Adaptive Management Areas: Achieving the Promise, Avoiding the Peril

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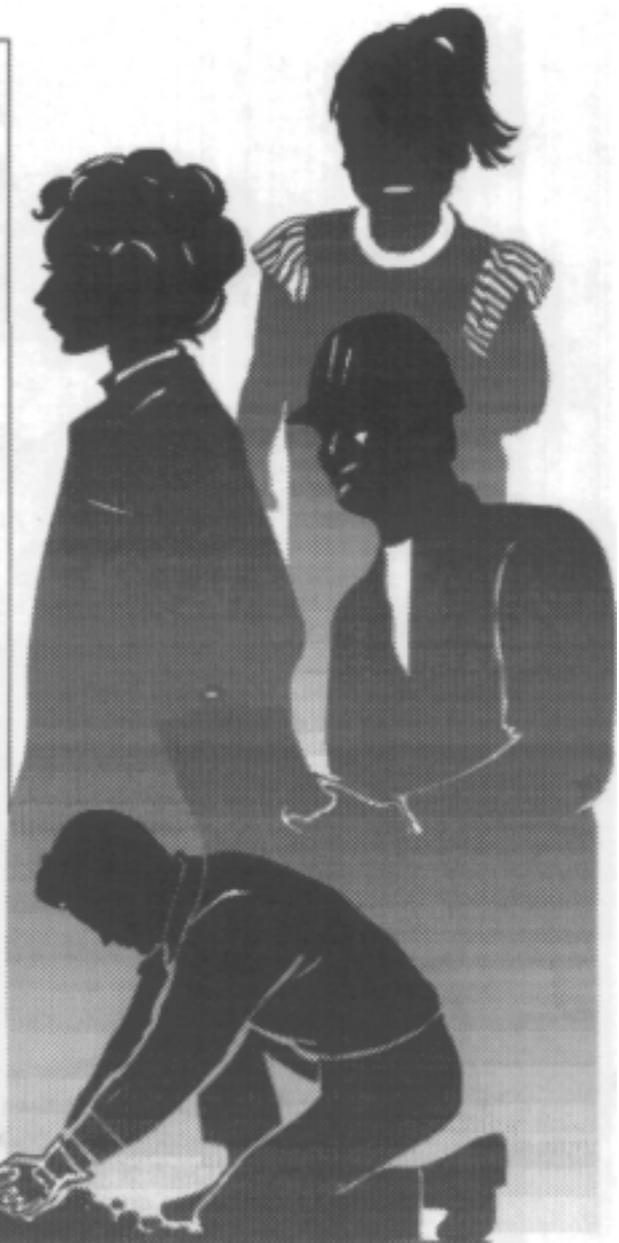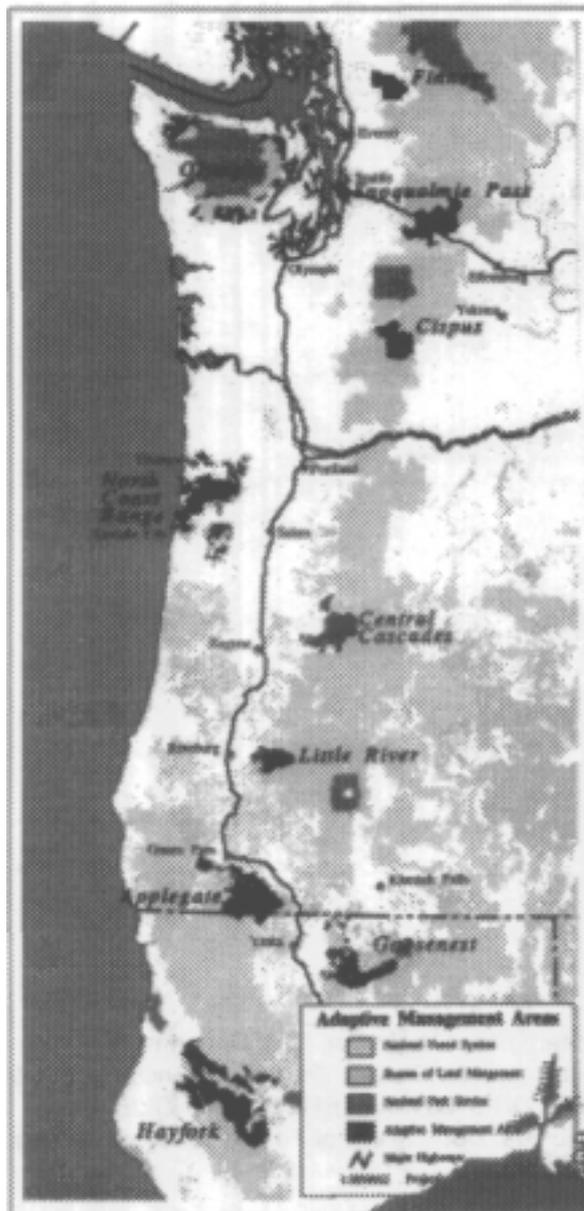
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Abstract

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Ten Adaptive Management Areas (AMAs) were created in compliance with the Northwest Forest Plan. Although the essence of adaptive management is to treat management as an experiment and to "learn how to learn," several barriers affect the successful implementation of AMAs. Four propositions are identified that address these potential barriers: (1) area boundaries must hold social meaning for stakeholders, (2) a focus on these 10 areas will highlight limitations in scientific knowledge, (3) management of the AMAs will highlight differences in how the world is perceived, and (4) effective management of these areas will challenge existing institutional arrangements. In response to the challenges contained in these four propositions, nine observations are presented that suggest the kinds of actions managers, researchers, and citizens need to consider to ensure that the promise embodied in the Northwest Forest Plan to more closely link communities and forest management can be achieved.

Keywords: Mutual learning, systems planning, adaptive management, public participation, social learning.

Introduction

Recent interest in the concept of adaptive management can be traced to the mid-1970s and the work of C.S. Holling and his colleagues at the International Institute of Applied Systems Analysis in Austria. Their work, Holling writes, was grounded in a "bias" that understanding how natural systems respond to human disturbance is essential to "living with the unexpected" (cited in Lee 1993, p. 54). The implicit idea underlying the work of Holling and other investigators is that "humans could not and should not try to control as many natural fluctuations as industrialism seems to demand" (Lee 1993, p. 54).

More recently, Holling (1995, p. 8) has noted that the interest in adaptive management has been motivated by a "puzzle":

> The very success in managing a target variable for sustained production of food or fiber apparently leads inevitably to an ultimate pathology of *less resilient and more vulnerable ecosystems, more rigid and unresponsive management agencies, and more dependent societies.* This seems to define the conditions for gridlock and irretrievable resource collapse [emphases added].

Although recent concerns with "gridlock and irretrievable resource collapse" (for example, the continuing conflict over management of forests in the Pacific Northwest and the extinction of Pacific salmon runs in an estimated 40 percent of their historical breeding ranges in Washington, Oregon, Idaho, and California [National Research Council 1996]) have contributed to the growing interest in adaptive management, its origins go far back. The peoples of many ancient civilizations practiced the art and science of adaptive management. For example, Falanruw (1984) describes how the people of Yap in Micronesia for generations have sustained high population densities in the face of resource scarcity by using adaptive-management techniques. Such techniques have resulted in the production of termite-resistant wood and the creation and maintenance of coastal mangrove depressions and seagrass meadows to support fishing. The Yap have altered their environment by using adaptive-management processes: they have undertaken actions, observed and recorded the results through story and songs, and codified their practices through rituals and taboos. The Yap experience embraces the modern conception of adaptive management: "policies are experiments; *learn from them"* (Lee 1993, p. 9).

At its core, adaptive management embraces an apparent contradiction. For example, "the primary expectation of adaptive management is the unexpected" (Gunderson and others 1995a, p. 490); it explicitly requires practitioners to anticipate the unanticipated. "Because adaptive management treats the system experimentally, the possibility of surprising outcomes is recognized from the outset" (Lee 1993, p. 65). Or, as Westley (1995, p. 394) describes, "As I read it, adaptive management is a way of managing in order to ensure that the organizations responsible for ecosystems are responsive to the variations, rhythms, and cycles of change natural in that system and are able to react quickly with appropriate management techniques."

This fundamental quality of adaptive management—a recognition of the inevitability of surprise and an institutional capacity to respond quickly and idiosyncratically—often comes in conflict with our belief in, and reliance on, the deeply rooted positivist traditions underlying science as well as the strategies and structures of modern bureaucratic organizations. Positivism, as used in this paper, refers to the idea that an objective, knowable reality exists and that it can be reliably discerned through the systematic methods of scientific inquiry. Consequently, failure to anticipate surprise is

seen as a failure in competence rather than an inevitable consequence of trying to explain and predict a complex world. Thus, thinking in adaptive terms and learning to operate in a world where surprise is the norm will require major changes in how management and research organizations operate, not the least of which will be a recognition that "surprising results are legitimate, rather than signs of failure, in an experimental framework" (Lee 1993, p. 65).

There are, however, signs of a growing recognition of the importance of adaptive management (for example, see Gunderson and others 1995b, Holling 1978, Lee 1993, Walters 1986). For example, Lee reviews case studies from Australia, Canada, the Mediterranean, and the United States; he also notes experiences that derive from adaptive-management efforts in other, nonresource management sectors, such as criminal justice and health care. Gunderson and others (1995b) add experiences from five case studies across North America and the Baltic. Collectively, these accounts suggest that although great potential exists with regard to adaptive management, great problems confront its successful application.

In this paper, we examine the establishment of the Adaptive Management Areas (AMAs) prescribed in the Northwest Forest Plan (FEMAT 1993) initiated by President Clinton's Forest Summit, held in Portland, Oregon, in spring 1993. We offer four propositions as a basis for a framework to evaluate the AMAs. We also discuss how this large-scale policy experiment in land management might be organized to enhance successful implementation, and we identify some key research issues associated with the propositions.

FEMAT and the Adaptive Management Areas

The Forest Ecosystem Management Assessment Team (FEMAT) report (1993) called for creation of 10 AMAs across Washington, Oregon, and northern California. These areas would "encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives" (USDA FS and USDI BLM 1994, p. D-1). Opportunities to learn how to manage on an ecosystem basis—to learn how to learn—would be encouraged. In such areas, localized, idiosyncratic, and particularistic approaches—as opposed to uniform, institutionalized standards and guides—would provide managers with flexibility, discretion, and opportunity to adapt practices to local circumstances (fig. 1).

The AMAs also were seen as settings in which connections to local communities could be fostered. They would offer opportunities to capitalize on local knowledge and skills that could be integrated into locally attuned management approaches. They also could provide opportunities for timber production and other revenue-producing activities.

Although the AMAs were proposed in mid-1993 with the publication of the FEMAT report, they became a reality only in December 1994, following a judicial decision that affirmed the legality of the Northwest Forest Plan. Thus, the system has had only a relatively short time to reach its objectives. Nevertheless, sufficient time has passed to permit assessment of the extent to which the AMAs are achieving the ideals and objectives identified in FEMAT. On the one hand, there is a disquieting feeling among some observers, both within and outside the agencies, that the ideals expressed in FEMAT about the AMAs have been compromised or lost altogether. Alternatively, some believe that the ideal and potential objectives remain viable, although the lack

Figure 1-A system of 10 Adaptive Management Areas (AMAs) was established in 1994, following adoption of the Northwest Forest Plan.

of specific guidelines and perceived organizational support continues to be of concern. Such contrasting views are similar to the conclusion noted by Lee (1993) and are not necessarily mutually exclusive; both peril and promise face implementation of adaptive management.

In assessing the future of AMAs in particular, and adaptive management in general, we have identified four propositions against which the usefulness and progress of the AMAs might be tested:

- Adaptive Management Area boundaries must possess social meaning for stakeholders.

- Adaptive Management Areas will highlight limitations in knowledge.

- Adaptive Management Areas will highlight differences in how the world is perceived.

- Adaptive Management Areas will challenge existing institutions.

We use the term "proposition" for these statements because they are intended for discussion and analysis; we recognize that their validity and applicability are arguable. They derive, however, from both an assessment of management experience and the research literature. Potentially, they can help identify barriers to effective implementation of adaptive management as well as the kinds of actions that might overcome these barriers. Thus, following these propositions, we offer a set of observations regarding actions and opportunities relative to implementation of adaptive management in general and to the AMAs in particular.

Proposition 1: Adaptive Management Area Boundaries Must Possess Social Meaning for Stakeholders

The act of drawing a boundary around a piece of land infers that the enclosed area possesses some kind of meaning. Boundaries, as Michael (1995) notes, are important to both individuals and organizations. They support prevailing belief systems and, in turn, reinforce them. They determine access, power, and legitimacy. The level of formality with which their meaning is codified can differ widely; it might be statutory (for example, a wilderness or national park), administrative (a recreation site or timber sale), or it might be highly informal, albeit widely recognized (The Gorge, The Palouse). The key point is that the designation carries with it a meaning that many people recognize and value.

With AMAs, we find a mix of conditions for how this proposition is satisfied. The 10 AMAs present a variety of biophysical, economic, and social contexts. For example, the Applegate Partnership is a loosely knit coalition of diverse local publics (and, until recently, Federal partners) founded in 1992 that has attracted attention for several years. Although the partnership predated creation of the 325,000-acre Applegate AMA, the ideals underlying the partnership were conceived and implemented around a common concern with the ecological, aesthetic, and economic future of the Applegate River watershed. Such ideas are wholly consistent with both the spirit and intent of the AMAs as envisioned in FEMAT (1993) and the subsequent record of decision (ROD) issued jointly by the Bureau of Land Management and Forest Service (1994). Although locally distinct "neighborhoods" can be defined within the larger area, there still exists a sense of social identity, meaning, and organization that knits the area together (Preister 1994). It is likely that the watershed-based perspective of the partnership helped legitimize formation of the current AMA because the federally managed AMA

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lands are interlaced in a checkerboard pattern with private lands within the watershed. Thus, in many ways, definition of the Applegate as an AMA simply imposed formal and federally codified recognition to an area already possessing strong social coherence, meaning, and relevance (fig. 2).

The 158,000-acre Central Cascades AMA presents a different picture. Here, long-term interaction between scientists and area managers, centered at the H.J. Andrews Experimental Forest within the Willamette National Forest, has resulted in an AMA that possesses a relatively high sense of recognition, at least among the scientific community and Forest Service personnel. Recognition of the AMA among citizens, however, is problematic. Shindler and others (1996) report that interest among members of adjacent communities for forest management is high as well as suppor-tive overall of the concept of adaptive management (for example, most of those sur-veyed agreed with the statement, "In general, adaptive management areas seem like a responsible approach"). But in a separate survey of area residents, only 16 percent were aware that the Central Cascades AMA existed.[7] One reason this AMA lacks public recognition may be that it does not possess the natural geographic attributes of the Applegate AMA—it is spread over several major watersheds and is accessed by three different state highways (fig. 3).

A third situation can be found in an AMA such as the 213,000-acre Snoqualmie Pass area lying along the crest of the Washington Cascade Range. Here, the AMA bound-ary is a result of the criteria specified by scientists working on the FEMAT project, and now imposed on the land. Moreover, whereas the Applegate and Central Cas-cades AMA lands are predominantly under the jurisdiction of the Bureau of Land Management and the Forest Service, nearly one-half of the Snoqualmie Pass AMA is controlled by private owners or other public agencies. There is neither the type of highly organized, locally based constituent group we find in the Applegate nor the long-term connection between researchers and managers as is the case in the Cen-tral Cascades AMA.

The area within which the Snoqualmie Pass AMA is found, however, has long held important meaning to local citizens, reflected in the intense interest and concern from three public planning issues: (1) efforts to define areas suitable for wilderness during the Roadless Area Review and Evaluation (RARE) process in the 1970s, (2) debates regarding establishment of the Alpine Lakes National Recreation Area, and more recently, (3) support for establishment of the "Mountain to Sound Greenway" corridor. It is likely that the records of public comment received on these, and other planning exercises over the past 25 years, contain a substantial amount of information and insight that would help identify the kinds of meanings, values, and uses associated with this area by various stakeholders. As discussed in the social assessment chapter in FEMAT (1993, p. VII-102), existing public involvement records are an important and rich data source; they often can uncover a history of public interests and con-cerns which, in turn, provides land managers with important clues about key individ-uals, organizations, and other interests and insight to the meanings associated with

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[1] Povey, David; Snyder, Judy. 1995. McKenzie River corridor household survey final results. University of Oregon com-munity planning workshop. On file with: George H. Stankey, Forestry Sciences Laboratory, Pacific Northwest Research Station, 3200 SW Jefferson Way, Corvallis, OR 97331.

Figure 2—The 325,000-acre Applegate AMA invovlves a mixture of private and public lands in southwestern Oregon

Figure 3—Much of the pioneering research on old-growth forests was initiated in the area now found in the Central Cascades AMA.

places. In the case of the high-profile planning issues mentioned above, records might reveal that associated stakeholders not only have different ideas about place but also that the interest reaches far beyond local boundaries.

Understanding Connections

If one conceives of landscapes as tracts containing social meaning and, especially, if one envisions managing these with the active participation of managers and citizens (a purpose explicitly noted in FEMAT and ROD), then it is essential that a sense of ownership and legitimacy be associated with these places; in short, there must be a "connection" between place and people. When this connection is lacking, we are left only with "space" (Sack 1992), which lacks any sense of social meaning. In implementation of the various AMAs, an understanding of the synergy between people and place is essential.

This connection between people and place has taken form in various ways, ranging from formalized and centralized structures to those that are informal and diffuse. Across the AMA system, it might be possible to describe a continuum or typology relative to the nature of social organization linked to individual areas. Each position represents a different way in which the social meaning of the AMA is held. A major challenge facing the management of AMAs is determining how these meanings have evolved and how they are tapped and used, particularly in those cases where clearly identifiable, central structures (for example, the Applegate) are not present. The search for social connection is especially critical because the boundaries of most AMAs have been jurisdictionally imposed, thereby resulting in biophysical representations (constructed along watersheds) that might not be widely understood.

More importantly, each position along this social organization continuum or typology implies differences in the nature of the roles and responsibilities that the managing agencies might play. In some areas, where well-established local structures exist, the role of the agencies might be relatively limited; for example, as a source of technical expertise and advise. In other areas, where local support and interest are sparse, the agencies might be called on to take a leadership role, underwriting efforts with investments of time, money, and knowledge.

Recognizing Problems of Legitimacy

When we examine how AMAs were created, we find demonstrated connections between people and place, and the associated legitimacy of individual AMAs, problematic. It is problematic among citizens who were not involved in establishing boundaries or in discussions about the purposes and functions of such areas, but who now are confronted with yet another "bureaucratic allocation." It is problematic for managers; AMAs were imposed on them through the FEMAT process (in which they did not participate) and forced them into new alliances (for example, partnerships across jurisdictional lines). The AMAs have produced an allocation for which there is only limited understanding of how it relates to the wider scheme of forest management and especially to the implementation of ecosystem management.

This lack of personal and professional connection and a feeling of "ownership" also could contribute to a sense of frustration among managers. The AMAs might be seen only as another obligation, or perhaps even a constraint, imposed on their discretion, heaped on an already overloaded plate of responsibilities. Adaptive management is a difficult, complex undertaking; by definition, it will involve actions and processes for which we have little guidance or direction. Adaptive management carries a "price tag" (with the price largely unknown), and it comes at a time when Federal forestry staffs and budgets are being reduced. Thus, the innovative and aggressive programs required to deliver on the promise of adaptive management might be seen as not worth the investment or risk, especially when public support and political will are problematic.

Proposition 2: Adaptive Management Areas Will Highlight Limitations in Knowledge

We noted earlier that the essence of adaptive management is "living with the unexpected" and an acceptance of surprise as the norm rather than the exception. Adaptive management acknowledges that great uncertainty surrounds our knowledge; we do not know enough and never will. By focusing attention on specific AMAs, we will expose and highlight both the limits and limitations of our technical-scientific knowledge base.

The implications of this proposition are profound. Modern American forestry has deep, strongly held links to the practice of science. As Wondolleck (1988) describes, professionally applied scientific expertise, deriving from the time of Pinchot,[2] has been called on to deal with the increasingly complex problems confronting forestry. The "scientific-rational" paradigm that emerged from nearly a century of experience continues to govern the thinking and structure of modern forest management; central to this view is the belief that the forestry problems facing society are technical and scientific in nature and thus best left to professionals trained in scientific methods of management and decisionmaking (Wondolleck 1988, p. 120). The creation of the AMAs, however, has the potential to draw attention to the limitations of the scientific-rational paradigm in solving the problems facing forestry. Two principal reasons underlie this.

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[2] Gifford Pinchot, first Chief of the Forest Service.

First, much technical knowledge is theoretical in nature, reductionist and functional in scope, and limited in generalizability. Many reasons explain why this situation prevails; however, when existing knowledge bases are applied to particularistic, idiosyncratic problems (for example, a particular stand at a certain elevation with a particular aspect, etc.), we often find that the expected consequences do not occur. This is the essence of adaptive management. The need to adapt, to accommodate existing knowledge in light of particularistic applications will place significant demands on management organizations—a point we shall return to later.

Second, knowledge about particular places is held by many stakeholders, not just managers and scientists (Lang 1990). Knowledge is compiled not only through scientific inquiry but also from the interaction between people and the places they live, work, and play. Such "experiential" or "personal" knowledge (Friedmann 1987) can provide rich insight as an adjunct to the formal, scientific knowledge held by experts such as wildlife biologists or silviculturists. Acknowledging the validity of such knowledge, however, can be discomfiting to those educated in the positivist traditions of modern science. Positivism is a complex notion, but its central quality is that a knowable reality exists and that, through scientific methods, involving systematic empirical observations, we can define that reality. More formidably, incorporating such alternative forms of knowledge might prove virtually impossible in organizations where the predominant paradigm (in this case, the scientific-rational model) is deeply imbedded and widely held. When new knowledge challenges these predominant paradigms, the organizational tendency is to resist and reject. Westley (1995, p. 397) argues that the liability associated with such a response is that the organizations can fail to pick up stimuli signaling fundamental changes in the environment (either natural or sociocultural), thereby reducing internal diversity and the capacity of the organization to respond appropriately to these new demands.

Furthermore, the traditional positivist view is under increasing criticism, even in an archtypical "hard" science such as physics. Feather than indisputable "bits" of knowledge on which we all agree, facts are seen as a function of the meanings assigned them, which differ, in turn, by experience, training, values, etc. Such an interpretation challenges the fundamental view of "value-free and objective science." As Lowe (1990, p. 138) notes:

> Given the limitations on our knowledge and the absence of a controlled experiment, the gaps in our understanding are inevitably filled with assumptions. Those who would like to see the rainforests left as they are naturally make different assumptions to those made by logging interests, and consequently reach predictably different conclusions. Thus the complexity of the system involved and the inaccessibility of data introduce an inevitable element of subjectivity.

The idea that reality depends on individual perspective and how it is measured (even that reality is altered by the act of observation!) means that new ways of thinking are called for (Wheatley 1994). Yet, most scientists, managers, and even citizens, are uncomfortable with such ideas, given their disparity with traditional approaches.

Figure 4—Adaptive Management Areas represent locations where new approaches to learning can be pursued, linking citizens, managers, and scientists. (Photo courtesy of Shannon Donnelly)

Incorporating Multiple Forms of Knowledge

But just as the AMAs have the potential to aggravate the conflict between these different ways of "knowing" (that is, scientific and experiential), they also possess the potential to capitalize on the diversity and richness these different forms of knowledge represent. A central criticism of many scientific planning processes is that they lack the richness necessary to generate meaning (Westley 1995); this becomes especially critical when organizations are structured in a hierarchical fashion where decisionmakers often lack sufficient interaction with persons at lower organizational levels or with those stakeholders on whom the consequences of their decisions will fall (fig. 4).

Additionally, to the extent that relevant knowledge is seen as held only by "experts," conflicts with those who claim knowledge by virtue of a history of connection with a place are likely. These latter stakeholders, whose knowledge has derived from extended periods of living, working, or recreating in these settings, likely will interpret the expert's disregard for their understanding as *prima facie* evidence of the old adage "knowledge is power." However, such a perspective on the part of planners might be reflective of a more serious problem: a perception that the underlying problems are only technical rather than political in nature. From such a perspective, it is a short leap in logic to conclude that sound technical work will prevail on its own merits (Forester 1989).

On the other hand, a more cooperative and collaborative approach that sees personal or experiential knowledge as rich, relevant, complementary, and the source of insight that verifies or challenges scientific understanding will likely prove beneficial. For example, an open, honest exchange of knowledge of all forms creates opportunities for a critical examination by all stakeholders of the assumptions and caveats associated with that knowledge. It helps democratize decisionmaking processes by making the store of technical knowledge, a major "currency" in decisions, available for public review and scrutiny. Contrary to what some might think, such public scrutiny of decisionmaking processes often results in improved, rather than diminished, technical quality. Two reasons underlie this, and both are germane to the link between AMAs

and local communities. First, local citizens often have a direct, personal interest in uncovering problems and, second, they often are able to bring intensive, detailed knowledge of local conditions and situations to the analysis (Paehlke and Torgerson 1990).

Clearly, there is no guarantee that local conversations will result in expanding or challenging our knowledge base. We have recognized previously that Americans tend to prefer positivism and dogged persistence toward a goal, even when the goal is neither attainable nor desirable. One could easily envision a scenario where local consensus interprets adaptive management to mean "now we can get back to work." And in some places this might be a prudent course of action. In AMAs, however, the interaction among managers, scientists, and local citizens creates a potential for learning from one another, particularly as communities become more diverse.

This more open approach gains special relevance because we have asked ourselves new questions about social connections, stand management, landscape management, and so on. Given a growing awareness of the uncertainties we face and the painful experiences incurred as we struggle with the political gridlock characterizing many natural resource issues today, we need enhanced ways to learn. In her thoughtful essay in response to a series of case studies reported in Gunderson and others (1995b), Westley (1995, p. 401) notes that "learning provides an alternative to crisis"; it does so by challenging previously unquestioned paradigms and ideologies. Perhaps most importantly, the interaction between differing forms of knowing, linked to a specific setting, creates a venue in which mutual learning can be fostered. By this, we mean that scientists and specialists can benefit from local experience and understanding; conversely, local citizens and managers can benefit from an improved understanding of how theories, scientific methods, and technical knowledge can be used in forest management.

Proposition 3: Adaptive Management Areas Will Highlight Differences in How the World is Perceived

Adaptive Management Areas (as geographic entities) represent places where adaptive management (a process) will be practiced. Adaptive management, for all the rhetoric and headlines, however, is an abstraction, with limited examples of real world application. The practice of adaptive management is based on the central premise that management activities are treated as experiments, with specification of hypotheses, careful monitoring and evaluation, and modification of further management practices as necessary. These are good ideas, but ones for which only limited experience exists, especially at the scale at which they are envisioned (that is, these are not small-scale projects in which external "noise" can be controlled, but large-scale and long-term undertakings, in a noisy, highly politicized, and often largely uncontrolled setting).

In confronting these characteristics of adaptive management, the AMAs have a potential to highlight cultural differences, especially between managers and researchers. By cultural, we mean differing frameworks ("windows" on the world) through which the world is understood and interpreted. As noted above, the practice of adaptive management calls for innovation, creativity, experimentation, and flexibility. It also requires an ability to operate in the face of ongoing uncertainty, with surprise the only guarantee. Adaptive management does not call for single prescriptions, "how-to" manuals, or universal standards and guidelines. In short, adaptive management will truly demand a "new way of doing business."

Adding to the dilemma is the fact that because the concept of adaptive management is relatively abstract, it puts front-line managers in "uncharted waters." Few know "how to do" adaptive management, despite the hope among agency hierarchy that field personnel can implement it. This uncertainty is aggravated by limited resources, uncertain support, and a lack of established protocols and frameworks that collectively work against the "can-do" spirit characterizing the natural resource professions. Meanwhile, the public expects positive actions but sees mostly rhetoric and hesitancy. Recent social research on AMA sites shows that citizens strongly support changes in the way National Forests are managed (Shindler and others 1996). Perhaps a major shift in the culture of management is called for, one encouraging risk, accepting that "failures" will occur, (recognizing that such "negative feedback" [Dryzek 1987] can be the most productive source of learning), and supportive of innovation in the face of uncertainty. An anonymous quote is appropriate here: "There are no paths; paths are made by walking."

Incorporating Multiple Points of View

There likely will be similar reticence among researchers to confront the realities that underlie an adaptive-management approach. For some, the kinds of problems confronting managers, where control is low and "noise" is high, might hold little appeal as the focus for research. Some might feel reluctant to make recommendations about what should be done until more data are available. But because knowledge is provisional, and because science has always been concerned more with falsification than with verification, there will always be more to learn. Adaptive management will require researchers to address the problems confronting citizens and managers collaboratively, bringing the best state of knowledge to bear on them.

The collective perspectives brought to bear on the AMAs by citizens, managers, and scientists, however, also contain a richness in both scope and depth that is simply not possible from any one view. Although we all tend to see our view as a measure of "the real world," in fact, there are many "real worlds." One of the great challenges facing implementation of any type of collaborative approach is in creating a sense of this diversity among all stakeholders (fig. 5).

Holling (1995) and Schwartz and Thompson (1990) describe how different belief systems or "myths of nature" underlie the current debates regarding natural resource management. For example, Schwartz and Thompson describe the idea of "plural rationalities"; that is, that people see nature in fundamentally different ways. Some see nature as endlessly resilient, others see nature as perilously fragile, and still others see something in between, with nature capable of resiliency but only to a point, beyond which catastrophe lies. The key points of Schwartz and Thompson's analysis, however, is that these perspectives are all valid and operate in concert to facilitate, and are essential for, social progress.

Similarly, in AMAs, the presence of what we might call "plural perspectives" can help ensure that no one view dominates. It helps ensure that alternative perspectives inform and challenge one another. The sum result should be a conception of an AMA that is robust, diverse, and varied; essential characteristics typically associated with the concept of sustainability.

Figure 5—A challenge facing AMAs is how to better incorporate a range of concerns, issues, and knowledge held by diverse publics. (Photo courtesy of Shannon Donnelly)

Proposition 4: Adaptive Management Areas Will Challenge Existing Institutions

Do the natural resource professions and institutions possess the capacity to capture the potential of adaptive management and avoid the perils? The answer to this question is problematic, and there are reasons for concern. Comments to the 1995 Wildlife Society meeting by Carl Walters, author of "Adaptive Management of Renewable Resources," revealed a pessimistic evaluation of past adaptive-management efforts. Several specific reasons were cited for this assessment: bad experimental design and inadequate monitoring, lack of long-term commitment, inadequate funding, and a collection of items Walters' described as "management difficulties," including risk aversion, inability to admit failure, and perceived threats to existing interests.

In a similarly critical vein, Westley (1995), in reviewing the case studies contained in Gunderson and others (1995b), comments on the disconnection between knowledge and action; she observes that scientific study "seemed to be carried on *in lieu of action*" (Westley 1995, p. 398; *emphasis* in original). The substitution of study as an alternative to action, she concludes, "has taken on a magical, tension-reducing function, much like witchcraft in traditional societies" (Westley 1995, p. 398).[3]

Such observations are troubling as we consider the future of AMAs as well as efforts to make adaptive management a central feature in ecosystem management or other natural resource management paradigms. The lack of effective institutions has been cited as the major constraint facing implementation of ecosystem management (Grumbine 1994, Slocombe 1993); much the same conclusion underlies Walters' assessment of adaptive management. Two examples illustrate these difficulties.

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[3] This disconnection between knowledge and action is serious. When knowledge does not inform action, the likelihood of serious, perhaps irreversible impacts, increases. Similarly, when action fails to contribute to knowledge, we lose the core output of the adaptive-management process. Interestingly, the essential link between these ideas is noted in Lee's "Compass and Gyroscope" (1993) repeatedly in the form "action yields knowledge", and Friedmann (1987) acknowledges the link as a subtitle to his book "Planning in the Public Domain: From Knowledge to Action."

Attention to Research Design

First, to accept, as a central premise of adaptive management, that policies are experiments and that we must learn, it is essential that such policies be designed so that we can, in fact, learn from them. This means that such policies must be designed to determine cause-and-effect relations and to the extent that outcomes differ from those predicted, to explain why they differ and describe what else might be attempted. This means that good scientific design criteria must be followed; clear specification of objectives, a specified theoretical foundation, documented methods, including monitoring protocols, reasoned analytical procedures, and the like.

These criteria will demand a high level of rigor in design as well as in analysis and evaluation. They also point out the need to test various treatments as well as to provide contingencies should some experiments fail to meet management objectives. As Walters' critique suggests, however, the capacity to deliver on these qualities might be limited. He notes that bad design characterizes many so-called "experiments": the scale is too small, the treatments are weak, no replication is available, they lack baseline data and adequate monitoring, and there is limited flexibility (tolerance) to test options.

As we focus specific policies on individual AMAs, such weaknesses will rapidly become evident. Given current institutional structures, do we have adequate internal capacity to provide the kind of scientific rigor called for? Will we be able to formulate policies and protocols that lead to learning, or will we simply be left with a series of "interesting" anecdotes whose lessons, implications, and generalizability remain problematic?

It is difficult to respond to such questions in any conclusive manner. Given reduced staffing and budget levels in both management and research, one might be pessimistic about the capacity to bring the kind of rigor and attention required in evaluating adaptive-management policies, including field management activities and social processes. A critical assessment of training, reward systems, management-research relations, links, and partnerships with universities, and other measures taken to upgrade and expand internal capacity for effectively addressing such questions seems necessary.

Attention to Human Interaction

A second example relates to the interaction among AMA participants. The vision embodied in FEMAT and given substance in the ROD calls for a new, collaborative relation among citizens, managers, and scientists. The potential for productive interactions among these groups is great; moreover, there is a growing number of examples that demonstrate that such efforts can lead to improved management, reduce conflict, and promote more efficient and equitable outcomes. In a nationwide review of projects that "bridge" the Forest Service and the public, Wondolleck and Yaffee (1994) describe 35 case "vignettes" that document many of the essential principles associated with adaptive management; cooperation and collaboration, joint fact-finding, incorporation of differing perspectives, etc. Such examples support the proposition that useful models for implementing new approaches to management exist and can work.

A potential constraint to such collaboration can be found in the Federal Advisory Committee Act (FACA). Passed in 1972, FACA was explicitly designed to constrain agencies from inappropriately excluding some public interests from agency decision-making. Such redress likely was called for in some cases. An important distinction to make here, however, is that although FACA was designed to discourage an un-democratic style of participation, it was not structured to encourage true democratic

participation. For example, Wondolleck and Yaffee (1994, appendix D-1) note, FACA "...does not provide a proactive structure and set of incentives to encourage the open exchange of information and collaborative decision-making needed in today's plural-istic society. Indeed, its mechanisms stand in the way of a number of needed innova-tions in federal administration."

To some, FACA has been a convenient reason for not pursuing public participation beyond information-sharing events. Others have struggled honestly with how to initiate public participation activities and still remain consistent with the law. A few have taken the view that FACA should not preclude thoughtful interaction with the public and have developed projects or plans that are relevant and meaningful to local citizens. The previously noted Applegate Partnership is probably the best known group to attempt a truly collaborative approach, and before FACA became the perceived legal barrier that it has, they achieved significant success. But more recently, notoriety and conservative interpretations of FACA have severely limited agency participation in the partnership.

Consequently, all AMAs are living with FACA fallout. This usually means having to create cumbersome chartered oversight entities, whose capacity to represent the breadth and richness of public interests is arguable, or disregard the public and con-duct business as usual. Either response seems equally negligent in responding to the promise to achieve "desired social objectives." For agencies to implement the AMA concept, some restructuring of the FACA legislation is needed that deals, on the one hand, with the legitimate concern of preventing undue influence from selected inter-ests, and on the other, with providing an open, unencumbered opportunity for demo-cratic participation by all citizens.

Adaptive Management and AMAs: Where to Next?

In light of the above propositions, what are the issues and opportunities before us as we strive to implement the concept of adaptive management in general and the AMA system in particular? Nine observations are offered here, which derive from one or more of the propositions.

1. There is need to work toward a common definition of the problems that adaptive management and AMAs are intended to solve.

As noted above, the positivist traditions under which we operate tend to reinforce the notion that natural resource problems can be resolved by applying science and tech-nology. Yet there is growing appreciation that the nature of these problems requires new ways of thinking; as Allen and Gould (1986) argue, natural resource problems are not only complex and complicated, but also "wicked", or in Weinberg's (1972) term, "trans-scientific." Although such problems will continue to require the input of sound science, effective progress that leads to an improvement in conditions (as opposed to some kind of "final" answer) will require an increased sensitivity to the social, normative nature of the concerns and questions to which adaptive manage-ment must be responsive. In short, good science is a necessary, but not sufficient, quality of effective adaptive management. In this case, adaptive management is called for not only to accommodate the growing appreciation of the provisional nature of knowledge, but also to be responsive to the growing debate as to the desired goals of natural resource management and the role of the various stakeholders in both the choice process as well as the implementation of management actions.

2. There is need for clarification of expectations about the role AMAs play as well as the roles that various stakeholders should take on.

This means that clear statements of purpose and direction, or conversely, an elimination of vagueness and ambiguity with regard to adaptive management and AMAs are needed. For example, in a study of the Landcare policy (a community-based approach to rural development) in Victoria, Australia, Curtis and others (1995) report that contradictory policy guidelines and ambiguity about the roles of various stakeholders contributed to public confusion about the program, confounding efforts to obtain broad public representation. More directly related to AMAs, Shindler and Neburka found that citizens in nearby communities to the Central Cascades AMA believed forestry projects were more successful when the purpose for public interaction was defined, and a desirable end project identified, at the outset of a participatory process.[4] A specific issue that confronts AMAs, for instance, is the extent to which the areas represent simply a new system of "experimental forests" as opposed to venues in which experiments in the kind of "civic science" for which Lee (1993) calls.

3. Broad public representation is essential to the success of the AMAs.

As discussed earlier, we must recognize that many definitions and meanings of the areas identified as AMAs exist. Some interests can be readily identified; for example, those who live within or adjacent to the AMAs or those who derive their living from them. Many others, however, hold an interest in the AMAs, and these "communities of interest" do not necessarily reside close by. Thus, processes with a capacity to reach, inform, and solicit ideas from a wide range of interests across a broad geographic area must be developed. Citing again the experience in Australia, inadequate representation of community interests was a key factor in understanding why the Landcare policy failed (Curtis and others 1995). This experience also highlights the importance that widespread, capable citizen involvement plays in offsetting "the power of government agencies through both perception of expertise and their control of information" (Martin and others 1992, p. 197).

4. Achieving broad public representation implies a willingness to honor the legitimacy of the range of concerns identified and the knowledge revealed.

Questions and issues of concern to citizens might contrast sharply with those held by managers and researchers who have been involved with the areas now within AMA boundaries. Similarly, much of the knowledge held by citizens will not "fit" the conventional mold of scientific understanding familiar to scientists and managers, nor will it necessarily be responsive to the kinds of concerns held by the wider citizenry. Given that both concerns and knowledge derive from people who will often have long histories of involvement with these areas, it is critical that their opinions be assigned a level of legitimacy and credibility that ensures serious and thoughtful consideration.

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[4] Shindler, Bruce; Neburka, Julie. 1995. Citizen participation on the Willamette National Forest 1989-1994. Unpublished report. On file with: George H. Stankey, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331.

5. For interested citizens and communities to have a "real" ability to participate in, and an influence on, AMAs, they must possess a capacity for participation.

Such capacity is a function of several factors, of which money is only one. Access to knowledge and the capacity to interact with, and contribute to, that knowledge also are crucial. Building local community capacity—through direct financial support, technical training, ready access to the infrastructure of knowledge (for example, GIS, computers), and a sincere commitment on the part of the agencies to listen—will help ensure that decisions about AMAs reflect both the knowledge and concerns of citizens. It also will ensure an opportunity for citizens to ask questions of managers and scientists, an opportunity essential to informed public participation.

Such an effort will challenge existing management and research institutions in terms of budget, administrative capacity and, perhaps most formidably, organizational culture and attitude. Yet, promoting and facilitating such community capacity or development is essential to "building within local communities the understanding, commitment, knowledge, skills, and resources to effectively engage in a long-term process of developing sustainable land use practices" (Woodhill and others 1992, cited in Curtis and others 1995, p. 417). At another level, as Neustadt and May (1986, p. 55) comment, "putting all presumptions on the table and then testing them is one defense of the layman against experts."

Collectively, observations four and five address the crucial yet contentious issue of power. As Westley (1995) notes, although the concepts of consensus and collaboration are featured throughout much of the discussion about adaptive management, in the final analysis, substantive discussion regarding the issue of "power dispersal" (that is, who gets to participate, who has the principal influence, and who makes decisions) remains notable only by its absence. She writes, "Actors involved in collaborative efforts must ensure that some equal access to resources is provided, even if this involves designing processes that give a higher profile to stakeholders who are weak" (Westley 1995, p. 419-421). The control of information in planning—through actions (purposeful or not) that determine who receives information, who has the capacity to process the information that is held, even what kinds of information are admitted to the planning process—constitutes the exercise of power over both process and product (Forester 1989). Effective adaptive management must therefore explicitly confront the issue of power distribution.

In discussing adaptive management, Westley (1995) gives special attention to the ability and willingness of organizations to be responsive to changes in the environment within which they exist. "Companies that take the environment seriously change not only their processes and products, but also the way they run themselves" (Cairncross 1992, cited in Westley 1995, p. 427). One paradox facing organizations, such as the Forest Service, with its historically strong sense of mission, *esprit de corps,* and "can-do" mentality, is that these very qualities, which facilitate action, will hinder the ability and capacity to interpret and incorporate ideas, knowledge, and perspectives contrary to the dominant ideologies and paradigms of the organization. Thus, in the application of adaptive management, this paradox makes even more important the participation of a diverse clientele reflecting multiple perspectives that serve to continually challenge convention and the dominant paradigm (Lang 1990).

6. It is critical that the future of the AMAs be linked to wider social and economic concerns within communities.

This concept of "linkage" is key; the management of AMAs (or of forests and natural resources in general) cannot be dissociated from how management organizations are perceived as responsible stewards of the land and citizens in the wider social fabric. In one AMA, the question of citizen involvement in the management of the area was viewed with great skepticism locally by virtue of the perceived failure of the Forest Service to meet its obligation in the maintenance of a local child-care facility. One citizen remarked, "How can we trust them to manage thousands of acres when they can't keep the place painted or the fence fixed?"

Overcoming perceptions of distrust will not be an overnight activity. Once heralded as a highly regarded "superstar" agency (Clarke and McCool 1985), the Forest Service has, over time, fallen from public grace. The AMAs have the potential to provide a venue where long-term healing can accrue, particularly if responsible managers demonstrate genuine concerns for local problems.

7. In the absence of a clear public identification with an AMA, there is a need to undertake efforts to establish one.

This is a difficult task. It is not a simple matter to establish a relation between people and places when such relations did not previously exist; however, two strategies seem useful. First, although there might not exist formal associations between people and an area, there almost always will be a history of a relation—through recreation, work, etc.—that represents a starting point for establishing the meaning and importance of the area to citizens. Tapping into these connections requires talking with recreationists, woods workers, and others to begin acquiring a sense of this history and connection.

Second, because our knowledge of the AMAs will always be less than what we might desire, there are opportunities for working with citizens as a source of existing knowledge (as noted in the first point above) and as the source of contemporary information. For example, Wondolleck (1988) has suggested "joint fact-finding" as one strategy for generating more meaningful and satisfying participation by citizens in agency decisionmaking processes. In the case of AMAs and the implementation of adaptive management, careful monitoring is essential to document outcomes and adjust management regimes accordingly. Development of and training in agreed-on protocols for monitoring effects could represent an important arena for interaction among citizens, managers, and scientists. One not-incidental benefit is an increased sense of ownership and connection among all three groups and between them and the AMA.

8. Each of the propositions contain significant research challenges.

For example, when we consider the issue of how boundaries are established, it will require an improved understanding of the variable conceptions of "place" held by different stakeholders and how such conceptions might be integrated into, and accommodated by, natural resource planning processes. In addressing how the AMAs will highlight limitations in knowledge, we must improve our capacity to tap the various forms of personal knowledge held by stakeholders as well as establish processes for integrating such knowledge with formal, scientific understanding. In coping with the reality that different views of the world exist among stakeholders, we must improve

Figure 6—On the Applegate AMA, local children have become involved in tree planting, monitoring, and even in discussions regarding future forest management goals

our ability to tap into the various images of forests and forest management and understand how these images and conceptions take form and how they might change. The limitations of institutional capacity call for research into alternative processes and structures to implement adaptive management, including such difficult issues as the most appropriate links between research and management and meshing local needs and desires with regional or national-level concerns and priorities.

9. We must understand that successful implementation of adaptive management in the AMAs will take time.

There are no shortcuts or any way that we can accurately estimate the kind of time required. In part, this reflects the fact that the critical natural resources problems with which we are engaged have been in the making for a long time; this certainly includes many of the forestry issues (FEMAT 1993) as well as the growing concerns with salmon runs (National Research Council 1996). Some clear "successes" will be apparent soon; others might not be revealed for years. Moreover, some of the most important "successes" will derive from experiences that contemporary evaluations will judge as "failures," yet, in the long run, will be the source of significant learning (fig. 6).

Unfortunately, the pressures for quickly demonstrated results characterize the culture of resource management. Deadlines for performance, with decisions based on results at some usually arbitrarily selected date, typify much of our style of operation today. Such a mentality will work to the detriment of adaptive management and to efforts to promulgate successful policies and programs in AMAs. For example, given high levels of distrust among stakeholder groups and between them and management organizations, sufficient time must be invested for mutual respect among the various parties to develop.

Conclusion

Yankelovich (1991) observes that the major constraint to achieving better public understanding of, and appreciation for, the complex issues facing society today is the lack of forums in which deliberate, thoughtful, and reflective thinking and discussion take place. Such forums, he argues, facilitate efforts by citizens to "work through" difficult problems. This includes defining what the problem is, what alternatives exist, and the consequences and implications associated with these various alternatives. It is also a place where the various perspectives that surround any issue are revealed and where people can come to an understanding of, if not agreement on, these different views. Unfortunately, in our society today, such forums are most notable by their scarcity.

It is this kind of function—of encouraging "working through"—that AMAs might be especially capable of facilitating. They have the potential to offer settings where thoughtful consideration of possible futures for places that have meaning to a wide range of people can occur. AMAs might provide a needed "grounding" for the debates about where we as a society want to go. Yankelovich notes that working through is best accomplished when people have choices to consider; he also comments that "in no respect is the art of leadership more demanding than in the need to grasp the available choices" (Yankelovich 1991, p. 167). In the AMAs, we might find an important opportunity where natural resource managers regain a leadership role in their relation with both local communities as well as the wider society.

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Ten Adaptive Management Areas (AMAs) were created in compliance with the Northwest Forest Plan. Although the essence of adaptive management is to treat management as an experiment and to "learn how to learn," several barriers affect the successful implementation of AMAs. Four propositions are identified that address these potential barriers: (1) area boundaries must hold social meaning for stakeholders, (2) a focus on these 10 areas will highlight limitations in scientific knowledge, (3) management of the AMAs will highlight differences in how the world is perceived, and (4) effective management of these areas will challenge existing institutional arrangements In response to the challenges contained in these four propositions, 9 observations are presented that suggest the kinds of actions managers, researchers, and citizens need to consider to ensure that the promise embodied in the Northwest Forest Plan to more closely link communities and forest management can be achieved.

Keywords: Mutual learning, systems planning, adaptive management, public participation, social learning.

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