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Political ecology: where is the ecology?

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I Introduction

Political ecology has become firmly established as a dominant field of human-environmental research in geography. To a great extent, it has eclipsed its predecessor and cognate field of cultural ecology. As a very rough measure, a search for research and review articles published in major peer-reviewed geography and related journals between summer 1993 and spring 2004 found 163 results for the key words 'political ecology'. The same search for the key words 'cultural ecology' retrieved 19 articles[1] (although much of what once would have been called cultural ecology is now labeled sustainability science or land change science). The movement toward self-identification under the label of political ecology is particularly strong among young scholars – suggesting that this field is only likely to become more dominant. Yet this shift has not been embraced without reservations by all scholars of human-environment relations in geography, and some of the reasons will be examined in this review.

While political ecology has thrived, its coherence as a field of study and its central intellectual contributions remain the subject of sometimes contentious debate. One of the recurrent, and unresolved, questions has been 'Where is the ecology in political ecology?'. Indeed, controversy has emerged about whether, in fact, the field has become 'politics without ecology' (Bassett and Zimmerer, 2004: 103). This brief review examines this question and argues that, despite the claims of critics, there is a great deal of research in political ecology that engages biophysical ecology as a central concern. However, as political ecology continues to expand in new directions, the degree to which it is likely to retain or enhance this engagement with ecology appears open to question. Given its present trajectory, it may be valid to ask whether the field is likely to (or even whether it *should*) retain a claim to its identity as political 'ecology' rather than a primarily social science/humanities study of environmental *politics*. This is a question that goes to the heart of tensions among scholars of political ecology and related areas of study about what (as critics have put the question) the field wishes to contribute, and to whom we wish to speak. As an increasingly dominant field of study of human-environment relations in contemporary geography, this is a question of considerable importance. Moreover, to the degree that human-environment relations are ascendant in contemporary geography (Turner, 2002), the future of political ecology is likely to have important implications for the future of geography as a whole.

After briefly sketching the roots and contemporary expressions of political ecology,

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this article turns to recent debates about the role of ecology in political ecology, assesses the merits of these arguments, and considers the implications for the subdiscipline and for the study of human-environment relations in geography broadly.

II Roots and branches

The roots of political ecology in ecological and social science are described by Paulson *et al.* (2003; also Peet and Watts, 1996). The ground from which political ecology first emerged in the 1970s (the first use of the term is often traced to Wolf, 1972) was defined by the confluence of cultural ecology (Steward, 1955), which linked human strategies of ecological success to cultural adaptation, with community ecology, cybernetics and systems theory (Odum, 1970; Bateson, 1972). Despite important differences, these areas of study shared a focus on flows of matter, energy and information within integrated human-environmental systems. Political ecology was also influenced by the hazards school (Burton *et al.*, 1978), with its focus on perception, adjustment and management of environmental hazards. The training of scholars in these fields and the intellectual orientation of these traditions strongly emphasized biological ecology and earth sciences (Butzer, 1989: 193).

By the 1970s, however, the utility of studies that applied theories of adaptive responses, organic analogies and behavioralism to local-scale human-environment interactions appeared in doubt in light of growing awareness of the integration of local societies into colonial and postcolonial global market economies. Responding to the resurgent Malthusian theories of global environmental crisis of the late 1960s, and deriving inspiration from peasant studies (Shanin, 1971) and Marxist theory (e.g., Frank, 1969; Wallerstein, 1974), early writings in political ecology focused on unequal power relations, conflict and cultural 'modernization' under a global capitalist political economy as key forces in reshaping and destabilizing human interactions with the physical environment. Whereas cultural ecology and systems theory emphasized adaptation and homeostasis, political ecology emphasized the role of political economy as a force of maladaptation and instability. Thus, in what is certainly the most widely cited statement of the principles of early political ecology, Blaikie and Brookfield (1987) defined the field this way: 'The phrase "political ecology" combines the concerns of ecology and a broadly defined political economy. Together this encompasses the constantly shifting dialectic between society and land-based resources, and also within classes and groups within society itself' (p. 17).

Blaikie and Brookfield identified key analytical approaches in political ecology, including a focus on the ways the environmental actions of the 'land manager' (usually understood as rural land users in the third world) are shaped by economic, ecological and political 'marginalization', 'pressure of production on resources' and flawed environmental data and policies that can be understood through 'chains of explanation'. The increased integration of third-world land users into global markets under unequal relations of power was viewed as undermining these land users' keen localized environmental knowledge and long histories of successful adaptation to sometimes harsh and unpredictable environments (e.g., Watts, 1983) – creating a 'situational rationality' that could potentially force land users to degrade their environments in acts of 'desperate ecocide' (Blaikie and Brookfield, 1987: 13). Such political-economic approaches in the 1980s and early 1990s largely defined what is now considered the 'structuralist' phase of political ecology.

Notably, research in this first phase of political ecology remained strongly tied to close examinations of biophysical ecological change. For example, Blaikie and Brookfield's (1987) foundational text emphasizes the role of the biological/biochemical and physical characteristics of particular environments (for example, on p. 9 they discuss in detail the relative impacts of erosion of oxisols and

ultisols on crop yields in Indonesia) in creating a variable management task for land users within the context of broader social and political economic conditions. Although it is rarely noted, the edited chapters that form the body of Blaikie and Brookfield's book focused on in-depth environmental histories and examinations of methods of environmental assessment that appear to owe much to established traditions of cultural ecology and ecological science. Indeed, this emphasis on detailed ecological analysis was characteristic of much of the political ecology of the 1980s and early 1990s.

For example, Stephen Bunker (1984) ties Marxist world systems and dependency theory to ecological systems theory to assess the flow of energy and matter from the global periphery to the core. Susanna Hecht (1985) examines the effects of cattle grazing on pH, calcium and magnesium, potassium, phosphorous, soil nitrogen and organic carbon in Amazon soils to assess the productivity and sustainability of the these soils under a political economy of ranching subsidies by the Brazilian government. In his landmark study of the role of the 'simple reproduction squeeze' (from Bernstein, 1979) in environmental degradation in West Africa, Michael Watts (1985) applies paleoclimatic data and local-level ecological analysis to critique then-prevailing theories of population- and drought-driven desertification, concluding that 'a form of economic disequilibrium in the socio-economic system is transmitted as a form of ecological disequilibrium' (p. 30). Thus, by treating ecology as the study of interactions between humans as living organisms and their biophysical environment, such studies would be clearly recognizable to most outside the subdiscipline as meriting the label political *ecology*.

In the 1990s, however, political ecology branched out in new directions in which the place of biophysical ecology became less central. Some scholars complained that the 'structuralist' political ecology of the 1980s, with its focus on the role of political economy in shaping the environmental decision-making of the 'land manager', was overly deterministic and provided remarkably little attention to *politics*. There was, in the memorable words of Michael Watts (1990), little attention given to 'the rough and tumble' of environmental politics (p. 129) – the actual day-to-day struggles over control of resources. Donald Moore (1993), for example, complained that the 'macrostructural frameworks' of political ecology in the 1980s 'elide[d] two critical factors . . . (1) the micropolitics of peasant struggles over access to productive resources, and (2) the symbolic contestations that *constitute* those struggles' (p. 381, emphasis in original). Thus, the 'poststructuralist' political ecology of the 1990s increasingly turned attention to local-level studies of environmental movements, discursive and symbolic politics, and the institutional nexus of power, knowledge and practice (Watts, 1997). With the new focus of 'political ecology' on *politics*, the role of *ecology* became, in the view of some critics, increasingly marginalized.

III Ecology in contemporary political ecology

Most notable among these critics are Pete Vayda and Brad Walters (1999), who argue that 'more attention to political influences on human/environment interactions and on environmental change is no doubt a good thing', however:

> some political ecologists do not even deal with literally the influence of politics in effecting environmental change but rather deal only with politics, albeit politics somehow related to the environment. Indeed, it may not be an exaggeration to say that overreaction to the 'ecology without politics' of three decades ago is resulting in a 'politics without ecology'. (p. 168)

Yet, in claiming a trend toward 'politics without ecology', Vayda and Walters present as evidence only two examples from political ecology in any detail – only one of which, Gezon (1997), they identify by name. Many political ecologists have responded by

suggesting that the accusation of 'politics without ecology' *is* an exaggeration; while some political ecology has indeed branched in directions that do not engage biophysical ecology or environmental change directly, the tradition of careful examination of environmental change (rooted in older cultural ecology) remains alive in political ecology today.

For example, among the studies in political ecology that directly engage ecology and environmental change through detailed empirical research is the work of Matthew Turner (1993), who challenges the conventional view that the size of livestock populations in West Africa is primarily determined by bioclimatic factors. Instead, Turner argues that livestock populations are determined largely by increased local demand for cattle resulting from shifting power relations between local cultural groups. Turner situates his research in the context of his own long-term empirical studies of the ecological impacts of grazing on the spatial distribution of plant nutrients (Turner, 1998a) and rangeland productivity (Turner, 1998b), which he integrates into his assessments of the ecological impacts of livestock management institutions (Turner, 1999a), class-based relations of labor availability for livestock herding (Turner, 1999b) and the role of shifting relations of power between male and female livestock owners on livestock species composition (Turner, 1999c). Ecologically grounded political ecology is also provided by Karl Zimmerer, whose meticulous research in the Peruvian and Bolivian Andes describes: how ecological conditions contribute to the persistence of peasant agriculture (1991); the impacts of changing labor conditions on soil erosion (1993a); how differing social perceptions of the causes of soil erosion influence conservation practice and environmental degradation (1993b); how simplistic agroecological models may undermine effective conservation policies (1999); and the ways in which multiscale social networks support conservation of agricultural biodiversity (2003). Indeed, Zimmerer defines political ecology as the study of the 'fusing of biogeophysical processes with broadly social ones' (2000a: 153). A similar approach is taken by Bassett and Zueli (2000), who challenge common environmental 'orthodoxies' in West Africa and argue that more rigorous research on environmental change dynamics is 'of utmost importance' (2000: 90).

Nevertheless, it is also true that some political ecologists do not engage questions of biophysical ecology or environmental change in more than a glancing manner. For example, in one of the most outstanding examples of high-quality ethnographic research in recent political ecology, Richard Schroeder (1999) critically evaluates how international agroforestry programs in The Gambia reshape village-level politics in ways that can undermine economic development for women. Schroeder shows how a shift of international development priorities during the 1980s and 1990s from women's market-gardening projects to agroforestry projects undermined women's access to land, reduced their capacity to earn much-needed cash, and imposed upon them new unpaid labor obligations in agroforestry projects. However, concerns about *environmental degradation* are discussed mainly as historical context for the agroforestry programs that set in motion the gendered social contests that are the book's main focus. Schroeder is largely silent, for example, on whether the conventional wisdom of a looming ecocatastrophe in the Gambia's future is real, or how the complex local politics that he brilliantly describes relate to these environmental questions. Similarly, Walker and Fortmann (2003; also Hurley and Walker, 2004) describe in detail the ways that competing 'environmental imaginaries' (Peet and Watts, 1996) tied to competing, fully modernized forms of rural capitalism engender fierce struggles over land-use planning in a gentrifying rural area of the California Sierra Nevada, but do not examine in depth how biophysical ecology shapes these struggles, nor how the outcomes of these struggles may

ultimately influence environmental change. Other examples of works in political ecology that focus on the exercise of power and access and control over resources without strong emphasis on ecology or environmental change include Carney and Watts (1990), Moore (1993; 1998), Braun (Willems-Braun, 1997; Braun and Castree, 1998) and McCarthy (1998; 2001).

From the standpoint of those concerned that political ecology is becoming 'politics without ecology', perhaps even more disturbing is the seeming indifference to this trend among some leading political ecologists. For example, at the 2004 annual conference of the Association of American Geographers, a panel session was devoted to examination of the future and prospects of cultural and political ecology.[2] In the session, panelists emphasized the importance of closer examination of: access to resources; space and scale; discourse; the relationships between empirical and theoretical knowledge; the need for a renewed emphasis on fieldwork; problems associated with social-deconstructionist approaches; the need to integrate political ecology with ecological modernization theory and environmental justice; the relation between conservation practice and neoliberalism; issues of security, violence and ethics; and questions of citizenship formation. Only one panelist made a direct appeal to bring biophysical ecology back to the center of political ecology. Another panelist, however, lamented that the increasing emphasis in political ecology on the social science/humanities interface and the relative decrease in emphasis on the interface between social science and natural science has marginalized the field in terms of its recognition outside academic geography and has diminished its capacity to contribute to solutions to environmental problems.

Moreover, when political ecologists do engage with concepts of ecology, they sometimes do so in ways that are perceived by biophysical ecologists as selective and ideologically driven. For example, theories of a 'new' nonequilibrium ecology have been popular during the poststructural turn in political ecology because the perceived debunking of long-standing models of 'climax' communities is said to illustrate the 'social framing' of science (Forsyth, 2003), and provides greater opportunities to address concerns of social justice by viewing human communities as contributors to ecological sustainability rather than as environmental threats (Leach and Mearns, 1996). Some political ecologists display a sophisticated understanding of nonequilibrium ecology (e.g., Zimmerer, 1994; 2000b), but others are faulted by ecologists for flawed and seemingly opportunistic use of ecological theory. For example, conservation biologist and environmental activist Michael Soulé (1995) argues that some social scientists in the social deconstructionist tradition use concepts of nonequilibrium ecology to give blanket justification to human disturbance, when in reality ecosystems that experience natural flux can also be compromised in ways that weaken their resilience (the capacity to regain key ecosystem functions following disturbance). Thus, most biophysical ecologists consider *both* equilibrium and nonequilibrium concepts essential to understanding ecosystem dynamics (Holling, 1986; Sprugel ,1991; Reice, 1994; Holling and Gunderson, 2002). Equilibrium (or 'climax') ecology remains a useful concept, a fact sometimes ignored by political ecologists. For example, the statement by Michael Watts (2003) that 'the new "non-equilibrium" ecology posits . . . that climax models of ecological stasis are unhelpful' (p. 9) risks oversimplifying and misrepresenting the state of modern ecological science, undermining the claim that contemporary political ecologists wish to engage seriously with ecological theory.

IV Discussion

Mark Twain reportedly once responded to news reports of his demise by quipping that 'rumors of my death have been greatly exaggerated'. The much-discussed demise of ecology in political ecology is likewise greatly

exaggerated. The most noted heralds of this alleged demise, Vayda and Walters (1999), state correctly that '*some*' political ecologists do not engage biophysical ecology, but incorrectly go on to intimate that political ecology has therefore become 'politics without ecology'. As this brief review has shown, this conclusion is plainly wrong. Or, more ominously, perhaps it is premature. The trajectory of research in political ecology has clearly moved in directions that call into question the centrality of biophysical ecology. What this means for the future of the field of political ecology – and for the study of human-environment relations in geography more generally – is a more difficult, and important, question.

Michael Watts (2003) offers an eloquent defense – even celebration – of the new directions in political ecology, in particular those that view 'environment' as a question of knowledge and representation *as well* as biophysical nature:

> A key question is, of course, what passes for the environment and what form nature takes as an object of scrutiny. And here Vayda and Walters display their own parochialism … For Vayda and Walters (1999) the *only* expression of environment can be the biophysical events of environmental change … But political ecology rests *on the dialectical and non-linear relations between Nature and Society* in which environment can be approached in a number of ways … what political ecology has done obviously is to open up the category of the environment itself and explore its multiform representations … Another way to approach the environment is to examine knowledge of the environment and why and how particular forms of knowledge predominate … (pp. 8–9, emphasis in original)

It is here – in questioning what constitutes 'environment' and 'ecology' – that one finds the nub of disagreement. While there is no question whatsoever that the poststructuralist turn in political ecology has been enormously productive in stimulating new ideas about environmental knowledge and representation (and, not unimportantly, in attracting many new scholars into the field), some critics complain that the biophysical environment in political ecology too often becomes 'simply a stage or arena in which struggles over resource access and control take place' (Zimmerer and Bassett, 2003: 3). Vayda and Walters (1999) are correct that in *some* political ecology the social and discursive politics of access and control over resources take center stage while the biophysical ecological implications of these struggles receive little explicit attention.

Whether this new direction in political ecology is to be celebrated or condemned is of course largely in the eye of the beholder, but it does raise significant questions about the goals and identity of the field that merit serious consideration.

One issue is a question of naming. Even those political ecologists who do not engage biophysical ecology as a central research question still invoke the 'concerns of ecology' (Blaikie and Brookfield, 1987: 17) as a defining question of their research (for example, see McCarthy, 2002: 1297; this definition is also reiterated in the poststructural political ecology of Peet and Watts, 1996). Yet, in much contemporary political ecology the 'concerns of ecology' ('ecology' is often used interchangeably with 'environment' and 'nature') become primarily questions of power, struggle and representation, while the connections of these struggles to the biophysical environment remain unexamined. Although this broadening of the definition of 'ecology' may appear entirely reasonable and constructive to many political ecologists, scholars of ecology and environmental science can perceive this as an act of discursive trespassing, marginalization and expropriation of intellectual terrain (social scientists are not alone in understanding that language is power!).

In the natural sciences, the term 'ecology' has a quite specific definition as the study of the interrelationships between living organisms and their physical environment. It is for this reason that Zimmerer and Bassett (2003), for example, distinguish between 'social-environmental interactions' and the themes of '"environmental politics" or

"politicized environment" that dominate current political ecology' (p. 3). Yet efforts to make such clear distinctions are rare in political ecology. Language and meaning are key themes of contemporary political ecology, making the scarcity of critical self-reflection on the semantic muddle of 'ecology', 'environment', 'nature' and social struggle difficult to defend. The multiple and sometimes conflicting meanings of 'ecology' in political ecology not only encourage lack of clarity about the goals of the field, but also provoke unnecessary and unproductive tensions with physical scientists who view the very loose uses of the term 'ecology' in political ecology as sloppiness, at best.

This issue of naming also relates to an unresolved and even more fundamental tension within political ecology over the goals and direction of the field. The central goal of the early political ecology was relatively clearly defined as the explanation of 'accelerated [environmental] degradation', calling for 'the combination of analytical tools of both the natural and social sciences' (Blaikie and Brookfield, 1987: xvii). By the mid-1990s, however, the field had expanded in so many new directions that '[p]olitical ecology has in a sense almost dissolved itself . . . as scholars have sought to extend its reach' (Watts, 2000: 592). To the degree the field retained any central, defining goal, it appeared to have shifted to the much broader social project of 'rais[ing] the emancipatory potential of environmental ideas and to engage directly with the larger landscape of debates over modernity, its institutions, and its knowledges' (Peet and Watts, 1996: 37). Concern emerged not only that political ecology suffered from incoherence and sprawl, but also that the shift of the field's defining question from environmental change to the emancipatory potential of *ideas* of environment would further marginalize scholarship – and scholars – that seek to engage biophysical ecology as a central theme of political ecology. In 2002, for example, an unfortunate (and partly accidental) exchange of opinions via electronic mail on the list serve for the Association of American Geographers' specialty group that includes political ecology revealed starkly the poorly kept secret that some scholars who adhere to the older environmental-change traditions in cultural and political ecology perceive the conceptual shift not as a *broadening* of the field, but as a dismissal by many in the field of these older traditions.

Whether real or perceived, the internal frictions over this issue should be a matter of great concern for the future of political ecology. Clearly some of the greatest contributions to knowledge in political ecology derive from successes in combining the strengths of social and biophysical ecological theory. For example, political ecology first came to prominence in part by riding a wave of interest among academics and the general public in high-profile environmental problems such as soil erosion (Blaikie, 1985) and tropical deforestation (Hecht and Cockburn, 1990). The works of Melissa Leach (e.g., Fairhead and Leach, 1995; Leach and Mearns, 1996), which critically but directly engage theories of biophysical ecology, have been among the few that have crossed over into mainstream environmental science (for example, as required reading in some graduate programs). Though not without their own critics, these successes were achieved by engaging studies of the natural environment that are of great public concern. If, as the example of the electronic mail discussion (above) suggests, those who practice biophysical ecology perceive that their contributions are not highly valued in political ecology, this may represent a serious threat to the long-term success of the field, *especially* for recruiting younger scholars with training and interests in the natural sciences (it should be a cause for considerable concern that few of the young scholars entering political ecology today have extensive scientific or ecological training).

Advocates of the recent shifts in political ecology will justifiably argue that the existence of ecologically based political-ecology

studies such as those described earlier in this essay proves the point that political ecology *is* inclusive, but the continuing trajectory of the field toward greater emphasis on the social sphere (Bassett and Zimmerer, 2004) does raise valid concerns. Political ecology is today's most prominent inheritor of traditions in geography with deep historical roots in the study of *both* biophysical ecology and social science. This rich genealogy represents a gift and a responsibility: even the possibility that biophysical ecology may become crowded out of this field should be cause for mature collective reflection, not adversarial bickering. If, as most political ecologists proclaim, the field should remain broad, inclusive and integrative, some of the recent incendiary language on *both* sides of the issue (e.g., Vayda and Walters, 1999; Watts, 2003) does not seem to further this goal.

This is an issue of more than academic concern: as Forsyth (2003) emphatically states, environmental problems *do* exist, and, while we should be critical of some environmental science, environmental problems of major proportions do in many cases threaten both people and ecosystems. Political ecology, as a field of enormous intellectual vibrancy and momentum, is positioned to make uniquely valuable contributions to understanding these threats – *and* to enhancing the prominence of the discipline of geography as a player in addressing these issues of major public concern. The ongoing low-intensity warfare between 'politics' and 'ecology' in political ecology – or, simply, the failure to provide an intellectual environment that nurtures the integration of ecological and social science – does this cause no good.

The path toward a modern political ecology – with all its important advances in understanding social and discursive struggles over resources – that retains biophysical ecology as a central research theme has already been at least partly mapped. For example, leading scholars such as Zimmerer and Bassett (2003) encourage political ecologists to be 'inveterate weavers of analysis that . . . bridge[s] the social and biogeophysical sciences', and to use these other sciences in a manner that is 'well-informed rather than perfunctory' (p. 276). Forsyth (2003) outlines the ways critical-realist and poststructural political ecology can contribute to a more 'democratized' and socially relevant environmental science (for example, through 'hybrid science' – see Batterbury *et al.*, 1997). These approaches do not retreat in any way from social theory, but continue to place biophysical ecology and environmental science at the center of analysis. As the field expands in new directions, it will be important to ask whether such approaches will contribute to a political ecology that places a revitalized engagement of social science and biophysical ecology at the core of its identity, or whether such ecologically engaged research will be only one thread in a broader tapestry. This is a question that looks to both the history and future of the field: it asks us to consider the implications of a significant break from a tradition strongly rooted in questions of biophysical ecology; and it ponders the place of political ecology (and studies of human-environment relations in geography more generally) in a world where, as Zimmerer and Bassett (2003) put it, 'ecological science continues to expand worldwide . . . [and] where it is a source of information and a claim to power and influence' (p. 281).

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Notes

1. Search conducted on 22 May 2004 using the Ovid Current Contents database journal articles in the physical, social and biological sciences, the arts, humanities and other fields from over 7500 journals. All major journals of geography and interdisciplinary journals commonly used by geographers were included (for example, *Society and Natural Resources, Human Ecology, Human Organization, Environment and Planning*). Note that journals specific to anthropology were *not* included. While political ecology research in geography

and anthropology overlap considerably, distinctive identities and trends within these subdisciplines remain.

2. Panel session: *Cultural and Political Ecology at the AAG Century Mark II: Futures and Prospects* (sponsored by *Cultural Ecology Specialty Group*) 16 March 2004.

References

Bassett, T.J. and **Zueli, K.B.** 2000: Environmental discourses and the Ivorian Savanna. *Annals of the Association of American Geographers* 90, 67–95.

Bassett, T.J. and **Zimmerer, K.S.** 2004: Cultural ecology. In Gaile, G. and Willmott, C., editors, *Geography in America at the dawn of the twenty-first century*, Oxford: Oxford University Press.

Bateson, G. 1972: *Steps to an ecology of mind; collected essays in anthropology, psychiatry, evolution, and epistemology*. Chandler Publications for Health Sciences. San Francisco, CA: Chandler.

Batterbury, S., Forsyth, T. and **Thomson, K.** 1997: Environmental transformations in developing countries: hybrid research and democratic policy. *Geographical Journal* 163, 126–32.

Bernstein, H. 1979: African peasantries: a theoretical framework. *Journal of Peasant Studies* 6, 420–43.

Blaikie, P.M. 1985: *The political economy of soil erosion in developing countries*. New York: Wiley.

Blaikie, P.M. and **Brookfield, H.,** editors 1987: *Land degradation and society*. London and New York: Methuen.

Braun, B. and **Castree, N.** 1998: *Remaking reality: nature at the millennium*. London: Routledge.

Bunker, S.G. 1984: Modes of extraction, unequal exchange and the progressive underdevelopment of the extreme periphery: the Brazilian Amazon, 1600–1980. *American Journal of Sociology* 89, 1017–64.

Burton, I., Kates, R.W. and **White, G.F.** 1978: *The environment as hazard*. New York: Oxford University Press.

Butzer, K. 1989: Cultural ecology. In Gaile, G. and Willmott, C., editors, *Geography in America*, Columbus, OH: Merrill Publishing Co.

Carney, J. and **Watts, M.** 1990: Manufacturing dissent: work, gender, and the politics of meaning in a peasant society. *Africa* 60, 207–41.

Fairhead, J. and **Leach, M.** 1995: False history, complicit social analysis: rethinking some West African environmental narratives. *World Development* 23, 1023–35.

Forsyth, T. 2003: *Critical political ecology: the politics of environmental science*. London: Routledge.

Frank, A.G. 1969: *Capitalism and underdevelopment in Latin America: historical studies of Chile and Brazil* (First Modern Reader paperback edition). New York: Monthly Review Press.

Gezon, L.L. 1997: Political ecology and conflict in Ankarana, Madagascar. *Ethnology* 36(2), 85–100.

Hecht, S.B. 1985: Environment, development, and politics: capital accumulation and the livestock sector in Eastern Amazonia. *World Development* 13, 663–84.

Hecht, S.B. and **Cockburn, A.** 1990: *The fate of the forest: developers, destroyers, and defenders of the Amazon*. New York: Harper Perennial.

Holling, C.S. 1986: Resilience of ecosystems: local surprise and global change. In Clark, W.C. and Munn, R.E., editors, *Sustainable development and the biosphere*, Cambridge: Cambridge University Press.

Holling, C.S. and **Gunderson, L.H.** 2002: Resilience and adaptive cycles. In Holling, C.S. and Gunderson, L.H., editors, *Panarchy: understanding transformations in human and natural systems*, Washington, DC: Island Press.

Hurley, P.T. and **Walker, P.A.** 2004: Whose vision? the political ecology of land use planning in Nevada County, California. *Environment and Planning A* 36, 1529–47.

Leach, M. and **Mearns, R.** 1996: *The lie of the land: challenging received wisdom on the African environment*. London: James Currey.

McCarthy, J.P. 1998: Environmentalism, Wise Use and the nature of accumulation in the rural West. In Braun, B. and Castree, N., editors, *Remaking reality: nature at the millennium*, London and New York: Routledge.

— 2001: Environmental enclosures and the state of nature in the American West. In Watts, M.J. and Peluso, N.L., editors, *Violent environments*, Ithaca, NY: Cornell University Press.

— 2002: First World political ecology: lessons from the Wise Use movement. *Environment and Planning* A 34, 1281–302.

Moore, D.S. 1993: Contesting terrain in Zimbabwe's Eastern Highlands: political ecology, ethnography, and peasant resource struggles. *Economic Geography* 69, 380–401.

— 1998: Subaltern struggles and the politics of place: remapping resistance in Zimbabwe's Eastern Highlands. *Cultural Anthropology* 13, 344–81.

Odum, H.T. 1970: *Environment, power, and society*. New York: Wiley-Interscience.

Paulson, S., Gezon, L.L. and **Watts, M.** 2003: Locating the political in political ecology: an introduction. *Human Organization* 62, 205–17.

Peet, R. and **Watts, M.** 1996: *Liberation ecologies: environment, development, social movements*. London: Routledge.

Reice, S.R. 1994: Nonequilibrium determinants of biological community structure – biological communities are always recovering from the last disturbance – disturbance and heterogeneity, not equilibrium, generate biodiversity. *American Scientist* 82, 424–35.

Schroeder, R.A. 1999: *Shady practices: agroforestry and gender politics in The Gambia*. Berkeley, CA: University of California Press.

Shanin, T. 1971: *Peasants and peasant societies; selected readings*. Harmondsworth: Penguin.

Soulé, M. 1995: The social siege of nature. In Soulé, M. and Lease, G., editors, *Reinventing nature?*, Washington, DC: Island Press.

Sprugel, D.G. 1991: Disturbance, equilibrium, and environmental variability: what is 'natural' vegetation in a changing environment? *Biological Conservation* 58, 1–18.

Steward, J.H. 1955: *Theory of cultural change*. Urbana: University of Illinois.

Turner, B.L. 2002. Contested identities: human-environment geography and disciplinary implications in a restructuring academy. *Annals of the Association of American Geographers* 92, 52–74.

Turner, M.D. 1993: Overstocking the range: a critical analysis of the environmental science of Sahelian pastoralism. *Economic Geography* 69, 402–21.

— 1998a: Long-term effects of daily grazing orbits on nutrient availability in Sahelian West Africa: 1. Gradients in the chemical composition of rangeland soils and vegetation. *Journal of Biogeography* 25, 669–82.

— 1998b: Long-term effects of daily grazing orbits on nutrient availability in Sahelian West Africa: 2. Effects of a phosphorus gradient on spatial patterns of annual grassland production. *Journal of Biogeography* 25, 683–94.

— 1999a: Conflict, environmental change, and social institutions in dryland Africa: limitations of the community resource management approach. *Society and Natural Resources* 12, 643–57.

— 1999b: Labor process and the environment: the effects of labor availability and compensation on the quality of herding in the Sahel. *Human Ecology* 27, 267–96.

— 1999c: Merging local and regional analyses of land-use change: the case of livestock in the Sahel. *Annals of the Association of American Geographers* 89, 191–219.

Vayda, A.P. and **Walters, B.B.** 1999: Against political ecology. *Human Ecology* 27, 167–79.

Walker, P.A. and **Fortmann, L.P.** 2003: Whose landscape? A political ecology of the 'exurban' Sierra. *Cultural Geographies* 10, 469–91.

Wallerstein, I.M. 1974: *The modern world-system* (two volumes). New York: Academic Press.

Watts, M.J. 1983: *Silent violence: food, famine and peasantry in northern Nigeria*. Berkeley, CA: University of California Press.

— 1985: Social theory and environmental degradation: the case of Sudano-Sahelian West Africa. In Gradus, Y., editor, *Desert development: man and technology in sparselands*, Dordrecht: D. Reidel.

— 1990: Review of land degradation and society, by Piers Blaikie and Harold Brookfield, 1987. *Capitalism, Nature, Socialism* 4, 123–31.

— 1997: Classics in human geography revisited: P.M. Blaikie: *The political economy of soil erosion in developing countries*. *Progress in Human Geography* 21, 75–80.

— 2000: Political ecology. In Johnston, R.J., Gregory, D. Pratt, G. and Watts, M.J., editors, *Dictionary of human geography*, Oxford: Blackwell.

— 2003: For political ecology. Unpublished manuscript, University of California, Berkeley.

Willems-Braun, B. 1997: Buried epistemologies: the politics of nature in (post)colonial British Columbia. *Annals of the Association of American Geographers* 87, 3–31.

Wolf, E. 1972: Ownership and political ecology. *Anthropological Quarterly* 45, 201–05.

Zimmerer, K.S. 1991: Wetland production and smallholder persistence – agricultural change in a highland Peruvian region. *Annals of the Association of American Geographers* 81, 443–63.

— 1993a: Soil erosion and labor shortages in the Andes with special reference to Bolivia, 1953–91 – implications for conservation-with-development. *World Development* 21, 1659–75.

— 1993b: Soil erosion and social (dis)courses in Cochabamba, Bolivia: perceiving the nature of environmental degradation. *Economic Geography* 69, 312–27.

— 1994: Human geography and the new ecology – the prospect and promise of integration. *Annals of the Association of American Geographers* 84, 108–25.

— 1999: Overlapping patchworks of mountain agriculture in Peru and Bolivia: toward a regional-global landscape model. *Human Ecology* 27, 135–65.

— 2000a: Rescaling irrigation in Latin America: the cultural images and political ecology of water resources. *Ecumene* 7, 150–75.

— 2000b: The reworking of conservation geographies: nonequilibrium landscapes and nature-society hybrids. *Annals of the Association of American Geographers* 90, 356–69.

— 2003: Geographies of seed networks for food plants (potato, ulluco) and approaches to agrobiodiversity conservation in the Andean countries. *Society and Natural Resources* 16, 583–601.

Zimmerer, K.S. and **Bassett, T.J.** 2003: *Political ecology: an integrative approach to geography and environment-development studies*. New York: Guilford Press.