3 New Trends in Forest Policy and Management: an Emerging Postmodern Approach?

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Forest policy and management throughout most of the 20th century was firmly rooted in patterns established during the progressive era in the USA, which can be characterized as seeking to provide the greatest good for the greatest number through science and governmental allocation of resources. Many of the key elements of this approach to conservation were challenged during the last two decades of the 20th century, and a number of new approaches have emerged. These new approaches, such as ecosystem management and sustainability, challenge many established tenets of natural resource policy and management, and some authors have characterized these changes as a switch from modern to postmodern natural resource management. This paper uses examples from the USA and Costa Rica to evaluate the claim that a new postmodern conservation has emerged in the practice of natural resource management and policy.

From Modern to Postmodern Conservation

Natural resource policy and management began in earnest in the USA at the beginning of the 20th century, when *de facto* environmental policies promoting conversion of resources into commodities and disposal of government-owned resources to private entrepreneurs were replaced by new policies emphasizing planned management and use of resources based on the progressive philosophies of government (Andrews, 1999). Theodore Roosevelt, one of the principal proponents of progressivism, saw government as an active force in serving the public interest by being a counterweight to the power of big business (Andrews, 1999). This period of time saw the development of a new role for government in the regulation and management of natural resources, including the creation of most of the current government resource management agencies and the beginning of formal natural resource management on public lands (Andrews, 1999). One of the key ways in which this was carried out was by staffing government agencies with what were regarded as neutral scientific and technical professionals charged with the task of promoting efficiency in natural resource management on both public and private lands (Andrews, 1999; Cortner and Moote, 1999).

Fairfax and Fortmann (1990) have summarized the key tenets of progressive-era natural resource management as follows: (i) the use of non-partisan technical expertise as the basis for decision making; (ii) the advocacy of large-scale, comprehensive government resource management; (iii) an emphasis on providing fibre for industry (e.g. silviculture as forestry); and (iv) a view of natural resource management as a biological undertaking, with social factors being viewed as constraints and

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problems rather than as a source of the goals and values to be achieved by natural-resource professionals.

McCay (2000) presents a similar argument, suggesting that the dominant conservation approach of the 20th century can be characterized as modern conservation. McCay sees modern conservation as having the following features: (i) organized around utilitarian values, emphasizing 'the greatest good for the greatest number'; (ii) an emphasis on marketable commodities (and when recreational or subsistence values are recognized, a tendency to express them in market terms); (iii) science and policy relying on single-species data and models; (iv) a hierarchical approach to natural resource management, organized by the government in a top-down fashion; (v) decisions based on scientific data or scientific thinking; (vi) a tendency to use deterministic scientific models that expect predictable relationships among variables; and (vii) little attention to people, except as constraints and demands on the system.

Several authors have discussed the changing natural resource management and policy approaches and philosophies during the 20th century. Fedkiw (not dated) focuses on changing management of the US national forests, noting that the emphasis has shifted from a focus on forest resource use alone to a broader vision that includes the protection of resources, maintaining watershed and ecosystem values, and maintaining pristine wilderness areas. Fedkiw sees these changes as largely reflecting two developments: (i) greater and more diverse demands from society for products, services, and values from the national forests, and (ii) new scientific knowledge that recognizes the greater complexity of managing ecosystems for these diverse values – in particular, the need to manage larger spatial units and to include humans in ecosystem science.

Mazmanian and Kraft (1999) find that there was a paradigm shift in environmental policy in the latter two decades of the 20th century, away from policies based in government ownership and regulation towards, at first, market-based approaches and, later, community- and sustainability-based approaches. They argue that these new approaches: (i) work at the level of complex, linked human and natural systems; (ii) focus on development of new social mechanisms and institutions; (iii) work at multiple levels; and (iv) promote collaboration, partnerships and community capacity building. Honadle (1999) sees these options as not necessarily replacing each other but, rather, cumulatively creating a diversity in available policy and management options that include command and control, self-management and incentives (direct and indirect) that can be matched to the particular context at hand.

Wallace *et al.* (1996) note that scientists, land managers and others have proposed that natural resources can be best managed through an ecosystem management approach, and distil five main themes of ecosystem management from the literature: (i) desired ecological states and means of achieving them are socially defined; (ii) attention to the parts, functions and structures of the ecosystem as a whole; (iii) management at larger spatial and longer temporal scales than was previously the norm; (iv) open communication and collaborative decision making; and (v) institutions need to be adaptable so as to respond to complexity and uncertainty.

McCay (2000) goes further than these other authors, using the example of ecosystem management to argue that a new, 'postmodern' natural resource management has emerged. She describes the tenets of ecosystem management as follows: (i) utilitarian values existing alongside less anthropocentric values such as biodiversity and ecosystem integrity; (ii) a tendency to look at whole systems, and to view them as non-deterministic (i.e. capable of complexities, discontinuities and surprises); (iii) scientific uncertainty creating openings for other sources of knowledge, ranging from traditional knowledge to junk science; (iv) formalization of uncertainty into science-based management models, such as adaptive management; (v) recognition of the importance of local and user knowledge, through bottom-up and collaborative approaches; (vi) people as active participants in the system, for example as monitors and managers (McCay, 2000). The key elements of McCay's analysis that go beyond other descriptions of changes include the recognition of multiple interests unresolvable by an authoritarian scientist or manager, and a questioning of the authority of science itself.

McCay's (2000) fundamental point is that ecosystem management is a new approach to natural resource management and policy that reflects broader cultural changes from modernism to postmodernism. Gabardi (2001) describes modernism as being bound up with the rationalist and progressive spirit of 18th century enlightenment,

and postmodernism as a critique of modernism rooted in French structuralism, post-structuralism and the German Frankfurt school of critical theory. Rudel and Gerson (1999) note the importance of postmodernism as a scholarly trend in the last two decades of the 20th century. They summarize postmodernism as having five components: (i) rejection of comprehensive explanations and grand theories; (ii) ever-changing social conditions that require people to be flexible and adaptable, producing constant change and reinvention in individuals and institutions (thereby making them more contingent and less subject to essentialist explanations); (iii) rejection of universal, and a corresponding emphasis on the local and particular; (iv) polyvocality, or the existence of multiple groups with different concerns and voices; and (v) attention to the interpretation of signs and texts, in which meaning is contingent on social relations. Rudel and Gerson (1999) believe that many university-based scholars have found postmodern thinking attractive, accounting in part for its importance in the social sciences today. If McCay's (2000) analysis is correct, its influence within academia has included natural resource management and policy.

Purpose of this Chapter

There can be little doubt that natural resource management and policy have undergone fundamental changes in recent years. While analysis of broad trends and paradigm changes is often left to historians, it is also important to attempt to understand trends and changes as they are happening. Postmodern thinking has profound implications for society, and it is appropriate for us to question the extent to which the actual practice of natural resource policy and management reflect this burgeoning postmodernism, and what this means. To address these questions, I draw on examples from the two countries in which I have been most involved in natural resource research: Costa Rica and the USA. Natural resource management and policy in these two countries will be evaluated across four general trends, all of which reflect to some extent the attention to multiple perspectives that is characteristic of postmodernism, i.e. shifts from: (i) simple to multiple interests in natural resources; (ii) simple ownership to bundles of rights; (iii) deterministic science to multiple knowledge systems; and (iv) public interest to stakeholder groups.

From Simple to Multiple Resource Interests

For many years, natural resource management tended to be organized around single resources – for example a huntable wildlife species or harvestable timber species. The limitation of concern to a relatively few species and their economic benefits made it possible to develop straightforward management plans and to apply them at relatively small geographical scales. Recently, attention has been focused on a greater variety of forest products and services, values for socio-cultural as well as economic reasons, which often accrue at a variety of spatial scales.

In the USA, there has been a broadening in the number and type of species that are of interest and concern, with greater attention being paid to non-commodity values (Farnham *et al.*, 1995). Wildlife management broadened beyond game species beginning in the late 1970s, with increasing attention paid to wildlife viewing, birding and biodiversity (Shaw and Zube, 1980; Hunter, 1990). In forestry, increasing attention has been paid to non-timber forest products across the US (von Hagen *et al.*, 1996; Greene *et al.*, 2000). Part of the shift involves recognition by managers of long-standing uses of forest products, while another aspect is the rise of new uses as a result of immigration (bringing in user groups with different cultural values) and new international markets. The Pacific Northwest shows this clearly (Hansis, 1996). Native American, Asian and Hispanic people are now collecting berries, mushrooms, foliage and other specialty products from forests that were previously regarded mostly as sources of timber. These new products are important economically, particularly in the informal economy and as a source of occasional or safety-net income to many of these people (requiring a very different sort of economic analysis than that which has typically been done by forest economists). These products are also important for reasons far beyond their economic value, including their relationship to culturally important subsistence uses and socially important experiences for families and communities.

In Costa Rica, this shift is exemplified by the emergence of new agricultural and forest commodities. A great deal of attention has been directed to non-traditional forest products such as vines, butterflies, iguanas and forest foods that can provide economic returns from forest lands without conversion to agricultural land-use (Watson *et al.*, 1998). As in the USA, these non-timber forest uses often involve groups and communities that have previously received little attention in forest management, including the poor and ethnic minorities. Other areas of interest include agroforestry options, such as shade-grown coffee, windbreaks and mixes of agricultural crops and trees (Perfecto *et al.*, 1996; Harvey and Haber, 1999; Harvey, 2000). Many of these options are oriented towards ecological and social services rather than products – for example, trees as windbreaks, shade canopies, bank accounts, and natural areas for various social and cultural values (Schelhas *et al.*, 1997; Watson *et al.*, 1998; Langholz *et al.*, 2000).

Concern for biodiversity and ecosystem service has grown, expanding management responsibility to much larger scales. The biodiversity limitations of US national parks has been analysed (Newmark, 1995), and a number of NGO (non-governmental organization) efforts have arisen to work on conservation planning on larger regional scales (e.g. the Wildlands Project and the Yellowstone to Yukon, or Y2Y, wildlife corridor). The watershed is emerging as an important management unit, for example the management of the Columbia River Basin for mixed objectives (including hydroelectric power generation and salmon fishing) and the management of land use in the mountains that supply water to New York City (Lubchenco, 1998).

There are also new trends in forest management and policy in Costa Rica that reflect concern for broader scales and ecosystem services. A major share of the international attention and funding for forest protected areas and biodiversity conservation in recent years has been directed at conservation corridors, ranging from regional corridors, which protect seasonal altitudinal migrants, to the MesoAmerican Biological Corridor, which proposes a Central-America-wide framework to improve connectivity between parks and protected areas (Boza, 1993; Schelhas, 2001). Carbon sequestration has also been a growing area for forest policy and international funding, with deals being brokered for Costa Rica to maintain forests as carbon sinks to counteract the release of carbon dioxide into the air through the burning of fossil fuels in industrialized countries (Watson *et al.*, 1998). Costa Rica has been an innovator in developing market arrangements for biochemical prospecting, such as the relationship between Merck and INBio (Watson *et al.*, 1998).

From Simple Ownership to Bundles of Rights

Perhaps one of the most fundamental changes in resource management is the tendency for concepts of simple and complete ownership to give way to a tenure relationship that fits more closely with the sociologists' view of a bundle of rights that can be disarticulated and held by different people. In some ways, this view of tenure has been quietly with us for a very long time. Wildlife has long been legally viewed as owned and managed by the state, not by individual landowners, and there is wide recognition that easements can be used to separate development rights from land ownership. What has changed is that previously widely accepted and stable distributions of tenure rights are being contested much more frequently. There are many examples of this: for instance, in the USA, endangered species laws have been used to limit habitat modifications on private lands. The argument for government intervention is essentially that endangered species are a resource of value to the public as a whole (or at least to large segments of the population), and therefore a landowner does not necessarily have the right to do anything he wishes with resources found on his own property. Such claims on the 'private property' of others have gone far beyond government-initiated laws and regulations. Several states have had citizen ballot initiatives seeking to limit certain forestry practices, and radical environmentalists have taken direct action ranging from civil disobedience (e.g. tree sitting, blocking roads) to sabotage and property destruction (e.g. burning of ski-resort facilities and houses). That these efforts have a mixed record of success is largely beside the point. They have become standard tactics and options in environmental disputes, indicative of the rising importance of tenure claims that reach across physical property boundaries marked with fences or other markers.

In Costa Rica, similar trends exist, although they have played out in different ways. International and urban interests have advocated for forest and wildlife conservation to encourage biodiversity and mitigate global climate change; for example, through opposition to the conversion of forests to pasture on private lands. However, the less-developed country context appears to have produced less attention to broad-based citizen action, and more to expert-led government regulation, incentives and environmental development projects. One innovative area is the use of government and private payments to landowners for public environmental benefits on their lands, for example for wildlife or for ecosystem services (Watson *et al.*, 1998; Langholz *et al.*, 2000).

In both the USA and Costa Rica, explicit and implicit claims of rights to resources or their functional attributes on land owned by other people has been problematic. There is no one point at which these rights and claims can be balanced, resulting in a constant process of social and legal renegotiation. Complicating this is the fact that many of these issues involve externalities and cross-boundary resource concerns. The policy tools that support these complex questions are not well developed, and there are fundamental questions about regulation, property rights and compensation that remain to be worked out. But clearly there is an emergence of a number of different fora and techniques in and by which these issues are contested and balanced, including markets, social norms (moral questioning of the rights to do certain things with natural resources), legal and policy restrictions on certain practices (which may be implemented at many different levels of government or society), and collaborative decision-making processes.

In addition to individual stakeholder group and public sector claims on the attributes of private property, there has been a tendency to break down or unpack previously uncontested notions of private and public property. In Costa Rica, only a portion of the national parks are owned by the government agency that manages the parks, with large percentages owned by other government agencies and private individuals (Zúniga Villegas, 1998). The situation is very similar in the USA, where inholdings, public–private mosaics, lease agreements and divisions of tenure for different resources are often controlled by different individuals or groups, resulting in complex, overlapping tenures (Fairfax *et al.*, 1998; Geisler, 2000). While the facts on the ground have not changed, there is a new, explicit recognition that many of these conditions are not necessarily temporary anomalies and that natural resource management and policy must therefore develop the means to incorporate these complexities rather than to act as if they did not exist (Fairfax *et al.*, 1998).

Along with a blurring of public–private ownership categories, there has been a growing legitimacy given to other ownership options. Modern conservation was firmly based in the idea, expressed in Hardin's classic 'Tragedy of the Commons', that we are faced with a choice between the free-market and government regulation to avoid the failures inherent in common ownership. At the theoretical and case study levels, a large body of literature has emerged that counters Hardin's argument by showing four property options: open-access, communal, private/individual and government (McCay and Acheson, 1987; Feeny *et al.*, 1990). Of particular interest is the distinction between open-access and communal options. What Hardin called common property, recent scholarship has argued, is in fact the free-for-all of open access. Common property comes with many social institutions that make use of the resources and lands that are held in common (Feeny *et al.*, 1990). This has led to increased attention to and respect for persisting examples of communal ownership and management of forests and rangelands (Gibson *et al.*, 2000). In the USA, examples include the Hispanic communities in the Southwest and the communal forests of New England (McCullough, 1995; Peña, 1998). In Costa Rica, this has been reflected in community-based approaches and conservation on indigenous reserves (Watson *et al.*, 1998.)

From Deterministic Science to Multiple Knowledge Systems

In recent years, there have been significant changes in science itself, and the relationship between science and other knowledge systems. The change from deterministic to chaotic models in natural resource management shows up mainly in the literature on fisheries management in the USA (e.g. Acheson and Wilson, 1996; Walters, 1997), with relatively little work in this area in forest management research evident in either the

USA or Costa Rica. There has been more attention paid to interdisciplinary approaches, and their links to adaptive management in both countries. Examples include the Interior Columbia Basin Ecosystem Management study (Quigley *et al.*, 1996) in the USA, and Cornell University and Organization for Tropical Studies research efforts in conservation biology and sustainable development in Costa Rica (Rich *et al.*, 1996; Schelhas, 2000). These efforts reflect a growing regard for disciplinary pluralism, and a corresponding effort to find multidisciplinary and interdisciplinary approaches that integrate different perspectives and approaches (Zube, 1982; Norgaard, 1989; Schelhas *et al.*, 2001).

Movement beyond science to other knowledge systems, including indigenous and folk knowledge, is also evident in both countries. The uncertainty of traditional science in addressing some of the forest management issues in the western USA is one example where multiple knowledge claims are being put forth in the USA. For example, the finding that many of the species most widely harvested by indigenous people in western USA are currently on threatened or endangered species lists suggests that these practices had certain biodiversity advantages over scientific natural resource management approaches (Anderson, 1993; Anderson and Nabhan, 1991). Berkes *et al.* (2000) suggest that traditional ecological knowledge may take into account some of the long-term lack of predictability in complex ecosystems that has often not been fully appreciated by scientists.

McCay (2000) observes that recognizing multiple knowledge systems, like the local knowledge of user groups, also leaves the door open to many other types of knowledge claims. Among these are 'fractious interest-driven claims to knowledge masquerading as science (i.e. 'junk science')' (McCay, 2000: 4). Recognizing multiple claims to knowledge can mean that each interest group puts forth its own version of the truth, raising questions about how to mediate between these 'truths' and the role of science and other knowledge forms as the basis for decision making.

The trend towards certified sustainably grown and harvested forest products is another example of greater pluralism in the knowledge systems that are considered in management and policy. Certification of timber, for example, explicitly challenges the forestry profession (and its claim of authority in science) by arguing that foresters alone cannot make all the judgements about the 'right' way to manage forests. Although there is great variation among certification systems, most expand the values that need to be accounted for in forest management beyond those related to production of a single commodity. Biodiversity, ecosystem processes, ecosystem health, social issues and off-site environmental concerns may all enter into the process. In addition to bringing professionals and scientists from different disciplines into the process, non-scientific values (consumer, environmental groups, public, etc.) often also become a part of the certification criteria. The struggle for legitimacy in certification plays out in the social and political arena, and expresses the power relationships among interest groups as well as the science that underlies these positions. For example, de Camino and Alforos (2000), reviewing certification in Latin America, suggest that certification is driven by the interests of northern NGOs with questionable benefits for the South (given that price premiums are often not realized by forest landowners).

From the Public Interest to Stakeholder Groups

One of the fundamental tenets of progressive-era conservation was management for 'the public interest'. Postmodernism looks for power relationships along class, racial and ethnic lines that might distort any such claimed 'public interest' in favour of certain groups who have been historically privileged. Ultimately, this approach leads to breaking down the public into stakeholder groups – smaller groups who share common interests – that receive different sets of costs and benefits from natural resource management and policy decisions.

Viewing interests in natural resources from a stakeholder perspective ultimately leads to supplementing, or even replacing, scientific determination of the public interest with new governance procedures to listen to, consider and balance the interests of stakeholder groups. Under this view, each group is now able to articulate their interests themselves (as opposed to having these interests determined by scientists), and resolving disputes and reaching workable management decisions requires participation and collaboration. Natural resource management and policy become processes of governance, supported by, but not driven by,

science. Ultimately, decisions are made not through hierarchical processes where the lines of authority and responsibility are clear, but through panarchies – emergent sets of loosely connected institutions in which action can be initiated from any level (Gunderson *et al.*, 1995).

In the USA, this change is manifested in a number of different arenas. Planning for the National Forest, for example, has embraced the notion of collaborative stewardship to deal with the multiple pressures of interest groups and stakeholders (Committee of Scientists, 1999; Wood, 2000). However, the change has gone far beyond government-driven processes. In many places where natural resource management involves contentious issues, grass-roots groups have sprung up which include stakeholders on all sides of the issues. Many of these groups have a collaborative philosophy, looking for management strategies that consider environmental, community and economic variables. The Quincy Library Group is one such example of a stakeholder-based collaborative group that is distinctly different from, and sometimes challenges, science-based management approaches (Ruth, 2000).

The less-developed country context of Costa Rica shows different manifestations of similar trends. In 1991, the national parks were organized into regional conservation areas, which worked across park boundaries and sought to include NGOs and local people along with scientists and government agencies. Similar to the USA, these processes are not always controlled by the government. Environmental protests and new social movements have sufficient power to drive elements of the natural resource management and policy process (Watson *et al.*, 1998).

Discussion

The above exposition presented examples from two countries of four important recent trends in natural resource management and policy (see summary in Table 3.1). Many of these trends reflect efforts to come to terms with complexity. Ecological systems and their relationships with human systems are inherently complex and interconnected. This is reflected in attention to broader scales and cross-scale relationships (see point 1c in Table 3.1), multiple values in ecosystems (points 1a, b), and the shift from simple ownership to bundles of rights (points 2a, b, c). These changes are not inherently postmodern, and may have taken place even in the absence of the postmodern trend. Nethertheless, it is important to note that their recognition and rise to prominence was facilitated by paying attention to multiple points of view, which has been fostered by postmodernism.

'Modern' natural resource management could incorporate much of the complexity in natural and social systems and still remain a science-driven, hierarchical management and policy process. The trends towards multiple knowledge systems (particularly openings for non-scientific knowledge) (points 3a, b, c) and participatory and collaborative processes involving stakeholder groups (points 4a, b, c), however, are fundamentally postmodern. Like postmodernism, they recognize the importance of hearing multiple voices and perspectives, and multiple knowledge systems. They reject management based in grand theories and universal policy and management approaches in favour of management addressing the particularities of each situation. They recognize contingency – including the possibility of shifting the behaviours of actors in broad but non-deterministic ways through participatory approaches; for example, discursive approaches of participatory environmental management that lead to civic discovery (Uphoff, 1992; Rudel and Gerson, 1999; Fischer, 2000).

Table 3.1. Summary of recent trends in natural resource policy and management.

1. Simple to multiple interests
a. Mixes of products, rather than single commodities
b. Non-commodity values
c. Broader scales and cross-scale relationships
2. Simple ownership to bundles of rights
a. Cross-boundary claims on private lands
b. Intermixed public–private domains
c. Legitimacy of communal ownership
3. Deterministic science to multiple knowledge systems
a. Unpredictability, surprise, chaos
b. Interdisciplinary science and management
c. Traditional knowledge
4. Public interest to stakeholder groups
a. Power as influencing 'public interest'
b. Stakeholder groups
c. Panarchies replace hierarchies

However, in spite of the important influence of postmodernism, it is more difficult to assert that a truly postmodern management and policy has emerged. Strict, or strong, postmodernism places competing claims on equal footing, providing little basis for choosing among them. A truly postmodern natural resource management and policy would become simply a struggle between interest groups, determined by different parties' discursive claims and the power behind them. While some would seem to welcome this, there is little evidence of it gaining credence in management and policy. The reasons for this are found in the emerging critique of postmodernism.

Postmodernism has by no means been uncritically accepted within academia, and in the past few years it has been assaulted by considerable backlash and criticism. One of the principal criticisms is that postmodernists overstate the extent to which 'reality' is socially constructed, and ignore substantial evidence that there is an underlying empirical reality to our socially constructed interpretations. Harris (1999) makes these points in his argument against the excesses of postmodernism. He agrees with the 'postmodernist discovery that science is culturally embedded and culturally constructed', and therefore influenced by values, race and class (Harris, 1999: 154). His objections are with what he terms 'strong postmodernism' – arguments that go beyond showing bias in scientific inquiry to maintain that there can be no 'privileged' paradigms or indeed truth itself.

A number of authors have argued that 'strong' postmodernism, in privileging discursive claims over empirical observations, risks social irresponsibility by ignoring social or biophysical realities. Edelman (1999) criticizes postmodernism for ignoring important social facts in history and political economy related to resource and income distribution, including poverty, inequality and power. McCay (2000) suggests that the emphasis on social construction and contingency have gone too far, that academic postmodernism's emphasis on texts and interpretations neglects engagement with the real needs and concerns of people. She suggests that respecting people's lives, institutions and environments demands the apparent bane of postmodernism: 'careful, empirical, and reproducible research' in the natural and social sciences (McCay, 2000: 6). Rocheleau (1999) suggests that, in addition to purely social analyses, we need to conduct material ecological analyses of the movements of energy and materials in different socially structured environments. Stonich (1999) similarly cautions against overestimating the power of human behaviours to change environmental forces while underestimating the transformative power of the environment (nature) on social relations. She argues, then, for balancing the social/cultural construction of nature with what she terms 'the natural construction of the cultural and social' (Stonich, 1999: 24). Ignoring the biophysical processes that give rise to social issues, and social factors such as power and exploitation, in favour of discourse risks ignoring factors that are very 'real' in many people's lives at the expense of what many see as largely academic discussions.

Natural resource management and policy cannot simply offer critique or align itself with the victims of central authority. It must find a balance between the benefits of postmodernism, which include attention to diverse perspectives and interests and greater self-reflectivity, and the benefits of more traditional science-based approaches to natural resource management, which include the discovery of empirical regularities in complex social–natural systems. The task before us is then to develop a new approach to resource management that incorporates aspects of both modernism and postmodernism. Gabardi (2001) calls this critical postmodernism, and defines it as the combination of scepticism with a pragmatic experimental approach to daily living. Kai Lee's seminal book, *Compass and Gyroscope* (1993), proposed an approach that integrates a science-based process of adaptive management with democratic processes of governance Buck *et al.* (2001) build on this idea, proposing the concept of 'adaptive collaborative management' and exploring worldwide experiences that fit within this general model.

If the future of natural resource management and policy will place science and governance on more equal footings, there are changes and challenges ahead. For science, the social and political spheres must be incorporated into the very heart of our approaches, and not considered as problems or mere afterthoughts. We must seek a genuine articulation between disciplinary theories and models, forming new interdisciplinary approaches. Governance, in turn, must find ways to systematically incorporate science into its processes. Somewhat paradoxically, science then becomes more important, by producing empirically verifiable research that helps to sort out competing knowledge.

However it must be a more bounded, humble, pluralistic and interdisciplinary science which recognizes the ways that values infuse its processes and influence its outcomes. Governance will need to avoid the anarchy of multiple discursive claims underlain by power and self-interest and develop new governance processes that take into account multiple viewpoints but lead to effective management practices to create and protect social and biophysical states that truly do produce value across all segments of society over time. The outlines of a new approach – neither modern nor postmodern – is taking shape in the form of the trends described in this chapter, for us to recognize and engage as we move into a new century of natural resource management and policy.

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