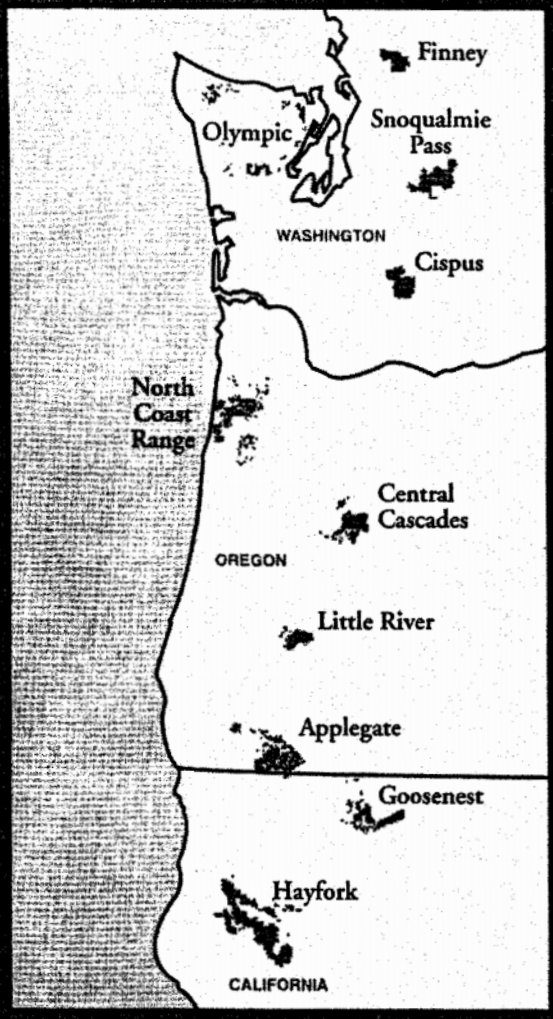

Adaptive Management and the Northwest Forest Plan

Rhetoric and Reality

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Abstract

Adaptive management represents a process to use management policies as a source of learning, which in turn can inform subsequent actions. However, despite its appealing and apparently straightforward objectives, examples of successful implementation remain elusive, and a review of efforts to implement an adaptive approach in the Northwest Forest Plan proves the point Barriers include an institutional and regulatory environment that stymies innovation, increasing workloads coupled with declining resources that constrain learning-based approaches, and a lack of leadership. The time is right to learn from experiences and consider alternatives.

Keywords: endangered species; Pacific Northwest: policy; USDA Forest Service

Although adaptive management has attracted growing attention by scholars and practitioners (Holling 1978; Walters 1986; Lee 1993),examples of successful implementation remain elusive (Walters 1997). This article reports on an evaluation of efforts to implement adaptive management in the Northwest Forest Plan (ROD 1994). Based on a review of the literature and organizational documents, along with interviews with managers and researchers, we report on factors affecting efforts to incorporate an adaptive approach and suggest steps to facilitate implementation.

Theory and Application

Despite the attention adaptive management has attracted, questions per-

Figure 1. **The Adaptive Management Area system.**

sist regarding the ability to implement such an approach (Walters 1997). What does an adaptive management approach imply? Our literature review revealed three key ideas, along with several persistent critiques.

First, adaptive management treats actions and policies as experiments that yield learning. An adaptive approach mimics the scientific method: It specifies hypotheses, highlights uncertainties, structures actions to expose by-, potheses to field tests, processes and evaluates results, and adjusts subsequent actions in light of those results. In an adaptive approach, actions and policies are undertaken based on the best available knowledge and they are implemented in such a way as to produce new understanding that can inform subsequent actions.

However, despite learning's central role in adaptive management, there is little agreement in the literature as to when learning has occurred. For example, what criteria might be used to assess whether the results of an adaptive policy constituted new understanding and the basis for a revised policy, or simply were an idiosyncratic outcome? Confusing chance variation with actual treatment effects could significantly confound efforts to understand complex systems and develop appropriate and responsive policies (Bednar and Shainsky 1996).

Second, rather than treating risk and uncertainty as a reason for precaution, adaptive management embraces them as opportunities for building understanding that might ultimately reduce their occurrence. As experiences in bioregional assessments confirm, the management of complex biophysical and socioeconomic systems inevitably involves risk and uncertainty (Johnson et al. 1999). Typically, such conditions trigger calls for caution or, in some cases, no action until more is known. However, acting in a risk-averse manner can suppress the experimental policies and actions needed to produce understanding that will reduce risk and uncertainty. Ironically, under conditions of uncertainty, it is problematic as to whether such minimalist approaches are, in fact, preferable to experimentation as a way to protect endangered values. Moreover, a consequence of the failure to act adaptively in the presence of uncertainty is that potential learning which might better inform future actions is foregone.

Third, effective adaptive management involves three elements: (1) producing new understanding, based on systematic assessment of feedback from management actions; (2) incorporating that knowledge into subsequent actions; and (3) creating venues in which understanding can be communicated (McLain and Lee 1996). However, the adaptive management literature reports only modest achievements in any of these elements. For example, the asymmetry between the economic, political, and personal costs of experimentation (often immediate and obvious) and the benefits (often displaced to the future and problematic) can act to suppress investments in knowledge acquisition and distribution.

Although the literature provides ample evidence that adaptive management can offer important benefits for dealing with complexity and uncertainty, it also identifies formidable barriers standing between the concept's potential and on-the-ground implementation. In light of this, we were concerned with assessing the progress achieved through adaptive manage-, ment in implementation of the Northwest Forest Plan.

FEMAT and the Northwest Forest Plan

The gridlock behind President Clinton's 1993 forest conference in Portland, Oregon, was grounded in conflicts associated with pressures to protect old-growth forests and associated species (such as the northern spotted owl) on the one hand, and, on the other, the social and economic impacts associated with declining timber harvests. The Forest Ecosystem Management Assessment Team (FEMAT), created in response to these concerns, was asked "to identify management alternatives that would attain the greatest economic and social contribution from the 1993, p. ii) and that were consistent with applicable laws and regulations, such as the Endangered Species Act (ESA). The FEMAT team focused attention on the federal lands of western Oregon and Washington and northern California, an area of approximately 24 million acres.

The eventual~selected alternativethe Northwest Forest Plan-was grounded in the principles of conservation biology, emphasizing risk avoidance to the region's environmental system in the short term (ROD 1994). The plan's system of terrestrial and riparian reserves, when combined with existing congressionally reserved areas (e.g., national parks) and other administratively withdrawn areas, embraced nearly 80 percent of the planning region. In addition, a suite of standards and guidelines further restricted management activities and development, even in areas outside the reserves.

FEMAT's mission statement, however, acknowledged that the uncertainties facing forest managers, fostered by the complexity of the scientific issues and the ambiguity of the political setting, would require an adaptive approach:

> Your assessment should include suggestions for adaptive management that would identify high priority inventory, research,. and monitoring needed to assess success over rime and essential or allowable modifications in approach as new information becomes available. (FEMAT 1993, p. iii)

The plan further emphasized an adaptive approach by allocating 10 Adaptive Management Areas (AMA) (*fig. 1*), covering about 1.5 million acres, or 6 percent of the planning area, across the three-state region "to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives" and to help agencies "learn how to manage on an ecosystem basis in terms of both technical and social challenges" (ROD 1994, p. 6).

Given this evolutionary and knowl-

Table 1. Adaptive management Interview Sample

Interviewee category	Number of Interviews (N=50)	Percent
AMA coordinators	19	38
AMA lead scientists	8	16
Policymakers	5	10
Line officers	7	14
FEMATChapter 8 authors	3	6
REO staff	2	4
Other (citizens, academics)	6	12

edge-driven strategy, adaptive management represented more than a tactic or allocation; it was the cornerstone to the plan's long-term success (Pipkin 1998). Adaptive management complemented the precautionary short-term strategy by offering a long-term strategy focused on expanding knowledge of the underlying biophysical system and its interaction with the social and economic systems as a way to improve management policies. Over time, as understanding and knowledge grew, both the allocations and the standards and guidelines could change (Pipkin 1998).

However, in an assessment of plan implementation, Pipkin (1998, p. 9) described adaptive management as an "area where initial expectations have fallen short" and called for a review, including an assessment of impediments and suggestions for improvement. In 1998, the authors submitted a proposal to the Pacific Northwest Research Station to undertake an evaluation of the adaptive management and AMA program. The proposal was approved, and this article reports on that evaluation.

Methods

The evaluation relied on several information sources. As noted above, an extensive literature review was undertaken, including adaptive management as well as cognate fields such as learning theory and decisionmaking. Based on the review, an interview guide was prepared, which provided a structure for discussions with agency personnel (management and regulatory agencies) involved with implementation of the plan. The interview results provide the basis for much of the following discussion. As our analysis relied heavily on qualitative methods, the following provides a brief overview of this approach.

A qualitative approach is useful for issues in which variables are not clearly identified, theories need to be developed, a detailed view of a topic is needed, or the study requires that individuals be studied in a "natural" setting (Creswell 1998). In a qualitative study, research often begins with "what" or "how" questions. This study was guided by questions of how the adaptive management program had been implemented and the factors that facilitated or constrained implementation.

A semi-structured interview format was used, which included questions regarding a variety of themes while remaining open to changes in the sequence and specific wording of questions, so that interviewees were able to respond in their own terms and in ways that made the most sense to them (Kvale 1996). Interview questions were based on recurring concepts derived from the literature (e.g., role of organizational commitment and resources, development of monitoring and evaluation protocols) as well as specific aspects related to management of the AMAs (e.g., training received, budgetary support).

Fifty individuals were interviewed (*table 1*). Given our focus on implementation issues, we elected to interview those directly involved in undertaking the adaptive management program objectives. This included AMA coordinators, managers, and lead scientists; members of Provincial Advisory Committees or Board of Directors; and agency line officers and staff. Interviews also were conducted with Jack Ward Thomas, leader of the FEMAT project, and the principal authors of FEMAT Chapter 8, where the strategies of adaptive management and AMAs were outlined. Other interview participants included the Region 6 regional forester, Pacific Northwest Station director, former Pacific Southwest Station director, the Forest Service National Adaptive Management Coordinator, and the head of the Regional Ecosystem Office (REO).

Interviews lasted from one-half to three hours. Each respondent could decline to answer any question and could end the interview at any time during the process (none did). Interviews in Washington State, southern Oregon, and northern California were audiotaped with approval of the respondents. The remaining interviews were documented by extensive written notes.

The audiotapes and interview notes were transcribed and reviewed until themes became apparent. These themes were compared to those used in the interview guide to see if there were any major inconsistencies; there were none. Analysis consisted of coding data from individual interviews, then grouping similar themes and ideas from all the interview texts into categories (Rubin and Rubin 1995). After coding was completed for each interview, similar themes were grouped from all interviews and emergent themes were summarized and reported. Results of the full evaluation will be published by the Pacific Northwest Research Station.

The evaluation also benefited from direct involvement of some of the authors in writing portions of the FEMAT report and with implementation of the AMA program. Authors Clark and Stankey, for example, spearheaded creation of the lead scientist program at the Pacific Northwest Station, in which individual researchers were assigned to each AMA in Oregon and Washington to provide liaison between managers and the research community. (The Pacific Southwest Station did not assign lead scientists, but individual scientists were involved with the Goosenest and Hayfork AMAs and were interviewed.) Since establishment of the AMA program in 1994, several of the authors have participated in coordinator meetings and collaborated with individual coordinators and scientists. The study also was

informed by information gathered through other authors' participation in discussions, field trips, and other interactions with AMA personnel, line officers, and management staff over the past seven years.

Information from the interviews, the literature review, and our review of organizational plans and reports produced rich insight on efforts to implement adaptive management as part of the Northwest Forest Plan. Although adaptive management was seen as offering an innovative approach to management and to links with stakeholders, there was open and candid recognition of the formidable barriersinternal and external, operational and systemic-challenging implementation. In some cases, the barriers are chronic and some might see a focus on them as discouraging. Yet, as Kotter (1995, p. 60) notes, successful organizational change efforts often start with a frank discussion of potentially unpleasant facts, the purpose of which is "to make the status quo seem more dangerous than launching into the unknown."

Adaptive Management: What Is It?

The term "adaptive management" embraces a variety of actions, ranging from experimentation to traditional scientific inquiry to less formal, trialand-error approaches. These conceptions are a testament to the concept's richness, but also a source of confusion. Lee (2001, p. 9) describes adaptive management as particularly "worthwhile when laboratory-style precision seems infeasible but trial and error seems too risky." In the case of the Northwest Forest Plan, Lee concludes that its use does not seem to "emphasize experimentation but rather rational planning coupled with trialand-error learning. Here 'adaptive management' has become a buzzword, a fashionable label that means less than it seems to promise" (Lee 2001, p. 12).

The interviews revealed conflicting conceptions and expectations regarding the definition, purpose, and objectives of adaptive management and the AMAs. The lack of a consensus as to what the terms mean has a number of implications: What kinds of training and skills are needed to think and act adaptively? What institutional changes-external and internal, legal and organizational-are required to facilitate adaptive approaches? What criteria are used to define learning, and how might learning be incorporated into subsequent actions? The lack of explicit consideration of these questions in defining adaptive management in the plan also carried over into widely divergent notions as to the role of the AMAs, ranging from a view of them as a type of economic enterprise zone to support local communities, to simply a new name for experimental forests. Some respondents held that management agencies always had been adaptive, which served to justify the contention that no significant changes were necessary in the way agencies operated.

Building Organizational Capacity

When the Northwest Forest Plan was implemented, Forest Service Pacific Southwest and Pacific Northwest Regions and the Bureau of Land Management (BLM) assigned coordinators to each AMA. Some coordinators volunteered whereas others were assigned, but collectively the authors were impressed with the enthusiasm, interest, and commitment they brought to their assignments. However, although coordinators were asked to undertake a leadership role in implementing adaptive management, organizational commitment to support and foster their role was limited. For example, interviews with coordinators revealed they received no training or orientation, were provided no support staff, and the time and energy they could devote to AMA-related programs quickly eroded as new demands arose. Most estimated they spent only 20 to 25 percent of their time in this role (two AMA coordinators, both from BLM, are fulltime), down from nearly a full-time commitment when they first undertook the job. Nor was there any evidence of efforts to support mentoring or career development; as a consequence, the coordinators noted their ranks were "only one deep."

There also was evidence of conflicts over resources and priorities within and across local management units. Coordinators and some line officers cited the belief among some colleagues that the AMAs received undue or even unfair attention and support. This perception of favored treatment often stymied efforts to collaborate with others, even within their own management agency.

With respect to the coordinators, most felt their job was not considered a priority by supervisors or other staff. Adaptive management repeatedly was described as not "on the radar screen"; in short, there was a demonstrated lack of evidence of a clear and unequivocal organizational commitment to facilitate and support a "new way" of doing business.

Coordinators and line officers cited few incentives to undertake adaptive approaches, arguing that experimentation and risk-taking are not standards against which they are evaluated. They described their organizations as risk-averse (i.e., concerned with minimizing the possibility of harm occurring [Wildavsky 1988]) but acknowledged that such behavior is rational and appropriate in a world in which the burden of proof has shifted to land managers to provide rigorous evidence that any proposed action (including experimentation) will not lead to adverse consequences for threatened and endangered species (Lee 1993). They also acknowledged how such a stance stands in contrast to an adaptive approach.

It was difficult to track budgetary support for adaptive management. Beginning in 1994, funds in support of implementation were available for adaptive management work. However, in 1998 much of this support disappeared in the face of declining budgets and shifts in regional priorities. At present, funds to support adaptive management largely derive from local benefiting functions; some support is available from state BLM and regional Forest Service offices.

Our interviews revealed confusion as to where responsibility lay for developing polity direction for adaptive management and the AMAs. For instance, at the onset of the AMA program, there was a decision in Forest Service Region 6 headquarters to not provide direction, guidance, or other

Update on Plan Revisions

In early 2002, the Bush administration announced plans to revise the Northwest Forest Plan, soliciting feedback from regional heads of the USDA Forest Service, Bureau of Land Management, and other agencies. Currently, the administrationis working to revise certain elements of the Northwest Forest Plan, including the Survey and Manage Guidelines and the Aquatic Conservation Strategy,. Both of these policies were adopted as mitigation measures in the Final Environment Impact Statement for the Plan in 1994 and were intended to achieve a balance between species conservation and economic needs of the region. However, many have questioned the efficacy of these policies, claiming they do not meet thier intended purposes and could in fact conflict with other existing land management policies.

Therefore, in October 2002, the administration announced plans to examine the Survey and Manage requirements of the Northwest Forest Plan and determine whether revision or eliminiation of the guidelines is necessary. In November the administration announced its intention to revise the Aquatic Conservation Strategy to ensure its consistency with the original intent of the policy. SAF comments on the proposed changes to the Survey and Manage Guidelines are available at WWW.safnet.org/policy/psst/surveymanage.htm

instructions for implementation of the AMAs. However, during interviews with regional office officials, they explained their decision was intended to avoid imposing a top-down set of rules, while offering field staff an opportunity to frame more local, individually attuned solutions and approaches. However, because the rationale underlying the regional office's silence in setting policy and protocols was not communicated to field personnel, the absence of regional direction was interpreted as evidence of a lack of interest and support for adaptive management and the AMAs.

Forest Service Research generally failed to capitalize on the opportunities and challenges of adaptive management. For example, opportunities were (and still are) available to develop techniques to facilitate learning from management actions (e.g., development of monitoring and documentation protocols). In 1998, following the loss of Forest Service Region 6 funds, the Pacific Northwest Station withdrew its financial support of the lead scientists, who, like their coordinator colleagues, interpreted the decision as evidence of a lack of priority given to adaptive management.

Statutory and Regulatory Environment

A common theme among interviewees was that laws such as the Endangered Species Act and the regulatory agencies that enforce such laws (e.g., Fish and Wildlife Service [FWS]) provide little latitude for the practice of adaptive management. In one AMA, a research proposal to test alternative silvicultural prescriptions in fostering old-growth conditions along the riparian zone was opposed because the researcher was unable to provide fishery biologists and regulators with a guarantee that the experiment would not jeopardize salmon populations; approval was contingent on provision of sound scientific evidence that such adverse effects would not occur. The resulting catch-22 situation, in which experimentation can be undertaken only if there is a guarantee of no adverse consequences,. establishes a difficult, if not impossible, decision criterion to satisfy (Wildavsky 1988). Yet we found little evidence of efforts on the part of the management and research organizations to work with the regulatory agencies to build understanding and support for adaptive management and its role in the long-term implementation of the Northwest Forest Plan.

Moreover, official license to deviate from the standards and guidelines within the AMAs, following certain prescribed conditions, was available in direction provided by the Regional Ecosystem Office (2000). Thus, the lack of projects involving experimentation and the testing and validation of standards and guidelines appears rooted in a more complex set of factors than can be explained simply by restrictive laws and zealous regulatory oversight.

However, the relation between the management and regulatory agencies clearly requires attention. Under prevailing interpretations, actions judged to pose a risk to endangered species generally are opposed, even when the efficacy of precautionary approaches is poorly understood. However, failing to embrace risk (Gunderson 1999a) by emphasizing conservative-but ultimately ineffectual-policies might not only threaten long-term survival of endangered species but also could result in a loss of the learning that experimental actions might have provided. Although such learning would come too late for the extirpated species, it could lead to an improved capacity to sustain other threatened species. Although there are costs to experimentation, there are also costs in failing to experiment (Wildavsky 1988).

While coordinators and other management staff cited external constraints on innovation and creativity, they acknowledged that internal problems were equally daunting. In their view, the tendency in both the Forest Service and BLM to operate according to prescriptive approaches and standardized rules greatly constrained innovation. Despite the acknowledged role of AMAs as venues for testing and validating the standards and guidelines and other innovative management approaches, the lack of dear, explicit organizational support for such efforts, coupled with concerns about opposition from internal staff groups, special interest groups, and the regulatory agencies, largely stymied such efforts.

The risk-averse nature of the management organizations was openly and widely acknowledged by interviewees. They noted that the public, environ-

mental groups, and especially the regulatory agencies disapprove of decisions that involve risk, but they also recognized that such a perspective runs counter to the notion of adaptive management. As a result, many concluded that in such a risk-averse, litigious context, an experimental-based type of adaptive management would prove difficult to implement, a conclusion in which Gunderson (1999b, p. 35) concurs: "... if the risk of failure during experimentation is not acceptable, then adaptive management is not possible." The irony here is that while continuation of policies that have not worked seems to ensure continued failure, undertaking actions where outcomes are uncertain is resisted because of the inability to ensure that unwanted effects will not result.

When minimizing the possibility of failure dominates the policy and management process, we trade uncertainty for a "spurious certitude" (Gunderson 1999a) that provides a comforting but illusionary sense of predictability and control. Although it might be assumed that the Northwest Forest Plan's precautionary strategy is the most viable approach to long-term protection of key species, another perspective is to treat this assumption as a "question masquerading as an answer" (Gunderson 1999b, p. 35). Yet, as several interviewees noted, in todays risk-averse environment, avoiding experimentation and its inherent uncertainty to minimize or eliminate personal and professional risks becomes a rational response, even though it carries with it outcomes that might endanger those values society desires to protect.

Learning How to Learn

Despite the depiction of learning as a key element of adaptive management, most AMA coordinators, managers, and lead scientists acknowledged there has been little in the way of systematic design and documentation to promote learning or to address the question of what it means to learn. Projects cited as evidence of adaptive management often involved any activity within an AMA, irrespective of its objectives, when or why it was undertaken, or evidence of its impact on policy or practice. Moreover, much of this evidence involved descriptive and anecdotal accounts and, although these are not without value, the lack of rigor, detail, and specificity limits their contribution to learning (Walters and Holling 1990; Bormann et al. 1999).

Nonetheless, two important examples of landscape-scale adaptive management experiments can be reported. The Central Cascades AMA, in association with the H.J. Andrews LongTerm Ecological Research group, (led by the Pacific Northwest Research Station and Oregon State University), has begun implementing an alternative strategy to the Northwest Forest Plans reserve system, focused on natural disturbance regimes (Cissel et al. 1999). Although the 57,000-acre Blue River landscape study so far lacks a control and has yet to be replicated, associated modeling and similar efforts in the adjacent Augusta Creek buoy confidence in the study's interpretation. A different landscape-scale approach is taking shape in the Five Rivers drainage on the Siuslaw National Forest in a 16,000acre management experiment comparing three strategies to integrate road, plantation, and stream management to meet plan goals (ROD 2002). The three strategies are replicated four times on randomly designated 1,300-acre areas. These efforts demonstrate that implementing adaptive management is possible on federal lands and their implementation might represent an important foothold for efforts elsewhere.

What's Next?

Despite the intuitive appeal of adaptive management as a strategy for responding to risk and uncertainty and of making incorporation of the best available knowledge more efficient and effective, it has not translated easily into practice. The reasons underlying this difficulty are diverse, as our discussion suggests. What does this imply for efforts to realize the role envisioned for adaptive management and the AMAs in the Northwest Forest Plan?

It is important to recognize that an innovative process such as adaptive management requires time and patience. Significant time lags confound efforts to confirm the effects of treatments on complex biophysical systems; similarly, organizational culture, norms, and beliefs will not change overnight. At the same time, our results suggest that significant barriers confront adaptive management and that legal, organizational, and ideological changes must occur before implementation can succeed. An adaptive approach will require a significant transition in how we think and act, including a capacity and willingness to acknowledge that current actions and beliefs might be wrong. To do so will require transformative actions for both individuals and organizations (Bridges 1991; Danter et al. 2000).

A major factor compromising long-term implementation of the Northwest Forest Plan has been the failure to implement a rigorous, experimental-based model of adaptive management, relying instead on an approach to decision-making that is informal and incremental but nonetheless widely accepted as what an adaptive approach involves. This conclusion echoes Lee's (2001, p. 12) observation that adaptive management in the Northwest Forest Plan was a "buzzword that meant less than it promised." Although the failure to take a more experimental approach can be attributed in part to legitimate barriers imbedded, in the political and legal structures within which natural resource management takes place, it has resulted in an inability to test and validate many of the underlying assumptions on which the Northwest Forest Plan is based, and it has similarly limited development of alternatives to the plans precautionary direction.

After seven years of experience, now might be the time to revitalize and reinvigorate efforts to make adaptive management the central strategy which the Northwest Forest Plan originally intended it to play. The following areas require particular attention in such efforts.

First, there is a critical need for leadership to assert itself in support of an adaptive approach throughout the management and research organizations. Specific actions needed include establishing stable funding, promoting training and career development options, facilitating development of organizational competency and capability

in adaptive management, and encouraging and supporting risk-taking.

Second, there needs to be organizestional recognition that adaptive management represents a significant change in how work is done, and such changes must permeate agency actions rather than be seen as limited solely to the AMAs. Managing the transition to a new way of doing business will require patience and skill, as it involves changes in deeply rooted beliefs, norms, and behaviors (Bridges 1991; Danter et al. 2000).

Third, steps must be taken to engage the regulatory agencies as active participants in management experiments, particularly those that focus on questions critical to threatened and endangered species survival and habitat restoration programs. Tuchman et al. (1996, p. 121) observed that "the regulatory and management agencies differ in their opinions about the extent of management and experimentation allowed within the [Adaptive Management Areas]"; this situation persists and must be addressed more effectively. This should include collaborative efforts among the regulatory, management, and research communities to test and validate the assumptions on which the plan is based and to establish processes regarding the evidence required to trigger adjustments in standards and guidelines.

Fourth, because adaptive management inevitably involves risk and uncertainty, enhanced efforts to build and sustain mutual trust among key stakeholders-agencies, citizens, politicians, and the courts-is essential. Without it, efforts to implement adaptive management will lack the social approval necessary for implementation (Stankey and Shindler 1997).

Fifth, activities that foster learning (e.g., the National Environmental Policy Act [NEPA] and decision processes, monitoring and evaluation, and public involvement processes) need to be better defined, coordinated, and communicated both within and among agencies and key external interests. A significant investment in learning (through sharing learning techniques) and training, is required; establishing learning as a performance element for practitioners and scientists is one example of how this might be encouraged.

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