Nipped in the Bud: Why Regional Scale Adaptive Management Is Not Blooming

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ABSTRACT / Adaptive management is an approach to managing natural resources that emphasizes learning from the implementation of policies and strategies. Adaptive management appears to offer a solution to the management gridlock caused by increasing complexity and uncertainty. The concept of adaptive management has been embraced by natural resource managers worldwide, but there are relatively few published examples of adaptive management in use. In this article, we explore two watershed management projects in southeastern Australia to better understand the potential of adaptive management in regional scale programs through qualitative, case study--based investigation.

Adaptive management is an approach to managing natural resources that encourages learning from the implementation of policies and strategies. Adaptive management offers a complementary approach to conventional management, which has traditionally relied on models of reductionist science and one-way transference of knowledge. The idea of adaptive management has become popular in the last two decades because of its visceral appeal. If pursued actively, adaptive management promises to allow managers to keep managing their forests, oceans, farmland, and waterways despite the increasing complexity of societal goals and a growing recognition of the uncertainty surrounding management activities (Gunderson and others 1995, Holling 1978, Holling 1995, Walters and Holling 1990). Because adaptive management combines experimentation with management, learning can be both more efficient and more socially inclusive compared with conventional management (Lee 1998). Despite these manifold attractions, and multiple attempts to use adaptive management in various fields, few are documented and even fewer appear to have achieved their potential (Lee 1999, McLain and Lee 1996). The research presented here, the first of its kind from Australia, is an attempt to understand the absence of actual adaptive management in the midst of its rhetorical abundance.

Context
The term "adaptive management" can be understood from a variety of vernacular and technical perspectives, and at many scales. In this article, we focus on adaptive management as a means for achieving and improving policy outcomes in environmental/natural resource management, particularly at the regional scale.

Understanding regional scale adaptive management is important because regions are increasingly central to the delivery of natural resource management policy. For instance, in Australia many programs, including those relating to dryland salinity, biodiversity, and water quality, are supported by federal government funding directed at regional activities (NHT 2002). Similarly, community funding for environmental works is delivered through regions in Canada (Environment
Canada 2004); in the United Kingdom, rural and environmental issues are addressed through a regional framework (Department of Environment Food and Rural Affairs 2002), and United States forests are managed through regional systems and strategies (USDA Forest Service 2004).

Adaptive Management

Adaptive management is about learning to live with natural variability through the implementation of policies and strategies: simply learning from doing, except that it is not simple. The term "adaptive management" covers three distinct forms of learning from doing, which can be described as evolutionary, passive, and active adaptive management (Walters and Holling 1990). Evolutionary adaptive management is undirected learning from random experience, or trial and error learning. Passive adaptive management is more directed, being focused on the implementation of an historically informed best practice or policy, followed by review of that implementation. Passive adaptive management is sometimes considered to be equivalent to the current conventional approach to managing natural resources (Parma and others 1998). Effective passive adaptive management involves the following:

- an active culture of reflection comprising effective evaluation, rewards for thinking and reflection, and appropriate communication fora for all project participants; and
- provision of mechanisms for incorporating learning into planning and management.

Active adaptive management is different from both evolutionary and passive adaptive management because it is focused on learning, rather than implementation. Within an active adaptive management paradigm, implementation of policy and strategy is designed to test hypotheses (Dovers and Mobbs 1997, Lee 1995, Walters and Green 1997). Active adaptive management may use a range of treatments—practices designed to achieve strategic goals—to test the hypothesis that "best" practice is just that. Viewed from within the active adaptive management paradigm, policy becomes "questions masquerading as answers" (Gunderson 1999, p. 1). Active adaptive management incorporates both features of passive adaptive management listed above, plus:

- management activities are specifically designed to test hypotheses through ecosystem scale holistic experiments;
- complexity is embraced;
- provision of mechanisms for multidisciplinary and multistakeholder involvement; and
- there is strong emphasis on social learning.

The Research

We are seeking to better understand the current use, or more accurately, the nonuse, of adaptive management in regional scale natural resource management programs. Specifically, we are asking if adaptive management is being used, and if it is even possible within current social norms and institutional frameworks. We also ponder what can be done in a social or institutional context to use adaptive management more effectively. We chose a qualitative approach, centered on two regional scale case studies from southeastern Australia, and then compared our case data with evaluations of the Adaptive Management Areas of the US Pacific Northwest. Because of space constraints, we draw on the case data superficially in this discussion; those interested in more detail should refer to Allan (2004).

Research Approach

Qualitative, interpretive research facilitates deep understanding of processes through studying people and their activities in natural settings (Denzin and Lincoln 2000). Case studies were chosen because they allow deep, detailed explorations of single examples of a class of similar phenomena to provide insight into an issue (Rossman and Rallis 2005, Stake 1994). We used a combination of document review, semistructured interviews with individuals and groups, and participant observation to create the data about the cases. Over 90 people participated in the research through 22 individual interviews, a group interview, and 19 separate observation events, supported by informal conversations with case study participants. The interviews were audiorecorded and transcribed, the observations and conversations were noted by hand, and selected documents were reviewed. Thus, the data of this research are in the form of words: stories, ideas, beliefs, and musings (throughout this article, verbatim extracts of these words are shown in italics). Our analysis involved interpreting the meaning of these words and assigning a category and label to them, as described by Dey (1993). We used two distinct systems of categorization: thematic categories for the objective information provided by participants, and metaphorical categories to expose some assumptions behind what was said. The thematic categories were
developed inductively from the data, and eventually were organized into 11 major category headings, such as "knowledge," "learning," "values," and "actions." The transcripts were then recategorized based on the metaphors used by participants. Metaphor analysis treats spoken metaphors as a reflection of metaphorical thinking, which both mirrors and shapes people's understanding of intangibles such as ideas and emotions (Lakoff and Johnson 1980, Moser 2000). Metaphor analysis thus offers a way of understanding people's operational schemas or world views, which adds depth to the understanding of the literal information. Although previously used mainly by psychologists in both research and therapeutic settings, systematic analysis of spoken metaphor as a means of understanding human constructions of realities is now used being used by social scientists in many fields. For example, Slingerland (2004) used metaphor analysis to inform his comparative study of understandings of "self" in ancient Chinese and modern American culture, Oberlechner and others (2004) used metaphor analysis to expose the functioning of the foreign exchange market, and Nerlich (2004) explored newspaper coverage of the recent foot and mouth epidemic in Britain.

Our method involved noting each time a metaphor was used, determining what sort of metaphor it was, and what its use implied about the conceptualization, or world view, that allowed the metaphor to function. For instance, when talking about a local project, a research participant referred to "structuring things." We categorized this as an example of a building metaphor. Another participant spoke of "the right framework," and this was also categorized as a building metaphor. Eventually there was a long list of these building metaphors: some to do with structures, others with frameworks, still others with doors and gates. A variety of things were considered to be sufficiently "like" buildings to be understood through a building metaphor, but these things fell into three broad categories: communities (for example, communities were described as needing "support," and there were worries about "overloading" communities), natural resource management projects (they were "developed," had "frameworks," and were protected by "gatekeepers,"), and information (which could be "set in concrete," and was said to need a good "base" or "foundation"). Thus, by analyzing the metaphors in use we can begin to expose the ways in which the concept of community, or information, is understood at a less-than-conscious level.

We used these identified metaphorical conceptualizations, along with the literal themes that emerged, to describe the social norms and institutions within which the two case studies operate. This description of the social setting was compared with a description of the features of adaptive management developed from a literature review to assess the degree of agreement between them. An overview of this research approach is provided in Figure 1.

Case Studies

The regional case studies were located within 100 km of each other, one just north, and the other just south, of the Murray River in southeastern Australia. The study area is within the Murray-Darling Basin, the environmentally and economically important "foodbowl" of Australia. Within each of the case study areas there were active community-based watershed groups, which are called landcare groups in Australia (Curtis and others 2002).

Regional case study #1: The North East Salinity Strategy (NESS). The Northeast region of Victoria covers 2 million ha and provides 38% of the water for the Murray-Darling river system (North East Catchment and Land Protection Board 1997, p. 15). Over half of the region is forested, but agriculture is a dominant landuse in the 500–1200-mm rainfall zone (North East Catchment Management Authority 2001). Much of the highly modified agricultural landscape supports sheep and cattle grazing in the eastern uplands, with some cereal cropping in the west. An unintended consequence of recent land modification is dryland salinity, which is an emerging problem for the region (Lumsden and Reid 1996). The community-initiated North East Salinity Working Group (NESWG) formed in November 1994 to develop a salinity management plan. The North East Salinity Strategy (NESS) was released as a draft in 1997; although not explicit, a passive form of adaptive management was implied by the NESS program logic.

The authors of this article were commissioned to review the NESS after 5 years of implementation, and one of our aims was to seek evidence of adaptive management. Semi-structured, confidential interviews were held with 20 project participants, following the general methods of Patton (1990) and Silverman (2001). Interview participants included local and head-office land management agency staff, representatives from local government, and members of community-based watershed groups. A group research interview involving watershed group facilitators followed an interview framework and process similar to that used for the semistructured individual interviews. All interviews were audiotaped and then transcribed in full, following the orthographic transcription notation of Jefferson (Wood and Kroger 2000).
Regional case study #2: Heartlands (Billabong).

Heartlands is an initiative of the CSIRO, Australia's national scientific research establishment. Launched in 2001, the Heartlands project aims to facilitate large-scale landscape change that is both environmentally and socially acceptable. A Heartlands foundation principle is the active application of adaptive management (CSIRO Heartlands Core Group 2000). Heartlands involves hydrologists, foresters, and ecologists working with land managers to achieve widespread implementation of recommended environmental practices such as revegetation, farm forestry, and the establishment of perennial pasture. Financial assistance for landholders undertaking works on their properties was provided through established state and federal government programs.

We used the Heartlands project in the Billabong watershed in the southern part of the state of NSW as a case study. The Billabong watershed covers approximately 300,000 ha, straddling forested hills, high rainfall upland grazing areas, and lower rainfall arable country used for cropping (CSIRO Land and Water 2003). Members of the Billabong communities have identified declining economic viability and a lack of natural resource management knowledge, understanding, and skills as important issues in the catchment, as well as physical problems such as tree decline, soil acidity, and dryland salinity (Upper Billabong LWMP Working Group 1999). There are three well-established watershed groups, and there is strong community involvement in setting direction of local natural resource management. Heartlands in this area was managed by the Billabong Operations Group (BOG), a steering committee comprising local watershed group staff, CSIRO scientists, state government agency staff, and farmers.

The primary form of data creation for this case study was participant observation of BOG activities from their commencing in early 2001 until the end of project funding in late 2003. Participant observation involves a researcher making systematic observations of social situations in which they are involved (Spradley 1980). Observations of planning meetings, subcommittee meetings, and public Heartlands activities were recorded by hand, and later transcribed using a transcription protocol that differentiated verbatim passages from approximated conversation and observer contextual and analytical notes, while remaining consistent with the NESS interview transcription protocol.

Key Learnings

Is Adaptive Management in Use?

We found little evidence of even passive adaptive management in the NESS case study, and only limited use of adaptive management in the Heartlands case study. Our review of the first 5 years of the operation of the NESS confirmed that it was a useful implementation project; despite scarce resources, the project raised community awareness of dryland salinity and its impacts, developed a better understanding of local hydrogeology through traditional research, and promoted the implementation of best management activities (Allan and Curtis 2002). However, although operation within a passive adaptive management paradigm was implied within the NESS document, there was little evidence of any form of learning from the implementation activities. For example, the limited research budget was guided by hydrological experts, and they focused on understanding and describing the hydrology of each region. There was no spare research money to direct to developing and trialling locally appropriate management options, a situation that was lamented by interview participants. As one farmer participant explained:

Management is the answer, and being able to use your land and keep using it, but they can’t answer questions like how many trees do we grow before it affects the water table, before it affects salinity. ... The boxes aren’t being put in to give those answers either. Because they’re still looking at a big picture, they’re not looking at a specific picture as to what’s going on.

The main focus of the NESS project was implementation, and across the district scores of landholders were planting trees and perennial pastures each year in the hope of managing water tables and salinity. These plantings could have been seen as management “experiments,” but were not because they were funded by “implementation” money rather than “research” money. There appeared to be no expectation of learning from funded works, because there was no systematic monitoring or evaluation of most of these activities. Three sites (of hundreds) did have specific monitoring regimes, but these were established with the stated intention of “demonstrating” the effective practices, rather than learning from them.

Further evidence that adaptive management was not practiced is provided by the approach to evaluation and incorporation of new knowledge within the NESS project. Regular reporting was required by federal and state funding sources, but these bodies wanted, and were provided with, activity and financial audits rather than reviews or evaluations. The formal review that we undertook was first contemplated 5 years into project implementation, and resulted from a statewide review...
of salinity projects, rather than being initiated from within the NESS. Because the concepts of review and reflection were not woven into the fabric of the NESS project, we were restricted to sifting through incomplete project evidence in the hope of finding something useful. Even if knowledge or greater understanding was generated by projects, there were few opportunities or mechanisms for incorporating learning into central decision making processes. The NESWG was disbanded, and no effective community forum was established in its place, severely impacting on the opportunity for community learning and sharing in the project (Allan and Curtis 2003).

Heartlands listed (active) adaptive management as one of its foundation principles, but in practice much of the implementation was very similar to that of the NESS and most other contemporary watershed management projects. Implementation of recommended environmental practices occurred across the Billabong watershed, and in most instances the work of the Heartlands project was indistinguishable from any other government program that supported on-ground work. However, the small watersheds drained by the Simmons and Ten Mile Creeks provided a focus for small-scale holistic experimentation. In each of these subwatersheds, ground and surface water monitoring equipment was installed with the hope of measuring impacts of tree and pasture planting. Information from this monitoring, enhanced by a detailed soil survey, supported computer modeling of different scenarios of vegetation type and management, including commercial vegetation such as cereal cropping, forestry and pasture, and environmental plantings of native vegetation (CSIRO Land and Water 2003). In these small watersheds, information sharing and co-learning relationships were established between the scientists and local farmers. However, the Simmons and Ten Mile Creek projects were only a partial move to adaptive management in the Heartlands project. Government funding for implementation was only available for 2 years, which forced the pace of the physical planning. Works could only be considered for the land of farmers who were already willing to undertake recommended environmental practices, because there was insufficient time to promote the program to other farmers, some of whom farmed in more experimentally useful positions in the landscape. As one of the scientists involved explained:

‘We’re not anywhere near getting the sort of the combination of the revegetation works, or getting sufficient area to be able to get to that long term goal at the moment.’

The implementation funding guidelines also have strict eligibility criteria, and there is little flexibility in the level or type of assistance that can be offered to landholders to facilitate participation. Thus, the type and placement of the works to be monitored were controlled by funding guidelines and the capacity and interest of individual landholders, rather than by optimum experimental design. The research funding came from a different source, but was also only available for 2 years: just sufficient for the establishment of
the monitoring hardware and baseline measurements. There is no guarantee that monitoring will continue in the short term, let alone in the medium or long term.

The special cases of the Simmons Creek and Ten Mile Creek projects aside, Heartlands was focused on implementation, with little emphasis on reflection or learning. As it was in the NESS project, reporting from the Billabong was required to focus on activity auditing, and evaluation was only considered by the BOG after 1.5 years of project implementation, as exemplified by this brief exchange extracted from a mid-2002 BOG meeting, nearly 2 years into the project.

BOG member 1: Do we need to do any project evaluation? Get someone from outside?

BOG member 2: Do we have to do a final report?

The Possibility of Practicing Adaptive Management Within Current Social Norms and Institutional Frameworks

The difficulty of catching adaptive management in action in NESS and Heartlands suggests that there are some major constraints on practicing adaptive management. To understand these constraints, it helps to understand the social context within which natural resource management projects are planned and implemented. We achieved this by further exploring the literal narratives and metaphorical conceptualizations presented by participants in the two case studies. Examination of the case data from the two case studies suggests that there are number of unspoken assumptions or agreed "plots" that underlie, and indeed compel, many discussions and activities associated with natural resource management. We have called these underlying plots "imperatives," but they could equally be thought of as cultural assumptions or as underlying discourses. We have identified seven "imperatives" in the case data that we think have implications for current attempts to practice adaptive management.

**Imperative 1: Got to keep moving.** The overwhelming impression from each case study is of constant activity and movement, of a desire for rolling-up-your-sleeves-and-getting-things-done. Activity is unquestioningly assumed to be laudable, a position encouraged by government funding programs that stress activity audits and the need to set "goals" and meet "targets." Many of the NESS participants expressed concern or frustration when they considered there was insufficient project activity. Viewing the project in terms of a journey, they spoke of the need to "push" the project along, "drag people along" with them, and "drive" activities in certain directions. Heartlands BOG participants spoke of "fast tracking" activities and getting projects "off the ground."

Feted leaders in both case studies were the ones who pushed, drove, and achieved. Project "success" was audited in relation to progress towards a destination, again strongly encouraged by social norms and institutional frameworks that recognize and applaud physical achievement and attainment of goals. Even the acceptance of scientific thinking in natural resource management programs, a comparatively novel idea, appears to stem from the belief that social science is about the identification (and ultimate removal) of barriers to predetermined forward movement, especially "barriers to change" and "barriers to adoption."

Although projects do need to be achieving and progressing, an overemphasis on project activity has implications for the learning that can occur from that activity. Learning was rarely discussed by case study participants, but when it was, it was usually in the context of sedentary activities, as described by a NESS participant:

> Oh well, I do think we haven't done enough of that in the past; when things are not working, we sort of haven't sat down and said, you know, we sort of just kept plodding on, instead of saying, hold on a minute, all stop, look; you know, this is not working, what do we need to do to make it work?

Sedentary, backward-looking activities are the very opposite of the movement that is so valued in current natural resource management culture.

The present government emphasis on attainment of milestones or targets implies confidence in the results of the activity and the final destination. When the destination of the journey is "known" so confidently, there is no incentive to stop and reflect; for what purpose does seeing where you have come from serve, except perhaps to celebrate your rate of travel? As a different NESS participant commented:

> We should know the answers before we go out and spend the money, whether it's going to work. ... Well, that's the role of research scientists.

There is thus a real tension inherent in the idea of "learning from doing," as the act of learning, or looking back, may be thought to slow or halt the act of doing.

**Imperative 2: Got to have control.** Less obvious than the need for constant activity, but at least as pervasive in the case data, is the need for control: of people, of projects, and of natural resources. It was an apparently unquestioned natural law for case study participants that controlling hierarchies exist in society, exemplified by constant reference to appropriate "levels" of decision making and getting "down to grassroots." Even the well-used rhetoric of "bottom up" approaches was merely an inversion of hierarchical thinking, because hegemony was maintained through the tacit acceptance of an
existing social ladder. Order and control are also inherent in ideas of inside and outside. Managing the movement of people and their ideas was often referred to directly, or indirectly through recourse to door and gatekeeping metaphors; determining who was "on board," or how to get "a foot in the door" used considerable resources in each case study. In the NESS this was determined through physical "priority areas," whereas the Heartlands delineated "core" and "fringe" people and activities.

Control maintained through hierarchies and gatekeeping encourages a narrow focus, a demarcation of activities, and compartmentalization (we have heard this referred to as "silo" mentality in Australia and "fortress" mentality in the United States). This tendency to control and compartmentalize encourages reductionism and thwarts the opportunity for the collaborative and holistic thinking required for adaptive management. Demarcation and compartmentalization also make it easy, possibly even desirable, to give the responsibility for aspects of natural resource management to separate organizations, rather than to a society of individuals. It is difficult for social learning to flourish in such a system.

An important aspect of controlling hierarchies is the power they can exert on the types of knowledge or understanding that is sought, and what can be reported as having been learned from an activity.

Two brief extracts from separate BOG steering meetings illustrate that reporting is required to suit the funding bodies' needs, and that this requirement can hide activities and learning:

In the NHT we need to dwell on all the wonderful things, but there needs to be a more candid report. Longer but more useful, but we haven't budgeted any time or money for that.

BOG person 1: "Don't say you're using public money for pests and weeds."
BOG person 2: "Use assisting regeneration."
BOG person 1: "Use all the weasel words you want."
BOG person 3: "Do we want to test the incentive rate to get them to make the change, rather than hiding it as an inconvenience payment?"

To enhance chances of future funding, information and ideas must be contorted to make them fit the expectations of the funding bodies. Gaining funding through the written application system thus encourages the use of standard buzzwords and expected responses, rather than encouraging reflection on what was learned about the system being managed.

**Imperative 3: Got to see well.** There appeared to be an urgent desire for "clear" by case study participants, particularly in the sense of clarifying details of physical processes and project management. For instance, participants spoke of needing "a clearer sense of purpose," "a clear vision of what Heartlands is," and "a picture of what's going on." Participants from both case studies also encouraged "focus" in research, implementation, and planning.

One result of this desire for clarity and focus in the case studies is a tendency to try to reduce the complexity of their socio-ecosystems. This process, taken to the extreme, can result in what Gunderson (1999) termed "spurious certitude." The desire for clarity also creates a disincentive to learn, because doing so may add to the complexity of management. As a NESS participant noted about salinity:

*But this is a case of managing, not curing, not getting rid of it, and so I believe that the time frames associated with all that are getting longer and longer, the more we find out about it, so that's a bit depressing.*

Again a cultural imperative, in this case to see clearly, to know everything and project a simple solution, is in tension with adaptive management, which embraces complexity and promotes holistic thinking and action.

**Imperative 4: Got to sell.** In each case study, communication of ideas and information was vital, because successful project implementation relied on persuading private landowners to adopt recommended management practices to achieve landscape change. For instance, from the NESS,

...and they're never going to do anything, they've got to be encouraged to do differently. I don't think we can afford to let 40% of landholders do nothing.

The most frequently articulated conceptualization of communication was of it being like commerce, with effective project staff being referred to as good "salesmen," who can make land managers want to "buy" recommended practice. Individual farmers, communities, organizations, and policymakers were each conceptualized as individuals exercising their free choice in a marketplace of ideas and activities.

To sell something you need to promote it, and to project confidence in it. The confidence required to sell an idea or project inhibits the questioning of that idea or project. This becomes a particularly important point when implementation relies on selling ideas about land use change to individual land managers. In the context of a high degree of uncertainty about how to proceed to address many of the critical land and water degradation issues in Australia, it is difficult to see how the current persuasive approach could also accommodate the basic questioning at the heart of adaptive management. "Best" or "recommended" management practices are much easier to promote to a landholder than the active adaptive management approach of "this is one of a suite of things that we think"
might work, but we’re learning as we go and would like you to try it.”

Attempts to share and co-create information are overwhelmed by market-based thinking. Rather than learning being seen as a social activity that occurs between participants of equal status, information is managed by powerful groups and sold, sometimes metaphorically, sometimes literally, to the less powerful. Thus, the imperative to sell ideas not only works against the culture of questioning and reflection that is at the heart of adaptive management, but it also promotes the demarcation and privileging of certain types of information.

**Imperative 5: Got to compete.** Case study participants frequently referred to “winning” and “losing” various political and environmental “games.” For instance, comments such as “...that way the ecology can win and the farmers can win,” and “One of the potential win-win situations is to drive more widespread farm forestry” show how ingrained concepts of winning are in the case studies. When natural resource management and politics are considered to be games, stakeholders necessarily feel that they need to be playing the right game, and that they should be playing to win. Organizations thus “compete” with each other for recognition and funding. No eyebrows are raised, for example, at the annual announcement of community watershed group awards in Australia, although the works are undertaken to address problems, not to vie with other works. A competitive, rather than collaborative approach to management inhibits the holistic, social learning dimensions of adaptive management.

**Imperative 6: Got to maintain institutions.** Institutions, whether formal organizations or less formal social habits, require input of time, money, or other resources to maintain their existence. Case study participants frequently conceptualized formal organizations as being like machines, with government agencies pictured as having a variety of policy “tools” to use, project participants described as “cogs,” and conversations referred to as “engagement.” This is not surprising, because the fundamental metaphor for modern organizations is a mechanistic one (Morgan 1997), but the implications of such thinking are profound. Machines are only useful when they operate correctly, and the same is assumed to be true for organizations. Therefore, maintaining a “smoothly” operating, efficient organizational machine can dominate thinking, especially within government agencies. Sometimes this impacts on problem definition and learning from implementation. For instance, in the NESS case study the effective community-based NESWG was disbanded because it did not mesh well with the functional design of the management authority. That one act removed most of the opportunities for a variety of community voices to direct the implementation and learning activities of the project. As the administrative person who oversaw the creation of new implementation committees (ICs) saw it:

The IC system never worked well, and eventually it too was dissolved.

**Imperative 7: Got to be comfortable.** Most of us like to be comfortable, and we try to avoid pain and distress. Goleman (1997) suggests that modern humans are most at risk from psychological pain, in the form of affronts to self-esteem, and in apprehension. Denying a threat is one way to avoid stress arousal and to remain comfortable. Denial and deception, either of the self, or of others, are among the most common ways for individuals and institutions to maintain their level of comfort. Within the cases studies, individuals and groups maintained their comfort by denying that they had learned. For example, as noted earlier, deception was apparent in the submissions and reports made to funding bodies. To ensure future funding, project activities were presented in “a good light,” and the necessary “spin” was applied to anomalies so that they conformed to the expected outcomes, thus maintaining the comfort of future funding. Possibly even more prevalent was self-deception: the almost prolific use of metaphor by case study participants may itself be a comfort-seeking activity. Metaphor use by case study participants was greatest when new ideas or difficult concepts were under discussion. Understanding a difficult or threatening idea by transforming it into a more familiar and safe one was possibly a way to avoid admission of a need to learn or to change behavior because of that learning.

A final example of being comfortable through denial is particularly relevant to this research. When we have discussed adaptive management at public fora people often comment, with obvious umbrage, that they are already managing adaptively. Perhaps rather than admit to tacit accusations of stupidity, it is better to cling to the comforting notion that humans always learn from experience.

The implication for adaptive management of these various forms of seeking comfort is that learning from experience is avoided. Evidence that may highlight a
need for new understanding is explained away or distorted through metaphorical massaging.

Comparison of Our Case Data with Forest Management in the US Pacific Northwest

By the late 1980s, forest management in the Pacific Northwest of the United States was in crisis, with high-profile debates raging between environmental and logging user groups. The Northwest Forest Plan was developed to address management and other social issues in the forests of the Pacific Northwest, and it included adaptive management as a foundation principle (FEMAT 1993). Adaptive management as a process was supposed to underpin forest planning and management across the entirety of the forests of the Pacific Northwest; in addition, 10 designated Adaptive Management Areas (AMAs) were created to allow more intensive management-scale experimentation and learning. One could expect that in the decade or so since the establishment of the Northwest Forest Plan, many examples of adaptive management in action could be found, but this is not the case. Just 4 years after the establishment of the AMAs, a major report on the Northwest Forest Plan, commissioned by the US Department of the Interior, urged a "rededication" to the principle of adaptive management, after noting that the management practices in use had no methods for seeking or incorporating new information (Pipkin 1998). Rededication apparently failed to happen. Stankey and others (2003, p. 44) summarize their assessment of adaptive management in the Pacific Northwest as a general failure "to capitalize on the opportunities and challenges of adaptive management."

Some of the weaknesses identified in the Northwest Forest AMAs include limited practical support for the adaptive management process, problems with funding long-term monitoring, disconnections between participants in different disciplines or roles, and difficulties with transferring learning from individuals and small areas to the larger community (USDA Forest Service 2002). These bear remarkable similarity to the experience of adaptive management in our Australian case studies. Are the social or institutional imperatives we have identified also operating to constrain adaptive management in the Pacific Northwest? Some similarities are certainly apparent. As with the Australian case studies, there appears to be a strong desire for managers at many levels to maintain control of all situations in the AMAs. For example, in an attempt to insulate itself from risk, the US Forest Service requires almost foolproof experiments, where the outcomes are already known (Shindler and others 2002). Learning also appeared to be passively avoided by a failure to develop systematic processes for recording and incorporating new learnings (Stankey and others 2003). Linked to the need for control is a desire to understand all of the functioning of systems and the consequences of management activities. The complexity of ecosystem management, with its multiple scales and "bewildering" interactions constrained the use of adaptive management in Coast Range AMA (Gray 2000). The imperative of institutional maintenance and protection also operates, especially in relation to organizational structures. Adaptive management and the AMAs arose from the FEMAT process as a grand vision that had to be realized within existing organizational frameworks. Including the demands of various regulatory authorities and agencies placed numerous constraints on experimenting within the forests (Stankey 2002). And, as with the Australian case studies, part of the reliance on existing structures stems from a desire for comfort. As Stankey (2002, p. 165) explains, "...the planning process became dominated by a reliance on traditional technical-rational approaches—because they were ideologically familiar and comfortable...." Gray (2000, p. 14) makes a similar comment, "Following current management guidelines insulates management to at least some extent from citizen appeals and regulatory oversight." The requirement to sell is also apparent, with some practitioners lamenting their "...limited marketing ability that is needed for leveraging resources" (Pacific Northwest Regional Office of the United States Department of Agriculture Forest Service 2002).

There are also some notable differences between the AMAs and the Australian case studies. The management of forests in the Pacific Northwest appears to be less frenetic than the watershed management in our Australian case studies. The evaluations of the AMAs cited above convey little sense of a need to be doing, or competing. This may reflect the contexts in which adaptive management is being attempted. The Forest Plan is about protection rather than restoration, finding equilibrium rather than creating new landscapes. In the United States the land in question is, on the whole, managed directly by the government. There is less need generally to promote desired land management practices, although a quick browse through various AMA web pages suggests that there is some attempt to sell the AMA concept to the wider US public.

What is very similar between the Australian and US situations is the apparent lack of support at various management levels for the practice of adaptive management (Stankey and others 2003). Our analysis of the Australian case studies provides some clues to why such apparent apathy occurs.
Conclusions

We suggest that the major constraint on using adaptive management at the regional scale is that it just does not fit with the current dominant approach to managing nature. In this article, we have described a natural resource management culture that values activity, control, comfort, and clarity over reflection, learning, and embracing complexity and variability.

The poor fit of adaptive management with current natural resource management culture goes a long way to explaining why managers have failed to use adaptive management, even when it is officially encouraged. While our natural resource management cultural framework remains unchanged, adaptive management is unlikely to flourish and bloom. Some of the cultural issues we have highlighted are institutional and organizational in nature and could be addressed if there is sufficient will and commitment. Other constraints are entrenched in societal norms and may be more difficult to address in the short-to-medium term, especially by individual projects or regions working in isolation.

The entrenched nature of institutional constraints suggests that much information and learning about adaptive management is required before attempts are made to apply the approach, but to date little support has been provided to the managers who are expected to manage adaptively. This poor support may be because adaptive management is merely a political catch phrase, or a comforting gesture, and there is no real intention to try to incorporate it into natural resource management at any scale. If this is the case, the sooner the sham of supporting adaptive management is dropped by policymakers, the better it will be for managers, who will then be able to focus on conventional management without having to pretend to be managing adaptively.

If, however, there is a genuine desire to incorporate adaptive management into natural resource management, a much greater effort than has been made hitherto is required from policymakers and on-ground managers. To achieve this requires acceptance that adaptive management, especially in its active form, is indeed a new and different form of management, and that new knowledge and new skills will be required to practice it. A few cherished beliefs, such as that "we always learn from experience," should be examined and, probably, abandoned. If adaptive management is genuinely accepted, existing institutional frameworks will need to change to accommodate new ways of learning, new ways of sharing information, and new ways of incorporating learning into planning.

The nonsupportive cultural background of natural resource management is a great challenge for those who wish to manage adaptively. It is not feasible to suddenly change society into one that values reflection as well as action, and that rewards thinking and sharing, humility and understanding. It should be possible, however, to create pockets of culture within organizations, regions, or projects that support these ideals and so, ultimately, support and nurture adaptive management. Creating these pockets requires affirmative action, which would include regular airing and discussion of the assumptions underlying actions, and rewards for learning of all kinds. Discussion networks such as the OzAm in Australia and CAMnet in the United States provide an important forum for sharing ideas and questioning assumptions about the way natural resource management is approached. Traditional education also has a role to play in creating suitable conditions for adaptive management to thrive. Adaptive management teaching in tertiary institutions currently occurs mostly as part of ecology courses, with a strong focus on the design of field experiments. Exploring the social dimensions of adaptive management in these courses would greatly enhance the abilities of future ecosystem managers.

In this article, we have emphasized the importance of the social setting in determining whether adaptive management is effective or not. We have exposed some of the assumptions underlying natural resource management and the tendency these have to constrain adaptive management. New adaptive projects would benefit from managers examining the constraints that we have identified in relation to their own project operation and developing mechanisms to address these constraints within their projects. We also encourage managers to develop procedures for sharing their assumptions among project stakeholders, and to include social issues in the teaching and learning of adaptive management principles. Greater support for adaptive management is needed if it is to fulfill any of its promise. There needs to be greater commitment to understanding and sharing the theory and practice of adaptive management. This commitment needs to come now, before adaptive management is tossed out onto the heap of also-ran ideas.

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Literature Cited


