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Adaptive Co-Management and the Gospel of Resilience

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Two new environmental management paradigms have emerged in the past few decades: cooperative management (co-management) and adaptive management. Although the two arose largely independently of one another, some scholars and resource managers have recently begun advocating a new approach integrating the two: *adaptive co-management*. They view this strategy as potentially offering solutions to some of the problems identified by critics of more standard forms of co-management. Indeed, the title of this volume suggests that the fusion of adaptive and cooperative strategies might be the key to overcoming some of the problems of co-management. In this chapter, I consider how adaptive co-management fares against one set of critiques that have been levelled at standard co-management: that despite the rhetoric of local empowerment that generally accompanies such processes, they often actually serve to perpetuate colonial-style relations by concentrating power in administrative centres rather than in the hands of local/Aboriginal people (Cruikshank 1998; Feit 1998; Nadasdy 2003). To this end, I examine the political and cultural assumptions implicit in the project of adaptive management, particularly the key concept of *resilience*. I begin with a brief look at the principles of adaptive management before considering how these principles play out in a co-management context.

The Principles of Adaptive Management

Although there is no simple way to characterize the body of theories and practices that fall under the rubric of "adaptive management," it is safe to say that adaptive management grows out of attempts to apply the insights of what Scoones (1999) dubs the "new ecology" to the practice of resource management. The new ecology refers to a revolution in ecological science brought about in the 1970s by the realization among ecologists that there is not, in fact, any natural tendency for ecosystems to develop towards a state of maturity (characterized by an increase in either biomass stabilization, diversification of species, cohesiveness in plant and animal communities,

and/or homeostatic regulation), as had long been supposed (Botkin 1990; Scoones 1999). This overturned the long-standing assumption that ecological systems are characterized by a single state of stable equilibrium to which ecosystems can return following a disturbance. Instead, ecosystem scientists came to realize that what they had conceived of as "the environment" must be viewed as a set of nested non-linear social-environmental systems of great complexity. The relations between various processes in such systems are so complex that the system's overall behaviour is unpredictable. As a result, cause and effect are not easily linked. Indeed, the notion of "cause" itself becomes highly problematic in complex non-linear systems. All this had profound implications for the practice of environmental management.

Conventional scientific resource management was developed over a hundred years ago, when it made sense to talk about designing strategies to maintain and enhance the stability of ecosystems. In the new ecology, this no longer makes sense. Adaptive management as a field of applied science owes much to the work of C.S. Holling (1978, 1986; Holling and Goldberg 1981), who argued that conventional resource management does not work because it is rooted in a set of outmoded assumptions about the environment and the nature of environmental change. And indeed, by the mid-1970s, many scholars and resource managers were beginning to realize that conventional resource management, rooted as it is in equilibrium-based models of the environment, was simply not working very well. Some turned to the new ecology for possible solutions.

Designing a management strategy based on the new ecology is no easy feat, however. Indeed, the new ecology represents something of a crisis for the very idea of environmental management. To begin with, the new ecology renders the concept of "management" deeply problematic. The linked social-environmental systems of the new ecology are characterized by a fundamental uncertainty (resulting from extreme dependence on initial conditions, a non-linear relationship between cause and effect, and the complex interdependence of multiple scales). This makes it extremely difficult – if not impossible – to predict the consequences of any particular action, including those initiated by would-be managers (Winterhalder 1994, 38-39).

Proponents of adaptive management claim that, as a result, management regimes need to be flexible enough to adapt to changing circumstances and, most importantly, managers need to be able to learn from experience if they are to manage complex systems effectively. As the consequences of particular management practices change (in response to changes in the social-environmental system), management institutions need to be able to respond appropriately. Management can no longer be based on static environmental models; instead, managers and management institutions must monitor and learn from the effects of their actions. This notion of "learning-by-doing" is the hallmark of adaptive management (Berkes and Folke 1998, 10).

Even the idea of learning-by-doing, however, is problematic in the context of the uncertainty associated with complex non-linear systems. As Holling himself notes, "what a complex system is *doing* seldom gives any indication of what it *would do* under changed conditions" (1978, 4). Since social-environmental systems are constantly evolving, what one learned by doing in the past may no longer be valid under current, even only slightly changed, conditions. To get around this problem, proponents of adaptive management have embraced Holling's concept of "resilience." Resilience is "the ability of a system to maintain its structure and patterns of behavior in the face of disturbance," and it is distinguished from stability, which is the "propensity of a system to attain or retain an equilibrium condition of steady state or stable oscillation ... resist any departure from that condition and, if perturbed, return rapidly to it" (Holling 1986, 296). Unlike stability, resilience "emphasizes non-equilibrium events and processes, variability, and adaptive flexibility. From a resilience perspective, incremental change may not reliably signal its effect. If a boundary [around the domain of attraction] is reached, the effect will be abrupt, unpredicted, and disproportionate to the cause – a surprise" (Winterhalder 1994, 37).

Rather than assuming the existence of a stable equilibrium and designing management programs to help maintain that stability, as in conventional management, proponents of adaptive management advocate managing for resilience – sometimes at the expense of short-term stability.[1] Holling (1995) has noted that conventional management, associated as it so often is with capitalist resource extraction and agro-industry, tends to focus on maintaining the stability of some part of the managed ecosystem – almost always for socio-economic purposes. The goal is typically to reduce the variability of some element of the system whose normal fluctuations pose problems for user groups (e.g., logging companies, fishers, ranchers, and so on). Such management practices necessarily also cause changes to the larger social-ecological system, however, and generally, the more "successful" the stability-based management practices, the greater such changes. These changes are seldom beneficial to the system as a whole: "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" (Holling 1995, 8).

According to this view, then, the secret to avoiding nasty environmental surprises and the collapse of social-environmental systems is to eschew the economically induced temptation to manage for a reduction in the natural fluctuation of important resources and instead allow regular minor disturbances to lead to the sorts of natural variation that enhance resilience. As a result, proponents of adaptive management call for the development of

more flexible institutional structures and of mechanisms for social learning within those institutions. The idea is that flexible institutions that can learn will be better able to adapt to changes and so forestall catastrophic system shifts.[2]

Adaptive Co-Management and Its Legitimacy

The recognition that management institutions and practices need to be flexible enough to adapt to constant changes in social-environmental systems has led some proponents of adaptive management to look to the practices of indigenous peoples – who, in many cases, successfully adapted to their environments over millennia – for evidence of (and inspiration for) adaptive management. Increasingly, those who do so are declaring that indigenous people have been practising adaptive management all along (Armitage 2003; Berkes 1999; Berkes et al. 2000, 2003; *Ecology and Society* 2004; Olsson et al. 2004). One such study, for example, claims that "adaptive management can be seen as the rediscovery of traditional systems of knowledge and management" (Berkes et al. 2000, 1260), while another refers to a set of indigenous beliefs and practices as "traditional adaptive management strategies," claiming that this "traditional resource management system and local knowledge framework *premised on principles of adaptive co-management* continues to be used" in the region under study (Armitage 2003, 81 [emphasis added]). Of course, in making such statements, proponents of adaptive co-management do not claim that indigenous peoples developed the scientific theories and experimental practices of academic adaptive management. Rather, they argue that "adaptive management may be viewed as the scientific analogue of Traditional Ecological Knowledge because of its integration of uncertainty into management strategies and its emphasis on practices that confer resilience" (Berkes et al. 2000, 1260).

Proponents of adaptive co-management, however, are hardly the first to claim that the scientific management practices they espouse are merely a rediscovery of ancient indigenous knowledge and practices. As long as a hundred years ago, Gifford Pinchot, the founder and first head of the US Forest Service and one of the most influential early advocates for scientific resource management in North America, believed that he and others were merely reinventing what "Indian" people had already been practising before Europeans arrived on the continent (Miller 2001, 377-78). Since then, advocates of scientific management have regularly made claims that, in effect, they are merely rediscovering the land-based knowledge and practices of indigenous people. Even the co-management literature is replete with claims, such as Hobson's, that "Traditional Knowledge *Is* Science" (1992, 2).

What are we to make of the fact that scientific resource managers have claimed to be reinventing indigenous knowledge and practices for over a hundred years now – in spite of dramatic changes in the assumptions,

techniques, goals, and practices of scientific resource management itself over the same period? Given the legitimizing power of the term "science" in contemporary Euro-American society, it is hardly surprising that anyone wishing to take indigenous knowledge and practices seriously would first need to label them as "science" (see Nadasdy 2003, 138-39). This is clearly part of what is going on when scientific managers claim that traditional knowledge and practices *are* science (or adaptive management). But indigenous knowledge and practices represent a powerful symbolic currency in their own right; they, too, can confer legitimacy on other practices with which they become associated. Numerous scholars have noted this phenomenon, and many have begun their analysis of it with what Redford (1991) dubbed the image of the "ecologically noble savage."[3]

This common stereotype is based on the assumption that indigenous people are the "original conservationists," whose ecological wisdom and spiritual connections to the land can serve as a model for more sustainable human/environment relations. Even critics of this stereotype admit that it has great symbolic power and has long proven to be an effective device for criticizing dominant Euro-American beliefs and practices. Those who successfully manage to link themselves to the mythic figure of the ecological Indian tap into its symbolic power and thereby legitimize their own environmentalist positions (Conklin and Graham 1995). Because the ecologically noble Indian represents a symbolic ideal rather than any actual set of beliefs and practices, the stereotype is extremely malleable; anyone can invoke the image to bolster his or her own particular vision of the ideal human/environment relationship. And, indeed, environmentalists of all stripes – many of whom have disagreed profoundly with one another – have attempted to associate themselves and their agendas with the ideal of the ecologically noble Indian (Nadasdy 2005b).

But why should proponents of adaptive co-management – who are building on the latest scientific theories to manage resources for the benefit of all – feel the need to appeal to this stereotype to legitimate their position? To answer this, we need to situate adaptive co-management in its proper social and historical context.

Adaptive Management as a Social Project

Geographer David Harvey (1993, 25) notes that "all ecological projects (and arguments) are simultaneously political-economic projects (and arguments) and vice versa. Ecological arguments are never socially neutral any more than socio-political arguments are ecologically neutral." Environmental management is nothing if not a socio-political undertaking. Environmental historians and anthropologists alike have noted that the development of the institutions and practices of state wildlife management at the beginning

of the twentieth century was inextricably bound up with the expansion of state power. In many parts of the world (including North America), it was the imposition of state wildlife management and conservation programs that first brought not only land and wildlife but also local and Aboriginal people under the effective control of central governments (see, for example, Feit 1998; Jacoby 2001; Marks 1984). Wildlife management, they have shown, is "very much a social activity serving needs and interests of specific groups, and not simply those of wildlife or of society in general" (Feit 1998, 133). In fact, resource management has often been a very unpopular and controversial undertaking, entailing, as it does, the establishment of elaborate government bureaucracies and regulatory regimes for restricting people's access to and use of the environment. Although adaptive management differs in some important ways from conventional resource management, proponents of adaptive co-management, too, like their predecessors, advocate particular social objectives having to do with access to and control over resources. The social and institutional changes proposed by adaptive managers are often every bit as controversial as those imposed by conventional managers a century ago; as a result, they face stiff opposition – not least from within now-entrenched (conventional) resource management bureaucracies themselves.

The fact that adaptive management is situated within a particular set of beliefs and social relations should not be surprising, but it compels us to attend to the socio-political interests and agendas that both shape and are reflected in adaptive management. To do so, we need to consider the nature of the management project itself. Environmental management is a normative endeavour; it is based on the presumption that some ecological (or, in the case of adaptive management, social-ecological) states are more desirable than others. Indeed, the goal of all management is to promote or maintain certain desired ecological states as opposed to others. The equilibrium-based concept of nature that was dominant until the 1970s lent itself well for use as a model for the social-environmental "good," because it provided a clear basis for evaluating environmental states: anything that contributed to equilibrium, stability, and coherence of the ecosystem was good, while anything that detracted from them was bad (e.g., Leopold's now classic discussion of a "land ethic" [1949, 201-26]). From its beginnings, the equilibrium-based science of ecology inspired social criticism and was used as the basis for political action (Worster 1979, 198-209). It was a powerful force in shaping the views of most environmental activists and organizations (including the institutions of conventional management), and it is still evident in much of their rhetoric and practice.

It is for this reason that some environmental scholars and activists view the rise of the new ecology with some trepidation. Environmental historian

Donald Worster (1993), for example, sees the new ecology as a grave threat to the environmental movement precisely because it undermines the movement's ethical foundations. Without the notion of ecosystem balance to guide us, there is no longer any foundation for an ecological ethic upon which to base political/environmental action. After all, if the environmental consequences of one's actions are ultimately unforeseeable, how then is one supposed to judge between one environmental practice and another? Worster argues that these developments in the science of ecology are merely one aspect of post-modernism, a broad cultural shift away from the emphasis on stability, production, and progress that characterized modernity to a focus on disequilibrium, information, and non-linear change in nearly all aspects of contemporary Euro-American society; and he views the rise of the new ecology as at least in part a reaction against the political ideals and implications of equilibrium-based ecology (1993, 166-67).

Worster's pessimism does not seem completely justified, however. In the first place, as Harvey (1993, 10-15) so convincingly argues, values do not inhere in nature, but rather emerge from particular sets of beliefs and social relations. So, although some may indeed embrace the new ecology as a means of opposing environmental activism, there is nothing *inherently* anti-environmentalist about a non-equilibrium ecology. Second, I would argue that the rise of adaptive management itself should be viewed at least in part as an effort to reconstruct a "land ethic" in the context of the post-modern emphasis on disequilibrium and change. The great majority of scholars contributing to the literature on adaptive management advocate managing *for* resilience; so, that which contributes to resilience is "good" while anything that detracts from it is "bad." In place of the "balance of nature," we now have "resilience" as the ecological ideal against which to judge social-environmental action.

A few scholars, however – particularly those studying degraded social-ecological systems that have already flipped into highly resilient but undesirable states (e.g., Carpenter et al. 2001; Walker et al. 2002) – recognize that resilience in and of itself is not always desirable. These scholars have developed a more sophisticated concept of resilience,[4] one that does not easily lend itself to use as the basis for an environmental ethic. In the process, however, these scholars do not abandon the search for an ecological ethic; they simply replace the concept of *resilience* with *sustainability* as the absolute social-ecological "good" for which managers should strive. Carpenter and colleagues (2001, 766), for example, note that, unlike resilience, which is neither inherently good nor bad, "sustainability is an overarching goal that includes assumptions or preferences about which system states are desirable" (see also Walker et al. 2002, 19).[5] Unfortunately, even though they recognize that sustainability, like resilience, has many meanings (Carpenter

et al. 2001, 765), they make no effort to define the term, except in the broadest generalities.[6] Even so, it is clear from the context in which they use it that their notion of "sustainability" remains closely linked to that of "resilience." Indeed, for them, sustainability seems to refer to the resilience of the *desired* equilibrium configuration of a social-ecological system (as opposed to the resilience of the undesirable ones) (e.g., see Carpenter et al. 2001, 778; Walker et al. 2002, 19, 24). Thus, these scholars continue to advocate managing *for* resilience – with the caveat that "where an SES [social-ecological system] is already in an undesirable configuration, resilience management involves reducing the resilience of this configuration as well as enhancing the resilience of desired ones" (Walker et al. 2002, 20).[7]

Although the rise of a post-modern land ethic may be good news for environmentalists and environmentally minded resource managers, it also highlights the fact that adaptive management is rooted in a particular set of social beliefs and values. Why, for instance, in the context of complex systems with multiple equilibrium states, should resilience be seen as an absolute good? When a social-ecological system is perturbed enough to push it into a new domain of attraction, the system as a whole is likely to experience massive disruption and change. But the consequences of such a shift for any individual species are difficult to predict. While dominant species may suffer catastrophic declines, other (previously marginal or absent) species will flourish and become dominant. The same holds for people and institutions; while a system shift may render previous economic activities unsustainable and bring about social and institutional collapse, other economic/ecological possibilities will emerge to take their place, along with corresponding systems of social organization.

When proponents of adaptive management valorize resilience, then, they necessarily also valorize one particular set of social-ecological relations (those that characterize the domain of attraction within which the social-ecological system is currently functioning). But why should the current equilibrium state – which is but one workable possibility – be viewed as intrinsically better than all others? Better for whom? This is fundamentally a political question. Unfortunately, merely substituting "sustainability" for "resilience," as Carpenter and colleagues do, does not solve this problem. Managing for this type of sustainability, like managing for resilience, assumes that one equilibrium configuration is better than all the others (although perhaps not the current one). It does not answer, nor even ask, the question: Better for whom? If a person's notion of sustainability (i.e., the social-ecological good) is influenced by his or her position within the social-ecological system, we cannot assume that there will be agreement about which equilibrium state is most desirable. So, although substituting sustainability for resilience may enable us to avoid the trap of assuming

that the current configuration is necessarily good, it fails to help us address a crucial political issue: that is, who gets to decide what the "desired" social-ecological configuration is? And, just as important, what happens if there is disagreement over what is desirable?[8]

How one evaluates resilience and/or the current configuration of the social-ecological system necessarily depends on one's position within that system. The more one has invested (ecologically, socially, or economically) in existing social-ecological relations and institutions, the more one is likely to view resilience as "good." Those who are marginalized or excluded are less likely to view a collapse of existing social/institutional structures as an unmitigated disaster. Indeed, they may even embrace the kind of radical socio-ecological change brought about by a system shift. The valorization of resilience, then, represents a decision – at least implicitly – to endorse the socio-ecological status quo.

Proponents of adaptive management may object to this, asserting that, in fact, they do call for quite substantial reforms to the institutions and practices of environmental management. This is true; as we have seen, they have issued a clear call for the development of more flexible institutional structures and mechanisms for social learning within those institutions. For all their attention to institutional change, however, proponents of adaptive management have largely ignored the broader political and economic context within which environmental management institutions are themselves embedded. This is not to say that they ignore politics altogether; on the contrary, some proponents of adaptive management (Lee 1993) have described in detail the extraordinary political complexity of adaptive management arrangements, while others (Walters 1997; Pinkerton 2003) have identified numerous obstacles to successful adaptive/cooperative management, many of which are of a political nature. All of these scholars, however, take for granted the broader political/economic context of capitalism/colonialism that gave rise to the notion of and need for resource management institutions in the first place. Thus, although proponents of adaptive management clearly recognize that it is the economic imperatives of modern extractive and agro-industries that are the root cause of the management "pathologies" that lead to decreased resilience and ultimate collapse (Colding et al. 2003; Holling 1986, 1995), their proposed solutions do not address these larger issues at all. The focus on building flexible management institutions that can learn is fine as far as it goes, but it ignores the political economy of resource extraction that drives management in the first place. Indeed, it is my experience that scientific resource managers are among the first to complain that science often plays too small a role in resource management decisions. As often as not, their scientifically generated management recommendations are ignored by politicians in the face of pressures exerted by powerful special interests in resource extraction and

agro-industry. In such a context, changes in the mindsets of managers and in the structure of management institutions – not to mention the science underlying them – are almost beside the point.

Environmental managers may now prefer to manage for resilience – even at the expense of short-term stability – but powerful interests in the extractive and agricultural industries do not have that luxury. Capitalist production *demands* a degree of short-term stability. Companies must have access to reliable supplies of necessary resources if they are to recoup their investments in capital and labour (not to mention raise investment capital in the first place). It is, as proponents of adaptive management themselves recognize, precisely this dynamic that leads to overexploitation and system collapse. Indeed, it could be argued that it is largely because of this dynamic that conventional resource management even exists. It is certainly the reason conventional resource managers developed and continue to use concepts like maximum sustainable yield, so despised by proponents of adaptive management (for example, see Chapter 5). As long as this capitalist dynamic exists, the pressure to make management decisions based on the stability of one or two key resources will remain enormous. In such a context, it is hard to imagine how management institutions – however flexible and "smart" they may be – will be able to avoid the kinds of pathologies proponents of adaptive management attribute to conventional management.

There are also theoretical problems associated with ignoring the context of capitalism. Adaptive management proponents' failure to take into account the broader political/economic context within which environmental management actually takes place renders a thorough analysis of social-ecological systems impossible. As Harvey (1993, 28) points out:

> Money flows and commodity movements ... have to be regarded as fundamental to contemporary ecosystems ... because these flows form a coordinating network that keeps contemporary ecosystems reproducing and changing in the particular way they do. If these flows ceased tomorrow, then the disruption within the world's ecosystems would be enormous. And as the flows shift and change their character, so the creative impulses embedded in any socio-ecological system will also shift and change in ways that may be stressful, contradictory or harmonic as the case may be.

To the extent that they fail to take such flows into account, proponents of adaptive management necessarily adopt an impoverished view of the social-ecological systems that they purport to study.

Capitalism simply cannot be viewed as a set of social processes and relations that play themselves out on a neutral landscape. Rather, present-day social-ecological systems are themselves the products of capitalist processes and social relations. As human geographers, environmental historians, and

ecological anthropologists have repeatedly demonstrated, resource extraction and agro-industry have literally remade global and regional ecosystems (e.g., Cronon 1991; Crosby 1986; Smith 1990; White 1996; Worster 1979). Because of the dialectical link between social and environmental processes, contemporary environments must be viewed as integral aspects of the capitalist relations and processes that shaped them. Thus, in an important sense, the relations of capitalism are "embodied" in contemporary social-ecological systems. As Harvey (1993, 27) put it, "created ecosystems tend to both instantiate and reflect ... the social systems that give rise to them" so that "the very design of the transformed ecosystem is redolent of its social relations."

This should hardly come as a surprise to proponents of adaptive management, who themselves argue that environment and society are inextricably linked. Yet, it means that their focus on resilience – on *maintaining* the existing social-ecological system in more or less its current state – has the implicit goal of maintaining the social-ecological relations of capitalist resource extraction and agro-industry. Nor does the strategy employed by some ecosystem scientists (e.g., Carpenter et al. 2001; Walker et al. 2002) of substituting the goal of sustainability for resilience help practitioners avoid this problem, especially given the vagueness surrounding their use of the term "sustainability."[9]

The implications of this are especially problematic where indigenous peoples are concerned (i.e., in much adaptive co-management) because it is precisely the relations of capitalist resource extraction and agro-industry that are most responsible for the marginalization of indigenous peoples and the dispossession of their lands and resources. Historian William Cronon (1983), for example, has shown how English colonists' importation of diseases, plants, and animals to New England, along with their imposition of particular forms of governance, property relations, and strategies for capital accumulation, so radically altered the regional ecology as to deprive indigenous peoples of the ecological basis for their way of life. This was a social-ecological system shift if ever there was one. Yet, while this shift was disastrous for many indigenous species, including people, it clearly benefited European colonists and their biological imports. So, although indigenous people may indeed engage in flexible and adaptive practices that seem on the surface to qualify as adaptive management, the social and political assumptions upon which they are based are completely different. Indigenous people, who are often politically and socially marginalized within existing social-ecological systems (shaped as they have been by capitalist dynamics), have far less invested in maintaining the resilience of those systems than do resource managers.

Nor does the strategy of substituting sustainability for resilience prevent ecosystem scientists from treating the landscape of capitalism as a given. In their analysis of degraded rangelands in Australia, for example, Carpenter

and colleagues (2001) take for granted the eviction and replacement of Aboriginal peoples (who historically maintained the land in the desired grassy state through burning) by European ranchers engaged in wool production for the world market. Taking the economic/ecological relations of ranching as their baseline, these scholars identify ranchers' weak property rights and the vagaries of the market (rather than the dispossession of Aboriginal people and the cessation of burning) as two of the principal factors leading to the loss of resilience of the grassy state (Carpenter et al. 2001, 776). Thus, they cast social-ecological restoration as a technical problem that should be solvable by strengthening ranchers' property rights over heretofore public lands and encouraging ranchers to diversify economically. Such a view clearly takes for granted the dispossession of Aboriginal people. As long as we are considering the restoration of an ecological system that – by the authors' own admission – is unlikely to occur, why not consider the restoration of Aboriginal land rights and regular burning, the only practice that we *know* enhanced the resilience of the desirable grassy state? Undoubtedly, there are all kinds of problems, political and otherwise, with this suggestion, but the fact that Carpenter and colleagues do not even discuss such a possibility (even if just to discount it) indicates the degree to which they take the colonial relations of capitalism as a given in their analysis. They also fail to consider the potential social impacts of their suggested solutions for increasing sustainability (e.g., strengthening of ranchers' property rights) – especially for any remaining Aboriginal people in the region who might be hunting or gathering on the public lands they would privatize.

Given the legacy of social-ecological system shifts like that which occurred in colonial New England and the embeddedness of notions about resilience in relations of capitalist exploitation, we should not be surprised when indigenous people refuse to embrace these ideas and even actively oppose adaptive co-management. This is precisely what happened in an effort to adaptively co-manage Dall sheep in the southwest Yukon. Below, I provide a brief description of this effort and show that it was the political and economic assumptions underlying the proposed adaptive co-management project that led First Nations people to reject it.

Adaptive Co-Management in the Ruby Range

The Ruby Range Sheep Steering Committee (RRSSC) was created in 1995 and charged with the task of developing a set of recommendations for managing Dall sheep in the southwest Yukon's Ruby Range.[10] RRSSC representatives were chosen from a wide range of groups with interests in the sheep, including government biologists, affected outfitters, and members of the Kluane First Nation, Aboriginal inhabitants of the area. It soon became apparent that different members of this co-management body had radically different ideas about the magnitude of the decline in the sheep population,

the reasons for this decline, and potential management solutions. Biologists and outfitters sitting on the RRSSC saw the population decline as relatively minor, a temporary fluctuation caused by several years of unusually bad weather. Significantly, neither biologists nor outfitters felt that hunting by humans had contributed to the sheep decline. As a result, they opposed any restrictions on hunting, the outfitters adamantly so.

By contrast, Kluane First Nation members saw the decline in the sheep population as long-term and catastrophic. They argued that the population had been declining steadily since the 1960s and that the situation had now reached a crisis. They vehemently disagreed with biologists and outfitters about the role of weather and the significance of human hunting. Indeed, Kluane people identified hunting – especially by outfitters – as the single most important factor leading to the decline of the sheep population and advocated a ban on sheep hunting in the region (or, failing that, imposition of a quota).

The members of the RRSSC all agreed that more information was needed to determine which factors were having the greatest effect on the sheep population, so they decided to develop a comprehensive research plan. As it turned out, however, committee members were unable to reach an agreement on this plan. Since biologists did not see the problem as an emergency requiring immediate action, they advocated a policy of adaptive management. Rather than just doing anything that might work to help the sheep (i.e., manipulating any and all relevant variables simultaneously in an emergency effort to save the sheep), biologists wanted to manage a limited number of variables and monitor the effects of their management practices closely, so they could alter their strategy in response to the effects it was having on the sheep. As one biologist put it: "The assumption was that the actions (both management and monitoring) should be designed to test predictions about the effects of these actions and to measure and compare population and behavioral parameters in sheep exposed to different human actions. In this way, the relative influence of different influences on the sheep could be assessed. This applies more of an adaptive management paradigm" (Nadasdy 2003, 286). A crucial part of this approach involved leaving part of the population completely unmanaged to serve as a control group. Biologists felt that, in the long run, this adaptive approach would enable people to manage sheep much more effectively. They saw the Ruby Range situation as an opportunity to learn about sheep management rather than simply as a case of sheep needing to be saved.

Because the RRSSC had no mandate to deal with anything other than sheep, it was somewhat hamstrung in its ability to manage for ecosystem resilience; it was clear, however, that the biologists had resilience in mind. Although none of them ever used the word during a meeting, they were clearly disdainful of conventional management concepts like "maximum

sustainable harvest" (RRSSC 1996a, 12). They steadfastly refused to place an absolute limit on the number of sheep that should be killed each year, preferring instead a management strategy flexible enough to adapt not only to ecological uncertainties (e.g., fluctuations in the size of the sheep population) but also to socio-economic ones (e.g., in the price and number of hunts that outfitters could sell and in the success of those hunts).

Although Kluane elders and hunters agreed with biologists on the need to maintain flexibility (RRSSC 1996b, 4) and were generally not averse to scientific studies of the sort advocated by biologists (but see Nadasdy 2003, 199-210), they felt that the sheep crisis was so acute that the RRSSC could not afford to "waste time" taking the kinds of half-measures the biologists were proposing. Indeed, Kluane people for the most part viewed the biologists' approach as self-serving; several of them told me they felt that biologists were more concerned with maintaining their jobs (by generating yet another series of scientific studies) than with saving the sheep.

The disagreement over how to conduct research also had obvious political and economic dimensions. Dall rams, with their large, curving horns, are a prized trophy animal for big game hunters all over the world. As trophy animals, Dall sheep represent a significant potential income for big game outfitters as well as for the territorial government, which sells hunting licences and collects trophy fees and taxes. Because of outfitters' considerable political power in the Yukon, it would have been difficult for the biologists to implement any management initiatives opposed by them (such as a ban on hunting), regardless of any recommendations by the RRSSC. This is not to say that it would have been *impossible,* but at the very least, wildlife managers would have needed convincing evidence (to Yukon politicians) supporting such action. And, despite rhetoric about the value of traditional ecological knowledge, this still means evidence produced by biologists, *not* the uncorroborated testimony of First Nations elders, especially if that testimony contradicts the biological evidence. To prove that human hunting was a relevant factor in the decline of the sheep population (and so obtain the biological evidence essential to ban hunting), however, any adaptive management program would have had to treat human hunting as a variable. That is, biologists would have had to *ban* hunting in at least part of the research area to observe how sheep fared there compared with non-hunted areas. Politically, this was simply not an option. Kluane people were understandably less than enthusiastic about participating in a research program that would not be studying the effects of human hunting, the factor they believed to be the principal cause of decline in the sheep population.

Although the strategy advocated by biologists may in some ways have been a novel approach to managing/researching sheep in the region, it was perfectly consistent with the existing social and political relations underlying the management of sheep. In the first place, it took for granted the

bureaucratic and institutional structures of wildlife management in the territory. Indeed, it would clearly have enhanced the role of Yukon government biologists in the management of Ruby Range sheep in that it would have united experimentation, monitoring, and policy making. Second, the biologists' plans for adaptive management were clearly geared towards enhancing the resilience of the existing socio-ecological system, *including* the activities of outfitters, the very group that Kluane people saw as the source of the problem. By avoiding research questions that might ruffle political feathers (such as an inquiry into the effects of outfitter hunting on sheep populations), not to mention overtly political questions (such as who should have the right to hunt sheep in the first place, and who should have jurisdiction over their management), the biologists' program took for granted the broader political and economic context in which sheep are managed in the Yukon.

By contrast, the kinds of actions supported by Kluane people (including perhaps policy-based research on the effects of human hunting) directly challenged existing social and political relations underlying sheep management in the territory. After more than fifty years of oppression by government officials in the name of wildlife conservation (Nadasdy 2003, ch. 1), Kluane people can be excused for being wary of changes that strengthen the hands of government wildlife managers, especially when they viewed the latter as being more interested in creating future work for themselves than in saving sheep. And Kluane people's insistence that future research look into the effects of human hunting, which in turn would have called into question who was doing the hunting and who was benefiting from it, questioned the socio-political context of sheep hunting/management in the territory and threatened those with powerful vested interests in the status quo.

In the end, RRSSC members were unable to agree on even the outlines of a research program, adaptive or otherwise (Nadasdy 2003, 206-7), and research on Ruby Range sheep ground nearly to a halt. The RRSSC was disbanded in 1998, and few of its recommendations were ever implemented. Kluane people had lost faith in the process and chose to pursue their interests in Ruby Range sheep through the more overtly political process of land-claim negotiations.[11]

Conclusion

The preceding discussion demonstrates that while a flexible co-management institution pursuing a robust adaptive strategy might well have solved some of the problems of managing Dall sheep in Kluane country, it is unlikely that such an institution could have addressed the political/economic inequities that lie at the heart of Kluane people's concerns about the sheep.

What is more, had Kluane people agreed to participate in the adaptive management process, they would have become complicit in their own marginalization, because the process itself took for granted a political context within which they were already marginalized. The problem is that the equitable treatment of marginalized peoples is simply not a management issue (cooperative, adaptive, or otherwise); it is a political issue. "Management" itself, as a concept, is based on a set of underlying assumptions about the world that are rooted in the political and economic context of capitalist resource extraction. Since management efforts, adaptive or otherwise, are explicitly designed to be carried out within that context, those who engage in management have no choice but to take that context for granted. The practices and complex institutional structures of "management" are not neutral, but instead constrain thought and action in ways that end up reinforcing existing political and economic inequalities. Because managers necessarily take for granted existing relations of inequality and exploitation, they tend to view the project of management itself as a relatively straightforward exercise that involves identifying a series of "problems" (some of them perhaps political) that stand in the way of management, finding technical solutions to those problems, and implementing those solutions. This view of management necessarily obscures the relations of political and economic inequality and exploitation that are the root causes of such problems in the first place (see Nadasdy 2005a).

If we are to take seriously one of the central insights of adaptive management – that social and environmental systems are inextricably linked to one another – we must expand our analysis of socio-ecological systems to include not only the nature and workings of management institutions but also the embeddedness of those institutions (however flexible they may be), and indeed of management itself, in the relations of capitalist production. Because of that embeddedness, it is extremely unlikely that analysis and reform at the institutional level will by themselves lead to the equitable treatment of local and indigenous peoples in the management process. Adaptive co-management, like all environmental management, is an inherently political undertaking, not simply a technical one. The kinds of recommendations adaptive managers make (whether for institutional reform or the strengthening of ranchers' property rights) and even the questions they do or do not ask (such as whether human hunting affects Dall sheep populations in the Ruby Range) are deeply political. We must not, therefore, view adaptive co-management simply as a means for the enlightened use of resources and empowerment of local people – a means that is, unfortunately, beset by various problems. Rather, we must consider the fact that even "successful" adaptive co-management may, like conventional management, be part of the larger project of colonialist resource extraction.

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Notes

1 But see below.

2 Also, given the ultimate inevitability of such shifts, flexible institutions are regarded as ideal for taking advantage of the productive creativity of the collapse and reorganization phases of non-linear system change (Holling 1986).

3 As Shepard Krech (1999) has pointed out, however, this is little more than a (marginally) new twist on the age-old stereotype of the noble savage, and its use is vulnerable to many of the same criticisms.

4 See especially Carpenter et al. 2001 for a lucid discussion of the multiple possible meanings of "resilience" and of the ways in which the concept depends upon one's spatial, temporal, and social perspective.

5 Even these scholars, however, are less than consistent in their use of the term "resilience." At times they seem to slip back into a more standard use of the term, one in which it appears to be a desirable goal in and of itself (e.g., Walker et al. 2002, 17). In other works (e.g., Folke et al. 2002), some of these same scholars revert completely to an unproblematized concept of resilience.

6 Walker and colleagues (2002, 24), for example, refer to sustainability as "the continued well-being of the economy, society, and the natural resource base."

7 The language of "managing for resilience" is so entrenched in the field that these scholars sometimes speak about the improvement of degraded social-ecological systems as an increase in the resilience of the desired configuration – even though that configuration no longer exists! (For example, see Carpenter et al. 2001, 773.)

8 It might be objected that this is exactly what scenario planning is for (e.g., Chapter 15); yet the literature on scenario planning deals inadequately, if at all, with questions of representation (i.e., who gets to represent whom at the scenario-planning exercise?) and control (who designs, chooses, presents, and interprets the scenarios – which, like models, are simplifications of complex realities based upon assumptions and best guesses?). Nor do proponents of scenario planning generally say how they intend to proceed in the face of fundamental disagreements among participants over their preferred scenario.

9 I have not examined the concept of sustainability in this chapter, except for its use by some ecosystem scientists as a stand-in for resilience. In its general use, however, sustainability is a notoriously slippery concept, with so many meanings that it is in danger of becoming an empty buzzword. Yet, because no one wants be seen as opposing something that on its face seems so beneficial, the term "sustainability" – now embraced by the political right as well as the left – has proven a remarkably effective tool for justifying the expansion of control by central management bureaucracies and the maintenance of global and regional inequalities (Kearney 1996, 107; Sachs 1992; Escobar 1995, 192-211). Indeed, some of these scholars have noted that the concept of sustainability not only takes for granted the dynamics of capitalist development but has actually helped rehabilitate that dynamic in the eyes of many erstwhile critics (Sachs 1992).

10 See Nadasdy 2003 for a more complete discussion of the structure of the RRSSC, the political context in which it functioned, and how it worked.

11 As of the summer of 2006, no new research plan had been put in place. Sheep research in the Ruby Range continues, but it has been scaled back dramatically. During the years leading up to the creation of the RRSSC and while it was in existence (1992-97), the Yukon Government Fish and Wildlife Branch carried out aerial sheep surveys of the region every year. Since then, however, they have conducted only two such surveys (in 2001 and 2004), both of which indicated a continuing, though slight, decline in the total population. Kluane First Nation negotiators were unsuccessful in their efforts to establish a special sheep management area in the Ruby Range as part of the First Nation's land-claim agreement (which was signed in 2004), and many Kluane people remain convinced that the sheep will ultimately disappear from the Ruby Range.

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