, Earth and Other Ethics (New York: Harper and Row, 1987), esp. Part IV, and two essays written in response by J. Baird Callicott, which are published as Part III of Beyond the Land Ethic (Albany, NY: State University of New York Press, 1999). On the empirical question of whether most Americans are pluralists or monists, Ben Minteer and Robert Manning [“Pragmatism in Environmental Ethics: Democracy, Pluralism, and the Management of Nature” Environmental Ethics ()199x:] have provided strong evidence that pluralism is in fact the dominant mode of value expression in the United States.

nature would be the destruction of humans. Conservationists have always seen the values of protection of nature as additive; Muir, in choosing to fight on the side of the bears, of course believed that the humility enforced by a victory of the bears would also be just the right prescription for human arrogance. From Muir to Leopold to Adaptive Managers, what has been constant is a commitment to a convergence on a set of policies that would serve both the goals of saving humankind in the long run, and of saving present elements and processes of the natural world. Of course there will be disagreements about priorities and immediate objectives, but if policies are devised to protect as much of nature as possible for the use and enjoyment of humans for as long into the future as possible, then it is perhaps not crucial whether those values preserved are counted in one theoretical framework or another. Remaining disagreements are more likely to be formulated as testable hypotheses about possible effects of actions, or as disagreements about priorities in the expenditure of resources to pursue various goals. Unlike ideological and ontological disagreements, these latter disagreements are open to test or to negotiation.

The viewpoint advanced here is referred to as *environmental pragmatism*, which is a philosophy of environmental action that begins with real-world problems, not with abstract, theory-dependent questions regarding what kind of value nature has.¹⁴ Environmental pragmatism bypasses the theoretically grounded questions of environmental ethics and focuses on learning our way out of uncertainty in particular situations. Adaptive management is social learning; and pragmatism provides an epistemology adequate to support social learning through experimental adaptation.

¹⁴ Andrew Light and Eric Katz, Environmental Pragmatism (London: Routledge, 1996; Norton, Sustainability

Further, pragmatism complements the search for sustainable development because it is a forward-looking philosophy, defining truth as that which will prevail, within the community of inquirers, in the long run. This feature makes it a natural complement to the theory of sustainable development and acts as the unifying thread in the justification of preservation efforts at all scales: This forward-looking sense of responsibility and commitment to learning our way to sustainability can be thought of as pragmatism's contribution to the theory of sustainable development.¹⁵

In the remainder of this presentation, I will propose one approach to a new environmental philosophy, a philosophy that is more geared to learning to live sustainably than in defining what kind of good nature has. This philosophy emphasizes social learning and community adaptation, and it derives its method more from the epistemology of pragmatism than from theoretical ethics.

Part II. Adaptive Management

Adaptive management, which can be understood as a search for a locally anchored conception of sustainability and sustainable management, sets out to use science and social learning as tools to achieve cooperation in the pursuit of management goals.¹⁶

Three characteristics can be taken to define a process of adaptive management:

¹⁵ Lee, 1993; Norton, 1999; Norton, 2005

¹⁶ Holling, (1978) Walters, 1986; Lee, 1993; Gunderson, Holling, and Light, 1995; Gunderson and Holling, 2002; Norton, 2005). A note on terminology: perhaps the closest analogue to adaptive management in Europe is "Ecological Modernization," which shares some tenets with adaptive management, but also differs in emphasis. See Hajer, (1995).

1. Experimentalism: adaptive managers respond to uncertainty by undertaking reversible actions and studying outcomes to reduce uncertainty at the next decision point.
2. Multi-Scalar Modeling: adaptive managers model environmental problems within multi-scaled (“hierarchical”) space-time systems.
3. Place-Orientation: adaptive managers address environmental problems from a “place” which means problems are embedded in a local context of natural systems but also of political forces.

By profession, most adaptive managers are ecologists and most discussions to date have emphasized learning our way out of scientific uncertainty; these ecologists have paid less attention to developing appropriate processes for evaluating environmental change and for setting intelligent goals for environmental management. I incorporate the ideas of these ecologists and expand them to include learning about social values as an integral part of the adaptive management process.

The adaptive management approach that I wish to defend rests on three intellectual pillars.

I. *A Commitment to a Unified Method: Naturalism.* Attempts to separate factual from value content in the process of deliberation are rejected; there is only one method for evaluating human assertions, including assertions with all kinds of mixes of descriptive and prescriptive content, and that is the method of experience—active experimentation when possible, but careful observation otherwise. The scientific method is embraced as the best approach to evaluating hypotheses about cause and effect, but it is

also considered the best way to evaluate hypotheses about what is valuable to individuals and cultures.

A more realistic—and less theory-driven—view of the relation between factual and evaluative discourse is advocated by BAO Williams, who argued persuasively that, in ordinary discourse, fact-discourse and value-discourse are inseparable; when philosophers separate them, they do so on the basis of a specialized theory, such as logical positivism.¹⁷ In the ordinary discourse in which citizens discuss and evaluate their environment, these discourses are inseparable; to insist on partitioning policy discourse into fact-discourse (positivistic science) and value discourse is to artificialize that discourse. There is an alternative, of course. Following pragmatists such as C.S. Peirce and John Dewey, one can advocate a pragmatic epistemology for environmental science and policy discourse, a discourse conducted so as to maximize social learning among participants.¹⁸ This epistemology insists upon a single method—the method of experience—and this method applies equally to factual claims and to evaluative ones. Following Dewey, assertions that something or some process is *valued* are taken as a hypothesis that that thing or process is *valuable*. Pursuing that value, and acting upon associated values, provides communities with experience that can support or undermine the claim that the thing or process is indeed valuable.

So, rejecting non-naturalism, the first pillar of my proposed approach is a form of methodological naturalism. This method, while not expecting deductions from facts to values, relies on the open-ended, public process of challenging beliefs and values with contrary experience. From these challenges, we expect attitudes, values, and beliefs to

¹⁷ BAO Williams, Ethics and the Limits of Philosophy (1985)

¹⁸ (Dewey, 1927; 1966; Lee, 1993)

change—but the changes cannot be justified by deductive arguments flowing one way from facts to values. The changes needed to support a new conservation consciousness are usually reorganizations and re-conceptualizations of facts, not deductions from value-neutral facts. The specific means by which assertions of value are connected will be through the development and refinement of measurable indicators that reflect values articulated by the stakeholders who represent multiple positions within the community. Pluralism is operationalized in process as communities participate in choosing multiple indicators, as will be discussed in the next two Sections.

II. *An Emphasis on Process.* The form of naturalism I adopt, I call it "methodological naturalism" because it replaces abstract principles of right and good that are thought by some naturalists to be derivable from observation of nature with an emphasis on a process of deliberation and learning. Process-oriented approaches are not burdened with the need to defend a general principle that is to be applied to particular cases; process approaches emphasize the way problems get formulated and addressed across time by participants in public discourse, and provide heuristic guidance to encourage the asking of the right questions. The process approach, to put it in the terms of decision science—while it may make use of optimizing models as part of simulations or broader inquiries—does not seek optimal outcomes or expect real-world problems to be "solved" by algorithms. It seeks, rather, to improve the "rationality" of the process. Here, however, rationality does not refer to computational "solutions" to optimization problems, but to heuristic attempts to make the management process more open, and to make the process one that is conducive to cooperative action. In my book, I endorse a way of talking about how to accomplish such improvements— called "social learning" by

Dewey—that relies heavily upon the work of Jurgen Habermas and his work on "communicative ethics." While time does not permit a full discussion of this endorsement here, its mention may give some idea of the kind of discourse and decision processes that might be favored. Having forsaken the hopeless goal of algorithmic solutions to complex problems, pragmatists and adaptive managers analyze processes and offer heuristics, general rules that help communities, in as democratic and open a process as possible, to remain focused on the right questions, the questions that will lead to plans to protect their place and the values it embodies in their own culture.

III. *A New Approach to Scaling and Environmental Problems.* Building on this Empirical Hypothesis, scalar choices in modeling environmental problems, if made a topic for open public discussion, might provide insight into the temporal and spatial "horizons" over which impacts will be measured, and processes of change monitored. In policy, they direct the formation of effective administrative strategies for addressing problems; scientifically, careful attention to the dimensions and models developed in response to environmental problems might clarify problem formulation and illuminate public discourse.

Before going on to introduce the application of a new way of thinking about space-time relationships in environmental problem formulation, I cannot resist the chance to mention some pertinent research I am doing with colleagues at Georgia Tech and the University of Illinois. We have noticed that, when both experts and other interested discussants address an environmental problem they, usually implicitly, "bound" the system to which they attribute that problem. Further, we realized that these implicit boundaries represent a huge part of the "mental model" people—whether expert or lay—

have of environmental problems. Finally, we noticed that the best predictor of the mental model to which an interested party in a debate will subscribe is the interest group he or she identifies with ("I am a sport fisherman," "I am a sailor," "I am a developer"). In some research just begun recently, we seek to understand these implicit choices, their base in values and priorities, and their cognitive and emotional effects on the formulation of environmental problems. This research, we hope will to some extent de-mystify the way in which values, even while implicit, go a long way toward shaping the mental models we employ in problem formulation. If our hypotheses, that people's *values* are the most basic shapers of an individual's mental models, and that groups that share economic and other interests develop disparate *cultural* models, are supported by social science research, we may be able to develop some tools that will make more rational the ways in which people "bound" environmental problems in space and time and, in the process, uncover the important ways in which values shape the conceptualization and formulation of "environmental problems".

Part IV. Scaling and Environmental Problem Formulation

Environmental disputes are so difficult, among other reasons, because it is so difficult to provide a definitive problem formulation. This feature was well explained by Rittel and Webber (1973), who distinguished "benign" and "wicked" problems. Benign problems, they said, have determinate answers and when the solution is found, the problem is uncontroversially "solved." Mathematics and some areas of science exemplify benign problems. Wicked problems, on the other hand, resist unified problem formulation; there is controversy regarding what models to use and what data are important. Rittel and Webber suggest that wicked problems, because they are perceived

differently by different interest groups with different values and goals, have no determinate solution because there is no agreement on the problem formulation. They can be “resolved” by finding a temporary balance among competing interests and social goals, but as the situation changes, the problem changes and becomes more open-ended. Rittel and Webber explicitly mention that wicked problems have a way of coming back in new forms; as society addresses one symptom or set of symptoms, new symptoms appear, sometimes as unintended effects of treatments of the original problem.

Most environmental problems are wicked problems; they affect multiple values, and they impact different elements of the community differently, encouraging the development of multiple models of understanding and remedy. Resistance to unified problem formulation is endemic to wicked problems; they require iterative negotiations to find even temporary resolutions and agreements on actions. Another aspect of wicked problems--the temporal open-endedness which often attends wicked problems and brings them back in more virulent form as larger and larger systems are affected—may be susceptible to clarification through modeling. Ecologists have introduced “hierarchy theory,” (HT) as a set of conventions to clarify space-time relations in complex systems.¹⁹ HT can be characterized by two axioms (which happen to coincide with the second and third key characteristics of Adaptive Management listed in the “Introduction”). HT encompasses a set of models of ecological systems that are characterized by two constraints on observer and system behavior: (i) The system is conceived as composed of nested subsystems, such that any subsystem is smaller (by at least one order of magnitude) than the system of which it is a component, and (ii) all observations of the

¹⁹ (Allen and Starr, 1982; Holling, 1992; Norton, 2005)

system are taken from a particular perspective within the physical hierarchy. A major addition, encouraged by environmental pragmatism, is to expand (ii) to (ii'): All observations and evaluations orient from a particular perspective within the physical hierarchy. An effect of this innovation is to make environmental values, evaluation, and social learning about values endogenous to the broader, adaptive management process.

This conceptual apparatus allows us to see human decision makers as located within layered subsystems and supersystems, with the smallest subsystems being the fastest-changing, and the larger systems changing more slowly, providing environments for the subsystems. Each individual person represents a small system that makes choices against the backdrop of a larger environment. These larger, slower-changing systems provide the environment for adaptation by subsystems (including organisms and places—composed of individuals and cultures). This convention allows us to associate temporal “horizons” with changing features of landscapes as is illustrated in the famous metaphor used by Aldo Leopold, the forester and wildlife manager. Leopold set out to remove predators from the Forest Service ranges he managed in the Southwestern US. When the deer starved for lack of browse, he regretted his decision to extirpate wolves, chiding himself for not yet having learned to “think like a mountain” (Leopold, 1949). He had not yet, that is, understood the role of the targeted species in the broader system. When he came to understand that role, he accepted responsibilities for the long-term consequences of his decisions, and advocated wolf protection in wilderness areas.

Leopold intended to improve the lot of human consumers of nature’s bounty—but his activity threatened larger-scale dynamics. Thinking like a mountain—or a watershed—requires accepting responsibility for the impacts one's decisions will have on

subsequent generations. Accepting this responsibility is inseparable from adopting a larger ecophysical model of the system under management. At this point in time, armed with some knowledge of changing systems and how to model them, we begin to accept moral responsibility for actions that were once thought to be morally neutral. In both cases, accepting moral responsibility—and a sense of caring—were inseparable from adopting a changing causal model of what has happened to deer populations on Leopold's metaphoric mountain.

Using this framework of actions embedded within nested, hierarchical systems, it is possible to articulate a new approach to evaluating changes in human-dominated systems. Human management of the environment takes place within environmental systems as they are embedded in larger and larger—and progressively slower-changing—super-systems. Each generation is concerned for its short-term well-being (personal survival), but also must be concerned to leave a viable range of choices for subsequent generations. Given our expanding knowledge of our impacts on the larger and normally slower-changing systems that form our environment, it seems reasonable also to accept responsibility for activities that can change the range of choices that will be open to posterity.

A concept of sustainability nicely "falls out" from this conception of adaptive management, in that a "schematic definition" of sustainability can be constructed on the axioms of adaptive management, provided only that prior generations accept responsibility for their impacts on the choice sets of subsequent generations. Given this rather sparse set of assumptions and hypothetical premises, it is possible to provide a simple and elegant definition of *sustainability*, or rather what might better be called a

schema for sustainability definitions.²⁰ Because of the place-based emphasis of adaptive management and the recognition of pervasive uncertainty, there is only so much that one can say about what is sustainable at the very general level of a universal definition. Speaking at this level of general theory, sustainability is best thought of as a cluster of variables; local communities can fill in the blanks, so to speak, to form a set of criteria and goals that reflect their needs and values. While local determination must play a key role in the details, adaptive management, and its associated definitional schema, makes evident the *structure* and *internal relationships* that are essential to more specific, locally applicable definitions of sustainable policies.

The two principles of hierarchy theory, when embodied in models, place individual actors in a world that is encountered as a mixture of opportunities and constraints; some of the chooser's choices result in survival: the chooser lives to choose again. If the chooser survives and has offspring, the offspring will also choose in the face of similar but changing environmental conditions. Some choices of others lead to death with no offspring. Other choices lead to continuation and to offspring who will face a similar, but possibly a changing array of possibilities and limitations. This is the basic structure of an evolution-through-selection model that interprets the environment of a chooser as a mixture of opportunities and constraints; it contextualizes the "game" of adaptation and survival and can be represented as in figure 1A below.

Community-level success, in other words, requires success on two levels: at least some individuals from each generation must be sufficiently adapted to the environment to survive and reproduce *and*, for the population to survive over many generations, the

²⁰ Norton, Sustainability

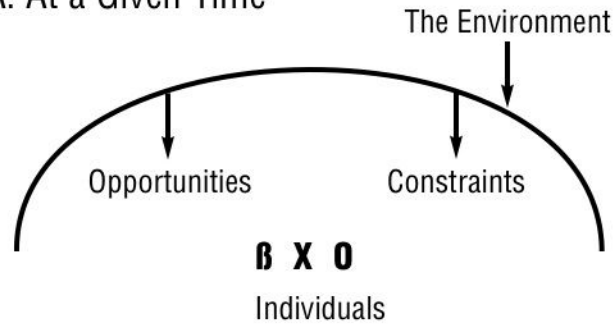
collective actions of the population must be appropriate for (adaptive to) its environment. Since humans are necessarily social animals (because of the long period of helpless infancy of individuals), individual survival depends also on reasonable levels of stability in the "ecological background" and in the cultural context, the stage on which individuals act. Successful cultures develop specific adaptations appropriate to their place, adaptation to the cycles and constancies of background systems that usually change more slowly than individual behaviors. This simple model, if given a temporal expression, represents the relationship between individuals who live in an earlier generation and those who live later, and the possibility that later generations might face opportunities limited by the collective choices of their predecessors is represented in Figure 1B below.

From this simple framework, a schematic definition of sustainability emerges: Individuals in earlier generations alter their environment, using up some resources, leaving others. If all individuals in the earlier generations over-consume, and if they do not create new opportunities, then they will have changed the environment that subsequent generations encounter, making survival more difficult. A set of behaviors is thus understood as sustainable if and only if its practice in generation m will not reduce the ratio of opportunities to constraints that will be encountered by individuals in subsequent generations n, o, p .

Although the model has a "flat," schematic character, it could also be given a richer, normative-moral interpretation, as is hinted at by use of the terms *opportunities* and *constraints*. If we stipulate that the actors are human individuals, then the simple model provides a representation of intergenerational impacts of decisions regarding resources; our little model can thus be enriched to allow a normative interpretation or

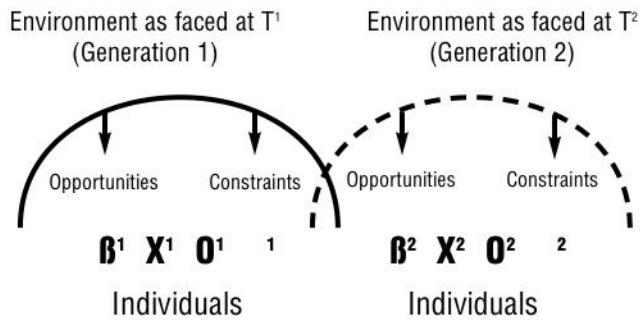
Figure 1. Schematic Definition for Sustainability²¹

A. At a Given Time



Individuals face their environment as a complex mix of opportunities and constraints as they adapt to their environment at any given time

B. The Cross-Scale Dynamic across Time



Choices made by members of an earlier generation can change the mix of opportunities and constraints faced by subsequent generations, limiting the latter's choices in their attempt to adapt

analogue. If we accept that having a range of choices is good for free human individuals, we can see the structure, in skeletal form, of the normative theory of sustainability. An

²¹ From Norton, 2005, p. 97.

action or a policy is not sustainable if it will reduce the ratio of opportunities to constraints in the choice sets of future people.

Part V: Multi-Scalar Valuation: An Adaptive Approach

Each generation stands in this asymmetric relationship to subsequent ones: choices made today could, in principle, reduce the range of free choices available to subsequent generations. Thus it makes sense to recognize impacts that play out on multiple, distinct scales. If it is agreed that maintaining a constant or expanding set of choices for the future is good, and that imposing crushing constraints on future people is bad, our little model has the potential to represent, and relate to each other, the short- and long-term impacts of choices *and* to allow either a physical, descriptive interpretation or a normative one.²²

This schematic definition, understood within the general model of adaptive management, captures two of our most important basic intuitions about sustainability: (1) that sustainability, incorporating a multi-scalar and multi-criteria analysis, refers to a relationship between generations existing at different times, and having to do with equitable opportunities to choose among undiminished opportunities.; and (2) that this relationship has an important normative dimension, a dimension that cannot be captured by economic measures alone, but one that involves important questions of

²² I recognize that I am not addressing, here, one—perhaps seemingly fatal—objection to my definition: economists will be quick to point out that opportunities based on natural resources will, in a maturing economy, be replaced with other opportunities based in industry, education, and technological development, and that these opportunities will replace ones based in natural resources. I readily admit that much more must be said to clearly separate nature-based opportunities from human-developed ones. In Sustainability, I show how a community which loves its place can be encouraged to choose and define (in terms of indicator-measured targets for maintaining certain processes necessary to support the community's value commitments) the processes key to retaining the beloved features of a place.

intergenerational equity. Thus we can tentatively put adaptive management—complete with a schematic definition of sustainability—forward as a useful and comprehensive approach to environmental science and management. Adaptive management, in this context, encompasses the experimental search for better understanding, better goals, and better decisions.

Part V: Multi-Scalar Evaluation: An Adaptive Approach

Armed with this schematic definition and an associated conception of sustainability goal-setting as communities defining the variables—the indicators—that really matter to them as residents of a place, we can move boldly to introduce a new approach to evaluating environmental change. Rather than "chunking" nature and aggregating it into entities that are "commodities," and other entities that are "consumers," I suggest we set out to evaluate *development pathways*—which are possible paths that development and change can follow in a place—*according to multiple indicators*—which are variables judged important enough to monitor in the process of adaptive management. Adaptive management, and public participation in its discourse, can thus provide a forum for discussion and revision of management goals. Accordingly, its discourse and deliberations must be normative as well as descriptive in nature. Public values will be embedded in the discussion, as arguments are made, and compromise policies are forged, as participants try to influence policies by placing emphasis on one indicator or another. Once important variables are identified for monitoring, public discourse can address questions of priorities: which of the indicators is highest priority.

Monitored variables would then represent social values indirectly, as easily measurable indicators are chosen, and priorities are set.

In this way, values can be integrated into a rational decision process without being measured as increments in consumption or welfare associated with a particular chunk of nature, human or otherwise. Evaluation will be by multiple measurable indicators,²³ possibly including economic indicators, but applied holistically to paths of system change rather than as increments to an aggregated sum of utilities of individuals. Since these indicators measure trends in processes believed important by the community that inhabits a place, they allow the comparison of various possible futures according to a variety of value-laden yardsticks. Public debate about values would then shift away from its currently ideological formulation, which causes discourse to get stuck on the question of whose well-being counts, and toward real public policy choices about which variables to monitor as indicators, which goals to set with respect to management performance with respect to those indicators, and how to weight and prioritize the various indicators that emerge from public discussion and stakeholder negotiations. These questions will ultimately come down to questions about how communities, acting through an adaptive management process, expend their resources on management projects. Every management initiative thus becomes an experiment to learn how to do something better—as measured against the list of indicators endorsed as expressing community goals—and

²³ See Judith E. Innes and David E. Booher, "Indicators of Sustainable Communities: A Strategy building on Complexity Theory and Distributed Intelligence," Planning Theory and Practice, 1:No. 2 (2000): 173-186, for a detailed discussion of the promise—and the requirements for success—of processes designed to settle upon indicators of management success.

goals as well as accumulated scientific wisdom can be reconsidered in the light of new experience.

Once value questions are reformulated in this way, a powerful new tool for discussing and relating public values to policy actions is available: backcasting. In backcasting exercises, a group, hopefully representative of a community that loves a place, identifies certain goals with respect to a list of variables projected fifty and twenty-five years into the future. Then, one can "back-cast", asking: where would we have to be with respect to variable (x) in year 20yy, if we are to achieve our 25- and 50- year goals?²⁴ This question can, in turn, spark a re-opening of the question of goals and priorities. By evaluating processes we bypass many "metaphysical" problems, and we also endogenize the discourse of environmental evaluation within a learning environment.

Once ideological theories are stripped of their a priori claims to represent all environmental value in their single, tortured conceptualizations—once we embrace pluralism of value, the useful ideas that provoke ideological rhetoric—economic analysis may provide useful analysis of how to achieve the goals set by the community efficiently. Intrinsic value theorists-- even as they argue among themselves in a cacophony of voices regarding what intrinsic value is—remind us that there are also many situations when our values and principles—of fairness toward others and of non-economic love of a place for what it is—should often trump purely economic considerations. As such, these former ideologies, once they advance their value arguments as explicating one of many kinds of

²⁴ For a very clear, if brief, discussion of back-casting, see John Robinson, et. al., "life in 2050: ", pp. While others have explored back-casting in more detail, the Robinson groups discussion stands out for a very clear articulation of the value aspects of the back-casting approach.

value are reborn as voices advocating strongly for certain values in a participative process of deliberation, problem re-formulation, and deliberation. Central to this deliberation must be a cooperative spirit and a commitment to pursue social learning by testing various possible actions and policies in pilot projects that will improve our understanding by enhancing our experience. The special sciences can be enlisted to seek reliable, and measurable, indicators. The community can then concentrate on choosing goals with respect to those indicators. If one then asks: "But what will the scientists use to guide their recommendations for setting goals with respect to a given indicator?" it is now possible to answer: "We have studied the process that has been chosen as an indicator, and in our scientific opinion, this indicator ought not to fall below X, *because measures below X make it unlikely that the social values and associated goals chosen by the community will be met.*

This discussion, I fear, has been rather abstract, even though the changes I envision would be very concrete and practical, transforming ideologically strained and fractured dialogue about local and regional problems into an active search for indicators that express the true aspirations of the communities that are integrated into their places. Perhaps I can give a little specificity, if not concreteness, to my proposal by sharing briefly with you a fantasy I have regarding the paths of growth that take place in the Atlanta region I inhabit. I call it a fantasy because, I fear, it could only happen if there were almost unimaginable changes in the way participants in public discourse approach disputes about environmental goals, actions, and regulations. Suppose, however, that there were to emerge in the Atlanta area a public process of deliberation and discourse aimed at setting rational goals for environmental management, and that that process

might even take on some of the characteristics of Habermas' "ideal speech community:" a process open to all, in which ideas and values are evaluated according to reasons given and challenges to those reasons are backed up with countervailing reasons. If that were to happen, I hope there might emerge an open and public discussion about what really matters, and that that discussion would eventually shift into a discussion of how to measure what really matters—to the question, that is, of what indicators to track, and what goals to set with respect to the various, accepted indicators.

One of the problems with pluralism is that when one sets no constraints on what endpoints are valued, members of a community will express so many valued endpoints that careful measurement—or even adequate discussion of the various values—becomes impossible. Consequently, the adaptive management process must encourage a careful search for "integrative" measures that apply at various scales on the ecological system that encompasses Atlanta and its rapid Northward growth. By an integrative measure, I mean an indicator that, because it focuses on a process that can be expected to track multiple variables that have been identified by the community as important values that define a place and make it "home" to the people who live there. So, if my imaginative "ideal speech community" were to emerge in the Atlanta area, I would inject into that process the following synoptic indicator: the percentage of land in the extended metropolitan area that remains permeable to water. I would justify the choice of this indicator because success in reducing pavement and other impermeable surfaces in the process of development can be easily tracked by landsat satellite imagery and it can be expected to stand in as a proxy for a number of widely shared values held by residents. Atlanta is sometimes called "the city of trees," and one of the shared values is to maintain

the sense of a "city in a forest." But this is just the beginning of connections between our proposed proxy and social values in the region: such a synoptic indicator would draw support from wildlife lovers, from those who are concerned about water quality and water quantity, as success in maintaining permeable surfaces reduces run-off and allows water to be cleaned as it percolates into the aquifer. In other words, uniting behind this indicator would allow the community, driven by diverse values, to express goals—and criticize various development plans as negatively impacting the synoptic indicator, and as threatening the values residents associate with their place.

To illustrate the multi-scalar possibilities of the adaptive management approach to evaluating environmental change, it is also possible to consider what might be chosen as a broader-scale indicator of landscape health extending beyond the boundaries of the Atlanta metropolitan region, to encompass the ecosystem of the Southern Appalachians and the Piedmont, which forms the broader context of the city's expansion. Here, I would suggest adopting an indicator that would measure the percentage of landcover in the area that remains in mixed hardwood forest, the dominant ecosystem type before development and before the creation of pine plantation tree farms. Again, this variable is easily tracked through satellite imagery, and I submit that it can act as a proxy for the healthy and balanced development of the area, standing in for a variety of deeply held values that express the love many residents have for their place. This larger-scaled variable complements the permeable surfaces criterion that is applied locally, embedding that smaller-scale criterion in a broad commitment to protecting native forests wherever possible.

Conclusion:

I have argued that, following the death of ideology—which is what is really being proclaimed by critics of environmentalism—would allow a New Age of Adaptive Management, an age in which the battles over environmental goals will be argued out within a management structure that addresses real world problems through an experimental and experience-based model of social learning through deliberation and compromise. After the Age of Ideology is truly dead—I fear it is only in a permanent vegetative state, and I hope we now have the courage to pull the plug on the rhetoric of old--it is time to advance into an adaptive age where we explore diverse values, and seek to protect as many of our true values as possible. If we cultivate a common language of indicators and measurable goals, our deliberations will turn to questions of how to achieve as many management goals as available resources allow. All of these questions, unlike the questions provoked by the ideologues, can be explored and learned about, and there are more-or-less answers that can lead to compromise and win-win situations.

The Age of Ideology in environmentalism, while historically understandable as the sprawling United States of America chose a development path across the West in the 18th Century, must now come to an end. The rich rhetoric of those halcyon days, however, has dealt nothing but frustration to the advocates of environmentalism in the Century since, and especially in the last decade with the ascendancy of the Right and the enshrining of the ideology of Free Markets, as every possible solution to a problem gets entangled in arguments about its ideological purity. Badly formulated questions are answered badly; hence the current mess in environmental policy, as federal commitments whiplash back and forth between the regulators (Democrats and Liberals) and the free marketers (the Republicans and Conservatives), who remove or refuse to enforce them.

If the passing of the Age of Ideology is necessary to make way for the Age of Adaptive Management, and the shifting of arguments from polarized and all-or-nothing to negotiable differences about goals, priorities, and how to expand resources—then I say, let it die. But let us replace ideological environmentalism with adaptive management, a search for communication and cooperation, and a thirst for social learning..