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Political Ecology Revisited: Integration of Politics and Ecology Does Matter

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This essay aims to strengthen our comprehension of the dynamic articulation between political and ecological processes within the contexts of human–environmental interactions. Utilizing the theoretical approach of political ecology, this study emphasizes the importance of recognizing the active role that nature plays in shaping human–environment relations and the need to see environmental change as the result of social action and ecological dynamics. In order to do justice to the constantly shifting relationships between nature and society, political-ecological analyses require an integrated understanding of the interconnections between political struggles over environmental resources, cultural meanings attached to the environment, and the ecological dynamics of environmental change.

Keywords agency, environmental change, human–environmental interactions, nature–society relations, political ecology

Within the last 15 years, political ecology has become one of the most important approaches for studying human–environment relations in the environmental social sciences. In their fundamental work *Land Degradation and Society*, Blaikie and Brookfield (1987, 17) define political ecology as an approach that “combines the concerns of ecology with a broadly defined political economy.” Similarly, Bryant (1992, 12) describes political ecology as a theoretical inquiry into developing “an integrated understanding of how environmental and political forces interact to mediate social and environmental change.” Both of these definitions emphasize the strategic confluence of political and ecological processes in the analysis of environmental change. In much of recent political ecology writing, however, the term “political ecology” has been used to refer to the *politics* of environmental change, with limited attention being paid to *ecological* dynamics. List and Rittberger

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(1992, 88) even state that sociopolitical approaches to the environment should not be confused with the difficulties of biophysical sciences. According to them, "it is here, in the process of articulating and mediating diverging goals and interests, that the ecological problem gains its political dimension, i.e. that ecology becomes political ecology."

With an increasing focus on sociopolitical struggles related to the environment, the role of ecology in political ecology has become less central (Nightingale 2003). While sophisticated insights have been developed into the power relations of resource access and control (Neumann 2004; Ribot and Peluso 2003), the ecological processes involved have often been left in the shadows. Relatively little attention has been paid to what natural scientists have to say about environmental change and thus an important part of the explanation of human–environmental interactions has been missed (Zimmerer and Bassett 2003).

Another trend in current political ecology aims at deconstructing the orthodox paradigms of environmental sciences. Stott and Sullivan (2000) question the legitimacy of environmental science by revealing the relations of knowledge and power that underlie this field. Forsyth (2003, 1–4) emphasizes that the task of critical political ecology is to develop a political philosophy of environmental science that indicates how social and political framings are woven into the formulation of scientific explanations of environmental problems and their proposed solutions. By illustrating how environmental explanations are thoroughly embedded in the social and political practices of scientific methodologies, Forsyth argues that the role of political ecologists is to deconstruct the politics of ecology as a scientific legitimization of environmental policy.¹

Although such studies address important aspects of the social construction of nature and knowledge, they often pay scarce attention to the physical processes involved in environmental change. As criticized by Grossmann (1999, 153), social constructivist analyses of nature tend to "portray the environment as a passive entity, moulded by political-economic forces," sometimes even questioning whether nature itself exists outside social life. Some critics have cautioned that constructivist-oriented political ecology may be mutating into "politics without ecology" (Vayda and Walters 1999, 168; see also Peterson 2000).

In response to these concerns, several political ecologists have called for a more thorough bridging of the politics of power relations and the study of environmental modification, or the "nature of nature," in political-ecological analyses of environmental change. According to these authors, political ecology needs to bring together analyses of ecological conditions, sociopolitical relations, and cultural practices in order to understand the complex dialectics between nature and society (Nightingale 2003; Walker 2005; Zimmerer and Bassett 2003; Zimmerer and Young 1998). Harvey (1993, 25) also highlights this issue in his statement 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."

In this essay, we aim to strengthen such trends in political ecology that acknowledge the active role of nature in human–environmental interactions and that call for a more thorough examination of shifting relations between ecology and politics in analyses of environmental change. As noted by Sneddon (2000, 522), the recognition of the multicausality of environmental change opens up the possibilities for new kinds of questions to be asked and new sorts of synergies to be created in a situation

where the boundaries between environment and politics, and nature and society, are blurred and in many respects artificial.

The first section of this essay briefly reviews the recent developments in political ecology with an aim to illustrate the theoretical shifts that have led to scarce attention being paid to ecological processes. The second section analyzes the active role of nature in shaping human–environment relations, while the third section elaborates an understanding of environments as arenas of interplay of ecological and sociopolitical processes. The final section draws some general conclusions concerning the need to bring ecology, politics, and society together in political-ecological analyses of environmental change.

Recent Developments in the Field of Political Ecology

The approach of political ecology is grounded in anthropology and geography, as well as in cognate subfields in sociology, political sciences, and environmental sciences. Because of its pluralist framework, political ecology is most appropriately considered as a theoretical approach rather than a theory *per se*. Its main areas of interest include environmental actions of local resource users, combined with an analysis of how these actions are linked to wider economic and sociopolitical conditions, and the historical changes involved (Blaikie 1995; Nygren 2004; Paulson et al. 2003). On this basis, political ecologists have been interested in exploring how control and access to natural resources are defined and contested in various political arenas. Analyses of different space–time relations are important to understanding the plurality of actors and environmental interests, while the ways in which local environmental relations are shaped by and feed back into global policies and discourses require an examination of multiscale processes of articulation (Gezon and Paulson 2005; Slotte 2002).

Antecedents of political ecology originated in the early 1970s at a time when human–environmental interactions came under close public and scholarly scrutiny. Early studies were influenced by theoretical formulations in cultural ecology and ecological anthropology, where a cultural-ecological theory was developed to demonstrate how local people maintain adaptive structures with respect to their environments (e.g., Bennett 1976; Rappaport 1968; Steward 1955). Certain cultural factors were considered as fundamental features of human life and necessitated by the ecological conditions under which subsistence is achieved.²

Such theoretical arguments, however, were subjected to criticism for their tendency to “naturalize” social processes and their unwillingness to recognize that local communities form nodes in wider political-economic networks. In response to cultural ecology’s functionalist and apolitical nature, a more politically oriented political ecology emerged in the 1980s. Several radical geographers and world-system theorists initiated a process of inquiry into the interaction of local resource use with the broader political economy (e.g., Blaikie and Brookfield 1987; Guha 1989; Watts 1983; Wolf 1982). These studies made the remarkable move of replacing the term “cultural” in cultural ecology with “political,” thereby denoting their desire to shift attention away from adaptation toward the study of social inequalities.

In the 1990s, new sorts of debates arose within political ecology, as an increasing number of researchers became interested in human agency and how people negotiate their relationships to the environment in their everyday interactions. Influenced by poststructuralism and discourse theory, the linkages between knowledge, power,

and representation became a crucial focus of analysis (Escobar 1995, 1999; Peet and Watts 1996). The turn to representations and meanings directed attention to culturally filtered images of nature (Biersack 1999) and to discursive formations of environmental governance that tend to privilege particular forms of environmental knowledge (Adger et al. 2001; Leach and Fairhead 2000). In feminist political ecology, inspiring insights revealed the gendered character of environmental actions (Freidberg 2001; Rocheleau et al. 1996), while increasing attention paid to social relations at different scales of environmental negotiation opened the door to sophisticated analyses of the role of politics and power in mediating resource access and control (Brosius 1999; Neumann 1998; Schröder 1999).

Poststructuralist political ecologists have provided a nuanced understanding of how ideas of nature are constructed by discursive practices; however, at the same time ecological processes have been pushed more into the background. While recognizing the importance of discourses in conditioning political-ecological struggles, we disagree with such views that presuppose that ecological processes only come into being as humans construct them, thus implying that “the virus, bacterium, force of gravity, and ozone layer had no effect on humans (and did not exist) before they conceived of such things” (Murphy 1994, 959).

In the following analysis we want to stimulate a more integrated view of the political ecology of environmental change. A more careful combination of the ecological processes with approaches that capture how people interpret and negotiate their environment could lead to challenging, new conceptualizations of nature–society networks. The theoretical arguments we present are illustrated through several examples of the linkages between political struggles over natural resources, cultural meanings attached to the environment, and the ecological dynamics of environmental change.

Nature as an “Actor”?

Cooperation between social and natural scientists in the study of environmental change remains relatively limited. As a consequence, natural scientists may not be very familiar with theoretical advances in the social studies of the environment, while social scientists may not be well acquainted with theoretical advances in the natural sciences. When referring to the human dimensions of environmental change, many ecologists still rely on concepts of homogeneous communities with locally evolved rules for resource access, even as a large number of political ecology analyses have shown that communities everywhere consist of multiple actors with diverse ways of using natural resources and with differentiated access to control and power (Agrawal and Gibson 1999; Nygren 2005). Political ecologists have also demonstrated the multiple links between local resource use strategies and wider institutional arrangements, thus emphasizing heterogeneity instead of homogeneity and trans-locality instead of immobility (Brosius 1999; Slotte 2002).

Correspondingly, many social scientists still subscribe to the view of ecosystems as stable and in equilibrium despite the fact that the predominant view in “new ecology” accents nonequilibrium processes and chaotic fluctuations. Increasing attention is also being given to the relations of ecological processes on different scales and to spatial-temporal discontinuities within ecosystems (Kay and Schneider 1995; Wu and Loucks 1995).

A better recognition of these, in a certain sense parallel, theoretical formulations could improve our understanding of the complexity of environmental change. While ecological approaches need to give more consideration to the sociopolitical forces and the cultural meanings that influence how people use and perceive natural resources, political-ecological studies could be complemented by better acknowledgement of the active role of nature in shaping human–environmental interactions. As noted by Robbins (2004, 11, 28), the effects of the physical environment on social action remain a relatively undertheorized research area. Conceptions that environmental changes are solely artifacts of social constructions of reality, based on arguments such that “a fish is only a fish if it is socially classified as one” (Tester 1991, 46), leave us with the paradoxical outcome that changes in our knowledge of nature lead to changes in physical reality. To take ozone depletion as an example; if the hole in the ozone layer is identical to the discourse about it, then the hole would simply disappear at the moment people stopped discourse about it (Radder 1992, 155–156).

In reaction to radical constructivism, several political ecologists have argued that physical world entities exist independently of human attempts to describe them, and ecological processes may maintain or change their functions independently of human consciousness (Paulson et al. 2003; Zimmerer and Bassett 2003). People can refuse to believe that cigarettes cause lung cancer and that a human immunodeficiency virus causes AIDS, or they can be indifferent to risks of nuclear waste and global climate change. These phenomena, however, affect human beings regardless of any denials (Murphy 1997, 804–805).

Correspondingly, the fragmentation of formerly contiguous forests into separate patches as a result of land clearing cannot be explained only as a change in our interpretations of these landscapes. Landscape changes per se alter the ecological dynamics of remaining forest patches, including their disturbance regimes and regeneration modes. Haila (1999, 237) provides an interesting example that illustrates why consideration of the active role of nature is important when studying forest fragmentation. According to Haila, human beings usually define a landscape as fragmented if it is perceived as consisting of one environmental type split into pieces by what is regarded as another environmental type. However, such a view might be irrelevant for many nonhuman organisms. Some bird species “patch together” several pieces of land that human beings perceive as being separated; thus for these birds this landscape is “functionally continuous.” On the other hand, a forest that human beings regard as homogeneous may be experienced as highly fragmented by various insect species.

These examples demonstrate that more attention needs to be paid to the active role of nature in political-ecological analyses of environmental change. Species migrate, populations fluctuate, climates change, rivers alter their courses, and diseases evolve apart from human perceptions of them (Peterson 2000, 324). Correspondingly, although the time needed to grow crops might be transformed via fertilizers and genetic manipulation, various constraints are nevertheless imposed by ecological processes on the human use of natural resources.

A recent example of this issue is the plight of Percy Schmeiser, a Canadian farmer, whose canola fields were found to contain DNA from genetically modified (GM) canola engineered by Monsanto Company. Despite the likelihood that winds blew GM seeds from passing trucks onto Schmeiser’s fields, Monsanto filed suit against Schmeiser in 1998 for patent infringement. In 2001, the Provincial Court in Saskatchewan ruled in favor of Monsanto and ordered Schmeiser to compensate

Monsanto for the technical and legal fees. In 2004, the Canadian Supreme Court upheld Monsanto's patents of the modified canola genome, although it ruled that Schmeiser did not have to pay the technical fees.³ At the same time, Schmeiser and other farmers in Canada and the United States have experienced high economic losses, as the intermingling of GM DNA with their non-GM products means they can no longer meet GM-free standards for their crops.

Similar processes are present in many responses of ecosystems to policies aimed at preventing natural events perceived as "undesirable" by human beings. In the United States, about 3.5–4.0 million ha of wildland is burnt each year, mostly due to ignition by lightning.⁴ Before strong fire suppression policies, wildfires, especially in drier forests, were relatively frequent and confined to the ground or understory, thus restricting the accumulation of fuel and the building up of high-intensity fire regimes. Due to the implementation of intensive fire suppression policies in recent decades, the habitat structure and species composition have changed in many forests. According to de Leo and Levin (1997), Ponderosa pine forests in Oregon used to have 74 trees/ha, and the average diameter of a Ponderosa pine (*Pinus ponderosa*) was 43 cm. After decades of fire suppression, tree density has increased 10-fold, while average tree diameter has dropped to 25 cm. Increased vulnerability to diseases and decreased resistance to drought accompany such high tree densities, and the ensuing accumulation of fuel increases susceptibility to high-intensity fires. Such events remind us of the necessity to consider the active role of physical forces and the complexity of ecosystem dynamics when implementing environmental policies.

Some researchers may, however, go too far in their arguments for nature's "agency."⁵ Metaphors of a "negotiation" between nature and human beings seem questionable, for example, because nature cannot intersubjectively contest the validity of representations being made about it (Demeritt 2002, 782). Hacking (1999, 105) illustrates this point by stating that "our knowledge about quarks affects quarks, but not because they become aware of what we know, and act accordingly." Labeling a quark as a quark thus does not make any difference to the quark. While we advocate widening our conceptualization of agency in human–nature relations, we also recognize the special characteristics of humans related to language and culture, which enable them to assess how they are being represented and how they are being acted upon (Murdoch 2001). Therefore, we can make sense of human–environmental interactions only if we retain a certain distinction between human and nonhuman organisms, one that is based upon their differing abilities to reflect upon circumstances and consciously change the interactions in which they are involved.

This distinction does not negate our claims for the active role of nonhuman forces and for their power to affect human affairs. It matters not whether zebras or trees operate out of any unfathomable intent; to exorcise the behaviors of nonhuman organisms from our analyses, however, causes us to miss the opportunity to take the nonhuman world seriously into account. Cattle egret diffusion from Africa and their population growth in the Americas were a complex response to favorable climatic conditions and their commensal relationship to grazing buffalo and the spread of cattle husbandry. Similarly, the Florida manatees' winter migration to the warm-water effluent exhausts of powerplants is a behavior to be understood primarily because of their biology, not because of their subjectivity.

A more careful recognition of the active role of nonhuman organisms does not imply that political ecologists need to become experts in physics or biology; rather, the political ecology approach should be broadened in a way that enables better

incorporation of social actions with ecological dynamics. As is shown in the next section, political, ecological, and sociocultural processes of environmental change mingle together in such a complex way that strict distinctions between the natural and the social become artificial.

Environments as Arenas of Interplay of Ecological and Sociopolitical Processes

In recent years, political ecologists have developed special competences for studying the sociopolitical causes and consequences of human interactions with nature. However, as suggested by Nightingale (2003), the approach of political ecology could be enriched by a more careful examination of the complex interplay of the ecological and sociopolitical processes in situations of environmental change. Such a conceptualization could provide challenging ways to analyze environments as spatial spheres of interaction between and among ecological processes, sociocultural actors and political-economic forces. It would also allow the examination of the “material” and “imaginary” dimensions of environmental change as mutually constitutive (Castree 2003).

Understanding these interactions is crucial, for example, when analyzing tropical deforestation. An important step in this direction is taken in Brechin's (2003) analysis of the complexity of multiscalar social relations, ecological conditions, and political-economic agendas that resulted in increased deforestation in Sumatra throughout the 1980s. First, local ecological conditions, including the climate, terrain, and soil characteristics, made south Sumatra ideal for coffee growing. Second, the severe frost in Brazil, one of the world's leading coffee producers, in two consecutive years in the late 1970s increased the price of coffee on the world market, providing the motivation for Sumatran farmers to expand their coffee production. A simultaneous change in Indonesian forest policies, which shifted the forest governance from local authorities to state officials, further encouraged the deforestation by diminishing the local opportunities for resource control and enabling the formation of wide-scale networks of illegal forest clearing.

The case study by Nygren (2000) of deforestation in Costa Rica from the early 1900s until the 1990s reveals an equally complex picture. Early-20th-century Costa Rican legislation bestowed perpetual land rights to those who “improved” the land through forest clearing, and this promoted deforestation as a path to land ownership. Government encouragement of deforestation of forest frontiers also served as a safety valve for social tensions caused by resource conflicts in more populated areas. Since the 1950s, lack of political control over timber concessions, subsidized credit schemes for agriculture, and the accompanying forces of land speculation further intensified the forest clearing for agriculture.

This case illuminates the complex intersection of cultural perceptions of environment, and changing ecological conditions and political-economic interests. The first struggles over physical territory and over cultural constructions of the “reasonable” resource use in this region were between the Cabécar Indians and peasant colonists during the first decades of the 20th century. In these struggles, nonindigenous settlers branded the communal land tenure system as inferior to the conception of land as a private commodity, and the native hunting–gathering practices as inferior to forest felling for agriculture. In the pioneers' worldview, the forest was an uncultured jungle. This conception was related to the epoch's political environment, in which the

socially constructed role of the colonists was that of frontier breakers who converted the “untamed” forests for the agricultural development of the country.

The construction of roads to this area in the 1950s led to intensive logging operations. In the worldview of this generation, the forest was a nonrenewable resource. After logging its timber for markets, farmers used the land for cash cropping of coffee and sugar cane. In the 1970s, Costa Rican government promoted extensive cattle raising programs to increase the country’s beef exports for U.S. hamburger markets. This generation of cattle raisers saw their relationship to the forest as distant. In the 1980s, Costa Rican forest policies placed strict restrictions on land clearing while encouraging farmers to join reforestation efforts. For the youth of this time, the “virgin” forest was a curious relic from their grandparents’ time. As children of an era of environmental education, they were interested in nature conservation. This case illustrates how cultural perceptions related to the environment are intimately linked to actual transformations in the physical landscape, as well as to the changing cycles of global markets and political agendas for development.⁶

Similar complexities become evident when analyzing the ecological and socioeconomic impacts of different forest management practices in the tropics. From an ecological point of view, it is important to note that human-induced forest activities, such as logging, often differ from natural disturbances in forest ecosystems. According to Swaine et al. (1987), the mortality rate of trees in tropical forests due to natural disturbances is on the order of 1–2% per year. Pinard and Putz (1996) report in their study of different logging practices in Malaysia that 19% of the residual trees were dead within the first year after reduced-impact logging, in contrast to the 46% mortality rate over the same period after conventional logging.

It is also important to consider issues of forest quality when examining the ecological impacts of logging. In community forestry projects operating in northern Honduras, timber harvesting is conducted with low-impact techniques. However, due to the steepness of slopes, the direction of tree fall is difficult to control, which causes damage to the surrounding vegetation. In addition, the gaps made by reduced impact logging may be too small for successful regeneration of shade intolerant species, such as mahogany (Kukkonen et al. 2008). As timber is processed with chainsaws, about 40% of the material is lost as residues, which reduces the economic viability of the operations. Market demand for few, commercially valuable timber species promotes heavy harvesting of these species, while species with lower economic value remain in the forest. This may have long-term implications for the reproduction rates of certain tree species and thus change species compositions in the forests (Markopoulos 2003).

This picture becomes even more complex when factoring in the social and political institutions that condition the actions of local timber producers. Power relations within and between the communities, state agencies, and timber markets shape the socially differentiated access to forests and, in so doing, affect the distribution of the costs and benefits of forest activities. Local forestry groups reap only a small portion of the profits in a situation where the value chains of timber are based on a host of intermediaries and patron—client relations (Keinänen 2004). The limited amount of political support from the government for community forestry also makes it difficult to develop more ecologically and economically sustainable operations. Illegal harvesting of endangered species affects the forest structure and, consequently, the course of environmental change. It also influences the socioeconomic sustainability of forest operations by driving down timber prices.

Despite the harmful ecological and social impacts of illegal logging, political decision makers have been reluctant to implement more transparent rules of resource control in Honduras. Understanding the reasons for this disinclination requires a detailed examination of the ways political and economic forces interact with each other in forest governance. Some authorities who are responsible for controlling illegal logging are themselves engaged in the business, and powerful operators use political manipulation and bribery to avoid prosecution for violations of the law (Nygren 2005; Richards et al. 2003). When considering these matters in conjunction with each other, it becomes clear that understanding the political ecology of forest-based conflicts requires analysis of the phenomena from multiple points of entry.

Recent efforts in political ecology to better relate the cultural meanings of environment to overlapping ecological and political processes reveal the inherent difficulty of conceptualizing the “environment.” As noted by Ingold (2000) and Pálsson (2006), environment is more than “all that surrounds”—it is a sphere of life activity and a place where one dwells and makes a living. Rikoon’s (2006) study of the conflicts over wild horses in Missouri, in the United States, provides an illustrative example of the competing cultural meanings that underlie environmental dilemmas. The plans by the National Park Service (NPS) to remove a small band of free-roaming horses from the Ozark National Scenic Riverways in the early 1990s sparked a lengthy conflict between the NPS and local residents. The source of disagreement was not any documented environmental damage; in fact, all sides agreed that the horses caused little habitat degradation. The NPS called for the horses’ removal because under the agency’s philosophy of reestablishing a pre-European settlement ecosystem, the horses were an exotic and “unnatural” species. The local pro-horse advocates argued that the horses epitomized naturalness and constituted landscape elements of great historical value. In their perceptions, the conflict symbolized the local resistance to environmental agendas based on a strict preservation ideology. This example demonstrates how cultural meanings attached to environment shape the range of conservation efforts and how the distinctions between legitimate and illegitimate resource management are culturally embedded.

Similar conflicts over protected area management in different parts of the world reveal how efforts targeted at environmental conservation are intrinsically interwoven with questions of power and political authority. Official designations of landscapes utilized by local people as territories of biodiversity protection have created many kinds of disputes and injustices, either by depriving local residents of critical resources without providing for replacements, or by removing them from their homes to make way for wilderness preservation (Wilshusen et al. 2002). Conservation regimes based on the view that the boundaries of protected areas constitute physical and symbolic divides between nature and culture are still dominant in many places, with little recognition of the fact that the histories of people and their environments are deeply intertwined and that most of the protected landscapes are the result of dynamic interaction between ecological and social processes (Neumann 2004).

Historical transformations of the landscape within Yellowstone National Park are a good example in this respect. The Native Americans who utilized the natural resources in and around Yellowstone for thousands of years before the establishment of the park had considerable impact on the area’s ecology. Their hunting practices probably controlled the distribution of antelope, elk and other large carnivores, and in this way contributed to the formation of complex ecosystems

of upland aspen and riparian cottonwood in the region. The extirpation of wolves from the park by the 1920s allowed elk to forage unimpeded on woody browse species, which reduced the aspen and cottonwood communities. This, in turn, reduced certain avian species and beaver populations within the park. The reintroduction of wolves in Yellowstone since the mid-1990s is once again changing the area's species composition and landscape structure (Ripple and Beschta 2004). In this situation, the perception of Yellowstone as "pristine wilderness" by most of the park visitors seems questionable. Instead of being an indication of the area's "untouched nature," the ongoing landscape change in Yellowstone has much to do with the active wildlife restoration and wildfire suppression policies implemented within the park (see also Robbins 2006).

Similar complexity between ecological and sociopolitical processes becomes clear in Goedeke's (2005) study of otter restoration efforts in Missouri. At the time of the initial waves of Euro-American settlement to Missouri in the early 19th century, otter populations were common in southern Missouri riverine ecosystems. Generations of Missourians hunted and trapped otters for their water-repellent furs, and by the 1930s the river otter was largely absent from the landscape. It was not until 50 years later that a restoration program was initiated by the Missouri Department of Conservation (MDC). In the claims of restoration supporters, otters were presented as mammals important to ecosystem health and ecological integrity.

After the introduction of almost 850 animals at more than 40 sites between 1982 and 1992, it soon became clear that the otters were not going to follow the story script written by restoration advocates depicting the mammals as "passive" participants in a "bounded" ecosystem development. Within a few years otters expanded more widely than wildlife biologists had ever predicted. Landowners 50 km away from the restoration habitats reported otters residing in their farm ponds, reservoirs, and wetlands. The MDC also began receiving reports of fishing locations and farm ponds denuded of bass and other large sport fish populations, which contradicted the biologists' projections that otters consume only crayfish and other nongame species. In addition, otters seemed to be capturing fish in numbers far beyond their sustenance needs. Narratives of otters piling dead fish on pond banks with only one or two bites taken from them portrayed otters as a "devil species," in contrast to the wildlife literature claims of a mammal that killed only as much as it needed to survive.

Constructions of the otters as animals that preyed on fish populations "belonging" to human owners led many anglers to demand liberalization of hunting and trapping regulations. Animal welfare activists opposed such proposals and countered with their own constructions of otters as significant barometers of ecosystem health. The MDC promoted the management of otter through selective harvesting regimes to maintain a "stable" population. In the legal-political contexts in which these interpretations battled for priority, the otters had no say. However, we cannot understand this story, or the dynamic networks included, without including the otters as "stakeholders" whose behavior was inextricably influencing, and influenced by, human action (Goedeke and Rikoon 2008).

The otters proved to be much more adaptable to different habitats than expected by wildlife biologists. Their numbers also increased more rapidly than scientists had predicted. Models that had indicated an otter population of 3000 animals in 1995 were updated to estimates of 18,000 in 2000. Recognizing reproductive rates "not seen elsewhere in the otter's range" and female otters attaining "sexual maturity

in record time” reveals the otters’ unanticipated activism. Enticott (2001) provides a similar example of the incalculability of nonhuman nature in his analysis of badgers and their links to bovine tuberculosis. Both of these studies question the conception of nature as “predictable” by demonstrating the capacity of nonhuman nature to “exert revenge upon” human life over exceptional spatial scales and across extraordinary lengths of time (Macnaghten and Urry 1998, 253).

Correspondingly, Fairhead and Leach (1996), and Leach and Fairhead (2000) have questioned popular assumptions concerning human impacts on forest degradation in Africa, by demonstrating how traditional resource management practices have enhanced, rather than prevented, the expansion of forest areas in western Africa. Flood-plain forests in Amazonia and multipurpose forest gardens in Southeast Asia provide similar examples of enriched forest management by local people (Anderson and Ioris 1992; Peluso 1992). On the other hand, studies of local resource management carried out without careful ecological analysis may misinterpret issues of ecological resilience and ecosystem functioning. According to Naughton-Treves (1997), the analysis by Fairhead and Leach (1996) fails to distinguish between different types of forest, equating the managed forests of rapidly growing tree species with more diverse old-growth forests. It is precisely the complex intersections between the ecological, sociopolitical, economic, and cultural processes that make the human–environmental interactions so difficult to understand.

This matter has been highlighted in recent studies of urban political ecology. Pelling’s (2003) study of urban flooding in Guyana demonstrates the influence of political structures on the sociospatial distribution of environmental risks and how unequal access to environmental services contributes to social vulnerability to natural disasters. According to Pelling, the majority of the poor in the southern cities live in hazardous areas subject to landslides and flooding. The lack of political will to apply risk prevention strategies in these shantytowns and squatter settlements, constructed as places of “social ills” and “health hazards,” creates a vicious cycle of poor livelihood options, increasing vulnerability, and further ecological degradation. As pointed out by Heynen et al. (2006), there is an urgent need to broaden the conventional view of environmental risks by considering environmental vulnerability as a topic that is deeply embedded in sociopolitical debates over hazard management.

The Asian tsunami catastrophe in 2004 and the disasters linked to hurricane Katrina in the United States in 2005 provide startling recent demonstrations. The tsunami reminded us that powerful physical processes maintain their existence independent of our actions, while hurricane Katrina provided a warning of the potential effects of human-influenced global climate change. It also revealed deep-rooted myths of nature, control, and expertise. Despite numerous scientific reports warning that the construction of shipping channels and removal of wetlands had opened up a “hurricane highway” into the city of New Orleans through which storm surges can be channeled and amplified, an engineering hubris prevailed (Bakker 2005; Travis 2005). When considering the debates over how the victims of these catastrophes should be aided, by whom, and through which channels, it became evident that these disasters were also socially constructed phenomena. Both of them tragically illustrated the gross inequalities in social discourses on disasters and in political agendas for hazard mitigation. As remarked in an editorial of the *Financial Times* on December 29, 2004, concerning the Asian tsunami, it was “the numbers of foreign holidaymakers caught in the

tsunami [that] ensured the rest of the world paid attention to the disaster.” Similarly, media coverage of Katrina’s aftermath portrayed images that, together with governmental evacuation strategies, revealed great race and class inequalities in people’s vulnerability to environmental disasters (Bakker 2005).

Conclusion

This essay has highlighted the complexity of human–environmental interactions and emphasized the need for a better integration of environment, politics, and society in political-ecological studies of environmental change. A more careful combination of ecological aspects of environmental change with approaches that capture how people interpret and negotiate environmental transformations would allow political ecology to expand in new directions of transdisciplinarity, to generate more nuanced understandings of human–environmental interactions, and to provide more equitable solutions.

First, documenting the more active role of nature in shaping human–environmental interactions would fruitfully enhance studies in political ecology. This requires a more careful incorporation of human/nonhuman linkages into our analyses of nature–society networks, as well as a more thorough examination of shifting relations between social action and ecological dynamics in our analyses of environmental change.

Second, more attention needs to be paid to the multifaceted ways in which ecological conditions, sociopolitical relations, and cultural practices interact with each other in order to produce particular kinds of environments and particular forms of environmental governance. Physical and ecological processes have an active role in shaping the sociopolitical relations and cultural conceptions related to the environment, while the multifaceted relations of politics and power, and the cultural constructions of the environment, shape the control and use of natural resources, and consequently the course of environmental change (Gezon and Paulson 2005). A more integrated understanding of human–environment relations is necessary in order to expand our horizons toward perspectives where politics and the environment are seen as interconnected and where new ways to analyze hybrid connections between multiple actors and multiple scales could be developed.

Notes

1. A problem in many of these studies is that they do not distinguish sufficiently between environmental sciences, environmental policymaking, and environmental activism. Many of the examples cited in their criticism of environmental scientists, in fact, refer to environmental activists or environmental policymakers.
2. Due to space limitations, we are not able to provide a detailed intellectual genealogy of political ecology here. For more on this, see, e.g., Bryant (1992), Neumann (2005), Paulson et al. (2003), Robbins (2004), and Watts (2000).
3. For the Canadian Supreme Court’s judgment, see www.lexum.umontreal.ca (accessed January 12, 2005).
4. USDA Forest Service, Wildland Fire Statistics, www.fs.fed.us/fire (accessed February 13, 2006).
5. See, e.g., Burningham and Cooper (1999) and Eder (1996).
6. For an inspiring study of recent changes in cultural perceptions of forests in Costa Rica, see Schelhas and Pfeffer (2006).

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