CRITICAL INTRODUCTIONS TO GEOGRAPHY

Paul Robbins

Political Ecology

Second Edition

Political Ecology

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Political Ecology

A Critical Introduction

Second Edition

Paul Robbins

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Preface to the Second Edition

The seven years between the first edition and this one have made the relevance and urgency of political ecology a difficult thing to determine. On the one hand, the field has grown so dramatically, and in so many directions, that it is even easier to say of this contested enterprise that it has become too diffuse to matter. References to "political ecology" in the Web of Science database have more than doubled in the intervening years but now reflect a huge range of approaches. One might think that political ecology has finally "jumped the shark," a phrase from the television industry suggesting the creative end of a franchise. I am sympathetic with those who may hurriedly wish to get on with the "next thing" as well as those who are still not sure what political ecology is, let alone whether it has a purchase on a special kind of explanation.

And yet if political ecology is no longer relevant, *no one bothered to tell the world*. The horrifying 2004 tsunami revealed structures of vulnerability that demand structural analysis. The summer monsoon of 2010 swept away hundreds of thousands of people in Pakistan, in a floodplain perfectly engineered to reduce the year-to-year hazard of flooding in defense of cash crop production, while increasing the decade-to-decade probability of human tragedy on an unimaginable scale. Areas gazetted for conservation mushroomed in recent years without consensus on how to deal with the displacement of people and loss of productive resources this entails. Mining concessions have ballooned on indigenous land. The world got warmer.

And Hurricane Katrina in 2005 came closer than perhaps any other single event of recent memory to tear back the veil on the structural inequalities of race and class in the United States, which are physically inscribed into the seascape, implicated in the ecological transformation of the coastal zone, and inseparably linked to the technologies that govern the flow of water through the Mississippi delta. That event came *closer*, but clearly not yet close enough. There is simply no way to pass through that obscure barrier without continuing to research, produce videos on, analyze, ecologically track, and mount soap boxes to shout about the swirling political and economic relationships that dialectically produce levees and slums, soils and dams, tourism and hunger, energy and climate, people and things. I am forced to conclude that there is as much or more need for political ecology

now than seven years ago, and the revised version of the book you have in your hands is the result.

Those familiar with the first edition will notice that changes in the book are numerous, but made in a judicious attempt not to throw in the "kitchen sink." I have attempted to update examples but many cases continue to draw on the canon from the field. I have added discussions of emerging traditions, including urban ecology and actor-networks, but not to the detail that they might receive elsewhere. Many new boxes have been added, including key recent works, but necessarily at the expense of some important older work. I have added a chapter (Chapter 7) engaging both land change science and the challenge of causal explanation approaches. I have introduced what I observe as a recent fifth "thesis" in the field, concerning the political-ecological status of non-humans (Chapter 12). But in the largest departure from my original effort, I have tried to stress that political ecology is not a method or a theory, nor even a single perspective. Rather, I suggest, political ecology is an urgent kind of argument or text (or book, or mural, or movie, or blog) that examines winners and losers, is narrated using dialectics, begins and/or ends in a contradiction, and surveys both the status of nature and stories about the status of nature (Chapter 4).

In light of this last revelation, I have tried to resolve the issue that seemed to bother many commentators: the insistence that I am not a political ecologist. I maintain that, insofar as political ecology is the characteristic of a text, one might be a political ecologist only in the same way those who consistently and exclusively write gothic novels might be considered gothic novelists. But this should not encourage any of us – whoever we are or whatever we do – to shy away from researching, reading, writing, and witnessing political ecologies, whenever or wherever it is scientifically enlightening or socially and environmentally urgent. One need not be a political ecologist to mobilize the resources, or learn from the insights, of political ecology.

Many Acknowledgments

Writing requires a rare space that is comfortable and intellectually challenging. I've been lucky to have two such spaces. Thanks to Ohio State University Geography and Larry Brown for my first intellectual home and to University of Arizona Geography and Development, John Paul Jones, and Sallie Marston for my second.

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Most importantly, throughout the whole process Sarah Moore continued to insist not only that the book would eventually get finished (despite my strong doubts) but that at least one person would eventually agree to read it; her comments on and support for my writing have saved a great many confusions and embarrassments over the years (the word "penultimate" means next to last, for example; who knew?). Her knowledge of the politics of waste and consumption was invaluable and her contributions are evident throughout this edition. Having said this, the interpretations and perspectives contained within the book are my own, and I certainly can't lay blame at anyone else's feet for controversial, confusing, or bizarre claims. The reader will have to address any complaints to me.

Paul Robbins, August 2011

Introduction

- The Goals of the Text
- The Rest of the Book

I am standing in a smoldering dumpsite, watching a small army of people disassemble radios. This pile of electronic trash has been dumped in the Agbogbloshie neighborhood of Accra, Ghana, a slum infamous for its role in processing tons of waste that are gathered here from around the world, from baby chairs and truck engines to radios and computers (Figure I.1). Looking across the scene, several somewhat contradictory things pass through my mind.

First, the many violent ecologies of global inequality are on display here. From where I stand, I can smell the pall of smoke rising from a vessel sitting over a small open fire, filled with melting lead, distilled by hand from batteries scavenged from countless devices littering the scene. The smoke, along with that from plastics, as well as rubber from wires burned to recycle the copper within, blackens the faces of the workers bent over these conflagrations and drifts over the scene. It darkens the sky over the nearby neighborhood where children are playing in the streets and where dinner is being prepared in countless open pots. The waterway that separates the worksite from the adjacent sea of informal businesses and housing, assembled in a jumble along its length, is green with sewage. The mountains

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Figure I.1 Residents of a slum in Accra, Ghana, buy, sort, and process hazardous materials and ewaste. Wires are burned and fused while battery lead is melted by hand for resale.

of trash, my hosts explain to me, include huge quantities of materials imported, legally and illegally, into the country. The ecology of the scene is rooted in a far-ranging politics of waste disposal, with unquestionably grim implications for local environments and residents.

It is hard not to notice, however, incredible technical inventiveness, ecological knowledge, and economic innovation on display here as well. Trucks of junk have been directed here by local team-leaders, who bid for access to shipping containers that make their way to the distant dockyards from China and the Americas. These teams together organize labor to disassemble and process the materials for sale to middlemen, whose massive industrial scales are positioned along the perimeter of the dumpsite, awaiting negotiations over prices of copper, lead, and steel. The men at work prying apart circuit boards and stripping components out of relict computers quickly sort materials that can be easily resold or refurbished from those that must be processed. They have a terrific grasp of the workings of the electronics, as well as the obsolescence of its components. The melting of lead is a delicate operation, conducted by people who can sift off materials for match-heads and purify the element to satisfy buyers. This is done with such efficiency, I am told, that the site can make a mountain of computers disappear in months or weeks. Livelihoods are being practiced in this landscape, by people who sometimes lack a grade

school education, but who possess far-ranging knowledge of markets, chemistry, and engineering.[1]

But one more thing is drawn to my attention: the radios are totally unused. As one worker pulls square angles of Styrofoam from their boxes and threads these along a length of twine, it becomes clear that these hundreds of music players have arrived on site encased in the very packaging in which they left their factory in China. This final fact changes the scene in an inexplicable way. Rather than the necessary outcome of contemporary consumer society and an unfortunate inevitability of modern life (someone "has to" process waste after all!), the ingenious workers of Agbogbloshie appear as part of a bizarre engine that maintains a self-replicating worldwide system of over-production. Oceans of organic and inorganic material are drawn from the earth and flow into an enormous feeding machine that re-forms them into myriad configurations (refrigerators, televisions, printers), devours energy in their transportation across the globe, and then summarily dumps them here, unused, in this deadly metabolic intestine of labor. There is Wonderland logic at work here that could only be considered comic if the human and environmental price was not so obviously high.

These three moments point to a convergence of things and people, which raise normative questions of basic justice and fairness, present daunting instances of human genius, and look out onto landscapes of irony and paradox. They are driven by a worldwide engine of economic exchange but reconciled by regional actors and metabolized in local soils and local bodies. They are highly technical problems but ones commanded by formidable systems of indigenous knowledge. They contradictorily suggest grossly unfair outcomes but retain openings for ingenuity and survival. They also demand different kinds of research and theory to fully understand, from the technical assessment of air and waterborne lead particles and the extensive study of electronics markets, to intensive survey of informally constituted local labor systems and institutions of redistribution. This dump might tell a number of interlaced and urgent stories.

This book is an effort to survey these kinds of contending tales and to describe the hard work that underlies researching and telling them well. By introducing *political ecology*, a field that seeks to unravel the political forces at work in environmental access, management, and transformation, I hope to demonstrate the way that politics is inevitably ecological and that ecology is inherently political. But more than this, I intend to show that research in the field can shed light on environmental change and dynamism, thereby addressing not only the practical problems of equity and sustainability, but also basic questions in environmental science.

The normative goal of the book is not over-ambitious. By explaining and constructively exploring the body of research sometimes called political ecology, I intend only to clarify the most persuasive themes in a highly disparate body of writing and show the politics of nature to be both universal and immediate. This, I think, may make a small contribution to helping us all break from an image of a world where the human and the non-human are disconnected, a fiction that remains so stubborn a part of our modern reasoning that it is as difficult to unimagine as it is to picture a world without patriarchy or class.

[1]The intricate details of this economy have been more exhaustively described by Martin Oteng-Ababio in his many articles, including: Oteng-Ababio, M. (2010) E-waste: An emerging challenge to solid waste management in Ghana. *International Development Planning Review*, 32 (2), 191–206.

I believe, however, that an alternative picture, where nature and society are undivided, is as much an act of remembering as one of inventing. Since the popular environmental movement has already done such an admirable job of getting many of us started, it may only be a matter of completing the revolution by rendering it more explicitly political.

It is my hope, therefore, that though this book is aimed at an academic audience, it presents the claims of the field in a plain enough way that picnickers, hikers, and hummingbird watchers can find in it a compelling argument for the way their concerns are implicated in those of working communities, disenfranchised minorities, and subsistence producers around the world. In this sense the book departs from some theoretical and programmatic approaches to the politics of nature, especially those that eschew alliances with traditional environmental movements. This rejection of "bourgeois" environmentalism, a hallmark of some political economic approaches to nature, is both shortsighted and impractical; what more radical challenge to the political economic status quo exists in US law than the Endangered Species Act?

Having said this, it is also my goal to persuade those concerned about the condition of forests, the threat of climate change, and the fate of wild animals that it is no blasphemy to admit that the world is crafted by political forces and human industry, even and especially those dearly held wildernesses that sell so many Sierra Club calendars. At the same time I hope to encourage those concerned with more traditional political economy that an increased sensitivity to the influence (and perhaps even the interests) of non-humans is essential for better politics, explanation, and ethics. The potential power of a popularized political ecology is so great, in fact, that merely shedding a few tightly clasped shibboleths on either side might make way for a very new world, emerging from these dark times when progressive politics in both human and non-human realms seem so painfully paralyzed.

The Goals of the Text

It would be impossible to survey the field of political ecology in its entirety. The contributors are too many, the breadth of topics too vast, and the regional diversity too great. I do not, therefore, intend here to provide exhaustive case studies of political ecological research (see especially Peet and Watts 1996a and Peet, Robbins, and Watts 2010) or a general account of the relationship between science and politics (Forsyth 2003), since this is a task well performed by others. Nor can I place this field and approach within the longer history of geographic science in more than a cursory way, though there are other excellent sources for this (Castree 2005, 2011 (forthcoming)). Neither do I intend to survey the world system as a whole, pointing to the processes, players, and dynamics that are at work politicizing the natural environment. Many excellent books survey the condition of global debt, the position of local producers in commodity markets, and the dwindling power of the state in managing nature (Sheppard et al. 2009 and Bryant and Bailey 1997).

Rather, I intend to do something different here. Whereas most summary texts on the state of global political ecology are designed to show political ecology as a body of knowledge, this book is designed also to show political ecology as *something people do*. And whereas collected volumes highlight a number of separate and distinct cases, this book also gropes for *common questions* that underlie them. Finally, where some work highlights the

field as a specific approach, I suggest instead that it constitutes a *community of practice* and characterizes a *certain kind of text*, albeit an extremely valuable one.

The book is also designed to serve as an introduction and companion volume to the key books, articles, arguments, and research statements that make up the core of the field, and should serve to introduce any interested party to its major works and contested ideas. In this regard, it is offered as a remedy for the purported problem that the field is so fragmented that citation in it, as senior political ecologist Piers Blaikie once remarked, "is largely a random affair."

But more than this, the book is a critical review of the work that goes on in the field, one that advocates a very particular vision of which approaches work and which do not and which lines of inquiry have the most political and analytic power and which do not. In the process, I further hope that the book reveals areas where the field might yet improve its analytical tools. I hope to show, notably, that political ecological analysis and argument have shifted from a focus on the destruction of environments, with a stress on human influences, to a more powerful focus on the production of socio-environments and their co-constitution by many kinds of human and non-human actors. Even so, the book will suggest that there may and must be ways to move "beyond" political ecology or to leverage political ecological texts to better effect. Even while showing the strength of the approach, therefore, the book is written to demonstrate weaknesses, while pointing the way forward towards a more coherent and simultaneously more critical way of doing research.

I will not provide and rehearse, however, the laundry list of more typically pronounced criticisms often made of the field – usually centered on the fact that it is too focused on the broadly defined "underdeveloped world" and that it is too "rural" in character. This is true, but such biases, as discussed here, grow quite inevitably from the professional and intellectual seeds from which the tree of political ecology sprouted – critical development research, peasant studies, environmental history, cultural ecology, and postcolonial theory. We have already seen in the past few years how political ecology has become more symmetrically concerned with the traditionally defined "first world" and urban areas and issues. This change has not guaranteed, however, that its approaches have become more coherent, or that the use of either ecological science or critical deconstruction has been managed with greater rigor. These explanatory problems, I argue, are prior to and more important than the specific topical and regional choices made in research.

The Rest of the Book

The remainder of this book directs itself to describing political ecology as a set of grounded arguments, attempting to show what makes political ecology researchers tick, what makes their work urgent to them, and what useful lessons they have provided for addressing important questions.

In Part I, I describe how political ecology came to be the way it is, with its inherent possibilities and limits. Chapter 1 introduces the term political ecology, distinguishing it from apolitical ecologies of various kinds, and showing a unity of practice amidst much diversity of thought. Chapter 2 reviews the deep roots of this line of inquiry, arguing that political ecologists have been around a very long time. Chapter 3 describes the

historical development of a critical science of the environment, showing the disparate fields and eclectic tools that converged in the last three decades of the twentieth century to give greater analytical form to the field. This chapter is dense with history and referencing, but is intended to be a source to which the reader can return. Chapter 4 draws this opening section to a close to stress the common character of diverse political ecological texts: they stress winners and losers, are narrated with dialectics, begin or end from contradictions, and stress simultaneously the politicized state of the environment and the politicized nature of accounts about the state of the environment.

The three chapters in Part II review challenges to the field from a range of sources. Chapter 5 examines challenges from ecology, and the question of environmental change as environmental degradation or destruction, while Chapter 6 attends to challenges in the way researchers have considered the environment to be imaginary or constructed. Chapter 7 examines other approaches to nature/society study, including those in "land change science" and those from the perspective that stresses "causal" explanation. These approaches are shown to provide useful, indeed critical, lessons for political ecology, while at the same time they continue to reflect and reinforce some problems political ecology has evolved to address.

Part III examines five central theses of political ecological research, each in its own chapter, which I describe as 8) degradation and marginalization, 9) conservation and control, 10) environmental conflict and exclusion, 11) environmental subjects and identity, and 12) political objects and actors. The case materials in each chapter are selected to represent a range of research regions across the world, including cases from the "developed" and "underdeveloped" worlds. The biases of my training and experience will be evident throughout. The research described comes predominantly from the discipline of geography, though it is coupled with work in environmental history, development studies, anthropology, and sociology. While I have tried to include examples from both the global north and south, including cases from North and South America, Africa, and Asia, I have mentioned nothing of Western or Eastern Europe or of Australia. Research and theory in English predominates in the volume, despite the strong parallel threads of Francophone political ecology (Whiteside 2002; see also the forthcoming volume in French by Gautier and Benjaminsen (2012, forthcoming). Referencing of North American work somewhat outweighs that from other places. Finally, numerous international case examples were cut in final editing, owing to a lack of space.

Each of the chapters in this section also includes case histories of how, in my own work, I have tried to do research, and how on many occasions I have been tripped up by hidden pitfalls. These sections only reflect what I have done in research rather than what political ecologists have done more generally, but I think my methodological choices are not unique and the problems I have faced are common not only to political ecology, but to much research in general.

The conclusions in Part IV will critically evaluate the status of the field and point to ways political ecology can expand and improve. My central argument here is that, dominated by a certain kind of argument and rooted in case studies, political ecology needs to reach increasingly both outward to a more synthetic global politics (briefly reflecting on the case of climate change) and inward to a highly immersive form of practice (briefly considering the question of school gardening).

Scattered throughout the text are boxed critical summaries of important individual contributions to political ecology and the people who made them. These are based on my own reading, but wherever possible these also include direct reflections and responses from those authors kind enough to provide them.

The sum of the effort can only be said to give the reader a "feel" for a field of practice that certainly has come to be influential and whose reach has arguably crossed many social and environmental sciences. Curiously, however, for a field of this stature, it seems odd that political ecology is so hard to define! We first must attend to why this might be so.

Part I
What is Political Ecology?

In which eclectic uses of the term "political ecology" are introduced and wherein much divergent research is shown to share an intellectual history, a community of practice, and a certain kind of text. Rather than finding a single body of theory, we discover instead a number of independent trains of thought colliding in the field, leading to a remarkable synthesis in the late twentieth century.

Chapter 1

Political versus Apolitical Ecologies

- What is Political Ecology?
- Five Dominant Narratives in Political Ecology

For many of us who are unable to travel to the plains of East Africa, our images of the region are given life on late-night cable wildlife television, in bold IMAX presentations at natural history museums, or perhaps in the vivid spectacle of Disney's *The Lion King*. The imagined patterns of the "circle of life" in these media – complete with lions, hyenas, and baboons – play out on a yellow-filtered savanna where migrations of wildebeest cross the Serengeti chasing seasonal rainfall, hunted in turn by stoic predators. The scenes are compelling and they inspire in us a justifiable affection for the beauty and complexity of the non-human world around us. These images are also ecologically important, since they give us a picture of connectedness, which is essential to understanding life on the savanna. Across the borderlands of Kenya and Tanzania forage grasses follow rainfall, wildebeest pursue forage, predators pursue wildebeest, scavengers pursue predators, and so on.

The absence of people from these imaginary landscapes seems in no way strange for most of us; these are *natural* landscapes, apparently far from farms, factories, and the depredations of humankind. It is perhaps inevitable, therefore, that an intuitive reaction to the news that wildlife populations are in crisis – including declines in giraffe, topi, buffalo, warthog, gazelle, and eland – is to imagine that the intrusion of humankind into the system is the cause of the problem. Growing populations of impoverished African

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Figure 1.1 Wildebeest crossing the Mara River in Kenya. The migration of wild animals across the region occurs amidst a fully humanized and highly political environment. Photo © Paul Banton / Shutterstock.

people, we might imagine, have contaminated the natural rhythm of the wilderness. Indeed, the sense of loss in contemplating the declining biodiversity and destroyed landscapes may inspire frustration, coupled with a feeling of helplessness; the situation in the Serengeti and the steady march of growing populations seem far beyond the control and influence of life where we live.

Stepping back from the savanna, however, and gazing across the Serengeti–Mara ecosystem both in time and in space, habitat loss and wildlife decline appear more complex and more connected to the daily lives and routines of urban people in the developed world. Cross-border analysis shows that the decline in habitat and wildlife in Kenya is far higher than in Tanzania. Why? Rainfall, human population, and livestock numbers do not differ significantly. Rather, private holdings and investment in export cereal grains on the Kenyan side of the border have led to intensive cropping and the decline of habitat. These cereals are consumed around the world, as part of an increasingly globalized food economy. As Kenya is increasingly linked to these global markets and as pressure on local producers increases, habitat loss is accelerated. Less developed agricultural markets and less fully privatized land tenure systems in Tanzania mean less pressure on wildlife. The wildlife crisis in East Africa is more political and economic than demographic (Homewood et al. 2001).

These facts undermine widely held apolitical views about ecological relations in one of the most high-profile wildlife habitats in the world. They also point to faulty assumptions about the nature of "wild" Africa. Firstly, the image of a Serengeti without people is a fallacious one. The Masai people and their ancestors inhabited the Central Rift Valley for thousands of years before European contact, living in and around wildlife for generations. Indeed, their removal from wildlife park areas has led to violent conflicts (Collett 1987). More generally, the isolation of these places is also a mistaken perception. Export crops from Kenya, including tea and coffee in other parts of

Kenya beyond the Central Rift Valley, continue to find their way to consumers in the first world, even as their global prices fall, constraining producers who must increase production, planting more often and over greater areas, further changing local ecological conditions. With three-quarters of the population in agriculture, economic margins for most Kenyans become tighter every year, and implications for habitat and wildlife more urgent.

The migration of the wildebeest, and its concomitant implications for grasslands and lions, therefore, does not occur outside the influences of a broader political economy. Land tenure laws, which set the terms for land conversion and cash cropping, are made by the Kenyan and Tanzanian states. Commodity markets, which determine prices for Kenyan products and the ever-decreasing margins that drive decisions to cut trees or plant crops, are set on global markets. Money and pressure for wildlife enclosure, which fund the removal of native populations from the land, continue to come largely from multilateral institutions and first-world environmentalists. All of these spheres of activity are further arranged along linked axes of money, influence, and control. They are part of systems of power and influence that, unlike the imagined steady march of the population "explosion," are *tractable to challenge and reform*. They can be fixed.

The difference between this contextual approach and the more traditional way of viewing problems like this is the difference between a *political* and an *apolitical* ecology. This is the difference between identifying broader systems rather than blaming proximate and local forces; between viewing ecological systems as power-laden rather than politically inert; and between taking an explicitly normative approach rather than one that claims the objectivity of disinterest.

When the bottom drops out of the coffee market, as it did in the late summer of 2001, what happens to the peasants who depend upon it and the forests in which it is harvested? When the World Bank helps to fund massive afforestation programs around the world, aimed at preserving tree cover and animal biodiversity, what actually happens to the hill forests designated for enclosure and the tribal people who live there?

These are the questions of political ecology, a field of critical research predicated on the assumption that any tug on the strands of the global web of human–environment linkages reverberates throughout the system as a whole. This burgeoning field has attracted several generations of scholars from the fields of anthropology, forestry, development studies, environmental sociology, environmental history, and geography. Its countless practitioners all query the relationship between economics, politics, and nature but come from varying backgrounds and training. Some are physical scientists (e.g., biologists, geomorphologists, and hydrologists), others are methodological technicians (e.g., geographic information or remote sensing specialists), while most are social and behavioral scientists. All share an interest in the condition of the environment and the people who live and work within it. These researchers, moreover, advocate fundamental changes in the management of nature and the rights of people, directly or indirectly working with state and non-governmental organizations (NGOs) to challenge current conditions. This book reviews the work that these people do, pointing towards the common factors evident in a research area often noted for its diversity, and revealing the strengths and weaknesses in a field that has grown far too quickly to prepare a comprehensive survey or census of its accomplishments and failures.

What is Political Ecology?

The term political ecology is a generous one that embraces a range of definitions. A review of the term from its early use (first used to describe this kind of work by Wolf in 1972) to its most recent manifestations shows important differences in emphasis. Some definitions stress political economy, while others point to more formal political institutions; some stress environmental change, while others emphasize narratives or stories about that change (see Table 1.1). Even so, there seems to be a set of common elements. The many definitions together suggest that political ecology represents an explicit alternative to "apolitical" ecology, that it works from a common set of assumptions, and that it employs a reasonably consistent mode of explanation.

Challenging apolitical ecologies

If there is a political ecology, by implication there must be an apolitical one. As such, research in the field commonly presents its accounts, whether explaining land degradation, local resource conflict, or state conservation failures, as an alternative to other perspectives. The most prominent of these apolitical approaches, which tend to dominate in global conversations surrounding the environment, are "ecoscarcity" and "modernization" accounts.

It is not my intention to provide sustained criticisms of these two approaches here; later chapters of the book should reveal the characteristics of these perspectives and demonstrate their ethical and practical weaknesses. An outline of each should suffice to present their basic arguments, with which readers are probably already very familiar, common as these approaches are to most environmental explanation.

Ecoscarcity and the limits to growth

The dominant contemporary narrative of environmental change and human–environment interaction is a well-established one with a long history. In Western Europe since the late 1700s, when human influence and response to the environment was first submitted to scientific scrutiny, the central driving explanation for social/ecological crisis has been increasing human population, measured in absolute numbers. Following from Thomas Malthus's *Essay on the Principle of Population*, the argument is straightforward: as human populations grow out of proportion to the capacity of the environmental system to support them, there is a crisis both for humans, whose numbers fall through starvation and disease-based mortality, and for nature, whose overused assets are driven past the point of self-renewal. This argument took many forms during the twentieth century, from the "population bomb" of Paul Ehrlich (1968) to the Club of Rome's "Limits to Growth" (Meadows et al. 1972), but its elements are consistent. All hold to the ultimate scarcity of non-human nature and the rapacity of humankind's growing numbers.

For ecoscarcity proponents, this is nowhere a more serious problem than in the under-developed world, where growth rates and absolute numbers of people remain the highest in the world. That the poorest regions of the world are the repositories for what are viewed

Table 1.1 Defining political ecology.

Author/Source	*Definition of "political ecology"*	*Goal*
Cockburn and Ridgeway (1979)	"a useful way of describing the intentions of radical movements in the United States, in Western Europe and in other advanced industrial countries . . . very distant from the original rather sedate operations of the eco-lobby" (p. 3)	Explicate and describe first-world urban and rural environmental degradation from corporate and state mismanagement; document social activism in response.
Blaikie and Brookfield (1987)	"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)	Explain environmental change in terms of constrained local and regional production choices within global political economic forces, largely within a third-world and rural context.
Greenberg and Park (1994)	A synthesis of "political economy, with its insistence on the need to link the distribution of power with productive activity and ecological analysis, with its broader vision of bio-environmental relationships" (p. 1)	"Synthesize the central questions asked by the social sciences about the relations between human society, viewed in its bio-cultural-political complexity, and a significantly humanized nature" (p. 1).
Peet and Watts (1996b)	"a confluence between ecologically rooted social science and the principles of political economy" (p. 6)	Locates "movements emerging from the tensions and contradictions of under-production crises, understands the imaginary basis of their oppositions and visions for a better life and the discursive character of their politics, and sees the possibilities for broadening environmental issues into a movement for livelihood entitlements, and social justice" (pp. 38–39).
Hempel (1996)	"the study of interdependence among political units and of interrelationships between political units and their environment . . . concerned with the political consequences of environmental change" (p. 150)	Explore and explain community-level and regional political action in the global sphere, in response to local and regional degradation and scarcity.

Continued

Table 1.1 *Continued*

Author/Source	*Definition of "political ecology"*	*Goal*
Watts (2000)	"to understand the complex relations between nature and society through a careful analysis of what one might call the forms of access and control over resources and their implications for environmental health and sustainable livelihoods" (p. 257)	Explain environmental conflict especially in terms of struggles over "knowledge, power and practice" and "politics, justice and governance"
Stott and Sullivan (2000)	"identified the political circumstances that forced people into activities which caused environmental degradation in the absence of alternative possibilities… involved the query and reframing of accepted environmental narratives, particularly those directed via international environment and development discourses" (p. 4)	"Illustrating the political dimensions of environmental narratives and in deconstructing particular narratives to suggest that accepted ideas of degradation and deterioration may not be simple linear trends that tend to predominate" (p. 5)

as important and scarce environmental goods makes the problem doubly serious. In this way of thinking, the perilous decline of Kenya's wildlife, as described above, can be predicted to follow inevitably from the growth of Kenya's population.

The problems with this line of argument are many. In general terms, and as will be shown throughout this book, the demographic explanation is a consistently weak predictor of environmental crisis and change. Firstly, this is because the mitigating factors of affluence and technology (following Commoner 1988) tend to overwhelm the force of crude numbers. A very few members of the global village consume the majority of its resources. When these factors are considered, overpopulation, to the extent that such a thing exists on a global or regional scale, appears to be a problem strictly of smaller, wealthier populations, especially the United States, rather than the apparently larger populations of the global south (Table 1.2).

The more fundamental problem with this formulation, however, is that it posits the environment as a finite source of basic unchanging and essential elements, which set absolute limits for human action. However intuitive (divide a limited stock of earth materials by a potentially infinite hungry human population and the result always approaches zero), this assumption has proved historically false and conceptually flawed.

Market "optimists," expressing the problem in economic terms, suggest that any form of resource scarcity creates a response that averts serious crisis. As a good becomes scarcer, they suggest, its price tends to rise, which results either in the clever use of substitutes and new technologies to increase efficiency, or in a simple decreased demand for that good. The result is that apparently finite resources are stretched to become infinitely available as

Table 1.2 Who is overpopulated? Comparative per capita consumption of resources and production of waste (World Resources Institute 2010). India is three times larger than the United States, in terms of population, but consumes a comparatively tiny quantity of key resources and produces a fractional amount of waste.

Resource	*India*	*United States*
Meat (kg, 2002)	5	125
Paper (kg, 2005)	5	297
Water (m^3)	633	1,687
Energy (kg oil equivalent, 2005)	514	7,921
Carbon emissions (tonnes, 2005)	1	20

consumers use less and producers supply more efficient alternatives and substitutes (Rees 1990). Even if populations rise on a limited land area, for example, the demand for land and rising land rents will increase its efficiency of use, with more and better production on each unit of land. Even if petroleum becomes scarce, the rising price per barrel will encourage the use of otherwise expensive alternatives like wind and solar power, or simply cause consumers to drive less, endlessly stretching the world's energy supply. While such optimistic prognoses are themselves fraught with problems, they do point to an important and increasingly well-accepted truism: resources are constructed rather than given.

This is not to argue that the number of organisms versus the extent and character of local resources is not an important issue; ask anyone who is in charge of extending water services to suburbs outside of Denver or Phoenix. To be sure, the number of people who use trees, food, water, metals, and other materials in part determines proximate demands on the environment. So too, the adaptation of natural systems to meet changing needs, whether driven by absolute numbers or changing consumption patterns, is an important element of human–environment interactions. Even so, the Malthusian population pressure model poorly reflects the complexity of global ecology. The argument does, however, hold serious implications for the use and management of resources.

When it was first offered up in Malthus's 1793 formulation, the ecoscarcity argument was presented as an explicit justification for social policy. In particular, Malthus insisted that since famine and starvation were essential to controlling runaway human populations, such events are "natural" and inevitable. England's Poor Laws, the modest redistributive welfare subsidies to feed the most marginal groups, were pointless and counter-environmental. By increasing rather than decreasing their numbers, such subsidies were the source not the solution of misery. So too, in such a conceptualization, the crisis for the poor lay not in the larger economy or ecology of their subsistence, but instead in and amongst the poor themselves: "In searching for objects of accusation, [the poor man] never adverts to the quarter from which all his misfortunes originate. The last person he would think of accusing is himself, on whom, in fact, the whole blame lies" (Malthus 1992, book 4, ch. 3, p. 227).

The implications for contemporary global environmentalism are equally programmatic. Environmental crises as demographic problems exist at the site of resource use, in and

amongst the world's poor, who are simply too numerous. Subsidies of the poor do little to alleviate the crisis, since they only serve to reinforce the demographic trend. Population control, rather than reconfiguration of global distributions of power and goods, is the solution to ecological crisis. The continued advocacy of an apolitical natural-limits argument, therefore, is implicitly *political*, since it holds implications for the distribution and control of resources.

Demographic explanations of environmental change have become considerably more sophisticated than those outlined by Malthus and the Club of Rome. Attention to high-density urban development and the associated energy costs and infrastructure demands of megacities has created justifiably renewed attention to population as an important driver for environmental change. More recent research has come to demonstrate that the position of women in the workforce and their increased access to decision-making, calories, and education are closely linked not only to changing environmental conditions but also to decreased fertility and population growth. New approaches have come to redefine our ways of thinking about population, power, and environment. Even so, crude Malthusianism regrettably remains a typical way of thinking about environmental change, and so provides a unifying target for many political ecologists.

Other apolitical ecologies: Diffusion, valuation, and modernization

Other prominent accounts of environmental change also dominate current thinking, asserting apolitical answers to extremely political questions. It is commonly argued, for example, that ecological problems and crises throughout the world are the result of inadequate adoption and implementation of "modern" economic techniques of management, exploitation, and conservation. Generally, this way of thinking is underpinned by a commitment to economic efficiency.

These approaches to environmental management and ecological change generally assert that efficient solutions, determined in optimal economic terms, can create "win–win" outcomes where economic growth (sometimes termed "development") can occur alongside environmental conservation, simply by getting the prices and techniques right. Such approaches are persuasive, at least insofar as they reject the cataclysmic prognoses of Malthusian catastrophe described above. The assertion that economic efficiency pays environmental dividends is further supported by many examples over the recent period of industrial technological change. The historically dirty pulp and paper industry, in a prominent example, has simultaneously increased profit margins and decreased emissions through efficient industrial ecological practices (Pento 1999). By freeing individuals and firms to seek their own best and most efficient use of resources, propelled by competition on an open market and sustained by modern technology, waste, environmental destruction, and resource degradation can be tamed. Moreover, the sometimes perverse influence of strong state bureaucracies over the environment is perhaps avoided through market- and technology-based solutions.

For global ecology, such an approach suggests several general principles and policies. (1) Western/northern technology and techniques need to be diffused outwards to the underdeveloped world. (2) Firms and individuals must be connected to larger markets and given more exclusive property controls over environmental resources (e.g., land, air, wildlife). (3) For wilderness and biodiversity conservation, the benefits of these efficiencies

must be realized through institutionalizing some form of valuation; environmental goods like wildebeest, air, and stream quality must be properly priced on an open market.

The debates and critiques surrounding such approaches and the logics that underpin them are too numerous to summarize here; even so, there are some serious general conceptual and empirical problems with this perspective. First, the assertion that modern technologies and markets can optimize production in the underdeveloped world, leading to conservation and environmental benefits, has proven historically questionable. The experience of the green revolution, where technologies of production developed in America and Europe were distributed and subsidized for agrarian production around the world, led to what even its advocates admit to be extensive environmental problems: exhausted soils, contaminated water, increased pest invasions (Lal et al. 2002). Beyond these failings, the more general assertion that superior environmental knowledge originates in the global north for transfer to the global south is in itself problematic, reproducing as it does paternalistic colonial knowledge relations and a priori discounting the environmental practices of indigenous and local communities (Uphoff 1988).

Articulation with global markets, as will be shown in the case materials presented here, has also proved to be a mixed environmental blessing at best. Changes in markets, falling commodity prices, and altered land values that have followed from globalized exchange have often led to land degradation and social disorder in the less developed world. A call to intensify these forms of exchange must be viewed skeptically. More generally, even in free and open markets, monopoly control of resources commonly perverts allocation and distribution, leading to far from optimal social and ecological outcomes. Indeed, the tradition of conservation in the United States is largely based on the understanding that collective control of environmental resources is necessary for fair and sustainable distribution.

Asserting and adopting the apparently apolitical approach to the environment suggested in market and modernization approaches, because of the institutional and political changes that such an approach mandates, is also inherently political. To individuate and distribute "collective" goods like forests or water by necessity requires the alienation of previous user groups. To implement new technological approaches in agriculture, resource extraction, or wilderness management requires a transformation of existing institutions. Increasingly open markets demand deregulation of labor and environmental controls. There is nothing apolitical about such a proposal.

The first lesson to draw is that the dominant contemporary accounts of environmental crisis and ecological change (ecoscarcity and modernization) tend to ignore the significant influence of political economic forces. As we shall see, this is to ignore the most fundamental problems in contemporary ecology. The other lesson is that apolitical ecologies, regardless of claims to even-handed objectivity, are implicitly political. It is not so much that political ecology is "more political" than these other approaches to the environment. Rather it is simply more *explicit* in its normative goals and more outspoken about the assumptions from which its research is conducted.

Common assumptions and modes of explanation

Following Bryant and Bailey, political ecological accounts and research efforts also share a common premise, that environmental change and ecological conditions are the product

of political process. This includes three fundamental and linked assumptions in approaching any research problem. Political ecologists: "accept the idea that costs and benefits associated with environmental change are for the most part distributed among actors unequally . . . [which inevitably] reinforces or reduces existing social and economic inequalities . . . [which holds] political implications in terms of the altered power of actors in relation to other actors" (Bryant and Bailey 1997, pp. 28–29).

Research tends to reveal winners and losers, hidden costs, and the differential power that produces social and environmental outcomes. As a result, political ecological research proceeds from central questions, such as: What causes regional forest loss? Who benefits from wildlife conservation efforts and who loses? What political movements have grown from local land use transitions?

In answering, political ecologists follow a mode of explanation that evaluates the influence of variables acting at a number of scales, each nested within another, with local decisions influenced by regional polices, which are in turn directed by global politics and economics. Research pursues decisions at many levels, from the very local, where individual land managers make complex decisions about cutting trees, plowing fields, buying pesticides, and hiring labor, to the international, where multilateral lending agencies shift their multi-billion-dollar priorities from building dams to planting trees or farming fish. Such explanation also tends to be highly (sometimes recklessly) integrative. Bryant (1999) described the field as a series of "disciplinary transgressions," where researchers trace their personal and professional trajectories from political studies and sociology to geography or from geography to development studies. And as we shall see, a group of people and institutions has emerged around such interdisciplinary transgressions, a global assemblage of diverse practitioners who make certain kinds of movies, write certain kinds of books, and advance certain kinds of arguments.

So, rather than adding yet another definition to a crowded field, it is best to suggest at the outset that political ecology is a term that describes a *community of practice* united around a *certain kind of text*. The nature of this community and the quality of these texts, as well as the theory and empirical research that underpins them, are the topic of the remainder of this volume. But broadly they can be understood to address the condition and change of social/environmental systems, with explicit consideration of relations of power. Political ecology, moreover, explores these social and environmental changes with an understanding that there are better, less coercive, less exploitative, and more sustainable ways of doing things. The research is directed at finding causes rather than symptoms of problems, including starvation, soil erosion, landlessness, biodiversity decline, human health crises, and the more general and pernicious conditions where some social actors exploit other people and environments for limited gain at collective cost. Finally, it is a field that stresses not only that ecological systems are political, but also that our very ideas about them are further delimited and directed through political and economic process. As a result, political ecology presents a Jekyll and Hyde persona, attempting to do two things at once: critically explaining what is wrong with dominant accounts of environmental change, while at the same time exploring alternatives, adaptations, and creative human action in the face of mismanagement and exploitation: offering both a "hatchet" to take apart flawed, dangerous, and politically problematic accounts, and a "seed," to grow into new socio-ecologies (see Chapter 4).

Five Dominant Narratives in Political Ecology

In this sense, political ecology characterizes a kind of argument, text, or narrative, born of research efforts to expose the forces at work in ecological struggle and document livelihood alternatives in the face of change. This does not mean that political ecology is something that people must write and think about all the time. Much of this work is carried out by people who might never refer to themselves as political ecologists, who count writing, researching, or arguing as only one part of their job, or who might do so in only one sphere of their work. Neither is political ecology restricted to academics from the "first world." Indeed, the critical ideas and arguments of political ecology are often produced through the research and writing, blogging, filming, and advocacy of countless NGOs or activist groups around the world, surveying the changing fortunes of local people and the landscapes in which they live. This may actually comprise the largest share of work in political ecology. Published only in local meeting and development reports, or uploaded as short documentary videos or slide presentations, this work is as much a part of the field as the well-circulated books or refereed journal articles of formal science.

Big questions and theses

What unites the diverse work in these many locations is a general interest in five big themes. Over-simply, political ecology research has demonstrated (or attempted to demonstrate) the general theses shown in Table 1.3, each of which receives a chapter later in this volume.

The degradation and marginalization thesis

Otherwise environmentally innocuous production systems undergo transition to overexploitation of natural resources on which they depend as a response to state development intervention and/or increasing integration in regional and global markets. This may lead to increasing poverty and, cyclically, increasing overexploitation. Similarly, sustainable community management is hypothesized to become unsustainable as a result of efforts by state authorities or outside firms to enclose traditional collective property or impose new/foreign institutions. Related assertions posit that modernist development efforts to improve production systems of local people have led contradictorily to decreased sustainability of local practice and a linked decrease in the equity of resource distribution.

The conservation and control thesis

Control of resources and landscapes has been wrested from producers or producer groups (associated by class, gender, or ethnicity) through the implementation of efforts to preserve "sustainability," "community," or "nature." In the process, local systems of livelihood, production, and socio-political organization have been disabled by officials and global interests seeking to preserve the "environment." Related work in this area has further demonstrated that where local production practices have historically been productive and relatively

Table 1.3 Five theses of political ecology and the things they attempt to explain.

Thesis	*What is explained?*	*Relevance*
Degradation and marginalization	*Environmental conditions* (especially degradation) and the reasons for their change	Environmental degradation, long blamed on marginal people, is shown in its larger political and economic context.
Conservation and control	*Conservation outcomes* (especially failures)	Usually viewed as benign, efforts at environmental conservation are shown to have pernicious effects, and sometimes fail as a result.
Environmental conflict and exclusion	*Access* to the environment and conflicts over exclusion from it (especially natural resources)	Environmental conflicts are shown to be part of larger gendered, classed, and raced struggles and vice versa.
Environmental subjects and identity	*Identities* of people and social groups (especially new or emerging ones)	Political identities and social struggles are shown to be linked to basic issues of livelihood and environmental activity.
Political objects and actors	*Socio-political conditions* (especially deeply structured ones)	Political and economic systems are shown to be underpinned and affected by the non-human actors with which they are intertwined.

benign, they have been characterized as unsustainable by state authorities or other players in the struggle to control resources.

The environmental conflict and exclusion thesis

Increasing scarcities produced through resource enclosure or appropriation by state authorities, private firms, or social elites accelerate conflict between groups (gender, class, or ethnicity). Similarly, environmental problems become "socialized" when such groups secure control of collective resources at the expense of others by leveraging management interventions by development authorities, state agents, or private firms. So too, existing and long-term conflicts within and between communities are "ecologized" by changes in conservation or resource development policy.

The environmental subjects and identity thesis

Institutionalized and power-laden environmental management regimes have led to the emergence of new kinds of people, with their own emerging self-definitions, understandings of the world, and ecological ideologies and behaviors. More firmly: people's beliefs

and attitudes do not lead to new environmental actions, behaviors, or rules systems; instead, new environmental actions, behaviors, or rules systems lead to new kinds of people. Correlatively, new environmental regimes and conditions have created opportunities or imperatives for local groups to secure and represent themselves politically. Such movements often represent a new form of political action, since their ecological strands can connect disparate groups, across class, ethnicity, and gender.

Political objects and actors thesis

Material characteristics of non-human nature and its components (dung, climate, refrigerators, bacteria, lawn grass, road salt, goats, and tropical soils) impinge upon the world of human struggles and are entwined within them, and so are inevitably political. Yet as these characteristics and agents assume new roles and take on new importance, they are also transformed by these interactions. People, institutions, communities, and nations assemble and participate in the networks that emerge, leveraging power and influence, just as non-human organisms and communities do. In recent history, hegemonic institutions and individuals (environmental ministries, multinational corporations, corrupt foresters) have gained disproportionate influence by controlling and directing new connections and transformations, leading to unintended consequences and often pernicious results. In the process, resistance emerges from traditional, alternative, or progressive human/non-human alliances marginalized by such efforts (especially along lines of class, ethnicity, and gender).

The target of explanation

Of course, each of these theses actually seeks to explain something somewhat different. While degradation and marginalization offers an explanation of why *environmental systems* change (because of capital accumulation), environmental subjectivity research seeks to explain why *social identities* change (because of transformed environmental institutions). This diversity of targets for explanation has been the source of some confusion in the field (Vayda and Walters 1999) and reflects its historic development.

Research linking environmental change to political and economic marginalization emerged first in the 1970s and 80s as an attempt to apply dependency theory to the environmental crises of the period (see Chapter 8). The problematic effects of global and regional conservation efforts, including World Heritage Sites, national parks, and biodiversity zones, also became increasingly apparent in the 1990s, and political ecology on the topic benefited from a growing interest in the historical development of conservation (Chapter 9). Interest in environmental conflict soon followed, as many environmental issues became increasingly politicized in both regional contexts, from Love Canal to the Amazonian rainforest, as well as global ones, with the emergence of global agreements and debates on climate and biodiversity (Chapter 10). Interest in the new environmental activism and identities grew from all of the issues above, and was placed squarely on the agenda by local people themselves, including Andean peasant movements, the Zapatistas, *chipko*, and a host of other movements (Chapter 11). An interest in political objects and agents is the most recent addition to debate in political ecology, rooted in its deep historical

materialism, but also in an emerging concern more generally for the way the non-human world impinges on the human one (Chapter 12).

The diversity of political ecology research also results from innumerable, smaller, differing arguments addressing, among many issues:

- possibility for community collective action;
- role of human labor in environmental metabolism;
- nature of risk-taking and risk-aversion in human behavior;
- diversity of environmental perceptions;
- causes and effects of political corruption;
- relationship between knowledge and power.

These many topics and concerns overlap, and, as I hope to show by the end of the book, a coherent set of answers to these questions is beginning to achieve something of a consensus. They also provide bridges to one another, creating a kind of lattice-work of investigation. Understanding how changing forms of knowledge, like computerized mapping, for example, lead to new systems of control over a forest probably leads a researcher to ask: What are the concomitant changes in the behavior of foresters, and does this create new patterns of actual forest ecology?

Moreover, in their linkages to local communities and NGOs, political ecologists, whether they are more interested in the biophysical or social aspects of a problem, have helped to build practical, detailed, integrated, empirical databases on all these diverse issues, recording land covers, farming practices, wildlife management systems, technological innovations and diffusions, local folk tales and oral histories, and informal markets and economies. These basic empirical findings help communities make decisions, aid in advocacy for social and environmental causes, and serve as a record to future scholars about the way things looked at the dawn of the twenty-first century.

The value of this last contribution, providing an historical record, is not a trivial one. Much of what we know about the political economy of the environment is bequeathed to us by political ecologists of previous generations. Indeed, political ecology can arguably said to be very old, since nineteenth- and twentieth-century environmental research in geography, anthropology, and allied natural and social sciences has a long critical tradition. Even before a semi-coherent body of political ecological theory emerged in the late twentieth century, many explicitly political practitioners emerged from the ranks of field ecologists, ethnographers, explorers, and other researchers. These represent the deep roots of the field.

Chapter 2

A Tree with Deep Roots

- The Determinist Context
- The Building Blocks

Peter Alexeivich Kropotkin was born a Russian aristocrat in 1842, but by the time he died in 1921 he had become a globally known anarchist philosopher whose writings had done as much to explore the linkage between people and the environment as any in that tumultuous century. As an activist, a keen observer of nature, and a scientific explorer and ethnographer, Kropotkin was an early political ecologist.

As a geographer, Kropotkin set out in 1865 to explore the most remote areas of the Russian Far East where the Sayan highlands border Manchuria. There were no charts of the region at this time and in preparing for the expedition he came across a map prepared by a Tungus hunter with the point of a knife on tree bark. "This little map," the explorer explained, "so struck me by its seeming truth to nature that I fully trusted to it" (Woodcock and Avakumovic 1990, p. 72). This trust for the environmental knowledge of local people was reinforced throughout his journey. Traveling for months with a local Yakut man, Kropotkin traversed 800 miles of rugged mountains. During his journey he encountered and described farmers, herders, and hunters who all organized their lives to thrive under what urban Russians would have considered unthinkably adverse conditions.

Like his previous expeditions, this arduous trip reinforced his growing appreciation for "the constructive work of the unknown masses, which so seldom finds any mention in books, and the importance of that constructive work in the growth of forms of society" (Woodcock and Avakumovic 1990, pp. 59–60). The evidence amassed during these

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

journeys, of plants, people, and animals making a living from the land, convinced Kropotkin, moreover, that the survival and evolution of species is propelled by collective mutual aid, cooperation, and organization between individuals.

The Determinist Context

Yet such research was by no means the norm. For the most part, early geography and nascent anthropology were the tools of social and political control, reproducing the political and ecological order that critical human–environment researchers would later challenge and undermine. Linking environment to society through a tradition of *environmental determinism*, scientific and field researchers were servants of colonialism and empire.

Rooted in the theories of nineteenth-century geographer Friedrich Ratzel and championed later in North America by the influential researchers William Morris Davis, Ellsworth Huntington, and Ellen Churchill Semple, the determinist approach maintained that geographic influences determined human capabilities and cultures, with its practitioners attempting to codify that thesis into scientific practice. Huntington was perhaps its most prolific exponent: "Today a certain peculiar type of climate prevails wherever civilization is high. In the past the same type seems to have prevailed wherever a great civilization arose. Therefore, such a climate seems to be a necessary condition of great progress" (Huntington 1915, p. 9). The empirical vacuousness of this thesis need not be belabored here. In even simple analysis, European and American environments have proved no more productive or inspiring for human life than any other (Blaut 1999, 2000). Where confronted with contradiction (e.g. "high" civilization in "bad" climate), Huntington and his colleagues generally retreated behind "complex" and "competing" factors and poorly defined trajectories of climatic change, while harsh climates were simultaneously used to explain the ingenuity of some groups and the cultural limits of others.

The implication of this theory in the perpetuation of global, imperial, racist rule by Euro-Americans should be immediately evident. By even asking the question "why are Anglos more productive, civilized, and advanced?" the fallacious assumptions have already been made that first, they are, and second, it has to do with something inherent in the place or people involved, rather than being a consequence of historical and geographical interactions with the rest of the world. And in "scientifically" attempting to untangle the ancient question of heredity or environment, "Race or Place?" as Huntington put it in his classic volume *Civilization and Climate*, the fundamental political and historical questions of domination, colonization, and extermination are erased. In the answer, moreover, came a confident and scientific rationale for Euro-American dominance – *it's only natural*. Indeed, by rendering colonial domination an environmental inevitability, the practice of colonialism comes to appear *apolitical*.

This scientific thesis was quickly adopted in public service (Harrison 1999). Elementary geographic education during the turn of the twentieth century, in particular, was explicit on themes of environment and society linkage, with typically racist and colonial goals. For example, a widely distributed text from the time, *Guyot's Physical Geography* (1873, p. 121), clearly asserts the association of continents and "ever-varying external conditions" with adaptive and functional purposes. "Each continent has, therefore, a well-defined individuality, which fits it for an especial function. The fullness of *nature's life* is typified by

Africa . . . in the grand drama of *man's life* and development, Asia, Europe, and America play distinct parts, for which each seems to have been admirably prepared."

Each such region was further associated with clear and distinguishable "races of men." Of the "primary races" (white, Mongolic, and negro), the white race was held as "normal" and "typical," associated with the "refinement and culture of the European nations," and linked to the special function of Europe and America (Guyot 1873, p. 114), whereas "the secondary races have contributed nothing to the present condition of mankind; and none of the existing branches have taken more than the first steps in civilization, except under the influence of the White or Mongolic races" (p. 118). This body of theory was crudely set in a roughly social Darwinist theory of selection, holding that geographic influences, acting through selection of superior specimens, created racial and cultural characteristics. This was accompanied by a great deal of pseudo-science, including most notably craniology and the comparative measurement of various body parts (Gould 1996). So too, a deterministic geography was supported by semi-theological theories suggesting the providential progress of divinely inspired dominion of the earth by Anglo-Americans (Livingstone 1994, p. 136).

The research implications for this kind of work were stultifying. By assuming the role of nature to be a determinant, fixed, and unidirectional influence, the complex influences of humanity upon non-human systems were lost altogether. As a result, nature was seen as a one-way force that determined cultural development, even at the very moment that the world of nature, ironically, was transforming under the processes of industrialization. Despite deleterious changes in air, land, and water resulting from economic and political developments of the era (smokestack industries, urban waste, and deforestation), nature was viewed during this period as beyond human influence.

A political ecological alternative

In this imperialist context, where environmental influences were understood to determine the superiority and inferiority of human races through competitive natural selection, and where human influences on the environment were viewed as unworthy of examination, counter-movements were growing. In the work of several early researchers a radical alternative to these dominant modes of explanation emerged, an incipient political ecology. Perhaps most prominent amongst these early dissenters was Kropotkin.

In contrast to the political and social conservatism associated with the geography of the period, Kropotkin's experience in the field brought him to renounce his princely title, to espouse a revolutionary socially cooperative anarchism, and to resist and dismantle the hierarchic social conditions of the time (Kropotkin 1990). In his work he sought simultaneously to tear down the socially loaded assumptions of contemporary, taken-for-granted, scientific knowledge, and to establish the empirical basis for an alternative model of social and natural organization. His research took a political ecological "hatchet" to the elitism and classism that pervaded natural science, while "seeding" the field with rich empirical investigations and normative visions of alternative futures.

Kropotkin's hatchet was aimed at the "scientific" socio-biological emphasis on competition that many other scholars saw in nature. Kropotkin argued that the case for competition as the central component of evolution was a product less of empirical observations of

natural phenomena than of reading a social hierarchy into the natural world (Kropotkin 1888). Kropotkin searched throughout the animal kingdom and human history and pointed to cooperation being central to survival and selection, and therefore to evolution. His rigorous field observations made way for an argument not only about the state of nature, but also about the possibilities for society, free from domination, violence, and hierarchy.

Kropotkin's approach to human–environment interaction sets a precedent for the kind of work that would follow more than a century later. The work resembles contemporary political ecology (and its progenitor, cultural ecology) in its focus on production, its archival and field-based empirical approach, its concern for marginalized and disenfranchised people, its interest in local environmental knowledge, and its concentration on the landscape as an object of explanation.

- A focus on *production* (farming, fishing, herding) as a key social-environmental process means taking seriously the notion that "the means of production being the collective work of humanity" (Kropotkin 1990, p. 14), the business of making a living therefore provides the most direct window into the mechanisms of social and environmental interaction.
- A rigorous *archival and field-based* empirical approach allows detailed observations of plant and animal life as well as historical social case histories from around the world (Kropotkin 1888).
- An explicit concern for *marginalized and disenfranchised* communities enables exploration of "institutions, habits, and customs" that, despite persistent exploitation by landlords and the state, locals prefer to maintain rather than adopt inadequate state-sponsored solutions "offered to them under the title of science, but [that] are no science at all" (Kropotkin 1888, pp. 260–261).
- A strong interest in the position and power of *traditional environmental knowledges* allows a pragmatic view of social and technological change. Though Kropotkin was a strong supporter of innovation, he insisted that the elements of progress could only be found in the existing resourcefulness of communities (Kropotkin 1985). The "hierarchical" forces of state and capital tend to crush "popular genius" (Kropotkin 1987).
- *Starting from the landscape* facilitates a grounded approach to social and political analysis, especially the influence of people on environmental systems. Ever the geographer, Kropotkin was as interested in environmental change as he was in social reform (Woodcock and Avakumovic 1990).

This is not to say that this early work is without flaws. In particular, Kropotkin's distrust of the state – in any form – and his romantic assumption of popular cooperation are problematic. In an era when corporate power and global markets rival that of the nations, should progressive ecologists call for the state to be dismantled? Is cooperation the "natural" state of local production systems, or is conflict important in the history of social and environmental change? Even so, Kropotkin's call for a critical science of environmental sustainability and equity was compelling and direct, and forecast a synthesis of social and environmental research.

The Building Blocks

The elements of Kropotkin's critical social ecology were offered at a time when geography and a nascent anthropology were anything but progressive or emancipatory tools of social and environmental change. Even so, other contemporary researchers took critical positions against those arguments for the "natural" character of an unjust social world as well as those that ignored the human influence on the environment.

Critical approaches in early human–environment research

The late nineteenth and early twentieth centuries produced a range of critical environmental approaches, at varying scales of abstraction, which sought to describe and analyze the patterns of human interaction with the environment.

Early scientific critics: Humboldt, Reclus, Wallace, and Sommerville

Perhaps earliest in this area was Alexander von Humboldt, arguably the grandfather of modern geography, who is best known for his empirical investigations of the environment, which took him around the world during the early 1800s. Humboldt's travels brought him into contact with people making a living under a wide range of conditions and coping with varying degrees of political and economic hardship. These gave him an apparent appreciation for the political and economic context in which people make a living and cope in their daily lives.

His interaction with local producers also gave him a feeling for the unity of humanity and distaste for the racist myth of natural difference. Though his five-volume *Cosmos*, which aspired to be a truly comprehensive physical guide to the universe, had only a scant few pages on humanity, and these dedicated to race, Humboldt was careful to insist that "while we maintain the unity of human species, we at the same time repel the depressing assumption of superior and inferior races of men" (Humboldt 1858, vol. 1, p. 358). Though sometimes invoking the racial language of the period and though clearly implicated in colonial-era exploration, Humboldt was insistent that the "inequality of fortunes" between white colonials and indigenous communities could only be solved through equal access to both civil employment and fertile land (Humboldt 1811). These conclusions arose especially from Humboldt's experiences in South America, as did his sensitivity to traditional resource-use practices and the implications of colonial economic systems for social and environmental reproduction.

In a typical example, Humboldt described at length the perilous decline of the pearl fisheries in the Cumana region of Venezuela, a unique resource whose fruits had been traded throughout the continent for generations. While allowing the possibility that tectonic forces (earthquakes and submarine currents) played some role, he was explicit that recent overfishing during the colonial period was probably to blame, since mercantile practice increasingly involved large-scale mining of the beds, so that oyster "propagation had been impeded by the imprudent destruction of the shells by thousands." The pearl-bearing oyster, he added, lives only nine or ten years, producing pearls only after the fourth year, making the mass extraction of the oyster (a boat might collect 10,000 oysters a week)

extremely destructive and only marginally profitable. He further insisted that traditional native practice, opening promising shells one by one, sustainably supported a high-demand economy for the commodity before European contact (Humboldt 1852, pp. 191–194). Humboldt held the political history of the region to account for contemporary levels of destitution, underdevelopment, and environmental decline, rather than native practice or racial characteristics.

Like Humboldt, the French geographer Elisee Reclus was dedicated to comprehensive accounts of human and physical geography. His *The Earth: A Descriptive History* was only slightly less ambitious than Humboldt's *Cosmos* in its universal scope (Reclus 1871). The critical politics in his orientation towards human–environment questions were considerably more explicit, however. Like Kropotkin, he insisted that observation of human interaction with nature held the key to understanding society and insisted that "the sight of nature and the works of man, and practical life, these form the college in which the true education of contemporary society is obtained" (Reclus 1890, p. 10). He asserted, moreover, that eruptive political action against current systems of inequity – revolution – is part of evolutionary change in social/environmental systems. Combining an urge for justice for workers with a broader project of describing socio-ecological change, Reclus challenged the notion that contemporary social structure and ecological practice were the inevitable products of evolutionary selection.

These kinds of challenges to social domination and imperialism can also be seen grafted into the very roots of evolutionary theory. Alfred Russel Wallace, a British geographer and naturalist, simultaneously developed the theory of natural selection while elaborating a critique of social hierarchy and land management. Wallace's travels in Amazonia and the Malay Archipelago during the mid-1800s led him to investigate how geographic factors influenced the range of species, whether by enabling or limiting their distribution. The boundary he discovered, which passes through the South Pacific, separating the distribution of Asian animals from those of Australasia, still bears the name "Wallace's Line" (Raby 2001). His experience also drove him to investigate how people indigenous to these regions made a living and classified the natural world. He would be remembered best, however, for his assertion that individual animals best adapted to their environments had the best chances for survival, thus influencing the emergence of differential adaptations. Several years of correspondence with Charles Darwin on the topic followed, after which Darwin's own *Origin of Species* (Darwin 1860) would be published. Thus Wallace became a co-developer of the thesis of natural selection, fundamental to evolutionary theory (Gould 1996; Raby 2001).

These more famous works, however, encompass only half of Wallace's concerns. Along with support for women's suffrage, workers' rights, and socialism more generally, Wallace's earlier experiences in land surveying led to an abiding concern for land planning and social reform of property rights. Having observed land ownership traditions in non-European contexts, Wallace became convinced that there was nothing socially or ecologically optimal about current tenancy arrangements in Britain, leading him to advocate nationalization of land. With tremendous foresight, he anticipated public concerns for control of land to encourage historic preservation, development of parks, and limits on urban growth and sprawl (Clements 1983).

As noted earlier, these nineteenth-century political ecological critiques are all the more notable in light of the role that geographical and ethnological sciences were playing in the

creation of empire. Humboldt critiqued racism and ecological degradation in the Americas in a way quite counter to the typical role of most geographers, who mapped and surveyed for military and civilian control (Capel 1994). More radical critiques like those of Reclus flew directly in the face of French geography, which advanced the notion of nationalist imperialism and viewed the expansion of empire, especially in Africa, as a cure for "decadent" and "insular" contemporary French society (Heffernan 1994). Though he held to a controversial spiritualism, Wallace linked evolution, social justice, and land management to offer a critical anti-racist alternative to emerging social Darwinism (Clements 1983). Together, these turn-of-the-century critiques prefigured contemporary political ecology by more than a hundred years.

A simultaneous European re-assessment of human impact on the land was also under way, but witnessed and articulated by an observer unusual during this period for both her gender and her background. Mary Fairfax Somerville was born in Jedburgh, Scotland, in 1780, and, gaining access to only the limited levels of formal education afforded to women in the period, became self-educated, making her own way through Ferguson's *Astronomy* and Isaac Newton's *Principia* (Patterson 1987). Authoring many scientific papers, her central contribution, *Physical Geography* (Sommerville 1848), was unusual for the time, owing to its emphatic insistence on the impact of humanity on land, rather than vice versa. Though the book is marred with pejorative characterizations of non-Europeans somewhat typical of the time, it is also filled with strident critiques of slavery, of land theft from aboriginal peoples, and, most notably, of reckless degradation of environmental systems by people through overuse, extraction, and the introduction of alien species. In a remarkable counter-argument to Huntington's climatic determinism, Sommerville argued that humans, by altering watercourses, cropping, and forest clearing, had actually altered climates, anticipating such arguments in contemporary science by more than a century. At the same time her volume bemoans the reckless power of colonial states, which had driven indigenous people from their land and to the brink of extermination. Sommerville linked political and ecological destruction, urging reflection and caution. Nor was she unique in her contribution; large numbers of women naturalists in the nineteenth century set a similarly critical alternative tone for scientific exploration (Gates and Shteir 1997).

Such emergent political ecologies in Europe set the foundations for a century of work that is too large in scope to survey here. Francophone political ecology, whose continued rise coincided with the decline and fall of French imperial adventures in Africa and Asia, grew throughout the twentieth century from these solid critical roots (Whiteside 2002). Other contemporary European political ecologies, from the United Kingdom to Iberia, are also deeply rooted in the contributions of these early practitioners (Martinez-Alier 2002).

Critical environmental pragmatism

As *fin de siècle* natural sciences in Europe were colliding with theories of society and fostering the emergence of critical sciences at the human–environment interface, a simultaneous movement in North America sought to break the hold of determinism. While the momentum towards a critical human–environment project had been halted with the "false start" it made in its embrace of determinism (Turner 2002), a contrasting school of human impact study was emerging, closely informed by traditions of pragmatism and

utilitarianism. Led most prominently by George Perkins Marsh, a Vermont-born philologist with a lifetime of experience in the American diplomatic corps, a "new school of geographers" emerged in the late nineteenth century. For these researchers, the analytic challenge was to determine humanity's role in changing the face of the earth in order to preserve it for the future. Marsh wrote in a normative tone, insisting that responsible science and practical development required that conservation of the planet was essential, "thus fulfilling the command of religion and of practical wisdom, to use this world as not abusing it" (Marsh 1898, p. 7).

In his groundbreaking volume *Man and Nature* (later *The Earth as Modified by Human Action*) Marsh exhaustively listed the impact of human activity on degrading terrestrial ecosystems, rivers, lakes, and oceans, and traced the secondary impacts of such transformations on connected systems. In particular, Marsh was concerned with loss of forest cover, in terms of its effect on climate, erosion, and siltation of waterways. With remarkable foresight he anticipated the "invisible bonds" of ecology, pointing to the seriousness that declines in mayflies and aquatic larvae, for example, might have on the broader environment (Marsh 1898, pp. 136–137).

With its concerns for human impact on the landscape and its focus on the effects of uncontrolled extraction on the reproduction and sustainability of complex ecosystems, Marsh's work was a precursor to political ecology. Even so, the work contains very little in the way of political economy or any focus on the way economic and political power is exercised to determine the rate and character of these problems. Nor was his concern for the productive capacity of the ecosystem extended in any way to the local populations who had traditionally managed them. Indeed, in a revealing footnote, Marsh castigates the peasantry who "set fire to the woods and destroy them in order to get possession of the ground they cover" (p. 373 footnote), with absolutely no effort to place those actions in political or economic context. Why are peasants seeking to increase their holdings? What are the legal and institutional structures encouraging or dissuading such actions?

There is also in Marsh's work a remarkable enthusiasm concerning the power and desirability of human "reclamation" of the earth. Writing on American forest plantations, for example, he fervently asserts that forest can and should be established anywhere and everywhere possible, specifically for its timber value. He further insists on the great social benefits of draining swampland (which today we call "wetlands") and straightening rivers, both practices that contemporary environmentalists abhor. His call for better stewardship of the environment was one that demanded more, not less, control over nature, especially by state authorities and private firms.

So while Marsh recognized the power of human economy to wreak environmental havoc, his faith in humanity's powers over nature led him to champion large-scale authorities and economies in a way that might have made Wallace, Reclus, and Kropotkin (not to mention late-twentieth-century environmentalists) uncomfortable. Even so, these themes – degradation, sustainability, and the culpability of human systems in the transformation of the earth – would all be central to political ecology a century later. Clearly, an incipient form of critique lay in the works of many researchers working at the nature–society interface in the twilight of the nineteenth century. Political ecology would not appear, therefore, as if with a thunderous lightning stroke, full-grown, in the last decades of the twentieth century.

From sewer socialism to mitigating floods: Hazards research

The politics and economics of environmental issues, though briefly eclipsed by environmental determinism in the early twentieth century, therefore never fully left the scientific agenda. With an increasing recognition of the vulnerability of modern society to environmental perturbations like floods, earthquakes, droughts, and fires, as well as to the toxins of its own invention, a policy-oriented avenue of research began to open in the early twentieth century. Focusing both on "natural" and "technological" problems faced by human communities, hazards research took as its goal the rational management and amelioration of risk – defined as the calculable likelihood of problematic outcomes of human actions and decisions.

This approach emerged in the wake of increasing political urban activism around issues of environmental health and welfare, as settlement house workers and other activists, mostly women, rose to take stock of environmental conditions and the planning regimes that surrounded waste, water, and air. The Women's National Rivers and Harbors Congress, Women's Forestry Commissions, and Federation of Women's Clubs throughout America joined with socialist/progressive mayors, unions, and municipal leagues during this period to champion food safety and urban infrastructure reform. The research component of this "sewer socialism" was informal but thorough, and activist researchers like Alice Hamilton and Florence Kelly performed path-breaking street-level analyses of environmental hazards, revealing relationships between typhoid and plumbing, and between toxins or machinery and workplace injury and death (Bailes 1985; Darnovsky 1992). More formally, Jane Addams, along with her cadre of public-university-trained social workers, conducted the first-ever systematic assessment of the relationship between municipal garbage collection in Chicago's wards and local death rates (Addams 1910).

In formal academic circles this pragmatic approach to risk was later rendered in more apolitical terms. In a now classic example of the hazards approach, Gilbert White challenged the conventional way of thinking about and dealing with floods, calling for a rational and somewhat radical alternative. Writing his thesis in the early 1940s, White concluded that the traditional way of dealing with flood hazards – building more engineered structures – is expensive, irrational, and does little to deal with the underlying, fundamentally *human* problem. Better land use planning and changes in people's behavior could more easily mitigate future impacts of natural flood events (White 1945).

More than simply informing the practical question of flood insurance subsidies and dams, White had gained a valuable insight into human–environment interaction; the traditional distinction of those things *natural* from those things *social* is rendered particularly difficult when viewing the environment as a hazard. A flood is a hybrid human–environmental artifact, no more an act of nature than one of planning.

This powerful lever on the problem opened several decades of research into human adjustment to the environment, leading later researchers like Robert Kates and Ian Burton to venture the claim that the environment is actually becoming more hazardous as a result of human development, rather than less so (Burton et al. 1993). The implication that current economic and political structures increase the riskiness of natural events holds tremendous implications for how our society and personal lives are ordered.

But as the academic project of hazards research matured into the late twentieth century, it lost the critical momentum of its activist precursors and failed to form a robust

Box 2.1 Jane Addams' *Twenty Years at Hull House*: Progressive-Era Urban Political Ecology

Published in 1912, Jane Addams' reminiscences of street-level ecology in Chicago is almost as fresh today as it must have been at the turn of the twentieth century. Recounting two decades of social work amongst poor, immigrant communities, Addams documents a rigorous and committed urban political ecology.

Hull House itself was a "settlement house," really a cluster of buildings providing residence and offices for people – all women – to provide social services and education to local communities. The volume is, therefore, a well-known contribution to social history, recording the dawn of modern social work.

But the most dramatic and immersive parts of the work recount how the women doctors of Hull House doggedly investigated the conditions that created health problems in the community, turning over stones, examining sewage flows, tracking insects, and otherwise piecing together the ecological puzzle of poverty and disease. Notable among the many residents of Hull House is Dr Alice Hamilton, whose work to uncover the conditions that either caused or exacerbated typhoid outbreaks in Chicago slums resulted in critical insights about sanitation and disease. More than this, however, Addams and her colleagues traced the source of immediate causes to political and economic drivers, mainly the cozy relationship between slumlords and state agents. As Addams reports of Hamilton's work in what might best be described as "shoeleather" epidemiology:

> Her researches were so convincing that they have been incorporated into the body of scientific data supporting that theory, but there were also practical results from the investigation. It was discovered that the wretched sanitary appliances through which alone the infection could have become so widely spread, would not have been permitted to remain, unless the city inspector had either been criminally careless or open to the arguments of favored landlords. (p. 298)

And yet the pragmatic political ecology of Hull House was not always enough to satisfy purist ideologies of the time. In her account of an encounter with Leo Tolstoy during a visit to Russia in 1896, Addams describes being castigated by the aging socialist for dressing too formally and not providing for her own subsistence through farming (pp. 268–269). Leaving aside the strange mismatch of Tolstoy's peasant-oriented politics against those of the very urban Addams and the immigrant communities with whom she worked, there are echoes here of later debates in political ecology, and radical praxis more generally, about the purity of goals versus the practicality of outcomes. Addams' book, and the work of all those at Hull House, reminds us that "the front is long" in political ecology, and that contributions and insights come from places and methods of enormous diversity. Ideas and actions most productively coexist, rather than compete.

theoretical account of social adjustment to the environment. By 1975 hazards researchers reviewing their own field concluded that future research strategies should elucidate the different problems and opportunities provoked by specific disasters (White and Haas 1975). Though new hazards (global warming, nuclear waste, ozone depletion) present new specific problems (Burton et al. 1993), this does not necessarily open onto clearer or more comprehensive understandings of environment–society interactions.

Yet the field left tremendous scope for critical insight and research. As White so profoundly discovered in the 1940s, improved planning by state agencies and individual farmers who lived in floodplains was retarded by the continued reinvestment in subsidies and massive investment in engineered structural solutions like dams and levees. But the urgent question raised by these results – why do structural solutions prevail in the face of better alternatives? – could not be answered within the hazards approach, which focused almost exclusively on individual choice, free markets, and rational regulation. Rather, the issue can only be addressed fully by examining the *political economy* of floodplain investment, the role of capital in agricultural development, and the control of legislative processes through normative ideologies, vested interests, and campaign finance. Similarly, the risk of floods is not uniformly distributed through populations. Are poor and marginalized groups more vulnerable to such events? What is the role of power in the environmental system and its relationship to people?

These questions raise manifold research opportunities for critical scholarship. As Ben Wisner and Maureen Fordham ask on their radical hazards webpage *Radix* (www.radixonline.org/):

> How are populations made more vulnerable to these hazards by war, by government policies, by misguided development projects? What about the spiking incidence of domestic violence after hurricane Andrew in Florida and the Red River floods, both in the USA? What about the fact that 40 percent of all deaths from tornadoes in USA occur in mobile homes – inhabited by low income people?

But to engage these questions would require a fundamentally different view of social and natural process. In hazards research, humans are purposeful individuals who first perceive a hazard, recognize available alternatives, and then rationally adjust their behavior. If an individual behaves "irrationally," it is the result of cognitive biases, willful ignorance, faulty perception, or other personal and social-psychological "problems." The contextual forces that create unequal vulnerability and differential response, therefore, fall outside the concerns of traditional hazards research. As Michael Watts put it in his critique of hazards research and human ecology, "in spite of the recognition by Kates, White and others of the strategic importance of social causality, they have no social theory capable of addressing social processes, organization or change" (Watts 1983a, p. 240).

The nature of society: Cultural ecology

In contrast to the pragmatic policy approach of hazards, a separate group of modern scholars took as their focus an academic exploration of the development and expression of culture, especially on and within the environment. Cultural ecology, as the field would

come to be known, approached human–environment issues ecosystemically: humans would be seen as part of a larger system, controlled and propelled by universal forces, energy, nutrient flows, calories, and the material struggle for subsistence. Unlike hazards, cultural ecology sought universal and generalizable rules of human–environment interaction. But like hazards, it would falter on the same conceptual and practical problem: accounting for and understanding change in a complex modern political economy. The crisis of explanation confronted by cultural ecology would become the fulcrum on which political ecology would be levered into prominence.

Historicism, landscape, and culture: Carl Sauer

Interest in the historical development of cultures and human impacts on the landscape, it must be remembered, was not much cultivated in turn-of-the-century geography. This was so much the case that the publication of an essay in 1925, which simply defined the objective of geography as the interpretation of landscape and humanity's role in changing that landscape, was considered a breakthrough.

That essay, "The Morphology of Landscape" by Carl Ortwin Sauer (1965a), led the field of geography into a new tradition of cultural landscape studies for several decades. Centered at the University of California at Berkeley, and shepherded by Sauer himself, this new school of scholarship directed itself to research human use of nature, especially the impact of human activities. Historical and archaeological data were joined with geomorphologic and soil studies to create bold, long-term accounts of how places came to look the way they did (Speth 1981). Inverting determinism, historical landscape studies sought to explain the physical patterns on the land (forest cover, soil erosion, stream flows) in terms of human culture rather than the other way around. Rather than focusing on the functional-causal explanations typical of previous determinism, this approach focused on the emergence and adaptation of culture over time, diffusion of cultural traits, and interaction between cultures (Speth 1978). Sauerian human–environment research would concern itself with detailed study of the *how* of local cultures, less than the *why*.

Sauer's concerns were also directed towards what he viewed as the ecological crisis of Western civilization. His strongly normative view of human impact on nature, inspired at least in part by the work of Marsh, was explicit in its castigation of environmental degradation and its characterization of the modern commercial economy as unsustainable:

> To this review of some of the suicidal qualities of our current commercial economy, the retort may be that these are problems of the physical rather than social scientist. But the causative element is economic; only the pathologic processes released or involved are physical. The interaction of the physical and social processes illustrates that the social scientist cannot restrict himself to social data alone. (Sauer 1965b, p. 152)

His interest in these topics was probably formed during his work for the Soil Conservation Service (SCS) and the Michigan Land Economic Survey (MLES) prior to his arrival at Berkeley. These services probably helped to foster both his concern for the condition of the environment and his interest in the everyday affairs of working people (Leighly 1965). This was coupled with Sauer's enduring belief, rooted in his field experience, that indigenous practices and agro-ecologies *made sense*. Displacing them through moderniza-

tion could only lead to disaster. In a letter to Joseph Willits, who was then the director of social sciences at the Rockefeller Foundation, the activities of which militantly promoted precisely such modern interventions during the Green Revolution in Mexico, Sauer wrote:

> A good aggressive bunch of American agronomists and plant breeders could ruin the native resources for good and all by pushing their American commercial stocks . . . This thing must be approached from an appreciation of the native economies as being basically sound. (cited in Perkins 1990, footnote 73)

The political and economic urgency in Sauer's worldview is seldom reflected in his research, however. Very little attention in any of Sauer's contributions to cultural research dwells explicitly on the modern economy and its relationship to the environment. On the contrary, over his long career, Sauer is most commonly associated with the study of "archaic" or pre-modern cultural and economic contexts: pioneers in Illinois, early human occupation of the Americas, and settlement of Kentucky "barrens," as prominent examples (Leighly 1965).

More significantly, however, Sauer established in the Berkeley school of geography a tradition of *fieldwork*. This empirical tradition sent researchers into the countryside and around the world, exploring the social world of people as expressed in their use of nature. This set a research agenda that would live on into contemporary political ecology, ranging from footwork in urban slums on access to water (Swyngedouw 2004) to deep historical ecology revealing the role of slaves in creating and maintaining complex systems of ecological knowledge (Carney 2001; Carney and Rosomoff 2010).

Julian Steward: A positivist alternative

The postwar period brought with it a change in the structure and direction of social scientific research. While the historicism of human ecology continued to be championed by researchers like Sauer, a new generation of cultural researchers became increasingly interested in an explicit, predictive *science*, one that sought laws with universal applicability using rigorous, quantitative investigation of cause and effect. Inspired by positivist approaches to social science – those that sought to establish scientific theories and laws of social behavior and function – these researchers wanted to move beyond descriptive histories and landscape studies. Without returning to crude determinism, anthropologists and geographers were searching for a science of culture.

In Julian Steward, they found an intriguing alternative. In contrast to Sauer and other historicists, Steward was driven by an interest in cross-cultural comparison. While the historicist notion of history creating culture, he claimed, avoids the problems of determinism, he insisted that it could not *explain*, and so must be rejected, in the hope that general processes could be discovered, and patterns that explained common, global, culture types might be sought. "The cultural-historical approach is . . . also one of relativism. Since cultural differences are not directly attributable to environmental differences and most certainly not to organic or racial differences, they are merely said to represent divergences in cultural history, to reflect tendencies of societies to develop in unlike ways. Such tendencies are not explained" (Steward 1972, p. 35).

Box 2.2 Cultural Ecology as Political Ecology in Judith Carney's *Black Rice*

In *Black Rice*, Judith Carney offers a rigorous historical mapping of the diffusion of rice (Oryza glabberima) from the flooded fields of pre-colonial West Africa to the antebellum plantations of North America, where it became the largest cash crop of the pre-Civil War period. This empirically rich project is most remarkable because it does the radical work of a postcolonial political ecology using the very traditional tools of cultural ecology. As Carney explained to me in 2010, her sources of inspiration were vast and eclectic, including Carl Sauer and Alfred Crosby on the significance of intercontinental species transfers in world history; Karl Marx, Karl Polanyi, peasant studies; and Michel Foucault. Scholarly literature on resistance brought her to slavery studies. But her central impetus was the depth of poverty and hunger in contemporary sub-Saharan Africa and her story parallels those of Africanist scholars like Michael Watts to engage its historical roots.

In the process, Carney's study turns Eurocentric diffusionist notions on their heads and shows the contributions of non-Euro-Americans (enslaved Africans!) to the environmental history of global knowledge and genetic exchange. West African rice production likely supported vast populations in the region into the sixteenth century, a hugely successful agroecology that ironically made it a target for slavers. Concomitantly, the success of American plantations, populated by Europeans with little or no reliable knowledge of subtropical production, depended entirely on seizing and capitalizing on African rice production knowledge – the knowledge of the enslaved.

"I had spent a great deal of time researching agriculture and environmental issues in West Africa and in African-descended regions of Latin America," Carney explains. "I became increasingly stunned by the lack of research attention to African contributions in shaping land use in the Americas." Indeed, the complex linkages of indigenous and African knowledge have long been under-appreciated, especially in the Caribbean where native populations had been exterminated.

"Africans emerged as the custodians of Amerindian knowledge systems. In effect, two tropical food systems merged in plantation societies, which offered the enslaved a profound understanding of food, medicinal, and environmental resources that would abet their survival and resistance."

In this way, the power of Carney's story in both contributing to, and inverting, diffusionist history is profound.

Unlike the determinists, however, Steward was emphatic in insisting that environmental factors do not determine humanity. Instead, *human interaction with nature through subsistence and work* is the determinant and directing influence of environment on the social and cultural order. The theoretical basis of this form of human ecology was elaborated as a model of determinant factors, premised on the imperatives of making a living, extending outwards to more contingent and globally varying cultural features (Figure 2.1).

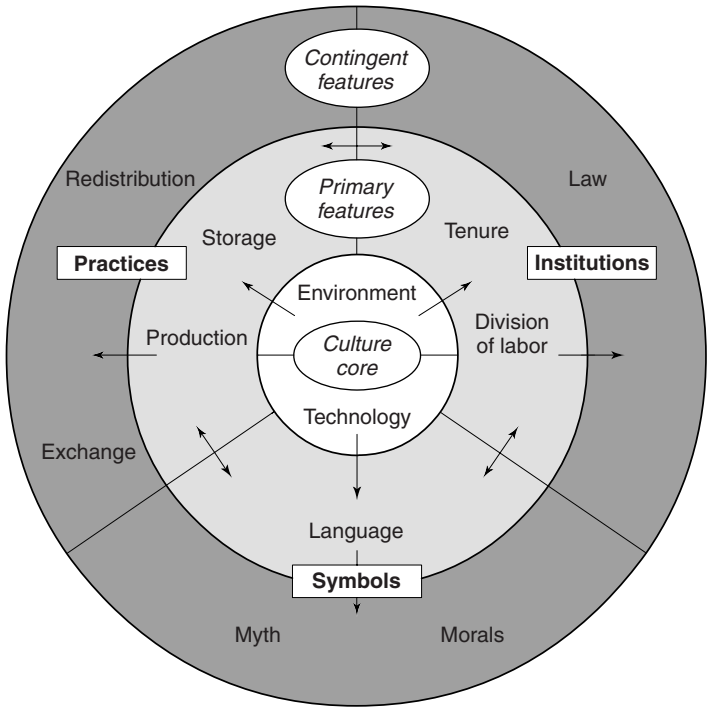


Figure 2.1 Julian Steward's cultural ecology.

At the center of human societies, Steward argued, is a "culture core," those fundamental features of human life, especially technology, necessitated by the conditions under which subsistence is achieved through farming, herding, collecting, and working more generally.

> The core includes such social, political, and religious patterns as are empirically determined to be closely connected with these arrangements. Innumerable other features may have great potential variability because they are less strongly tied to the core. These latter, or secondary features, are determined to a greater extent by purely cultural- historical factors – by random innovations or diffusion – and they give the appearance of outward distinctiveness to cultures with similar cores. Cultural ecology pays primary attention to those features which empirical analysis shows to be most closely involved in the utilization of environment in culturally prescribed ways. (Steward 1972, p. 37)

These features were necessarily determinant of other, more contingent cultural factors. Thus semi-arid ecosystems, for example, do not *determine* the structure of a society in any simple way. But since all societies who hunt and gather in semi-arid ecosystems face similar production challenges, common social structural solutions might be hypothesized, influencing property relations, marriage patterns, food sharing, and other facets that together make up human cultural life. These patterns might give rise to a range of higher-order cultural functions, hierarchy, cosmology, and the broader morals and ideals of the larger

culture group. Other cultural features may prove to be unrelated to subsistence practice and to have arisen through interaction with other groups or through "random innovations."

Methodologically, Steward's model formed a clear mission for researchers. By observing many cases of the same kinds of production and comparatively assessing those cultural characteristics that do and do not vary, researchers can scientifically understand what the ordered functions of social and cultural process might be. This regime further compelled researchers to study more "simply structured" and less complex social groups – hunter-gatherers, agriculturists, and herders. Though the same principles applied to modern industrial societies, it was reasoned, a scientific study should begin at the simple and extend only slowly to more complex cases (Steward 1972). Like Sauer, therefore, Steward's cultural ecology would focus on subsistence producers in rural areas, often in underdeveloped contexts. The implications of this for later political ecology cannot be overstated since contemporary work continues to remain overwhelmingly in the area of subsistence production in the third world.

Moreover, while Steward never directly references Marx or other Marxist theorists, in his concerns for production at the center of the "culture core," he comes quite close to articulating a materialist approach to culture, one fundamental to Marxian notions of the "mode of production" (Murphy 1981). For Marxian social science, explanations of history follow from tracing the way in which people make a living and its determinant impact on social organization, the flow of value, and the arrangement of labor. This would hold implications for research many years later. The transition from positivist cultural ecology to the critical challenges of political ecology did not compel a reorientation away from production. Indeed, Steward's most prominent students, including Sidney Mintz and Eric Wolf, pursued more formal political ecology throughout their careers.

System, function, and human life: Mature cultural ecology

But long before such challenges emerged, the science of cultural ecology would develop into a complex and diverse field of study in its own right, propelled by simultaneous enthusiasm in geography and the emerging sub-discipline of ecological anthropology, and drawing upon an increasingly sophisticated body of concepts and quantitative methods (Grossman 1977; Hardesty 1977). In particular, the science of ecology provided the central analytical tools with which cultural ecologists would experiment. These were attractive because they allowed researchers to discuss human behaviors and practices in terms of their function and role in regulating energy and nutrient flows in a larger *system*, towards or away from homeostatic equilibria (Foote and Greer-Wooten 1968). In other words, by viewing humans as essentially the same as other plant and animal species, basic functional hypotheses could be proposed to explain complex cultural patterns. Rituals, kinship patterns, and traditional institutions could be evaluated to determine if they served an ecosystem function – one that helped regulate the general system of human–environment relations, maintaining stability.

In a classic example, Roy Rappaport, an anthropologist with years of field experience amongst the Maring people of New Guinea, proposed that major features of the Maring's complex culture could be explained by virtue of their role in maintaining ecosystemic balances. Specifically he hypothesized that periodic ritual warfare and pig sacrifice were the

Box 2.3 Robert McNetting's *Smallholders, Householders*: Big Things in Small Places

Robert McC. Netting's *Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture* is a wonderful contradiction, typical of one of cultural ecology's most enigmatic observers. Amassing a huge body of evidence and summarizing a lifetime of work, Netting's opus is concentrated on making only a single (but nevertheless important) point: intensive, small, peasant landholdings are inevitable, persistent, and sustainable.

The book is a blizzard of impressive detail from Nigeria and Japan to the Swiss Alps (long Netting's stomping ground). These particulars of farm strategy are harnessed to answer some big questions: Can the world's peasantry compete on regional and global markets? How much land is required for a farm family to survive? What systems of tenure allow small producers to thrive?

Like the bulk of Netting's work, the book debunks the high priests of intensification who tout that large farms with more machinery, operated by full-time agribusinesses, produce more and cheaper food. Where Netting discusses the question of a farm's size versus its productivity, for example, a hotly debated question with implications for the decollectivization of post-socialist farms and the agglomeration of corporate farmlands, he notes that "as is so often the case, cultural values are said to be responsible for economic inefficiency," keeping "traditional" and "spiritual" people close to the land despite the hopelessness of production arrangements. Nothing could be further from the truth, he demonstrates. The economies of scale enjoyed by some plantation industries and the marginal conditions of some dry areas notwithstanding, small farms show extremely high yields with relatively few capital inputs.

Netting's politics are also fairly clear. He finds leftist accounts of emergent inequality and the disappearance of "the little guy" just as unsupportable as the celebration of consolidation by big-farm optimists. Intensive small farms, Netting insists, thrive in feudalism, capitalism, and late capitalism. And while "within-group" stratification of smallholders is a timeless reality, Netting insists that social mobility and opportunity in such groups are persistent – these high-population, high-intensity landscapes show remarkable social equality. These claims are contextual and debatable, of course, and do distract from troubling problems that smallholders will continue to face: unequal terms of trade, protectionism, and politically networked agribusiness. Even so, a material reading of the daily lives of smallholders shows a complex picture, one that defies grand theories about "the poor."

In this way, *Smallholders, Householders* does what many postcolonial critics have long urged: it abandons the creation of ethnographic accounts of the "other." Explicitly eschewing ethnology, Netting lays out his project from the start: "what follows is not an attempt to interpret 'culture,' a project of eliciting and perhaps creating meaning so grand that only the artist or the literary critic would confidently attempt it. Rather it examines a limited set of social and economic factors that are regularly associated with a definable type of productive activity" (p. 2).

Netting died in 1995. I regret that I never met or spoke with him. But this self-effacing passage seems to admirably capture his eminently practical voice.

indirect response mechanisms to cycles of population growth and decline amongst both pigs and people (Rappaport 1967, 1968).

Other researchers used ecological concepts like "ecological niche" and "adaptation" to explore within- and across-group relationships (Hardesty 1975). Frederick Barth, working amongst diverse subsistence communities in the mountainous regions of Swat, Pakistan, suggested, for example, that inter-group relations, whether in terms of trade or conflict, were regulated by the different niches that each group filled in the ecosystem (Barth 1956). Similarly, in the adaptation research of John Bennett, the practices of a range of ethnic groups on the northern plains of Alberta, including Hutterite farmers, Anglo ranchers, and Native Americans, were explained in terms of the different ways in which they made a living from the diverse resources of the prairie (Bennett 1969).

During the 1960s and 70s such hypotheses were tested using increasingly formalized methodologies. Following on Steward's interest in a comparative science, cultural ecologists became increasingly interested in developing common metrics with which meaningful cross-cultural measurements and comparisons might be made. How can the patterns of resource use in the forests of New Guinea, for example, be meaningfully compared to practices in rural England or the Soviet Union?

The answer, researchers concluded, lay in the universal measures used in the study of terrestrial plant and animal ecologies: energy, nutrients, and biomass. The first of these, energy as measured in joules or kilajoules, was deemed most attractive; it flowed through all systems and could be used as a measure not only of productivity but also of efficiency (Rappaport 1975). This concern for efficiency would mark many scientific fields, propelled by the rise of systems theory in the last half of the twentieth century. By assuming that systems tend towards homeostatic balance, or that they shift between dynamic equilibria, the pattern of human action can be seen in a broader, systemic, and predictive order.

By following these flows of energy and matter, research into energetics could explore some profound and interesting questions. Has agricultural intensification through the green revolution in places like India and Egypt significantly altered the efficiency of production? Which is more efficient, Soviet collectivism or modern English smallholding? The results of this form of energetics research often cast traditional and "primitive" practices in a startlingly positive light. Bayliss-Smith's exhaustive and meticulous quantification of energy flows in agricultural systems around the world concluded that modern farming was remarkably inefficient, revealing the hidden ecological costs of fossil-fuel dependence (Bayliss-Smith 1982).

The adaptive practices of swidden (shifting cultivation or slash and burn) farmers, in particular, though long maligned by colonial officers and later development officials, were subject to careful scrutiny by cultural ecologists, who usually reached the conclusion that such farming systems were streamlined, effective, efficient, and environmentally benign (Conklin 1954; Geertz 1963; Dove 1983). Far from primitive and isolated, moreover, swidden was demonstrated to be well integrated into complex market systems (Pelzer 1978), with recent work underlining its importance as a supplement for the poorest and most impoverished households (Hecht et al. 1988). These findings, presented in a world where modern, high-input, "green revolutionary" systems were being proposed as superior to those of traditional communities, sounded an important note of caution.

Finally, the cultural ecological approach is most notable for its serious attention to the logic of local people taken on its own terms, particularly their ecological knowledge and

the relationships between that knowledge and environmental practice and the production of landscapes. Beyond the systems and adaptation approaches (most of which have lost prominence in the field over the years), research into people's logics and landscapes continues to thrive. Cultural ecological work with smallholders and rural cultivators is most notable in this regard, in that it demonstrated that though local production is immensely complex and highly variable, it operates in a sensible, rational, and relatively comprehensible manner. Whether examining the patchwork landscapes of field, pasture, and garden produced by Swiss peasants or untangling the complex property rights in Nigeria, cultural ecology consistently demonstrated that people close to the land act with sophisticated ecological motivation and understanding to produce the world around them (Netting 1981, 1986, 1993).

Cultural ecology, in this way, opens the door to a range of productive questions, allowing a continuing exploration of the complex and sophisticated adaptations of people who had historically been characterized as backward. Related work continues to show the immense adaptive capacity of people, from the indigenous people of pre-Columbian North and South America to the producers of agro-food systems in the present day (Turner and Brush 1987; Turner 1990; Butzer 1992; Doolittle 2000; Denevan 2001). Researchers also continue to explore traditional ecological knowledge and management, with increasing recognition of the role of regional economic cycles in setting the terms of subsistence (Barham and Coomes 1996; Berkes 1999). By uniting highly specialized skills in agronomy, pedology, and hydrology with social and cultural exploration, cultural ecology has, moreover, created a model for integrative multidisciplinary research in anthropology and geography (Butzer 1989; Turner 1989).

The incipient critical politics of cultural ecology is also readily apparent. Farming, herding, and hunting groups around the world, who have been characterized as primitive, conservative, and inefficient, become the focus of sustained and focused study, revealing the veracity and sustainability of their ways of life. It is the modern development state, by implication, with its high-input agricultural systems, its market orientation, and its urge to separate producers from resources, that appears primitive and inefficient. In the evolution of their work, cultural ecologists almost invariably, though perhaps not intentionally, have come to champion the most marginal and powerless groups, revealing the problems and limits of state and commercial power.

Even so, cultural ecology has been the subject of many criticisms over the years, in terms of both its concepts and its practices. Firstly, the excesses of the logic of adaptation, so central to cultural ecology, often lead to problematic reductionist conclusions, suffering from a fundamental teleological flaw: if people do it, it must be adaptive (Trimbur and Watts 1976). Indeed, the adaptation approach is focused specifically on assuming and demonstrating the ecological functionality of the most unusual cultural practices. The crude theories that developed from this approach propelled some truly bizarre and excessive claims. Aztec human sacrifice traditions, for example, the immensely complex socio-religious institutions of Mexico in the pre-Colombian period, were explained to be an adaptation to protein deficiencies for which human flesh was a crucial supplement. Leaving aside the fact that human protein demands could easily have been met with the maize–legume combinations of regional domesticates, the bold reductions necessary for such a claim were found to be unsatisfying and unrigorous even by supporters of the approach (Winkelman 1998).

This "neofunctionalism" was further criticized for its crude use of the concept of "carrying capacity," which uncritically assumed that there are given limits to human population density, despite extensive and growing evidence to the contrary (Behnke and Scoones 1993). The assumptions, moreover, that a given subsistence population could be analytically bounded also posed difficulties, as did the short time scales of research over which arguments for long-term adaptation were made (Orlove 1980).

So too, neofunctional cultural materialism, as championed by anthropologists like Marvin Harris, has been overturned, often simply through rigorous field research. Harris, for example, argued that the cow became sacred in India because of the ecological value of its protein provision and agricultural traction power (Harris 1966). Highly inconsistent data and questions of cause and effect in cattle protection undermine any such simple explanation (Simoons 1979; Freed and Freed 1981). Do adaptive uses lead to taboos creating surpluses or does the surplus of animals lead to adaptive uses? As adaptation researcher Alexander Alland (1975) once insisted, the worst cultural ecology in this way represents little more than "just so stories" (p. 69).

Most problematic, the thrust of some cultural ecological argument explicitly naturalizes and, by implication, legitimizes what can be seen as contingent social behaviors and practices, recalling the socially and politically disturbing features of determinism. If the Native Americans of Bennet's *Northern Plainsmen* fill an "adaptive niche" by living at the edge of subsistence, scavenging at the periphery of the larger economic and ecological system, the implication is that such a status is natural, and not the result of land seizure, political marginalization, discrimination, and decades of exploitation (Bennett 1969).

The politics that both make up and constrain the daily life of such people, who are perpetually engaged in social and ecological conflicts over subsistence, are little in evidence in this work. This disinterest in resource politics, in the end, often makes it difficult for cultural ecologists to explain the outcomes they observe in the world. Even where truly visionary cultural ecology has called attention to looming development-driven crises, as cultural ecologist William Denevan did with remarkable insight for the Amazon as early as 1973, the limits of the approach, like that of hazards, are established by the absence of theoretical tools to address the larger political and economic context.

Beyond land and water: The boundaries of cultural ecology

These limits are perhaps no more clearly seen than in *Between Land and Water*, Bernard Nietschmann's groundbreaking study of social and ecological change along the Miskito coast of Nicaragua. Nietschmann was a naturalist and by all accounts a lover of sand and sea, but with a strong interest in the workings of culture and a commitment to the scientific study of development problems. In 1968 he departed for a small community of Miskito Indians in the village of Tasbapauni on the Pearl Lagoon on the Caribbean coast of Nicaragua. Equipped with all of the robust tools and theories of cultural ecology, having been trained at the University of Wisconsin by William Denevan, a senior researcher in the field, Nietschmann intended to study subsistence strategy and change along the coast. The study would be extensively quantitative and would involve careful measurement of crops and game, with an eye towards exploring energy inputs and outputs, especially in terms of

the harvest of green turtles, which were crucial components of Miskito subsistence and livelihood: classic cultural ecology.

Nietschmann's extensive and detailed quantitative conclusions are complex. His work concluded that the Miskito depend on hunting and fishing as key supplements to crop subsistence, since they provide dependable food security and consistently productive yields. Specialization by individuals in hunting or fishing, he maintained, was in part a result of expensive equipment costs and because mastery of the complex knowledge required was difficult (Nietschmann 1972). Similarly, Nietschmann recorded the complex and sophisticated systems that governed sharing of meat catches, examined in terms of the cultural role of redistribution in the reproduction of the social order and availability of proteins (Nietschmann 1973). All of these bear the traditional marks of cultural ecology's questions and answers.

But things were not in homeostatic order, by any means. The monetization of the local economy had redirected flows of exchange and harvest of hunted wild animals. Specifically, the trading of sea turtle meat and other products, though a practice dating from at least the early seventeenth century, had radically accelerated in recent years. This brought with it a breakdown of social reciprocity, an acceleration of harvest, and decline of turtle resources. This decline fed a spiral of overexploitation and capitalization with serious social and environmental implications (Nietschmann 1973).

Ultimately, Nietschmann concluded, the fundamental problems of Miskito subsistence and the emerging livelihood crises along the coast were not related to the metabolism of the internal ecological system – the governing system imagined to be so important in systems approaches of cultural ecology – but the broader global market. As he explains in a compelling narrative account of his life in the field, *Caribbean Edge*:

> These green turtles, caught by the Miskito Indian turtlemen off the eastern coast of Nicaragua, are destined for distant markets. Their butchered bodies will pass through many hands, local and foreign, eventually ending up in tins, bottles and freezers far away. Their meat, leather, shell, oil, and calipee – a gelatinous substance that is the base of turtle soup – will be used to produce goods for more affluent parts of the world. (Nietschmann 1979, pp. 173–174)

Concerned not only about the lives and livelihoods of the Miskito, with whom he had developed a strong rapport, but also for the turtles themselves, Nietschmann began to ask new and pressing questions. How much more overextraction might be expected before the Miskito respond economically or politically to their position in Nicaragua's political economy? Did struggle lie ahead? Could Miskito systems of production function with one foot in subsistence and the other in the market?

Evidence on the relationship between social conflict, markets, and turtle population decline was clear, especially in terms of traditional systems of reciprocity:

> Tension is growing in the villages. Kinship relations are strained because of what some villagers interpret as stingy meat distribution. Rather than endure the trauma caused by having to ration turtle meat, many turtlemen prefer to sell all of their turtles out to the company and return to the village with money, which does not have to be shared . . . the situation is bad and getting worse. Individuals too old or too sick to provide for themselves often receive little meat or money from relatives. Families without turtlemen are families with neither money nor access to meat. (Nietschmann 1979, p. 186)

Nor would the political imperatives and entanglements of Miskito livelihoods in Nicaragua end there. The Nicaraguan Sandanista government of the 1980s, during their protracted conflict with US-supported guerrillas, enacted price controls and land seizures throughout Miskito territory, which further highlighted the marginal position of the community within the global economy as well as within their own national polity (Nietschmann 1989). Nietschmann was compelled to address these issues, and would do so both as a researcher and as an activist apprenticed to the Miskito community.

The limits of progressive contextualization

Though this struggle would drive research for the rest of his life (he died in 2000), the tools of Nietschmann's science did not seem to fit the range of questions he faced. Even as he had walked through a political doorway, Nietschmann had hit a conceptual wall. Restricted to research tools like organicism, function, adaptation, and equilibrium, further understanding could not cross the barrier point where markets meet subsistence and where the same local populations carry out the creation and destruction of the environment.

Cultural ecology offered one more methodological instrument for understanding such complexity. Andrew Vayda (1983), writing in the early 1980s, proposed that explanations of people–environment interactions follow a path of "progressive contextualization," where human–environment interactions are explained "by placing them within progressively wider or denser contexts" (p. 265). The predicament of the Miskito, and communities like them, can be best explained by describing the changes and conflicts in their production system, while slowly refocusing the analytical lens to understand the social context of decisions, the economic context of those social systems, and the political context of that economy. Nesting immediate events within previous causes, Vayda argued, leads to an understanding of driving processes in an empirical and "abductive" way. Abduction, a technique for moving iteratively between causes and effects, can explain any outcome as a product of other forces, actions, or events.

As we shall see in Chapter 4, explanations in political ecology came to mimic, in many regards, this sort of chain of explanation, linking immediate outcomes to more distant processes. Vayda's insistence, however, that each event can and should be traced to its own cause presented its own limits. As a somewhat ad hoc and adamantly atheoretical approach, progressive contextualization allowed few (or no) powerful theoretical and conceptual tools and discouraged researchers from asking *why recurrent and persistent outcomes seem to prevail* in socio-ecologies, and so elided habitual and structural tendencies in human ecology.

Why are turtles declining? Because of overfishing. Why is overfishing occurring? Because of changing markets. But why are markets changing? And what is the overall relationship between markets, state authority, local power, and ecological cycles of production and decline? The interactions between state institutions, coercive social relationships, commodity markets, subsistence, and natural resources were dynamics that required new theoretical tools and categories, not simply a longer list of causes. This is especially true if the analyst wants not only to describe changing human–environment interactions, but to *change* them as well.

So too, the political role of the researcher in representing and interacting with the groups with whom they work had so far received little discussion in human–environment study.

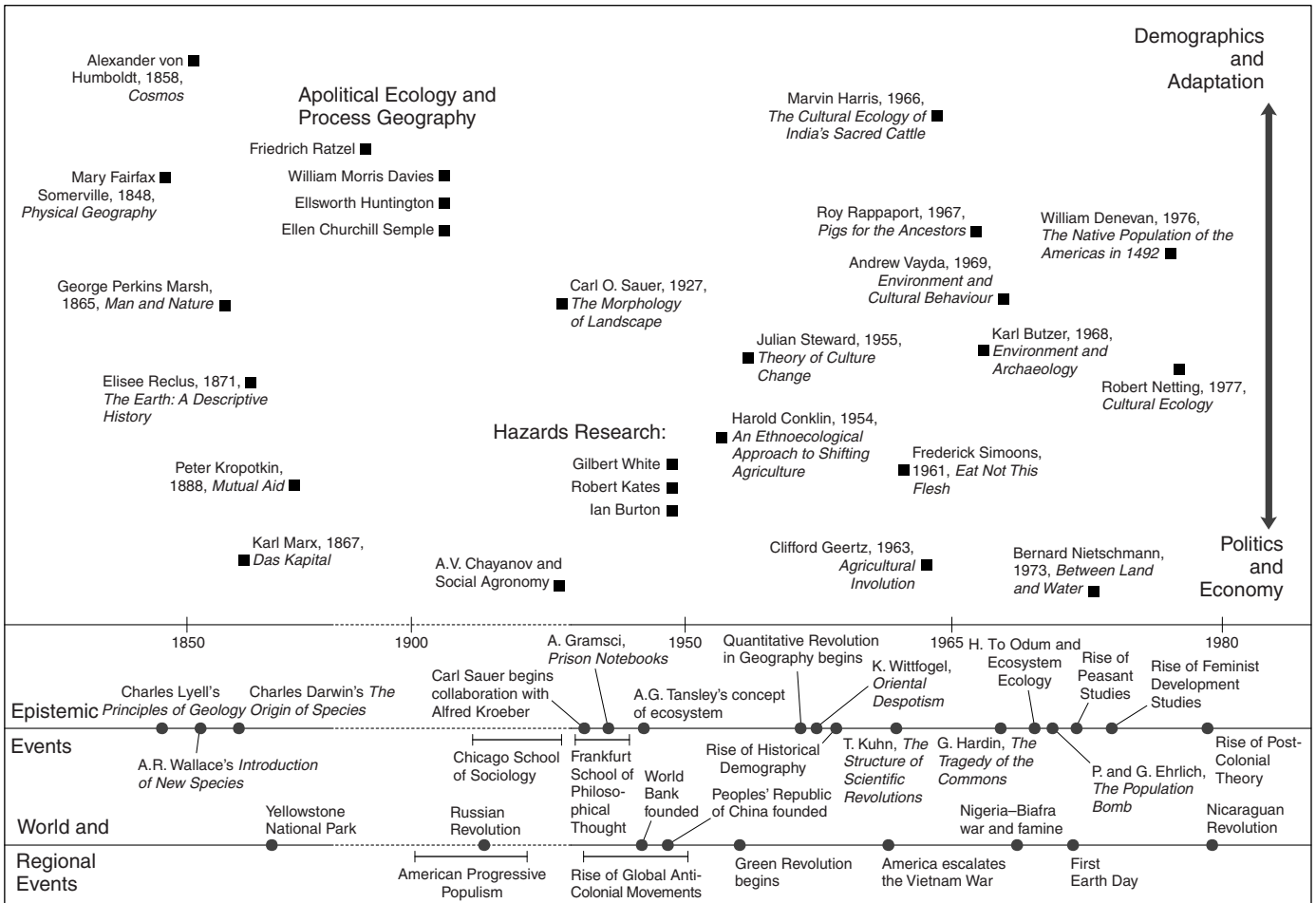


Figure 2.2 Antecedents and the rise of cultural ecology.

What are the obligations of the researcher to the researched? What are the inherent power relations that create problems in that relationship? Who can speak for whom? To whom is research speaking? To what end? These issues, though inherent in the work of hazards researchers and cultural ecologists, had received little serious attention. They would require far more elaboration before practical and progressive work might be done.

Like many researchers before him, Nietschmann was beginning to do what we now call political ecology. He had argued that Miskito articulation with global political economy had simultaneously created reconfigurations of social systems governing redistribution, cultural standards governing resource management, and environmental systems governing the populations of wild species. He had found change, but not the change he thought he would find. And as in Humboldt's observation of pearl fisheries, Sauer's anxiety over commercial economies, and White's examination of "irrational" flood policy, the theoretical tools to explain *why* such changes occur, which might help to steer both research and activism, were not yet fully formed.

In sum, the argument I have presented here, insofar as the history of several fields can be used to draw any coherent lesson, is that critical politics in environment–society research are not at all a new thing. Indeed, from the very origins of evolutionary theory, through the complex social and ecological revolutions of the late nineteenth century, into the era of technocratic intensification and urbanization, researchers have continued to articulate a relatively coherent program of political ecological research. This work, from the anti-authoritarianism and anti-commercialism of Kropotkin and Sauer to the local rationalism of White and Netting, has consistently interrogated the logic of local production, the value of local knowledge, the environmental costs of regional and global change, and the power-laden impacts of socio-environmental change (Figure 2.2). As I have tried to show here, however, the consistent problem has been the absence of an integrated set of critical concepts, methods, and theories from which to explain problems and upon which to build alternatives.

Such critical tools, however, lie close at hand. And in the explosive political and ecological events of the 1970s and 80s, these would find articulation in the increasingly formalized field of contemporary political ecology.

Chapter 3

The Critical Tools

- Common Property Theory
- Marxist Political Economy
- The Producer is the Agent of History: Peasant Studies
- Breaking Open the Household: Feminist Development Studies
- Critical Environmental History
- Whose History and Science? Postcolonial Studies and Power/Knowledge
- New Concerns: Cities, Subjects, and Objects
- Governmentality and the Creation of Subjects
- Objects, Actor-networks, and the Problem of Materiality
- Towards Political Ecology

In 1978 the government of India, working with a large number of NGOs, set out to modernize the cattle breeding system of the poorest communities in Orissa, a state long plagued by drought and poverty and highly dependent on the milk proteins their few cattle provided. As reported by journalist P. Sainath, the project was greeted with tremendous enthusiasm by all those involved. The region's poorest households were given a free cow, impregnated with Jersey semen to create offspring with high milk yields. They were further provided with an acre of free land to grow trees for animal fodder. Finally, they were provided with minimum wage payments for their labor with the trees and animals until the new modernization project got off the ground and the benefits of purebred Western

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

Figure 3.1 Indigenous cattle of Orissa, India. Though lower in productivity than foreign hybrids, local varieties are hardy, drought-tolerant, and adapted to local conditions. Photo © Steve Estvanik / Shutterstock.

animals were experienced by all, in the form of plentiful milk, good sales, and a sustainable future (Sainath 1996).

By 1990 the project was in a shambles. Most villages across the region were now without any animals, including not only the new hybrid but also their traditional subsistence beasts for milk and burden-bearing. The region's traditional Khariar bull, long treasured and outbred for profit, was biologically extinct. The trees, once harvested, had died. The land had been reclaimed for marginal food crops. Modern development had made local people more destitute and had depleted much of the region's environmental resources and faunal biodiversity. A project intended to decrease outmigration from the area had increased it, forcing more independent producers into low-wage labor (Sainath 1996).

What had gone wrong? Clues to the failure of the system can be found by employing the principles of hazards and cultural ecology. Viewed in this light, the periodic hazard of drought in South Asia has resulted in traditional risk-reducing breeding systems that balance production and survival in livestock species. The traditional use of marginal fodder resources produced consistent and steady regional milk exports from the region, if not large ones. Land management was thus traditionally well integrated with climate variability. So too, stud bulls were commonly treated as community and village property to optimize access to key resources as well as production levels, while diversifying genetic stock. Plantation choices mixed food as well as feed crops, depending on community grazing lands for livestock inputs. The result was a system where milk production in Indian grasslands was roughly a remarkable 1.85 tons per hectare, compared to a global average of 0.137 (Crotty 1980; George 1990).

From this point of view, the project directors in Orissa did *everything* wrong. By introducing an American stud animal that was ill-suited to the climate, they all but assured its decline during periods of environmental stress. Insisting on purity of the genetic material,

they slaughtered all local stud bulls so as not to dilute the breeding program. Producers who grew both food and fodder on their allotted lands had their vegetables torn from the ground (Sainath 1996). Despite historically communal breeding systems, animals were privately dispensed, as was fodder-producing land. The fodder tree species choice, *Leucaena leucocephala*, while a productive species, is not suited for all environments (Hocking 1993). So from a cultural ecological point of view, as well as from that of hazards adjustment, the project was poorly designed; indeed it was insane.

But the larger questions still loom. Why did the development authorities make the decisions they did? Why were local practices dismissed? Who sponsored foreign high-yielding animals, ones that required high levels of purchased inputs? Who benefited from this program in terms of animal and semen sales, international consultancy fees, and administrative salaries? How does the state's relationship with non-state actors and global markets direct the choices made? Does this represent a larger development trend in the articulation of local production systems with globally distributed and marketed trees and animals? How did independent landowners become landless workers? Who claimed their abandoned farms? These questions, hallmarks of political ecology, remain.

As with Nietschmann's Miskito, the tools of cultural ecology and hazards, though crucial for describing such ecological systems and problems systematically, are insufficient for asking and answering the pressing multi-scale questions of development-era environmental change. The emergence of a wide range of crucial theoretical concepts in recent decades – drawn from common property theory, green materialism, peasant studies, feminist development studies, discourse theory, critical environmental history, postcolonial theory, and actor-network theory – constitute a new and robust toolkit to directly tackle these questions. They together form the eclectic equipment of political ecology.

Common Property Theory

One of the first and most essential contributions to a contemporary political ecology is common property theory, which rests on the understanding that fisheries, forests, rangeland, genes, and other resources, like many of the environmental systems over which struggles occur, are traditionally managed as collective or common property. Indian pastures, like Nietschmann's turtle fisheries, White's rivers, and Humboldt's pearl beds, are all complex ecological systems that are difficult to divide into individual units of ownership – to "exclude" in the language of economics – owing to their spatial and temporal variability. But where private benefits are accrued at a cost to the group, there is a potential to overgraze rangeland, pollute rivers, overextract fish, and otherwise use resources unsustainably. Clearly, many of the environmental systems of interest to cultural ecologists and other environmental analysts seem to fall into this broad category of vulnerability. Moreover, since the possibilities for environmental degradation under these social and ecological circumstances are high, problems like declines in pearl beds or turtle populations might be explained as tragic outcomes of failures in collective management.

Local management structures, rooted in local knowledge of such environmental systems, however, commonly provide rules of use that maintain subsistence and renewal of these community resources. Community-managed resources in fact thrive around the world.

A widening international interest in the operation and function of those rules systems emerged in the 1970s and 80s, an interest that was concurrent with the rise of contemporary political ecology.

This body of research grew out of a response to the conventional wisdom in the West, wisdom rooted in the premise that private gains might hold social or ecological costs, and which held that collective use of resources tended inherently towards abuse and degradation. Codified into a socio-economic theory – "The Tragedy of the Commons" – this conventional wisdom insisted that only centralized regulation or privatization could solve the dilemma of collective resources (Gordon 1954). "Picture a pasture, open to all," Garret Hardin begins in his classic statement on the question:

> It will be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal war, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally however comes the day of reckoning, that is the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy. (Hardin 1968, p. 1244)

Robert Wade presented it with greater clarity. The choice facing community resource users is:

> either to cooperate with others in a rule of restrained access or to not cooperate. The argument is that each individual has a clear preference order of options: (i) everyone else abides by the rules while the individual enjoys unrestrained access (he "free rides" or "shirks"), (ii) everyone, including himself, follows the rule ("co-operates"); (iii) no one follows the rule; he follows the rule while no one else does (he is "suckered"). Given this order of preference, the stable group outcome is the third-ranked alternative, unrestricted access to all in the group. The second-ranked alternative, with mutual rule-bound restraint, is more desirable. But this is not stable equilibrium, because each individual has incentive to cheat and go for the first-ranked alternative (restrained access to all but him). Even if it turns out that no one else follows the rule, his cheating at least ensures that he avoids his own worst alternative – following the rule while no one else does. (Wade 1987, pp. 97–98)

Under this logic, individuals, assumed to be seeking individual benefit, will invariably take as much as possible from collective resources. Since the costs of that extraction, in reduced returns due to overgrazing, overfishing, or overcutting, are shared between all members of the community whereas the benefits are accrued alone, the inherent logic is to continue and indeed to accelerate individual extraction. When enough individuals behave in that fashion, environmental destruction is inevitable. The only options are centralized coercion or privatization. In the first case, a state entity, exogenous to the group, forces stocking rates on the herders, fishers, or woodcutters. In the latter case, the commons is divided into pieces and distributed between individuals, so that overuse of the resource will be immediately felt by the perpetrator and can be individually rectified.

The argument for the tragedy of the commons is tidy, internally coherent, persuasive, and meritorious given its assumptions. And using rational choice theory and game theory – where logical individual actions are modeled in anticipation of the actions of others – various scenarios of this sort can be tested. Consistently they seem to produce the same

result. Failure occurs where individuals seek personal benefit in environmental systems and costs are "externalized" to the group.

But empirical evidence compiled for the last four decades shows less support for such a model, and time and again evidence of collective stewardship appears in the management of resources ranging from fisheries from Maine to Turkey, pastures from Morocco to India, and forests from Madagascar to Japan. While "tragedy" theory suggested failure, the literature was filled with "exceptions," locally organized techniques, rules, and decision-making structures that organized extraction, defined user communities, and maintained harvests and yields. The empirical record on common property management is far too large to survey here, but the accumulated case material is impressive (see National Research Council 1986; Feeny et al. 1990; and Burger and Gochfeld 1998).

The search during the 1970s and 80s for an alternative theory, therefore, became an imperative for international and comparative social science research. How to account for these successes? When do they work? What makes them fail if and when they do? The theory that emerged would challenge the basic assumptions of the "tragedy" thesis, first by suggesting that commons users are not isolated decision makers but in fact live in communities where they can mutually monitor and communicate, and second, that the tragedy "game players" can watch outcomes unfold and adapt their decisions in later "rounds of play." Following the pragmatic tradition of institutional economics, this alternative theorization suggests that in fact myriad solutions to the problem exist, if conditions allow for negotiation and iterative observation of outcomes (Commons 1990).

Success of collective management, theorists maintained, is a result of the fact that such commons are not unowned (legally, *res nullius*) but are in fact commonly held property (legally, *res communes*) (Ciriacy-Wantrup and Bishop 1975). Failure of collective management, by contrast, merely represents failures in the specific structure of rules that govern a collective property, by virtue of increasing scarcity or value of the resource or alterations in local social structure and culture. Recovery of sustainable management is a task of crafting new and better rules, not one of slicing up the commons into private bits, nor imposing strong-arm central authority (Ostrom 1990, 1992; Ostrom et al. 1993; Hanna et al. 1996).

Again for problems like those facing the Miskito, where broader economic forces were transforming the harvesting of traditional resources, this approach provides some useful lessons. Overfishing of mobile resources, like sea turtles, is by no means an inevitable or even a common outcome of collective ownership and management. Communities like the Miskito had sustainably harvested such resources for generations, through clearly defined systems of social sanction, redistribution, inclusion, and exclusion. Explanation of the failure of the sea turtle fishery lies, therefore, in the problem of how the rules work, and whether they can adapt to socio-economic change; the Miskito, as rational decision-makers, might yet craft new rules.

In this way, most responses to the "tragedy of the commons" took the question on its own terms, proving empirically that given the opportunity to negotiate and given the proper structure of rules, degradation was by no means the inevitable result of collectivity. Rational choice, therefore, was used to form an apparently apolitical theory of environmental commons.

Other critics were bolder, however. They held that the increasingly capitalized economies were radically altering the social and political circumstances of the players of these commons games. Indeed, as Muldavin phrases it, the entrance of coercive states and new

markets results in the *appropriation* of communal capital away from locals and into the hands of elites, non-residents, and other distant parties (Muldavin 1996). The "tragedy of the commons," moreover, by placing the fault of degradation at the feet of disempowered local communities, actually disguises and supports this outcome. This observation would become fundamental to political ecology.

An *apolitical* theory of the commons, therefore, though attractive, is inadequate. Multiple scales of power and diverse players acting on local commons are unexamined and the multi-scale structure of the economy unacknowledged. The broader historical trajectory of socio-economic change is ignored. Moreover, by continuing to insist on the apolitical nature of the problem, such approaches to the common property problem reinforce the normative assumptions of rational choice "tragedy" approaches. Practical action is limited to internal "rule crafting," which does not challenge the more fundamental economic forces at work. A more ambitious and explicitly political thesis would be required, drawing on materialism and political economy.

Marxist Political Economy

In the same year that Peter Kropotkin returned from Siberia to begin his work as an activist and philosopher, 1867, Karl Marx published the first volume of his three-volume masterwork *Capital*, cementing what would become a parallel but distinct line of environmental investigation emerging in philosophy and economics. For Marx and Engels, who observed the industrial revolution with both awe and concern, the degradation of the environment was a fundamental feature of capitalism. The politics of the environment were, therefore, linked to the politics of class struggle, industrialization, and capital accumulation.

Though Marxist philosophy and economics are complex and provide a range of tools, two key precepts in particular would later have a great influence on the development of political ecology. The first is the assertion that, according to Marx, social and cultural systems are based in historical (and changing) material conditions and relations – real stuff. Following from a long line of philosophers, including the Greek philosopher Epicurus (c.341 BCE) whose work was the topic of Marx's doctoral thesis, materialists challenge the notion of idealism, which holds that philosophy, consciousness, and ideas are the engines of history, constituting the world and its transformation. In contrast, the materialists argue that the way humans interact with the world of natural objects provides a "base" upon which law, politics, and society are founded and around which they are given form. As production and the relations of production (social relationships that govern how objects, food, and goods are made, harvested, and assembled) change, society changes as a result (Foster 2000). Such a notion echoes Steward's concept of the "culture core" described above.

The second key notion is that capitalist production (a specific and recent kind of production) requires the extraction of surpluses from labor and nature. As that extraction increases in intensity, contradictions emerge that provide barriers to further growth, bringing a possible end to capitalism. Capitalism is a roaring engine that proliferates contradictions that must be solved either through ongoing rapacious growth, or increasing exploitation of workers and the natural environment. For materialists, environmental degradation is therefore inevitable in capitalism but also one of its fundamental weaknesses (O'Connor 1996). Most forcefully, it suggests that the characteristics that make the modern

economy vibrant are those that contain within them, contradictorily, the seeds of ongoing social and ecological crisis.

Historical materialism

This materialist view of history lends itself to investigations of the relationship between nature and society. If forms of social organization are rooted in production (how things are made), they are, by implication, ultimately explained by how people use nature. For many materialists, this has meant a broad, general, and all-encompassing theory of history, explaining how one society transforms into another. For these historians, the central concept in understanding such change is the "mode of production." Simply put, a mode of production is a combination of key social and material elements; these elements are constant, and include labor, technology, and capital, but their interrelationships, combination, and recombination are in constant flux, leading to differing ways of making a living from nature, and changing organization of society across history and over space. In a pre-capitalist mode of production, for a simple example, shoemakers own their own capital/equipment and make shoes, selling the finished product to buyers. In a capitalist mode of production, on the other hand, the machinery of shoe manufacture is owned by a capitalist; workers do not own that equipment, and have nothing but their labor to sell, being paid for time spent making shoes that belong to the owner.

The transformation from one system to another is driven by internal changes and "contradictions" in the system, leading to ongoing historical struggles that create new ways of organizing labor and nature (Althusser and Balibar 1970). Contradictions are elements in the systems whose relationships to one another are necessary but inherently at odds, eventually leading to crisis, fracture, and collapse. Materialists assert, for example, that because surplus value must be constantly extracted from workers and from the soil to landlords and commodity traders, the conditions (human health, soil quality, nutrients) required to maintain that production cannot be sustained, leading to a crisis, and possibly socio-economic change. Where one mode of production encounters another – kin-ordered subsistence like the Nicaraguan Miskito encountering global turtle markets, for example – a process of "articulation" follows between the two (Hindess and Hirst 1975). The power of global capitalism, however, tends to be so great as to dominate the process so that inequalities are created and tend to persist between capitalist powers and the pre-capitalist peripheries with which they articulate (Emmanuel 1972; Peet 1991).

For political ecologists, such a theory has many attractions. When Nietschmann's producers in Nicaragua, for example, encounter regional and global markets, we might be able to predict the inequalities in power and exchange that result from their "articulation" with a capitalist mode of production. Such imbalances can further be interpreted in terms of their changes in labor and exchange relations (reciprocity versus markets) and in the manner and mode of environmental extraction (craft fishing versus intensive harvesting of turtles), potentially leading to crisis. This approach expands common property theory appreciably, linking the process of accumulation with the encroachment and dismantling of traditional commons. Indeed, Marx's own argument on accumulation was predicated on his careful observation of the commons of the Scottish highlands appropriated by elites in the nineteenth century (Marx 1990).

Even so, the role of the environment in human affairs remains somewhat vague in this formulation, since humans are portrayed as "Promethean," capable of endless manipulation of natural systems as economies advance. It is unclear how the environment might influence history in such a general account. Other, more specific materialist efforts at analyzing ecological influences on the character and trajectory of society have been attempted, however.

In a prominent example, Karl Wittfogel argued that the roots of "Oriental Despotism," epitomized by those Byzantine Asian bureaucratic states like historical China, lay in the establishment and maintenance of agriculture. Though a vociferous anti-communist theoretician, his thesis attracted the attention of Marxists and non-Marxists alike with its apparently far-reaching and explicitly materialist foundation. Writing in 1957, Wittfogel maintained that agricultural production systems in arid places, which depend heavily on big irrigation systems, must therefore require immense centralized bureaucracies. Thus, the political history of many of the world's great centralized states, particularly in Asia, can be explained as a simple result of the problems of water management.

The thesis is fundamentally flawed on both empirical and theoretical grounds. Large irrigation systems do not necessarily require central authority for management (Ostrom 1992) and there is no archaeological evidence of an association between large irrigation systems and centralized authority (Butzer 1976; Hunt 1988). The argument is also rooted in an *Orientalist* (Said 1978) assumption of the superiority of "western" civilizations, similar to many Eurocentric theories of environmental history (Aston and Philpin 1985; Blaut 2000). These qualities make Wittfogel's argument attractive, but profoundly flawed. Even critics of the thesis admit to the importance of the linkage between production and the social systems of management they necessitate, however (Hunt 1988). Extensions of the broad argument to US water management and the accumulation of bureaucratic agency power in the management of irrigation in the rural west, for example, has proved a productive line of thinking (Worster 1985b).

Dependency, accumulation, and degradation

Despite the shortcomings of some historical materialist research, materialist theory provided great explanatory purchase during the cold war period, and began to expose many of the more glaring sources of global inequality. Most compelling was the concept of *dependency*, first thrust onto the world stage by Latin American economists in the 1960s. For dependency theorists, the marginal conditions of the world's poorest nations were directly the result of the terms of trade established during the colonial period, when most colonized countries were forced to produce primary products, rather than more valuable industrial and craft goods. This was most notably the case in India, where a tradition of textile production was shunted aside by colonial authorities, who desired cheap cotton from Indian fields, but no competition in finished goods for textile mills in Manchester. These relationships hardened into a perpetual economic order of underdevelopment where, as Peet (1999) explains, "real power was exercised from external centers of command in dominant ('metropolitan') countries. Dependence continues into the present through international ownership of the region's most dynamic sectors, multinational corporate control over technology, and payments of royalties, interests, and profit" (p. 107). Even years after colonialism, and even where these poorer states are sovereign and control their

Box 3.1 The Intellectual Politics of Wittfogel's *Oriental Despotism*

Karl Wittfogel's *Oriental Despotism* is an ambitious, frustrating, thoughtful, and vastly reductionist account of the roots and character of Asian civilization. In this book, subtitled "a comparative study of total power," he lays out his well-known carefully structured argument that despotic civilization in Asia, to which Soviet and Chinese communism are heir, is the result of traditions of bureaucratic control mandated by the management of large-scale irrigation systems. Despite wide-ranging empirical and theoretical flaws (Hunt 1988), the book is influential, especially among modern global economic historians.

Wittfogel was a scholar of tremendous intellectual and personal complexity. Associated with the Frankfurt school of social theorists, he drew upon the work of Marx (modes of production) and Max Weber (formation of bureaucracy) to analyze Asian society and history as an apolitical, scientific, and objective endeavor, as is evident in the tone and approach of *Oriental Despotism*. Wittfogel's career, however, bears testimony to the degree to which any scientific practice is rooted inevitably in a personal biography, enmeshed in broader political economy. As a refugee from Hitler's Germany, Wittfogel sailed to New York in 1934 to foster the Chinese History Project at Columbia University with the support of the Institute of Pacific Relations (IPR) and the Rockefeller Foundation. With the Nazi–Soviet pact of 1939, Wittfogel became disillusioned with Marxism, later moving to the University of Washington in 1949, where modernization studies centered on Asia were burgeoning during the cold war. As McCarthyist anti-communism heated up, such institutions became the target of government attention (Ulmen 1978).

When confronted with accusations that he was a communist sympathizer, Wittfogel was quick to denounce his colleagues and protest vociferously concerning his anti-communist credentials. Especially egregious was his denunciation of Owen Lattimore, a prominent Asianist, prolific and talented scholar, former friend, and socialist. Under subpoena before the US Senate McCarran Committee, formed by Senator Joe McCarthy in 1950 and charged with investigating the IPR and other academic organizations that might be "subversive," Wittfogel repeatedly denounced Lattimore, insisting that he was not only subversive but, more importantly, naïve concerning the social and political character of Asian "feudalism." Lattimore, he charged, had been led by his subversive communist ideology to totally misanalyze the character of Chinese agrarian society and state power (Ulmen 1978, pp. 289–294). This was the beginning of an ongoing attack on Lattimore that ultimately ended in the destruction of his career (Newman 1992).

It was in the midst of this struggle that Wittfogel completed *Oriental Despotism*, his own treatise on Asian environment and power, which was finished in 1954 and published in 1957. Clearly *Oriental Despotism* and Wittfogel's other works are more than ambitious attempts at a comprehensive account of human–environment systems. They sit at the center of ideological and personal struggles that ripped at the core of academic freedom and political identity during the cold war. Wittfogel's journey, though marked by academic achievement, is also marred by personal and ethical tragedy, a testimony to the fact that apolitical ecology is ultimately impossible.

own economies, their position in global trade remains disadvantaged as capital is accumulated elsewhere.

This holds implications for explaining ecological transformation in the contemporary world, and for exploring the relationship between economics and ecology. This linkage is built into materialism in a fundamental way since, as noted earlier, Marxist economics is based on the notion that capital accumulation requires the exploitation of both labor and nature.

For Marx, value comes from labor. Yet capitalists, he points out, make a handsome living without laboring in their own factories. The *surplus* – the difference between the value of the capital and labor put into a commodity (like a shoe, umbrella, or car) and the value accrued by the factory owner – must come from somewhere. The system of production under capitalism, Marx explains, is ordered so that workers, technicians, and engineers perform extra labor, the balance of which goes into the pocket of the owner, a non-worker. The same goes for nature; by expropriating nature's capital and underinvesting in restoration or repair of impacted ecological systems, capitalist firms squeeze surplus from the landscape, even and especially where commodity prices are falling and profit margins are tight. Moreover, the extraction of both labor and nature is simultaneous and interlinked. For crop production, for example: "all progress in capitalistic agriculture is the progress in the art, not only of robbing the laborer, but of robbing the soil; all progress in increasing the fertility of the soil for a given time, is a progress towards ruining the more lasting sources of that fertility" (Marx 1990, p. 638).

The same applies for forestry and other land uses. For environmental industries, the rate and intensity of extraction must always outpace that of restoration. "The development of civilization and industry in general has always shown itself so active in the destruction of forests that everything that has been done for their preservation and production is completely insignificant in comparison" (Marx 1992, p. 322).

Tied to the concept of dependency, a pattern begins to emerge. Not only are the Miskito tied into a global economy where they are disempowered, they live within a Nicaraguan state system where they are most marginal, and where new demands for capital can only be met by exploiting their local natural resources, sea turtles. And though the Nicaraguan state at the time was ostensibly Marxist, it exists on the dependent periphery of a global exchange network, unable to establish favorable terms of trade. As accumulation continues, sea turtle overexploitation continues, social stratification increases, and the system becomes unstable.

Finally then, green materialism insists that such ongoing pillage of the environment must ultimately result in a political response. Just as the exploitation of labor leads to a labor movement, the exploitation of nature must result in an environmental movement (O'Connor 1996). In capitalism's excess, therefore, lie the seeds of more sustainable and equitable practices. The way these dynamics play themselves out in contemporary politics has, in recent years, gained a great deal of attention. Authors like Ted Benton (1996), John Bellamy Foster (2000), and James O'Conner (with the journal *Capitalism, Nature, Socialism*) all champion a materialist approach to contemporary environmental movements. This has arguably developed into its own distinct school of research into the *political economy of nature*, with work exploring the politics of water resources (Bakker 1999), of mining (Bridge 2000), and of training the environmental technocratic elite (Luke 1999).

Lessons from a broadly defined political economy

The impact of this line of thinking on political ecology is somewhat indirect. While not all of contemporary political ecology is explicit in its allegiance to materialism, much of the work at least tacitly assumes many materialist precepts. Among these, the most prominent assertions are that (1) social and cultural relationships are rooted in economic interactions amongst people and between people and non-human objects and systems, (2) exogenous imposition of unsustainable extractive regimes of accumulation results in environmental and social stress, and (3) production for the global market leads to contradictions and dependencies.

In this sense, almost all research in political ecology is theoretically engaged with what has often been described as a *broadly defined political economy* (following Blaikie and Brookfield, see Chapter 1). The systems that govern use, overuse, degradation, and recovery of the environment are structured into a larger social engine, which revolves around the control of nature and labor (Althusser and Balibar 1970). No explanation of environmental change is complete, therefore, without serious attention to who profits from changes in control over resources, and without exploring who takes what from whom.

The Producer is the Agent of History: Peasant Studies

As it happened, the tools required to address the questions posed by the predicament of agrarian producer groups like the Miskito lay nearby. Investigation of these very dynamics – smallholder integration with broad markets, social unrest in rural areas, and political movements of agrarian communities in the face of coercive power – had become a locus of research activity in the social sciences in the 1960s and 70s. The academic interest in these communities was not entirely innocent, since the cold war era saw a growing political urgency for understanding the world's poor agricultural communities. Fear of revolution made even very conservative thinkers interested in small, "backward," and agrarian places.

This is because revolutionary movements around the world were becoming increasingly rural in orientation in places like Mexico (1912), El Salvador (1932), China (1949), Bolivia (1952), Cuba (1962), Indonesia (1965), and Nicaragua (1979), mystifying both the capitalist West as well as Soviet industrial Marxism (Wolf 1969). Academically, conversely, interest in smallholding producers had been minimal and little was known about peasant behavior. A new field of investigation in this area, made up of rural sociologists, anthropologists, political scientists, agricultural economists, and geographers, would come to be known for many years as peasant studies, spawning several academic journals with that title.

The term "peasant" has always been contentious. Often used as a pejorative term for smallholders – "rural cultivators practicing intensive, permanent, diversified agriculture on relatively small farms" (Netting 1993, p. 2) – "peasant" is a catch-all term. It stresses households that make their living from the land, partly integrated into broader-scale markets and partly rooted in subsistence production, with no wage workers, dependent on family and extended kin for farm labor. Knowledge of these kinds of communities during the early post-World War II development era was riddled with misconceptions. Peasants consistently frustrated the aggressive development efforts of proponents of green

Box 3.2 Balancing Theory and Practice in Blaikie's *Political Economy of Soil Erosion*

As Piers Blaikie recently explained to me in reflecting on the intellectual context of the early 1980s, which informed his *Political Economy of Soil Erosion in Developing Countries* (Blaikie 1985), "I characterize neo-Marxist approaches of that time as a Soviet tractor – it produces loads of smoke, is sometimes heavy and cumbersome, but is still hugely powerful and does the work." The book expresses these very strengths and weaknesses. In a remarkably brief 150 pages, Blaikie provides a critique of neo-Malthusian explanations of soil erosion, unmasks the oversimplifications of technocratic solutions for complex ecological problems, and still has time to offer a sweeping theoretical account of what perpetuates rural soil erosion: capital accumulation by elite class interests. He further bluntly asserts that (1) soil erosion is only brought into check when it challenges systems of accumulation, and that (2) this doesn't happen very often.

With a background in geography with geomorphology and citing his influences as the radical development pragmatists Robert Chambers and Alain de Janvry, Blaikie was working in the 1980s, along with Nepali colleagues, to extend neo-Marxist thinking to serious environmental development problems. The initial monograph, "Centre and Periphery and Access in West Central Nepal: Approaches to Social and Spatial Inequality," was not widely published (maybe because of its title!) and so led to the later volume. The structuralist explanation that resulted is terrifically compelling and elegant. Filled with boxes, arrows, and flow charts that came to define explanation in political ecology, *Political Economy of Soil Erosion* graphically lays out causes and effects of erosion in Africa and Asia, showing that households make land use decisions in broader economic contexts and that state policy in the postwar development era has made huge withdrawals from the soil bank of the rural poor to serve the interests of wealthier people in distant cities.

Twenty years later, Blaikie explains that *Political Economy of Soil Erosion* does not fit well with his current advisory and activist foci. Having moved to advocacy and paid policy work, radical critique of this kind has become more difficult, since "he who pays the piper calls the tune." *Political Economy of Soil Erosion* and an earlier book, *Nepal in Crisis* (Blaikie et al. 1980), both severely interrupted Blaikie's career as an international consultant, getting him temporarily banned from travel to Nepal, even while it did much to promote his career as an academic. Balancing criticism and effective policy intervention – weighing political ecology's hatchet against its seed – is demonstrably difficult.

Blaikie's relationship to Marxism is also marked by ambivalence. He explains:

> since PESE I remain a modernist, albeit a more modest one . . . a credible return to a structuralist approach now seems both implausible and undesirable . . . Anyhow, Marxism is thoroughly out of favor and is considered arcane and deeply flawed in most quarters. Also, PESE has since been criticized to have treated environmental politics rather cursorily, something I plead guilty to – it simply was not intended to be that kind of book. Still, my current interests in political ecology draw upon many Marxist ideas, although at a recent seminar I was roundly criticized for abandoning a classic Marxist approach and for letting the comrades down.

revolution technologies in the West and collectivism in the East. Why didn't the rural producer adopt modern methods? Why was it so difficult to organize them into large-scale collectives? For modernization theorists and Marxist planners alike, the peasant was a conundrum, and was considered to be (1) irrationally conservative, (2) inefficient, and (3) in a state of global decline, giving way to more modern farming arrangements. Peasant studies was to prove such assertions to be thoroughly unfounded and would insist that far from a minor or miscellaneous player in the global political economy, the peasant was an agent of history.

Chayanov and the rational producer

Findings on the peasant that contradict critical claims of development elites (in both the World Bank and the Kremlin) arguably begin with the work of A. V. Chayanov, an agricultural economist working in early-twentieth-century Russia during and after the revolution. As a key early player in Soviet planning, his views of the peasant put him at odds with Lenin and other leaders, who insisted that agriculture is more efficient when collectivized into large farms. The hesitation on the part of peasants to cooperate in these efforts, moreover, was seen to be a sign that peasants were inherently conservative petit bourgeois capitalists.

A populist pragmatist with a firm grasp on the logic of how farms work, Chayanov insisted that, on the contrary, peasants allocate labor not like a capitalist firm bent on capital profit, but instead with a thought towards meeting household subsistence needs while minimizing drudgery. They are risk averse but by no means uninterested in technological change, cautious but not irrational (Chayanov 1986). While many of Chayanov's specific claims about farm behavior do not hold up in all places and times – his land-abundant context of Russia in 1920 is far different than the densely populated rice fields of Southeast Asia in 2010, for example – his basic approach and precepts do (Durrenberger and Tannenbaum 1979), driving a set of Chayanovian questions on into the present. Do peasants maximize profits or leisure, risk or drudgery, integration or autonomy? These questions would be the center of ongoing field research, debate, and modeling (de Janvry 1981; Ellis 1993).

Scott and the moral economy

While Chayanov provided an economic logic of smallholder production, he did not provide a political one (Brass 2000). Drawing on Chayanov, therefore, it is possible to make rough predictions about what a farm family with given resources might do with its labor during periods of scarcity or market fluctuations, for example, but it is not possible to predict when they might undertake political revolt, as the Miskito did. The intriguing possibility of an ecological theory of political resistance became the work of other thinkers, therefore.

Peasant studies provided two concepts and debates that would be crucial to political ecology in later years: *moral economy* and *everyday resistance*. These two ideas, the product of work by researchers E. P. Thompson and James Scott, help to form an image of the small

producers who commonly play the role of protagonists in political ecological stories about land, forest, and fisheries.

The first concept – the moral economy of the peasant – holds that small producers are faced with subsistence risks that help to create social systems of mutual assistance and tolerable exploitation. Since, as noted above, peasants tend to be risk averse, they develop social arrangements and relationships that help them to redistribute surpluses and protect themselves in bad years. In a bad year, for example, a smallholder in Southeast Asia has traditionally been able to call upon reciprocal support from their neighbors or extended kin network, while in good years they can expect someone to make demands on their surplus grain. These systems are extended to shared land and labor as well as to the overall tolerance of smallholders for certain forms of redistributive rent, where a proportion of their harvest is lost in sharecropping and taxation.

The fundamental conclusion of work in this area is that some forms of extraction from peasants are acceptable to them (indeed they are moral subsistence *obligations*), while other forms are not. Peasants withstand exploitation, but not all kinds of exploitation, especially forms that put them consistently below a minimum line of subsistence, exposing them to undue risk. It is under the latter case that peasant movements arise to challenge political and economic authority. So too, as colonialism and market controls over household transactions increase, the moral economy becomes less stable, fomenting possible social upheaval (Scott 1976; Wolf 1969).

Hegemony and everyday resistance

The second concept follows from the first. For rural producers, faced with increasingly exploitative relationships with local elites, outright armed resistance is often unfeasible or impossible, indeed it is unacceptably risky for most (Bowen 1986). On the other hand, ongoing *everyday resistance*, ranging from slander and back talk to work slowdowns and pilfering, can be used to oppose the limited social and ideological control of landlords and officials (Scott 1985b).

This approach to peasant resistance is rooted in the notion of *hegemony*, put forward by the Italian thinker Antonio Gramsci (1891–1937), a global traveler, critic, socialist, and activist. Sentenced to prison in 1926 and placed for the next decade in brutal solitary confinement, Gramsci wrote prolifically in a series of notebooks and letters before dying from a cerebral hemorrhage. Central to his concerns were both the coercive power of the state in its service to economic elites and the ability of the elite to achieve the spontaneous consent of the non-elite populace through the control of culture, opinion, and ideology. The limits of this coercive and cultural control, on the other hand, are the openings within which cultural and political resistance can occur, especially on a small scale, and especially amongst marginal populations, like peasants, without access to arms or more formal instruments of struggle.

Political ecologists would repeatedly acknowledge and use these ideas in research. As economic liberalization and market change occurs in, for example, rural grasslands of India, cooperative relationships begin to break down as the *moral economy* dissolves, potentially leading to overgrazing of the range (Jodha 1985, 1987). When the authorities in Madagascar restrict the setting of fires, an important traditional tool of local

subsistence production, local smallholders respond in acts of *everyday resistance* by lighting more fires (Kull 2002). This cooperative, rational, risk-averse, authority-resisting peasant is deeply embedded in the political ecological approach to explanation, which is often directed towards exculpating peasants from blame for land degradation and showing the adaptive social logics of cooperative, small-scale, smallholding producers and their daily acts of resistance. After decades of scorn had been heaped on small producers, blaming them for everything from soil erosion and famine to deforestation and overfishing, this represents a refreshing enthusiasm for the peasant, echoed in James Scott's sentiments when he urged "two cheers for the petty bourgeoisie!" (Scott 1985a).

All of these concepts are open to argument, however. Opponents have pointed to weaknesses in Scott's "top down" view of ideological control (Akram-Lodhi 1992), his risk-centered view of producer logic (Roeder 1984), and his overlooking of gender and the extraction of female labor value in peasants' households (Hart 1991). This last criticism is part of a much larger and far-ranging set of critical investigations that would also become fundamental to the formation of political ecology: feminist development studies.

Breaking Open the Household: Feminist Development Studies

In the post-World War II era, development assistance and investment swept the globe, led by large multilateral lending agencies like The World Bank Group – which includes the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) – and global superpowers like the United States. Money poured into projects ranging from agricultural intensification to dam building and industrial development. By as early as the 1970s, however, it was clear not only that real economic growth throughout the "underdeveloped" world had not occurred but that, moreover, the position of many less powerful groups, especially women, had actually become worse in the process.

Agrarian development was especially problematic in this regard. Green revolution investments in farming had left women hungrier while advancements in rural processing and changes to cash cropping had made women poorer (Jain and Banerjee 1985; Soysa 1987). Critical feminist development theorists were quick to point out that these problems, though related to the historical marginality of women in rural areas, actually stemmed from the very development institutions that were designed to improve their lot. This included especially efforts in environmental development like forestry, farming, and water development (Shiva 1988).

As summarized by D. Rocheleau, B. Thomas-Slayter, and E. Wangari (Rocheleau et al. 1996), the central lesson from this apparently contradictory effect is that human–environmental interactions and processes are *gendered*, meaning that men and women experience the environment differently and often have different access to and control over ecological systems, as a result of their divergent social and cultural roles. Social conflict between men and women can be predicated on socio-ecological change, therefore, and changing gender roles or power can drive environmental transformation. This is true, they argue, in at least three ways.

First, women's survival skills around the world are based on a different knowledge of environmental processes and systems than that of men. Women in a rural African village may reject tree-planting schemes by well-meaning development officers, not because they are unaware of the value of forests, but rather because they know the selected species will fit poorly into local ecology. Moreover, women may depend on different species than men and utilize altogether different areas of the landscape (Fortmann 1996). State-imposed development schemes (crop improvement schemes, plantations, or breeding programs) or marketed products (seeds, trees, or hybrid cattle) for the improvement of production may take seriously men's environmental knowledge and priorities, while ignoring those of women altogether. This may lead not only to conflict, but to the collapse of environmental systems, tended to and managed by women (Cashman 1991).

Second, rights to access environmental resources are commonly differentiated by gender, as are responsibilities for the management of various ecological systems and functions. In many parts of Africa, land and tree rights are divided in a complex fashion, with gender figuring prominently in determining differential access. Gambian women, as a prominent example, traditionally control the products of all of their agricultural labor on private plots, but owe the harvest of communal village areas to the household. Development efforts that seek to alter local production systems with the goal of intensification may inadvertently reduce the resources that can be claimed by women, while increasing their labor burden (Carney and Watts 1991).

Finally, women are motivated to social and political action differently than men, vis-à-vis environmental problems and crises. Women under conditions of agrarian exploitation in Malaysia, for example, have taken action against their employers where men have not (Hart 1991). In a first-world urban example, community activism against the placement of hazardous processing in New York City's Harlem, like similar activism throughout the world, was led and championed by women of color (Miller et al. 1996). Efforts by men to expand collective agricultural production in Mexico, making heavy demands on female labor, have resulted in women's defiance (Mutersbaugh 1999).

It is important to note that the gendered differences in knowledge, access, and activism have little or nothing to do with physical/physiological differences between men and women – sex/biological differences. Rather, these divergent ecologies are the products of socially and culturally created structural positions relative to labor and nature. "Normal" women's work and "normal" men's work – what is expected of people based on their socially assigned gender – explains much about what women and men know about the environment, how much access they get to environmental systems, and their level of tolerance and resistance to environmental risks and burdens.

These three axes of potential gender difference hold implications for questions that concern political ecologists, explaining both environmental conflict and environmental change. The implementation of new high-intensity farming technologies like industrial fertilizers and pesticides in India, for example, may not lead to significant concern amongst male land managers in a rural setting. Indeed, the intensification of production may be welcome, since increased yields may put more money into the hands of producers. For women from the same households, however, the increase in cropping and extension of agricultural land actually result in an *increased* labor burden for women, who must travel farther and work harder to produce the same necessary goods that support the household, including fuel, fodder, and construction materials (Robbins 2002). The differential power

of men and women and their uneven access to investment dollars from development may also lead to an expansion of cropping at the expense of lands for fuelwood, fodder, and medicinal plants (Robbins 2001a). These conflicts take place within rural households rather than between them, and resistance to changes in ecological process might therefore be expected specifically from women, rather than from an undifferentiated peasant class.

Ironically, increased awareness of women's work resulted in an explosion of development programs directed specifically at women: the "Women in Development" (WID) approach of international aid. Busily trying to recruit women into development programs, either as recipients of aid or as "community participants" in a revolution of self-help, development activity unfortunately exacerbated many existing household tensions between men and women and, on some occasions, inadvertently reduced access to key resources upon which women depended. The resulting changes in human–environment interactions at household, community, and regional levels became a central focus for political ecology research, following its interest in understanding the unintended consequences of modern development (Jewitt and Kumar 2000).

But the underlying assumptions of some of this work also set traps for political ecologists trying to understand political and ecological change. In exploring the relationships between producers and environmental systems, there is sometimes a tendency to imagine that women are closer to nature and that their knowledge of the environment is not only different than that of men, but uniformly more accurate. These assumptions are problematic, especially when variations in women's experience are seriously considered: at different moments of their lives, under different socio-economic constraints, and in varying cultural contexts around the world. Priorities and environmental knowledges of women vary tremendously, whether between wealthy and poor women in a Bulgarian village, between farming and herding women in Morocco, between white and black women near a hazardous New York sewage plant, or between women producers in an African peanut field and women consumers of peanut butter in a Canadian supermarket (Bonnard and Scherr 1994).

Even so, as with the other tools of critical theory that emerged in this period, the power of the approach is immediately evident. The hidden costs of agricultural change, for example, might now be seen simultaneously as costs in women's time, health, autonomy, and drudgery. Likewise, the decline of women's power and prominence in environmental management might be understood in terms of a concomitant decline in gender-specific expertise, critical for community survival. In the wake of feminist critique, labor, nature, and social power could now be linked through novel and powerful hypotheses and investigations.

Critical Environmental History

Yet like other critical approaches, and despite claims to an investigation of historical processes, the temporal depth of much of this work is remarkably thin. One might claim, for example, that current changes in planting and harvesting ignore women's *historically* evolving ecological knowledge or that changes in agricultural contracts lead to alterations in the *historically* flexible adaptive decision-making of farmers, but these claims are commonly evaluated only in *contemporary* development settings. History is theoretically

important to political ecologists, but empirical research in these fields was initially not historical.

In the humanities, however, concern about the environment has blossomed since the late 1960s, and the field of environmental history offers a powerful model for political ecologists interested in change over time. Poring over the accounts of explorers, settlers, missionaries, business people, and administrators, environmental historians provide clues to long-term political ecological change. In France the tradition of weaving complex interlinkages between geography and history has long been practiced. The "Annales" school of history, established and championed by Fernand Braudel, documented the emergence of global economies in *longue durée* – history over the long haul – as focused around and through the environmental possibilities and limits of landscapes (see, for example, Braudel 1982).

The practice has since become established in Anglophone history. Donald Worster, in a prominent example, turned his attention to the American Dust Bowl and concluded that the ravages of the landscape during this period were a nearly inescapable result of increased risk-taking behavior growing from the development of capitalist agricultural markets (Worster 1979). Caroline Merchant and William Cronon examined the histories of New England landscapes to trace the complex relationships between Indians and colonists, farmers and hunters, men and women, across the landscape of the colonial period. Their work points to the divergent ideologies as well as economies of settlers and Native Americans that influenced the peculiar ecological changes of the colonial period (Cronon 1983; Merchant 1989). Even more ambitiously, Alfred Crosby linked the historical waves of colonial and imperial migration and control to the expansion of "neo-European" ecologies, invasive plant, animal, and disease communities that followed and mutually supported European invasions of the Americas and Australia. Indeed, he argues, this "portmanteau" biota (so named for its coming along as part of conquest's baggage) was largely responsible for European colonial success in these areas (Crosby 1986).

This work holds several insights for critical environmental research. Firstly, historical research challenges the quick development "snapshots" of environmental research conducted in the present. Consider, for example, the degree to which Nietschmann holds integration of Nicaraguan Miskito ecology with larger markets to be the roots of contemporary crisis. What if that economic integration is really not so new, but instead dates to well before European contact (McSweeney 2004)? If regional and transregional exchange in native Central America is significant, can integration account for contemporary declines in turtle populations? Only multiple temporal scales of analysis can answer these kinds of questions.

Second, environmental history calls into question many of the discrete categories of environmental research. The environment, as traditionally considered by many researchers, is associated with rural areas away from the social and economic histories of cities. The bias of cultural ecology towards primary production systems (farming, ranching, and herding) further drives critical research into the countryside. Historical analysis has demonstrated the simultaneous development of cities and countryside, however, and explored their interlinked emergence over time (Cronon 1992). For a nascent political ecology, such an integrative view of the world is essential, if underdeveloped.

Third, environmental history provides a powerful reminder that ecological change is not unidirectional. Despite the propensity of some environmental historians to tend to see

degradation as a one-way path, landscapes over time usually show ongoing change, fluctuations, declines, and recoveries. Some of the seemingly wildest landscapes are the product of deliberate planning in the remote past (Spirn 1996), while many of the most apparently stable ecosystems have been subject to fluctuation in the past.

Despite these insights, environmental history has its limits. It is extremely difficult to compile thorough and comprehensive accounts of environmental conditions – comparable to those of contemporary ecological survey – from historical documents. Measures such as the diversity and ecological structure of a forest, or even the quantity of its canopy cover, are extremely hard to derive from narratives and, where they are available, are difficult to compare with contemporary data sources. This may lead to some unfounded or uncertain claims about important relationships in social and environmental change. Worster's *Dust Bowl* makes sweeping comments on the prehistoric state of grasslands ecologies, both in the United States and Africa, positing a long history of ecological balance against a contemporary situation of ruin. But what do we really know about grasslands ecosystems in Kansas before the arrival of capitalist farmers, let alone across the Sahel? Contemporary rangeland ecology suggests high levels of "natural" as well as anthropogenic variability in semi-arid regions, drawing such static and unidirectional models of change into question. Only through more exacting, small-scale, long-term, and detailed study of local ecologies, using the more exacting methods of historical ecology, can environmental history defend its often grand hypotheses (Russell 1997; Wynn 1997).

More significantly, the historical narratives are prefigured and limited by the larger contexts in which they are produced. Indeed, the writing of history is a political and social act, linked to, and embedded in, larger events and movements, including colonialism, imperialism, the cold war, and the contemporary struggles for global economic expansion and control. A re-evaluation of the role of history and science in politics has become the agenda of many theorists, whose influence on contemporary political ecology is equally profound.

Whose History and Science? Postcolonial Studies and Power/Knowledge

In his now classic volume *Orientalism*, Edward Said explained that specific forms of academic writing and analysis, in history, geography, religious studies, ethnography, and even economics, reflect scholarship that is enmeshed in the colonial and imperial contexts within which it is produced. Orientalism was that specific form of knowledge created to establish and describe the fundamental differences between something broadly defined as the East, characterized by mysterious backwardness and spirituality, and something called the West, characterized by forward-looking rationalism. Invariably, Orientalist narratives sought to explain why the East was one way and the West another. Said demonstrates that such writing did the colonial work of justifying the domination of one part of the earth by the other. In this way, Orientalist scholarship, by assuming difference, produced it in the process.

Orientalism, Said insists, has little or nothing to do with the Orient, per se. Neither does it reflect some simple, conscious, and cyclical nefarious "Western" imperialist plot to hold down the "Oriental" world. Rather, he suggests, Orientalist writing is a window into the

minds, politics, and societies of its authors, linked closely to systems of political, social, and moral power that propel certain kinds of questions, descriptions, and answers, specifically in the context of American, British, and French scholarship in international contexts.

By way of example, in his historical and sociological analysis of India, Louis Dumont wrote that the Indian worldview was contained in a hierarchic ideology that "is directly contradicted by the egalitarian theory which *we* hold" (Dumont 1966, p. 4, my emphasis). The audience – "we" – is directly recognized in this passage, as throughout the rest of the volume, as civilized, egalitarian, democratic, and *Western*, living in freedom and thoroughly mystified by the hierarchic and structural world of "they." The balance of the text is a careful demonstration of the structural and hierarchic alien world of India. Backwardness, economic weakness, and dependency, by implication, are not causes of inequity throughout the region, they are its products. Leaving aside the ethnographic, empirical, and historical data that contradict his thesis, the question that drives Dumont's narrative is in and of itself problematic. Following countless observers (from Weber to Marx), the thing to be explained is the Oriental "other," an object of mystery and fascination, whose shortcomings highlight the power and advancement of the author's own culture (Inden 1990).

Historically, colonial knowledges of the environment were constructed in a similar fashion. In the colonial administrative model, involving large-scale plantation, centralized irrigation authorities, and other modernization efforts, theories of environment were linked to theories of political domination. As environmental historian David Gilmartin puts it in the case of British colonial science: "the definition of the environment as a natural field to be dominated for productive use, and the definition of the British as a distinctive colonial ruling class over alien peoples, went hand in hand" (Gilmartin 1995, p. 211).

Contemporary apolitical ecology follows from much the same logic. For example, in his recent search for an environmental explanation of human civilization, *Guns, Germs, and Steel*, theorist Jared Diamond asks why *they* in the global south are not as developed as *we* in the north are. Indeed, he more pointedly suggests that an "indigenous" New Guinean companion, Yali, posed the question, washing his hands of the clearly colonial implications of such a query and placing it in the mouth of the underdeveloped subject. Diamond's answer – the shape and latitude of northern continents determined the disparity – becomes more than a selective assemblage of empirical data, it is a Eurocentric history that can itself be seen as part of a long tradition.

More disturbingly, the neocolonialism of demographic apolitical ecology is evident in Malthusian views of development and global equity; they, the masses outside the lifeboat, are of a different order than we inside, making possible some remarkable pronouncements. "How can we help a foreign country to escape overpopulation?" Garret Hardin asks. "Clearly, the worst thing we can do is send food . . . Atomic bombs would be kinder" (quoted in Commoner 1988, p. 156). A human–environment science that begins with queries about *our* difference from *them* is ultimately a hand-me-down of not yet forgotten colonialism.

Indeed, the foundations of the most modern development projects arguably remain rooted in these same binary colonial logics. In the Orissan development case described previously, the introduction of optimal modern breeding stock was seen to require the slaughter of indigenous stock; the implementation of plantations meant the destruction of locally devised mixed land uses. These distinctions and conflations, dividing us/modern from them/primitive and local/backwards from foreign/progressive, stem from logics of

domination, suggesting ideological controls of both environmental systems and local people.

The extension of this line of criticism against the binary logics of imperial science, along with a range of other critical examinations of "first world" science and humanities writing, has come to be known as postcolonial theory. The term is somewhat contentious. In one sense, it refers to a historical period – that of the contemporary post-colonized world, where unequal power relations prevail not only between colonial nations and their former colonies, but between northern academic writers, economists, and scientists and interpreters of the world in the global south. In another sense, it describes a methodology for approaching and investigating how European and American science is performed with specific attention to the context that influences its questions and answers (Mongia 1997). The challenge, postcolonial thinkers insist, is not only to explore and explain the dominant writings and theories about historically colonized peoples in terms of their contribution to global inequity and oppression, but also to rewrite history from the point of view of the colonized, rather than that of the colonizer.

This latter effort was codified by a group of historians (led by Ranajit Guha) who worked together to assemble a challenging and inverted picture of history, one where colonized subjects, often farmers, street dwellers, and workers in places like Kenya, India, and Indonesia, are active in global changes. Beginning originally from a South Asian perspective, this new view of the colonized subject, now referred to as the subaltern,[1] first sought to show that Indian independence was not achieved through the workings of educated middle-class nationalists, as it was commonly characterized, but instead through the struggle and resistance of peasants and the urban poor (Chaturvedi 2000). This approach champions traditionally marginalized communities, therefore, by further implicating local elites in colonial efforts, showing how indigenous rulers and privileged classes were complicit in the domination of the truly poor. This approach overlaps heavily with peasant studies; drawing again on Gramsci, subaltern studies focuses on reclaiming marginalized communities to their place in history.

This postcolonial turn in the humanities and social sciences was predicated on several factors. First, since the 1960s there has been a great increase in the number of postcolonial "subjects" in the political and social realities of previously colonial states. Immigration has reversed the cultural tide of colonial influence. Even in Anglo-American academic departments around the world, including history, English, geography, and sociology, a broad range of active global voices are increasingly heard. Second, increasing political activity – or perhaps recognition of political activity – in local communities around the world is placing the voices of marginal groups squarely in the current debates on globalization and post-cold-war global governance. Rather than be displaced by massive dams in India, for example, activists organize global-scale protests. Third, this change in thinking about the complicity of academic narratives in the extension of colonial power and repression, even narratives that ostensibly represent emancipatory ideologies like Marxism and feminism, is predicated on recent thinking about the nature of knowledge itself. This perspective,

[1] According to postcolonial theorist Gayatri Spivak, the term "subaltern" – originally meaning a lower-level military functionary – was introduced by Antonio Gramsci, who used the word to stand in for "proletarian" to escape the censorship of his writing during his long imprisonment (Spivak 1990a).

typically identified as *poststructural*, is one in which forms of knowledge can be explained by virtue of their relationship to establishing or subverting systems of power.

Power/knowledge

The term "poststructural" is somewhat too multifaceted and unevenly used to easily define here, but the power of the approach and its effect on contemporary social theory are significant. Associated with the writings of Michel Foucault, a former psychiatric worker turned historian-philosopher in the turbulent France of the 1960s, poststructuralism takes as its concern the instability of many of the categories we usually take for granted, including self, truth, and knowledge. Of Foucault's many influential theses, one of the most central was that truth is an effect of power, one that is formed through language and enforces social order by seeming intuitive or taken for granted. The key to understanding the character of society is to explore how certain taken-for-granted notions of the world are formed through *discourse* (language, stories, images, terminology) and how certain social systems and practices (medicine, forestry, prisons, schools) make them "true." By doing what Foucault referred to as archaeology – an effort to excavate the hidden history of meanings of concepts and things, along with their social and political histories – the hidden history of "truths" is demonstrated, making them appear less inevitable and showing their place in maintaining the power of individuals or groups. Some of Foucault's writings have been criticized for being opaque, but he summarizes this point fairly clearly: "Truth is a thing of this world: it is produced only by virtue of multiple forms of constraint. And it induces regular effects of power. Each society has its regime of truth, its general politics of truth: that is, the types of discourse that it accepts and makes function as true" (Foucault 1980, p. 131).

The implications of taking this notion seriously in environmental research are large. If accounts about people like herders or farmers or things like cattle or trees are conditioned and stabilized by social structures of power, the problem is not only understanding how social and environmental conditions change over time, or how they become undesirable, or how they can be changed. The problem is also understanding how scientific accounts, government documents, and local stories about those same social and environmental conditions are formed and made powerful by state institutions, media companies, experts, and families. How do specific ideas about nature and society limit and direct what is taken to be true and possible? For poststructuralists and postcolonial theorists such an investigation means methodologically taking apart, undercutting, and questioning dominant truth claims. This can take the form of *deconstruction*, following Derrida (1976), a rigorous analysis of text and its interpretation that seeks to open the contradictions that underpin it. Or it may simply signal a more informal ongoing habit of aggressively evaluating taken-for-granted dominant stories. In either case, such an approach seeks to dethrone "hegemonic" discourses – those stories that hold a lock on the imaginations of the public, decision-makers, planners, and scientists – so that other possibilities and realities are made possible (see Chapter 6).

Consider the debate over pesticide use across American farms, in part ignited by the publication of Rachel Carson's *Silent Spring* in 1962 (Carson 1962). Rather than accept the use of pesticides as an "acceptable risk" or as the "inevitable" price of progress, as advocated

by the American Chemical Society (Marco et al. 1987), observers began to ask why and how these stories and concepts were proliferated in the first place. How are notions of "development," "modernization," and "improvement" defined such that there is no alternative to high chemical inputs in agriculture? Poststructural research must explore the archaeology of ideas, examining the political effects, linkages, and sources of ostensibly "objective" and "apolitical" concepts, like "modern" agrarian methods, "improved" breeds, and "efficient" production.

Critical science and ethics

In summarizing and justifying the goals of Orientalism, Said outlines the explicitly political character of research:

> the general liberal consensus that "true" knowledge is fundamentally non-political (and conversely, that overtly political knowledge is not "true" knowledge) obscures the highly if obscurely organized political circumstances obtaining when knowledge is produced. No one is helped in understanding this today when the adjective political is used as a label to discredit any work for daring to violate the protocol of pretended suprapolitical objectivity. (Said 1978, p. 10)

Taken together then, the importance for critical environmental research of the revelations from postcolonial theory, poststructuralism, and deconstruction for producing and examining knowledge and "truth" is twofold. First, such theory provides researchers with a powerful tool, perhaps one of the most important in the set used by political ecologists, for understanding the historical role of environmental science in the control of local populations and resources. When researching forestry in West Africa, for example, explanations can be offered for why colonial and postcolonial forestry officials insist that tree cover is declining when measures suggest they are in fact increasing; the discourse of degradation is a lever in power struggles between officials and local people (Fairhead and Leach 1995). Even where there is agreement that environmental degradation is occurring, as where ongoing soil loss presents a serious problem in Bolivia, in another example, the specific discourses that control and dominate debate as to its causes are central in establishing control of agrarian resources and politics (Zimmerer 1993).

On the other hand, the sharp hatchet of deconstruction cuts both ways. If scientific accounts of environmental change, including that of the political ecologist, are forged in the political context of discourse/power/knowledge, to what degree can the claims of critical environmental researchers, especially those from American/Anglo-European training, be viewed as an instrument of postcolonial hegemony and control? What might an archaeology of the apparently emancipatory theories of the political ecologist look like? How do we hear local voices if they are only mouthed through the foreign researcher? Can a non-indigenous observer effectively participate in an effort to write ecology from the point of view of the colonized? Is it right, or even desirable, that researchers play such a role? Are they even able to?

This last crisis is one of the most problematic, insofar as it suggests some of the limits to even the most "radical" western research and activist traditions. As Gayatri Spivak

explains, even the most well-meaning efforts to aid marginalized people typically – and perhaps inevitably – involve speaking on their behalf, an effort that is ultimately self-defeating and something of a paradox (Robbins 2006a). Spivak argues that such efforts ultimately and ironically render the subaltern only more silent (Spivak 1995). Spivak argues, as a result, that instead of learning, scholars need to *unlearn* (Spivak 1990a, p. 56).

Despite its heterogeneity, therefore, postcolonial thought presents a methodology to address the colonial logic that lies at the heart of Euro-American cultural/scientific traditions, including human–environment research (Said 1978, 1994; Mongia 1997). Postcolonial and deconstructive theories therefore mandate an ethical evaluation even of what critical environmental researchers say and do. As we shall later see, this dilemma is not an easy one to resolve. Even so, joined to the several bodies of social thought informing research, knowledge/power approaches like these help to form the critical toolbox of an emergent political ecology.

New Concerns: Cities, Subjects, and Objects

To these critical traditions (common property theory, peasant studies, feminist development studies, postcolonialism), which together constituted the political ecology of the 1990s, several recent streams of thought and concern have been added, bringing with them a terrific vibrancy. First, the expansion of urban ecological research has caused the stream of political ecological thought to merge with that of urban studies, forming a swift-moving and turbulent confluence. Second, an increasing theoretical interest in the interplay of bodies, ideologies, and subjects has opened whole new areas of research concern. Finally, an increasing acknowledgment of the role of non-human actors and objects in the constitution of political life and experience has raised some thorny questions about where human and non-human leave off, and how to go about explaining a world where this is unclear.

The urban graft

The most pressing of these expansions of the political ecological toolbox has been the confrontation of political ecology with environmentally oriented studies and research in cities. Even as political ecologists have called for more engagement with urban and developed contexts (Zimmerer and Bassett 2003; Mustafa 2005), those engaged with urban politics and economic struggles have come to acknowledge the inherently environmental character of urban landscapes, whether in the flow of water through the city (Kaika 2005), the uneven distribution of trees in its landscapes (Heynen, Perkins, and Roy 2006; Heynen 2003), or the environmental hazards imposed upon its citizens (Klinenberg 2002). Where the former field is one rooted in cultural ecology, rural and development studies, and issues surrounding primary production, the latter field is one that develops out of formal sociology and urban geography, the architecture and economics of built environments, and issues surrounding industrial and post-industrial history. So, as if grafting one field onto another, so that the tissues of each join to produce a new individual, the fusion of urban political economy into political ecology (and vice versa) creates a new kind of analysis.

What this has meant for political ecology is a terrific opening of the range of things that are understood to be "environmental," from air conditioning units to garbage dumps. It further stresses the way the city is an especially dense tangle of people with non-human nature. As Gandy explains in his environmental history of New York, *Concrete and Clay*:

> It is paradoxically in the most urban of settings that one becomes powerfully aware of the enduring beauty and utility of nature. It is the reshaping of nature that has made civilized urban life possible. Nature has a social and cultural history that has enriched countless dimensions of the urban experience. The design, use, and meaning of urban space involves the transformation of nature into a new synthesis. (Gandy 2002, p. 2)

Urban metabolism

Of course, the distinction between the urban and the non-urban has long been questioned in geographic, historical, and anthropological research. Despite well-recognized distinctions between urban and rural life, morphology and culture (dating back to Chicago School sociological research in the early twentieth century, see Wirth 1964), there has been a longstanding countervailing effort to explore the dialectical way that the city creates the countryside and vice versa.

The very idea of the countryside, Raymond Williams conversely observed, is rooted in urbanization (Williams 1973). Emblematic in this regard is the work of William Cronon in his book *Nature's Metropolis* (1992), in which he records and explains the rise of the city of Chicago. In more traditional urban histories, the city is described as forming around activities internal to itself, growing to demand resources from the hinterland as a discrete organism, and eventually forming a node in a larger web of trade and economy. For Cronon conversely, Chicago and its surroundings are a political ecology formed through the mutual creation of new urban and rural objects, economies, and landscapes. The city comes to be constituted by the grain, meat, and other commodities that are themselves created through the networks of rail, storage, and processing that tie together the industrialized countryside and the urban core. Living things flow through and form the urban infrastructure, like the lifeblood of a larger organism.

As a result, one of the central concepts that has entered political ecology in its encounter with urban environments is the metaphor of *metabolism*. As urban political ecologists Heynen, Kaika, and Swyngedouw insist, the city is not a literal organism, but neither are the natural processes at work in the city free from social ties and political constraints. "Put simply, gravity or photosynthesis is not socially produced. However, their powers are socially mobilized in particular bio-chemical and physical metabolic arrangements to serve particular purposes" (Heynen, Kaika and Swyngedouw 2006, p. 6).

In this understanding of the city, powerful actors and interests (like automobile manufacturers, politicians, real estate developers, or planners) bend and funnel natural materials and forces into place in order to increase rents, develop properties, fuel growth, and control citizens. At the same time, however, these objects and forces enact their own tendencies or

interests in surprising ways, as rivers flood neighborhoods, insects thrive in tenements, and heat waves bake local residents, all with further implications for investment, social action, and urban politics. Urban metabolism is a powerful metaphor for political ecology, which reminds us that cities are fundamentally natural, in that they are populated by human and non-human residents, formed from earth material, and supported by ecological processes. It also means, however, that these residents, materials, and processes are always politicized in cities and no technical solution or ecological analysis can free them from the struggle of interests that make up the life of a city.

Environmental justice

Another key concept on which new urban political ecologies rest is *environmental justice*. Environmental justice is both a kind of social movement as well as a form of analysis. It is predicated on the well-established fact that disempowered communities, especially racial minority communities and the urban poor, are disproportionately located in and around technological hazards, like lead smelters, garbage incinerators, power plants, and other potentially deadly sources of exposure. Typically traced back to a report published by the United Church of Christ's Commission for Racial Justice in 1987 and the subsequent publication of a key work in the field, Robert Bullard's (1990) *Dumping in Dixie*, environmental justice has a long history of exposing the structural pressures of racism and classism that lead to unevenly distributed environments in the city.

Environmental justice as a tradition of analysis involves documenting cases of environmental racism or injustice and demonstrating through mapping, statistics, and sophisticated analysis that the exposure risks are significant and unquestionably associated with historically disenfranchised groups (Cutter 1995). As such, debates in the field have centered around "chicken and egg" questions of whether dumps are placed around poor people and minorities or whether rents in dumping areas tend to fall, attracting communities with economic disadvantages. The limited value of such debates notwithstanding, the field is one that fully unites political action and mobilization, environmental systems and considerations, and the uneven development of urban landscapes, underscoring the way white privilege and wealth can offload ugly externalities precisely by controlling the metabolism of the city (Pulido 2000).

For political ecology, the tradition serves as a springboard in many directions. Careful analysis, for example, can show not only how environmental "bads" are unevenly distributed, but environmental "goods" as well, as where urban forest cover has been denied to minority communities (Heynen et al. 2006). So too, as urban environments and green areas mature and become sights of neglect or danger, landscapes of fear can literally grow around marginal communities, as in Philadelphia, where differential neglect and enforcement in the urban park system have created overgrown areas that local residents fear and avoid (Brownlow 2006). Finally, by linking environmental justice to more traditional concerns of political ecology – including the creation of productive landscapes and issues surrounding sustainability – new possibilities emerge, including what theorist/activist Julian Agyeman calls "Just Sustainabilities," where new ecological possibilities can be nurtured in cities where injustice and risk have long prevailed (Agyeman, Bullard and Evans 2003).

Governmentality and the Creation of Subjects

A second area of emerging concern in political ecology is a growing interest in the way environmental management and governance become normalized within communities and individuals themselves. This interest stems from the observation that, as historically forceful and coercive models of regulatory and environmental government recede and other approaches like markets become more widely accepted, it is nevertheless evident that people come to *internalize* the mandates of the state and the interests of capitalism within themselves. People come to self-govern, and in a way that insidiously subverts their interests to the interests of the state, to capitalists, or other powerful institutions.

Such a process has been described in Foucault's terminology as *governmentality*, or the *conduct of conduct* (Foucault 1991). For Foucault, the logical extension to the notion of power/knowledge outlined above is that some logics come to pervade a network of power relations so that people, groups, and institutions within that web come to naturalize and accept these logics as their own. In this sense, the concept of governmentality resembles that of ideology and hegemony (as per Gramsci). More radically, however, Foucault and his adherents have noted that the internalization of these norms is a product of daily action, interaction activity, and work. People do not make up their mind about what is right, good, proper, and appropriate and then act it out. Instead, they act out their social and political interactions in the world and these come to govern their selves. In other words, what people do precedes who they are and what they think; practice precedes self; the body becomes the site of politics.

The implications for political ecology are startling and significant. On the one hand, this implies that environmental stewardship (e.g., a value of conservation) might be the *product* of ritualized embodiment of environmental practice (e.g., putting things in the recycling bin) instead of the other way around. That way of thinking suggests that a kind of "*environmentality*" (following Agrawal 2005 – see Chapter 11) might be inculcated in individuals through their participation in institutionalized management. The long effort by state governments to coerce people to "do the green thing" can be replaced with "soft power" – the stealthy decentralization of responsibility to communities and individuals that induces them to do it of their own apparent volition. Good news, it would seem.

On the other hand, accepting this model of human political ecological experience has an even more compelling dark side. It suggests a world where even the most intimate kinds of apparent volition (*being* an environmentalist, or a good neighbor, or a Christian, or a patriot . . .) are the products of more extensive webs of interaction and indirect influence.

This is because the core concept underlying governmentality is that of the *subject*, intended in the double sense that subjects both experience life as the apparent grammatical subject of a sentence, one who volitionally drives the verb, while at the same time existing as the subject of a sovereign (state, prince, company, church, or family). In this paradoxical condition, most closely associated with the social theory of Louis Althusser (1971), people are *subjected* to political webs of power through their interactions and are *made to be* who they are even as they appear to choose and act with autonomy and free will. Althusser observed, moreover, that people become precisely who they are through a process of social self-recognition, or *interpellation*. Here, they are literally hailed or called by others (from

the French *appeler*) into being, as when a policeman on the street calls out "hey you" (in Althusser's classic example) and you turn in response; at this moment of self-recognition, you are a subject of state power.

The implications of all this for political ecology are significant. How do people become the kind of environmentalists (or opponents of environmentalism) that they are, and through what systems of control do such subjects make social and political sense? Does a certain kind of person utilize industrial pesticides on their lawn (as discussed in Chapter 11) or does industry-induced chemical use create a certain kind of person? Concern for the subject in political ecology, in other words, means seeking to explain the way people's environmental actions and identities fit together, and the way these are together the products of power.

Objects, Actor-networks, and the Problem of Materiality

The rising interest in the political subject in political ecology has been matched by a parallel interest in objects, which represents a third new arena of recent expansion in political ecological theory. Insights from science studies and feminist theory have come to stress the material nature of social and political life. Importantly, these analytical traditions, as suggested previously, have also long emphasized the social and political nature of knowledge of the environment and its objects. As such, both traditions are appropriately associated with efforts to denaturalize things that were taken for granted as true, natural, and inevitable (e.g., gender, poverty, or race) and show them to be historical, contingent, and tractable to change (see Chapter 6). It is also true, however, that these fields have also produced a careful accounting of the way non-human actors and human bodies themselves present real, autonomous, and important effects on the world, beyond – if never fully outside of – human politics and society (Castree 2005). This latter insight, that the objects of the world exceed human political life and action but do not exist and cannot be known outside it, has led to a proliferation of debates, discussions, and research trajectories, referencing post-humanism, rematerialization, and more-than-human social science (Braun 2004; Whatmore 2006; Bakker and Bridge 2006; Robbins 2007a; Robbins and Marks 2009; Murdoch 1997a).

Symmetry: Networks and companions

As observer and historian of science Bruno Latour has long stressed, the outcomes, situations, and events we experience and observe in the world are the product of entanglements between diverse actors, which certainly include people but many, many more things as well. In his history of the "discovery" of microbes and the defeat of anthrax, *The Pasteurization of France*, for example, Latour stresses *both* the way social and ideological commitments sometimes make some scientific facts or findings easier or harder to accept (an account congruent with the idea that objects like microbes are basically social) but also the way objects themselves, specifically microorganisms, assert themselves and become part of alliances that produce political outcomes, specifically the success of Pasteur and his science as a hero of France. The implications of this are several, but include a serious reconsideration

of who (or what!) exactly might be considered important players in a political ecological explanation. Can ecological explanation embrace microbes as actors in political outcomes and, if so, how?

As Latour suggests more explicitly in his book *Reassembling the Social*, the key to explaining a world, where objects are socialized and society is constituted by objects, is to employ *symmetry*. Symmetrical explanations allow people and institutions critical roles in determining outcomes, but also allow non-people to have efficacy and a crucial role in making the world. For Latour, a good account "is a narrative or a description or a proposition where all the actors *do something* and don't just sit there" (Latour 2005, p. 128, emphasis in the original). Such an account is one that invokes "actor-networks," the association of many human and non-human things into a configuration that makes things happen.

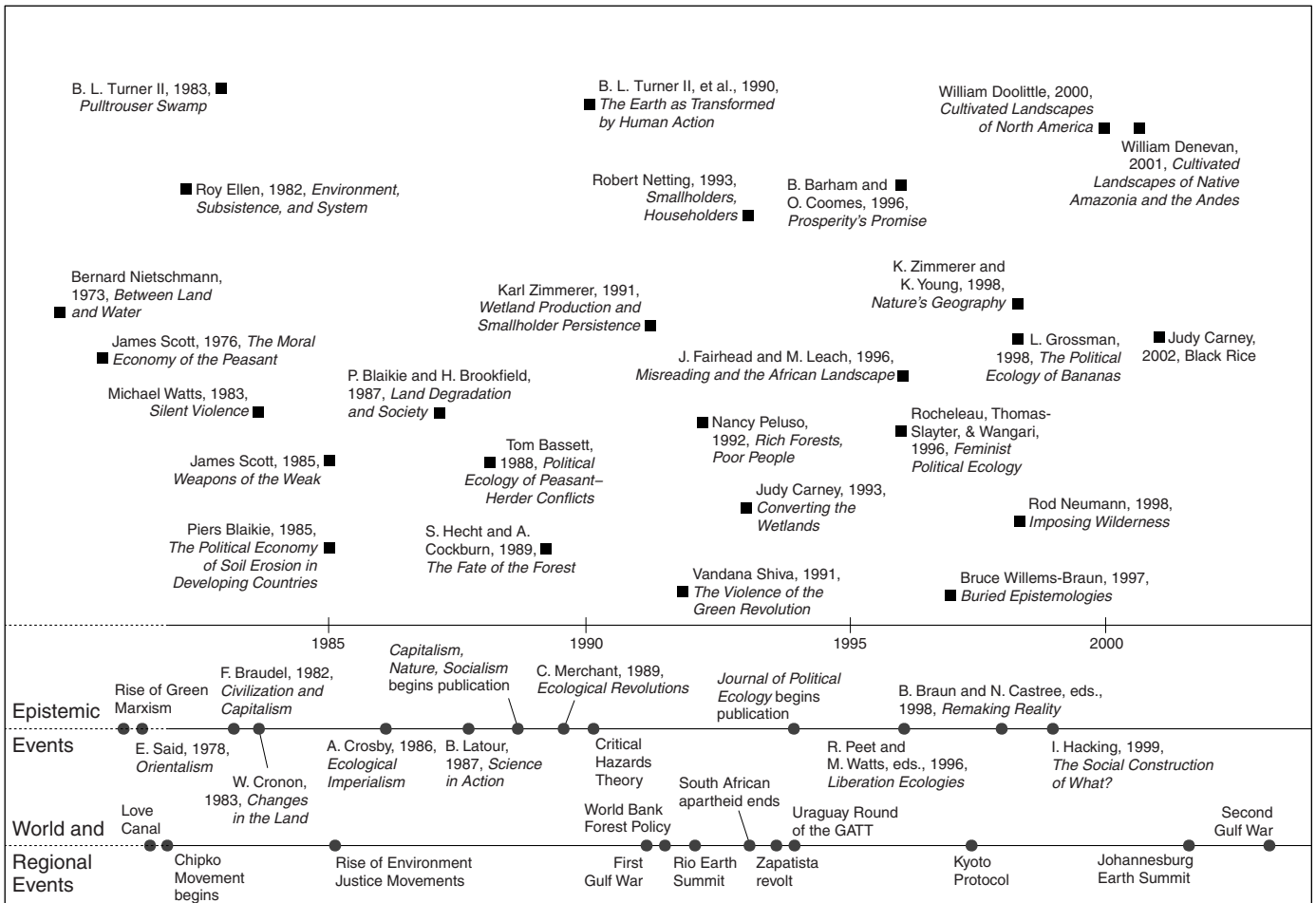
For political ecology, this seems at first a welcome innovation. It opens the lens of analysis to embrace the tangled material "assemblages" of humans and non-humans that make up the world. It also recognizes and embraces the way the relationships between people and things change both (Murdoch 1997b). This certainly recalls rudimentary political ecological Marxist precepts: the mixing of people and nature (through labor) transforms each.

But Latour's approach does not fit entirely easily with other traditions in political ecology. This is because Latour's view of the world, his metaphysics, stresses the relative, unstructured, and non-habitual character of assemblages. For Latour then, a network is not a real thing, an existing or persistent structure, it is instead the characteristic of a text:

> The network does not designate a thing out there that would have roughly the shape of interconnected points, much like a telephone, a freeway, or a sewage network. It is nothing more than *an indicator of the quality of a text* about the topics at hand. It qualifies its objectivity, that is, the ability of each actor to *make* other actors *do* unexpected things. (Latour 2005, p. 129, emphasis in the original)

If the story you tell, in other words, is narrated so that all the characters are active and effective, then it is a network story, and it is a good story. Such a story, moreover, should eschew theoretical baggage like "structures" or "systems" that might otherwise mystify the concrete relationships between things. Indeed, some have posited actor-network theory as an attractive alternative to political ecology altogether (Holifield 2009). Conversely, for a political ecology rooted in the notion that persistent outcomes are caused, at least in part, by structural constraints imposed by existing logics and processes in the world like capitalism, racism, colonialism, and sexism, such criteria for both producing and evaluating a text or an analysis may seem somewhat apolitical. Nevertheless, because political ecology operates in a world where a massive oil-spill disaster – like that in the Gulf of Mexico in 2010 – can result from a confluence of dead batteries, ineffective government agents, failed blowout preventers, callous investors, and high-pressure undersea environments (see Chapter 8), Latour's call to symmetry through actor-networks has necessarily influenced the field. After all, things, institutions, and people can well be imagined to occupy, and together to constitute, political ecologies that are exploitative, contested, and structured (Birkenholtz 2009).

Other articulations of these kinds of linkages have also made key contributions to political ecological thinking, notably including the work of historian and theorist of science


B. L. Turner II, 1983, Pulltrouser Swamp
B. L. Turner II, et al., 1990, The Earth as Transformed by Human Action
William Doolittle, 2000, Cultivated Landscapes of North America
William Denevan, 2001, Cultivated Landscapes of Native Amazonia and the Andes
Roy Ellen, 1982, Environment, Subsistence, and System
Robert Netting, 1993, Smallholders, Householders
B. Barham and O. Coomes, 1996, Prosperity's Promise
Bernard Nietschmann, 1973, Between Land and Water
Karl Zimmerer, 1991, Wetland Production and Smallholder Persistence
K. Zimmerer and K. Young, 1998, Nature's Geography
James Scott, 1976, The Moral Economy of the Peasant
L. Grossman, 1998, The Political Ecology of Bananas
Judy Carney, 2002, Black Rice
J. Fairhead and M. Leach, 1996, Misreading and the African Landscape
P. Blaikie and H. Brookfield, 1987, Land Degradation and Society
Michael Watts, 1983, Silent Violence
Nancy Peluso, 1992, Rich Forests, Poor People
Rocheleau, Thomas-Slayter, & Wangari, 1996, Feminist Political Ecology
James Scott, 1985, Weapons of the Weak
Tom Bassett, 1988, Political Ecology of Peasant–Herder Conflicts
Judy Carney, 1993, Converting the Wetlands
Rod Neumann, 1998, Imposing Wilderness
Piers Blaikie, 1985, The Political Economy of Soil Erosion in Developing Countries
S. Hecht and A. Cockburn, 1989, The Fate of the Forest
Vandana Shiva, 1991, The Violence of the Green Revolution
Bruce Willems-Braun, 1997, Buried Epistemologies
1985
1990
1995
2000
Epistemic Events
Rise of Green Marxism
F. Braudel, 1982, Civilization and Capitalism
Capitalism, Nature, Socialism begins publication
C. Merchant, 1989, Ecological Revolutions
Journal of Political Ecology begins publication
B. Braun and N. Castree, eds., 1998, Remaking Reality
E. Said, 1978, Orientalism
W. Cronon, 1983, Changes in the Land
A. Crosby, 1986, Ecological Imperialism
B. Latour, 1987, Science in Action
Critical Hazards Theory
R. Peet and M. Watts, eds., 1996, Liberation Ecologies
I. Hacking, 1999, The Social Construction of What?
World and Regional Events
Love Canal
Chipko Movement begins
Rise of Environment Justice Movements
World Bank Forest Policy
South African apartheid ends
Uraguay Round of the GATT
First Gulf War
Rio Earth Summit
Zapatista revolt
Kyoto Protocol
Johannesburg Earth Summit
Second Gulf War

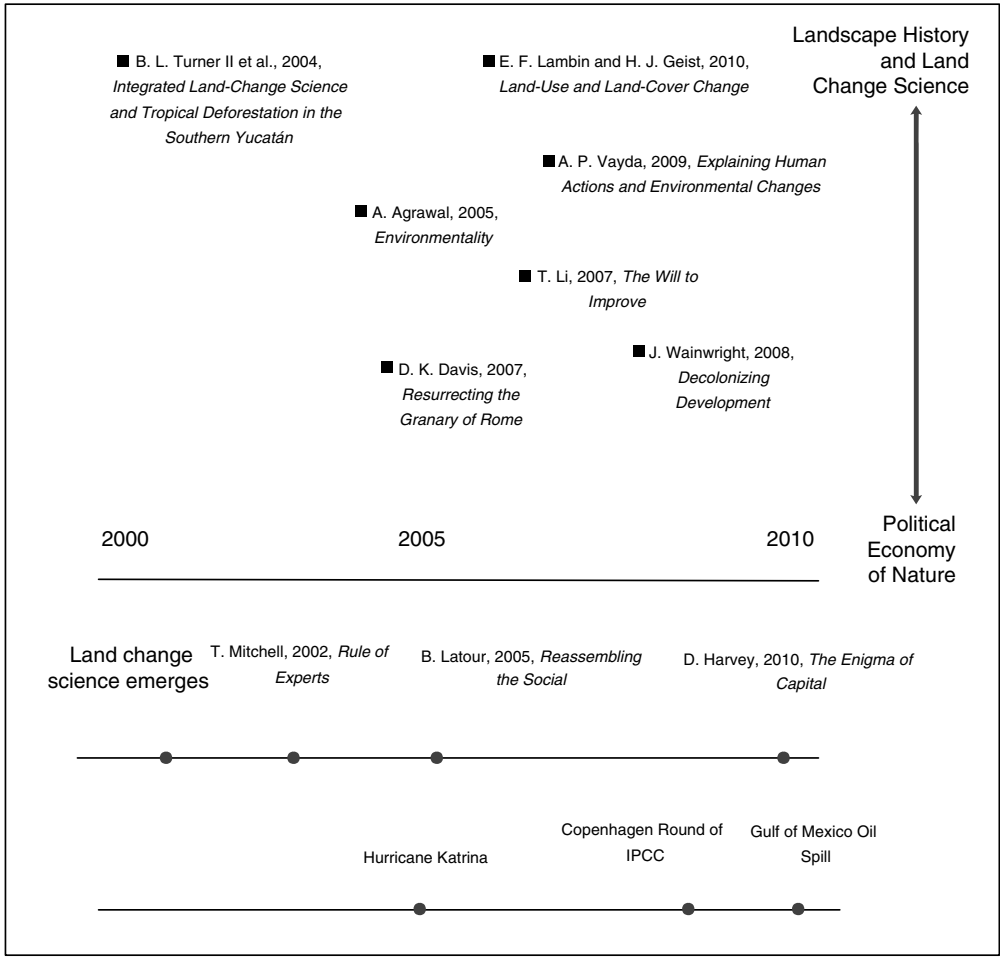


Figure 3.2 Integration and diversification.

Donna Haraway. Simultaneously interested in the social nature of objects and our knowledge about them, Haraway has pointed to the intimate role of non-humans in constituting human life and experience. Specifically, Haraway is supremely interested in the way humans and other species become the way they are through a co-evolved entanglement. "Through their reaching into one another," Haraway suggests, "through their 'prehensions' or graspings, beings constitute each other and themselves. Beings do not preexist their relatings" (Haraway 2003, p. 6). Her most notable example, in the book *When Species Meet* (Haraway 2008), is a key "companion species": the domesticated dog. But this insight extends to many, if not most forms of life that have crossed the path of humans over the millennia and who have found their way into the industrial ecology of the twenty-first century, ranging from factory-bred chickens living in the cramped metal sheds of the industrial food system to the bacteria living in our stomachs that make digestion and human life possible. Unlike the antiseptic networks of Latour, this raises uncomfortable ethical questions. In this sense, Haraway's vision of the world is highly congruent with political ecology, and might be mobilized in evaluation of problems of conservation, food politics, genetic modification, and animal rights.

Towards Political Ecology

From all of this, it is possible to argue that political ecology as a field of research and action emerged in the past 30 years as a result of three convergent factors. First, cultural ecology and other related positivist human–environment social sciences had reached some limits of explanatory power for addressing some important questions about environmental change. It is certainly true that these other traditions and texts continue to thrive in the form of land change science, decision science, environmental anthropology, and related fields, with which political ecology engages in ongoing dialogue (see Chapter 7). Nevertheless, a distinctive form of argument and a growing body of evidence continue to point towards the power and persuasiveness of political ecology.

Second, as this chapter has surveyed, insights have emerged from critical theory of many kinds, including green materialism, peasant studies, postcolonial theory, urban political economy, feminism, and science studies. These have by no means created a coherent theory or offered a single method for research. They have, however, posed a set of pressing questions that have previously gone unasked and unanswered.

Third, apparent contradictions and feedbacks of global ecology appear to be accelerating in the late twentieth and early twenty-first centuries (Figure 3.2), providing very real reminders of ecology's politics. Images of Sahelian droughts were broadcast to households around the world during the 1980s. Global anthropogenic climate change began to present evidence in the 1990s that capitalist economics can indeed undermine the conditions of its own reproduction, and on a scale of such enormity as to suggest the global significance of political ecology. The enormous "natural" catastrophes of the early 2000s – including the Southeast Asian tsunami in 2004, Hurricane Katrina in 2005, the massive earthquake in Haiti in 2009, and the devastating floods in Pakistan during the monsoons of 2010 – all disclosed the violent inequities of a wholly *unnatural* global political economy, which paved the way for the outrageous, unjust, and jarring devastation these events wrought amongst

the world's most marginal communities. Global conservation organizations were beginning to vie for attention against multinational corporate machines. American consumers, while calling for preservation of tropical biodiversity, were eating bananas harvested from plantations that displaced rainforests.

The excitement of these convergences (mixed with a kind of panic) in critical environmental studies should not be understated. At a moment when urgent problems appeared to be proliferating around the globe, a sophisticated mode of explanation was forming to explore the roots of such phenomena. The devastation associated with deforestation, climate conditions, soil erosion, tsunamis, and famines, long characterized as either "natural" and "inevitable" phenomena or the product of ignorant and overpopulated land managers, might now succumb to new kinds of explanation. Political ecology had arrived, and at what might have been exactly the right moment.

Chapter 4

Political Ecology Emerges

- Political Ecology is not a Theory or a Method
- Political Ecology is a Community of Practice
- Political Ecology is the Quality of a Text
- Winning and Losing
- Human–Non-human Dialectics
- Starting from, or Ending in, a Contradiction
- Claims about the State of Nature and Claims about Claims about the State of Nature
- The Power of Political Ecology: The Hatchet and the Seed

We have seen that a period of political and environmental dynamism was paralleled by an explosion of theoretical activity in the socio-environmental sciences in the late twentieth and early twenty-first centuries. This introduced a range of concepts and processes that enormously expanded the toolbox of people examining environmental problems. It also put observers on the lookout for certain potentially predictable dynamics (Table 4.1).

Where historically well-adapted agricultural systems turned destructive to the soil, investigators were invited to consider transformations in cash-cropping economies, contracts, or labor systems, rather than immediately blaming peasant ignorance or household size (Watts 1983b). Where crises in a city's water system occurred, observers were directed to the way scarcity is produced through changing arrangements of resource control rather than merely aggregate water demand (Kaika 2005). Where people come to espouse forest

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

Table 4.1 Concepts and processes in political ecology.

Field/approach	*Concepts*	*Things to watch for*
Hazards	Low- and high-risk behavior	Traditional management systems, geared to minimize risk, are altered under political/economic pressure.
Behavioral cultural ecology	Rational land manager	Production decision-making, geared to minimize drudgery, is altered under political/economic pressure.
Common property	Institutions as rules Collective action	Dismantling environmental institutions in political economic change leads to system failure
Marxism/ Materialism	Surplus and accumulation Exploitation and hegemony	Changing production systems and economic crises increase exploitation and degradation of labor and environment.
Peasant studies	Moral economy Everyday resistance	Reconfiguration of environmental management results in political and social crisis and resistance.
Feminist development	Division of labor and power	Reconfiguration of environmental management leveraged on extraction of marginalized labor and resources.
Environmental history	Floating baselines	New ecological systems emerge from competing and subsequent uses of the environment.
Postcolonial/ subaltern studies	Political embeddedness of social science	Accounts of social change used to extend and cement political control over marginal and colonized groups.
Science studies	Social embeddedness of physical science	Accounts of environmental change used to obtain political control of people and resources.
Urban political economy	Urban metabolism Environmental justice	Control over the flow of environmental goods and bads results in uneven exposure, risk, and opportunity.
Environmental subjects	Governmentality Environmentality Interpellation	Environmental values are the results of behaviors rooted in systems of micro-political and institutional control.
New materialism	Actor-networks Distributed agency	Socio-political systems and outcomes are co-constituted by the material characteristics of objects and things.

protection as a goal after generations of destructive behavior, analysts were pointed towards examining changing arrangements of micro-power in local institutions, rather than elusive environmental education (Agrawal 2005). Some political ecologists continue to draw directly on the struggles and questions raised by thinking in peasant studies: How do subsistence producers respond to changing global economics? (Gupta 1998). Others focus on

the imperatives of marginalization raised in postcolonial theory (Jewitt 1995). Some explore the character of landscape morphology under conditions of social and political struggle (Zimmerer 1991), while others investigate the social and political changes that grow from implementation of environmental control (Ribot 1996).

Political Ecology is not a Theory or a Method

This enormous empirical and theoretical heterogeneity challenges the unity of the enterprise as a whole. Indeed, some of the progenitors of the field have gone as far as to suggest that political ecology is effectively incoherent, a mere "cover for anarchic development" (Bryant 1999, p. 148). Senior practitioners have opined that the field has become so far-reaching and inclusive that "it seems easier to say what [political ecology] is, than what it is not" (Blaikie 2008, p. 766). It is certainly true that the proliferation of varieties of traditions and approaches to the politics of the environment have invited a sense that there is no center to political ecology, and that it is a largely eclectic body of work.

Despite this diversity, the central concerns and questions of political ecology continue to revolve around several common conceptual tools and processes (see Table 4.1). As such, it is inviting to imagine that political ecology is a kind of theory, or body of theory. To a degree, and at a very general level, this is true. Political ecologists contributed to the creation of general theories suggesting that capital accumulation necessarily undermines the ecosystems upon which it depends, for example, propelling environmental movements (O'Connor 1996). Similarly, they have demonstrated the difficulties and barriers that environmental variability – both spatial and temporal – presents for capitalists, causing them to surrender or strategically underinvest in some sectors of the economy (e.g., agriculture) (Henderson 1999).

Even so, as it is generally practiced, the eclecticism of political ecological explanation does defy any effort to represent it as anything like a single theory or body of theory. Rather than a specific set of overarching categories or claims, political ecology instead mobilizes concepts from broader schools of thought to explain otherwise confounding socio-environmental outcomes. In many cases, moreover, political ecology focuses heavily on case studies that stress idiosyncrasies, contextual outcomes, and local surprises that precisely fly in the face of general theory-building. Political ecology, therefore, utilizes and supports theory-building to an enormous degree, but it would be grossly misleading to call it a body of theory.

Given this eclecticism, it might be conversely tempting to assert that political ecology is instead a kind of method: something that people *do* (Robbins 2004). Political ecologists typically operate from case studies, often using immersive techniques to understand both values and practices of people, within households, communities, and localities. Participant observation techniques are common, as are survey instruments. This approach reflects the field's deep roots in development-oriented research in small communities, where anthropological and geographic field techniques were typically ethnographic. These are further analyzed in a comparative fashion, stressing how local knowledges and practices, along with their social networks and ecologies, are impinged upon by political and economic upheaval – commodity price changes, the implementation of conservation reserves, or the introduction of new markets, contracts, or technologies. That analytic, as

a sort of methodological procedure, constitutes some significant slice of political ecological work.

But a more extensive examination of political ecology challenges any such claim. Political ecology includes the use of remote sensing technology and time series analysis of landscape change. It includes modeling efforts to explore patterns of interaction and resource use. It includes extensive archival research in colonial record offices or the basements of NGOs. It includes network analysis of inter-linkages between institutional actors. All of these are analyzed in qualitative and quantitative ways, ranging from interpretive techniques that search for systems of meaning to statistical tests that evaluate the relative influence of specific variables. In short, there are very few techniques, technologies, or analytics not used in political ecology, again suggesting the elusiveness of coherence in the field.

Political Ecology is a Community of Practice

And yet when a conference session is entitled "the political ecology of X," it is often overflowing with observers and participants. When a call for papers on the "political ecology of Y" is sent on a listserv, it typically receives numerous enthusiastic responses. If political ecology is neither a method nor a theory, it certainly seems to have a lively set of adherents.

In part, this is because political ecology has unquestionably formed a general constituency: a global conversation revolving around a set of specific themes, one that adopts a specific sort of critical attitude. By constituency, I mean a large group of people who come from a yet larger pool who both read and write professionally (like university academics and journalists) as well as those in international agencies (e.g., the Food and Agriculture Organization (FAO)), international non-governmental organizations (e.g., the World Wildlife Fund (WWF)), national state bureaucracies (e.g., the United States Environmental Protection Agency (USEPA)), and local and regional NGOs. Typically, therefore, its constituency operates in the borderlands between analysis and action, and between social practice and environmental impacts, resources, or changes.

More specifically, it is a constituency that holds a deep and abiding skepticism precisely of the institutions within which it operates. It is a community whose members participate in institutions that manage the environment but who are cautious of the implications of environmental management (Robertson 2010). It is a community that teaches courses on environment and development but is woefully concerned that development has been largely environmentally destructive and ethically problematic (Jarosz 2004). It is a community that works in applied circumstances to establish community-based solutions to problems, but which is cognizant that "communities" are often rife with internal conflict, domination, and exploitation (Batterbury and Horowitz 2011, in press). This is a skeptical and ambiguous group, which is in turns hotly politically engaged and coolly dispassionate. As Robertson reflects on his experience doing research both "inside" and "outside" of federal regulatory authority while working and observing at the EPA, for example:

> Emerging 32 months later . . . I found I was unsure how to think of my own subjectivity as a researcher. On the one hand I had a clear sense of having immersed myself in the subjectivity of the environmental bureaucrat, following sociologists of science. On the other hand, I forged

> personal alliances, engaged in policy advocacy, and did not conceal my own oppositional instincts. (Robertson 2010, p. 7)

The constituency of political ecology is one that simultaneously constructs and deconstructs, criticizes and defends, listens and argues. The population of such a diverse constituency is necessarily large, of course, and by its nature heterogeneous, differentially invested in theory and practice, and divided in its aims and scope, but when a discussion on "political ecology" is assembled, it consistently brings many people to the table. Political ecology is a community of practice, therefore.

Political Ecology is the Quality of a Text

This highly motivated but necessarily ambivalent community is held together by more than its skepticism, however. It is also linked together by an amorphous and ever-changing canon of texts. To be clear, by text, I do not solely mean written and printed articles, though these are most certainly and extensively included. Text here describes symbolic content, images, and media that tell stories. This includes books, of course, but also maps, videos, conference presentations, online PowerPoint slides, audio logs, blogs, and other artifacts of communication.

For a compelling example, consider the work of the Beehive Design Collective who create complex illustrative, instructional, and evocative images of topics including biotechnology, the war on drugs, and the violence of the oil economy (Figure 4.1). More traditionally, the video efforts of Tor Benjaminsen and his colleagues invoke the complex issues surrounding the invention and uses of "desertification" in North Africa ("The Timbuktu Documentaries"). These texts all address, in some basically familiar way, the themes of ecology, environmental knowledge, and power.

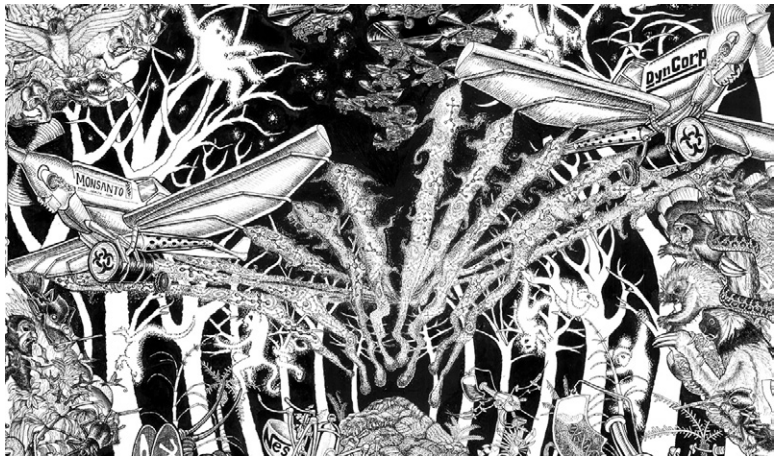


Figure 4.1 Section of a Beehive Design Collective Graphic Campaign on the social and ecological horrors associated with the US war on drugs operation: Plan Colombia. A political ecology text. Image courtesy of The Beehive Design Collective.

Political ecology texts are empirical in that they are based on the myriad rigorous methods described above, including participant observation, ecological field study, remote sensing, oral history, and immersive experience. They are theoretical, insofar as the inspiration and interpretation of data and knowledge produced in situ are examined through multiple lenses drawing on the traditions of critical theory described earlier, including Marxist, feminist, and anarchist traditions, but also a range of other categorical and conceptual approaches.

But as noted previously, the enormously eclectic and sometimes contradictory combination of these many techniques and ideas is not what makes political ecology, and its texts, a coherent whole. Instead, it is the overall conventions and orientations of political ecological text that give it a unified effect. These qualities together make political ecology a form of representation, or argument, or literature: like expressionism is a form of painting; gothic is a form of novel; film noir is a form of cinema. Extensive review of articles, books, and other resources in the field suggests that the characteristics of political ecology, as its own form of expression, are (at least) fourfold. Political ecologies:

- track winners and losers to understand the persistent structures of winning and losing;
- are narrated using human–non-human dialectics;
- start from, or end in, a contradiction;
- simultaneously make claims about the state of nature and claims about claims about the state of nature.

Winning and Losing

Political ecology stories are stories of justice and injustice. In such narratives, the transformation of a forest to a pasture, the loss of urban community gardens, or the degradation of a fishery is never an undifferentiated event. Rather, it is understood to have causes and consequences that are uneven between communities, classes, and groups. This is, in part, a reflection of the simple fact that the environmental effects or costs of human action are typically offloaded onto communities, people, or spaces with inadequate political or financial resources to resist. In this sense, foundational political ecology narratives overlap with those of the environmental justice (see Chapter 3), which attends specifically to the dynamics of locating environmental hazards, and the tendency for minority communities to be exposed to toxic dumping, poor air quality, and soiled water resources.

At bottom it is never enough to say that outcomes have winners and losers; it is essential to understand the degree to which such outcomes are non-incidental, persistent, and repetitive: a structure of outcomes that produces losers at the expense of winners. Thus, political ecology narratives typically track the historical processes, legal and institutional infrastructures, and socially implicated assumptions and discourses that typically make unjust outcomes the rule, rather than the exception. Such narratives often challenge long-held assumptions. A traditional assumption, for example, is often made that global food systems produce a "circle of poison," where there is a prevalence of pesticides on foods imported to wealthy countries from the global periphery. Political ecology on the question, however, demonstrates that in many cases pesticides are more prevalent on food grown by the global poor for domestic consumption, rather than export. It is the global poor who

often receive the brunt of pesticide risks, owing to complex patterns in the global regulatory and commodity system (Galt 2007, 2008a, 2008c, 2008b, 2010). By anticipating and critically evaluating who is put at environmental risk and why, political ecologies pull on threads of the global environmental system, to better explicate how it works.

This notion of justice and injustice can be extended to the environment itself, insofar as ecosystems or species may lose or suffer for the benefit of other actors. Even so, political ecology narratives of such outcomes differ from more straightforward animal or environmental rights accounts insofar as they reveal at the same time the deep structural economic drivers of unjust outcomes and attend to the simultaneous marginalization of disempowered people through the same systems and processes. Political ecology of industrial agriculture in the United States, for example, is rooted in an urgent unveiling of the violence against animals themselves through factory farming (Ufkes 1998). Similarly, Emel's (1995) political ecology of wolf eradication in the United States narrates the violence and malevolence acted against wild animals.

Notably, however, in both cases, these stories stress other key elements. Industrial agriculture is not merely a result of poor ethical choices by consumers, but is instead locked into place by the structural nature of the global food economy, its pricing of commodities, and the decline of small producers. In the case of the American Grey wolf, the narratives and masculinist assumptions that led to its extirpation are those developed and exorcised against native American people during the same period. Political ecology stories, therefore, narrate the uneven and structurally unjust character of socio-natures. Rather than undifferentiated and generic environmental problems, political ecology describes the sloped surfaces and tilting fulcrums of uneven power that control the flow of value from the environment and exact the terrible prices of accumulation, within the shifting systems of political economy that perpetuate both.

Chains of explanation

As a result, placing local and regional environmental problems in a broader context has long been a core of environment–society research. When Humboldt describes the decline of the pearl beds of Cumana, pointing to the increasing rapacity of economics after the Colombian encounter (Chapter 2), he is contextualizing environmental change in political economy. He is, moreover, establishing a chain of explanation, from pearl beds and their reproductive cycles, to producers and their fishing techniques, to markets and their demands, and finally to states and colonial powers, with their propensity for short-term benefits accrued in places distant from the site of extraction.

The result is an effort to trace the contextual forces that constrain and direct more immediate outcomes, and write an explanation of these outcomes that is also, simultaneously, a map for the way value flows out the landscape, through local communities, and towards sites of accumulation far away. When herders conflicted with farmers in Côte d'Ivoire in the 1980s, for example, pioneering political ecologist Tom Bassett (1988) examined the vertical pressures on the system to conclude that these violent *local* outcomes were actually a result of pressures to increase livestock production at the *national* scale, for state-sponsored export to *international* markets. Such an analysis represents what Blaikie and Brookfield called a "chain of explanation." This:

> starts with the land managers and their direct relations with the land (crop rotations, fuelwood use, stocking densities, capital investment and so on). The next link concerns their relations with each other, other land users, and groups in the wider society who affect them in any way, which in turn determines land management. The state and the world economy constitute the last links in the chain. Clearly then, explanations will be highly conjectural, although relying on theoretical bases drawn from natural and social science. (Blaikie and Brookfield 1987, p. 27)

Of course, any given political ecological text will rarely include all of these elements, either because the regional context renders them irrelevant or because a single specific link is of greatest importance to the researcher. Research may, for example, focus solely on the way state authorities respond to elites and economic pressures to determine the regulation of specific forms of extraction (e.g., clear-cutting, strip-mining). Other research in the same context, on the other hand, might just as easily focus on the way producer communities respond differently to altered institutional arrangements, mobilizing different resources to adapt their use of the landscape with varying ecological outcomes (Figure 4.2).

The problem in assembling such explanations of winning and losing, therefore, is that selecting a suite of variables and an appropriate scale is difficult and must be driven at least

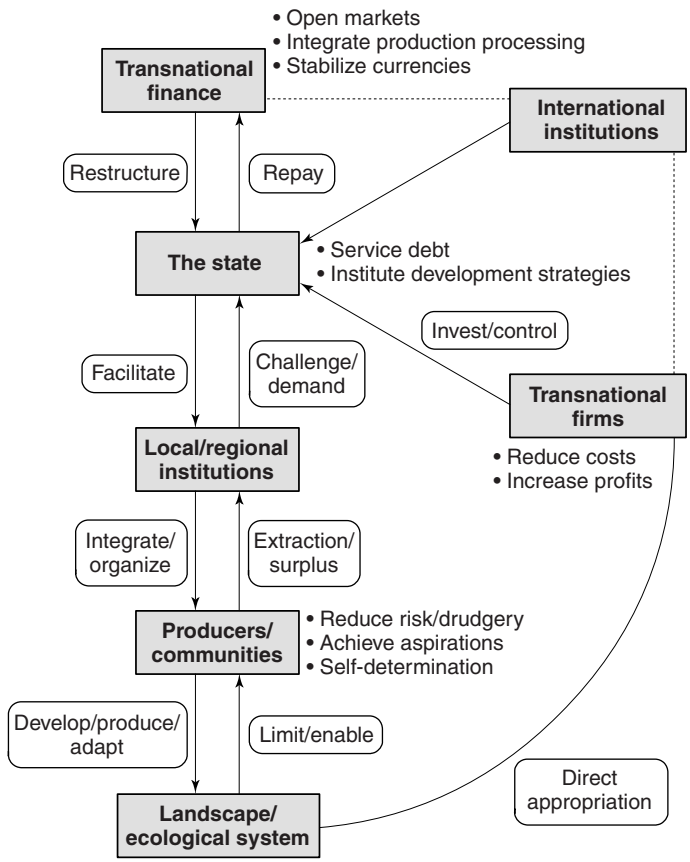


Figure 4.2 The chain of explanation.

Box 4.1 The Reluctant Political Ecologist: Harold Brookfield and *Land Degradation and Society*

Harold Brookfield does not lay claim to the title "political ecologist." But reflecting over several decades of human–environment work, he admits that he has actually done quite a lot of political ecology after all.

Brookfield began his career squarely in the "Pacific school" of cultural ecology, which was typified by long-term observation of the agrarian cultural practices of the people of Borneo and New Guinea (Brookfield 1962). Even as early as 1963, however, with publication of *Struggle for Land* (Brookfield and Brown 1963), a book exploring the problem of production and territory amongst the Chimbu of Papua, it is clear that Brookfield's concerns had inherent political dimensions. Later research projects on the effects of colonialism in Melanesia and the urbanization of villages in Malaysia were stamped with the effects of power and political economy in the lives of rural people.

It was not until the publication of *Land Degradation and Society* (Blaikie and Brookfield 1987), however, that these concerns came to be called "political ecology." Teamed in an unlikely way with Piers Blaikie who co-taught a joint workshop on land degradation with Brookfield in Canberra in 1984, Brookfield explicitly adopted some critical tools and *Land Degradation and Society* became a convenient rallying point for disparate research trajectories centered on the political economy of environmental change. The book had myriad contributors (often forgotten in the shorthand "Blaikie and Brookfield") including among many others the renowned common property theorist Narpat Jodha; it was in many ways a synthetic volume. Even so, Brookfield's voice (cautious, inductive, thorough) can be heard throughout.

Like most senior cultural ecologists, however, Brookfield remains wary of the Marxist and structuralist core concepts in political ecology, which were swept into the mainstream with the publication of *Land Degradation and Society*, although in a watered-down form. Like many other researchers, Brookfield fears that the introduction of a political economy approach lures thinking towards oversimple top-down explanation – or "structural determinism" in Brookfield's own terms.

Even so, the role of political economy is never far from his concerns. As recently as 2002, describing his experiences working in the United Nations University project on People, Land Management and Environmental Change (PLEC) in 12 countries from Peru to China, he concluded,

> not without some surprise, that there has been a good deal of political ecology in PLEC, and in the book on "agrodiversity" that I have written in the same period. But it has been a political ecology which focuses strongly on how individual farmers and their communities manage, adapt and innovate within the changing political and economic system, rather than on how the system determines what they do, and what happens to their land.

This suspicion is certainly understandable, since it reflects Brookfield's richly empirical and inductive approach to places, people, and systems. But reluctance to embrace the tools of critical theory was by no means passed along to future researchers. While Brookfield helped to build the doorway into a new mode of explanation, others have passed through it with far less trepidation.

in part by theory. The chain of explanation is as much art as science: "The knack in explanation must lie in the ability to grasp a few strategic variables that both relate closely together in a causal manner, and which are relatively sensitive to change. In that way the most promising policy variables and paths to social change can be identified" (Blaikie and Brookfield 1987, p. 48).

Marginalization

Along with the chain of explanation, the structures of winning and losing are frequently expressed through the concept of *marginalization*. Blending concepts of the margin from neo-classical economics, ecology, and political economy together, marginalization is a process that leads to simultaneous and increasing impoverishment and land degradation in and amongst the global poor. Marginalization is a process whereby politically and socially marginal (disempowered) people are pushed into ecologically marginal (vulnerable and unstable) spaces and economically marginal (dependent and narrowly adaptable) social positions, resulting in their increasing demands on the marginal (increasingly limited) productivity of ecosystems. As a consequence, those individuals and groups will tend to increase their efforts on the landscape, increasingly pushing the limits of its capacity, and achieving lower and lower yields. The result is hypothesized to be a degraded landscape that returns less and less to an increasingly impoverished and desperate community – a cycle of social and environmental degradation (see Chapter 8).

The silent violence of famine in Nigeria

For those trained to think about the adaptive capacity of people and the incredible resilience of communities that live in uncertain environments, this concept of marginalization has proven useful. Notably, as the now-infamous crisis of starvation pervaded the Sahel through the 1970s and 80s, new questions could be raised. Weren't the farmers and the herders that lived in this region already well adapted to the common problem of drought? And if so, why were those adaptations failing in the contemporary period?

An answer came in the exhaustive study of Nigerian famine, *Silent Violence*, by Michael Watts, a critical geographer trained in hazards and cultural ecology, who connected the crisis in the Sahel to a century of economic and social transition. The problem lay, Watts argued, in "the rupture of local systems as they become part of coherent and highly integrated global networks" (Watts 1983b, p. 14). *Silent Violence* reveals the ecological and

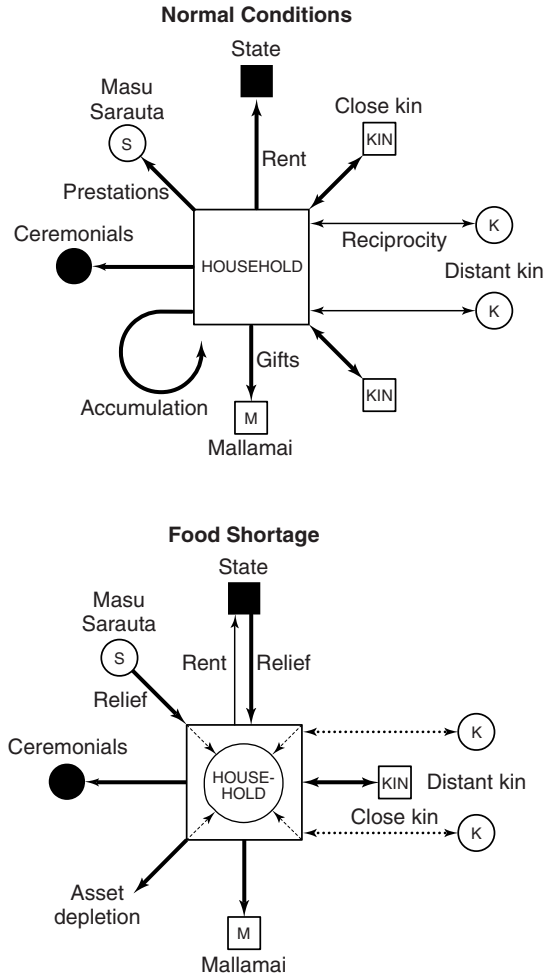


Figure 4.3 Watts' moral economy of famine in Hausaland and Sokoto. *Source*: Reproduced from Watts 1983b, Figure 3.2. © Michael Watts. Reprinted with the kind permission of the author.

economic feedbacks of marginalization, where decreasing social power and resource access leads to depletion of resources, reinforcing social and political subjugation.

While shortages occurred in pre-capitalist economies, access to food in the past was determined by systems of reciprocity and social exchange within the economies of Hausaland and the Sokoto caliphate (Figure 4.3). Here, during normal (rainfall) conditions, households paid rents to the state, exchanged extra grain with kin, and accumulated and paid out small surpluses as a reserve against famine (Watts 1983b). As *Silent Violence* further demonstrates, however, the colonial and postcolonial capitalization of exchange relations transformed that famine ecology. Seeking petroleum receipts and cash-crop exports, the Nigerian state subsidized programs for cheap food imports and industrial development. This led to increased rural debt, the disappearance of the redistributive systems of previous regimes, a turbulent roller-coaster ride of commodity market price

Box 4.2 Revolution's Influence "On the Poverty of Theory"

Michael Watts's 1983 essay "On the Poverty of Theory: Natural Hazards Research in Context" departs from just about everything. By arguing against "naïve empiricism," Watts departs from traditional geographic science. By deconstructing the neo-Darwinism of "adaptation," Watts departs from cultural ecology. By rejecting the "rational agent," Watts departs from the dominant approach to hazards research (Watts 1983a).

All of this departing must have taken a great deal of energy, but as Watts has explained, there was a lot going on at the time to fuel so much schism. Watts had joined with a group of "Nigerian and expatriate Left intellectuals" (in his own words) who were:

> working on similar problems rethinking postcolonial Nigeria – working and living in northern Nigeria during the oil boom of the 1970s . . . It had an urgency because of the ruinous famines in the region and because of a certain political energy around Third World revolutionary politics (as it then seemed) which included of course the revolutionary movements and successes of the 1970s (Vietnam, Nicaragua, Zimbabwe and so on).

Specifically, the project was to "denaturalize" things that were inherently social but constantly attributed to climate: famine, destitution, and poverty. The article sought to establish a critique of what Watts viewed as "naturalizing" approaches – empiricism, hazards, and cultural ecology – and the article formed the theoretical foundation of Watts's larger (indeed sprawling) book *Silent Violence* (1983b). This foundation was built on Marxism, peasant studies, and the British New Left historiography of thinkers like E. P. Thompson, whose essay on *The Poverty of Theory* (1978) loaned its title to Watts's piece. But more directly, Watts drew on the thinking of Althusser and his structural account of class society operating like a big machine.

And to be sure, the essay is written in the language of high Marx. Typically, for example, the text urges that "the forces of and social relations of production constitute the unique starting point for human adaptation which is the appropriation and transformation of nature into material means of social reproduction" (p. 242). The often arcane prose (for those less initiated) can be frustrating, though it is crucial to his point.

But digging through the thickness of the language is well worth the effort, since the essay delivers a convincing story about the role of colonialism in shattering traditional responses to drought. It also provides an account of the horrors of famine formed from the paralyzing economic structures of emergent postcolonial states. All this and a critique of positivism in about 30 pages; not bad.

Most important, such structural critiques of famine cannot be mistaken as a fad of the 1970s and 80s. The essay continues to be extremely influential, reflected in recent work on historical as well as contemporary famines (Davis 2001). Watts noted in 2002 that "I am perhaps embarrassed to say that I have not changed my ideas about famine and climate."

changes, and soil mining leading to land degradation. The near-record drought in the 1970s triggered the region-wide famine disaster that followed, whose causes were rooted in the marginalization of producers and landscapes (Watts 1983b). Here, a political ecology of winners and losers becomes a structural analysis of why some perverse outcomes persist.

Human–Non-Human Dialectics

A second characteristic of political ecology accounts is their tendency to narrate causes and effects in a dialectical fashion. This represents a shift of view from more intuitive and straightforward ways of seeing natural processes and things. Typically, we think of objects and things in the world as discrete. A tree as an organism, for example, is intuitively understood as having bounds and distinct characteristics, which interact with other discrete things in the world, by drawing up nutrients from the soil, for example, and pushing its roots through cracks in the pavement.

This is by no means the only way of seeing objects and things in the world around us, however. In many senses, a tree is by no means discrete. Instead it is the momentary fusion and embodiment of complex elements that come to appear (to most of us anyway) as a single environmental phenomenon. So too, its momentary concatenation possesses tendencies and qualities that are more than this sum of parts (e.g., the respiration of oxygen). Finally, it is only part of a larger set of processes that constitute other phenomena around it, and from which it is inseparable (e.g., the climate). So too, the tree is in a state of ongoing becoming, and is never the same thing at any time, from the first shoots of its seedling growth to its senescence, decay, and death. Dialectics, as a method of explanation and analysis descended from Hegel and Marx into contemporary socio-environmental theory, causes us to rethink the tree as momentary, differentiated, and becoming. The tree becomes the way it is through a constant remaking of other things. Similarly, the tree itself is not a discrete element of something larger, but produces its contextual conditions even as it is remade. It is not discrete objects or events that make up socio-environments but relations and processes. Thus from a dialectical position, things are relations. Following Ollman (1993, p. 11), dialectics means:

> . . . replacing the common sense notion of "thing," as something that has a history and has external connection with other things, with notions of a "process," which contains its history and possible futures, and "relation," which contains as part of what it is its ties with other relations.

A reading of the world through dialectics invites a more processual and complex picture of the nature of things. As a result, dialectical stories, as those typically narrated by political ecologists, rarely focus on how individual things or variables cause outcomes or explain other things in a straightforward way, but instead how things and relations change by becoming entangled with one another. In political ecology, this means that non-human objects (elk, ice-makers, fungi), as well as human beings themselves, contain and are constituted by their relations to other things. So too, they are always becoming something else, precisely through their relating.

Writing environmental problems and conditions, therefore, becomes a reading of their collective historical constitution and the momentum of that constitution into the future. It is true that not all (or even most) political ecological work self-consciously states its approach as dialectic, but methodological, historical relationality is stitched into the fabric of most political ecological narratives.

Consider the political ecology of *Nature's Metropolis* (1992), described earlier (see Chapter 3). In that work, William Cronon narrates the rise of the city of Chicago in basically human/non-human dialectical terms. The city comes to be constituted by the grain, meat, and other commodities that are themselves created through the networks of rail, storage, and processing that come to constitute the city itself. In more traditional urban histories, conversely, the city is described as forming around activities internal to itself, growing to demand resources from the hinterland as a discrete organism, and eventually forming a node in a larger web of trade and economy.

For Cronon, the city and the country are simultaneously constituted by the development of commodity economies of production and distribution. In the harvesting, movement, and transformation of each commodity (grain, meat, etc.), a set of geographies, buildings, social interactions, and transportation networks are stitched together to create what we now call "Chicago." The city is, in a sense therefore, nothing more than the ossified sinews along which environmental goods have been made to flow, turned into generic tradable goods, and redistributed outwards to global markets. This is complex, insofar as it shows a self-organized system that makes its own geography. It is historical in that development over time cascades forward in a non-teleological way – non-pre-ordained, and filled with surprise and uncertainty. It is political ecology, however, most notably because it holds at its center a dialectical relationship in which things come to explain one another.

Starting from, or Ending in, a Contradiction

A further element of political ecological texts, and part of their dramatic appeal, is the tendency for their structure to begin or end in a contradictory situation, proposition, or mechanism. The term contradiction is defined loosely here to mean an apparent inconsistency between things or outcomes stemming from the same process, history, or condition. It describes the "incompatible development of different elements within the same relation . . . elements that are also dependent on one another" (Ollman 1993).

Placed at the beginning of a political ecological tale, contradictions compel fascinating mysteries worthy of socio-ecological investigation. The banning of pesticides in the United States has been observed to contrarily lead to increased use and exposure of the same chemicals abroad for foods exported to the United States. Does market integration increase such exposures? (Galt 2010, 2008a). Consumers who apply chemicals to their lawns, for example, are more likely to say that such chemicals are environmentally problematic than people who do not use them. Why? (Robbins 2007). Both these chemical questions are predicted on apparent mismatches between practice and expectation and between "common sense" and complex reality. They propel political ecology narratives to unravel cognitive knots and explain the unexplainable.

On the other hand, placed at the conclusion of a political ecological story, contradictions invite serious scrutiny of the taken-for-granted approaches, techniques, or ideas of

Box 4.3 The Paradoxes of Feel-Good Consumption in Guthman's *Agrarian Dreams*

The idealistic producers that entered American organic farming in the 1960s and 70s imagined a new kind of society: more sustainable, more interconnected, more grounded in ecological and social realities, and altogether more fair. The take-home message from Julie Guthman's *Agrarian Dreams* (2004), however, is that the dynamics of capitalist agriculture paradoxically made organic agriculture contribute to anything but a new kind of society. Indeed, from this paradox stems many more: regulation and certification designed to guarantee sustainability resulted in its opposite; because of cost squeezes in production, an ideologically committed industry became brutally exploitative of labor.

As Guthman explains, "when I began on this research in 1995 . . . the romance about organics was still very much alive, and I was really interested in seeing how the reality matched up to the claims. The first research outing, actually done as part of a class seminar, was pretty mind-blowing in terms of what we found: e.g., farms with hundreds of acres growing salad mix components on contract for grower shippers – far from the way organic farming is imagined."

In simple terms then, *Agrarian Dreams* lays out the history of organic production as a part of, and not separate form, the larger ongoing history of California's capitalist agricultural system. In lucid prose, Guthman shows how ideologically committed practices, directed at producing ecological and social alternatives, were not only subsumed under modern industrial agriculture, they became crucial to maintaining it. She bolsters this argument by exhaustively documenting and evaluating the activities of a large number of growers, by examining the history and success of organic certification outfits, by interviewing producers and processors, and by carefully comparing the character of organic and conventional growers both economically and demographically over time.

The results, she bravely suggests, demonstrate that the success of organics has undermined the progressive goals of its progenitors, precisely because they have (1) allowed an unconvincing and naïve agrarian populism to cloud their view of the inherently industrial history of California agriculture, and (2) assumed that the market logics of commodity production stand in for a more meaningful understanding of how the industry actually works. As she sums up, "it may be the case that the larger organic movement never meant to alter the entire food system systematically, the existing structural conditions of agriculture have limited its reach in surprising and profound ways" (p. 178).

As a result, Guthman has become the self-described "bad girl" of alternative food. "For some," she told me, "I'm a thorn in the side; but . . . I like to see my research as friendly critique. And I really believe it's been effective. Over the past 15 years I've seen major changes in how that alternative food movement frames its social justice concerns. Now, for example, there is growing concern about the whiteness of the movement."

Wielding political ecology's hatchet, in other words, has allowed Guthman to help open doors for seeding and growing new possibilities.

mainstream perspectives, which have produced or overlooked the reverse effects of those assumed or desired. Participatory development techniques designed to bring local ecological knowledges to the decision-making table, for example, result in, and accelerate, their exclusion (Ribot 1996; Agarwal 2001; Goldman 2003; Balint and Mashinya 2006). Slave-holding plantation owners came to depend on the ecological cropping knowledges of those they had enslaved (Carney 2001). Green, progressive, and "alternative" organic agriculture came to be a vanguard industry for labor exploitation and large-scale capitalist development (Guthman 2004). By beginning from often straightforward questions (i.e., what does participation do to management? Where does American rice come from? How did organic farming evolve?), but ending in a contradiction, such political ecologies force us to consider what forces skew, loop, and reverse expected causation to create surprising outcomes. By empirically rooting ironic observation in actually-existing socio-ecological contradictions, such political ecological texts help to identify places to positively untangle the causes of undesirable, unsustainable, and unjust socio-ecological outcomes.

Claims about the State of Nature and Claims about Claims about the State of Nature

Finally, political ecologies are characterized by a stubborn insistence on describing the transformation of the physical world as well as the complex systems of meaning and representation that make it difficult, if not impossible, to know the condition of the physical world. Both such claims are frequently found within the very same essay or book, moreover, presenting an important, if somewhat uncomfortable, juxtaposition of claims. The first kind of claim, common enough in environmental writing, is a realist one, which might describe the characteristics of an ecosystem, the quality of a water supply, or the density of a tree canopy. It is set into motion typically by further assessing changes in conditions, as in the degradation or recovery of resources, the expansion or contraction of forest cover, or the increasing or decreasing prevalence of a species of concern. Core political ecology stories are ones that describe environmental change and explain the conditions that effect that change or are precipitated by it.

The latter kind of claim, conversely, is a constructivist one, which concerns the conditions in which ideas about the environment are formed, about the discursive resources that make certain assumptions about the environment more possible or likely, and about the way political power, social habits, and cultural norms may set human beliefs about the way the world both is, and ought to be.

The epistemological issues raised by this uncomfortable juxtaposition are several (see Chapter 6), but it is immediately clear that the second set of claims might be imagined to undercut the former ones and vice versa. This is a longstanding concern in the field of "science studies" (see Hess 1997), but one that appears to present a contradiction for political ecology. A story that stresses the conditional nature of environmental knowledge on first appraisal seems to fit poorly, after all, with one that stresses empirical evidence for significant environmental change.

And yet some of the most notable and compelling political ecologies work at both ends simultaneously. Canonical work by James Fairhead and Melissa Leach (1995) carefully documents the institutional, colonial, and governmental systems that directed scientific

observers to accept the assumption that forests in many parts of West Africa were declining. Further efforts showed the way successive generations of scholars inherited their baseline estimates of forest cover from yet other scholars who borrowed theirs from yet earlier accounts, leading back to flawed, faulty, or entirely unfounded estimates located deep in the colonial past (Fairhead and Leach 1998, see chapter 6). These accounts, based on rigorous exploration of historical documents, stress the instability and socially conditioned nature of environmental claims. This sort of analysis, rooted in the genealogical approaches to knowledge demonstrated by Michel Foucault (see Chapter 3), point to the fact that certain forms of knowledge, however egregiously problematic, thrive owing to their congruence with the political and institutional forms of organization and practice in which they were established and used.

The Power of Political Ecology: The Hatchet and the Seed

In sum, political ecologies are difficult and troubling sorts of texts, which undercut knowledge while reinforcing it, stress contradictions and paradoxes, and direct attention to relationships, transformation, and instability. Such stories are political precisely because they disrupt normal expectations, undermine inherited assumptions, and do not deny the inevitable political roots of all environmental knowledge. Such narratives form the textual fabric of a diverse community of skeptical researcher practitioners, united in the reading, writing, telling, filming, and conveying of stories we know as political ecology.

For practitioners, curious readers, advanced theorists, or those deeply and directly involved in high-stakes environmental struggles, the assertion that political ecology is a kind of text may at first seem deflating. Merely a text? Just a narrative style? So all of this sound and fury is only paper thin? To this, the answer must consist of an enthusiastic reminder that all of us think in texts, that text is revolutionary, and that radical changes in the terms of a debate, in the images associated with an idea, or in the making intuitive the counter-intuitive, are all the work of text.

But can political ecology be used in action, then? Absolutely. Why not? And more to the point, just because someone is dedicated to writing, filming, blogging, or singing a political ecology (of fuelwood degradation in Mali or nuclear waste disposal in the United States or white fly infestations in French hothouse tomatoes or locust outbreaks in India or wind power installations in China . . .) does not mean that they could not also do a number of other things (collect signatures, organize farmers, block traffic, start a community garden, test water quality, file lawsuits, boycott, teach, live).

Political ecologies, insofar as they are narratives that confound, complicate, and challenge social and environmental practice, are not always perfectly suited on every occasion for making these social, environmental, or political tasks easier. Rather, the power of political ecology, it is hoped by those who produce it, is conversely that it would be difficult to do any of these things the same way after having been immersed in such texts. As such, political ecology is a tradition that aggressively dismantles other accounts (wielding its intellectual hatchet), while making space for, and nurturing, other possibilities (planting intellectual and practical seeds).

The hatchet: Political ecology as critique

As critique, political ecology seeks to expose flaws in dominant approaches to the environment favored by corporate, state, and international authorities, working to demonstrate the undesirable impacts of policies and market conditions, especially from the point of view of local people, marginal groups, and vulnerable populations. It works to "denaturalize" certain social and environmental conditions, showing them to be the contingent outcomes of power, and not inevitable. As critical historiography, deconstruction, and myth-busting research, political ecology is a hatchet, cutting and pruning away the stories, methods, and policies that create pernicious social and environmental outcomes.

These critical efforts have more recently been extended to encompass research that not only demonstrates the way many dominant accounts are wrong, but shows, moreover, how those accounts themselves are instrumental in political and ecological change. To take but one example, "The Pristine Myth" of the Americas, a story which holds that the landscapes of the New World were in an Edenic and "natural" order unaffected by human activity prior to European arrival, has been placed under political ecological scrutiny. As geographer William Denevan has demonstrated (1992, 2001), summarizing 30 years of his own archaeological, field, and historical research, pre-Columbian environments were heavily influenced by native peoples' cutting, planting, terracing, and building. Political ecology suggests, moreover, that the myth of a "pristine" environment was itself important in the colonial process of marginalizing and disenfranchising native peoples. By writing indigenous people out of the landscape, the business of control was easier to carry out (Sluyter 1999). Political ecology takes a hatchet to such stories.

The seed: Political ecology as equity and sustainability research

This research has another side, which seeks to document the way individuals cope with change, households organize for survival, and groups unite for collective action. In this sense, much political ecology involves the detailed analysis of agrarian practices, social systems for resource distribution, and techniques for cataloging and harvesting non-human nature. Often this means careful attention to "traditional" ways things were done historically, documenting local knowledges and understandings of ecological process.

As Peet and Watts insist, however, this "concern is not simply a salvage operation – recovering disappearing knowledges and management practices – but rather a better understanding both of the regulatory systems in which they inhere . . . and the conditions under which knowledges and practices become part of alternative development strategies" (Peet and Watts 1996a, p. 11). In other words, political ecology seeks not simply to be retrospective or reactive, but to be progressive. A political ecological analysis of the decline of traditional water-harvesting techniques under the increasing influence of state irrigation authorities, for example, is not simply a mournful or romantic call for a lost technological past. By documenting not only the changing economic and bureaucratic pressures under which water management is currently being transformed, but also detailing the way it is managed traditionally and describing techniques of local adaptation and resistance, political ecological research helps to plant the seeds for reclaiming and asserting alternative ways

of managing water (Rosin 1993). The goal of any such effort is preserving and developing specific, manageable, and appropriate ways to make a living. Thus, much political ecology is about evaluating and explaining environmental change as well as explaining and determining the impact of ideas about environmental change. As a result, the field faces several challenges in ecology, in social construction, and in explanation itself.

Part II

Conceptual and Methodological Challenges

In which efforts to measure the changes in the environment are described, along with the difficulties and pitfalls that accompany such research, and wherein the "construction" of nature is discussed, as well as competing schools of explanation. Methodological caution and rigor are urged in measuring both environmental changes and imaginaries, and the merits and limits of alternative approaches are used to point towards areas for improved research.

Chapter 5

Challenges in Ecology

- The Focus on Human Impact
- Defining and Measuring Degradation
- Limits of Land Degradation: Variability, Disturbance, and Recovery
- Methodological Imperatives in Political Analysis of Environmental Destruction

A walk into a German forest is an experience that for me raises contradictory feelings. Approaching down a dirt track into the thickness of the Schorfheide Forest (Figure 5.1) from the open farmed glacial landscape of the northern lowlands of Eberswalde, Brandenburg, the darkness is at first impressive. These trees are thick on the land, the sun blocked by the towering boughs up above. It is dark, quiet, and feels far removed from the orderly arrangements of the nearby poppy fields, canals, and autobahn. My first feeling is one of the weight of the growth, the darkness of primal nature. This is Germany's largest contiguous forest tract and the sense that I am "in the woods" is undeniable. This is a space to be preserved, protected, and fostered, if for no other reason than it provides respite from the expanding commercial landscapes of the world beyond. The forest, as it turns out, is a biosphere reserve, recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as a site worthy of global attention and preservation.

Coming to a halt in the shade and gazing into the thickness, however, I am immediately struck by the incredible creepy homogeneity of the scene. These trees are all of the same age, all equally thick and tall. They are almost all pine (*Pinus sylvestris*) with occasional specimens of European beech (*Fagus sylvatica*). Absent from the highly acidified forest floor is any significant undergrowth or any species other than the quick-growing, harvestable

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

Figure 5.1 Plantation forests tend to be even aged and evenly spaced; their ecology matches the economic and social imaginaries of foresters and planners, but only to a degree. Photo © Kwest / Shutterstock.

trees. Few gaps are open in the canopy and little disturbance or secondary succession is evident. There are no signs of natural predators, or faunal diversity of any sort. I am, in that instant, overwhelmed by the strange feeling that this forest represents a degraded scar, a deprived and empty landscape, where commercial and state interests have halted chaotic natural processes in their tracks. The area has been used as hunting grounds from the time of Friedrich Wilhelm IV and even the former East German leader, Erich Honecker, and his comrades bagged game in these woods. The forest in that moment conveys the feeling of a sterile and overworked cornfield, laid bare by the ravages of a rather narrow set of political and economic demands.

On walking a few paces off the dirt track into the woods, however, a third discovery is inevitable: the tremendous order that such an effort in forest farming entails. The cathedral-like architecture of the place is remarkable, with pillars of trees arranged in perfect rows. The sense of control, foresight, and care is carved into the orderly lanes of trees arranged with systematic breaks. This forest is actually ground zero for the development of modern commercial forestry techniques, and as early as the 1830s standardized techniques for growth and harvest were being implemented on this landscape, purging undesired species and enforcing even-age planting and harvesting. This is no forest at all, but the dream of an engineer, a social construction of what a forest *should* look like, made real by political planning on an extremely large scale.

And yet, walking further off the track into the trees, signs of uncontrollable chaos emerge from the neat patterns of the planner's mind. Openings in the woods do indeed appear, windfall gaps and depressions from ancient glacial movements. These are filled with a range of unintended species, which, as they push their way up to the light, begin to crowd out the even rows of commercial trees. Animal species *are* here, many of them indigenous to the region, many more migrants, and a great many feral descendants of human introductions and experiments gone wrong. Even the raccoons that run wild in the area are descendants of some that escaped from a fur farm in the 1940s – an uncontrollable natural experiment exerting its own non-human will.

This raises puzzling and immediate questions in my mind about what is natural and what is not, what should be preserved and what should not, what is degraded and what is not, what can be controlled and what cannot. Is the Schorfheide Forest a natural wilderness, to be preserved from the depredations of development that are beginning to sweep the now unified eastern part of Germany? Is it a degraded scar, which demands restoration and disconnection from the institutional mechanisms of utilitarian forestry? Is it a social construction, revealing the human imagination of nature enacted onto the land? Is it a chaotic tableau, in which non-human species produce unintended and normatively undecipherable outcomes, despite humanity's best efforts at control? The answer, of course, is that it is all of these.

But in investigating political ecological process and seeking explanations of environmental and social change, this answer ("well . . . it's complicated") is insufficient. If an argument is to be made that the region is a victim of utilitarian extraction that has caused environmental decline and loss of species, which to be sure it has, then degradation – *destruction* of nature – must be defined and methods of measurement must be devised. Has there been a decline in natural productivity, biodiversity, or usefulness? If one is to argue that the forest is the product of a specific normative imaginary (a vision of what a forest ought to look like), then the history of describing, categorizing, and organizing its environmental systems – *construction* of nature – must be demonstrated. Who controls the language and normative assumptions of how a forest ought to look? The burden of explanation and investigation changes, depending on the approach to environment and ecology that one selects.

In the great diversity of research, political ecological questions and answers have depended predominantly on measuring or revealing one or both of two processes: the *destruction* and *construction* of environmental systems or landscapes. In this chapter, I will briefly outline the ways in which political ecologists have evaluated "destruction" of nature, human impact on the environment, and land degradation. The following chapter assesses the ways in which the ecology is "constructed" by humanity through systems and categories of knowledge. These two views have been extremely useful and are prerequisite to any understanding of human–environment interaction.

There are, however, serious tensions between wanting to claim that normatively undesirable environmental outcomes are "unnatural" (e.g., land degradation is an avoidable and bad thing) while wanting to show that the way we view what is "natural" is predetermined in the first place by social and cultural concepts/filters/structures. I will later suggest, therefore (in Chapter 11), that these two approaches be supplanted by a synthetic notion of environmental "production," which takes seriously the normative implications of land degradation, recognizes the socially constructed character of the conceptual apparatus for understanding nature, and is sensitive to the natural system components that participate in socio-environmental change.

The Focus on Human Impact

Recognizing and understanding the destruction of natural systems is an integral part of political ecology. When starvation occurs in Nigeria because of soil mining resulting from economic crisis, for example (Chapter 4), the political ecological claim is that the

productivity of the land has decreased from a previous state, and has been altered by human exploitation. The impact of global seed oil markets cannot be said to have affected local ecology if the soil quality has not changed, if its lost productivity arose strictly from non-human causes, or if pre-existing practices would have resulted in the same outcome. Implied in this question of destruction is also the assumption that changes in ecology are ones from which the system might not be expected to recover for a long period of time, or indeed ever.

In this sense, there is a great range of "destructions" that have seized the attention of political ecologists. Soil erosion, deforestation, desertification, biodiversity loss, water pollution, as well as atmospheric and climate changes are all common targets for research attention. These environmental crises are selected in part because they are of pressing concern to producers around the world who, in making a living off the land, encounter them daily and are placed at disproportionate risk. But perhaps more importantly, these topics are of central interest because they are important to *apolitical* ecologists, whose dominant narrative – that people destroy ecosystems out of ignorance, selfishness, and overpopulation – is the central target of political ecology's critique.

By responding to the environmental cries of Malthusians and technocrats, political ecologists have inherited their project: identifying and explaining forms of regional environmental destruction or degradation. In so doing, they have taken on a difficult task. There is no doubt that environmental crises are ongoing. Globally, forests have decreased by nearly 20 percent since 1700 (Richards 1990); soil degradation is evident in every known type of environment (Rozanov et al. 1990); people infected with water-borne diseases number in the billions (Schwarz et al. 1990). Even so, many regional changes occur in environments already experiencing climatic and geomorphologic transformation, like long-term aridification or mountain growth. Such trends may drive land cover change and soil erosion quite independently from farmer practice or logging. So too, some human impacts serve to increase rather than decrease landscape productivity or diversity. Thus environmental destruction, a crucial concept for political ecology, presents serious analytical challenges.

The Sahelian crisis provides an instructive example. Here is a case where a disaster of historic proportions involved the decline of environmental systems on a regional scale and social and political upheaval for countless millions of people. Popular accounts put the blame on nature and population, holding that scarcity of resources, spread too thinly during an inevitable crisis, led to mass starvation. Political ecological accounts, on the other hand, asserted not only that socio-economic and institutional changes had made poor communities and households more vulnerable to scarcity (holding less land and with fewer redistributive moral networks) but further that political economic change had made ecological systems more vulnerable to degradation. The progressive pressures placed by marginal communities on the land were environmentally destructive, causing declines that were difficult, if not impossible, to reverse in the middle term.

But this destruction occurred in a highly variable environment, itself subject to serious and frequent drought. What if soil loss would have happened anyway? How are human influences determined amidst uncertainty and variability?

Defining and Measuring Degradation

In as straightforward a definition as is available, Johnson and Lewis define land degradation as "the substantial decrease in either or both of an area's biological productivity or usefulness due to human interference" (Johnson and Lewis 1995, p. 2). This might include reduced catches from fisheries as a result of increased effluents from on-shore activities like farming and industry. It might include reduced production of crops per unit of land and labor as a result of decreased soil potential arising from over-cropping and reduced fallow. And it might include reduced grassy animal forage because of the plantation of unpalatable plantation species on a pasture.

Note that in many cases, a system's "degradation" may be a loss of one capacity in exchange for another. Blaikie and Brookfield point out:

> As a perceptual term, however, [land degradation] is open to multiple interpretations. To a hunter or herder, the replacement of forest by savanna with a greater capacity to carry ruminants would not be considered degradation. Nor would forest replacement by agricultural land be seen as degradation by a colonizing farmer . . . Since degradation is a perceptual term, it must be expected that there will be a number of definitions in any situation. (Blaikie and Brookfield 1987, p. 4)

In that sense, the selection of criteria is a specifically political choice, conditioned by the purpose of investigation and the categories of concern of the researcher. The range of possibilities is endless, but some categories of importance to political ecologists include land degradation as:

- loss of natural productivity;
- loss of biodiversity;
- loss of usefulness;
- creating or shifting risk ecology.

Each of these is measured differently and each can be evaluated in multiple ways. The pitfalls in such measures are several, however, and the degree to which ultimate and measurable "land degradation," free from political assumptions, can be established is debatable.

Loss of natural productivity

The productive potential of a fishery, a field, or a pasture is determined by a number of factors. In the case of terrestrial environments, direct loss of soil through erosion has historically been equated with loss of productivity, though this is not necessarily an effective proxy; highly eroded landscapes may remain productive, while low productivity can occur in areas where there has not been significant soil loss. Degraded environments are better understood as those showing decreasing quantities of important soil nutrients, increasing levels of salinity, and loss of surface biomass (Johnson and Lewis 1995). These conditions

might be measured directly, through soil sampling and surface survey, or indirectly through measures of downstream siltation, remote sensing using air photos, or analysis of satellite imagery (Kumar et al. 1997).

To demonstrate a loss of productivity, however, especially as induced by human agency, requires more than a measure of current conditions. It further requires either a measure of conditions over time in one place, or a comparative spatial assessment under varying uses. In either case it is necessary to determine the underlying and baseline conditions (bedrock, rainfall, slope, etc.). For changing soil conditions, there is a wealth of available techniques, ranging from direct observation and local histories using standardized classification schemes (Ovuka 2000) to indirect examination of downstream siltation using stratigraphy and chemical analysis (Zhang et al. 1997).

Loss of natural productivity can also be measured through changing conditions in biotic land cover away from "ecological climax" conditions deemed to be the "natural" vegetative state. This approach proceeds from the traditionally accepted ecological notion that, under given climatic conditions (prevailing precipitation and temperature within a range of inter- and intra-annual variation), if left alone, land cover vegetation achieves a relatively stable and predictable state through the process of succession. Sandy semi-arid regions of India, for example, which are subject to grazing and cutting, tend over time to be recolonized by low-lying herbaceous species, later by fast-growing shrubs, and eventually by slow-growing "climax" *Acacia* species. Land degradation, it is theorized, is succession in reverse, where climax species are removed, leaving only faster-growing cover, closer to the ground (Kumar and Bhandari 1993).

Following this logic, evidence of the existence and extent of degradation can be gleaned by examining current biotic structure on the ground. Measures of degradation using this method can employ direct floral surveys at sampled locations or work through remote sensing platforms to determine general patterns of vegetation cover. These are commonly supplemented with measures of overall surface biomass, again either through direct measuring of sample areas, or through the use of satellite imagery to create land cover images and biomass density maps, using the Normalized Difference Vegetation Index (NDVI) – a ratio of spectral reflectance denoting biotic production. These surveys and images can be used to quantitatively compare land cover over time, suggesting trends in the productive potential of the landscape (Eastman et al. 1991). This can be further supplemented with oral history, written records, and other supporting documentation.

Such approaches commonly reveal the complexity of trends in land degradation and recovery. For example, Turner et al. (2001) have measured land cover change in southern Yucatán, an area where protection of forest for ecotourism development is sometimes contradicted by the construction of infrastructure designed to support that tourism. Pressures on the forest, like road development and farming, are tied to increased integration with global tourism and commodity markets. But has that development resulted in overall degradation and decline of native forest? Here, evidence of land cover change is obtained through remote sensing and local history to present a complex picture. While forest cover is shown to have declined from 1969 to 1997 by around 9 percent and agricultural land nearly to have doubled, the coverage of secondary growth – areas in regrowth towards mature forest – expanded almost eightfold (Table 5.1). This suggests that human distur-

Table 5.1 Land cover changes (in square kilometers) in the southern Yucatan peninsular region.

Land cover	*1969*	*1987*	*1997*
Forest	11,042	10,356	10,068
Secondary growth	111	634	845
Agriculture	228	391	468

Source: Turner *et al.* (2001, p. 364).

bance of forest has increased over the past three decades, with areas under "degraded" or secondary growth expanding. Even so, this in no way necessarily represents a permanent trend, since forest is returning. More details are required – what species are in decline and what is the rate of forest recovery in secondary growth? – before a comprehensive picture of environmental change is clear.

Loss of biodiversity

As an imperative in global conservation, species diversity is of increasing concern. For resource-dependent people also, the diversity of the landscape may be of crucial importance, since the range of available species on which people depend can be far more important than the soil structure or overall biomass of an area. Biodiversity loss also provides a window into the potential long-term effects of human impact. Biodiverse and heterogeneous systems are complex and can potentially withstand and recover from intense human and environmental shocks. A decline of diversity may be the leading edge of serious and sustained declines in later productivity.

Measuring biodiversity on the ground is a difficult and time-consuming exercise. It requires careful sampling of the landscape to establish a representative set of plots in which to work. Some techniques require researchers to scour hundreds of 20-meter plots over several hectares (Dallmeier 1992), while others demand the survey of thin swaths of land along enormous transects (Gentry 1986). In either case, work must carefully document the number and richness of species, with specific attention to important indicator species that are most vulnerable to disturbance. In a singularly heroic example, the Idaho National Engineering and Environmental Laboratory created a reserve to explore species cover, density, and frequency over time. Examining 79 permanent plots over 45 years, they were able to determine relationships of disturbance, recovery, invasion, and diversity (Anderson and Inouye 2001).

Little of this sort of long-term data exists for political ecological analysis, precisely because its research questions are directed at *in situ* (rather than experimental) socio-environmental conditions. But sustained and field-based biodiversity assessment remains an important part of political ecology, especially when conducted in collaboration with indigenous communities. Rocheleau's research in the Dominican Republic, for example, has revealed diversity change resulting from economic and institutional change in remarkable detail. There, the introduction of a fast-growing cash timber species (*Acacia mangium*), when linked to economic development initiatives, was demonstrated to have transformed

biotic assemblages not only in the forest, but in producers' fields, pastures, and gardens (Rocheleau et al. 2001).

Loss of usefulness

Assessing whether or not an environment is more or less useful as a result of human action is in many ways the most direct, practical, explicit, and politically honest approach to measuring environmental destruction. When a pasture cannot be used for its traditional purpose of grazing, a field for growing crops, and a forest for providing socially and economically important tree species, some kind of important change has occurred.

Measurement of usefulness is, however, not altogether straightforward. Is land more useful when it is providing the highest return or providing the greatest collective benefit to a community? Is it achieving highest current return or lowering risk of future disaster? Is it measured in financial return or by some other criteria?

Determination of an area's "appropriate" use is also explicitly political. As noted above, turning forest into pasture or vice versa may be seen as degradation or improvement depending on the community and its resource use priorities. Despite this, or perhaps because of it, the "use" approach is perhaps the most pervasive one in formal management policy. The Clean Water Act in the United States, as a leading example, requires biannual assessment of American waterways to determine whether or not they are meeting designated use criteria (fishable, swimmable, etc.), thereby codifying explicit social goals into environmental management (Adler et al. 1993).

Methodologically, assessment of changing "usefulness" is also perhaps the most viable approach, since even where explicit and detailed soil histories, land cover descriptions, and diversity profiles are unavailable for past landscapes, land uses are commonly recorded. Oral and written histories, photographs, and management records can all provide some kind of historical picture of the changing useful capacity of environments. More standardized data comes in the form of crop yields, stocking rates, and economic value. These kinds of data can be deceptive, insofar as they vary in response to a range of forces beyond ecological conditions, but they do provide a starting place for assessing environmental change.

The anthropocentrism of the approach is worth noting also, however, since ecologically impoverished landscapes, lacking in diversity and providing few ecosystem services, may well be serving important uses, if only as sinks for waste or provision of a small range of resources. This notion, that an area might act as a "sacrifice zone" for other areas, is an important one in land degradation study because it indicates the complex issue of *creative destruction* – where some uses and functions are lost to benefit others (Johnson and Lewis 1995).

Socio-environmental destruction: Creating or shifting risk ecology

In many cases, the research question is not whether land use or management has altered productivity, diversity, or usefulness, but instead whether it has led to an increasing vulnerability of an area to destruction (fire, erosion, mass slumping) or created new risks or hazards for local residents. This is of particular interest in political ecology if the level or location of risk is shifted onto vulnerable or disempowered populations.

Box 5.1 Ecology Matters in Rocheleau's Dominican Republic

Any paper that begins by stating that "forests . . . are inscribed with social relations" suggests a research effort into discourses, gender relations, struggles between states and localities, popular organization, and non-governmental organizations. And to be sure, in two key publications (Rocheleau and Ross 1995; Rocheleau et al. 2001) Dianne Rocheleau and her several colleagues have assembled compelling accounts of conflicts over control and access to resources in the Dominican Republic. For example, they show that the farmers of the region have acquired (or recaptured) their land in a series of non-violent struggles using civil disobedience, and that now, allied into rural federations, they continue to struggle for land rights.

But what sets this work apart is its sensitivity to the way ecological conditions matter in explaining the way things turn out. The research shows that while the adoption and impact of *Acacia mangium* – a highly politicized, fast-growing plantation species introduced to provide commercial opportunities for poor smallholders – is affected by social factors, it is also determined by local landscape ecology. This means that while land tenure, gendered household division of labor, and affiliation with political/development organizations are important to understanding the rate and trajectory of tree cover change, so are things like existing plant biodiversity and species composition on farms. Rocheleau's investigation, which began as a short-term exploration and turned into a multi-year survey, details the way supposedly deforested areas, targeted for monocultural afforestation, are actually diverse and species-rich.

As Rocheleau explained in 2003, "Rather than being content with this profusion of social data, I found myself absolutely *needing to know* about the biodiversity of these patches and ribbons of forest in a regional landscape quilted by the Federation members into a distinctive socio-ecological formation, a regional agroforest rooted in community, a shared history of struggle and visions of a possible agrarian future."

These concerns reflect Rocheleau's long-term commitment to revealing the intertwining of human and non-human ecologies. Indeed, this work makes it difficult to distinguish the independent influence of one separate from the other. The simplification of ecology (e.g., biodiversity decline in house plots and fields) and the marginalization of women (e.g., increased labor burden and less control over resources) are tied together. Social movements and development strategies that influence one, influence the other. Rocheleau reminds us that just because forests are inscribed with social processes, they are not suddenly deprived of biophysical ones. Instead, this work asks us to consider how illusory the boundaries between these are.

Rocheleau regrets only that publishing this kind of integrated analysis is difficult, since scientific conservation biology and political ecology have too little understanding of or patience for one other and too rarely communicate. As she explains, "the two banks of the river are treated as separate continents."

If, for example, changing land prices drive poor people – with relatively little latitude of choice for house construction – into building houses on steep hillsides, immediate erosion may not be visible or evident, but the risk of catastrophe during an abnormal rain event is definitely increased (Smyth and Royle 2000). In agrarian environments this process might take the form of increased extraction from landscapes that, though they show little immediate vegetative cover change, may be dramatically affected by a major climate event like a drought.

In many settings, changes in the ecology of production may increase productivity but also create increased risks for cultivators in terms of health and welfare (Shiva 1991), as is the case where farmworker exposure to toxic chemicals is precipitated by changing agricultural practices (Pulido 1996). Much recent research in the area of environmental justice, which focuses largely on the location of man-made hazards like industrial plants or waste sites in the proximity of disempowered populations, draws attention to ecologies where risk is spatially "externalized" from one group to another (Szasz 1994; Cutter 1995; Miller et al. 1996; Been and Gupta 1997; Pastor et al. 2001). Thus, the production of risks and hazards in the environment represents a form of environmental destruction, where normal risk situations are made acute or shifted to specific people or groups through ecological change.

Limits of Land Degradation: Variability, Disturbance, and Recovery

Despite their common employment, these methods of degradation assessment have flaws and can be extremely misleading. Whether for measuring loss of productivity, diversity, or usefulness, new understandings of ecological dynamics raise questions about degradation as a meaningful approach to understanding human impact and disturbance.

What baseline? Non-human disturbance and variability of ecological systems

Many biotic systems are given to tremendous variation both within and between years, and most natural systems, even when isolated from human influence, are highly dynamic. This is especially true in the tropics, where important wet–dry cycles and frequent atmospheric anomalies mean years with luxuriant growth often interrupted by long cycles with little growth or development. Some vegetative cover trends are long-term responses to regional climate change and may in no way reflect human impacts over time.

Consider the Boundary Waters Canoe Area of Minnesota and Ontario. Currently an area of thick marshes and forest, the region shows tremendous variability in its long history since it was locked in tundra 10,000 years ago. As ecologist Daniel Botkin describes, lakebed pollen records suggest that following the last glaciation:

> the tundra was replaced by a forest of spruce, species that are now found in the boreal forests of the north, where they dominate many areas of Alaska and Ontario. About 9,200 years ago the spruce forest was replaced by a forest of jack pine and red pine, trees characteristic of

> warmer and drier areas. Paper birch and alder immigrated into this forest about 8,300 years ago; white pine arrived about 7,000 years ago, and then there was a return to spruce, jack pine, and white pine, suggesting a cooling of the climate. Thus, every thousand years a substantial change occurred in the vegetation of the forest, reflecting in part changes in the climate and the arrival of species that had been driven south during the ice age and were slowly returning. Which of these forests represented the natural state? (Botkin 1990, pp. 58–59)

In more recent history, the American tropics and subtropics underwent climatic changes during the pre-Columbian period, with drying and wetting trends over several thousand years. These were further punctuated by inter-annual variations and spikes, probably linked through teleconnections – pressure and temperature interconnections around the globe – to South Pacific warming and cooling cycles we today know as El Niño (Lentz 2000). In this context, it is particularly difficult to assign environmental impacts to humans, either indigenes or colonial invaders, in any simple way.

Even on shorter time scales, production, disturbance, and regrowth may cycle repeatedly, meaning that current conditions, even where there is no influence or impact from people, may reflect a transitional state. Fire cycles in the United States, for example, show 25–30-year recurrence in mixed conifer woodlands (Agee 1993). At any moment a regional forest may be in a successional state far from climax.

The implications for political ecology are evident. Current environmental conditions are merely a snapshot of complex change. Determining whether apparently low levels of current production represent a significant trend, or even a product of human action, requires careful attention to temporal variation and the establishment of meaningful baselines for comparison.

Landscapes are also ecologically and spatially heterogeneous, or "patchy." A relatively small area of forest may have spaces dominated by a few species, bare areas, and patches of diversity. Fisheries are marked by similar submarine diversity, with "sweet spots" and breeding areas interspersed throughout open ocean (St Martin 2001).

This tendency towards environmental heterogeneity also holds implications for political ecology. Claims of degradation or environmental change are inherently *scale-specific*. Pre-existing landscape diversity can be seriously decreased by large-scale transformations, as where highly varied Brazilian tropical forests have been converted to soybean production on a large scale. On the other hand, some disturbance may enhance ecological diversity depending on the scale of analysis. An area of forest may have experienced serious decline in floral biodiversity in the wake of human cutting or burning, for example, with new herbaceous species invading the once-shaded forest floor. The adjacent spot, however, may be covered with indigenous canopy. Together, the two spaces actually represent greater diversity than if the patch had not been burned. Some woodland areas, under heavy but spatially scattered human usage, have been found to be particularly species-rich (Blumler 1998).

What impact? Variable response to disturbance

Equally important, many biotic systems actually depend on disturbance, including fires, windstorms, or herbivory, for the maintenance of important species and the

development of what were historically considered pristine "climax" conditions. Forests of the North American Pacific Northwest, for example, are adapted to the periodic fires that sweep the region such that many important species depend on fire to clear out competition, allow cones to open, and seeds to germinate (Agee 1993). Considerable work has also shown that anthropogenic disturbances can mimic "natural" disturbances. This means that human disturbance, including cutting, grazing, and digging, may increase biotic productivity and maintain climax conditions. Reading non-climax conditions as evidence of human impact, therefore, is to make an oversimple assumption in many ecosystems.

As with biotic productivity, ecologists have long recognized that biodiversity is also enhanced by periodic, non-catastrophic disturbances (Huston 1979; Petraitis et al. 1989). As long as the interval between disturbances is less than or equal to the recovery time, transient communities, which typically comprise more species per area than non-disturbed communities, will dominate a given area. Evidence from semi-tropical and tropical woodlands and savannas, for example, has shown that even under conditions of continuous grazing and browsing by livestock, biodiversity can be maintained if not enhanced (Huston 1979; Turner 1998; Oba et al. 2000; Fuhlendorf and Engle 2001).

Differing types and intensities of disturbance may produce differing results. Where heavy grazing by cattle may have an impact on the succession of grasses and herbaceous species, for example, goat and sheep browsing might affect tree sapling development. Intensive plantation agriculture differs from long-fallow rainforest farming in its dampening of diversity. In industrial contexts, the conversion of wetland to agriculture is considerably different than its conversion to pavement, especially for faunal species making use of the ecosystem.

The capacity of differing systems to absorb human disturbance also varies greatly. Consider a rainforest in Nicaragua cleared with chainsaws and bulldozers for timber. The apparent visual effect is dramatic. The landscape of the forest is covered in fallen and dead tree and leaf litter. The sky, usually roofed by thick layers of canopy, is open to the punishing heat of the tropical sun. Even so, the overall diversity structure of the forest is little affected and, when it recovers, will retain the system components of its pre-disturbance state. Plantation of the region into bananas, however, may over time create significant structural changes in local diversity, such that, when it is abandoned, the forest will return, if it returns at all, to a considerably different state (Vandermeer and Perfecto 1995).

Different systems, therefore, may respond very differently to human impacts, depending on the ecosytem characteristics, including initial diversity, climate, annual and inter-annual variability, and the disturbance profile (Figure 5.2). Some systems are highly stable; their productivity (or diversity or whatever other indicator of destruction/degradation is of concern) may decline slowly with impact, while others may be sensitive to low levels of impact. Such sensitive or "fragile" systems often exist where productivity of the system is low, as in arid ecosystems and grasslands. Still other systems reflect more complex dynamics, and are able to maintain moderate levels of impact or extraction with little or no effect upon productivity until a threshold is passed, when such systems may change rapidly. Current ecological research suggests that many natural ecosystems behave in this fashion, not showing signs of degradation until rapid change is seen.

Box 5.2 Colonial Complexity in Crosby's *Ecological Imperialism*

Eight of the ten most common lawn and golf course grasses in the United States, which make up as much as a quarter of all urban land cover, are not indigenous to North America (Robbins and Sharp 2003a). Indeed, these most "American" of all landscapes are actually quite foreign. Tens of thousands of other plant species, which make up much of the daily landscape of Canada, Mexico, and the United States, marched into the environment long ago, along with their allies, human beings. That there is a relationship between this pattern of environmental change and the pattern of colonization and imperial control of the New World in the "age of exploration" is the central thesis of Alfred Crosby's landmark book, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Crosby 1986).

In this clearly written, compelling, and well-researched environmental history, Crosby argues that Europeans brought with them a set of *portmanteau* biota, including diseases, songbirds, housecats, weeds, cattle, and horses, which advanced in a mutually supporting phalanx across the "neo-Europes" of the Americas and Australia, displacing native species and supporting the coercive efforts of human occupation.

Most of this transformation and accompanying mass extinction occurred in the colonial era, Crosby explains, since previous efforts at invasion (in the Crusades and the conquests of Asia, for example) entered environments where existing patterns of disease, flora, and fauna were well enough integrated and networked to provide a solid defense. The neo-Europes were ecologically more vulnerable to invasion.

It might seem a "natural" jump to extend this explanation to account for human success in the New World and to argue, in other words, that Europeans came to dominate the world *because* their ecologies allowed it and indeed encouraged it. Such arguments have been made elsewhere (Diamond 1997). Crosby intends no such thing, however, and draws a rather subtler historical conclusion.

He argues that environments and people are mutually produced, leading to complex strengths and vulnerabilities of ecological systems. The simplification of New World ecologies, for example, which allowed the invasion of Old World species in places like the South American pampas grasslands, had been facilitated by the hunting and landscape modification (e.g., fire) of pre-colonial native people. Thus, "advanced" whites did not ecologically triumph over "inferior" indigenous human ecologies. Crosby's thesis, in this way, "places the Amerindians, Aborigenes, and Maori, on the one hand, and the European invaders, on the other, in a fresh and intellectually provocative relationship: not simply as adversaries, with the indigenes passive, the whites active, but as two waves of invaders of the same species, the first acting as shock troops, clearing the way for the second wave" (Crosby 1986, p. 280).

Such a theory, with cultural ecological evidence of native landscape influences growing (Doolittle 2000; Denevan 2001), is a refreshing step away from notions of European cultural and environmental superiority. As such, the book represents an elegant and ecologically solid example of political ecology.

Figure 5.2 System resilience in coppice recovery of savanna trees. This khejri (*Prosopis cineraria*) tree is harvested heavily during the dry season (left) but recovers after only the first rainfall (right).

The implications for researchers interested in political and economic influences on environmental change are several. First, such dynamics suggest that certain intensities of human uses, local peasant extraction or forest harvesting, for example, may have little immediate or sustained impact on an ecosystem, while increases in intensity of use or extraction, due to falling commodity prices or failed common property management rules, may have sudden and precipitous effects (Reynolds and Stafford Smith 2002).

It is also likely that different kinds of extraction/use on the same landscape follow different impact curves from one another. Heavy or sustained grazing in a forest may result in reduced productivity as animal numbers increase until it reaches a high-intensity final saturation point. The impact of tree-cutters on the same forest might be considerably different, however, as an increasing number of extractors have little overall impact on the forest until a "breaking point" is passed and forest reproduction is significantly reduced. Socio-economic changes may create demands for new resources from the same ecosystem or deliver new forms of waste. The change in type of impact may be more important than the change in intensity.

Significantly, a system can demonstrate tremendous variability but still remain highly resilient. Imagine a productive pastureland that experiences short-term acute heavy grazing by a passing herd of cattle. The biodiversity, productivity, and usefulness of the system might all decline precipitously. The landscape may recover quickly and fully, however, with

the arrival of the first rain, especially where ungerminated annual seeds and deep perennial rootstocks lie dormant below the surface.

The implication of this variability is crucial for political ecology. It suggests that systems can withstand and thrive under a range of human uses, especially those of moderate intensity, under which the ecosystem may have evolved and to which it may be adapted. This means that the traditional subsistence livelihoods of the world's poorest people, including smallholders, slash-and-burn agriculturists, and nomadic herders, may have no serious long-term negative impacts on ecosystem productivity. Rapid changes in such systems, on the other hand, including increases in energy throughputs, higher levels of extraction, or new species, may have serious and sudden deleterious results. Thus, while ecological research suggests caution in attributing and determining degradation, it can support the general political ecological principle that subsistence communities are not a threat to ecosystem sustainability until larger developments and socio-economic changes alter key elements in their use of the landscape.

Can we go back? Variable recovery from disturbance

The impact of a human disturbance, though it may lead to decreased productivity, diversity, or usefulness in the short term, may not represent a sustained, permanent, or seriously irreversible impact. Different systems may recover from disturbance in a range of ways. Some demonstrate temporary decreases in productivity, followed by speedy recoveries. Others remain low in productivity for long periods. Still others recover, but in an altogether new state, with a different mix of species, never returning to their former state. Experimental research reveals, for example, that relatively rapid recovery of ecosystems can follow the removal of disturbance pressure, but that dystrophic (highly leached and low-nutrient) soils tend to seriously retard recovery time (Harrison and Shackleton 1999); many systems are remarkably resilient, but rates of recovery are determined by complex edaphic conditions.

For political ecology, this serves as a cautionary lesson; not all environmental destruction is permanent. Even so, some ecosystems are extremely vulnerable to long-term transformation, and some of what determines the recovery of ecosystems inheres in the environmental conditions of soil, moisture, diversity, etc.

Many ecosystems, however, exhibit further characteristics that make their dynamics especially complex: modality and hysteresis (Lockwood and Lockwood 1993). Modality is the existence of multiple distinct states that a system can encompass. Hysteresis is a condition where processes of degradation are not reversible simply by eliminating disturbance, which may instead lead to new states.

A grassland, for example, may have a desirable "climax" condition, with rich and diverse coverage, dominated by perennial grass species, which is maintained under herbivory and which is relatively productive. The ecosystem may exhibit *modality*, however; it may have a second equilibrium state, where annual grasses dominate, with lower overall diversity and productivity. The grassland may further exhibit *hysteresis*, where the recovery from disturbance is not always reversible by simply stopping the disturbance event. Indeed, recovery from disturbance may lead to an altogether new state (Westoby et al. 1989). Under traditional management of such a grassland, where heavy grazing causes a decrease in

productivity, achieving a return to the original state is usually thought to only be a matter of removing the grazers from the land and waiting for the perennials to return. Since the system has multiple states, however, and the path back from a disturbance is often different than the path forwards, this may not be the case. After some rest, the pasture may not revert back to perennial grasses but may instead become dominated by other woody species and annual herbs. In this sense, some impacts may be considered "irreversible" within reasonable human time scales.

On the other hand, it also means that human activity can produce new landscapes through management, and intimate knowledge of ecosystem transition, the kind of knowledge that many local producers around the world have, has allowed ecosystem "engineering" for millennia. Re-engineering of these landscapes is possible, especially when social, political, and economic stressors drive changes in the type and intensity of use.

Consider the coastal grasslands of the Eastern Cape Province of South Africa, a crucial economic resource that provides grazing, building materials, and medicines, and is central to the lives of rural people throughout the region. The ecology of the region is, moreover, incredibly diverse; among others there are high-quality grazing lands dominated by *Themeda triandra*, unproductive grasslands dominated by *Aristida junciformis*, and valuable collection lands dominated by *Cymbopogon validus*. Researching the origins of these landscapes, Thembela Kepe and Ian Scoones (1999) consulted local producers and reconstructed the history of environmental change, both in terms of the biotic communities on the land as well as the institutions that produced them. Their work reveals that these varying ecologies were all products of transitions from other environmental states, encouraged or discouraged by locals through burning, grazing, and enriching or disturbing soils (Figure 5.3).

Aristida junciformis grassland, for example, may be transformed through seasonal burning and periodic rest into highly productive *Themeda triandra* pasturage or into

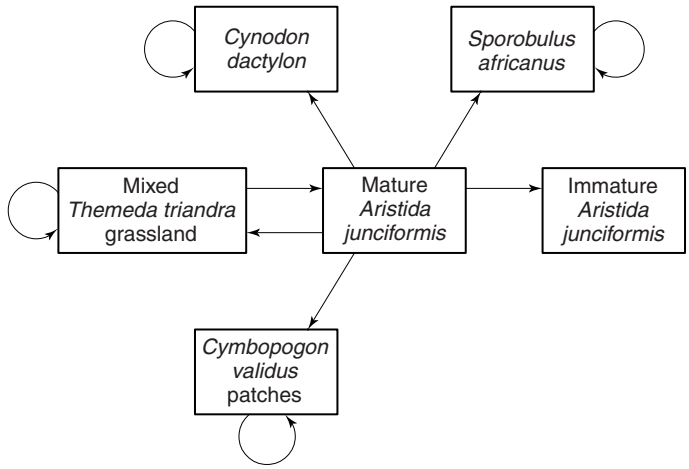


Figure 5.3 State and transition for ecosystems in the Mkambati area. *Source*: Kepe and Scoones (1999), Figure 5. Reprinted with permission of Springer.

Cynodon dactylon grasslands by soil enrichment. *Themeda* pasture, on the other hand, can return to a state of *Aristida* domination (lower productivity and usefulness) through heavy grazing, whereas heavy grazing sustains *Cynodon* grasses. The ecology of landscape change is complex but amenable to careful research.

As Kepe and Scoones go on to show, moreover, the transitions between various states are achieved by different groups, with different goals, all working to shape the grassland in different ways. The resulting diversity of outcomes does indeed include instances of difficult-to-reverse destruction, including transition to low-productivity, immature grassland dominated by the marginal species. But so too, many other transitions are possible, including to productive perennial pasture, literally produced by human action. A political ecology of human impact that takes seriously the complexity of degradation and recovery dynamics can, therefore, point not only to the political drivers of degradation, but also to the political possibilities of sustainable management.

Methodological Imperatives in Political Analysis of Environmental Destruction

Thus, to paraphrase Marx, people make landscapes, but not always those of their own choosing. Systems are driven to new states, some recover, others don't; some take new forms, which in turn enter new states, or return to earlier mixtures of elements. In examining environmental change we should perhaps think in terms of a political ecology of *transitions*, rather than unhealthy/healthy or broken/fixed ecosystems. It is probably better to think of a political ecology of *production*, rather than of destruction, therefore.

However, even while the measurement of degradation is a complex matter, as is the burden of its proof, the concept is essential to explicitly normative and political approaches to the environment. Fertile and productive land can be rendered nearly unusable. Diverse forests can be transformed into monocultural plains. Plant and animal species can be eliminated. Indeed, they are disappearing at rates unprecedented in human history. These changes are serious and sometimes extremely difficult to reverse. Research that engages crucial questions about the interaction of human and non-human processes can ill-afford to ignore such trends, despite the complexity of addressing and interpreting them. Such trends can be measured, moreover, at least in local and regional contexts, and the reward for careful and thoughtful research in this area is a more open door onto sustainability in the future.

In sum, research in regional political ecology, especially investigation into system changes that attribute environmental transformation to social and political forces, requires an acute attention to the ecological characteristics of the landscape in question. Researchers must:

- establish the overall type, rate, and direction of, possibly multiple, environmental changes;
- identify the drivers of that change, human and non-human;
- determine the environmental context in which such changes occur, including pre-existing variability and dynamics;

- explore the specific impacts of various practices in terms of their intended and unintended effects;
- examine the capacity, rate, and direction of routes of ecological recovery following changes or cessation of impacts.

In truth, political ecology has not always been entirely attentive to these methodological or conceptual problems. This reflects less on the approach than it does on the enormity of the undertaking. The political ecologist's goal, to show the influence of political economy on such already complex systems, is therefore absolutely realizable, but only with attention to ecological dynamics. It also means shifting a single-minded focus on the destruction or degradation of nature to a serious consideration of the way the environment is *produced*, by people and non-humans together.

From destruction to production

The efforts of traditional political ecology have been directed as reactions to apolitical ecologies. As such, research has often focused on demonstrating that the causes of environmental "problems" (defined by ministries, media, and other powerful agents) were not always what they appeared to be. These problems, for example soil erosion, were assumed to exist in an unproblematic way; only their explanation was challenged.

As both better environmental science and genealogical approaches were applied to these problems, however, two parallel discoveries were made. First, the environment turned out to be more complex and variable than was previously known. This made a simple focus on explaining land degradation difficult, since the biophysical phenomenon of degradation became harder to define, measure, and predict, at least in any simple way. At the same time, historical examinations of conservation science were beginning to suggest that the very apolitical notion of "degradation" is itself a highly relative and power-laden concept (Demeritt 1994).

The implications of this happy convergence of thinking are twofold. First, it demonstrates that while tensions between scientific ecology (measuring degradation) and constructivism (defining degradation) are perhaps inevitable, they need not restrict cooperative and mutual exploration of social/environmental phenomena (Chapter 6). "Why has the environment changed?" is a question inevitably intertwined with "How are the terms of change defined and by whom?"

Second, this increasing ambivalence towards prognostications of environmental degradation further suggests that a switch from a metaphor of environmental *destruction* to that of *production* would benefit observers of all kinds. This follows Neil Smith's (1996) essay on the question (entitled the *Production of Nature*), in which he suggests that the metaphor simultaneously expresses: "the inevitability and creativity of the social relationship with nature; the very real project of domination embodied in the capitalist mode of production; the differentiated relationship with nature according to gender, class, race, sexual preference; the implausibility of autonomous nature; and a strong response to the almost instinctive romanticism which pervades most treatments of nature" (Smith 1996, p. 49). Following this way of thinking, I would suggest simply that the environments around us, including and especially those composed of non-humans, are clearly produced. Forests are produced

as much as factories, polar ice sheets as much as reservoirs, Yellowstone's wilderness as much as a toxic dump. That human beings are by no means the only players in the production of these spaces makes them no less artificial (in the sense of "created"). Indeed, as political ecologists continually emphasize, the environment is not a malleable thing outside of human beings, or a tablet on which to write history, but instead a produced set of relationships that include people, who, more radically, are themselves produced. As we shall see, the case material in this volume seems to support such a proposition. Indeed, research in political ecology, whether by accident or by design, seems to meet the challenges laid down by Smith.

This does not mean a retreat, however, from normative environmental struggles against undesirable outcomes: lost species, ugly life spaces, toxic landscapes. Just because all environments are produced does not mean all environments are inevitable, desirable, just, or sustainable. It simply represents a renunciation that there is a social/environmental state to which we can and should ever *return*. This does not undermine environmental struggles; it simply suggests we approach them with a new language. Indeed, this conception helps us to symmetrically imagine human and non-human processes in the landscape, surrendering a position of "mastery" over the non-human world; this being, after all, the ultimate goal of mainstream environmentalism (a movement Smith unfairly chastises).

Returning, then, to the Schorfheide Forest, some specific, researchable questions *can* be asked about such a produced nature. Is this forest more or less diverse than the landscape that stood in its place three centuries before? Are areas within the forest that go unplanted or unburned more or less productive or diverse than those that do not? What policies have led to decreased or increased productivity and diversity? What political interests and power coalitions produced such policies, and what user communities were removed either from forest, decision-making, or both, in the process? What, in sum, is the relationship between power and environmental change? Rigorous and careful landscape assessment, perhaps using remote sensing, ground-level survey, and oral and written history, taking careful note of ongoing non-human influences and trajectories of change, can provide a political ecology of the forest.

But to have asked and answered these questions is not to have pursued the full range of processes and relationships at work. Bear in mind that the thick, ordered monoculture of the forest, despite its relative lack of diversity and ecosystem function, is one that many foresters, officials, and regional residents would historically have considered as natural, or at least as forest. This is by no means uncontroversial. Many environmentalists might argue that the monoculture farm forestry of the area is barely a forest, and by no means natural. So too, the definition of this kind of conservation landscape as forest reflects an intentional, if not conscious, social program that is an important part of scientific forestry history in Germany. The question one might ask, therefore, is: How did this specific notion of nature, this image of the forest, become the taken-for-granted one? How was the forest constructed and by whom?

Chapter 6

Challenges in Social Construction

- Why Bother to Argue that Nature (or Forests or Land Degradation . . .) is Constructed?
- "Barstool" Biologists and "Hysterical Housewives": The Peculiar Case of Local Environmental Knowledge
- Methodological Issues in Political Analysis of Environmental Construction
- From Production to Co-Production

On a day several months into the Indian dry season, a forester stands in a low alluvial plain, looking out at the stones in the streambed and to the hills beyond. Pointing at a thick area of thorny trees on the opposite bank, he explains to me that the forest is returning in this area after years of abuse and neglect. Deep-rooted hardy tree species are securing the embankments and restoring greenery to the desert. The species responsible for this remarkable turnaround in the region is largely imported through global initiatives in scientific forestry. The tree, *Prosopis juliflora*, he explains, is salt-tolerant, nitrogen fixing, drought-resistant, and very productive. Along with several other introduced species – *juliflora* was brought from the Mexican/US southwest a century ago – the tree has helped to triple forest productivity in the past 30 years.

For the forester, this increase in forest area represents not only an institutional victory, but also a personal triumph. Foresters in the crowded middle and lower ranks of the bureaucracy sometimes go decades without a promotion, watching projects develop with little or no success. To the degree that they are repaid for their effort, small bribes from

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

local people and the occasional small "feast" from a local landlord are more common than official reward. The achievement of significant forest cover – the official goal not only of the Indian state but also of World Bank donors – is an important success for the local bureaucracy, one that will minimally assure the flow of already limited funding and support. In listening to the forester's story, it seems that, far more abstractly, this achievement of forest cover is a deeply internal and aesthetic pleasure. Greenery is good.

But standing again in the same streambed a few months later with a local herder, a member of the *raika* caste, an extended kin network of herders and livestock breeders who have lived in the region for countless generations, I learn that this tree cover represented something else entirely. The old man, leaning on a tall gnarled staff and shaking his head at the cover of *juliflora* across the rocks, explained that the tree was a hazard and a blemish, that it had no value, and that it crowded out valuable grasses and forage. More to the point, he insisted that the trees represented no kind of forest at all; on the contrary, they had created *banjar*, degraded wasteland. This wasn't *junglat* (forest), this was simply *angrezi*, foreign *English* landscape.

Standing there amidst the mesquite, I experience exactly the same feeling of intriguing confusion that I do when walking in the Schorfheide Forest. There is simply no objective way to determine whether the trees at which I was gazing were forest or not. Forest, put simply, is not a *natural* phenomenon, object, or idea, it is a *social* one, forged by convention and context, and enforced by its very taken-for-grantedness. This becomes especially political when one considers that, depending on whether this bunch of trees is considered "forest" or "degradation," significant state and international resources will be invested in its protection or its eradication.

Such a realization, that an evidently natural object, idea, or process is, at bottom, an expression of the human imagination, suffused with political and cultural influences, is one that is fundamental to much explanation in political ecology. Examining historical and contemporary environmental discourse and environmental science, political ecologists commonly argue that the environment we take for granted is actually *constructed*.

Why Bother to Argue that Nature (or Forests or Land Degradation . . .) is Constructed?

This approach is by no means a novel one. In *The Critique of Pure Reason*, nineteenth-century philosopher Immanuel Kant proposes a metaphysics where philosophical knowledge comes *prior to* experience. Radically, he suggests that our ideas do not conform to the objects of the world around us but that, rather, objects are constituted by the world of our ideas (Kant 1882). In the century since its publication, a wide range of philosophers and historians of science and knowledge have pursued the question, with a recent explosion of claims to the constructedness of just about everything.

Michel Foucault (see Chapter 3) led the most recent generation of critical scholarship pursuing this line of argument. By doing intense historical study of many taken-for-granted ideas, including insanity and sickness, Foucault shows that many concepts that we currently assume to be universally true simply didn't exist in other times and places. He demonstrates, moreover, that the promulgation of these novel categories of reality has consistently been linked with the emergence of new authorities and institutions empowered to manage,

rule, care for, or otherwise control social life, including medical and penal systems made possible only by social invention of madmen and deviants. So systems of new knowledge necessitate new forms of social power and vice versa. Ideas are not powerful because they are true, Foucault insists, they are true because of power. This development marked a change in critical politics. Rather than simply pursue the goal of the 1970s bumper sticker, "Question Authority," Foucault and his followers pressed us to more radically "Question Reality," as the more recent bumper sticker invites.

The implications for environmental management are important because they direct our attention to the social origins of environmental processes and objects. Soil erosion, for example, is not a universal truth. Rather it is a social construction, invented in the historical moment when colonial land management authorities, state environmental bureaucracies, and other ecological elites were given the power to control other people's behaviors and property in the name of "soil conservation." Resistance against the imposition of such colonial controls, as was common in colonial Africa, was viewed by officials as environmental irrationalism by an ecologically destructive and ignorant native populace (Grove 1990). Soil erosion was a social construction that helped to secure colonial power.

This sort of investigation is extremely common in contemporary political ecology, but specification of the meaning of terms is often neglected. What do political ecologists really mean when they say something is "constructed"? Following philosopher Ian Hacking, this claim means that some kinds of environmental processes, concepts, ideas, or entities are not natural or inevitable, even if they appear that way, and the history of these phenomena can be traced, and their invention discovered, through analysis. Moreover, as normative researchers, political ecologists generally pursue this claim because they believe that these processes, concepts, ideas, or entities, in the current socio-political context, are doing pernicious work or helping to secure the power of an elite community. Moreover, the politics that govern the fate of natural systems are secured without resistance to the degree that this constructedness is hidden from view. Political ecologists suggest, therefore, that because this stuff (processes, concepts, ideas, or entities) is not inevitable and has history, it can be unmasked for what it is, reinvented, and changed for a better and more sustainable future. In any case, in political ecology, things are rarely what they appear.

Debates and motivations

The constructivist approach to the environment is politically and intellectually valuable, but it is not uncontroversial. To say that a phenomenon like soil erosion is socially constructed, for example, appears to deny the physical forces and processes that determine soil movement, which are usually the purview of soil scientists and not critical theorists.

Debate about constructivism in science revolves around several specific and somewhat irresolvable philosophical disagreements. It is impossible to fully review these here. Nevertheless, these are important for understanding why many political ecologists make constructivist claims. These boil down to a basic suspicion on the part of many political ecologists that the categories of reality described in much environmental science and state management are ultimately arbitrary and serve specific, often narrow, political interests. Constructivists argue that categories (indigenous, scientific, or otherwise) may adequately capture some commonalties in the pattern of reality but they are no more accurate than

any other possible classification. Any given classification clusters and excludes different phenomena, but does so in a no more accurate way than its alternative. "Scientific" expertise only lends more social and political weight or credibility to one arbitrary classification over another. As Foucault asks:

> when we establish a considered classification, when we say that a cat and a dog resemble each other less than two greyhounds do, even if both are tame or embalmed, even if both are frenzied, even if both have just broken the water pitcher, what is the ground on which we are able to establish the validity of this classification with complete certainty? On what "table," according to what grid of identities, similitudes, analogies, have we become accustomed to sort out so many different and similar things? (Foucault 1971, p. xix)

Consider the classification of a species of palm tree or fish. Are palms trees? While they are in some cultural and scientific lexicons, they are not in others (Ellen 1998). The identity of catfish and the inclusion and exclusion of Asian varieties from its classificatory domain have been a matter of US congressional testimony (Mansfield 2003).

Constructivists seek to highlight this contingency in their assessment of environmental science and planning. In so doing they suggest that current facts (or those asserted at any historical point) are not inevitable outcomes of empirical inquiry, that the natural world can be described in a range of categorical fashions beyond those that currently exist, and that this decade's scientific "truth" is apt to change with the political and social wind. Many hardcore "realists" adopt the opposite position. Most practitioners in political ecology dwell somewhere in between.

In application, this approach reveals much. Consider the case of West African deforestation. The universal account of forest conditions throughout all of Africa, and especially in West Africa, has long been that tree cover has been declining at an accelerating rate in the past few years. Official hard facts and statistics to build this case have been promulgated by the FAO, the World Resources Institute, and a range of other credible expert sources. The blame for all this tree cover loss, in most accounts, lies with poor, ignorant, and overpopulated local communities – the traditional targets of apolitical ecology (Fairhead and Leach 1998).

As James Fairhead and Melissa Leach suggest in their extensive exploration of data from colonial policy, contemporary development narratives, official statistics, oral histories, and air photography, the case for regional deforestation is indeed remarkably thin. When forestry officials look at the islands of forests around villages and imagine that they see remnants of what used to be larger forests, in fact they are seeing forests actually in expansion (Figure 6.1). This reforestation and afforestation occurs, moreover, specifically as a result of informal local land management by village producers, not despite them (Fairhead and Leach 1996). Some challenges have been raised to these conclusions and their generalizability across the region (Nyerges 2010), but the overall historical magnitude and power of orthodox claims of deforestation and their lock on official imagination is unquestionable, despite the longstanding absence of empirical support.

What does this suggest about the commonsense narratives that supported the opposite claims? From a simple realist perspective, they were "wrong"; bad science produces bad numbers. Political ecologists, however, in keeping with their constructivist urge, want to ask further questions. How did this conception of environmental change persist, and

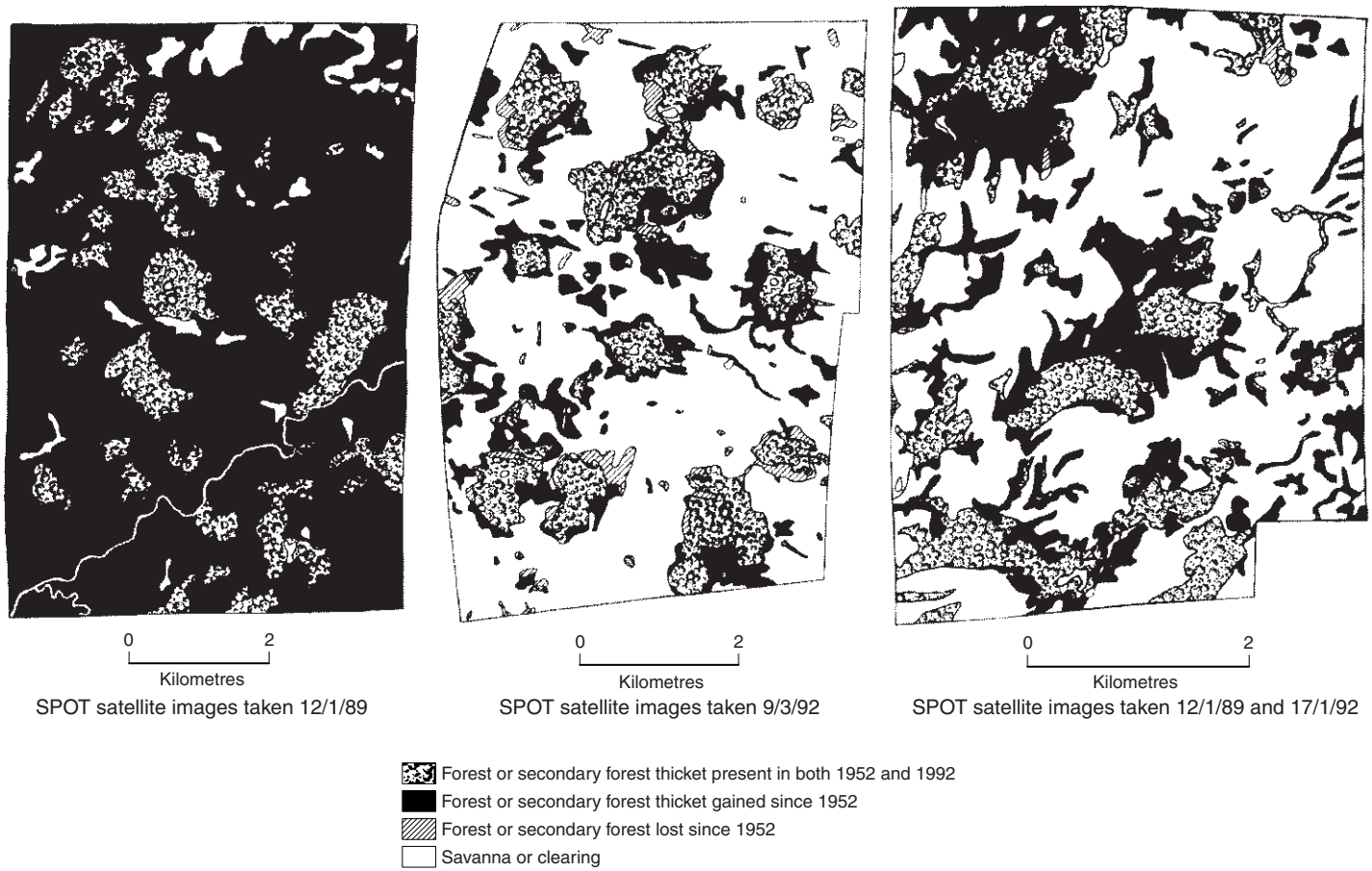


Figure 6.1 West African forest islands in expansion. Areas in black show forest and thicket regrowth between 1952 and 1992. *Source*: Fairhead and Leach (1996), Figure 2.2. Reprinted with permission of Cambridge University Press.

indeed survive into the present decade, in the face of its readily recognizable falsehood? What social and political benefit might it have had for conservation experts, government officials, and international agencies? Why and how did it get constructed the way it did? To whose benefit and whose loss? And even where some degradation is occurring, is it an irreversible disaster or rather a temporary change of ecological state? If the latter, what drives a narrative of crisis?

Thus, for many important questions in political ecology, the issue of environmental destruction is not the only relevant factor in determining what happens in the world. Control over resources is commonly not adjudicated by whether overgrazing, erosion, or biodiversity decline is actually occurring in the landscape, but rather by the *accounts* of environmental conditions and change that are held as true by decision-makers, local people, and competing interests. Moreover, since the scientific practice of determining land degradation occurs within a politicized environment, formal land degradation study does not provide by itself an absolute and neutral position from which to adjudicate disputes over environmental control and management.

Hard and soft constructivism

But to say that environmental facts like soil erosion in East Africa are constructed, rather than inevitable, inherent, or stable, is still to underspecify how political ecologists think. In fact, there is a range of possible "commitments" to the constructivist position in political ecology and by no means is there simple agreement among researchers as to which should prevail. The multiple forms of constructivism, drawing on their elucidation by Demeritt (1998) and Sismondo (1993), include what I call here "hard" or "radical" constructivism, and "soft" social object and social institutional constructivism. Each makes a different claim about how science interacts with other social practices and each provides a different mandate for how to treat expert claims.

"Radical" constructivism

The environment is arguably an invention of our imagination. What we know from experience of much of the world, moreover, is related to us through stories, conventions, and idea systems that we learn from other people. Processes and transitions are captured in conceptual terms that are fundamentally symbolic and abstract. This is as true for modern urban residents as it is for forest-dwelling shifting agriculturists, perhaps more so. Ideas about nature inevitably reflect our social world.

In its most radical form, "hard" constructivist epistemology takes this symbolic and ideational character of environmental knowledge extremely seriously, insisting that it is social context alone that conditions and determines our concepts for understanding the world, and so *creates the world*, at least effectively, in the process. This position suggests that things are true because they are held to be true by the socially powerful and influential, because they are true on television, and because they are true in our minds. This radical position is relativistic insofar as it holds that science, as one specific social method, cannot be used for adjudicating disputes between different claims about what is real, all of which are arbitrary. As philosopher of science Steve Woolgar insists, "nature and reality are the

by-products rather than the predeterminants of scientific activity" (Woolgar 1988, p. 89). Environmental conflicts are, therefore, struggles over ideas about nature, in which one group prevail not because they hold a better or more accurate account of a process – soil erosion, global warming, ozone depletion – but because they access and mobilize social power to create consensus on the truth.

For most political ecologists, this approach is somewhat too sharp a double-edged sword. While it allows a critical examination of how politically empowered environmental science has influenced and created the environments of the world around us, which is an important political ecological project, this approach disallows the reference to non-human actors and processes (like soil, trees, and climate) in explaining outcomes, making it unattractive to many researchers. While producing a valuable open space for accepting and appreciating alternative constructions of the environment held by other social communities, like forest dwellers, nomadic herders, and religious philosophers, this approach makes the symbolic systems of humans sovereign over all other reality, apparently disabling empirical investigation in traditional environmental science.

"Soft" constructivism

As a result, most political ecologists tacitly cling to a "softer" form of constructivism, which holds that our concepts of reality are real and have force in the world, but that they reflect incomplete, incorrect, biased, and false understandings of an empirical reality. In other words, the objective world is real and independent of our categorization but filtered through subjective conceptual systems and scientific methods that are socially conditioned. Within this approach to constructivism, there are differing emphases, which center attention either on people's misunderstanding of objective facts or on the social biases that enter into scientific exploration (Demeritt 1998).

In the first case, false and socially biased categories of the world, like "race," are important to understand and explore even while their reality – consistent racially differentiated genetic differences – does not objectively exist (Mitchell 2000). Since people hold them experientially, these concepts, or social constructions, make a difference in the world, often with pernicious effects, and therefore need to be understood. This "social object" approach to nature is attractive for political ecologists, who are able to assume that ecological science can reveal real environmental trends, like soil erosion, while social investigation can show how ignorant people can create false pictures of the world, like "desertification," through power-laden social processes. This approach is satisfactory for most researchers since they consider themselves scientists (or at least allied with scientists). They can insist that their way of seeing the problem, using the tools of science, helps to unmask biased and incorrect views of nature.

The confidence that such an approach places in scientific practice, however, is highly problematic. As radical constructivists persuasively point out, and as is revealed in histories of science, the very categories of scientific investigation are the same order of "social object" as the false commonsensical notions of the lay population.

The history of ecology is revealing in this respect. The dominant theories of the operation of natural systems have consistently reflected the prevailing social languages and assumptions of their times. Emerging during the high industrial age, the science of ecology came to depend heavily on metaphors and concepts from mechanical engineering, with

orderly, cyclical, processes structured around balance and symmetry. It also drew heavily, and somewhat contradictorily, upon philosophical Romanticism and the obsession with holism and interdependence, as is found in Romantic writers like Henry David Thoreau (Worster 1985a). These metaphors, on which science depends, became unsatisfactory in recent years, either because they reflected reality poorly or didn't fit changing social and cultural codes, and now are in a state of upheaval.

This should be in no way surprising, ecologist Daniel Botkin insists; previous views of nature, either as an organic whole or as a divinely ordered house, clearly reflected the social languages available to those who sought to explain nature's order (Botkin 1990). So too, the history of primatology, studied in careful detail by Donna Haraway, shows similar socially bounded evolution; the changing topics of explorations and experiments on chimpanzees and gorillas (maternal instinct, aggression, competition) reflect the social concerns of their historical moment, reading more like a history of contemporary American culture than orderly evolution of animal ethology (Haraway 1989). Our scientific ideas of nature inevitably reflect the social conditions and dominant metaphors in which they were formed. Nor is this necessarily bad. With changing metaphors come emerging ways of thinking about and reinventing the world. Even so, science is not free of "social objects."

An alternative soft constructivist approach, "social institutional constructivism," allows that such biases are a structural part of scientific practice, but that they nevertheless do not solely determine the conditions of the objective material world. Rather, these conceptual biases in science help to explain why science sometimes gets facts wrong. For social institutional constructivists, wrong ideas about nature are a product of the inevitable "socialness" of scientific communities. Over time, however, and through progressive experimentation and refutation, the "social" ideas are purged from our understanding of nature, moving towards a true understanding of the objects of the natural world. This is especially true, a social institutional constructivist might argue, as contemporary ecology and life sciences become more and more reflexive about the metaphors that underpin their analysis of objective systems (Sullivan 2000).

As an approach to political ecology, this is perhaps the most common and attractive epistemological compromise. Knowledges are all different, most researchers maintain, and different experiences, like those of biologists, herders, historians, farmers, and foresters, do indeed produce extremely different categorical structures for interpreting the objective realties of the natural world. Even so, these knowledges can be adjudicated by incorporating local ways of knowing into a flexible but rigorous scientific framework, which will distill myths from realties and produce better, more emancipatory knowledge (see especially Batterbury et al. 1997; Sullivan 2000). Acknowledging the socially situated character of science, the method can still be used to test contested claims (Forsyth 1996).

This approach is a pragmatic compromise but is troubling for many observers of science and politics. From a philosophical and historical point of view, it is somewhat unconvincing and asymmetrical; social institutional constructivism insists that only falsehoods, those situations where scientific facts are wrong, can be explained socially, whereas facts and true understandings of nature have no social component. Following science studies researcher Bruno Latour, under such an account: "Error, beliefs, could be explained socially, but truth remained self-explanatory. It was certainly possible to explain belief in flying saucers, but not the knowledge of black holes; we could analyze the illusions of parapsychologists, but

not the knowledge of psychologists; we could analyze Spencer's errors but not Darwin's certainties" (Latour 1993, p. 92).

For some political ecologists who are most definitely interested in how environmental concepts become powerful and true, this might be quite unsatisfactory. Such an approach only functions to explain things that we know to be "wrong," including the dominant account of nature, and only if we are already confident that whatever the facts are, they are wrong, and scientifically untrue. Generally this means that the claims of others ("enemies" like state soil conservationists, World Bank officers, or seed company representatives) can be disposed of as *constructions*, while the claims of other parties ("allies" like local herders or fishermen) are vindicated as holding environmental *knowledge*. Where even those knowledges fail the practical tests of science – whatever that is taken to mean – they too become constructions.

The ethical implications of such an approach are therefore equally problematic. Many political ecologists (though by no means all) come from Anglo-American universities and think tanks, travel on relatively large budgets, and exercise tremendous institutional authority. To arrive in other contexts, whether woodlands in Alabama or pastures in Mongolia, and consider it appropriate to provide adjudication between competing local claims should quite readily be construed as the height of colonial arrogance, rightfully denounced by postcolonial and subaltern critiques of academic research enterprises (see Chapter 3). Such an approach does little to dethrone the very structures of hegemonic power that political ecology seeks to challenge.

Constructivist claims in political ecology

Whatever type of constructivism is used, the central claims in the field follow several common threads. They seek to show how ideas and narratives about nature and society are mobilized in environmental struggle. The following represents a sample of such arguments with a few illustrative examples.

One common argument is that many things that are by no means environmentally natural are made to appear that way, and vice versa. In perhaps the most well-known and controversial case, environmental historian William Cronon, after examining the changing meaning of the concept of "wilderness" in Western history, concluded that the idea is historically contingent. Given the implication of humanity in producing "natural" environments all around them and the presence of natural processes in non-wilderness areas like the city, wilderness must be viewed as a social construction, and one that actually bars effective management and conservation, placing humans outside of nature as it does (Cronon 1995). The idea of wilderness, therefore, and the invocation of the pristine in wild nature is, by implication, less a reference to a real condition than it is an emotive image with broad political effects, including the promulgation of conservation reserves across the world, where traditional local residents are excluded.

Cronon's conclusions were far from uncontroversial, however, and many observers argued back vociferously that wilderness was "real," accusing Cronon of undermining progress in environmentalism. Opponents stressed the degree to which Cronon's own discourse – there is no wilderness – might be used by anti-environmental and economic development advocates to promote reckless exploitation.

Nevertheless, the political and ecological implications of this line of thinking have proven useful in progressive research around the world. Neumann (1998), for example, has carefully documented the way in which imported Anglo-American wilderness aesthetics – ideas of how wilderness *ought* to look – were imposed on African landscapes, inventing environments that had previously not existed. Labeling this aesthetic natural politically facilitated the removal and disempowerment of local people who had participated in creating the very "natural" landscapes of the tropical and subtropical savanna that colonial and postcolonial officials sought to preserve (see Chapter 8).

Similarly, though in an inverse fashion, political ecologists have sought to demonstrate the way in which environmental "problems" are constructed where none exist, or at least where the "problem" is a product of largely ecogenic processes. Crisis representations in particular, where environmental situations are framed as unprecedented and disastrous, have been politically useful for international agencies seeking funding (Jeanrenaud 2002), even while the long-term trajectory of such system changes may be highly variable and unstable (Behnke and Scoones 1993).

Political ecologists thus commonly examine the way claims about environmental systems become rooted in the political-economic systems that produce and sustain them. Such arguments diverge somewhat in tone. Some political ecology of forestry, for example, explores the deliberate and systematic way forest conditions are recorded by state agencies (Kummer 1992; Bryant 1996). The resulting official records of land cover change or degradation are commonly overstated or understated to divert attention away from a problem or, alternatively, to capture resources for solving a problem that may not exist. This approach, which emphasizes the conscious manipulation of environmental statistics and representation, might be called a *rhetorical* or *tactical* approach to construction.

A more definitively constructivist approach usually emphasizes the non-conscious way in which state managers, local people, and international agencies hold different normative ideas of the environment. Such an approach puts less emphasis on the intentional and strategic use of ideas and narratives about nature, and is more focused on how "naturalization" occurs, highlighting the social process whereby the constructedness of environmental concepts and practices is forgotten (Robbins 1998b).

"Barstool" Biologists and "Hysterical Housewives": The Peculiar Case of Local Environmental Knowledge

If expert accounts of nature are implicated in political struggles and represent constructed ways of viewing nature, it is logical to ask whether local, non-expert accounts are more accurate and practical. The resulting branch of constructivist investigations in political ecology explores "local" or "situated" knowledges. This tradition reveals the strength and efficacy of traditional ecological knowledge on multiple levels, including (following Berkes 1999):

- immediate empirical knowledge and taxonomies of plants, animals, and soils;
- practical knowledge of functional relationships and processes, like ecological succession;

- social knowledge of traditional rules, institutions, and systems of management;
- conceptual systems, worldviews, and more abstract beliefs that order experience and interpretation of the environment.

Whether or not traditional forms of environmental knowledge are exceptional, different, or superior to laboratory knowledge or that of experts more generally, however, is a matter of more general debate. Certainly the failures of many imposed environmental management solutions around the world, ranging from failed crop introductions to disastrous property regime changes, highlight the appropriateness of environmental knowledge developed locally (Brokensha et al. 1980).

Customary tenure relationships in Southeast Asia, for example, which recognize distinct land types for sedentary cropping, shifting cultivation, hunting, and gathering, have historically functioned extremely well until replaced by certain forms of imposed freeholding and land marketing with little acknowledgment or linkage to local environmental systems (Cleary and Eaton 1996). New England fishers similarly show a sensitive and well-developed spatial conception of fish biology – including explicitly mapped knowledges of breeding grounds, fish migrations, and other dynamic characteristics of the undersea environment – far superior to the aspatial conceptions of scientific bioeconomics most commonly used in official management (see Chapter 9) (St Martin 2001). Indeed, where local knowledge of biodiversity has been shown to be well developed, the most serious concern is not its efficacy, but rather whether local people will receive control over and due compensation for that knowledge when it is appropriated by plant growers and pharmaceutical companies (Brush and Stabinsky 1996).

Even so, sustained consideration suggests that highlighting distinctions between local and scientific knowledge obscures more than it reveals (Agrawal 1995). Other research has highlighted the differential value of local and scientific knowledge in varying contexts, as in rural Mexico where local knowledge has been shown to be somewhat less effective at evaluating the medium-term impact of human actions than scientific knowledge, even while being far more flexible and adaptive in its implementation (Klooster 2002). Similarly, research has highlighted the adaptability and persistence of local knowledge as it articulates with modern management systems, even in the face of globalizing pressures (Brodt 2001).

Attempts at integration of environmental management regimes and local knowledge systems are also therefore increasingly apparent, as in Senegal where local histories of ecological succession are incorporated into fire and plantation planning (Lykke 2000), or in Lebanon where local knowledge of mountainous terrain has been incorporated into land use mapping to develop otherwise unavailable data and facilitate democratic participation in planning (Zurayk et al. 2001). The construction of nature by officials and locals is sometimes well integrated and there has been a recent call for "hybrid research," which evaluates the usefulness of local knowledge based on a yardstick of practical efficacy (Batterbury et al. 1997).

More commonly, official and scientific managers continue to dismiss local environmental knowledge as politically interested, not objective, and poorly informed, even and especially in the first world. In the environs of northern Yellowstone, for example, state ecologists commonly dismiss the mental ecological models of hunters as "barstool biology." In Fernald, Ohio, the concerns of local women observing adverse environment hazards in

Box 6.1 Fikret Berkes's *Sacred Ecology* Between Two Worlds

Traditional systems of environmental knowledge are often awe-inspiring in their sophistication. Such knowledge can be something simple, like Cree Indian fishing practices, which set and alter fish net size to respond to changing harvest rates amongst differing age structures of fish populations. Or it may represent something considerably more complex, like the organization of the complex *ahupua'a* farm and fish water management systems of the Hawaiian islands, which historically ran from mountain slopes to the ocean, integrating water flow through farmlands, down through brackish fish ponds for harvesting marine foods, outwards through forest belts used to protect land from storm surge, and on towards the sea. The incredible effectiveness and wisdom of such traditional knowledge is a long-acknowledged fact of academic cultural ecology.

Fikret Berkes's *Sacred Ecology: Traditional Ecological Knowledge and Resource Management* represents more than simply an attempt to codify that local knowledge or to create a systematic account of how it works. Instead, Berkes's comparatively terse volume represents an effort to reform formal, reductive, and model-driven ecological science so that it embraces the sacred elements of traditional science. It is a manifesto aiming to reconcile reduction with integration, technology with wisdom, and skeptical inquiry with a feeling for the sacred.

The project was borne of Berkes's useful if sometimes awkward position between two worlds. Trained as a marine scientist and applied ecologist in the early 1970s, he turned down an opportunity early in his career to work in what he recently described as "reductive" formal marine ecology, choosing instead to work with an anthropologist colleague and spend his time fishing with the Cree Indians of James Bay, something he would continue to do for the rest of his long career. As a result, Berkes found himself at home collecting quantitative fish population data while simultaneously collecting folk histories of the sacredness of animals. The book reflects this vision, seeking to show not only that indigenous ecological knowledge "works" in the objective sense, but that it is spiritually whole, a unity of mind and nature.

The politics of this reconciliation between scientific and sacred ecology, however, are less well defined or discussed. The book provides a wealth of examples where modern scientific knowledge systems become tools for the erasure not only of local people's knowledge but also of their control over resources. But Berkes is less interested in discussing these political processes than in simply documenting and defending the knowledge of historically marginalized people. This reflects his own training and influences, far closer to marine science and cultural ecology than to the agrarian economy and Gramscian peasant studies of most political ecologists.

This decision makes the book more seed than hatchet, showing how local knowledge could help to heal modern ecology, without fully addressing and criticizing the political and epistemological barriers that make that outcome unlikely. Even so, Berkes remains one of the most experienced and articulate translators of traditional environmental wisdom, and brings a depth of experience sometimes lacking in political ecological explanation.

local water and air are characterized by scientists and planners as those of "hysterical housewives" (Seager 1996). As Fikret Berkes explains, these accounts, informed by local experience and opposed to the imposition of control over local resources, represent a "challenge to the dominant positivist-reductionist paradigm of Western science," largely for reasons that "have to do with power relations between Western experts and aboriginal experts" (Berkes 1999, p. 11).

So while local knowledge is increasingly on the agenda, the difference between formal and informal knowledge systems remains a source of conflict. And while constructivist accounts in political ecology can and must acknowledge the interested and contextual character of local knowledge, they must also explain the structured biases built into official knowledge systems, which are used by experts to secure employment, control resources, and justify extraction and enclosure (Robbins 2000). The knowledges of scientific practitioners and other "experts" are embedded in cultural norms, social relationships, and value-laden judgments, even and especially in large-scale scientific investigations like climate change research (Demeritt 2001).

The case of local environmental knowledge is, therefore, an important and pressing one for political ecologists, who must explain how certain accounts of environmental process became dominant and to what effect. Why and when do expert accounts of land degradation come to crowd out local accounts, such that some local environmental practices, like the use of fire in land management (Kull 2000) or the practice of swidden agriculture (Dove 1983), are singled out for restriction and control?

Eliciting environmental construction

To study the construction of nature is, however, as difficult as studying land degradation and amelioration, and presents equally complex methodological problems. Since knowledges and constructions span the scale from local taxonomies and narratives, to conceptual symbols and metaphors, empirically studying them is a challenge.

Talk and text: Construction in discourse

Constructions of the environment are communicated in myriad media, including advertisements, folk songs, photographs, scientific documents, daily conversations, diaries, and landscape paintings. Constructions are rarely fully embodied or realized in a single form, moreover, and are joined together from a collection of parts. Indeed, a construction of the environment (or more generally a "discourse") represents a combination of "narratives, concepts, ideologies, and signifying practices" (Barnes and Duncan 1992, p. 8), including the things people both say and do.

In this sense, constructions of the environment succumb to many modes of analysis, but by the same token require many methods to be revealed. Political ecologists commonly scour old forestry records, conduct open-ended interviews with producers and managers, read lengthy government reports, and even examine commercial advertising for clues about how, when, and why the environment is constructed through social and political processes.

In exploring divergent constructions, moreover, like those between herders and farmers, men and women, or the rich and poor, research typically seeks a broad and representative range of sources. Unfortunately, not all communities and individuals, especially those in differing positions of social and economic power, communicate their interpretations of nature in the same way. Such differences in modes of communication mean that the constructions bound up in those differing discourses are sometimes not treated on equal terms. While the discourses of scientific ecologists studying rangeland dynamics, for example, may be embedded in statistical documents, those of local pastoralists may rest in oral histories, herding practices, and place names. These are hard to place on a common scale. Comparison, discussion, and analysis are therefore difficult.

Categories and taxonomies

In many cases, constructions of the environment are most explicitly reflected in the categories with which nature is described and ordered. Local people, scientists, and other observers all have taxonomies for soils, species, and land covers, which both drive and reflect their constructions of the environment.

Eliciting such categories is a matter of intensive survey, where research seeks to produce exhaustive lists of the conceptual differences between groups of trees, landscapes, or soils, drawing upon many traditional techniques in environmental perception research as well as cultural ecology and ethnobotany. It is also fraught with linguistic pitfalls and problems of interpretation. Many taxonomies of plants or animals, like the Western/scientific Linnaean system, are organized in a complex hierarchic fashion, meaning that careful listening is required to determine the lumping and splitting of environmental phenomena, and many species and landscapes have multiple names (Berkes 1999). Most problematically, the classification of ordinary things is often so taken for granted, by farmers, scientists, or consumers, that it is easy to misunderstand the purpose and direction of conversations directed towards weeds, laboratory equipment, or other daily objects.

The benefits of careful study, however, are many. Table 6.1 shows the categories of land types amongst the Ifugao of northern Luzon in the Philippines drawn from years of fieldwork by H. C. Conklin. Each of these categories reflects a mix of land use and land cover and shows the different conceptual divisions between various components of human-managed production landscapes. Most prominently, the category system is centered around processes of succession and ecological state transitions in which "natural" landscapes like forest and grassland over time cycle through a system of swidden (slash and burn) production and secondary growth. The system not only reveals the conceptual world of the Ifugao, it further shows the way they make a living, the way they manage and respond to environmental change, and the divisions in property and production in their communities.

No data are available for the categorical systems that land management officials or experts from the Philippine government apply to the same landscapes, but it is certain that they would reflect little of the subtle succession and production variations evident in the local taxonomy. What might this mean for control of land and the trajectory of its development? What if, for example, portions of Mapulun grasslands and Qinalahan forests were enclosed under conservation mandates or wilderness preservation efforts, specifically because in official taxonomies these became "pasture" and "forest"

Table 6.1 Ifugao categories of land types and succession patterns (following Ellen 1982 and Conklin 1968).

Category	*Description*	*Species*	*Succession to*
Mapulun	Short, low, open grassland	*Imperata* spp.	Mabilau
Qinalahan	Public forest	*Thermeda* spp. (mid-mountain climax)	Habal
Mabilau	Cane grassland and secondary growth	*Miscanthus* spp. (canegrass)	Qinalahan
Pinugu	Private forest grove	Timber and fruit trees, erect palms, rattan	Payo
Habal	Slope swidden fields	Sweet potatoes, taro, yams, manioc, corn, millet	Pinugu
Lattan	Residential hamlet terrace		
Qilid	Drained terrace	Sweet potatoes, legumes	
Payo	Pond field, rice terrace	Rice and taro	

– atemporal, permanent, and fixed land cover types? In that case, key succession spaces to secondary growth and swidden fields would be lost, creating bottlenecks in production, threatening livelihoods, and creating scarcity in resources. Categorical and taxonomic information provides the building blocks for a political ecology of landscape production and control.

Spatial knowledge and construction

The categorical lumping and splitting of the natural world is also an inherently spatial process; the maps of production, degradation, and control that we carry around in our heads reflect deeply rooted and socially influenced constructions of nature. These also provide methodological opportunities to explore political ecology.

Most of the methods for deriving these spatial constructions draw heavily on the research tradition of "cognitive mapping," which encourages people to map their surroundings (Kitchin and Frendschuh 2000). Growing out of these practices, more recent work has tried to codify local conceptual geographies as Geographic Information System (GIS) data. These efforts at "geomatics" can later be used to defend native land rights against the depredation of lately arriving settlers or state authorities bearing formal titles (Poole 1995). Counter mapping, the most politically explicit form of geomatics, has as its aim to "appropriate the state's *techniques* and *manner of representation* to bolster the legitimacy of 'customary' claims to resources" (Peluso 1995, p. 384, emphasis in original).

The challenges in this methodological area are many, however. Paper and pencil mapping is foreign to many extremely knowledgeable local or traditional people, who may be far more comfortable in the oral communication of geography, or with sticks and rocks laid out on the ground. So too, the "formal" cartographies arranged by professional mapmakers following standardized guidelines may not reflect the environmental geographies in the heads of the individuals or institutions that produced these maps. The asymmetry between different communities – those historically called experts versus those historically called lay

– may in fact be reinforced through poorly defined cognitive exercises and sloppily executed mental mapping.

Narratives of ecological process and change

Environmental constructions are not limited to detailed taxonomies and geographies of production. Some of the most obvious and important constructions, especially those that impinge on the political control of the environment, are embedded in the stories of environmental change and memories of past ecologies that people hold. In explaining how environmental conditions change and why, people not only articulate their notions of how ecosystems work and the patterns of cause and effect they perceive, they further reveal their perceptions of how landscapes looked and functioned in the past.

Such narratives are usually rooted in collective agreement and tacit consensus reached within communities – whether these are peasant villages, planning offices, or GIS labs – such that stories of change provide a window onto collective priorities and group memory. When, for example, West African colonial and postcolonial land use planners reach an oral and written consensus that deforestation is serious and ongoing, despite some evidence to the contrary, we are forced to consider the structures and systems of agreement that allow that idea to prevail (Fairhead and Leach 1996).

At the same time, lack of consensus is also revealing in political ecology. In Bolivia, for example, Zimmerer (1993) derives dramatically divergent accounts of the status and causes of soil erosion in agrarian environments. Narratives that hold peasant ignorance, changing agrarian practices, and transnational exploitation accountable for erosion are held by development institutions, local producers, and trade unions, respectively. Such analysis underlines the way rifts in environmental interpretation follow existing political divisions.

The pitfalls of narrative approaches are several. Individuals and communities do not always believe what they say, and belief does not always lead directly to predictable action. Depending solely on the environmental narratives of individuals or groups is not a clear and open window into the complex constructions of nature held within and between groups. Rigorous techniques, survey methods, and sustained presence in a community are all prerequisite to clarifying and verifying human models of environmental change. Even so, such work is essential for robust explanations of the causes and consequences of ecological and political transition.

Genealogies of representation: Environmental history

While all of these approaches are revealing and powerful, the most sophisticated readings of environmental knowledges, narratives, and imaginaries require deep historical analysis. As noted previously, such historical analyses are ultimately necessary to shed light on the moments of invention or transformation that fix what appear to be timeless concepts to historical moments of political and economic change.

In perhaps the most trenchant recent analysis of this sort, Willems-Braun (1997) surveys contemporary representations of forest and wilderness in British Columbia, puzzling over the ways in which the environment, though one contested by contemporary native peoples, is represented in public debate as a "purified space" devoid of native

presence. While such a representation is of course politically convenient for the contemporary Anglo-Asian residents of the region debating the future of the forest, such an instrumental answer is ultimately unsatisfying for Willems-Braun, since it explains neither the power nor the longevity of this construction. Excavating early documents on the region by explorer George Dawson, his analysis uncovers the depth of the "purification" of the ecological record and the way in which even early writing expunged the native cultural presence from the wilderness of the forest. This lays a powerful groundwork for a contemporary debate that, though it acknowledges native peoples, allows them little voice in the control of "wild spaces," which is ceded instead to expert ecologists and foresters (Willems-Braun 1997).

In another example, Sullivan (2000) examines the roots of the contemporary view of uncontrolled land degradation in Namibia, which is commonly offered as justification for restricting use of the land by local residents. The research burrows into the past, including accounts by eighteenth-century travelers, reports by late-nineteenth-century managers, and studies by ethnographers in the mid-twentieth century. These diverse texts all consistently report conditions using the same terminology and the same mental pictures, which together invoke a scene of overgrazed and eroded soils. The depth and persistence of these stories are, at least in part, both a cause and consequence of their power in the planning process, and contribute to limiting the power and access rights of local people.

These genealogies are increasingly a part of political ecology. The work is far from simple, however, and the key linkages which connect the deep histories of explorers or colonial officers to contemporary politics today are more often inferred than demonstrated. This is largely because records are sketchy, partial, and littered with contradictory and opaque evidence.

Despite these methodological challenges, a serious and rigorous engagement with the construction of the environment benefits from tracing contemporary claims about nature backwards to their roots.

Methodological Issues in Political Analysis of Environmental Construction

In sum, the frameworks with which we imagine the non-human world are as important (and contested and puzzling) as the variability of that world as understood in ecological science. The mandate in much political ecology, therefore, is to map the politics of environmental ideas as carefully as the politics of material ecological change, working to link the two across space and time.

There are several immediate methodological barriers to effective analysis. The way in which knowledge systems are communicated and recorded can lead to asymmetrical analysis. The complexity between spoken and unspoken reasoning opens the door to confused attribution of motives and politics. These problems are often coupled with poor sampling strategies on the part of many political ecologists studying knowledge. Who, precisely, is interviewed or surveyed? Do they represent common knowledge? Are they experts? How does knowledge vary within populations? A general lack of attention to specific methodologies in local knowledge studies remains a serious problem (Davis and Wagner 2003).

Box 6.2 Vanishing Natives and Other Colonial Tricks in Braun's "Buried Epistemologies"

Postcolonialism is a big word. It also sometimes seems to belong to an obscure and arcane world of "critiques" and "theorizations" with little use for explaining things like trees. As Bruce Braun demonstrates in "Buried Epistemologies: The Politics of Nature in (Post)colonial British Colombia" (Willems-Braun 1997), however, the term captures much to explain what is going on in the forest.

In his investigation of conflicts over control of "wilderness" areas around Cloyoquot Sound, a long-occupied but heavily forested place in western Canada, Braun turns to the language of environmental groups and scientists, as well as to nature writing and photography, to show the way foresters, environmentalists, and other powerful groups think about and represent both nature and native culture. He argues that these groups define the terms of struggle – "nature" versus "culture" – in such a way that the indigenous peoples in the region, the Nuu-chah-nulth, are written out of the history of the production of the Cloyoquot landscape, except insofar as they are "traditional" people, living amidst totem poles and paddling canoes. The result, of course, is that the claims of these people over the forest and its fate are largely eclipsed.

More than this, Braun demonstrates that this "habit of thinking" (epistemology) is something that the contemporary Anglo majority – both industrial foresters and environmentalists – inherited from colonial logic and practice, with its methods of classifying, recording, and describing the world. He draws upon photographs and journals from a surveyor, George Dawson, who in the 1870s recorded the Cloyoquot landscape in such a way that native peoples fit neither as part of the natural environment (being cultural rather than natural) nor as part of the emerging Canadian national polity (being traditional rather than modern). The somewhat depressing conclusion is that violent exclusionary systems of domination are persistent and commonly reproduced even by "liberal" environmental observers with a purported sympathy for native peoples. They are made to "vanish" by a trick of epistemological habit rooted in the privilege of the colonizer, which ultimately determines what kinds of land uses can occur in the forest (preservation and timbering) and delimits who gets to say so (Anglo environmentalists and foresters).

For political ecologists, whose stock-in-trade is mostly writing and telling stories about people like the Nuu-chah-nulth, this serves as a warning shot across the bow. With its roots in cultural ecology, political ecology also has many habits of thought; those buried epistemologies that tend to make certain categories (e.g., peasants, nomads, old growth forest, etc.) "real." These categories are inherited, however, often from very ugly systems of exclusion and domination.

More than this, at the time of its publication, "Buried Epistemologies" suggested for many researchers, this author especially, that systems of representation, like photographs, journals, and the scientific categories, are as fruitful a place to understand environmental politics as in fields, factories, and workshops. So for political ecology Braun helps to open the door to a crucial renaissance of culture in the field.

Despite these difficulties, however, construction is a crucial process that defines, channels, and makes manifest struggles over the environment. As a research project, researchers must:

- elicit the conceptual vocabularies of the range of participants in ecological process and struggle;
- determine the relationships of rhetorical and deeply discursive formations to environmental and political practices;
- seek methods that assure the symmetry of inquiry between official knowledges, often in elite languages and formal texts, and local ones, which are often transmitted orally and in local vernacular;
- explore the way environmental narratives and cartographies unite and divide communities that might otherwise seem disparate or unified;
- establish the roots of the most obvious and taken-for-granted environmental conceptions that drive, direct, and dominate conflict;
- determine the degree to which ideas, discourses, and categorical imaginaries direct and regulate material environmental behaviors and practices.

As is the case for ecological analysis, political ecologists have not always been entirely attentive to these methodological imperatives. Again, however, this reflects the complexity of discursive/material interactions more than the research failings of the field. It may also suggest the limits of the metaphor itself – *construction* of nature, which implies sole human authorship in a world so clearly written by many actors.

From Production to Co-Production

As noted above, the "soft" constructivist approach – one that acknowledges both the material nature of the world and its categorical pre-imagining by human actors – is a pragmatic compromise that tends to dominate research practice in political ecology. It invites confusion, however, since it tends towards a view of knowledge in which social constructions or political influences are responsible only for *mis*understandings of the environment, as where colonial thinkers overestimate land degradation, for example, or construct empty wild landscapes in their minds, where they were actually historically full of indigenous people. As Bruno Latour has pointed out, however, this says too little about how nature is constructed, because it doesn't allow social influences to also account for *correct* understandings of the environment. So too, it says little about how non-human actors participate in the creation of accounts about themselves. He describes this as a problematic *asymmetry*, and it is one that "soft" construction seems to invite (Latour 1993, 2005).

Yet the political ecological world is filled with entanglements of knowledge, power, and landscape that are fully symmetrical. Consider the strange case of Amazonian Dark Earths. This term describes a range of soils (from very dark *Terra Preta do Índio* – black earth of the Indians, to the brown *Terra Mulatta* – brown earths) in the Amazonian basin that differ from the predominant Oxisol and Ultisol soil matrix, insofar as they incredibly fertile, hold nutrients and moisture more effectively, and are loaded with organic matter, resulting from charcoal in the soil. Making up perhaps 10 percent of the Amazon, they have presented a

kind of conceptual and ecological mystery rooted in a complex political ecology. While it is still unclear precisely how these soils are formed and the degree to which their creation is intentional, as Bill Woods, Antoinette WinklerPrins, and other historical ecologists have noted, evidence suggests that they are a product of *human* occupation and action. By discarding organic materials in dumpsites (middens) and by light burning over time, the soils of certain human-occupied regions of the deep Amazon have become more productive. Clearly, the first lesson of such soils is that they invite us to think beyond destruction of nature to production, as noted previously (Chapter 5). Amazonian Dark Earths show the human capacity to produce complex and desirable natures (Lehmann et al. 2004; Glaser and Woods 2004; Woods et al. 2009; WinklerPrins 2009; WinklerPrins and Aldrich 2010).

Issues of social construction also pervade this story, of course. A dominant discourse of Edenic or fully "natural" Amazonian rainforests makes it difficult to imagine, and therefore either to research or to ultimately accept the possibility of anthropogenic soils in the region. Indeed, some ecologists have gone as far as rejecting the evidence and argument of human creation of these soils, because they believe that such an account would encourage destructive use of the forest (Meggers 2001). Put simply, they insist that to deter overexploitation, the "natural" fragility of the soils must be emphasized as true. In this way, social construction might be used to think about how politically dominant narratives caused researchers to be "wrong" about Dark Earths for so long.

But this tells us too little. First, it tells us nothing about the conceptualization of the soils from the point of view of those who created it – native Amazonians themselves. How are their cosmology, behavior, and ecology constituted? Is there a connection between their worldview and anthropogenic soil conditions, an *ethnopedology* as WinklerPrins and Barrera-Bassols (2004) refer to it? Second, it does not encourage us to ask what explains the social and political conditions that encouraged, allowed, or opened new perspectives on these soils amongst non-Amazonian researchers. Is the "discovery" of anthropogenic soils merely an overcoming of a social construction of nature in favor of the "truth" and a random paradigm shift, or does it reflect the social and political conditions of changing relations between native people, researchers, and conservation authorities? How is this new truth constituted, and why now? And third, a narrow construction approach may not invite us to ask to what degree soils themselves materially connect with natives, researchers, and conservationists to help author the emerging accounts of Amazonia. Do they simply "sit there" and adjudicate the truth of new social constructions or are their ongoing transformations part of a network of relationships that create new, and highly politicized, accounts of the Amazon?

To ask and answer all of these questions, I would suggest, requires a more generous and complex reading than "construction" or even "production" alone can allow us. Rather, a view of these soils as "co-produced" signals a more dialectical understanding of the political ecology of ecological knowledge. In this view, the landscape is produced from the very ideas through which it is apprehended, even while those ideas are rooted in the material activities and changes of the landscape. Constructions of the environment are not solely pernicious politicized "inaccurate" accounts but are instead the scaffolding of knowledge that allows us to understand the material context of that knowledge. All of this is further subject to the political work amongst people and between people and the objects of their interaction.

That critical reflexivity, so fundamental to political ecology, is certainly more than simply social construction. It is also one of the elements that separates political ecology accounts from those of other approaches, like land change science or causal/event-based analysis (Chapter 7). Such other approaches, however, have a great deal to tell us about the world and about political ecology itself, as we shall see.

Chapter 7

Challenges in Explanation

- Meetings in the Forest
- The Challenge of Land Change Science
- The Challenge of Causal Explanation
- Towards a Dialogue in Co-Production

Meetings in the Forest

So far in our visit to Schorfheide Forest we have been forced to consider what a degraded or transformed state of nature is and how we might measure or define it. We have also considered the degree to which the forest is as much a conceptual object as a material one; a forest as a construction of human ingenuity and categorical imagination and not simply a material fact of trees.

But political ecologists are by no means alone in such a forest. The world of policy, science, development, and conservation is filled with other perspectives and voices, all with different claims on the "truth" of the forest, its degradation, and on explaining either or both. What satisfies an observer as a satisfactory, relevant, or important explanation will vary enormously as a result. Indeed, this forest might be filled with competing accounts, which may share a number of things with political ecological narratives, but differ in important ways. Of many perspectives, two are of special interest here: land change science and causal (or event-centered) explanation. These two perspectives are by no means exclusive from political ecology, or one another, but each holds lessons that political ecology

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might heed, even while their differences suggest limits that political ecology precisely seeks to transcend. A friendly review of the challenges these approaches pose helps us to understand when and why political ecology is powerful (or not), but also how it might be considerably more effective.

The Challenge of Land Change Science

Land change science is a loosely defined agglomeration of interdisciplinary research techniques and practitioners that together focus on tracking and explaining "changes in land and ecosystems and their implications for global environmental change and sustainability" (Turner, Lambin, and Reenberg 2007, p. 20666). Admitting that this general area of concern is one that includes work in many diverse fields – including political ecology – advocates for the approach more narrowly suggest a specific form of investigation, which combines high-powered observation technology with predictive and speculative models. This approach holds out an intriguing example in many regards but diverges from political ecology in a few key ways.

What is land change science?

As summarized by Turner et al. (2007), the land change science approach stresses

1) monitoring land change;
2) thinking about these changes as a "coupled system," combining human and environment subsystems;
3) constructing spatially explicit models (i.e., in a GIS environment);
4) evaluating outcomes of changes for people and the environment more generally.

By stressing monitoring, land change science encourages the use of cutting-edge tools and technologies, especially remote sensing platforms (e.g., satellites) and increasingly abundant computing power. By coming at the problem from a "systems" perspective, the approach appears to match the dynamic categories (e.g., sources and sinks) and relational concepts (e.g., feedbacks and emergence) of contemporary ecological science. Modeling is attractive to those who seek to build scenarios, as, for example, where one might want to speculate about whether forest conversion to agriculture might increase or decrease when there is a change in a subsidy on a commodity like soybeans. By attempting to be predictive, practitioners are invited to make proscriptive suggestions or claims about how to make outcomes more sustainable or to make people less vulnerable. That is an attractive package, indeed.

By its nature, the project is also one that tends to encourage researchers to produce outputs that are useful to other scientific communities, especially those in climate science. For example, by quantifying the extent of carbon and carbon fixing capacity in the forest canopy across a region of Amazonia, land change science outputs can become immediate inputs into models used in climate science to predict global change. This generally means also that the field necessarily privileges quantifiable metrics and statistical tests, relying on these to help evaluate whether or not a particular claim or explanation is a valid one.

As an eclectic field, it is also one that is fairly open-ended in terms of its sources of theory, knowledge, and of sources of information and hypotheses. Insights incorporated into land change models might, *in theory* anyway, come from diverse sources, including political ecology.

A brief review of research from the Southern Yucatán Peninsular Region (SYPR) project, a land change science collaboration ongoing for more than a decade, reveals many of the characteristics and results of such an approach (Turner 2010). The case region, a vulnerable forest area on the frontier edge of intensive cultivation and human migration cut across by an extensive biosphere reserve (Calakmul), represents the kind of area where large stocks of carbon are stored in the ecosystem, where large-scale forest loss can occur, and where land transformation is dependent on a host of proximate and more distant forces, including human numbers, crop prices, and state policy. This sort of laboratory is perfect, in a sense, for the ultimate goals of land change science: understanding and accurately predicting important land changes in turbulent landscapes. The project is notable in its collaboration between ecologists, geographers, economists, and anthropologists. This group performed detailed household survey and ground-level ecological research to understand individual decision-making (e.g., tree-cutting or crop choices) as well as micro-level changes in ecology (e.g., animal and plant dynamics and nutrient flows). These were linked to time series analysis of land cover change across the region drawing on remote sensing, and synthesized into models that allowed scenarios and projections of future land cover under differing circumstances or conditions.

The findings over the years have demonstrated a host of things, including the way different *ejido* communities (in terms of demographics and location) impact forest cover differentially, the way forest cover loss can occur in the absence of significant economic growth, and the sensitivity of forest loss to policy interventions. Model results on forest cover change have also been translated and calculated specifically in terms of carbon stocks, making them immediately applicable for climate forecasters as well as policy-makers experimenting with economic incentives to maintain forest to offset greenhouse gas emissions (Geoghegan et al. 2010) (see the special issue of *Regional Environmental Change* from 2010 for a summary of project goals and results).

Lessons for political ecology

There is a lot here of value for political ecology. It must first be acknowledged, however, that not all political ecology concerns itself with land cover change. Explaining the politics of consumption behavior and human health (Guthman and DuPuis 2006), understanding struggles over municipal dumpsites (Moore 2008), or examining the community self-identification in the wake of conservation policy (Sundberg 2004) may all have important indirect implications for land change science, but they are clearly not immediately comparable in terms of goals or explanatory orientation. And even where political ecology concerns itself with land cover change, whether that is urban forest cover in Milwaukee (Heynen et al. 2006) or the expansion of wooded savanna in Côte D'Ivoire (Bassett and Zueli 2000), relative to land change science, its goals are rarely predictive, typically focused on different variables, and more often (though not always) oriented towards to local actor audiences and political economies of *action* rather than policy, per se (Castree 2002).

Even so, several important facets of land change science suggest useful lessons. First, it offers a model for reaching and integrating with global audiences, especially global scientific communities. By explicitly considering from the outset that the output of research will be an input into someone else's research, land change science seeks to match the metrics and languages of user groups (typically climate scientists and economic modelers) that can mobilize their insights. So too, land change science typically builds multidisciplinary teams that are forced, by circumstance and mission, to communicate intelligibly. One needs to imagine a conversation between a resource economist who models timber markets and an entomologist who measures bark beetle infestations. Such conversations invite brutal miscommunication and so, mutual learning.

This might be taken more seriously in political ecology. Acknowledging that differing scientific communities operate from differing perspectives and typically from differing epistemologies from political ecology, there is no reason that framing of questions in the field might not also consider the usefulness of findings for allied practitioners. Of course, it is typically the case that political ecology texts are the "bearers of bad news" for brothers and sisters in other sciences. Consider the wealth of careful explanations and explorations of abject failure in the field of conservation (Brockington 2002, also see Chapter 9; Neumann 1998). Putting these in front of an audience of conservation biologists (which many of us do all the time!) typically results in exasperation on the part of the audience. It is nevertheless true that more serious consideration of such an audience would benefit political ecology when narratives are framed, vocabulary is selected, and arguments are made. Put simply, expecting the global scientific community to come to political ecology for insights and answers might be replaced with more proactive consideration of audiences.

Of course, political ecologists participate in multidisciplinary teams already quite a bit, and the literature is full of the fruits of such collaborations, either in advancing work that links to participation in formal efforts like long-term ecological research (LTER) teams or ad hoc teams and partnerships with biologists or other specialists in places as far ranging as the Florida Everglades (Ogden 2008) or the Indian subcontinent (Waite et al. 2007). It is also fair to say that political ecologists are as advanced in building conversations with local communities of concern, in the places they work, or considerably more advanced, than many members of the land change science community (Turner and Robbins 2008). Nevertheless, political ecology is notable in its tendency to "lone wolf" research, which can be somewhat insular (Walker 2005).

Second, land change science demonstrates the creative adoption of contemporary remote sensing and geographic information system technology but also stresses participation in stretching the bounds of the technology, precisely by working to fit it to the complexities of ground reality. By fully immersing itself in the technology, including its limits in capturing and conveying certain kinds of information and processes, land change science provides an interesting example of a way to "domesticate" a highly technical field (GIScience) heavily oriented towards tools over grounded questions.

Political ecologists have been long-time users and innovators in some areas of GIS and remote sensing. Whether evaluating cattle movements and grazing impacts (Turner and Hiernaux 2002), assessing the regulation of urban air quality (Buzzelli 2008), evaluating the spatial imaginaries of competing land managers (Robbins 2001b), or participatory mapping of local hazards associated with exploitative production (Tschakert and Singha 2007), political ecology is no stranger to GIS, satellite imagery, or spatial thinking.

Nevertheless, the range of spatiometric tools and capacities in GIS is arguably underutilized by political ecologists. Given the enormous significance of extremely *spatialized* concepts – like uneven development, circulation of value in and through the landscape, and the environment as an unevenly produced artifact – these tools could see a lot more use in the field. It is true that visualizing and modeling certain things (like the "production" of space itself, Lefebvre 1991) is difficult or impossible in a digital environment, but the challenge may lie in part in exploring such contradictions directly in collaboration with practitioners in GIScience.

Finally, land change science presents an interesting use of environmental science to evaluate non-human influences and co-evolved systems. By linking human actions explicitly in terms of key ecological variables (nutrients, carbon, etc.), land change science reconciles the mutual impacts of humans and non-humans on one another. It recalls, in that sense, the power of energetics in cultural ecology (Chapter 2), which allowed seamless connections of human actions (agriculture), plant growth (tree cover), commodities (crops), and inputs (pesticides) by tracking flows quantitatively through this metabolism.

This is by no means recommended for all kinds of political ecology research, or for all aspects of any given project. Studying the internal drivers of state climate policy and the cultural logics of planning in engineering offices in a place like Seattle (Rice 2010), for example, would descend into a ridiculous exercise if research results required expression in units of carbon! Nevertheless, the use of ecological common denominators may be valuable for some political ecological research and may provide an attractive alternative to the murkiness of actor-network theory (see Chapter 12).

Limits and incompatibilities of this approach

Obviously, there is no immediate reason that political ecology might not integrate its findings with land change science and vice versa, or that many of the successful tendencies of that dynamic field might not be emulated in political ecological research. Indeed, the overlap between the two approaches in areas ranging from forest transition research to vulnerability studies promises cross-fertilization and collaboration (Turner and Robbins 2008). There are several things, however, that might give us pause in embracing land change science, having learned some of the lessons of political ecology.

First, the overall success of land change science in integrating human actions, behaviors, and preferences with socio-ecological outcomes has depended upon treating the environment as an "array of ecosystem (environmental) goods and services" (Turner, Lambin and Reenberg 2007, p. 20666). As a result, land change science is largely dependent on concepts, models, and categories from neo-classical resource economics to translate across its "coupled system." Political ecology, conversely, represents a rejection precisely of this economic tradition. It is rooted instead in concepts, relationships, and processes drawing from political economy and historical materialism: value, production, commodity, accumulation, contradiction. A full review of the incompatibilities of these two fields of thought is beyond the scope of this volume (Harvey 1982, 1996), but it is more than a simple matter of shuffling terminology around to reconcile a view of producers in the Yucatán "optimizing their household resources" with a converse view of "peasant exploitation through articulation with capitalist production." Land change science, as a whole, is largely

committed to traditional economics and so differs dramatically from political ecology in its vision of economy and power.

It is also the case that the requirements of statistical testing and the metrical demands of both the GIS environment and most models present some limits on the range of variables, processes, forces, and relationships that can be meaningfully included in land change science. As noted above, of course, the capacity for technical tools to incorporate many qualitative forms of data is widely recognized (Kwan and Ding 2008). Admitting this, however, is different from suggesting that the modes of modeling and testing favored in postpositivist science of this kind are infinitely amenable to expressing and evaluating important but diffuse effects, like culture and power. This need not be considered a problem, once acknowledged. Rather, it merely suggests that such effects from political ecology may not fold into land change science easily. This must not mean they should not be considered and explored. Put simply, we would not want to choose our variables and categories solely based on whether they can be incorporated into an econometric spatial model.

There are more general things about the posture of land change science that might cause distrust amongst some political ecologists. As a kind of meta-technical field for prediction and master control, land change science must be seen to reflect some of the logics of state and capital that have led to violence and to the erasure of local voices, indigenous people, and the interests of nature itself. It requires a certain kind of colonial territorial bravado, after all, to imagine throwing a switch to change agricultural production relations in the Yucatán to direct the flow of carbon into the regional and global economy (Geoghegan et al. 2010)! A problem, therefore, may lie in the close match between the ambitions of land change science and those of the territorial state, global investors, and first-world consumers. The political ecological question is not whether land change science is a better or worse form of explanation; it is instead, *what kind of interests does land change science explanation serve*?

The Challenge of Causal Explanation

In 1999, Andrew "Pete" Vayda and Brad Walters published an essay that set itself, in its very title, "Against Political Ecology." Their argument suggests that, though politics is an important factor in environmental change, the political ecology approach is unsatisfactory. "As a general rule," they note, "more attention to political influences on human/environment interactions and on environmental change itself is no doubt a good thing, since such influences are no doubt often important . . . " On the other hand, they insist, the assertion that such influences "are *always* important" is problematic (Vayda and Walters 1999, p. 168).

Given that no political ecologist would claim that politics is *always* important for the outcome of all socio-environmental outcomes or situations, the critique may seem unnecessary. For Vayda and Walters, however, political ecology is flawed more generally. This is because, as they see it, it is often a theoretical and interpretive approach rather than a primarily evidence-based effort. Moreover, by approaching problems from their "political" sources, political ecology goes in search of effects rather than causes and so tends to have answers prior to asking questions. Rather, they insist, causal explanation is best.

What is causal explanation?

According to A. P. Vayda, the long-time champion of this approach, causal explanation means asking and answering "why" questions through: (1) empirical observation, (2) the development of conjectures leading to further investigation, and (3) sorting through available evidence and competing hypotheses by practical means to eliminate some explanations and retain others. "Why" questions might include why a particular fire started in a forest or why such fires happen at a particular frequency, why a specific national currency declined or why the global financial crisis occurred. They might include why a specific field suffered deforestation or why tropical forest losses are high in a region or place. Significantly, this approach downplays, as explanation per se, the act of interpreting or theorizing a known set of events (Vayda 2009).

More specifically, the elements of the approach include:

- choosing reasonably discrete, material, and largely agreed-upon *events* to explain (e.g., a specific forest fire that is widely acknowledged to have occurred);
- changing the grain of analysis from finer or less fine, depending on what one seeks to know;
- evaluating *competing hypotheses* that would explain the outcome in question (e.g., field burning, arson, lightning strike);
- using and seeking available evidence and weighing the relevance of specific causes from the universe of possible causes, until some possible causes can be eliminated;
- working backwards from effects to causes, through causal histories or chains, to identify what prior causes might have influenced more immediate ones, or not, depending on the researcher's interest.

There are a great many ways to achieve this goal, but several seem important. Counterfactual thinking might be employed; one could ask, in the absence of the purported cause, would the outcome have occurred anyway? Multivariate regression suggests itself, though proponents of the cause remain ambivalent about the value of statistical tests over other ways of evaluating evidence. Either way, causal adherents recommend "abduction" – a logical process of going back and forth between causes and effects, evidence and ideas, to eliminate at least some possible causes and retain others.

The approach implies some immediate things about the appropriate scope of investigation. First, the causes of any effect are ideally kept as closely linked and immediate as possible. This is because, following Lewontin (1994), "causal claims become more and more impervious to evidence as they are made about larger and larger domains of phenomenon" (Vayda 2009, p. 24). Certainly something as grand as Jared Diamond's thesis, which asserts that certain *continents* are friendlier to the development of agriculture and therefore are geographically responsible for the distribution of the world's current levels of development (Diamond 1997), would fall afoul of this admonition. Similarly, problematic grand theories like "hydraulic civilizations" (Chapter 3) crumble under this kind of scrutiny.

From this point of view, it is also essential to start from effects and be as agnostic as possible about specific causes from the outset, since it is difficult to eliminate a researcher's

favored cause and there is a tendency to collect only data that support one's own perspective. This tendency towards "confirmation bias" is not unique to political ecology, adherents suggest, but is really common to all approaches defined by their causes (e.g., spiritual ecology, cultural ecology, etc.).

There are some ancillary or concomitant implications as well. In terms of the analysis of environmental knowledges and discourses, causal explanation is ambivalent. Here, the study of knowledge, in and of itself, is of little or no value unless it can be used to directly explain a specific human action or intention, especially one relevant to an outcome (e.g., cutting a tree). In similar terms for the study of discourse, the approach suggests that discourse is over-studied to the degree that "studies showing actual, case-specific environmental impacts of discourse remain few and far between" (Vayda 2009, p. 28). The merits of this latter claim might be debated, but it is congruent with causal explanation to accept that discourse is only important if it can be shown to matter to specific (typically environmental) outcomes. Significantly, discourse is not dismissed out of hand here, but its role is defined very narrowly: speech making things change.

Equally important in this approach is an overall distrust for higher-order categories or emergent properties of relations. The casual approach holds in suspicion all purported phenomena that cannot be demonstrated in direct action. This is because these reified categories often come to stand in for, without evidence, direct and meaningful influences, in explanations where "'forces' become independent agents" (Vayda 2009, p. 196). These problematic processual reifications – treating systems as "wholes" – are numerous, but they include the uses of many cherished concepts from both social and environmental sciences. Most notably, this refutes many "structural" explanations, where structures are understood to be persistent social relationships that *drive* or explain people's actions or behaviors. For researchers in the causal tradition, such structures require proof of existence in *every case*, and cannot be assumed to exist a priori. Needless to say, this contradicts some key elements of political economy, which rely on well-established structural variables. But this symmetrically embraces a skepticism of "systems" (from ecology) and "emergence" (from complexity theory). Viewed as "processes," most of these are typically minimized except where satisfactorily proven. "The question of which constraints and causes are structural and which are contingent is to be decided not in advance of causal-history research but by means of it" (Vayda and Walters 2011, p. 8).

Lessons for political ecology

To evaluate the degree of usefulness of this approach for political ecology, we must first consider the definition of explanation it offers. As noted above, this definition minimizes, as explanation per se, *theorization* or *interpretation* of known situations, events, or histories. For political ecology, this initial distinction is a mixed message. Certainly numerous narratives in political ecology do seek to answer why a particular thing happened or things happen in a particular way. It is also true, however, that some powerful, useful, and important narratives in political ecology are based on research that rethinks or reinterprets or re-theorizes known facts or histories. These political ecology accounts invite observers to think about how things might be interpreted if one looked at them from another perspective (e.g., from the point of view of a forest dweller, the logic of capitalist firms, etc.) or

through terms and concepts provided from theory (e.g., the work of Gramsci, etc.). Arguments for the causal approach stress that explanations *should not end there*, and may not the best way to spend one's time in the socio-environmental sciences. This implies a value judgment: interpretation and theorization are not enough for explanation.

Many political ecologists might certainly and justifiably reject this, insofar as this sort of activity is what they do (sometimes) and that it serves all kinds of practical importance to do so. Indeed, a possible thought experiment might posit what books or articles might never have been written if narrowly causal explanation was the ultimate goal of social science. These would certainly include several notable works mentioned in this volume. Just as a single example among countless others, William Cronon's *Nature's Metropolis* (Cronon 1992) would be eliminated. This major work spends little or no time rejecting competing hypotheses for the rise of Chicago, or anything else, instead focusing on the interactions that dialectically transformed the city and the countryside through complex commodity chains in the process. What readers learn from such a narration is best left to them (though I can say I learned a lot!), but nowhere might it be argued that Cronon's book *explains* the rise of Chicago with reference to a limited set of specific causes, weighed against others. It is not explanation in the sense intended by adherents to causal approaches, therefore.

But that is probably just fine. Let me suggest, therefore, that there is plenty of political ecology that falls outside of the "causalist" definition of explanation, but which is urgent, viable, and relevant theory-building, history-telling, and analysis nonetheless. Insofar as such accounts *are* viewed as explanations by their authors and readers, there is disagreement here over the meaning of the term and the importance of one such approach over another. For many political ecologists, therefore, this sort of exclusion might be viewed as modestly doctrinaire, but not a reason to close up shop or drop what they are doing. Agreement to disagree, in other words, might be prudent here.

Accepting this, however, hardly limits the value of the causal critique for political ecology. Many political ecology analyses and narratives do *indeed explicitly purport to explain socio-ecological outcomes*. And this is the concern of proponents of "causal" approaches. They insist that insofar as political ecology research is explanatory in the sense described here, and seeks to answer "why" questions with assessment of observed causes, some of it simply is not very good.

Unquestionably, some of the weakest and most uncompelling accounts in political ecology (or any other analysis or nonfiction narrations) emerge from one problem identified by causalists: the search for categories rather than explanations. It can quite frequently be observed that scholars or investigators go in search of concepts used in political ecology (governmentality, discipline, marginalization, etc.) and subsequently "discover" them in the field. The concepts pre-exist such discovery and so always seem to turn up! One key lesson is certainly that the *reification of categories* early in the research process may be limiting and unnecessarily constraining. Better political ecology requires care in this regard.

Second is the question of competing hypotheses. Good research, it can be agreed, flexibly evaluates why things happen, keeps several influences in mind, and works through the available evidence. It would be hard to argue that better research does not come from even more open-mindedness and acceptance of the complex and over-determined nature of real-world outcomes. As a field that developed (as per Chapters 2 and 3) as an explicit rejection of certain overly used and often empirically ungrounded causal mechanisms

(especially "over"-population), it is also certainly true that political ecology typically begins from certain specific causal factors, and rejects some a priori at the risk of missing key elements or forces at work. This might definitely be improved. Accepting the possibility that local demographic pressures or demands might hold explanatory power in a given case, for example, would in no way undermine the larger effort to take seriously political economy.

So too, the insistence that a good place to start in analysis is some kind of demonstrable event also seems useful. Indeed, it has long been the tradition in political ecology to critically evaluate events that many observers have claimed to be occurring (notably including desertification among many others), only to conclude that they have not. There is clearly a value to more carefully selecting objects for explanation.

The value in taking some of these observations seriously, then, is to be sure that evidence is complete when making claims about the world and that rigorous thinking has been applied to considering alternative hypotheses about why things happen. Notably, when political ecology does this, as I would suggest occurs much of the time, but by no means always (and later chapters review some key work and literature in this regard), then good political ecology can make for good causal explanation. And the critique does provide a needed warning shot across the bow of sloppy research, doctrinaire writing, and short cuts.

Limits and incompatibilities of the approach

It is not the case, however, that all causal/eventual explanations make particularly good political ecology, conversely, and the admonition to be rigorous and open-minded, regrettably, is not a panacea for the problems political ecology developed to address. Specifically, political ecology accepts and takes seriously the unfortunate but inevitable entanglement of knowledge and power (Chapter 3).

This draws into question the insistence that sifting through the universe of available possible causes is solely a "practical" matter, conducted by an individual mind, in a social jar. Instead, the critical tradition has accepted the view that the theoretical and conceptual apparatus of an investigator is politically charged and socially implicated, and so an honest and rigorous investigation of the world places the theoretical equipment of the observer front and center. Put simply, downplaying theory doesn't make bias go away, it only closes the door on a full interrogation of the assumptions at work in explanation. As a result, political ecology necessarily distrusts the proposition that keeping an open mind, though necessary, is *sufficient* for rigorous exploration of the world. Instead, for this reason, theories are employed in political ecology precisely to turns things on their head, address old problems from less obvious angles, and stress counter-intuitives.

The treatment of concepts and processes is an equally important location of divergence. Higher-order categories like "structure" or "ecosystem" invite observers to understand feedbacks that reinforce conditions or erode them, and which operate in concert rather than alone. They need not be calls for conspiracy theories (where outcomes are the result of collusion by some part of the system) or functionalism (where outcomes are said to be caused by how they benefit the system as a whole). Instead, they point to the way outcomes are sometimes cemented or accreted into cycles or patterns that persist. Concepts like "emergence" invite researchers to consider how interactions can create things collectively

beyond the capacity of any individual element. All of them have shown significant analytic value in fields ranging from resilience and vulnerability studies (Gunderson and Holling 2001; Folke 2006) to political ecology and land change science (Brenner 2010).

Third, by insisting that knowledge per se is not a relevant for direct investigation, only the impact of one or another kind of knowledge on certain outcomes, the causal approach certainly diverges from political ecology. The insistence by causal adherents that, in studies of environmental change, discourse and knowledge are too rarely proven to cause specific changes in some direct way does have a degree of truth. But to imagine this to be the goal of discursive research is terrifically selective. Rather, as explained previously, the formation and perpetuation of specific, taken-for-granted, "truths" about the environment, through discourse, make specific outcomes easier or more possible, driving historical inhabitants from the land, for example, or reducing their legitimacy and range of rights.

Here, the empirical record seems pretty good. Bruce Braun's research in British Columbia (see Chapter 6) may not prove that environmental discourse ever cut down any trees, but that work, like so many other richly researched works on related topics reviewed here, such as Fairhead and Leach's (1996) *Misreading the African Landscape* or Diana Davis' *Resurrecting the Granary of Rome* (2007), very carefully documents the effects of old stories on current debates, their redeployment in current struggles over land, and their implication in the exclusion and marginalization of native peoples. To the degree that such an outcome – and the expectancy that a certain resource use system is "normal" – promotes logging or the plantation of exotic species, moreover, discourse seems a likely part of a causal explanation of cutting in a forest or expanding non-native land covers (Robbins 1998b). Causal adherents will no doubt demand more evidence.

In sum, political ecology investigations and narratives:

1. are sometimes, though not always, causal (as more narrowly defined by "causalists") in character, but not all good analysis need be causal in this sense;
2. would benefit from clearer articulation of what, precisely, is being explained;
3. would benefit from decreased reification of conceptual categories;
4. are more convincing when greater consideration has been given to the range of potential causes and impacts in the world;
5. remain skeptical of "open-mindedness" and "pragmatism" as a cure for confirmation bias and assert the socio-political implication of even well-meaning investigators and all categories of analysis, no matter how judiciously selected;
6. have demonstrated the value of higher-order categories in analysis, though not without risk of reification, as per above.

At its best, therefore, causal explanation represents a call for the kind of detective work that might make political ecology stronger and more compelling; through careful reconstruction of conditions and events that make outcomes happen, this approach compels political ecologists to be careful of their assumptions, martial their evidence with greater care, and exercise rigorous humility in restraining the grandness of their claims. Political ecology would do well to heed these cautions. As with land change science, constructive dialogue between traditions and perspectives is therefore desirable, beneficial, and eminently possible. At its worst, however, this approach flirts dangerously with the abandonment of powerful tools in social and ecological sciences (systems, structures, emergence)

Table 7.1 Lessons from, and limitations of, other modes of explanation from the point of view of political ecology.

Land change science	*"Causal" explanation*
Crucial lessons	
Reaches and integrates with global audiences and scientific communities	Insists on the phrasing of questions before answers and stresses rigorous observation and argument
Stresses and creatively adopts contemporary technology	Stresses the use of multiple working hypotheses
Integrates environmental science to evaluate non-human influences and co-evolved systems	Cautions against the reification of categories
Problems	
Favors problematic neoclassical resource economics over political economy	Non-reflexive or inquisitive about the political nature of knowledge and observation itself
Can allow the need for statistical tests and technical tools to delimit the range of variables and research questions	Downplays systems, structures, and emergence
Congruence of meta-technics with the interests of state power and capital	Unnecessary restrictions on what counts as explanation

in favor of ad hoc explanations that fearlessly exempt the researcher from the conditions of knowledge in the world.

Towards a Dialogue in Co-Production

This review has by no means exhausted the discussion or evaluation of land change science or causal explanatory traditions, their relative merits or drawbacks. Nor has it set out to reject them or suggest the superiority of a political ecology narrative over any other. Rather, I have used a discussion of these perspectives to suggest some explanatory challenges for political ecology, and to stress areas for attention in research practice and story-telling. Among these, several stand out (summarized in Table 7.1).

The larger lesson is perhaps that, as it matures, political ecology finds itself in a useful place to learn and dialogue with other fields. More importantly, it is a moment to reflect on the diverse audiences in the world at large and how better to reach them by attending to the modes and methods of political ecological explanation. We have some way to go.

Part III
Political Ecology Now

In which five overlapping arguments in contemporary political ecology are surveyed, their relative merits weighed, and some nagging problems discussed. Herein we also discover that doing political ecology requires patience, imagination, and a willingness to sometimes fail.

Chapter 8

Degradation and Marginalization

- The Argument
- The Evidence
- Evaluating the Thesis
- Research Example: Common Property Disorders in Rajasthan

On April 20, 2010, the offshore petroleum drilling rig Deepwater Horizon exploded in the Gulf of Mexico, killing 11 workers and injuring more than a dozen others. The explosion would predicate an oil spill of nearly unprecedented dimensions, putting thousands of people out of work and disrupting the ecology of the Gulf's coastal zone, perhaps permanently. Estimates of the peak flow of oil from the damaged wellhead over that period were highly politicized and necessarily imprecise, but best impartial technical estimates put the rate at as much as 60,000 barrels of oil per day (perhaps 200 million gallons when all is said and done), a quantity of toxic material that would drown hundreds of endangered species of birds and turtles, potentially poison the fisheries of the Gulf for a decade, and, after the application of highly toxic oil-dispersing chemicals, leave a layer of oil residue spread across the sea floor. Many instantly unemployed coastal fishermen, especially in the state of Louisiana, were turned into hazmat workers overnight, but only some of them donned protective gear when they joined in the cleanup effort (Wilson 2010; Lehner and Deans 2010).

Five years earlier, on August 29, 2005, Hurricane Katrina made landfall in southeast Louisiana. Though the Category 3 storm would pass with moderate immediate destruction, the levee system that maintained the city of New Orleans would suffer catastrophic failure leading to inundation of the city's poorest neighborhoods, especially the African American

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communities, resulting in perhaps as many as 2,000 fatalities. This unimaginable tragedy was compounded by the lethargic response of regional and national authorities. Beyond New Orleans, settlements in the coastal zone across the region were swept away overnight, with depopulation of the region ongoing today (Levitt and Whitaker 2009).

An apolitical view of these two events must insist them to be coincidental. Moreover, it might assert and highlight the inherently vulnerable nature of the region's geography. The Gulf zone of Louisiana is a low-lying coastal estuary in a storm-prone region, with stretches of land below sea-level, within a shifting flood zone, coincidentally near valuable oil reserves. In this sense, tragedy and disaster might be argued to be built into the landscape of the Gulf coast of the United States, an unhappy accident for its residents who, after all, chose to live there and benefit from jobs from its natural resources, especially including shrimping and oil extraction. A hurricane is an uncontrollable force of nature. The unfortunate failure on the drilling rig that predicated the recent spill – a product of poor inspection and a dead battery on a safety system, among other oversights – could have happened anywhere, moreover. After all, in 2009, the oil well's owner, British Petroleum, stated in its Initial Exploration Plan that "it is unlikely that an accidental spill would occur" and, in the event of an unanticipated blowout . . . "it is unlikely to have an impact based on industry wide standards for using proven equipment and technologies . . . " (Griffitt 2009, p. 14-4). An unanticipatable and unfortunate coincidence. Bad luck.

Such an assertion, geographer Brian Marks points out, requires ignoring the slowly but implacably established structure of vulnerability imposed on the region's coastline, economy, and ecology for the past century (Marks 2010a, 2010b). The economy of Louisiana, he points out, along with the funds that support the development and maintenance of its built infrastructure, are firmly rooted in oil receipts from off-shore drilling, as well as those from petroleum imports moving through the massive terminals constructed along the coast, along with concomitantly environmentally destructive industries stretched along the Mississippi River from Baton Rouge to New Orleans: gasoline, chemicals, and plastics. As a result, there is little or no political opposition to oil development, nor to the wholesale transformation of the Gulf coast that makes oil production and import possible: wetland drainage, canal dredging, levee construction, and settlement of working populations in low-lying areas. The things that make the gulf vulnerable to oil spills are precisely the ones that produce a coastal zone prone to flooding and storm destruction (Figure 8.1).

Simultaneously, Marks points out, the workforce of the region is largely un-unionized and vulnerable to turbulent fluctuations in the prices of both petroleum and shrimp, and exist in the margins of the global petro-food system. The benefits of these production systems, which include relatively cheap oil and a glut of seafood, accrue to consumers across the United States, but especially to investors and shareholders in distant locations, with little incentive to imagine and execute more sustainable reinvestment in the region's ecology and economy. The degradation of Gulf coast ecosystems is rooted in the marginal economic power of Gulf residents, even as their declining economic fortunes tie them ever more closely to a hazardous system of exploitation. Rather than an accident of geography, in other words, the global petroleum and seafood economies have produced *a geography of accidents*.

In addition to its own important, context-specific elements and insights, Marks' analysis fits into a larger body of political ecological theory: the degradation and marginalization thesis.

Figure 8.1 Environmental worker rescuing an oil-covered brown pelican (*Pelecanus occidentalis*) from Barataria Bay, Grand Isle, Jefferson Parish, Louisiana, USA, following the Deepwater Horizon oil rig in the Gulf of Mexico on April 20, 2010. Photographed on June 4, 2010. US Coast Guard / Science Photo Library.

The Argument

The degradation and marginalization thesis: otherwise environmentally innocuous production systems undergo transition to overexploitation of natural resources on which they depend as a response to state development intervention and/or increasing integration in regional and global markets. This may lead to increasing poverty and, cyclically, increasing overexploitation. Similarly, sustainable community management is hypothesized to become unsustainable as a result of efforts by state authorities or outside firms to enclose traditional collective property or impose new/foreign institutions. Related assertions posit that modernist development efforts to improve production systems of local people have led contradictorily to decreased sustainability of local practice and a linked decrease in the equity of resource distribution.

The theoretical underpinnings of this argument are several, and are laid out in greater detail in Chapter 3. They revolve, however, around two central assumptions that can be

quickly summarized, one regarding the reversibility of degradation and the second concerning the character of producer margins under conditions of accumulation.

Degradatiosn and reversibility

The first assumption is that *degradation* of environmental systems, especially after passing an undefined threshold, tends to require as much or more energy and investment to restore to its former state as was expended in its initial transformation. As outlined in Chapter 5, this model of degradation is not uncontroversial and specific ecological characteristics vary greatly between systems. Even so, in many cases, owing to problems of system resilience and hysteresis, degradation can have progressive momentum and be difficult to reverse.

Accumulation and declining margins

The second assumption is that with declining economic margins, especially under increasingly competitive global trade regimes and unregulated markets, costs and risks are passed downward to individual producers, who can be predicted to extract from the ecological system to balance their losses. The result is a pattern of *appropriation and accumulation* of natural capital, transformed into currency, at locations away from the site of production. When farmers cut their way into forests in order to increase production and offset tighter prices for agricultural commodities, the lost value of the forest (in ecosystem services or biodiversity) is understood to have been extracted from its location and accumulated on distant commodity markets, like bananas or coffee. Conversely, industrial inputs for production like pesticides or fertilizer are used with increasing intensity and cost, even while yields that result from these inputs continue to fall. In a world where the Net Barter Terms of Trade – the value of third-world commodities sold relative to first-world industrial goods purchased – fell to one-quarter its 1950 value by 1994, this model seems plausible (Spraos 1983; Sheppard et al. 2009).

The Evidence

This is not to argue that exploitation did not happen in the past or under other economic formations. Nor does it mean that traditional systems of social relations are non-exploitative or entirely equitable. Nor does it imply that all degradation is strictly a product of economic marginalization. It does suggest, however, that under conditions of increasing marginality and disruptive social change, especially where sustained economic exploitation is allowed, undesirable regional-scale ecological transformations ("degradation") tend to increase in momentum and become difficult to reverse. So too, declining environmental conditions can be expected first and foremost amongst the most marginal individuals and groups, driving increased extraction and placing greater demands on the ecosystem. The case study material supporting this assertion is extensive, though by no means without ambiguity. Three cases are instructive.

Soil degradation and cotton production in West Africa

The classic case of soil degradation is perhaps one of the most venerable of questions in political ecology, having inspired Piers Blaikie's (1985) canonical *Political Economy of Soil Erosion in Developing Countries*. Soil degradation is also a case that appears amenable to rigorous evaluation since soils and soil quality can be directly measured and the logics and actions of farmers are directly available to interviews and observation. So too, it is one that fits closely with logics emanating from the political economy of nature (Chapter 3); the idea that capitalist production tends to encourage mining of terrestrial soils is as old as the first volume of *Capital*, where Marx stresses the tendency to exploit both the worker and the soil (see chapter 3; Marx 1990, p. 638). This is strong stuff.

As a result, there is a growing body of research seeking to determine the impacts, if any, of increasingly globalized production of cash crops in vulnerable and historically marginal parts of the world, including West Africa. Cotton provides an especially attractive target for investigation. An export-oriented crop introduced under colonialism to countries like Mali, and one increasingly promoted for poverty alleviation around the world, high-yielding cotton varieties have high nutrient demands and are associated with widespread use of inorganic fertilizers and pesticides, especially relative to subsistence crops and even traditional or local varieties of cotton. Cotton draws suspicion, therefore, since it might be predicted that the flow of export value is merely a disguised form of soil nutrients and quality, spirited away from local producers, leaving West African soils and farmers more vulnerable, even while cotton traders and shirt manufacturers in distant capitals turn significant profits.

Some data and research point to precisely this process. The country of Mali made cotton exports a cornerstone of its development plan in the late twentieth century, providing and introducing high-yielding hybrid varieties of cotton to producers, creating parastatal monopolies over exporting and marketing, and coming to depend on cotton revenues heavily for state income (Moseley 2005). Over precisely this period, however, productivity of cotton yields began to fall precipitously, peaking around 1990 and continuing to fall in the early 2000s (Figure 8.2). This hints at soil fertility declines and structural disruption. Increasingly intensive cultivation and shorter fallowing cycles (less rest for the land) represent a kind of "soil mining," therefore, that depletes soil quality even as it increases cotton receipts and income (Van der Pol 1992). It also links to increasing pest problems resulting from intensification, with resulting increases in pesticides creating a chemical treadmill of inputs (Bingen 2004). As William Moseley's (Moseley 2005) farm-level soil analysis further demonstrates, poorer producers – who are most often blamed for soil degradation because of poor farming practices – have soil quality measures on their land no lower than those of wealthy producers. His work also shows that, despite lower levels of investment in fertilizer and other important inputs amongst poorer households, high-intensity practices in cotton production amongst wealthy households result in poor soil quality as well.

Careful examinations of quality in Mali, however, raise questions about the inevitability or universality of soil degradation under cash cropping in the region. Tor Benjaminsen and his colleagues (Benjaminsen, Aune and Sidibe 2010), notably, conducted an analysis of Malian cotton zone soils across the country and concluded that, relative to uncultivated land, land under cultivation or fallowing results in lower soil carbon and nutrients.

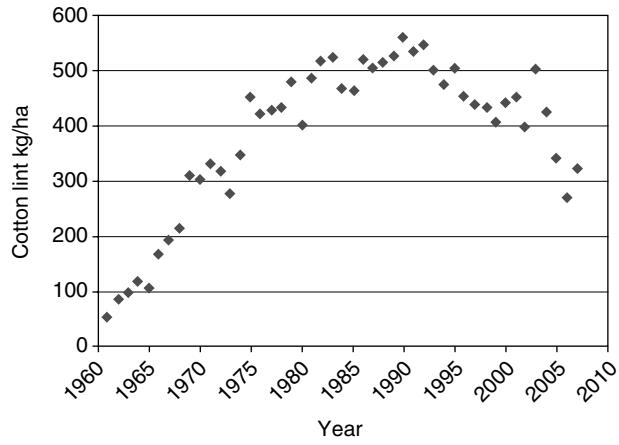

Figure 8.2 Cotton yields in Mali. Since the 1990s, the push for increased cotton production has resulted in declining returns. Why? *Source*: Benjaminsen et al. (2010), Figure 4.

Nevertheless, fallowed or rested land was in no way in better condition in this regard than heavily and intensely cultivated cotton soils. This is perhaps because, in ecologies like that of Mali, fallowing provides only nominal benefits for soil quality and recovery. Rather, Benjaminsen suggests, the decline in cotton yields is simply a result of extended cultivation in marginal lands and the limited availability of farm labor to sustain good outputs, though no analysis of these claims has yet been performed. Clearly the complex interaction of cropping, cultivation, markets, and the intensification and extensification of production in Mali eludes any simple link between marginalization and degradation of soils.

It is important to keep in mind that these data do not refute the tendency of diminishing profits and increased market incentives to lure producers to overproduction, in general terms. It does, however, raise questions about the degree to which this is a universal or inevitable phenomenon. It seems essential, therefore, to root specific claims about degrading economic forces in solid ecological evidence. It also invites us to reframe our questions with more humility: under what conditions does the engine of accumulation lead to soil exhaustion and what intervening practices, conditions, or variables influence such outcomes?

Amazonian deforestation

A second, equally emblematic, case of regional political ecology of degradation is that of deforestation in the Amazon. Without question it is one of the most prominent galvanizing images of environmental change in the past half century, in part because of the unprecedented rapidity of land cover change but perhaps more because the Amazon's historic metaphorical value gives it great currency as an ecological emblem. As Hecht and Cockburn (1989) phrase it in the beginning of their classic work on the question, *Fate of the Forest*, "what imbues the Amazon with such passion is the symbolic content of the dreams that it ignites" (p. 1). As a result, this area of tropical forest has received the attention of every

possible environmental and political community, and has become so highly contested that fundamental and immediate issues have often been obscured.

The region is steeped in misunderstanding for a number of reasons. First, the fantasies and romantic conceptual landscapes that European colonists brought with them to the Amazon, associating the unbroken tree cover with a pristine Eden, have become a basic part of colonization and settlement in the region, obfuscating the actual ecological processes of the forest and the practices of subsistence communities dwelling within (Slater 1996; Cohen 1999; Sluyter 1999). Second, careful controls over information historically exerted by colonial authority have allowed little good information out of the region for long periods, heightening an aura of mystery (Hecht and Cockburn 1989). And in the contemporary period, even when the crisis of the Amazon has been recognized as acute, misunderstanding has followed from a tendency of popular accounts to underestimate the long-term and large-scale effects of human impact, while overestimating the short-term ones. This has meant a focus on the cutting of trees at the local scale with insufficient examination of structural forces involving events and players in other places (Vandermeer and Perfecto 1995).

Despite this cloud of mystery, there is clear evidence of significant recent changes, even though the rate, extent, and reversibility of change are hotly debated. The period since 1975 has seen accelerating conversion of tropical forest canopy to grassland, fields, and secondary forest succession, with some 10.5 percent of the "originally forested portion" of the Brazilian Amazon deforested by 1991 (Moran 1993; Parayil and Tong 1998, p. 63). The losses are by no means ecologically trivial, moreover, and the uncharted diversity of the forest is clearly at risk.

Given the inherent monetary and non-monetary value of biodiversity in the forest, the romance of the forest and its Edenic associations, and the size and extent of the transformation, this change in land cover was unsurprisingly followed by an avalanche of academic and popular analyses. These attempted to heap blame for the transformation at the doors of the ignorance of poor farmers, the rapacity of cattle barons, the power of corrupt politicians, and the recklessness of multinational fast-food chains, most notably McDonald's. Population pressure also continues to be a favored explanation in some studies of this region and similar forests in the tropical Americas (Sambrook et al. 1999).

Political ecological explanation in the Amazon conversely seeks to uncover the underlying causes of the problem and rejects traditional Malthusian explanation, pursuing instead those forces conceptually and geographically far from the site of tree-cutting, upwards along the chain of explanation from the local to the global. In the process, a political ecology of the Amazon stresses the context within which tree-cutting occurs and the relationship between the disempowerment of marginal communities and the loss of tree cover.

Some of the earliest and most forceful political ecological analyses of the Amazon that followed this line of explanation were also some of the first to lay claim to the moniker of "political ecology." Schmink and Wood's "'Political Ecology' of Amazonia" (Schmink and Wood 1987) and their later *Contested Frontiers in Amazonia* (Schmink and Wood 1992) both confronted the socio-political system of Amazonian deforestation and addressed the problem in terms of surplus accumulation. Using an explicitly materialist interpretation that drew attention away from individual tree-cutters and towards struggles for control of the forest between powerful groups, they argued that as class stratification increases under conditions of market expansion, an increasingly hierarchic arrangement of groups will

struggle over the "surplus" that comes out of the forest, inevitably overextracting. As indigenous groups and small producers are drawn into market economies, which tend to organize the flow of capital into the hands of investors, landowners, and non-residents, people who have resided in the forest for generations with techniques of sustainable production are pushed aside by settlers and land buyers. Fundamental imbalances in landholdings emerge along with falling commodity prices, causing the marginal producers on the smallest landholdings to "overcrop" and cut forest disproportionately. Credit systems, middlemen, and commercialization of agriculture further reduce household margins, resulting in yet more intensive clearance. Where the state is involved, it serves the interests of elites, opening land settlement on the territories of indigenous communities, and, especially, encouraging land clearance for pasture (Schmink and Wood 1987, 1992). Degradation follows this process of enclosure and modernization, in turn driving more intense extraction: classic political ecology.

In a similar vein, Hecht and Cockburn's *Fate of the Forest* also turns attention away from stories of rampant deforestation by the poor and explains the ecological problem to be fundamentally one of justice. Their research expands upon, but also challenges, the narratives of structural political ecology offered by Schmink, Wood, and others. Certainly patterns of control and accumulation are significant, they argue, but the notion that "global capitalism" or distant hamburger consumers are the driving forces in Amazonian forest decline is oversimple. In particular, their account rejects the notion that export markets for cattle and other agricultural commodities are driving degradation. In 1990 only about 15 percent of Brazil's beef was exported, for example, and logging was centered most heavily outside of Brazil's Amazon. Moreover, debt, a common political ecological explanation, also has a tenuous connection to deforestation; many forests were cleared long before Brazil accumulated debt. So too, subsidized credit for cattle had only a limited effect in the region; roughly 10 percent of Amazon holdings required credit.

Instead, Hecht and Cockburn focus on the geopolitical strategies of the Brazilian state, directed by the ruling military elite, joined to a local entrepreneurial class, which rapaciously enclosed the Amazon in an effort not only to promote economic growth, but to control an unruly and revolutionary populace, providing land and labor in a series of enormous projects and land settlements. With each fitful enclosure, instability over property increased while returns from investment decreased, prompting episodes of land clearance. This process was less a series of economic decisions by atomized peasant producers than a protracted and ongoing war against indigenous communities, impoverished placer miners, petty extractors, and rubber-tappers, whose expulsion from the forest was prerequisite to control. The conflict was propelled by land speculation in a highly unstable national economy, encouraging land clearance to establish hegemony (Hecht and Cockburn 1989). Marginalization is again central to the explanation, but in a very different way: deforestation is the outcome of state-directed class war.

These themes and counter-arguments continue to be pursued in more recent research on the question, with attention given to specific land, labor, or market dynamics that drive tree-cutting at the local scale. In examining the pressures on household-level tree-cutting, for example, recent research on cattle-related impacts has demonstrated the disproportionate share of forest clearance attributable to wealthy, non-resident, elite, large landholders (Walker et al. 2000). Large markets for tropical hardwoods, state tax holidays, and generous licensing practices have also paved the way for an exponential growth of sawmills through

Box 8.1 Dark Struggles in Hecht and Cockburn's *Fate of the Forest*

Political ecologists don't write very well. For some reason, people at home in colonial forestry archives or East African millet fields can't seem to master simple phrasing and good anecdotes, nor convey to a broader audience the importance of the problems that they take so seriously. The implication of this failing is that political ecologists are not widely read and when they are read, they are not well understood.

Not so Susanna Hecht and Alexander Cockburn. *The Fate of the Forest* (Hecht and Cockburn 1989) is good political ecology but it doesn't read like political ecology; it is swift, organized, and urgent prose.

The book's project is a familiar one – to dispense with apolitical explanations of Amazonian deforestation and implicate instead political economy and the complex, coercive, and violent history of the region. Along the way, Hecht and Cockburn skewer the myths of Amazonian deforestation: that it is driven by logging and North American hamburger consumption. Rather, they demonstrate the violent subjugation of the region by local elites (first colonizers, later autocratic military leaders) chasing rubber receipts and minerals, resulting in rapacious ecological destruction and the mass murder of indigenous people. The pervasive feeling of the book is one of violence, therefore; even the photographic plates, which, besides showing farms and denuded vegetation typical of political ecology, also show generals and mass graves. The Kayapo Indians and local rubber-tapping producers of the forest become heroic in the account, not simply for saving forests, but for fighting against an industrial/military machine that has historically held a monopoly of force and shown a willingness to use it.

All this frank and direct writing should be unsurprising considering the authors. Cockburn, a long-time journalist and well-known radical writer, is now coeditor of the internationally read muckraking magazine *CounterPunch*. While Hecht's research history resembles traditional cultural and political ecology more closely – trained at Berkeley in geography, her own publications on ethnopedology and pasture dynamics were pioneering "takes" on deforestation and alternative management strategies – her work also embraces Latin American novelists. Both are trained to write.

Many of the details in this book have become dated. Logging has in fact become a more important part of Amazonian land use and land cover change since the book was written. So too, complex patterns of forest regrowth in some areas are an important ongoing dynamic that has only become evident in the last few years. Second- and third-wave migration into the frontier is also changing the nature of land cover transformation. But the power relations that Hecht and Cockburn lay bare remain as persistent as ever.

This book should be required reading for any researcher attempting to communicate their findings. By putting the record straight, by conveying human and ecological tragedy in plain terms, and by showing the baldly violent nature of ecological struggle, *The Fate of the Forest* is a model. The question remains. Why can't the rest of us write this well?

Figure 8.3 Deforestation in Brazil, aerial view of a large soy field eating into the tropical rainforest. Photo © Frontpage / Shutterstock.

the 1990s. While marginal farmers have continued to procure land in the region, these communities act as stressors rather than forces, settling in the wake of an increasingly mechanized forest extraction regime enabled by the state (Parayil and Tong 1998).

While this research powerfully substantiates rejection of apolitical approaches to the issue, it is not without problems. Specifically, degradation and marginalization research in the Amazon, even in its recent, sophisticated, and multi-causal form, depends upon a model of ecology that is increasingly being called into question. This traditional political ecology stresses the catastrophic and permanent character of the crisis, and the need to identify "the root causes of this *irreversible* environmental change" (Parayil and Tong 1998, p. 63, my emphasis).

Over the past few years, however, regrowth of initially deforested areas has been observed in many areas. While ecologists have historically emphasized the acidic nature of rainforest soils and the thinness of the soil horizon – conditions that lead to leaching where nutrients crucial to forest regrowth are lost – recent field studies have shown that some areas are suitable for secondary succession of forests much like those lost in initial cutting. In particular, the Alfisols of many Amazonian sub-regions can sustain clearance and abandonment, with rainforest recovery following disturbance, depending on the land use in the period after clearance (Lu et al. 2002). Cyclical patterns of cutting, settlement, and abandonment suggest that current rates of deforestation may not be permanent and that in many areas canopy will be restored. This merits some reconsideration of the "crisis" narrative of Amazonian political ecology, since extraction may not lead inevitably to the permanent degradation of the land and immiseration of its residents.

Having said this, the general processes and long-term nature of Amazonian deforestation are fairly well established. Regrowth of disturbed forest is extremely difficult, especially

on the dominant Ultisols and Oxisols of the region. Traditional extraction regimes, rubber-tapping, and swidden systems are considerably less demanding on succession than intensive grazing regimes. The final straw, wholesale conversion of forest land to intensive soybean cultivation for global export, represents long-term and profound degradation of diversity and ecological services, including land converted from traditional and local control. The relationship between the marginalization of local Amazonian communities and the destruction of forest is by no means a simple one, but it is a pressing issue.

Contract agriculture in the Caribbean

The rise of increasingly contractualized agricultural production systems in global food and cash crop trade provides another extremely compelling test for the degradation/marginalization thesis. In general terms, the increasing contractualization of agricultural sales, where a grower makes a crop agreement in advance with processor, buyer, or exporter, involves a surrender by the local producer of some measure of power and resources to the larger firm. Minimally this may assure some a measure of security to a producer in a turbulent global market. It also means, however, increasing concentration of capital and power at a higher level in the agro-food chain, turning farmer owner-operators into something akin to wage laborers (Pred and Watts 1992).

The pressures that such contractualization places on producers to grow specific kinds of products in specific quantities can be predicted to give rise to marginalization, since the grower loses control of labor-time allocation and autonomy. It might also be predicted to lead to land degradation, since the intensity of cropping and inputs are set by off-farm interests with little direct knowledge of farm-level conditions. Its general coincidence with the rise of cash crops over food crops might also be predicted to lead to food scarcity in exporting countries. These conclusions are reinforced by national-scale research around the world (Goodman and Redclift 1991).

These conclusions are further supported by more detailed political ecological analysis at farm level. Working in the highlands of New Guinea, political ecologist Larry Grossman demonstrated the way in which increasing cash-oriented agricultural activities in the 1970s, including cattle-raising and coffee-growing, led to declines in food security with baneful results during market busts in the 1980s. With increasing integration into highly variable regional and global markets, subsistence risks increase, especially for more marginal households, whose marginality itself developed from the economic stratification following the growth of a cash economy (Grossman 1984).

Yet Grossman's later research work on banana production in the Windward Isles of the Caribbean demonstrates the subtleties and complexities of political ecology and agricultural production, and shows that global generalizations can prove misleading. The case of eastern Caribbean bananas might appear, at least at first peel, to be open and shut. The central cash crop export of these islands is the banana, an industry originally introduced by British colonizers to islands like St Vincent, where Grossman performed his research in the late 1980s and early 90s. The St Vincent Banana Growers Association, a statutory corporation designed by the government to help purchase chemical inputs and facilitate

marketing, mostly to buyers from the United Kingdom, further supports the crop. This support and integration of individual producers, who contract delivery of banana harvests, has had a large effect on the regional economy. The value of banana exports from the island rose from 10 million to 80 million Eastern Caribbean dollars (currently 1 US$ = 2.657 EC$) over the period between 1970 and 1990.

The pieces are all in place to predict several detrimental political ecological effects, including the proliferation of chemical input hazards, the marginalization of smaller producers, and the stratification of rural communities. This is also suggested by the decrease in food crops at the expense of banana crop expansion; while banana exports grew over the period, food imports expanded in exact parallel, implying the displacement of food by bananas.

Despite the fact that food imports and banana exports on St Vincent are directly parallel, however, Grossman concludes after intensive fieldwork that there is no strong evidence to support the idea that cash crops are directly displacing food crops or leading to an increase in environmental degradation in the form of erosion and pesticide misuse. Bananas do not interfere with food crop labor demands; labor is in short supply, but is increasingly lost to time for education and, in addition, most laborers prefer to work in less demanding banana-related labor activities than in land preparation associated with food crops. Nor do these cash crops significantly displace land for food crops; intercropping of food crops and bananas is typical and indeed improves the growth of bananas. This further increases the efficiency of chemical input usage, since field preparations for food crops tend to discourage runoff more effectively than monocultural banana field preparation. This is especially true of the most marginal holders of the smallest farmsteads, those whose steeply sloping fields must be intercropped with food crops and bananas, thus encouraging the production of local foods and reducing excess chemical input inefficiencies. The poorest households are seriously affected by overall labor shortages, but these equally hinder food and banana cash crop production. The extension of banana markets and their encouragement in the Windward Islands are making neither the poor any poorer nor the land less productive, at least not in the near term (Grossman 1993).

Having said this, the fragility of these outcomes is clear. Here, relatively secure and stable marketing conditions from the grower's point of view were held together by the complex relationship between the Windwards, its former colonizers the British, and Geest Industries, a transnational banana firm. Recent World Trade Organization rulings against the European Union's preferential licensing for banana importers, it appears, have annihilated many of these gains. Indeed, a return to the case area less than a decade later reveals that the sustainable banana system Grossman observed had been decimated by changes in trade rules, leaving farmers more desperate than before and production systems drifting towards far less sustainable practice (Klak et al. 2011 (forthcoming)).

The case of eastern Caribbean contract farming therefore shows that marginalization and degradation are by no means necessarily and absolutely linked, at least at all times, and that conjunctural forces, especially state policies and trade conditions, are crucial to understanding specific political ecological outcomes. More to the point, it demonstrates that political ecological analysis need not only demonstrate degradation, but can also explain the absence of degradation, especially where industries that are encouraged and protected by the state can engage with the global market on terms more equitable to producers.

Box 8.2 Seeking Balance in Grossman's *The Political Ecology of Bananas*

Larry Grossman's research on bananas in St Vincent in the eastern Caribbean is unusual because it has a happy ending, at least sort of. Somehow, in their integration with international banana markets through contract farming, Vincentian farmers are able to provide food for themselves while increasing cash from crop sales.

This stands in marked contrast to the results from Grossman's previous work in the highlands of Papua New Guinea in the 1970s. There, examining the impacts of the introduction of coffee production and cattle-raising on a village community, he demonstrated the decline of subsistence resources in the wake of market integration. People's food security tended to deteriorate with the advent of new cash crop markets, despite the promise of plenty that free-market advocates suggest.

But whereas villagers in the highlands of New Guinea were producing for "open markets," peasant banana farmers on St Vincent were working under a system of contract farming, mediated through a powerful state producers' collective. The case is interesting because it raises the issue (and the possibility) of positive state intervention into peasant production, allowing for more humane and sustainable outcomes, as well as addressing the issue of how individual households creatively balance their labor to make a sustainable living. This allows political ecology to explain not only why some systems fail, but also why some succeed.

He noted in 2002 that his research "was not intended to generalize . . . that the impacts of global capitalism on local communities in developing countries are positive." Rather, the outcomes result from "specific environmental, historical, and cultural circumstances, the nature of the Vincentian state and its welfare tradition, as well as a protected market in the United Kingdom and periodic infusions of British aid."

In writing about farmer strategies and adaptations, Grossman also sought a more "balanced" form of explanation, between highly local social and environmental details on one hand and more broad-scale political economic driving forces on the other. As he explained:

> Political-ecological studies [tend] to be sophisticated in the analysis of the political-economic dimension, but weak in relation to the analysis of what cultural ecologists emphasized – the details of human–environment interactions and patterns of resource use. The environment is more than a malleable entity molded by human activity; rather, it has significance . . . My argument was not that the environment is more important in our explanations than political economy, but that the former has not received the attention that is warranted in political ecology. (L. Grossman, personal communication, 2002)

In not assuming that social/environmental disaster is a foregone conclusion in political ecology, and by balancing local environmental details against larger policies and markets, Grossman shows a way to make political ecology relevant and useful.

Evaluating the Thesis

A review of some evidence suggests that there are several challenges facing this ambitious thesis. The impacts of "traditional" pre-capitalist or non-capitalist forms of land use, for example, raise several questions. In Mali, notably, fallowing may not provide soil benefits, no matter if the soil is under traditional food crops or high-value cotton. Similarly, in Amazonian forests, land clearance in traditional subsistence production can have significant impacts on land cover, even in the absence of fully capitalized and market-integrated production. New research on human impact in Amazonian forests, for example, seriously calls into question Schmink and Wood's bold assertion that "subsistence societies, whose activities have only a minimal impact on the natural environment, approximate steady-state economies" (Schmink and Wood 1987, p. 41).

So too, an under-specification of what constitutes degradation, whether it be loss of diversity, loss of productivity, loss of usefulness, etc., leads to overgeneralized evaluations of both contemporary change and the metabolism of earlier societies. Is reduced carbon and nitrogen (as per Benjaminsen et al. 2010) the best or only test of soil quality in Mali? Likely not.

The serious introduction and consideration of regional environmental variation and variable state policy also make universal assertions problematic. Grossman's analysis of contract farming in the Windward Islands is a good illustration of this. All the conditions for predicted marginalization/degradation linkage appear to be in place: colonial and postcolonial cash-crop introduction, state-sponsored input subsidies, falling food production statistics, increasingly contractualized farming systems. On careful analysis, however, the system shows relatively sustainable and equitable outcomes (relative to many other cash-crop-producing areas, in any case). But even this outcome is questionable, insofar as these outcomes can be erased through a change in trade policy, with soils and farmers suffering as a result.

To sum up, there is a logical as well as empirical relationship connecting social processes of declining income, reduced landholding, and decreased security to ecological processes of species invasion, soil fertility decline, and forest biodiversity loss, even while simple and linear relationships are somewhat elusive. Amazonian forests are cut by marginalized settlers under market constriction, but with varying rates and trajectories of possible regrowth. Contract farmers do replace food crops with cash crops and utilize high-cost and soil-exhausting high-energy inputs, but only where the state and parastatal organizations poorly negotiate the terms of collective bargaining.

This raises some further questions about generalization in political ecology. Not all cases fit neatly into the simple pattern of degradation and marginalization. Careful examination of the specific policy environment and ecological conditions of production seriously complicates the general model as well. Does this condemn political ecology to a role as a descriptive idiosyncratic science? Does case study analysis only illuminate exceptions, rather than rules?

Clearly not. What research in the field has revealed are the *processes* and operating *influences* that link degradation to marginalization, while demonstrating the configurations (in terms of ecology and power relations) under which these linkages are most likely, including conditions of available labor, crop diversity, land markets, and non-domestic species

growth. The absence of degradation and marginalization patterns in St Vincent, for example, was specifically the product of state politics, local production patterns, and economic relationships with former colonial powers. As time proved in the Caribbean banana case, temporary confluences of conditions that resist the tide of degradation can give way in short order, with changes in the terms of trade or the legal structure of cultivation.

The question is not, therefore, to "prove" that degradation and marginalization coincide; they commonly do, and with effects that have a profound influence on *who gets to eat* and who does not, *who is forced to migrate* and who is not, and *who controls the labor of others* and who does not. Rather, the degradation/marginalization thesis is less a "generalizable" theory of some kind than an analytical framework in which to approach a problem. Cases where degradation and marginalization do not occur require explanation in the same way. By approaching the problem from a perspective that connects markets to hillslopes and trade policy to intercropping, it is indeed possible to make prescriptive claims about the conditions that make market integration sustainable and that do not lead to degradation and marginalization, specifically where there are strong collective contracting arrangements and state subsidy.

Even where the jury remains out on poverty and environment relationships, therefore, it is only through more detailed, ecologically rigorous, and politically contextual analysis that answers will be found. More comparative work, therefore, will yield insights, but also there is a need for the continued expansion of individual case research. The work has really only just begun.

Research Example: Common Property Disorders in Rajasthan

Operationalizing research in this area is by no means a simple matter, however. Methods vary dramatically, as do the social, economic, and environmental conditions under which research is done. I offer the following example from my own work to demonstrate the possibilities and pitfalls in marginalization/degradation research.

The research focuses on pasture and forest management in Rajasthan, India, a semi-arid state in the northwestern part of the country, where large areas of land have not been settled for agricultural development, and grasslands and savanna scrub are crucial parts of agrarian production, providing inputs into a pastoral sector that is enjoying unprecedented growth. Many experts and state officials, however, suggest that pasturage and forest resources are being destroyed in a free-for-all tragedy of the commons and that only state intervention and enclosure can preserve the lost productivity of this desertlike region. They draw attention specifically to overpopulation, chaotic and selfish producer behavior, and poorly organized practices, which need regulation by the state.

The degradation and marginalization thesis in political ecology would point analysis in an altogether different direction, however. One would be forced to ask: (1) What rules continue to exist to manage these systems? (2) Are they changing? (3) Are these changes and failures a product of increasingly impoverished producers overextracting to offset losses and tighter margins or are they related to cultural transformations in perceptions of authority, or both? (4) What differences do management, enclosure, or other rules systems make? Do they really matter ecologically? Is there evidence of degradation?

The work was conducted during the winter and dry season months of 1993 and 1994 in 28 villages in the western part of the state. Three of those villages were singled out for more intensive histories and interviews, while 34 sites within those three villages were analyzed to assess variation in ground cover and tree frequency, testing to determine whether people's responses to authority influenced their behavior and whether, in turn, their behavior influenced ecological conditions.

The specific research methods required for this work were as follows:

- Elicit the range of accepted rule systems and their variations in village geography.
- Record the actual ecological practices of people across these variations and determine the reasons and motivations for differential practices (cutting, grazing, etc.) and adherence to rules.
- Test to determine whether ecological variations followed from behavioral/institutional variations.

Each of these research tasks could easily fill its own methodological volume, but this account will be limited to just some considerations, successes, and failures of each in order to reflect the complexity of doing this kind of work. In discussing these, I hope to show that the concepts of marginalization and degradation do submit to empirical analysis, but not in any straightforward way.

Eliciting rules of use

The first task, determining the rules of use in the region's villages and their spatial patterning, was a terrific challenge. This is because many of the residents of the region had different knowledge and memory of the landscape and differing views on the legitimate systems of rules – what you can and cannot do on different parts of the landscape.

The problem was compounded by issues of caste, an important part of social reality in rural Rajasthan. As it was, I entered the field initially with a fellow researcher from a local university who was himself a member of a traditionally marginal caste: the *meghwal*. Historically a leather-working caste, they are today one of many smallholding peasant communities of the desert. Many doors opened for us as we traveled together. People, especially those from the poorest families, were eager and interested to relate their accounts of traditional and modern systems of management.

Research proceeded by listing the various kinds of land management rule systems that prevailed in each village. This was rarely a straightforward matter, and asking direct questions like "What rules are there here? Where do they spatially begin and end?" is simply absurd, nor does it make sense in the local *marwari* dialect. Instead, we used a mapping technique in which we asked what behaviors were allowed in various areas and what would happen if someone cut trees, grazed animals, or collected grasses from one area or another. We recorded almost a dozen different forms of rules, all varying not only in their form but also in the differing sources of authority behind each, and roughly mapped their outlines in several village clusters.

This was supplemented by formal surveys that queried the available assets of households, the major uses household members made of community lands, and the variation in

community land demands over the course of the year. This last query was of particular importance since desert ecosystems are highly variable in productivity from season to season, and household strategies tended to vary from month to month. Rules also varied greatly, and many rules that were important during the rainy season, banning grazing on fallow lands, for example, were irrelevant during the dry season.

Silent conflicts and distrusts emerged between elite high-caste communities and ourselves, however, which often waylaid the work. Not only was my research assistant unable to enter some houses, the location where we slept at night also became implicated in the research, reducing the number of reliable conversations we could hold. Before more extensive interviewing could begin, I was forced to hire an additional research assistant from an elite *rajput* family and we all began to sleep in the shed housing the engine for the public tubewell, since it was a location viewed as socially neutral by all parties. The reliability of many of our earlier interviews (some two months of work) must, in retrospect, be treated as suspect.

Recording environmental practices and response to authority

The second task required us to observe and record the actual land uses that people practiced in the varying institutional areas. This meant not only long interviews but also days spent following goats, collecting fodder grasses, and otherwise engaging in the business of the subsistence environment. Much of the detail recorded in this process, including information on how grass is stacked to prevent rotting, how leaves are processed for fodder, and how to convince a goat to go in one direction rather than another, was never used in analysis but proved important to our overall understanding.

As work proceeded, it became clear that formal, written rules in some areas were consistently violated while in other areas they were definitely not. Some communities were inclined to break some rules but not others. These different responses were consistently linked to local social position, wealth, and caste connections. Rules mattered, though in ways influenced by informal institutions and power.

Even so, this incredible variation of practices presented problems for analysis, as did the obviously variable motivations of people in choosing one action over another. Some days, individuals choose not to herd animals on public land to which they were entitled, for example. Why? Perhaps because of the proximity of the land to the house of someone to whom they owe money. Perhaps because they associated the area with some bad luck in the recent past, like a sprained ankle. Given the necessarily small sample of households and the large areas involved, separating individual motivations from more general patterns of response was extremely difficult, and sometimes frankly impossible.

Determining ecological outcomes

To test whether any of these forces mattered in terms of land cover, we sampled 34 sites under four different institutional types, each representing a different kind of village authority reported in the village surveys and conversations – sacred groves, private land under limited collective access, village commons, and land under state forest department control.

The problem of control was paramount. Sites were selected to be similar in as many respects as possible, in terms of slope, aspect, and other ecologically significant factors. Fortunately, except where large dunes dominated, such sampling issues could be taken into account. Even so, the challenge of turning a complex landscape into a clean grid for sampling proved to have some uneven results and sometimes required judgment calls in sampling design. It was necessary not only to sample ecological variation in a spatially stratified and random fashion but also to make sure the areas sampled were ones where we understood the rules of use and the actual behaviors of local producers in those areas. This limited our sample to a great degree.

We measured the intercept of herbaceous cover and specific species classes, in centimeters, along 100-meter transects at each site, laid in a random direction, from a point located by a grid overlaid on a local map, using a deck of cards. We also formed alternating quadrants along the length of the transects to record the presence or absence of specific species. This technique follows accepted practice for land cover analysis typically used in the region (Shankanarayan and Styanarayan 1964). The logistics of this operation, however, in an area used for subsistence production, were appreciable. On many occasions our plastic transect line was dragged away by grazing sheep and camels. Maintaining consistent recording required using the same small team for several jobs in relatively distant areas. The measurements were as consistent as possible under the conditions but, in retrospect, the sites were too few and too inconsistent for such study, and were I to conduct it today I would significantly increase our coverage.

Our results, which used a multivariate regression to explain the variations in land cover we measured, point to some reasonable conclusions. We did indeed find a significant relationship between the type of rules/institutions in place (grove, fallow, enclosure) and the total cover of herbaceous species, the frequency of trees, and the coverage of desirable perennial grasses, controlling for the density of livestock in the area, the distance from the village center, and soil conditions.

What the results further suggest, though it is inadequately reflected in the data, is something that local people hold as a general truism: degradation of local resources is a simultaneous product of increasing dependency of the poorest households on dwindling common property resources, and the differential power social elites have in controlling resource access and rules of use. State interventions, in the form of forest enclosures, can be enforced to hold off degradation, especially if local people are given a stake in protecting them, but such a stake commonly takes the form of direct employment or subsidy. While some traditional systems thrive, like those regulating public access to private fallow land, other systems, like traditional sacred forests, are seriously endangered by economic and social changes.

Our work also showed that the increasing marginality of many low-caste communities also caused disaffection with traditional management and, in some cases, a limited adherence to new rule structures. The most elite families, on the other hand, were the least likely to follow traditional rules, like those against tree-cutting. These effects were further complicated by gender, since women were disproportionately likely to follow the traditional rules against tree-cutting in sacred forests but disproportionately likely to break the rules in state controlled forest areas. Degradation and marginalization are interrelated, but mediated by local power relationships between men and women, and between the rich and the increasingly poor.

What such results do not reveal, even with the weight of their accompanying statistical evidence from surveys and transects, are the vagaries of field-based work, including the local politics of questions and answers in a socially stratified context, the problem of representing varying points of view and accounting for idiosyncratic behavior, and the variability of ecological systems in semi-arid environments. These are all too infrequently reported in political ecological work. In marginalization and degradation research, which requires talking with people, measuring landscapes, and determining motivations under highly charged political conditions, such vagary and variability are inevitable; they simply demand more explicit consideration than they usually receive.

Chapter 9

Conservation and Control

- The Argument
- The Evidence
- Evaluating the Thesis
- In the Field: The Biogeography of Power in the Aravalli

If environmental degradation is often associated with the marginalization of poor subsistence communities and working people, it might be logical to assume that conservation and preservation of environmental systems, resources, and landscapes are commensurate with community sustainability and the protection of livelihoods. This has proven far from true, however, even and especially where such communities are deeply implicated in environmental management and ecosystem maintenance. The case of Africa is superlative in this regard.

The plains and forests of east and southeast Africa have long been considered environmental wonders and justifiably received the attention of the world community as extraordinary and important sites of faunal diversity and complex ecosystem interactions. The annual rhythmic migration of the wildebeest across Tanzania's Serengeti and the dominant predators of the region, including lions and leopards, are globally famous. Masai Mara Game Reserve and Amboseli National Park in Kenya are two of the most heavily visited parks in the world, with rhino, elephant, and lions attracting thousands of visitors annually and hundreds of millions of dollars of tourism receipts. These gems of African ecology are heavily conserved and managed with an eye towards protecting a dwindling environmental resource.

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

Yet the management of these parks is fraught with conflict. Local people in the Serengeti trespass in park boundaries with livestock, hunt illegally, and steal wood. Why can't local people "get with the program"?

Apolitical ecology would direct attention to two factors, population growth at the park boundaries and the inherent tragedy that emerges from producers seeking individual good at collective costs. Greedy herders, in such an account, stand to gain by grazing animals in protected areas, for example, with costs borne by the state and the public more generally. The number of these invaders grows annually, since Kenya and Tanzania have annual population growth rates of 2.0 and 2.3 percent respectively.

Yet to approach the problem this way is flawed. First, it entirely ignores the problem from the point of view of local residents, who see the conflict in terms of lost ancestral resources and the risk that wild animals pose for human survival. Moreover, it overlooks the role of colonial authority in establishing and inventing the conservation tradition in the region. Perhaps most fundamentally, however, to approach the problem apolitically is to ignore the degree to which the traditional residents of the region have historically acted to help create the very "wilderness" that outsiders seek to preserve in their *removal*. So too, it means overlooking the way in which the aesthetics of the "wilderness" landscape, devoid of people, farms, and cattle, are entirely imposed by political authorities from outside the area. In sum, the problem may productively be seen as one of control over access, aesthetics, and landscape production – political ecology.

In East Africa, such analysis has been revealing. Roderick Neumann's detailed account of nature preservation in Africa, *Imposing Wilderness*, investigates the "national park ideal" and the political apparatus that enforces it in Tanzania. Through detailed historical analysis and village study around Arusha National Park, Neumann establishes not only the congruence of modern conservation with coercive colonial administration, but further shows the way that the very idea of wilderness, as an aesthetic sensibility formed in non-tropical England and Germany, has been enforced at the expense of local livelihoods and the integrity of the ecosystem itself. Wilderness conservation has turned complex cultural-environmental landscapes of *production* into commodified landscapes of tourist *consumption*, where environment and society are artificially partitioned at the expense of social and ecological sustainability.

Neumann, moreover, shows that the conservation tradition and the actual territorial boundaries of the Arusha park itself are rooted in the colonial occupation of the region, first under German and then British administrations. Arriving in the nineteenth century, these governing authorities established coercive land control measures in the Tanzanian region of Mount Meru, extirpating indigenous land use practices by the Meru people who had herded and cultivated the area in and amongst wild animal populations for 350 years. These traditional human land use practices, coupled with seasonal rainfall patterns and the herbivory of wild species, actually gave rise to the biocomplex landscapes of the region, which would later ironically be enclosed to protect them from people (Neumann 1998).

Moving the Meru people into the mountain country, settlers were given control of the plains, even while many upslope regions were placed into forest reserves, where African settlement, herding, hunting, or collecting were forbidden, reducing traditional migrations and other land uses. These restrictions further evolved into strict rules for the protection of wild fauna, directed by aristocratic game hunters, and wildlife game wardens were given stronger police authority in the area throughout the twentieth century (Neumann 1996).

Together, these evictions and enforcements drove the native populations into smaller and smaller areas of settlement, simultaneously robbing them of their rights to traditional methods and practices of subsistence. Equally importantly, by removing the Meru the colonizers had constructed an Edenic "wilderness" of their imagination, a land without people, which had actually *never existed before*.

When it formally emerged, Arusha National Park followed the outlines of previous game reserves closely, establishing a state-controlled, non-human, management zone for the use of visiting tourists, in place of what had been Meru grazing commons a century before. But it was now supported by a global conservation discourse, which clung to a story wherein dwindling global commons (biodiversity and wildlife) demand protection from rampaging human activity. The resulting conflicts and acts of resistance on the part of local people, including cattle-trespassing and wood collection, did not appear to the world community, therefore, as local land users attempting to re-establish control over the land or their rights to production. Instead these came to appear as greedy and irrational acts of uneducated locals poaching from the collective good. Efforts to gain access to the park for subsistence did not appear as a return to the integrated human–environment system of the nineteenth century, but instead as an invasion of people into a non-human wilderness (Neumann 1998).

More recent efforts in Tanzania have sought to reduce conflict by better redistributing the fruits of tourism development to adjacent local communities through formal state programs. These promise no return of traditional land rights in the park to the communities who historically lived in the region and who revere it for deeply symbolic and culturally important reasons. Nor do they provide any sort of challenge to the artificial division of nature and society, created in colonialism, which prevails in the commercial marketing of wilderness to foreign tourists. As Neumann points out, however, it is a first concession by the state to local livelihoods and it underlines the troubling fact that conservation is not only about control, resources, and receipts, but also about meaning, symbols, aesthetics, and the way we imagine nature "ought" to look (Neumann 1998). This well-crafted research and its convincing conclusions are typical of a second thread of political ecological investigation and argument, centered on conservation as control.

The Argument

The conservation and control thesis: control of resources and landscapes has been wrested from local producers or producer groups (by class, gender, or ethnicity) through the implementation of efforts to preserve "sustainability," "community," or "nature." In the process, officials and global interests seeking to preserve the "environment" have disabled local systems of livelihood, production, and socio-political organization. Related work in this area has further demonstrated that where local production practices have historically been productive and relatively benign, they have been characterized as unsustainable by state authorities or other players in the struggle to control resources.

The argument draws upon four fundamental theoretical foundations. First, it reflects a view that conservation reflects a form of hegemonic governmentality. Following Bryant (2002), the term "governmentality," borrowed from the work of Foucault (1991), defines a condition where consent of the governed is obtained through social technologies (e.g.,

conservation game reserves) and rule is self-imposed by individuals through methods of social institutions. These technologies and institutions enforce not only what people can do (rules), but also what goals and behaviors are considered socially desirable (norms and expectations) and what ecological outcomes are appropriate in the first place (aesthetics and ethics). Second, the argument depends on a growing understanding of traditional resource management strategies as institutional systems, where rules govern extraction without necessarily strong state intervention or individuated property rights. Third, it draws upon the notion that wilderness – as an imposed ideal and a produced material reality – is a social construct, specifically taking the form of nature without people. Fourth, the thesis reflects an increasingly prominent understanding of conservation territories, as bounded, regular, polygons, as ecologically and socially problematic, and inadequate to meet the goals of preservation either of wildlife or of livelihoods.

Coercion, governmentality, and internalization of state rule

The history of conservation clearly reflects elements of coercive statecraft. In an obvious example, the paradigmatic national park, Yellowstone, was managed by the US military up until 1916 when the Parks Service was formed; contemporary Parks Service regalia and uniform are indeed designed to recall that military heritage. So too, traditional native community users of the area, including Shoshone, Crow, and Blackfeet tribes, were all placed on reservations in the period just prior to the park's establishment. In colonial contexts, like Tanzania's Mount Meru, these coercive histories are all the more evident in that they continue to engender conflicts over land claims. Territorializing conservation space and controlling surrounding communities are central and primary goals in the history of environmental conservation.

Such state coercion is understood to extend beyond simply enforcing conservation rules, however. Rather, efforts center on extending the discretionary conservation power of the state by causing individuals and social groups to "internalize" the coercive missions of the government, creating *self-enforcing* coercion. In biodiversity management in the Philippines, for example, Bryant has shown how non-governmental organizations, which are usually celebrated as counter-movements to state control over local communities, have actually served state conservation goals at the expense of traditional communities. While empowering local groups to some extent, these NGOs have served to make certain state goals, like territorialization of protected areas and control of tribal groups, the internal goals of local opposition. Even while apparently opposing state control, therefore, the overall system of "governmentality" is extended even by NGOs who claim to represent marginal communities and dissent (Bryant 2002).

Disintegration of moral economy

This thesis also assumes that *social capital*, the relationships of trust and expectation between community members built through the investment of time and face-to-face interaction over long periods, is invested into traditional management systems stabilizing and regulating ecosystem flows and access to resources. The disruption of such systems is

typically the outcome of significant state policy changes and the imposition of new conservation regimes. Such disruptions tend to lead to violation of traditional constraints on resource use, and to decreasing accountability in natural system regulation. This assertion draws heavily on work in institutional economics and common property theory (see Chapter 3), and has extensive empirical support (Ostrom 1990).

Where traditional systems of forest management, for example, depend on strong informal norms against tree-cutting on sacred lands, state-imposed conservation measures in these same lands are not only not respected in local practice, but they further serve to displace and shatter traditional restraints, leading to chaotic outcomes and reckless extraction. While this model does not match all empirical environmental management cases (Sivaramakrishnan 1998), its prevalence in conservation history makes it a valid assumption.

The constructed character of natural wilderness

The third theoretical foundation of the thesis involves a critical interrogation of the very thing that state agents seek to conserve, including and especially "natural" environments that require restoration and "wilderness" that demands protection. As discussed in Chapter 6, such concepts, which depend on Edenic notions of non-human nature, are constructions with little empirical support either in environmental history, where humans are implicated in the creation of many ecosystems long considered "natural," or in the contemporary world, where roads, people, and indirect human influences extend to the most remote areas. For global environmental conservation, however, this construct is commonly used to write human communities, especially those with longstanding residence in a region, out of the environmental history of a place, leaving it to lions, tigers, and other charismatic megafauna that are easier to market to tourists.

This coding of nature as Eden is rooted more specifically in the tendency to cast the political/economic periphery (Africa, tropical Asia and America, arid Australia) in the role of a "natural" world contrasted with the "ravaged" human landscapes of core areas (Europe and the United States). This means that one of the central imperatives of colonial and postcolonial governance is to protect and enclose nature "out there" in the underdeveloped world.

> Nature's eternity was symbolized in Africa, with its herds of wildlife, not in the plain artificiality of industrialized urban society in Europe. This perceptual polarization of "despoiled" Europe and "natural" Africa has held sway since the nineteenth century. Indeed, it was in the African colonies that early environmentalists were first able to lobby government to exert an influence inhibiting environmental changes they did not like, long before this was politically practicable in Europe. (Anderson and Grove 1987, p. 5)

Territorialization of conservation space

Finally, this argument works from an understanding that the territorialization and spatial bounding of conservation units into discrete, mappable units is in itself

problematic (Zimmerer 2000). Supported by recent advances in landscape ecology as well as human ecology, this claim raises fundamental questions about the geography of conservation.

In ecological practice, the problem with such an approach is that the bounded spaces and territories typical of contemporary conservation (imagine big fenced squares or round polygons) poorly match the ecosystem functions and flows of diverse natural elements. The case of Kenya's Tsavo National Park is typical. Here, a large forested area, set aside for the protection of elephants in 1948, turned within 30 years into a deforested plain with few elephants to be seen anywhere. As ecologist Daniel Botkin (Botkin 1990, p. 19) observes, this is because the enclosure represents "the imposition of a political geography over an ecological geography" where regional-scale migrations of the great beasts could not be afforded within the restricted confines of the park's boundaries, making them vulnerable to periodic droughts and die-offs.

In social practice, the bounded, territorial, model of conservation is equally flawed. Most production systems are not spatially discrete and require the integration of different resources at different times. Livestock management, for example, requires the rotation and movement of animals through space, and many cropping systems depend on carefully managed spatial rotations and fallows.

This form of state practice is not unique to conservation; rather, it can be argued that it is inherent in the strategies and necessities of the modern state more generally. As James Scott insists, the grand scale over which states govern causes agencies, officials, and policy-makers to produce systems for measurement (maps, databases, typologies, concept-sets) that will render the world simple: neat categorical realities over which to govern that are, in his term, "legible." This legibility, and its inevitable reductions, tends towards low-resolution territoriality, just as we see in conservation areas, which poorly fit the dynamics of the local social/natural world (Scott 1998). Thus, bounding conservation reserves over traditional management spaces usually spells ecological trouble and opens the door for ongoing struggles over control.

The Evidence

It is important to note that the conservation and control thesis does *not* suggest opposition to the defense of ambient ecological systems, biodiversity, non-human flora and fauna, or areas of relatively low human impact. Rather, this argument emphasizes the degree to which such goals have historically failed, primarily because the instruments of conservation have disenfranchised traditional land managers and enforced the goals, desires, and benefits of elite communities who hold little or no investment in or understanding of ecosystem process, landscape, or local place.

In this way of thinking, political ecology is compatible with, and indeed prerequisite to, the goals of traditional environmentalism, including the celebration, protection, and maintenance of non-human nature. As the evidence below suggests, contemporary conservation not only drives traditional residents and users to the margins, it often fails even on its own terms, producing unsustainable results while perpetuating injustices and conflict.

New England fisheries conservation

Few other areas of conservation receive as much public attention as the world's fisheries, which are in distress in much of the world. The worldwide fish catch has increased more than five times between 1950 and 1995 while productivity in most global fisheries has declined. The crisis is a popular and emblematic target, therefore, for the popular press. State authorities, moreover, are embroiled in efforts to halt the problem. As the bête noire for conservation, contemporary fisheries management is usually characterized by apolitical criticisms that focus predominantly on "tragedy of the commons" logics and demographic explanations.

Tragedy theorist Garret Hardin's (Chapter 3) aquatic counterpart, Howard Scott Gordon, is credited with one of the earliest articulations of the "tragedy" argument in his 1953 theorization of fisheries, "The Economic Theory of a Common Property Resource." In this still-cited and much-discussed thesis, Gordon argues that overfishing is inevitable in fisheries because there is an absence of private, exclusive, property rights, so that competition over the resource by fishers who freely enter the seas and harvest at will must lead extraction past the brink of the capacity of the fish stock to recover. This problem, he argues, is compounded by the fact that, as a fugitive and invisible resource, fisheries are difficult to monitor, so that overextraction may proceed beyond a point of no return before fishers feel scarcity signals. Fish harvests must be managed either through some form of privately held and exchanged exclusive extraction rights, or some form of strong state limits and controls (Gordon 1954), a conclusion echoed in Hardin's later thesis.

The apparently incontrovertible logic of this bioeconomic thesis (following St Martin 2001) has established a general discourse of fisheries, with which all fishers, managers, and environmentalists must contend, in which (1) overfishing is understood to be primarily a product of fisher behavior, (2) the ocean is understood as an unenclosable space of open access, and (3) marine ecology is viewed as an isotropic environment of extraction.

The problems with such a theoretical geography are twofold. First, they take the fisheries question out of its biocomplex context, assuming that "fishing effort" – the number of fishers, boats, and nets – explains alone the complex reproductive systems of marine life. Fish demographics, however, are governed by a set of complex interactions, many of which have little to do with fishermen and other predators.

Consider, for example, the Pacific salmon fisheries off the coast of Oregon and California. Here, what was once the third most productive salmon ecosystem in the United States has been reduced to historic low yields, with some local salmon species actually becoming listed under the Endangered Species Act. Overfishing, however, has little to do with declining yields. Rather, the flow of water from the Klamath River, upon which the salmon depend for spawning, has been all but halted through upstream irrigation development from the federal Klamath Irrigation Project, which diverts most of the water from the basin for farming (Campbell et al. 2001). Similar crises are apparent for many in-shore fisheries, which are affected by pollutants, coastal management, and distant land use practices far from the sea. A conservation approach propelled by a discourse of "too many fishermen and not enough fish" avoids sticky political problems (like regulating on-shore land uses such as farming and urban development) by focusing attention on working fishermen.

Second, apolitical ecologies of fisheries operate from a model of producer communities that envisions them operating in an open-access environment, free of constraints on entry, and with no rules to govern their behavior and catch. But most fisheries are by no means so anarchic, and systems of knowledge and informal institutions often restrain entrance to fishing grounds. Indeed, as has been shown in the case of Pacific fisheries, the burgeoning growth of many fisheries is in fact a result of intentional state development efforts to reduce foreign competition (Mansfield 2001).

Most academic and policy analyses continue to focus on the fishing problem as one of property, demography, insecurity, and tragedy, nevertheless. As a result, conservation initiatives seek to remove fishermen from the sea, and reallocate fish take based on enforcement and market mechanisms, including privatized marketable permits and rotating enclosures across a grid. Conservation, therefore, is an exercise in determining which groups or individuals are allowed to harvest fish stocks and in spatially bounding territories in which fishing may take place – conservation is control.

Political ecological research on New England fisheries has traced the incongruities between the social/ecological fishery systems and these sorts of imposed conservation mandates. New England fisheries seem, at least at first, an obvious case for apolitical approaches to the problem. Economically crucial and historically important fish stocks in the region, including cod, haddock, and flounder, have been on the decline for decades and the region's problems were the focus of discussion in cover stories for major news weeklies like *Time* and *Newsweek* (Lemonick and Dorfman 1994). The apparent driving force behind the crisis, anarchic and numerous fishers competing their livelihood into oblivion, has long been the dominant narrative to explain the problem.

Promulgated by the New England Fisheries Management Council (NEFMC), the regional conservation authority, recent efforts by state authorities have somewhat predictably followed the traditional model of the crisis and the "bioeconomic" model of its control. As explained by St Martin (2001), these approaches eschew traditional restrictions on fishing effort and their corresponding rules that limit net mesh and boat size, offering a different menu of controls, based on territorializing resource use. To limit access to what is viewed as an "open-access" system, individually transferable quotas (ITQs) have been proposed, marketable quotas of specified quantities of harvestable fish stock that can be purchased by anyone and used anywhere in the management zone. Alternatively, area management schemes have also been proposed, which direct fishing pressure to a series of management zones that open and close on a rolling basis on a grid across the Gulf of Maine.

St Martin's research reveals weaknesses in the assumptions that underlie these apolitical models and methods of conservation, as well as the social, political, economic, and ecological problems resulting from their implementation. First, based on extensive ethnographic inquiry and time spent among the region's fishermen, he demonstrates the way in which access to New England fisheries is actually highly restricted rather than fully and easily open to all. This is largely the result of the highly specialized and carefully controlled systems of spatial ecological knowledge possessed, and only rarely shared, by the region's fishermen. These systems of knowledge take the form, among other things, of "papers," carefully mapped pathways that trawling boats record and follow in harvesting fish (Figure 9.1). The high-resolution micro-geography of these maps reflects an intimate knowledge of subsurface ocean conditions and dangerous obstacles without which no boat could operate (St Martin 2001). St Martin's results follow longstanding findings in cultural

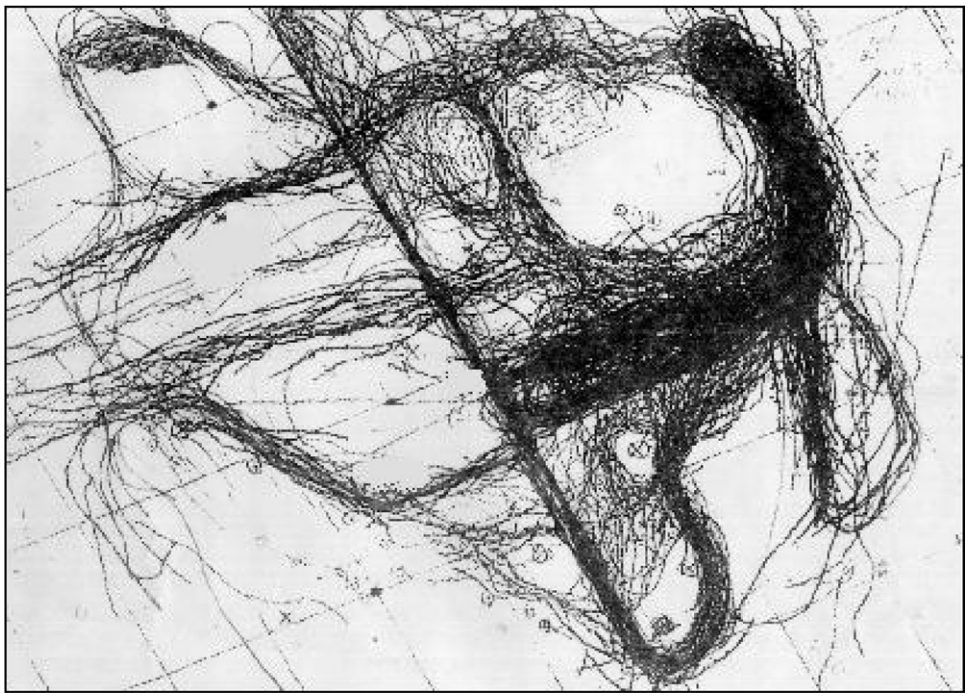

Figure 9.1 A "paper" showing the trawling routes of boats in one section of the Gulf of Maine. These represent highly spatialized and ecologically sensitive local knowledge without which fishing in the area is nearly impossible. *Source*: St Martin (2001), Figure 6.

ecology, which have consistently concluded that access to New England fisheries, whether for lobster or groundfish, is historically controlled and delimited by localized and traditional institutions (McCay and Acheson 1987; Acheson 1997).

Second, St Martin describes the way in which ITQs represent a serious assault on community economy and identity in the area, and pave the way for larger corporate boats, which allow for the consolidation of quotas and exclude traditional users. Drawing on related recent research that demonstrates the way in which individualized and privatized extraction leads to benefits for boat owners rather than workers, crews, or communities (Palsson and Helgason 1995), the analysis suggests the highly political implications of apolitical market solutions.

Finally and most significantly, this research points to the fundamental divisions in the spatial models of ecological process and conservation held by fishers and conservation scientists, stressing the incompatibility of bioeconomic conservation with the practice of fishing and the spatiality of marine ecosystems. Specifically, the gridlines and enclosure areas of the NEFMC follow neat, low-resolution squares, which do not follow the subsurface environmental features of breeding grounds, obstacles, and food sources so carefully traced by local fishers' "papers." The curvy and linear character of the extraction space marked in local knowledge stands in marked contrast to the boxy and territorial system of management geography imposed by state fisheries managers in US National Marine Fisheries Service maps. Management territories under official geographic organization are

opened and closed in a checkerboard, which has little or nothing to do with the ecologies and use patterns of fishers or fish.

As a result, enclosures commonly force fishing effort into less productive areas or displace groups that fish in different areas into shared management areas, causing competition in reduced ranges and exacerbating rather than reducing overfishing. Different boat types and gear types (trawlers, lobster pots, gillnets) that are usually spread across diverse ecological zones are similarly consolidated with little consideration of ecological conditions. Area-management approaches like this also pay little attention to interspecies relationships and the effect of harvest quotas of one species of fish on another (St Martin 2001). Thus, political ecological analysis of New England fisheries conservation reveals a regime of tight controls that marginalizes local communities and transfers control of resources away from those who know them intimately.

What this research fails to propose, however, is an alternative to the current crude systems of conservation. The appreciable complexity of coastal zones clearly calls for a far more sophisticated method of management, and the formation of workable fisheries institutions remains imperative. The keys to making them ecologically sound, spatially sophisticated, and socially viable appear to be held in work like that of St Martin and others; explicit alternatives remain scarce, however.

Fire in Madagascar

Just as fisheries have been made emblematic symbols for commons "tragedies," fire and its intentional use as a tool for land management has unjustly come to represent the "irrationality" of traditional environmental practices. The use of fire, like the use of plowing, terracing, and fertilizing, is a fundamental agrarian tool for controlling and directing environmental change. People use fire to produce and maintain pasture, to turn cut plant material into nutrient mulch, to control invasive species and insects, to clear crop waste, to aid in irrigation management, and to encourage the growth of selected species. Though a target for control and elimination by governments and environmentalists, anthropogenic fire is a building block of land management for hundreds of millions of subsistence producers around the world. The potential for conflicts around the use of fire, therefore, is enormous.

The case of Madagascar is typical, both in the divisiveness of the politics over fire and the uncertainty of its ecological impact. The island off southeast Africa's Arabian Sea coast is an impressively complex and diverse landscape. Its eastern half, dominated by tropical wet forests, is separated from its semi-arid tropical savanna western plain by steep mountainous terrain. The steep slopes of the east are covered in forests with high levels of endemism – unique native species and communities – while the long slopes of the west have fertile valleys. Roughly 2 percent of Madagascar is officially protected and the large Tsingy de Bemaraha Strict Nature Reserve became a World Heritage Site in 1990, especially for the protection of lemurs, a group of rare endemic (and charismatic) species on the island.

The forests and their biodiversity, however, are uniformly viewed as being in serious decline. The blame for this decline, moreover, is generally apportioned to the indigenous Malagasy people, the expansion of their population, and, most importantly, their use of fire. As the World Wildlife Fund succinctly insists, "the principal threats to Madagascar's

biodiversity come from the small-scale but widespread clearing of forests associated with slash-and-burn agriculture" (World Wildlife Fund 2003). On the western slopes of the island, moreover, even where forest reserves are not extensive, the use of fire for pasture and crop management is viewed as a form of "ecological mayhem." The tool of fire, portrayed as a reckless practice by a burgeoning population, is the central problem according to conventional wisdom represented by state conservation officers and also global conservation groups in the Unites States, Canada, and Europe, who insist on the protection of the forest and its rare flora and fauna (Kull 2000).

This model of Madagascar's forest history and its account of fire, however, are highly problematic. First, the conclusion that deforestation is a current crisis and of anthropogenic origin is predicated on faulty assumptions about the quantity of standing forest in the pre-human settlement period. Despite claims that the whole of Madagascar was covered in forest before settlement, palynological evidence shows that the island has been a mosaic of forests, grasslands, and complex secondary succession since the last glaciation (Kull 2000). Second, the understanding of the crisis as indigenous in origin and tied to population growth depends on a faulty historical model. As Lucy Jarosz has demonstrated, most primary forest in Madagascar (some 70 percent) was harvested in the 30 years between 1895 and 1925 under colonial government supervision, with shifting cultivation joined by logging, grazing, and export crop production, especially coffee, pursued as explicit goals of the French empire (Jarosz 1993).

This raises some difficult questions about fire control in the region, especially since burning is an explicitly criminal act, as it has been since shortly after Madagascar's conquest in 1896. What are the effects of such a repressive ecological regime and its reductionist account of the role of population and fire in creating ecological decline? By placing the burden of protecting the world's lemurs and other flora and fauna on the backs of Malagasy producers, while simultaneously removing important tools they traditionally use to make ends meet, this conservation regime has created tensions between rural people and the state (Figure 9.2).

One outcome that has *not* occurred, however, is an end to the use of fire. Rather, as Kull explains, the result of these efforts has been a standoff that hinders any form of compromise: "The result of these politics – the regulation and even criminalization of a traditional agricultural practice – closes the lines of communication . . . fire is not discussed; it occurs at night, and is blamed on 'passers-by' or 'evil people.' In this context, local organization and management of fires becomes impossible" (Kull 1999).

This analysis provides a useful antidote to narratives that direct blame for conservation failures on the rural poor. It does not make the problem of fire at the boundaries of biosphere reserves go away, however. Nor does it address the complex developments in Madagascar's agricultural economy and demographics in recent years. Given that the agricultural frontier in Madagascar is now effectively closed by the creation of reserves, what kinds of producer responses are desirable and possible? With hill forests closed to local producers, will farmers respond with environmentally benign and sophisticated methods of intensification, or do structural economic barriers mean inevitable over-cropping, soil erosion, and degradation? The evidence from intensive farm-based field study remains mixed, but producer choices and techniques in the region will clearly depend on broader elements of political economy: markets for cash crops, economic liberalization, and international development pressures (Laney 2002).

Figure 9.2 Agricultural burning in Madagascar. View from the space shuttle *Discovery* of controlled burning in Madagascar. Farmers burn forests to clear land for crops. © Corbis.

Social forestry conservation in Southeast Asia

The Southeast Asian nations of Indonesia, Malaysia, and the Philippines together contain roughly 120 million hectares of tropical forest, a land area five times greater than that of the United Kingdom. These countries also suffer from deforestation, with official rates ranging from 1.0 to 3.5 percent per annum. As a result, they have long been the targets for conservation schemes, investment, and social/legal institutions to slow or halt deforestation.

Rather than simply discouraging local people from harvesting trees, however, state forestry during both the colonial and contemporary periods has been instrumental in organizing the extraction of timber, especially of valuable species like teak (*Tectona grandis*) in Indonesia and mahogany hardwoods in the Philippines. Such hardwoods covered about 10 million hectares in the Philippines in the 1950s, but were reduced to roughly 2.2 million hectares by the 1980s, owing to commercial logging contracts arranged by the state, rather than the saws of local farmers and forest dwellers (Cruz et al. 1992). Such ongoing commercial extraction, which extends few benefits to local people in terms of either payment or employment, has been coupled with a series of debt crises in the region that force the urban poor into periodic rural migrations, exacerbating tree-cutting for agriculture in already forested areas (Kummer 1992). The actions of state foresters in the region, whose efforts to aggressively enclose and harvest the region's forests have been continuously blocked by violent resistance from local populations, reveal, moreover, the way in which deforestation "crises," and the techniques of conservation they appear to require, become techniques of state control.

Box 9.1 Christian Kull's *Isle of Fire* and the Stubborn Persistence of Politically Useful Ideas

Christian Kull first came to Madagascar as a backpacker and an employee of the World Wildlife Fund. The country he saw was colored heavily by the travel guide he carried in his pocket and the interpretive lenses of the international conservation community. As he explained to me in 2010, "those weren't rose-colored glasses, they were rather brown." These discursive resources invited Kull, as they do other visitors and members of the global conservation community, to see an island under siege from ignorance and poverty, where destructive and desperate farmers cut their way through precious rainforests, setting uncontrolled fires across the land. "But, gazing through the grimy windows of the train to Antsirabe as the morning fog lifted," he went on to say, "I saw something else. I saw a cultural landscape that had clearly been sculpted carefully by years of effort: terraced rice paddies, woodlots, and pretty little homes. This glimpse opened my eyes to other interpretations of environmental change on the island."

Isle of Fire (2004) documents Kull's re-envisioning of Madagascar's landscape and painstakingly shows the long history of fire in the Malagasy production system, the complexity of secondary succession after burning, and the role of fire as political resistance. The complexity of the ecological regimes that emerge from Kull's fascinating account are daunting, however. Pyrogeographies are by no means simple, nor are they always uniformly "good," and emerging ecological research on fire continues to raise questions about its ecological function. As a result of these changes, and Kull's own interactions with the global fire science community (Bowman et al. 2009), he explained that "there are particular arguments about fire ecology in specific vegetation communities that I would rewrite with less certainty, more tentativeness . . . But these also reinforce my overall stance on just how fundamental, normal, and long-standing the relationship of humans and fire is!"

Even as fire ecology has matured in recent decades, however, and even as more experts have come to accept fire in the landscape, managerial culture has been slow to change.

> "My work hasn't had much policy influence, despite it being familiar to many in the expat policy circles working on environment in Madagascar (I was told that one of my articles was spotted in the hands of the World Bank chief of mission). The power of the anti-fire ideology remains strong.

Such stubbornness in the face of persuasive science suggests the political usefulness of old accounts of fire for officials, enforcers, and global donor communities. It also underlines the structural impediments to both respecting and integrating traditional land management with emerging conservation regimes.

The case of Java in Indonesia is instructive. Surveyed by Peluso in her comprehensive critique of the state forestry in the region, *Rich Forests, Poor People*, the history of conservation is revealed to be one of struggles for political power and resistance, rather than simply tree protection and plantation. While pre-colonial Javanese forests, governed by kings in complex arrangements entwined with local use rights, were by no means managed in an egalitarian or democratic manner, the entry of colonial state law and market arrangements increased the consolidation of forests under state control. Dutch and Japanese occupiers of the island successively removed large areas of land from local control, making local people wage laborers. Peluso shows, in the process, that colonial forestry held to an ideology of paternalistic "mutual benefit" and extended limited access rights to producers as a social good (Peluso 1992). Javanese producers resisted these efforts at control, at first by avoidance but later through violent and organized movements. The paternalistic approach under colonialism and the occasionally violent resistance it inspired in local populations set a political pattern so enduring that current-day forestry closely resembles that of the pre-independence government. As Peluso reveals, the consistency of the colonial and post-colonial Indonesian state in forest policy was a product of the relative stability of the forestry bureaucracy itself from one period to the next as well as of the deeply held ideologies of state control built into conservation bureaucracies. In sum, the case of Java, like that of other Southeast Asian states, underlines the deep historical roots of conservation ideologies in forestry predicated on the removal of resource-dependent people.

The limits of social reform in forestry

Since the 1980s reforms of coercive and paternalistic forestry have been attempted throughout Southeast Asia and elsewhere. These reforms are usually referred to as "social forestry" and include techniques that attempt to reconcile the needs of local residents with those of conservation bureaucracies. Agroforestry, social forestry, farm forestry, and community forestry are all devised to improve local economies and ecologies, simultaneously helping people adapt to changing forest conditions while working to mitigate those changes.

The limits of such reforms, however, are set in the deeply ingrained social relations of foresters and local producers, and the political policy imperatives of central governments. Comparative forestry research in the region by anthropologist Michael Dove, among others, underlines that failures in social forestry are located in the divisions around defining the meaning of land degradation and even of forestry. The extent and causes of the problem are by no means agreed upon, and participants in the conflict are locked in deeply rooted beliefs. As Dove explains, "the first and perhaps most heatedly debated question in current social forestry discourse in Asia is the explanation of what degraded the forest resource in the first place," with foresters identifying long-term population-driven forces and locals stressing sudden exogenous events driven by officials and outsiders (Dove 1995, p. 318). By this way of understanding, social forestry fails, not simply because of a few local "bad eggs" and corrupt individuals, but because it poorly fits the extractive model of the national system and the silently held ideologies of national control (Dove and Kammen 2001). At bottom, then, even as social forestry and other collective means of co-management are developed to cope with the failures of conservation forestry, conservation still represents control, largely because the overall model of development does as well.

Box 9.2 Deep Experience and Peluso's *Rich Forests, Poor People*

"Peasants," Nancy Peluso writes towards the end of *Rich Forests, Poor People*, "file few reports, write few letters, issue no legal guidelines or justifications for community and household use of the environment" (Peluso 1992, p. 252). Tracking the history of a people "without" history therefore remains a driving motivation for many political ecologists, from James Scott and Michael Watts to E. P. Thompson. It presents a methodological challenge for political ecologists, however, in attempting to reconstruct earlier eras of resistance when formulating arguments for the rights of local people overlooked in development.

While this serious barrier can never be fully overcome, Peluso's text suggests that attention to people's own accounts and long-term and sustained research into a place and its politics can shine light on hidden historical processes of resource control, degradation, and recovery. Prior to even beginning graduate school, dissertation research, or conceiving her book, Peluso spent nearly six years in Indonesia, including a year as a member of a Man and the Biosphere (MAB) research team in east Kalimantan.

MAB, a United Nations program to foster sustainable development and biodiversity conservation, put researchers on the ground around the world to investigate resource use in long-term, field-based explorations. The MAB experience, combined with Peluso's three years of living in a rural Javanese village prior to her time in east Kalimantan, revealed political and intellectual contradictions for her, which she would explore in the research on which *Rich Forests* is based. While her associations with neo-Marxist anthropologists in Java drew her attention to agrarian political economy, her experience with MAB emphasized environment and human ecology; yet each group worked in isolation from the other.

Peluso's critical ethnography of political struggle was born of her urge to reconcile these experiences, her frustration with the increasingly anti-human agenda of conservation, and her interest in the consistency between two histories of oppressive exclusion in the colonial and postcolonial eras. As she told me in 2002:

> The first of these was some 150 years of exclusionary management of Java's teak forests, mostly for logging and conversion to teak plantation management, wherein people were regarded merely as occasional labor or as pests, squatters, and encroachers. The second entailed more recently developed state tactics of declaring and mapping extensive tracts of long-inhabited land as uninhabited forest for the benefit of state actors and corporate interests, as was the case in Kalimantan. International conservation interests and organizations entered into this fray in the name of saving forests, but oftentimes ignored the interests of the local people.

Ironically, the deep experience and knowledge that resonates throughout *Rich Forests, Poor People* reflects, at least in part, opportunities and perspectives born of Peluso's experience of ugly politics in the world of conservation. Nor is this unusual. Many of the field experiences and personal interactions with people and environ-

ments that drive political ecological research have been accumulated while researchers pursue careers in environmental and development science. As Peluso herself notes about her book, it was "a culmination of ideas and experiences that had brewed inside my mind for several years, as well as a new beginning." Peluso's trajectory, and the urgency of her transition, represents a common and important kind of political ecological biography.

Evaluating the Thesis

The accumulated political ecological evidence demonstrating the dysfunctions of environmental conservation, only briefly summarized here, is compelling. Clearly, militarized command-and-control and colonial legacies of development, backed by apolitical Malthusian and "tragedy" narratives, persist in contemporary conservation, leading to both inequity and failure.

Riven bureaucracies and efficacious species

But these bold arguments often neglect crucial complexities and opportunities inherent in conservation efforts. First, they often overlook the complex divisions and contradictions within the conservation agency itself, which lead to unexpected outcomes and possibilities for environmental reform. Second, these explanations sometimes ignore the role and effect of non-human actors in the conservation process and seldom extend demands for justice to flora and fauna, setting up false dichotomies between tigers and farmers, diversity and production.

In the first case, many critical histories of state conservation tend to characterize in somewhat monolithic terms the "ideology" of the state forest services or conservation agencies. Even comparatively rich social histories of agencies tend to describe single "institutional" cultures that determine what is normal, acceptable, and desirable. Complex internal divisions are thus reduced to limited caricatures. The state is an extremely complex entity, however, and just as local communities are riven with gender and class divisions, even small groups of similarly trained conservation professionals can differ in their imaginations and goals. So too, state conservation policy can divide and subdivide over space and time as it articulates with local community politics.

The implications for such oversimplifications are both conceptual and practical. As Sivaramakrishnan observes in his survey of colonial forestry in Bengal, the implementation of rigorous fire protection regimes came into conflict quite early with local agrarian practice, including burning for pasture and field preparation. As a result, forestry field officers, observing and struggling with local practice, soon came into conflict with ecological experts in distant offices. The occurrence of major forest fires and other political ecological events caused hardline conservation fire control to become more nuanced and differentially applied. Local and state knowledges mixed, conflicted, and produced new outcomes in an

internally divided conservation bureaucracy (Sivaramakrishnan 1996, 2000). In similar work on the contemporary evolution and application of local tree knowledge in India, Brodt demonstrates the pliability and social contingency of "traditional" ecological practices (Brodt 1999). The more general implication is that normative distrust by political ecologists of state science and expertise and its artificial conceptual separation from local knowledge and practice may serve to improve neither the equity of environmental management nor its ecological effectiveness (Agrawal 1995; Rangan 1997; Dove 2000).

Secondly, non-human elements of conservation ecology are sometimes lost in conservation and control research. Generally, political ecology in this area proceeds from an anthropocentric perspective, which reduces the efficacy and practicality of the explanation in two ways. First, it underplays the role of animals, plants, and soil in delimiting and directing conservation histories. Yet these players can produce profound effects in alliance with other actors. Fast-growing plantation tree species may shelter and reproduce some elements of local ecology in conservation but drive others out, for example (Robbins 2001a). Squirrels, pigs, and cats have altered ecological history as profoundly as human-caused fire and timber harvesting (Crosby 1986).

By defining the effects of conservation as the control of landscapes by specific human groups (foresters, farmers, herders, etc.) rather than groups of species (livestock, grasses, and humans), the complexity of ecological history is ignored. Equally, such an approach leaves no room for demands for justice on behalf of non-humans, whether charismatic or not. This suggests a woefully limited normative vision, which further ignores the way in which the environmental histories of both marginal people and animals – Native Americans and wolves, Indian forest dwellers and tigers, East African herders and lions – reveal the simultaneous coercive elimination of vulnerable people *and other species* (Emel 1998). Finally, such an approach suggests practical political limits, since it makes it hard to politically ally with concerned environmental groups whose sympathies may lie with tigers, elephants, or lemurs. To overcome these limits, as will be argued in Chapter 12, it may be necessary to examine and acknowledge how trees and animals form "alliances" and networks with human groups to establish and reinforce specific outcomes.

Alternative conservation?

What does this portend for understanding alternatives? What prospects exist for progressive environmental management that couples local justice with protecting desirable non-human nature, including charismatic carnivores, valuable herbaceous species, and complex ecosystems and landscapes? Can concessions to local people make conservation viable? The current record of such efforts is unpromising.

Even where some local land uses are permitted on the fringes of conservation territories, as is increasingly apparent in the new "buffer zone" approach to park management, the kinds of land uses and appropriate behaviors of local residents are placed under increasing control and scrutiny. As Neumann (1997) explains in his survey of buffer zone approaches in Africa, the approach depends on a romantic and exotic view of residents as primitives, whose use of some conservation boundary areas is tolerated as long as they uphold a socially undifferentiated and traditional pattern of behavior, as if they were part of the fauna of the park. So too, settlement of land claims for local communities is never straight-

forward or unproblematic, since the processes of relocation and enclosure during the colonial era, coupled with the complex social differentiation that grows from ongoing regional development, make any simple return of land rights highly political.

Buffer zone approaches, therefore, operate from an image of traditional society existing in harmony with nature that: "precludes any analysis of social differentiation and agrarian change, or understanding of rural communities' linkages to a larger political-economy . . . This conceptualization ignores the historical forces which link underdevelopment and environmental degradation in Africa" (Neumann 1997, p. 575).

Thus, there is no "going back" to a conservation regime whose concession to local communities is to admit "primitive" practices along a buffer. So too, any such state grants to local people, as in social forestry throughout Asia, will do little to undo the control function of conservation, since they fail to challenge the *process* whereby conservation territories are established and managed, which remains coercive and state-centered.

Comanagement and participatory efforts, though beyond the scope of this survey, offer some promise in this regard, as they appear to decentralize control over conservation from state to local authority (Jeffery and Vira 2001). The common assumptions in their implementation, however, that communities are identifiable and discrete units and that community involvement is largely a problem of defining property rights, are flawed (see also Chapters 10 and 11). Joint forest management in India, for example, which extends to local communities' control over forest conservation and allows profit-sharing from timber sales, marks an important departure from traditional practice, but it raises the possibility of new conflicts between communities by fixing and territorializing complex systems of use rights (Sivaramakrishnan 1998). Clearly then, the lessons of political ecology, which stress the entrenched systems and coercive character of territorialized environmental control, will remain essential to alternative conservation models as they emerge.

In the Field: The Biogeography of Power in the Aravalli

Implementing conservation and control research demands multiple methods and sustained time and resources. Continuing with an example from my own research, an investigation of conservation impacts in India, I present an example of the rewards and difficulties of creating a comprehensive account of land history, land use, and land cover outcomes from state interventions, pointing in particular to the gaps, estimates, and guesswork inherent in any such project.

A classic case of conservation and control?

This research focuses on the Godwar region of Rajasthan, located to the southeast of the research site described in Chapter 8, along the spine of the Aravalli hills. These hills are the highly eroded granite remnants of Precambrian uplift and divide the humid southeast from the arid northwest of the state (Lodrick 1994). Unlike the more desertlike Marwar region of the northwest, this is an area of relatively good rainfall, high groundwater levels, and reliable aboveground runoff, which provide the resources for irrigated agriculture in both the wet and dry seasons. The hilly forest area receives around 500~mm of rainfall annually

and is dominated by a range of tree species, including *Anogeissus pendula*, *Butea monosperma*, and *Ziziphus nummularia* (Jain 1992). The plains adjacent to the hills (Figure 8.3) are dominated by farms and pasture consisting mainly of grasses, especially *Cenchrus* species and *Cynodon dactylon*, and drought-tolerant trees (Robbins 2001a).

In 1986, 562 square kilometers of the forested hills were enclosed to form the Kumbhalgarh Wildlife Reserve, a wildlife park managed for panther, hyena, and sloth bear species. The enclosure is one of the few locations in India where the wolf is still breeding successfully, and other important species, including nilgai (*Baselaphus tragocamelus*), wild boar, and langur monkeys (*Presbytis entellus*), provide an important food base for predators (Chief Wildlife Warden Kumbhalgarh Wildlife Sanctuary 1996). Moreover, many areas on the surrounding plains have been identified as areas for social forestry development, and tree plantation is common in several other village reserve areas.

The enclosure of the forest did not come without conflict. Local producers have long used the hills to procure building materials, fodder, agricultural nutrient inputs, and thatch, while many of the poorest households draw on the forest for medicines and famine foods. The enclosure of areas from human use for wildlife protection, coupled with development of social forestry plantations, appears to be a classic case of *conservation and control* but many obvious questions arise in looking at the forest from a distance. Have local groups traditionally had access to the forest? How does forest use fit into the regional agroecology? Has enclosure meant a loss of household resources? Have plantations offset community use needs lost in enclosure? Have local users resisted enclosure with illegal forest extraction? What effects have enclosure and producer adaptation had on land cover?

In answering these questions, I undertook two seasons of fieldwork during 1998 and 1999, surveying a wide range of household types, analyzing satellite imagery, interviewing foresters, and following producers into the forest. The work yielded several useful results but became snagged on three difficult methodological sticking points, especially problems in:

- establishing historical patterns of access;
- understanding the contemporary land uses and enclosure impacts;
- tracking unintended consequences.

Establishing historical patterns of access

The enclosure of Kumbhalgarh was not an unprecedented one; state conservation in the area is longstanding. But the records that describe the nature and extent of conservation are scattered around the globe and often buried in the memories of aging locals and retired foresters. Initial investigation of the history of the reserve depended on current reports, review of relevant laws, and discussions with retired foresters. This revealed that the use rights of local producers were encoded into the Rajasthan Forest Act of 1953, which established the reserved forest, set fines and punishments for violation of forest land, and allotted access rights and nominal fees for all those who demonstrated *traditional use* of the forest. Traditional use was generally defined by residential proximity to the reserve, a system that has significant faults, given that many traditional forest users are migratory herders from beyond the region.

Further conversations with older foresters, over countless cups of tea and whiskey, revealed that local use was long accompanied by commercial and industrial extraction. The forest was managed under a private contracting system (*thekidar*) from 1955 to 1969 and later under a direct Forest Department marketing system (*vepar vibagh*) from 1970 through 1983. In both cases many important tree species underwent heavy extraction, including khair (*Acacia catechu*), safed dav (*Anogeissus latifolia*), and karaya (*Sterculia urnes*), three species reported to be currently scarce. These results are important, especially in evaluating any argument that attributes forest decline to local users, since intensive commercial extraction has a long history and targeted the very species that are now in decline. The establishment of the wildlife reserve, in part an extension of increasing focus in national policy on biodiversity and in part a product of international funding for wildlife habitat protection, would establish new controls, but only after a century of state-sponsored extraction.

Richer and deeper analysis of the reserve's history, especially in the colonial period, proved more difficult. Because Marwar was a semi-independent principality, unlike some adjacent kingdoms that fell directly under British hegemony, forestry management records, to the degree that they were kept in the earliest periods, are sketchy. Records on forestry in Marwar are especially thin, and a 10-day visit to the India Office records in the British Library proved useful, if over-brief. There, state reports from the late nineteenth century are kept in well-ordered volumes, indexed by date, handled in an organized fashion in a well-funded and climate-controlled collection.

These records reveal the tradition of spatially variable use rights for grazing and forest product extraction and the origin of a territorialized system of rotating blocks, in use to this day. The initial colonial-era report from the area states, for example: "The area for grazing is very large, so that closing a few blocks entirely would make no difference to the villagers. I would not stop grass cutting, which should be allowed in these blocks for two months, November and December" (State of Marwar 1887, p. 27).

The records are far from comprehensive, however, and 10 days is far too short for any serious investigation of historical management, as any environmental historian will tell you. Block numbers and descriptions of reserve areas, for example, have no matching maps from which to launch a field-based investigation of current conditions. Many gaps between years leave holes in the record of administrative change. Actual practices on the ground, the kind that might appear in the journals of field foresters, are obscured in administrative documents of this kind. In sum, many central questions of how the system of conservation at Kumbhalgarh had changed throughout the nineteenth and twentieth centuries were informed by historical survey, but robust details remain difficult to secure. We are left with only a sketch.

Understanding contemporary land uses and enclosure impacts

Contemporary land uses in the region are somewhat easier to determine, but require more footwork. Research assistance was acquired by working through the Lok hit Pashu Palak Sansthan (LPPS), a non-governmental organization that represents the interests of local herding communities who depend heavily on access to the forest, and the chief forester/warden of the reserve. I have long had a good working relationship with the LPPS, for whom I have produced summary reports used in advocacy. The LPPS was interested in the

survey results, as was the chief forester of the reserve, who considered his own information on local forest use to be limited. Working from these bases, and recalling previous experiences with local caste divisions, I hired two assistants, one from the warden's *rajput* family and the other from the *mali* (gardening/horticulture) community. Together we wrote a simple but comprehensive questionnaire that we used to quickly survey local producers' usage of non-domesticated species. Administering the survey to 157 individuals in eight villages bordering the reserve, we stratified the sample to be representative of local caste divisions, including 20 women and 18 foresters at varying stages of their careers and levels of bureaucracy. Most interviews were long, slow affairs, conducted while walking with herds in fallow fields, smoking cigarettes, threshing wheat, or grinding opium.

The results were revealing; the survey showed a total of 79 non-domesticated species important to household production and 113 species/uses in all, most of which were described as essential as inputs in farm and herding production. Most importantly, these wild species were not used as simple subsistence or famine-security inputs, but instead were fundamental inputs for capitalized production in the region. Moreover, they were heavily drawn from forest lands and village fallows. In the absence of offsetting inputs, conservation measures in the last few years, with decreased access to non-timber products, unsurprisingly meant decreased receipts, yields, and margins for almost all families in the region.

To confirm and understand the relationship between forest access and household inputs required many days of walking in the reserve, accompanying herders and wood, bark, and leaf collectors. It further involved an informal mapping exercise, often accomplished with a stick in the dirt, where people described the geography of their collection patterns and the location of important species. Such efforts were usually unproblematic, but on occasion inspired distrust; just as the "papers" of New England fishers represent knowledge that helps to control and delimit open access to the commons, the locations of graze, browse, and collection species are sometimes considered proprietary. Occasional violation of official enclosure boundaries, moreover, made some daily herding paths technically illegal; while most herders were unconcerned about their movements becoming public knowledge, many were less sanguine. Comprehensive maps of land use in and around the reserve, as a result, remain highly incomplete.

Tracking unintended consequences

Tracing the history of the reserve and indexing the dependence of local producers on a changing resource base provides a compelling picture of the way increasing national and global mandates for biodiversity preservation translate into costs and controls in the lives of regional producers. The ecological impacts of such conservation mandates, especially when coupled with the history of species plantation in the region, are less clear, however. To explore this final link in the political ecological chain, we overlaid two satellite images of the area, one from 1986, when the reserve was established, and the other from 1999. Both images came from the dry season and both came from years of comparable rainfall.

The later image was ground-truthed for accuracy, a slow and painstaking process. Dozens of ground points were established in locations stratified across the area of the image (some 900 square kilometers) and each spot was visited to determine land cover. Some of these spots were far from roads and involved a fair amount of legwork. These ground values

were then cross-tabulated against the land cover values established in the image to determine the accuracy of classification. In our case, we tested for an accuracy of around 80 percent. This means that one out of every five pixels was misidentified, a high figure given the variability of land cover, but certainly not one unusual in remote sensing applications; accuracy values are too often unreported in publication from this sort of analysis.

When the analysis was complete we were able to produce a coherent map of land cover change over a 15-year period. Changes in the area were rapid. Besides the obvious increase of dry-season cropping and the perilous decline of pasture resources for the region's large herds, a product of state and private investment in tubewell irrigation, there is also a startling increase in the amount of tree canopy. Indeed, tree canopy cover appears to have expanded by nearly 50 percent across the region.

But, as described in Chapter 6, this canopy cover largely consists of *Prosopis juliflora*, an introduced scrub tree species of little value in either wildlife conservation or local production. There are several reasons for this expansion, all of which are the indirect outcomes of state conservation goals. On the ecological side, decreased access to pasture resource, in part as a result of forest enclosures and in part because of state-subsidized agricultural extensification, means more animals feeding on less available land, in both village pastures and adjacent forests. This in turn results in increasing grazing and browsing disturbance, which removes diverse ground cover, allowing invasion of these scrub trees into noncompetitive environments (Figure 9.3).

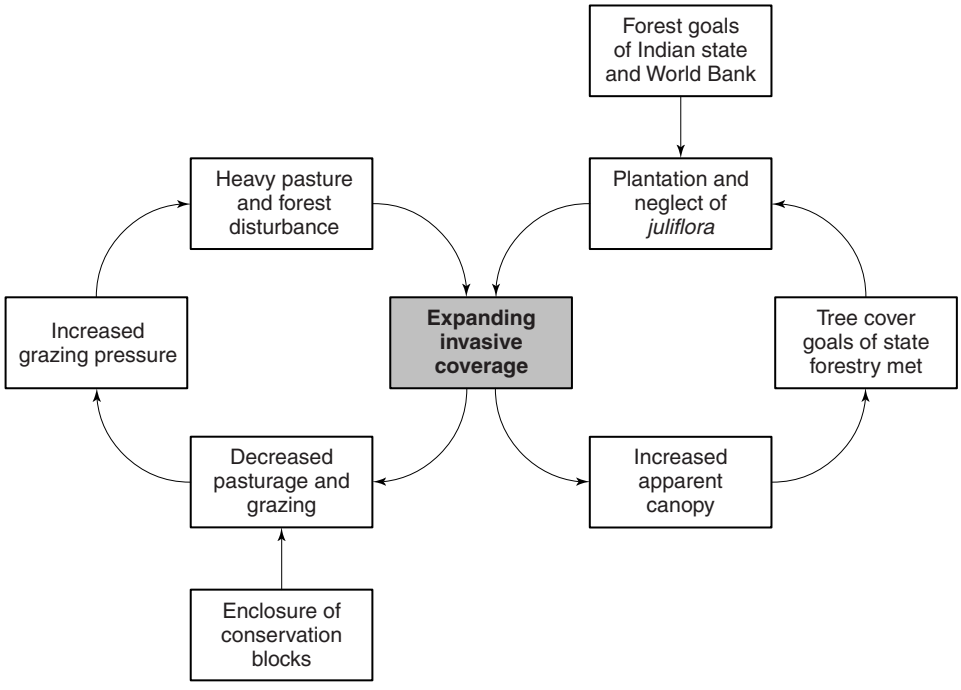

Figure 9.3 Explaining unintended land cover consequences of conservation in Godwar.

On the bureaucratic side, the expansion of canopy cover fits well with the goals of the national forest policy, reinforced by recent Word Bank mandates, to increase the cover of forest in India to 33 percent. As incentives to meet regional land cover goals are high, efforts to slow or halt the expansion of the species have been minimal. Even so, many foresters themselves express concern that the rapid expansion of tree cover may be anathema to their wildlife conservation goals, drawing into question their future tolerance for this tree. The investment required to halt or reverse the spread of the species, however, may even now be beyond the fiscal and manpower resources of the state, leading to some counter-intuitive conclusions. The efforts of the state to control land through conservation has not only reduced access for local people to traditional resource lands, it has created ecological outcomes increasingly out of the control not only of locals but of the state itself.

Even so, the methodological demands of explicating and confirming many of these links are high, and proved in some ways beyond my own capacity. Historical land records remain sketchy, comprehensive land use patterns remain incomplete, and land cover change dynamics remain snapshots at best. As a result, a full account of causes and effects of conservation is still elusive.

Chapter 10

Environmental Conflict

- The Argument
- The Evidence
- Evaluating the Thesis
- Research Example: Gendered Landscapes and Resource Bottlenecks in the Thar

In Oaxaca, Mexico, as in countless mushrooming cities around the world, the flow of waste into garbage dumps has accelerated with the modernization of the economy. As cities and economies grow, plastics, paper, building materials, and a wealth of other human trash find their way to largely unmanaged, sprawling dumpsites, populated by impoverished scavengers. In Oaxaca, moreover, recent migrants from the countryside find themselves settling on some of the only available land, at the fringe of the municipality, situated next to the city's garbage dump, a burning, toxic waste site that smokes day and night. At first blush, therefore, this is a simple case of environmental injustice, where marginal people are placed in disproportionately hazardous environments.

As Sarah Moore (2008) demonstrates, however, far more is happening here. Her research in Oaxaca shows that residents near the entrance to the dumpsite find themselves in the position to halt the flow of waste into the city, blocking the trucks that come and go. As garbage piles up in the city – a UNESCO world heritage site that depends on tourists wandering its clean and green streets for a lion's share of its revenue – the government is

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

forced to negotiate with residents causing the blockade, conceding them health clinics and other critical resources that they have long been denied. In this way, Moore shows, the metabolism (in the terminology of Erik Swyngedouw – Chapter 3) of the city's waste stream is leveraged in a conflict over development resources. The city's ecology is politicized.

The paradox of the city's ecology, moreover, makes this strategy especially effective. It is the city's growth as a tourist destination that has, to a great degree, fed the burgeoning dumpsite with trash, even while its image depends, even more than other cities in Mexico, on sanitizing the streets and plazas to produce an artificially pristine urban landscape (Moore 2009).

At the same time, however, the closure of the dump denies access of key resources to other communities: those that make their living directly on the dumpsite, and "farm" it for resources, recyclables, and goods. These *pepenadores* (garbage pickers) are instrumental to the flow of garbage through the city and the recycling of metal, plastics, and other resources even while they are entirely dependent on that flow for their livelihoods. The conflict between their neighbors and the state development authorities impinges on the ecology of their subsistence. More generally, the interests of the two groups – both marginal and disenfranchised – are put at odds through a development process that has failed to resolve the contradictions of its own waste regime. Here, the city's politics are ecologized.

Moore's examination of trash in urban Mexico highlights a more general phenomenon, therefore. Ecological issues are politicized through local and regional conflict, and political questions and conflicts are increasingly cast in ecological terms, or worked out through the control or transformation of ecological flows. This is another strong theme in political ecology.

The Argument

The environmental conflict thesis: increasing scarcities produced through resource enclosure or appropriation by state authorities, private firms, or social elites accelerate conflict between groups (gender, class, or ethnicity). Similarly, environmental problems become "politicized" when local groups (gender, class, or ethnicity) secure control of collective resources at the expense of others by leveraging management interventions by development authorities, state agents, or private firms. So too, existing and long-term conflicts within and between communities are "ecologized" by changes in conservation or resource development policy.

This argument is rooted in three fundamental lessons about social ecology, drawn from feminist theory, property research, and critical development studies. First, the argument works from an understanding that social systems are structured around divisions of labor and power that differentially distribute access and responsibility for natural goods and systems. Second, it reflects an understanding of property systems as complex bundles of rights that are politically partial and historically contingent. Third, it draws heavily on historical experience of development activities that shows them to be rooted in specific assumptions about the class, race, and gender of participants in the development process, often resulting in poorly formed policy and uneven results.

Social structure as differential environmental access and responsibility

Divisions of labor and access to productive resources mark human societies around the world. While the specific distribution of those divisions differs from society to society and across historical periods, the persistence of this pattern is universal. Different people, it has long been observed, are expected to carry out different kinds of work, and are allowed control over different environmental goods (Weber 1978, see especially vol. 1, chapter 2). So too, given the wide range of configurations, no single distribution of labor, access, and responsibility is natural or inevitable. Finally, from a normative political point of view, many such configurations are ethically and morally undesirable. Lack of access and opportunity and unfair distributions of labor burden are commonly rejected and so become the source of political struggles, as the history of women's rights, unionization, and civil rights in the United States has shown.

For political ecologists, the concern with this social fact is twofold. First, methodologically, an examination of environmentally oriented development activities or conservation efforts necessarily includes a careful census of (a) who controls what, (b) who is allowed to decide about what, and (c) who is expected to do what tasks. If conservation efforts alter ecological systems such that some productive resources are enhanced but others are hindered, the results will inevitably impinge differently on different groups, potentially creating or increasing conflicts and struggles. So too, any political or development effort geared at a specific group will hold implications for the environmental systems and flows governed by that group, gender, or community. Similarly, political efforts by different kinds of producers or managers, often at significant geographic distances, may be tied together by the mutual ecological systems they influence. Explicating, recording, and tracing these rights and responsibilities of the rich and poor, old and young, men and women, therefore, occupies considerable time and effort in political ecological research.

Second, this attention to division of access and responsibility constitutes one of the central normative concerns of most political ecological researchers. While divisions of labor are not, in and of themselves, in any way problematic, ecological change that unduly burdens some while benefiting others raises questions about alternative ways of doing things, and challenges the hidden costs of environmental conservation, remediation, or degradation.

Property institutions as politically partial constructions

More specifically, property institutions have proved to be complex bundles of rights, whose specific distribution has influence over trajectories and types of social/ecological change. The idea of property as a bundle of rights rather than a singular right is perhaps alien to many of us, especially those native to the United States, who tend to think of ownership as binary – either something is yours "fee simple" or it isn't.

In reality, no such system exists, even in apparently simple property systems like those of the global north. The ownership of things tends to be divided into a wide array of actual rights that may be exclusive to an individual or shared with a group. These include the

separable rights to possess, use, manage, control income from use, and control capital value (Honoré 1961).

An individual may possess the right to manage land, for example, but not the right to income from its use. Such is the case of public land managers around the world. A community may have the right to use land, but the right to the income from its use may in part rest with another owner, as in the case of sharecropping systems universally. Someone may have the right to possess and use land, but not to transmit it through inheritance to his or her children, as where some environmentally oriented development easements seek to return land from use without expelling the current owner.

The complexity of property rights over natural goods and systems, especially in traditional societies, is an essential part of understanding social and environmental change, and its implications for land degradation, sustainability, and equity. This is especially true as many development efforts increasingly focus on creating more "rational" systems of property rights by making them more exclusive. Where a complex traditional arrangement, for example, might give local women the collective right to harvest from trees on land that belongs exclusively to a particular man, who in turn must open the land to local herders for dry-season grazing, the institution of exclusive rights means that this complex bundle would be collapsed into a single right, under the control of a single individual.

Such complex rights have evolved over long periods to manage the many temporal and spatial variations in the landscape (trees, crops, grasses) and the varied systems and divisions of labor in the local community. Privatization of rights commonly leads to resource conflicts, production losses, and increasing inequality.

As Meinzen-Dick et al. point out: "The widespread trend to privatize resources and to confer formal ownership to land, water, or trees, which has been promoted as improving economic efficiency and reducing transaction costs, too often cuts off more marginal users, and has particularly restricted women's rights to resources. More flexible tenure arrangements are more likely to accommodate the needs of multiple users of resources" (Meinzen-Dick et al. 1997, p. 1300).

Property rights over nature politically and ecologically mediate between differing users and ideologies of use. By examining their variations and their change, therefore, political ecologists get a better grasp on the relationship between environmental and social conflict (Emel et al. 1992; Emel and Roberts 1995).

Environmental development and classed, gendered, raced imaginaries

Finally, the environmental conflict thesis is rooted in a reading of the history of conservation and development informed by postcolonial and feminist criticisms (Chapter 3). Specifically, postcolonial analysis of history has demonstrated the way that development and environmental management initiatives, no matter how well intended, tend to be based on assumptions that are classed, gendered, and raced.

In particular, development plans tend to imagine the subjects of development – the local farmer, herder, or fisher – with assumptions about their outlook, behavior, and interests that reflect the socially situated imaginaries of the planner. This tendency has the potential to cause environmental conflict. Since these assumptions tend to view resource users and environmental decision-makers as monolithic, with shared interests, they tend to overlook

the fact that the interests of different household and community members may diverge. Many important individuals and groups, because of their political marginality, are sometimes invisible to decision-makers, planners, and donors. Ignoring them does not make them vanish, however, and their role in managing, maintaining, or harvesting environmental systems usually becomes all too clear as conflicts erupt. Similarly, essentialist views of women, men, peasants, and herders create often bizarre expectations on the part of development planners, leading to differential investment and support for particular groups. There is, for all these reasons, a tendency for regional or global environmental management efforts to become enmeshed in local struggles, especially when outside authorities change the conditions in which people make a living.

The Evidence

There is a great range of case studies documenting these kinds of struggles. Some highlight the way pre-existing political differences become "ecological" – in the sense that longstanding struggles over social and economic power (e.g., labor movements, ethnic territorial disputes, or women's struggles for decision-making autonomy) are newly expressed or reframed as fights over the environmental (e.g., disagreements over conservation policy, finger-pointing over land degradation, or seizure of environmental goods). Conversely, other studies chart the emergence of new political divisions growing from existing ecological conflicts.

Agricultural development in Gambia

Despite regional variation, in Africa women constitute a large proportion of all farmers. West Africa in particular, one of the prehistoric breadbaskets of the world and a source of many of its important cultivars (Carney 2001), is a region where women cultivators have relative autonomy and have in many places historically held rights over property and the fruits of their labor.

It is also a region that has been consistently targeted by international development agencies for improvement of food and cash crop production. Experiments with cotton, peanuts, rice, and myriad other crops have turned many West African nations into grand experimental stations, often with disturbing results. Common to these efforts is an interest in facilitating agricultural intensification: an increase in the output of crop per unit of land.

Despite the importance of labor-saving technology in such intensification, it is often the case, as Carney and Watts put it, that:

> agricultural intensification is about getting people to work harder, a process that is social and gendered (getting *some* people to work harder than others) and that is typically coercive and conflictual. The manner in which labor intensification is negotiated and struggled over – that is to say, how agricultural intensification is played out through determinate rules of access to and control over resources – fundamentally shapes the character and the trajectory of agrarian change itself. (Carney and Watts 1991, pp. 652–653)

In her research into agrarian change in the Gambia, moreover, Judith Carney puts this conceptual claim to the test, evaluating how rice intensification schemes became the political and ecological point of change for the largely agrarian population, creating conflict and becoming the fulcrum of already existing struggle.

Gambia and the gendered land/labor nexus

Gambia is similar to many African societies – including both matrilineal and patrilineal societies – where access and use rights of land and other productive resources are divided by gender. In the case of Gambia, a thin country following the course of the Gambia River, this gender division closely follows ecological zones created by the grade and flooding of the watercourse. Women have traditionally managed rice production (*Oryza glabberima*, distinct from Asian rice varieties), carried out in the periodically flooded plain, and controlled the harvest of their labor. Dryer upland fields were traditionally cropped with cereals like millet and sorghum, and managed by men, though traditional labor management meant some gendered mixing of labor and shared crop work. With the growth of markets for groundnut ("peanut"), dryland/upland production became more important in the colonial period of the 1800s. As a result, this separation of labor became more distinct, with women becoming primarily responsible for lowland subsistence rice and men for cash-cropping peanuts.

More significantly, labor was divided in terms of where labor was obligated to be performed, as well as who controlled agricultural products from different kinds of work. For the Mandinka people of the region, seasonal obligations to produce crops for the household (called *maruo*) are coupled with seasonal rights to produce goods for sale and retain the personal profits (*kamanyango*). Men and women each possess these rights and obligations in different places and at different times, although, under changing development initiatives, these became the source of increasing manipulation and conflict.

Specifically, the tendency for the colonial cash-crop economy to drive the food system towards rice imports (in what had earlier been a rice-exporting region, see Carney 2001) inspired development responses by authorities in the late colonial and independence era. Beginning with rice mechanization efforts by the British Colonial Development Corporation and later in the form of large irrigation projects, development efforts pressed for systems of rice export to undo the imbalances created under colonial-era cropping innovations. International development donors later joined these efforts with pressure for horticultural food crop development.

But the mechanization and irrigation of rice, and later the pressure for horticultural development to create food security (assumed for obvious reasons to be an apolitical and normatively desirable outcome), had serious and divisive implications. In particular, these efforts were increasingly used to place *maruo* labor demands on women's land and time, extending them to new areas and over longer parts of the year. Women were increasingly expected to produce household food through increased labor on land that had previously been used for their own *kamanyango* cash production. These demands came both from development authorities, who saw women as more cooperative, and from Mandinka men, who benefited from the increased harvests with no cost in their own time and labor (Carney 1993).

All of these changes precipitate conflict. The loss of *kamanyango* land and labor benefits means a loss of autonomy for women as well as a loss of cash, further creating a breakdown in household cooperation and reciprocity. According to Carney, women increasingly demand cash compensation for their losses, withdraw their labor, and politically challenge agricultural schemes (Carney and Watts 1991).

In sum, changes in cropping and technology mean changes in property, which mean changes in labor and labor burden. Some community benefits are someone else's personal costs. In this case, as in many, the price of development was paid by women, specifically as a result of the social ecologies described above, where labor and rights are socially stratified, property rights are fluid and complex, and development authorities make gendered assumptions about labor and land which later strike political sparks.

Such development efforts persist nonetheless, despite setbacks and failures. Nowhere is this clearer than in the "women in development" (WID) movements of the 1980s, which swept across sub-Saharan Africa as a new paradigm that would take women seriously. Serious attention to women's economies does not erase the underlying gendered struggles for power in households and communities, despite the best intentions.

Efforts by Save the Children and other NGOs and mission groups in Gambia during the 1980s, for example, attempted to bring funding and technical attention to women's horticulture, following a spirit of WID. Progress was followed by a dramatic backlash, however. Subsequent non-governmental interventions concerned with recruiting women for agroforestry were seized upon and manipulated by local men and directed to land that had often previously been garden plots. As men predominantly control tree resources, this effectively allowed them to simultaneously seize control of garden lands and of women's labor. In this case, two separate strands of progressive environment-based livelihood schemes – gardening and agroforestry – were implicated in an ongoing gender struggle where men and women used each strand to economically bludgeon one another (Schroeder 1999).

An immediate lesson is that an increased focus on *women* in development by no means represents a better understanding or engagement with *gender* and the power relations inherent in a system with a strict division of labor. The case therefore reveals the patriarchal assumptions of environmental management and development efforts. Indeed, the idea that "saving the children" is best accomplished by supporting women's efforts exclusively appears highly problematic in retrospect. At a more abstract level, the case further documents the serious local politics of production into which all development interventions must inevitably become embedded – making decisions about gardens or trees in development is to make a decision about local power. Much the same can be said of land management in the western regions of the United States.

Land conflict in the US west

In 2000, in Nevada county in the scenic Sierra Nevadas of California, a planning regime called "Natural Heritage 2020" was forwarded by the County Board of Supervisors to encourage participatory and community-based decision-making and control what was perceived to be the loss of "natural and scenic qualities that distinguish [Nevada County] from other more urbanized regions of the state and country" (Walker and Fortmann 2003,

p. 470). To the surprise of many of its supporters, the proposal faced a dramatically resistant audience and a backlash that led to a terrific conflict. As Walker and Fortmann (2003) describe, in a tightly argued case of political ecology in the exurban west, this effort to introduce landscape aesthetics and environmental principles into county planning resulted in conflict because it drove a wedge into a fault line between the aesthetics of recent inmigrants and long-term residents, but also between their divergent positions in the regional political economy, each with its own attendant ecological regime. New residents, largely consumers of an imagined idyllic western landscape, ran directly into ranchers and loggers, whose production priorities were threatened by restrictions on land use.

The case is by no means unique. The demography of this part of the United States has gone through tremendous upheaval in recent years, as amenity-seeking migrants, looking for quiet exurban "natural" settings far from the hectic urban regions of the east, have come to settle in areas long occupied by primary producers: farmers, ranchers, and timber harvesters. New settlers bring with them their own position in the regional economy, as consumers. They also bring their own expectations of how western landscapes are supposed to appear and to function, especially images of "wild" nature, uninfluenced by human beings. These contrast starkly with the economics and ecological imaginaries of earlier residents, whose position in the economy is centered on production, and whose expectations of the landscape are associated with work, management, and ongoing transformation. The conflicts that flow out of this juxtaposition of people, ideologies, and economies are numerous, but each reflects the way that (1) apparently political conflicts are often rooted in ecological productive relations and (2) apparently ecological priorities and decisions heavily influence the distribution of resources and the political fortunes of winners and losers (Figure 10.1).

Conflicts over zoning and land law, like those Walker and Fortmann describe, are, therefore, predictable, if not inevitable. As James McCarthy and others have observed (McCarthy 1998, 2002), an increasing preference for restrictions on land management, especially oriented around conservation of wildlife or recreational values, encounters a deeply rooted existing institutional system. Far from being amenable to such land use changes, in most parts of the region limitations on property are loose or non-existent and allow residents to develop property as they see fit, to use land as their economic needs demand, and to parcel it off for sale with little notice. A call for restrictions against cutting trees or subdividing land into smaller parcels, intended to protect wildlife habitat, for example, collides with an insistence that private property rights are sacrosanct and that land use restrictions are an imperious imposition of state power.

The roots of this political conflict appear cultural. There is an *apparently* ideological encounter here, between an aggressively ecocentric view of managing to protect wild nature and a militantly anthropocentric aversion to government control. But viewed in more political ecological terms, the relationship between environment, economy, and property comes to seem more complex.

The flexible property regime established in many rural areas, which eschews moratoria on sales or development, has evolved to suit the boom and bust cycles of rural production systems (Robbins, Martin, and Gilbertz 2011, forthcoming). Farmers and ranchers, notably, are historically heavily dependent on seasonal credit, while simultaneously liable to significant periods of declining prices and farm receipts, owing to variability in markets for grain and meat, but also to uneven rainfall, bad winters, and periodic catastrophes, like a blizzard

Figure 10.1 A population and building boom across the American west has led to conflicts over land use, access to the environment, and property rights between competing classes and cultures. Photo © David M. Schrader / Shutterstock.

or flood. The liquidity of property, where land can be carved off in small parcels, is essential to debt payment, smooth operations, and rural survival. Much the same can be said about restrictions on land use like tree-cutting. Maintaining trees on property is a long-term investment, precisely intended to develop towards a single, critical harvest – appearing to amenity inmigrants as a god-awful clear-cut – where the landscape is made liquid and money is produced to leave to heirs and family or to pay debts with a lump sum of capital. Thus, competing ecological priorities over landscapes become immediately political since the face-off is not simply between ideas about nature but also basic underlying class differences and differential relationships to capitalist economics. Political showdowns over property rights concomitantly bifurcate over ecological dynamics that control the flow of value from the landscape.

The more general implications of the case, as for well-intentioned efforts like those of Save the Children in the Gambia, is that by failing to acknowledge the political character of ecological management, with its equity and power implications, the stage is set for failure.

Evaluating the Thesis

These kinds of environmental conflict cases probably represent the greatest bulk of political ecological research, and this environmental conflict research, among the wide range of

approaches in political ecology, has arguably made the greatest practical impact. Showing the distributive justice outcomes of environmental and economic change, this research makes it increasingly difficult for planners, states, or lending agencies to ignore the churning regional struggles into which any environmental management scheme will inevitably entangle itself. This detailed research, however, does more than simply assert the somewhat banal overall conclusion that ecology is political. It further demonstrates and reveals:

- that the fundamental hinge-points between human beings and the environment are not restricted to technologies of production (tractors, factories, automobiles) and levels of consumption (population and affluence), as is commonly asserted in apolitical ecology, but extend to distribution, access rights, and the division of labor;
- that despite the very material character of environmental struggles around the world, it is often concepts and constructions of community and nature that propel or suppress conflict;
- that the equity and sustainability of environmental management is not dependent on the scale of environmental governance (local, federal, community), as is sometimes asserted in anarchic or romantic localism, but depends rather on the specific arrangements of differing groups in an ecological network;
- that increased attention to poverty and women in environmental issues, a hallmark of new development initiatives, is not the same as attention to class or patriarchy.

More generally, the work presents a serious challenge to single-objective environment and development initiatives and encourages a view of the landscape through many lenses, as claims on ecological system components overlap in a complex environment. This also suggests an ecological critique of exclusive property rights, at least as they are popularly understood in the global north.

Stock characters and standard scripts

There is a tendency in this work, however, to treat many groups or "stakeholders" (a problematic term in itself, originating in business management theory) as categorically real. The work tells us about "men"/"women" or "herders"/"farmers," for example, in ways that do not seem to ring true, especially given the fluidity of the resources and rights so carefully documented in the research. These categories and groups themselves develop out of fluid ecological positions as much as the other way around. Political identities are not simply a product of social/cultural values, but also of rice fields, pasturage, and ranch boundaries. As these systems change, as a result of environmental, political, and economic shifts, we should expect the categories themselves to shift, and for these groups to dissolve and reform before our eyes. This does not always seem to be the case in political ecological research, however, where stock characters often walk on and off stage as if on cue.

In much the same way, these investigations of the behaviors of individuals or groups tend to provide a rich analysis of the contextual forces that put groups at odds with one another and create new distributions of rights, but with a far less clear account of how people actually respond, change their behaviors, or alter the landscape. The wide range of adaptations available to people and the dynamics of their responses receive too little

Box 10.1 Zones of Conflict as Zones of Sustainability in Zimmerer's "Wetland production and smallholder persistence"

Political ecologists have a long and abiding interest in resistance: people's conscious opposition to systems of domination. Even so, few researchers have taken the difficult (and inherently geographical) step to show how conflict and resistance are written into the landscape, how it changes environments and alters local ecologies.

Karl Zimmerer's "Wetland production and smallholder persistence: Agricultural change in a highland Peruvian region" (Zimmerer 1991) is unusual in this regard, and is in many ways an interesting model for political ecology realized too infrequently: a road less taken, between physical and social research. In this dense article Zimmerer engages some of the more traditional questions of peasant studies (Chapter 3): Why do smallholding peasants persist in the Andes when both Marxian and conservative neo-classical economic theory say that they should not? Turning detailed attention to the agronomy and history of the Colquepata district of highland Peru, Zimmerer shows not only physically *how* they do it, but also politically *why*.

The answer to the first question (how?) requires agronomic assessment. Zimmerer reveals that the peasant producers of the region manage, maintain, and produce an unusual wetland environment – drained-*wachu* agriculture – through carefully coordinated collective action. Exploring the physical dynamics of agrarian soils and drainage, he describes a sophisticated and elaborate network of canals, laid out in a herringbone pattern, that properly inundate and drain high-elevation potato fields. He also tracks the complex labor-scheduling required to coordinate many difficult tasks, including weeding, plowing, and planting. This work shows the trained eye of someone at home in both physical and social science.

To answer the second question (why?) requires a detailed understanding of the region's political history. As an area that has strained to maintain its autonomy through successive periods, spanning the colonial and independence eras, Colquepata has always been a "region of resistance" where free communities have struggled over land and labor rights with surrounding hacienda estates and state elites. Resisting the urban bias of the country's leadership and the skewed subsidies that disadvantaged the highlands, Colquepata peasants expanded and coordinated *wachu* agriculture and commercialized their own wetland production to persist and thrive. Here conflict and resistance fostered opportunities for new forms of sustainable ecology, rather than foreclosing them.

This synthesis of agronomy and history, canals and land rights, uprisings and markets reflects a background that is somewhat rare. Zimmerer's eclectic experience includes a BS in physics and biology, time spent at the Land Institute in Kansas, together with a Sauerian training with significant exposure to biogeography. Political ecology commonly makes claims to this kind of interdisciplinarity, but learning to do it is more difficult. Zimmerer's work shows the substantial benefits of that kind of training.

attention in many otherwise excellent analyses. The result is that the environmental conflict literature sometimes reads like a fairly standard script. It also means leaving aside many important questions: What accounts for the specific adaptation choices made under conditions of conflict? Along what lines are new environmental decisions and behaviors formed? What are the material environmental outcomes of conflict? To ask these questions and address such responses in a more than descriptive way might of course require new tools; decision analysis is scarce in political ecology.

These two issues further undermine an important potential project: explaining when conflict *doesn't* happen. Indeed, the inevitability of environmental conflict is by no means assured. For example, as some political ecologists have recently pointed out, tenurial systems where men's and women's responsibilities and access are carefully split can be potentially complementary and negotiable, allowing conflict to be averted in many cases and sustainable use to be achieved (Rocheleau and Edmunds 1997). But if decentralized and collaborative schemes do not in and of themselves assure sustainable outcomes, what does? To address this question means that we must better understand (1) how groups are not just situated but actually *formed* in ecological networks, and (2) how people *respond and adapt* with new social and ecological categories and strategies, influenced by knowledge, context, and political process.

Research Example: Gendered Landscapes and Resource Bottlenecks in the Thar

Whether or not conflict is inevitable, it is common, especially where large-scale environmental interventions lead to differentially distributed impacts. This is nowhere clearer than in the zones of green revolutionary agricultural change in India. The innovations of the green revolution – including high-yielding varieties of important cultivars, electrified groundwater pumping, and increased use of chemical inputs – have unquestionably increased the amount of food produced. The way in which these benefits have been distributed and the degree to which they have entailed hidden costs to some groups are as yet quite unclear, however, as is the degree of conflict that may arise from disparities in costs and benefits of agro-ecological change, especially between men and women.

Several factors affecting women's relationship to resources in India should be noted. First, despite differences based on class and caste, women are often involved in all spheres of the household. Agricultural labor is often heavily female; in the Jharkand region of Bihar, for example, for each 80 days of human labor required per acre annually, female workers supply 65 (Sharon and Dayal 1993). Women are often simultaneously responsible for procurement of fuelwood and other minor forest products, acquisition of fodder, herding of animals, child care, cooking, cleaning, and home construction and maintenance. Also, despite women's labor outside the home, men control much of the decision-making in agriculture. Because most communities follow a patrilineal and patrilocal pattern of social organization, young women typically marry into household economies where they become the least powerful and least well-established participants (Liddle and Joshi 1986).

Aggregate analysis of the impact of the green revolution on women points to a few trends. Despite increases in food supplies resulting from intensification, women experience

disproportionately poor access to nutrients and food (Das Gupta 1987, 1995; Messer 1997; Cassidy 1980) and the gap between male and female agricultural wages (of the order of 30 percent) is increasing (Singh 1996).

But a more fundamental question suggests itself: Do the specific ecological changes in green revolutionary production systems change the labor burden, resource rights, and environmental access of women? Here, secondary data on wages and calories become of limited value, and research must turn instead to the daily ecologies of the household and the specific dynamics of land use and land cover change.

My research in the Thar region of Rajasthan (introduced in Chapter 8) was extended to try to understand the changes that have occurred in women's daily workloads and in their access to and control over resources as a result of intensification. Rajasthan is instructive, since the adoption of modern intensive systems is widespread and gaining momentum. Whereas only 2.6 million hectares of land in Rajasthan were under irrigation in 1976, 5.5 million hectares were irrigated in 1999. The area under high-yielding varieties (HYVs) has also climbed; 255,000 hectares of land were under improved varieties of bajra (pearl millet) in 1976, while nearly 1.4 million hectares of HYV millet were grown in 1999. HYV wheat production climbed by more than 250 percent between 1976 and 1999 to a total of 2 million hectares. More food is being produced, to be sure, but does this lead to conflict over resources and differential burdens in the community?

Methodologically, answering this question required:

- determining differential land uses and rights and discovering what species different people depend upon;
- tracking changes in availability and determining how the availability of these resources has changed over the period of the green revolution;
- evaluating divergent impacts and weighing the benefits against the costs of environmental change.

Determining differential land uses and rights

As explained previously, the challenge in determining people's land uses and rights is made difficult by the "ordinariness" of daily actions; it can be difficult to query people about things they do every day, since those things seem trivial or taken for granted. This is coupled with the fact that use rights are often unstated, unwritten, and largely "understood" in a way that often makes them hard to articulate. For that reason, observation is usually preferable to interview, and certainly to questionnaires.

This being the case, methodologically, I proceeded by following people on their daily routines, asking occasional questions, and participating when I could – carrying sheaves of dried hay, for example, a task that is exhausting and somewhat itchy. In particular, I asked people about the important non-domesticated species that they used and about the places where they obtained them. This informal and intensive work was supplemented by a survey of men and women, with each individual listing the species important to production.

The results point to species and land use areas that are differentially important for women and men. Specifically, forest and fallow lands provide important species inputs into

household and livestock production, and the collection of these represents a significant amount of time and effort on the part of women: the reproductive labor burden of the household. These surveys also revealed precisely when certain lands were important. In particular, traditional forest lands (*orans*) and the more marginal stony and sandy lands around the village were most important in the growing season (when agricultural land is under crop), while fallow land is most important in the dry season, when productivity of the more marginal lands is exhausted.

There are several problems with this analysis. First, the class and caste balance of the sample is extremely biased. This is a result of very different social norms for low and high caste women in the Thar region as well as some of the same caste-based issues that created boundaries in previous work (Chapter 8). Traditionally, lower and middle caste women (*meghwal*) as well as women from pastoral groups (*raika*) are easier to approach, spend more time out of the house, and are involved in wage labor that involves travel and interaction outside the village. Also, my primary co-investigator was a member of the *meghwal* community, and our best contacts came from his associations. As a result, women from these groups became primary respondents and some groups, including and especially those from elite *rajput* families, largely went unsurveyed.

Tracking changes in availability

Once the timing and spacing of women's and men's resource use was roughly determined, it was necessary to determine changes in the coverage and availability of those lands, at least since land reform occurred in 1955. Since forest and fallow lands are especially important for women, the change in coverage of these lands can be queried in only a general way from Indian land use records, which do show the general decline of "waste" lands in the region, a category including all land that could be used for cropping but currently is not. This land has slowly fallen under the plow as double-cropping, irrigation, and chemical inputs enabled expansion of planting in time and space. This confirms the general notion that important lands for reproduction of the household have been lost, even as productive resources have expanded.

These general trends are relatively meaningless, however, especially since they provide no indication of the seasonal availability of resources and because the categories are aggregated ("waste") to include many different land uses and land covers, whose specificity are important to making a living. To get a more detailed and disaggregated sense of land use/cover change it is necessary to turn towards local records.

These records, *misl bandobast* records from land settlement in 1955 and more recent *jamabandi* records, exist for every village in Rajasthan. These are paper documents, threaded and written by hand, and keyed to large cloth maps kept by a village record keeper – the *patwari*. While the contemporary *jamabandi* records are kept in English and Hindi, the *misl banadobast* are typically recorded in Urdu, the administrative language of the Mughals still in use during the time of the British Raj and even in early independent Rajasthan. More problematic, however, is the fact that most of these records are stored in derelict buildings, in semi-organized piles, bound in bundles, coded by color and often-obscure markings. Though the arid conditions of the region help to preserve the paper somewhat, decay has set in for many of these records, and some are in their last generation of useful-

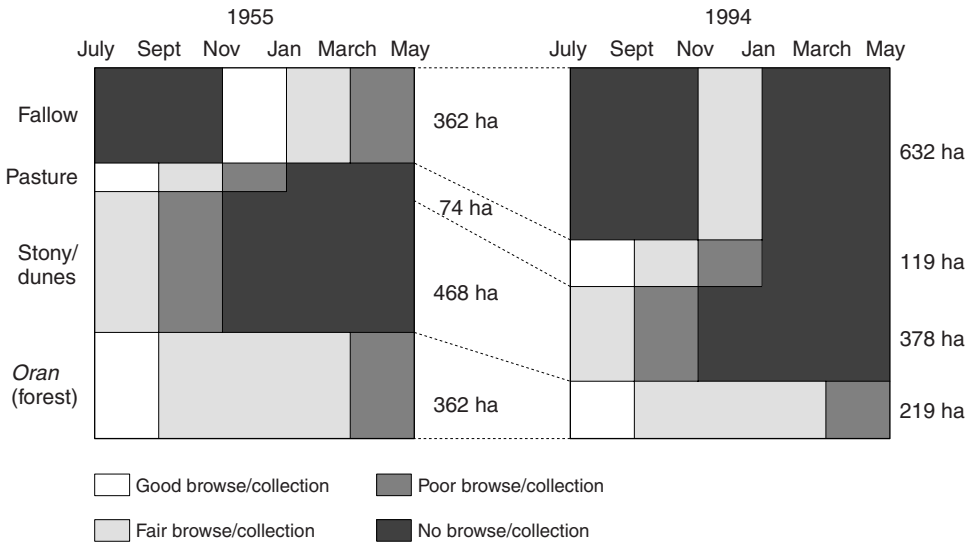

Figure 10.2 Change in available household reproductive resources for a sample of villages in Rajasthan between 1955 and 1994. *Source*: Reproduced from Robbins (2003), Figure 25.4.

ness. This is a far cry from the condition of some colonial records (described in Chapter 9), and presents some important challenges for research.

Even so, it is possible to assemble a record of change for a sample of these villages. By coupling the more detailed land cover data with measurements on the ground, interviews, and survey work, a rough profile of resource availability becomes clear. The resource calendars shown in Figure 10.2 are based on the mean land coverages described for 1955 and 1994 in village records for a sample of 29 randomly sampled villages (see Robbins 1998a). The vertical axis represents the spatial average coverage of each land type per village in hectares, while the shading denotes the quality of resource availability based on species coverage across the year.

Evaluating divergent impacts

The 1955 arrangement shows a system in which the loss of resource land to cultivation during the growing season (July to October) is offset by the availability of alternative resources, especially forests (*orans*) and other "marginal" and "waste" lands: stony lands, pasture, and sand dunes under grass and scrubby vegetation. When these lands become less productive in the dry season, fallow lands become available for use and harvesting. Women's labor, therefore, solves the *temporal* problem of scarcity by shifting *spatially* to obtain key reproductive resources.

By 1994, however, forest lands and dunes had been lost to enclosure and cropping. The *oran* lands in the region, though a key resource, had been enclosed for cropping. Moreover, as land is increasingly cropped twice and three times annually, dry-season fodder and fuel resources become scarcer as well.

These changes mean an increasing labor burden for women. Daily fuelwood and fodder gathering activities are reported as more time-consuming and more difficult for women in the survey villages. Girl children are increasingly involved in these activities in many households. Put simply, an expansion of cropping and an increasing flow of resources into the productive (and largely male) sphere of the household have meant a decrease in women's resources and an increase in women's work. Development is by no means a win–win prospect for locals, therefore, and portends conflict.

Have these changes meant the removal of girl children from school? Have they had an impact women's health or autonomy? Has this trend resulted in changing power relations within households? Has it led to an increase in conflict? Have women negotiated new labor relations as a result of changing resources? Have their species priorities or management of the ecosystem changed? What are women and men doing now? I was unable to answer these questions with the limited time and resources available, but they remain an urgent direction for future research.

Chapter 11

Environmental Subjects and Identities

- The Argument
- The Evidence
- Evaluating the Thesis
- In the Field: "Lawn People" as Environmental Subjects in the United States

In the late nineteenth and early twentieth centuries, the forests of Kumaon, a hilly and forested region of Northern India, came increasingly under the control of officers of the forest and revenue departments of the British colonial authority. Unfortunately for these well-meaning bureaucrats and field officers, these same forests had long been the domain and key resource for the villagers of the region, who responded by burning down the woods, repeatedly, effectively, and with terrific economic and ecological effect. For several decades, the harder officials sought to enforce and control these forests – now classified as state "reserved" forests – the more the forests were set on fire, as frustrated authorities found no way of controlling local incendiary resistance. So far, this is a classic case of the political ecology of government authority and its limits. Precisely as might be predicted from political ecological experience of conservation and control elsewhere in the world (see Chapter 9), the extension of state power into local ecologies becomes a struggle over control, in this case sparking resistance that leads to the large-scale destruction of the resource in question.

But Arun Agrawal, through a careful reconstruction of events in the decades that followed this period and based on his own interviews and surveys of local people over time,

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

identifies a more complicated dynamic. Specifically, in his book surveying this question, *Environmentality* (2005), Agrawal tracks the effects of a key concession by these colonial authorities to allow local forest councils to govern and control forests in the region, a policy continued by the Government of India after independence. This concession to local control, he documents, was accompanied by a concomitant institutional change, a kind of "technology of governance," which obligated local committees to track and categorize the forests of the region, to work with thousands of residents to establish rules, and to launch an ongoing census of forest resources. This combination of decentralization of authority with the promulgation of local responsibilities, he shows, led to the end of the fires that had previously stymied state authorities. Kumaonis, incredibly, now vigorously protected the forests they had previously burned, even as they counted them, propagated rules about them, and came to govern their own behaviors more aggressively. As Agrawal points out, currently: "Kumaonis control themselves and their forests far more systematically and carefully than the forest department could" (2005, p. 8).

More than this, however, Agrawal demonstrates that the rise of this system of self-governance was accompanied by (or more accurately: resulted in) a transformation of people's attitudes about the forest and themselves. In the wake of this institutional change, people came to insist that protection of the forest and of the environment were important values and goals, something they previously did not assert. The forest had become a value in its own right for them and they had become the kind of people who protect forests. They had become, in Agrawal's terminology, *environmental subjects*: "those for whom the environment constitutes a critical domain of thought and action" (Agrawal 2005, p. 16).

This assertion, though novel in many regards, represents part of a larger phalanx of political ecological research, which explores the way that people's behaviors and livelihoods (their actions) within ecologies influence what they think about the environment (their ideas), which in turn influences who they think they are (their identities). Equally importantly, it investigates how actions, ideas, and identities are entwined with the necessities and complexities of power. The insidious implications of these relationships are emerging key themes, as are the potentially emancipatory implications of very different situations where people's demands for autonomy are linked to other environmental practices and political identities around the world, such as those of the Zapatistas in Chiapas, Mexico, or the Miskito of Honduras and Nicaragua. Analyzing the livelihood conditions, regional economies, and political exigencies that propel emerging notions of both ecology and self forms the core of another fundamental body of work in political ecology: environmental subjects and identity research.

The Argument

Institutionalized and power-laden environmental management regimes have led to the emergence of new kinds of people, with their own emerging self-definitions, understandings of the world, and ecological ideologies and behaviors. More firmly: people's beliefs and attitudes do not lead to new environmental actions, behaviors, or rules systems; instead, new environmental actions, behaviors, or rules systems lead to new kinds of people. Correlatively, new environmental regimes and conditions have created opportunities or imperatives for local groups to secure and represent themselves politically. Such movements often represent a new form of

political action, since their ecological strands can connect disparate groups, across class, ethnicity, and gender.

In a sense, therefore, the environmental subjects and identity thesis is the reverse image of the degradation and marginalization thesis (Chapter 8); where exploitation leads to the simultaneous destruction of productive resources and of local producers, conservation and governance of nature draw together otherwise disparate communities and interests into collective action and so into collective awareness. Here, communities assert their identity through the way they make a living and vice versa. At the same time, however, the conservation state and other authorities, by setting the terms of self-governance, ownership, and responsibility, can develop and exercise the capacity not only to govern the environment, but to govern the very subjectivities of its local stewards: working people, citizens, and often disenfranchised publics. This argument draws upon somewhat oppositional theoretical tools in human ecology introduced earlier (Chapter 3): (1) producer and subaltern resistance, and (2) governmentality and interpellation.

Moral economies and peasant resistance

First, traditional political ecology has long stressed the way producer communities forge collective action and identity. This work also seeks to explain the conditions under which such movements form, unify, and mobilize. The theoretical tools to address this question in part lie in the foundational work of peasant studies on moral economies. As noted previously (Chapter 4), prevailing conditions of subsistence give rise to systems of reciprocity to reduce risk and moral expectations about shared burdens. Such systems can survive and adapt to a range of livelihood shocks, from both economic and environmental sources. But when the structure of that livelihood system is challenged by fundamental changes in the way labor is remunerated or risk is distributed, social mobilization becomes more likely (Scott 1976).

Contemporary struggles go beyond rebellions against the overextraction of harvests and taxes (the central preoccupation of traditional peasant studies researchers). They turn instead on the way livelihoods are challenged and violated on a more general and regional scale by modern forms of development practice, like large-scale displacement, significant shifts in credit, and promulgation of new technologies. More than this, social mobilization may lead on to new collective identities. And these, in turn, may be galvanized around different kinds of environmental truths or taken-for-granted knowledges. So too, such regional changes may unite communities that have traditionally been divided. The ecology of these movements thus includes the linkages between individuals and groups, and the livelihood threads that hold them together. These linkages are what make extended communities so vulnerable to certain forms of development, as where a large dam-building project inundates the fields of both rich and poor. But such linkages also make communities potentially powerful, since they have the potential of acting in concert.

Environmental hegemony and interpellation

All of these forms of resistance run up against a concomitant force: hegemony. Controlling the economy or the environment is in part, as explained previously (Chapter 3), about

Box 11.1 Who is the Jailer in Arun Agrawal's *Environmentality*?

Environmentality is a book that deftly merges the pragmatic concerns of contemporary environmental policy, especially the ongoing cry for "decentralization" of management, with the more abstract concerns of critical social theory, especially its visions of collective governance of the self. Agrawal explained in 2010 that though he originally tried to write a book about community forestry he instead found himself "wanting to adapt Foucault's ideas to a new field, realizing that colonially sponsored local management of forests in Kumaon exceeded much of what most independent nation states were doing in the name of decentralization." Inspired by Foucault's *Discipline and Punish*, Agrawal in other words suggests that modern states had failed to achieve what people had in Kumaon, because those people had themselves digested the colonial program of forest governance and made it very much their own, indeed they had made it themselves.

But the book, it must be acknowledged, dwells only superficially with the darker side of Foucault's insight. This is because Agrawal, inspired by institutionalist scholars like Robert Bates, Adam Przeworski, Elinor Ostrom, and Margaret McKean, is primarily concerned with understanding how and why institutional incentives gain people's compliance and collective outcomes for practical benefits. Beyond this, he wants to know, in his words, "whether there is a relationship between the inner and the outer lived experiences of human subjects." In the Kumaon case, the outer experiences profoundly influence the inner ones, it seems, and the practical benefits include the protection of the forest. We must assume also that these benefits extend to local people themselves, who gain forest use rights and revenues.

But if Agrawal is right, there is no reason to think that benefits from conservation must necessarily flow to those governing the resources. As Foucault (1995) more skeptically suggests through his famous history of the modern penal system, this process is one where we administer our own imprisonment, guarding ourselves for the benefit and increased efficiency of a hidden jailer. In *Environmentality*, who is the jailer, or perhaps more accurately: for whose benefit is the jail run by the prisoners? What, indeed, is the experience of the jailed?

Agrawal himself concedes that his book pays too little attention to the experience of Kumaonis themselves, noting that he "did not pay sufficient attention to the lives of people beyond what was necessary to make the argument in the book . . . to talk about people without really knowing them – a failure of nearly all social science research that claims to be about people – is quite unsatisfactory." Even so, Agrawal's historical analysis, his rigorous survey of the techniques of forest management and enumeration, and his careful survey of local people together effectively show the power of institutions to make people think and be in a certain way. The question remains: who labors and who benefits in such a way of thinking and being?

projecting and enforcing an expectation about what is *normal*. Hegemony is a condition of that normalcy, in which these expectations come to coincide with the interest of powerful actors and agents, to whom value and benefits flow from things *the way they are* (Gramsci 1973). In this way, power precedes knowledge and the two are together conditions for truth (Foucault 1980). More than this, political ecology has long suggested that hegemonic ideologies or social truths, precisely because they articulate with relationships of power, are neither random nor totally unpredictable. Rather, there are frequently patterns to the character of taken-for-granted knowledges. Most notably, the exigencies of governance, like managing a forest or the health of a population, make certain forms of knowledge – those congruent with the needs of state power – common to state agents and agencies (Scott 1998). Institutions that govern complex ecologies, owing to their mandate, must forcibly simplify them in the interests of making them governable, a process James Scott refers to as "seeing like a state." The perverse outcomes of such simplifications are many, since they inevitably cause friction with the complex and unpredictable nature of environmental systems (Scott 1998).

But these simplifications by no means remain the sole purview of census offices, health agencies, or forestry bureaus. Instead, as states promulgate systems of governance through populations, people and actors come to internalize the responsibilities and norms of state actors themselves; they become self-governing. Such norms, specifically geared to match the needs and logics of state power, represent governmentality: populations governing themselves (Foucault 1991). Hegemonic modern norms or values relative to the environment, therefore, may be in part those grafted into people's daily scripts from state mandates designed to categorize, census, or govern the environment. The site of contestation, between state and local priorities, therefore, is in the minds and behaviors of individuals, as in Chapter 9, where individual definitions and expectations of what a forest is, and whether it includes exotic species, are accepted as normal by some actors or rejected by others.

Finally, the resolution of these values and of what people believe about the environment is understood here to be linked to who they think themselves to be. Drawing on the central insight of structural social theory, self-identification of people is therefore linked to, and in part follows from, certain behaviors, values, and norms. This is a tacitly acknowledged truth of most environmental movements in contemporary history, which hinge on the strategy that people's experiences at a national park, in a museum, or in the daily practice of recycling can influence what they think about the broader environment, and ultimately come to change their way of thinking about themselves. The green subject is interpellated (following Althusser 1971) by its behavioral and normative context (Figure 11.1).

The Evidence

The more disturbing implications of this, of course, are that many environmental behavioral and ideological norms exist in competition, including those of capitalist firms and state agencies, and these too, through the process of governmentality and hegemony, can come to govern what people think and who they think they are. Cases from around the world demonstrate that the contestation of ecological priorities is also one of identities. Enacting certain environmental behaviors, it has been observed, comes to direct who and

Figure 11.1 A local herder pleads his case for forest use at a contentious local meeting with government officials in India. Can changing governance make people internalize the state's vision of the environment? © Dr. Anil K. Chhangani.

what people are, while rejecting or challenging certain practices, conversely, runs afoul of hegemonic expectations tied to identity, and vice versa.

Mayan identity and ecology

When most of us think about the Maya, we have an image in our head of a specific culture group, with complex writing and ritual practice, and of a great civilization that reached its zenith prior to the arrival of Spanish conquistadors in Meso-America in the fifteenth century. If we are more deeply read in cultural ecology, we might also associate the civilization with a certain kind of shifting agroforestry agriculture – milpa – which either maintained its communities and civilization (Kunen 2001) or which provided its ecological Achilles' heel from over-intensification. In any case, we think we know who the Maya are.

Other observers beg to differ. Notably, Joel Wainwright's historical political ecology of development in Belize, *Decolonizing Development* (2008), carefully traces the history of what we know about the Maya and shows it to be the product of colonial and state writing and thinking. Recording Maya culture, mapping Maya territory, and describing Maya agriculture are an old tradition in human ecology, beginning with sympathetic colonial observers and leading up to the current efforts to assemble an atlas of Mayan lands and cultural resources. But as Wainwright shows, each such effort has resulted in a more extensive enclosure of Maya lands, conversion of community resources into private property rights, and tracking and control by state authorities. In this way, Wainwright suggests, the effort to record and document a coherent and specific Mayan identity, however well meaning, has largely been responsible for many of the losses of land, autonomy, and resources of indigenous people in the region. Creating a Maya *identity* has been a component of Maya marginalization and control.

Box 11.2 Entering the Aporias of Joel Wainwright's *Decolonizing Development*

It has been repeatedly observed that well-meaning efforts in development fail utterly, including (and perhaps especially) those focused on the most historically marginalized, exploited, or neglected populations. Joel Wainwright's *Decolonizing Development: Colonial Power and the Maya* is an effort to recount the history of development in Belize amongst Mayan peoples and not only explain why this is true but also expose the inevitable contradictions of development that make this truth persistent. In this dense, historically rich, and sometimes distressing account, Wainwright argues that even the most high-minded and well-meaning participants in modern development are inevitably entwined with territorial and economic logics that support capitalism and the state at the expense of local people. These practitioners include archaeologists seeking to discover Mayan history, cultural ecologists seeking to understand and valorize Mayan agriculture, ethnographers attempting to record Mayan culture, and even participatory action cartographers seeking to map and defend Mayan lands. All of them seek to make development appropriate and humane, and all of them manage only to enclose and limit the Maya further; development is a trap.

Rather than throw our commitments in with "anti-development" that seeks to *avoid* this contradiction, however, Wainwright insists that we actually proceed precisely *into* these contradictions, facing head-on what he calls "aporias," a term he borrows from Jacques Derrida and Gayatri Spivak to describe spaces or passages that are "non-passages" that become "the experience of the impossible" and produce "radical doubt" (Wainwright, pp. 10–11). "We cannot not want development," Wainwright boldly asserts. Wainwright's book, then, is a dark invitation to face head-on the perverse political ecologies of development in order to imagine a place beyond them.

Wainwright is, of course, not free from his own critique, and the shadow of his own experience in Belize hangs over the volume. The roots of the book lie in the period Wainwright spent working for indigenous land rights in Belize alongside the late Julian Cho, an activist and leader of the Maya Movement, who was killed in December 1998. As he recently explained to me:

> I felt, like most of my friends and allies, that the movement was crashing down. I also lost a good friend and, with him, one of my strongest personal attachments to Belize . . . This period, when I was mourning Julian (and the decline of the movement he led), was crucial for my intellectual and political reflection on my earlier involvement in the Maya struggle. And this is when I studied postcolonial theory, particularly the thought of Gayatri Spivak, and made my first serious attempts to read Heidegger and Derrida . . . The experience of confronting postcolonial theory, coupled with a rigorous rethinking of the decline of the Maya land rights movement – and my own role in that movement – allowed me to broach new questions.

For Wainwright, then, all analysis, activism, explanation, researching, and writing is inevitably a part of a longer legacy that cannot be wished away. The postcolonial

lesson for Wainwright, as demonstrated in his challenging book, is to trace backwards the place of current political and ecological research and action within that longer legacy, while proceeding radically forward towards someplace better. As Wainwright explains: "I came to see the necessity of the analysis of the colonial roots of the current crisis, on one hand (which led to the archives) and the destructuring of capitalism qua development . . . These were the conditions that created the problematic of *Decolonizing Development*."

The outcomes of the resulting identity formation and contestation are complex. Juanita Sundberg demonstrates, based on her fieldwork amongst communities in and around the Maya Biosphere Reserve in the Peten region of Guatemala (Sundberg 1998), that NGO efforts to valorize supposedly traditional or indigenous Mayan agroforestry practices have caused competing groups increasingly to claim livelihoods and identities in an effort to seize and control land resources. Local producers – who represent a range of historic communities, settlers, and residents – adapt their forestry and agriculture to match the ideals of the NGOs who now adjudicate appropriate practices. Migrants from other regions, an equally heterogeneous set of groups, who do not adopt authentic Mayan practices (which in this case included monocultural citrus production for export), are branded as having practices deemed inappropriate and inauthentic. The resulting cocktail of identity and access allows different local players to carefully mold their cultural identity and livelihoods around NGO ideals.

This entanglement further configures expectations about gender and culture, as where the local Women's Group for the Rescue of Itza' Medicinal Plants interacts with an international non-governmental organization. In the wake of this interaction, where again indigenous identity is defined by well-meaning observers, women are advised "to carefully construct and perform an indigenous identity that will meet the NGO's expectations . . . this involves enacting helplessness and creating the space for the NGO to provide help . . . It also involves padding the group's message, to add a touch of the exotic" (Sundberg 2004, p. 51).

The Maya are, in this sense, subjects of development: the artifact of hegemonic systems of knowledge linked to a history of colonization, not to mention racialized and masculinist expectations. This does not mean that such an identity is necessarily always paralyzing, however. Indeed, social movements in the region, which represent often-radical efforts to create new democratic conditions and solidarities, sometimes capitalize on precisely these tropes and ideas, albeit in complicated and uneven ways (Sundberg 2003). But Mayan identity is fully in motion nonetheless, tied to the right to control land and environmental practices, linking who people think they are (or are said to be) to what they do on the landscape. People's ecological priorities and self-definition do not precede their actions in a development context; they are very much a part of power-laden development outcomes.

Andean livelihood movements

Still, not all identities are easily scripted by global actors. The highlands of Ecuador are an interesting laboratory, in this sense. The agricultural systems of the highlands (at 2,500–3,700~m) are remarkable in themselves, since they represent a set of serious constraints in terms of soil, slope, and climate. The degree to which the cultivation of potatoes, maize, and barley yields surpluses and stable populations, indeed supporting prehistoric empires, is a topic worthy of examination in itself. So too, the postcolonial history of the area presents interesting problems. The high-altitude regions are disproportionately occupied by indigenous *quichua*-speaking peoples and mixed indigenous–mestizo communities, historically linked to haciendas (large feudal landholdings) as laborers, but also holding their own small subsistence plots. With the breakup of the haciendas in the 1970s, land redistribution led to subdivision and accumulation. The resulting highly stratified state of landholdings in the region produces labor, class, and ethnicity dynamics of great complexity (Bebbington 1993; Jokisch 2002).

But this corner of the planet, with its peculiar history, is in many ways one of the most globalized and integrated regions in the world. The area has been a target for global development aid and technological diffusion since the dawn of the green revolution more than 30 years ago, and technicians, extension agents, and development officers have been crawling across the mountains for at least that long. So too, whole highland villages have been depopulated as migrants travel from this area to places like Queens, New York, and Barcelona, Spain, sending remittances with values in the millions of dollars annually. Thus, if there ever were a place to study the global–local linkages of survival, adaptation, and upheaval, this would be it (Jokisch 1997).

The region is also notable, however, for the way in which social movements and ethnic identity have been closely intertwined with changing crops, technology, and labor relations in the past few decades. Like indigenous movements in Ecuador more generally (Perreault 2001), these have demonstrated impressive variability, as a result of varying local ecological and political conditions. Even so, the rise of indigenous livelihood movements and the peculiar articulation of ethnic identity in the landscape point to some general patterns in the region: indigenous movements often embrace modernization, but on their own terms.

Modernization and identity

The highlands is a region where livelihood movements do articulate local concerns, which grow from traditional agricultural practices, but do so in ways that utilize contemporary agrarian technologies to enhance survival and surplus. Anthony Bebbington, whose research within and about NGOs in the region has tracked the history of these movements, describes the way traditional highland *quichua* speakers (known as *runa*) have increasingly pressed for autonomy, rights, and land reform to break up haciendas and redistribute assets to the poorer communities. These indigenous movements, based in a notion of collective identity, not only successfully forced local land redistribution in the 1960s and 70s, but also led to the creation of larger political federations, increasing the force and prominence of indigenous communities in national politics (Bebbington 1993).

The success of these movements, however, has ecological implications. Land has been subdivided and hacienda pasturage has given way to cropping. This means increased intensity of production on small plots coupled with a decrease in animal nutrients for the soil, leading to decreasing yields and erosion. Simultaneously, increasing integration with global commodity markets means new crops, increased migration, and tighter margins. Nongovernmental and church organizations working in these regions have responded by offering packages of modern high-input agrochemical technologies to local indigenous producers. This green revolutionary approach was fostered in spite of an avowed interest on the part of these organizations to protect indigenous technologies and knowledges (Bebbington 1996).

But Indian federations, with 30 years of experience in articulating community needs, have responded to these technological opportunities in surprising ways. Responding to the realities of market integration and the lack of interest on the part of local producers for entirely traditional approaches to production, they have begun to embrace the use of agrochemicals, especially fertilizers. By incorporating some, though not all, green revolutionary innovations to maintain crop yields, outmigration is reduced, leading to enhanced community cohesion. As Bebbington explains: "modernization, far from being a cause of cultural erosion, is explicitly seen as a means for cultural survival" (Bebbington 1996, p. 101).

Such efforts at modernization fly in the face of those accounts that point to the risks of the green revolution, both for dissolving traditional social structures and undermining the sustainability of ecosystems. The Andean case suggests that such predictions are somewhat premature. Bebbington puts it simply: "while agrarian modernization led to the erosion of some 'indigenous' cultures, this need not be the case: it depends on how the rural poor are able to incorporate and use modernization" (Bebbington 1996, p. 90). In other words, identity-based movements need not be "traditional" to be effective, and by controlling the conditions under which introduced technologies and outside forces act, such movements allow traditional communities to thrive.

Evaluating the Thesis

Research in this area argues for, and empirically supports, the fundamental ways that abstract human experiences and social processes like identity, ethnicity, and political agency are grounded in the most common material things, like trees, fertilizers, or drinking water; people make an identity as they make a living. Of course, there are some conceptual risks inherent in linking subjects to ecological institutions. These pitfalls should not distract us, however, from taking seriously either how local actors conversely confront expected identities by acting to secure their own social ecologies or how the imposition of institutions leads to problematic new kinds of people.

Making identity by making a living

Most political ecologists agree on certain general normative claims. People should be allowed to retain and maintain their own self-determination and control their own labor.

Communities should be allowed to build collective institutions, redistribute and share risk, and maintain the dignity of the least fortunate. Ecologies should be maintained with an eye towards medium- and long-term human use, while attending to their inherent values and diversity. But in fact, most political ecological research tends to focus on the forces that lead to *the destruction of these very possibilities*. Processes of marginalization and degradation, conservation efforts gone haywire, and divided ecological politics usually point to what has gone wrong.

The value of livelihood identity research, therefore, is that it transcends this work, to show how ecologies are viewed, produced, and defended by local people. That these people don't always do things the way outsiders would like – using chemicals or cutting trees – is not a problem, indeed it is exactly the point. A postcolonial political ecology has to admit that it doesn't have all the answers, and that knowledge close to the ground is as legitimate a form of science as that of academic observers.

And the degree to which indigenous, traditional, and marginal people embrace elements of development, finding new ways to make an identity while they make a living, is all to the good. If chemical fertilizers can help keep *quichua* people on the land, and allow them to articulate their own traditional identity, does it matter that chemical fertilizers are not "traditional"? As Bebbington observes: "People encounter development from their mundane, daily concerns to build and improve their livelihoods, to build places they enjoy being in, to give meaning to their lives through these livelihoods and places, and to maintain, and, as far as possible, to extend the degree to which they can exercise control over their conditions of existence" (Bebbington 2000, p. 513).

Local actions (whether or not they could be called "movements" of one kind or another) provide an alternative vision of politics and decision-making; by accepting some forms of modernization (fertilizer, nuclear waste, or industrial tree harvesting) while rejecting others, and doing so on their own terms, communities also present an active face, challenging the homogenizing and exploiting forces of globalization.

In this sense, the very idea of "community," so often romantically used by outsiders to characterize local polities and subjectivities, can be strategically useful. While such groups may not actually be organic "communities," they can certainly represent themselves in that way to provide a united front, provoke sympathy, claim collective property, and muster their identity against the forces arrayed against them (Li 1996). These movements show that while it is impossible to "opt out" of engagement with a globalizing world, it is by no means impossible to set some of the terms of engagement.

Are environmental subjects democratic ones?

But the entanglement of subjects, normative institutions, and livelihoods cuts both ways. As Agrawal's Garhwal producers exercise control over their conditions of existence, we find them internalizing priorities dictated or at least prized by authorities external to themselves. In this case, such environmentality leads to outcomes that appear benign. Trees are not burned and people expand their resource base: win–win. Other cases, however, like that of Mayan livelihoods and identity, raise questions about the harmlessness of environmental identities. To what degree has the imposition of appropriate Mayan behavior and identity subverted precisely the kind of self-determination that Bebbington extols?

If environmental priorities are the result of apparently decentralized delegation of authority, are they always in the interest of local communities? Are environmental subjects, in other words, democratic ones?

A quick consideration of the global "green" product certification process draws any such conclusion into question. Here, an apparently innocuous effort to assure that consumers receive "sustainably produced" products, like timber or coffee, remarkably aligns people's practices and identities through a pernicious governmentalized process, with ambiguous results. In the case of coffee, for example, Tad Mutersbaugh (2002) has demonstrated that the proliferation of community-overseen certification rules has created a forceful, local-level, panoptic system of governance that disrupts communities, pits social groups and workers against one another, and undermines historically useful producer unions. Even if local producers, therefore, emerge as environmental subjects of the certification regime, and become "those for whom the environment constitutes a critical domain of thought and action" (Agrawal 2005, p. 16), something has still gone terribly wrong.

From the consumer side of the same equation, the willingness and enthusiasm to consume green things has unquestionably produced "green consumer" subjects. As the work of Julie Guthman in organic production (2004, see Chapter 4) has shown, as have observers of other goods (Neilson and Pritchard 2007), the consumption of green goods in no way frees them from the complex coercions of global trade. Nor has it slowed the pace of consumption overall. Green consumers are consumers nonetheless, but ones with an identity that gives them license to feel good about their consumption, even where the black box of global trade disguises any of the potentially debilitating and undemocratic qualities of these markets. More than this, it makes them just another unwilling demographic profile for marketing exerts to target and manipulate (Diamantopoulos et al. 2003). Certification, in other words, has unquestionably created environmental subjects amongst both producers and consumers, in a way that political ecology suggests should make us worry.

Whatever normative outcome from environmental identity struggles and subject formation might be desired, however, the ambiguous reality in the political ecological record, from Bebbington to Agrawal, must be acknowledged. Both consent in, and dissent from, environmental regimes are not a mere matter of choice, or even political action, but are entangled with how people come to think of themselves. The reality of ecological consent and dissent presents contradictory tensions. An unromantic accounting of subjectivities, which takes seriously the opportunities of institutional innovation while remaining skeptical of the normative implications of such change, remains an urgent research agenda.

In the Field: "Lawn People" as Environmental Subjects in the United States

My own attempts to understand these relationships – between community, environmental technology, livelihoods, and subjectivity – center on the use of lawn chemicals in the United States. This work begins around 2000 with my own normative frustration (and fascination) with the widespread use of intensive pesticide treatments on what are, at bottom, ornamental landscapes. These chemicals represent a cocktail of problematic formulations,

Box 11.3 Meet the New Boss . . . in Tania Murray Li's *The Will to Improve*

The "bad old days" of environment and development, it would seem, are over. Global entities like the World Bank Group and global environmental NGOs like Conservation International have discovered the error of past ways and moved from coercive, restrictive, and exclusive systems of development to new ones that prize, celebrate, and foster local "social capital." These approaches differ from efforts of the past because they stress people's choices and the power of collective responsibility.

Political ecology on the subject, best represented in Tania Murray Li's book on development history in Indonesia, *The Will to Improve* (Li 2007), is far less sanguine on the question, however. Despite an insistence by many of her students that contemporary development is more culturally sensitive, participatory and NGO driven, Li was not convinced. Surveying the history of "improvement" efforts in Indonesia, especially amongst communities and officials in and around the Lore Lindu National Park in the Sulewesi Highlands, Li concludes that the new era of "government through community" carries with it the baggage of coercive colonial and postcolonial political economy.

The book is therefore dense with details that cover familiar and disturbing political ecological ground, linking the politics of securing capital from cacao production with forging new and fractious religious identities and tracking the long history of violence associated with state efforts to control rural populations. But it enters new critical territory as well, as it shows that the "will to improve" (landscapes, economies, citizens . . .) has been enrolled in decentralization efforts to make local people responsible for their own self-transformation and care for the environment. This often resulted in a substantive if fractious local scene, even while central authorities maintained a conversely "desultory, elite-dominated, formulaic" (p. 183) approach to development. This dark Foucaultian picture of subject formation provides a striking contrast to more benign images of environmentality.

It also means that political ecology is once again forced to be the bearer of bad news. As Li explained to me in 2010, the book raises the question of:

> whether every critical scholar should also be a programmer, coming up with new plans to improve the world . . . I made an argument for keeping the roles of programmer and critic distinct. I think both are valid and important, and the same person can do both over a lifetime, or perhaps on different days of the week. But if I had been obliged to end the book with a prescription for how to do development better, I could not have stood back far enough . . .

This has not crippled Li's interest in imagining alternatives. As she asks in her new project, "in places where something progressive has happened – a reduction in inequality, an increase in wellbeing – how did it happen? . . . Knowing it was possible doesn't mean it could just be replicated, blue-print style, but it does provide a counter to the dismal view that nothing can ever be done." In this way, Li uses political ecology's hatchet to make way for the seeds of alternatives.

Figure 11.2 The American lawn covers an area larger than the state of Michigan, yet a great many residents report that they would prefer not to have them. What work do lawns do on people? Photo © Delmas Lehman / Shutterstock.

ranging from potentially carcinogenic herbicides to organophosphate insecticides that act as nerve agents (Cox 1999; Greenlee, Ellis, and Berg 2004). These chemicals are notably mobile and wind up in people's houses and in ambient water systems (Nishioka et al. 1999, 1996). The American lawn, which covers an area equal to the size of the state of Michigan (Robbins and Birkenholtz 2003; Robbins, Polderman, and Birkenholtz 2001), is one that, though turfgrasses are remarkable resilient and in little need of maintenance as species, supports a nine billion dollar chemical and input industry. This contradiction seemed to demands research attention. Why do people apply chemicals in such large quantities?

My efforts, supported by the labor and insights of a number of graduate students, initially focused on a traditional political ecological chain of explanation. Why do people choose to use chemicals (non-environmental values, housing price priorities)? What conditions constrain or compel those choices (education, municipal land use codes)? What limits, if any, produce those constraints (income, real-estate markets)? One central hypothesis was that some kind of normative interest in environmental protection might coincide with lower chemical inputs.

Our methodological choices followed from these starting ideas. We launched a national survey of homeowners who had lawns (a "grassy place at the front or back of your house"), and asked a range of questions about their attitudes and demographics, but also about their practices and context: do they use chemicals; do they apply them themselves; do their neighbors use them? The survey was rigorously mounted in consultation with a pollimetrics laboratory, pre-tested, and overseen with terrific care. The sample was largely repre-

sentative of homeowners nationally and respondents enthusiastically answered our questions; people like to talk about their lawns. Yet, right from the outset we had trouble.

Specifically, we could find no relationship between a concern for the environment and non-use of chemicals. More confusingly, we found that those respondents who claimed that lawn chemicals were bad for the environment and for human health were *more likely* to use chemicals than those who do not use those chemicals. This contradiction, though fascinating, posed a dilemma. Either people who use chemicals know they are bad but do not care (although the issue of people who do not use chemicals but who do not say they are a problem remains!) or something else is at work on these respondents.

Changing methodological gears, we spoke with people in follow-up phone calls and visits to their houses, trying to understand the way people reconciled their beliefs and their behaviors. At the same time, we hunted through the survey data to find other clues to the complex relationship between people's behaviors, agro-industrial technologies, and their values.

Several things became clear. Interviews consistently stressed the role of anxiety in the lives of lawn chemical users. Specifically, many felt strong concern about their behaviors, but felt that a larger purpose was served in lawn chemical application. Use of chemicals was consistently associated with positive participation in local communities, with building local cohesion, and with doing the "right thing." In the survey, chemical use was found to correlate with the number of neighbors people could name off the top of their heads. It seemed, therefore, that chemical users, who put dozens of hours into lawn care and exposed themselves and their families to health risks that they commonly acknowledged, were engaged in what they understood to be the collective care of a turfgrass commons. More than this, participation in this kind of behavior was associated with being the right kind of citizen and neighbor. Informal but very strong rules about how, when, and to what degree labor and chemical inputs are used on American turfgrass are a kind of normative institutional expectation, resulting from the way the burden of neighborhood stewardship is centered on local individuals (homeowners) and collective choice groups (homeowners' associations).

It would seem, therefore, that we had come across precisely the sort of socio-environmental phenomenon that Agrawal would call an environmental subject: a person for whom the environment "constitutes a critical domain of thought and action," assuming environment is here understood as the carefully cultivated turfgrass monoculture of the American imagination, and its concomitant social collectivity.

But something else seems to be up here. The growth of chemical use unquestionably coincided with the creation of a system of middle-class home ownership in the United States and with the explosion of a global chemical industry that meets and fosters chemical demand. This structure of institutions and identity is therefore convenient first for a state system that harnesses a stable and docile middle class and second for an economic system that enrolls household landscape management into global capitalist chemical markets. The former is entrained to tax credits for mortgages, planning systems that plat big lots primed for grass, and municipal codes that restrict landscaping choices. The latter is moored in the circulation of investment in agro-industry and the debt-payment cycle of global chemical firms.

In other words, turfgrass tenders are subjects, but ones located in a larger political economy. Our work went on to pursue many of these angles, and worked to uncover the

political economies in which people's choices and identities rested. Chemical production firms, we found for example, increasingly demand reliable markets and invest significant budgets into advertising that precisely links lawn chemical use with environmental stewardship and good citizenship (Robbins and Sharp 2003a, 2003b). We cannot say that commercial chemical advertising *causes* people to use chemicals, but neither can we say that people's behaviors were not related to the bombardment of ecological information that comes from such companies. Rather, we have to conclude that local normative institutions for land management, together with powerful interests, produce collective responsibilities that create certain kinds of people: lawn people (Robbins 2007b).

But the animating process that makes all of this work out the way it does rests in complex systems of meaning and association coded within the lives of people. Here, our work remains painfully limited. Many of the complexities of these relationships lie beyond the ability of surveys to capture internal mechanisms of logic and action. Put simply, subjects are not easily apparent from surveys or industry and policy analysis, yet these remain the cornerstones of the evidence we managed to muster in our work. Certainly our investigation merely scratched the surface of this problem. It remains to researchers with greater aptitude in participant observation and, perhaps, critical psycho-analytic methods, to truly plumb the depths of these complex relationships. If we take the idea of environmental subjects seriously, in other words, our work, as political ecology, must be considered embarrassingly superficial.

Chapter 12

Political Objects and Actors

- The Argument
- The Evidence
- Evaluating the Thesis
- In the Field: Do Mosquitoes Manage Bureaucracies?

What could be more natural than fresh food? The terrible truth, however, which Susanne Freidberg (2009) concludes after studying the history of meat, eggs, and fruit, is an obvious one: freshness is the exception and not the rule; things rot. And for most of human history this inevitability was part and parcel of daily life. Though there would be many innovations for keeping food edible over the millennia (e.g., salting or smoking meat), the plain fact is that for a long time, nobody expected their food to be fresh. It was only with the advent of modern refrigeration, and especially the refrigerated train car, that people came into regular contact with vegetables, meats, and eggs that were edible, but which came from far away and were picked, slaughtered, or laid many days, weeks, or months in the past. Freshness isn't natural. It is instead a product of capitalist transport, production, and processing.

This radical change in both the idea and the physical management of food, Freidberg demonstrates, is not by any means always for the good. What kinds of massive investments in energy, sanitation, and transport are required to produce freshness? Freshness is by no means incompatible with "food miles" and air freight. Indeed, the more freshness one

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

requires, the more people, objects, and things are necessary to make it happen. As trust and distrust in the purity of the egg (and dairy) system started to expand in the United States a century ago, it drove a massive expansion of intermediary actors and industrial technological developments to assure the "natural" conditions of food. Freshness has cemented, arguably, the power of the very agro-capitalist food system that it seems to contradict.

But the additional conclusion that must be drawn from Freidberg's work is that the objects of consumption and the machinery of their processing have a profound influence on the political economy that manages and exploits them. The refrigerator itself, for example, creates a new and enormous set of economic actors in the food chain, between the consumer and the producer, and the preferences of shippers (for a fruit of a specific shape or size, for example) may trump the capacity of a farmer or the preferences of a buyer. The character and direction of political economic struggles over food quality (local food movements, efforts at food sanitation, etc.) are all staged by the specific qualities of the refrigerator or shipping container that brings it to market. Of course, this materiality of meat and eggs and refrigerators does not act alone. It only matters insofar as consumers come to *expect* that these materials come to them in a pristine state, like new – freshness is a condition but also an idea, a technology but also a story. The case of freshness underlines that material things are entangled in political economies, but also historically, culturally, and socially constructed. This insight is part of a larger political ecological engagement with the power and limits of non-human actors, which has organized around a tacit narrative about objects, networks, and power.

The Argument

Material characteristics of non-human nature and its components (dung, climate, refrigerators, bacteria, lawn grass, road salt, goats, tropical soils . . .) impinge upon the world of human struggles and are entwined within them, and so are inevitably political. Yet as these characteristics and agents assume new roles and take on new importance, they are also transformed by these interactions. People, institutions, communities, and nations assemble and participate in the networks that emerge, leveraging power and influence, just as non-human organisms and communities do. In recent history, hegemonic institutions and individuals (environmental ministries, multinational corporations, and corrupt foresters) have gained disproportionate influence by controlling and directing new connections and transformations, leading to unintended consequences and often pernicious results. In the process, resistance emerges from traditional, alternative, or progressive human/non-human alliances marginalized by such efforts.

This argument is predicated on two central observations about material nature, objects, and non-humans. First, following thinking in science studies and related fields, it is increasingly clear that non-humans are collaborators in complex relationships, influencing people and institutions and setting the terms of economic growth and political change. Conversely, however, the qualities of non-humans that are incongruent with state organization, capitalist accumulation, and various forms of social institutions cause them to resist or create friction with human activities, producing a different kind of political engagement.

Box 12.1 The Rotten Implications of Fresh Food in Susanne Freidberg's *Fresh: A Perishable History*

In *Fresh: A Perishable History*, Susanne Freidberg threads a theoretical needle between a determinism that suggests that objects and technology drive history and an econocentrism that suggests that people and firms can create whatever natures they require. By showing the way new norms for food were in part driven by and formed around precisely the limits that these foods present in their varied states of inevitable decay, she shows that capitalism transforms food while it also nimbly works around those characteristics of food objects it cannot defeat.

As she came to understand the history of freshness itself, moreover, she increasingly came to appreciate its bizarre ubiquity. As she recently explained to me, she "could not help noticing the word 'fresh' everywhere in our popular food culture, and used almost always in a positive sense. That is, if it's fresh, it must be better. Where did that assumption come from? That was the question I wanted to answer."

The implications of this question are far from merely theoretical. Being able to keep eggs fresh beyond their historic spring laying season allowed egg speculators to hoard across the year and attempt to capitalize on high winter prices. These efforts might be undermined by nature's surprises (an early thaw) or farmer ingenuity (changing the henhouse lighting schedule to induce laying in other seasons) but they underline the degree to which freshness has ugly possibilities.

A demand for produce, she demonstrates, culminated in the "Battle of Silinas," which broke the back of striking Filipino farm workers in 1936, showing the hidden human costs of an apparently innocuous food economy, which prizes fresh produce as morally "good." Similarly then, the recent obsession with fresh foods from local production may also contain insidious implications, insofar as it depends on subsidies for land, the affluence of its consumers, and an existing infrastructure of energy and labor.

> I wrote it at a time when books about how to find "real" fresh food were flying off the shelves. I thought it was important to show that this preoccupation with freshness and all the qualities associated with it (purity, wholesomeness, vitality, etc.) was not entirely new or innocent. In the past, demand for freshness has led to (or at least helped to justify) various sorts of harm to people, animals and the rest of nature . . . I wanted readers to think about the history that has made, say, Burkina Faso's farmers dependent on globalization but has made "local" markets viable and lucrative for farmers local to Berkeley or Manhattan or Madison.

Getting beyond the romance associated either with gee-wiz modernism of contemporary food science or the rustic romanticism of locavore food politics, Freidberg reminds us of the messy material facts of our food system, and the limits they place upon easy solutions for sustainability.

Collaborators: Dynamic actor networks

First, following the insights of Bruno Latour and numerous observers of nature/society interactions, it is increasingly clear that "social" interactions include associations between people and non-people, with this latter category including living things, like crop plants or bears, as well as other objects, like file cabinets or quartzite outcroppings (Latour 2005). What this further suggests is that the sociability of people and things causes them to become entangled and to transform one another. That transformation results in new hybrids, given things have no essential character, but are the product of these associations (Murdoch 1997b, 1998; Whatmore 2002). "Beings," Donna Haraway observes, "do not preexist their relatings" (Haraway 2003, p. 6; see also Haraway 2008).

The favored terminology here, that of "enrollment" with its connotations of membership and joining, suggests that things come to work together with one another, become mutually dependent, and form intimate associations. Significantly, this concept is by no means distant from the old-fashioned vision of *ecology*, a relational network of things that together produce a system in which they all evolve together. But the network metaphor eschews some of the potentially functionalist connotations of systems language, while retaining the sense that the relationship is as important as its diverse constituent elements. For political ecologists, then, the central innovations of this way of thinking include the expansion of the polity and the number of parties to a quarrel, struggle, or a *collaboration*, as well as a continued stress on the (arguably dialectical) relationship between differing elements of the world.

Insurgents: Uncooperative materiality

But this generative view of networks, stressing their cooperative and emergent effects, contrasts with a simultaneous view of non-human agency, which stresses the "stubbornness" and intractability of certain properties of non-human things, which impinge on, and limit, the power and influence of human actions or institutions. This insight is foundational to the "tragedy of the commons" (Hardin 1968) and related institutional thinking (see Chapter 3). The "tragedy" tends to occur, after all, precisely when the natural resource in question is fugitive, mobile, and difficult to capture or contain. Fishing provides an obvious example. It is difficult to exclude people from the ocean and the animals in question tend to move around and are difficult to count. This leads either to overfishing or to the emergence of clever local systems to manage ocean space (St Martin 2001; St Martin and Hall-Arber 2008). The materially uncooperative nature of the resource itself (following Bakker's analysis of water, Bakker 2004) makes it hard to commodify. It can also encourage cooperation, however, since collective action is necessary to sustain resource use (Ostrom 2002).

So while material non-human nature is at times pliant in its collaborations with human beings, many qualities of non-human nature present important barriers, which account for important political and economic outcomes as powerful interests (e.g., seed companies) struggle to change and control both the physical properties of things (e.g., through genetic engineering) and the institutional systems that govern them (e.g., patents on new forms of life). Non-humans can "resist" collaboration into networks, institutions, and systems

just as easily as they can collaborate. The implications of this for socio-ecological power and justice are numerous.

The Evidence

The growing body of research investigating these relationships commonly follows the political and economic effects of these same contradictory qualities: collaborative enrollment and material resistance. Newly constructed tubewells in arid parts of India, for example, have been shown to enroll farmers into cooperative social institutions required to finance them. These create new social tensions when the well technology leads to degradation of water quality, which resists the production of desirable varieties of crops (Birkenholtz 2009). Elm trees were enrolled in North American cities and maintained to improve housing investment values and civic stability, but their monoculture portended vulnerability from a resistant runaway fungus, Dutch elm disease, which piggy-backed onto the continent through global trade (Perkins 2007). The outcome of both cases is a new political economy and an unfolding struggle, propelled forward by specific ecological interactions.

Agricultural biotechnology

One of the core areas of political ecological insight involves the influence of nature and technology on agrarian economies. Political ecologists studying agricultural production have consistently demonstrated that the material challenges of primary production have created enormous impediments, as well as opportunities, in economic history. Controlling and transforming these very material conditions has led some firms and interests to near-monopoly power over many of the things we consume every day.

First the seed

Agrarian theorists Mann and Dickenson (1978) inaugurated much of this way of thinking in their analysis of modern agriculture. Reflecting on the fact that the small family farm seems to have persisted long after agriculture had been capitalized (which contradicts trends in many other parts of the modern economy), they concluded that it is the very material conditions of farming – especially the long growing season of crops, the length of time it takes for cattle to reproduce, and other natural limits – that makes it difficult for capitalist firms and investors to realize profits in farming like they would in, for example, automobile manufacturing. The key insight here is that industrial profit in agriculture depends heavily (or entirely) on speeding production times in a battle with nature – fattening cows artificially, for example, or shortening growing time in new varieties of seeds. So too, in some sectors – like forestry – where the realization of value is very slow indeed (it may take a century or more to grow a tree), it should not be surprising that the cost of growing trees is typically shifted to state entities (like the United States Forest Service) while the realization of value in harvesting is afforded to capitalist firms. Explaining many of the perverse outcomes of agricultural innovation or public–private relationships, therefore,

depends on understanding the specific lifespans, seasonality, and other characteristics of crops, domesticated animals, and trees.

Or consider the capacity of life itself to reproduce. Not a bad thing in and of itself (!), this fact becomes an enormous problem for capitalist production. The case of crop seeds is a paradigmatic example. Because seeds are the product of agriculture but also the central engine of production, it has historically been difficult to make a living in the breeding and sale of seeds. Once a farmer has purchased a seed from a company and harvested a seasonal crop, after all, she is, from then on, fully able to produce her own in perpetuity. As Jack Kloppenburg (1988) surveys in his analysis of the history of seed breeding, *First the Seed*, this simple fact has led to a century of political struggle and genetic innovation. For capitalist companies and investors to make money in the seed business, they would be forced either to create seeds that lost reproductive vigor in successive generations or to change laws so that famers could not claim ownership of the genetic material within seeds. Seed firms would do both.

On the one hand, companies poured resources into innovating highly productive seeds that would require periodic purchase, owing to the process of hysteresis (or hybrid vigor), where future generations of the same crop are decreasingly productive. The huge costs of this kind of research, moreover, would force them to influence state universities to cooperate in parts of the innovation process (like breeding experimental specialized lines of crops). On the other hand, they lobbied hard to control and direct patenting rules in the United States which made it possible to own the rights to specific varieties and genetic sources, so that they could recover investments and control ownership of seeds grown from patented genetic materials. Long a barrier to accumulation, Kloppenberg concludes, the seed finally gave way to capitalist investment, but only after herculean manipulations.

With the advent of genetic engineering, this process only accelerated, resulting in rapid changes in the global seed industry itself. As Philip Howard (2009) has observed, over the past few decades, fewer seeds are being saved by famers, genetic lines have begun to vanish, and research is more single-mindedly focused on a handful of varieties, with an accompanying trend towards consolidation. A handful of seed firms – specifically Monsanto, DuPont, and Syngenta – now control most of the global market and these sit at the center of increasingly centralized networks of agreements and contracts between firms. These networks are visualized in Figure 12.1, which shows the dense legal and economic networks that emerge from cross-licensing the specific genetic traits mobilized in modified seeds.

The urgent normative implications of this are numerous, but it clearly means an increase in capital requirements for farmers, greater debt, and the shifting of economic risk from firms who sell seeds to farmers themselves. Debt loads in the farm sector in India in recent years, notably linked to high costs of inputs, including seed, have led to a crisis in loan defaults and are linked to an epidemic of rural suicides across the country, perhaps as many as 17,000 farmers every year (Sheridan 2009). The stakes in this political ecological process are far from merely academic.

Genetic networks of surprise

On the other hand, not all agricultural innovation – even when designed and propagated by capitalist firms – necessarily produces negative effects. This is because, as predicted in serious consideration of the political ecology of actor-networks, the new technology

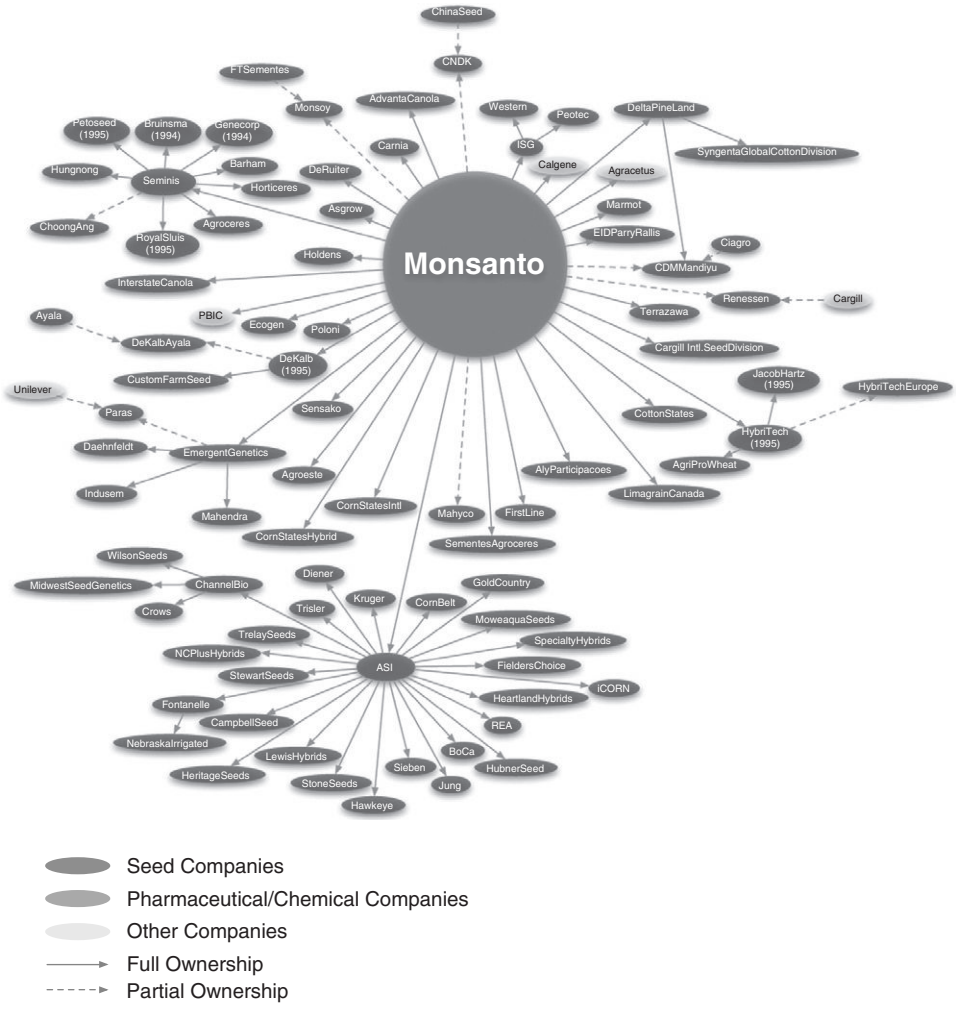

Figure 12.1 Monsanto seed company ownership ties. The global seed industry is increasingly consolidated, with big firms owning not only increasing numbers of smaller companies, but also the rights to the genetic codes of the seeds these companies produce. Adapted with permission from Howard (2009), 1266–1287.

becomes enrolled in a new web of social relationships that changes the conditions, the seeds themselves, and the adopters of the technology.

As Ron Herring (2007) has noted about Bt (*Bacillus thuringiensis*) cotton, a genetically modified variety of the crop that uses naturally produced bacteria to deter pests with lower applications of pesticides, the control and harnessing of the crop by the corporations that produced it have proven difficult. In places like Brazil and India, he observes, farmers and traders have proven too wily and enthusiastic to follow the legal obligations, economic norms, and international restrictions on the planting and trading of seeds. They have, instead, "saved, cross-bred, repackaged, sold, exchanged and planted in an anarchic agrarian capitalism that defies surveillance and control of firms and states." Specifically, farmers

have experimented with the seeds, hybridized them with local varieties, and created complex exchange networks – rooted in their historical seed systems – to proliferate new forms and varieties of the Bt cotton.

The political ecological outcomes of all these surprising genetic networks are potentially both good and bad, of course. As Herring observes, the doomsday scenario where global seed capitalists come to squeeze the life out of local producers by monopolizing the rights to seeds did not come to pass, despite high-profile support of this narrative by progressive political groups (Herring 2006). Bt introduction, moreover, does not appear to have specifically altered the rate of famer suicides (Sheridan 2009).

On the other hand, phytosanitary concerns, raised by cautious observers, about the effect of these introductions on indigenous crop varieties and crop diversity are by no means resolved. As has been observed in Mexico, the impact of introduced transgenes is as yet largely unknown (Mercer and Wainwright 2008). So too, the failure of Monsanto to control multiple generations of seed for which it owns genetic rights may not have resulted in their innovation of a "terminator" gene (one that makes secondary generations of a crop sterile, thus assuring repurchase of seeds), but it has only increased incentives to do so.

Either way, where an apolitical view of agricultural technology might suggest either that population growth or new economic demands lead to clever innovations of non-human nature or that environmental innovation is the very source of socio-ecological change, a political ecology of that innovation suggests precisely the inverse. It is instead the very limits of the accumulation of capital and power set by non-human actors themselves (e.g., seeds) that lead to economic and institutional change and the innovations that seek to overcome these limits. Dialectically, innovations, while not the drivers of change, become enrolled in power-laden networks of relations that create new opportunities to resist, rework, and re-imagine nature/society relationships.

Bear conservation

Another area of concern that has become a focus for understanding more-than-human influences is that of conservation. As reviewed previously (Chapter 9), conservation has long been a site for political ecological investigation of the play of power. By establishing conservation areas and rules and by enforcing conservation priorities in various forms, people come to control the environment, one another, and the flow of value for the landscape. It is worth noting, however, that most of the main actors in environmental conservation are not people and rarely do their behaviors and ecological responses map well onto the plans of even the most draconian conservation plans. The plants, animals, soil microbes, and weather and climate systems that predominate in areas of conservation, for obvious reasons, often have the last say in struggles to control, save, or exploit the earth. Nature, in other words, "talks back" to conservation all the time (Robbins 2007a).

Consider bears. These are creatures that have such a long political history with people throughout the world that it is hard to imagine them outside of their heavily loaded discursive trappings. In North American history, for example, cultural and historical differences between peoples have mapped many of the conflicts that bears engender. For many Anglo-immigrant settlers, grizzly bears (*Ursus arctos horribilis*) were demonic and frightening presences, which confronted and challenged settlers and famers (consider their Latin

designation!). Conversely, for many native peoples of the same continent, bears were part of a sacred order, a brother figure that – though fearsome – would never be considered evil. For environmentalists, some of whom may never have seen an actual bear save at the zoo, bears came to represent wild nature devoid of people, noble, autonomous, and fragile. It is easy to think, therefore, that bears are so overlain with stories, discourses, and ideologies that their actual physical presence would have little bearing on struggles over their protection, control, or elimination. The *idea* of bears, one might confidently assert, is really the core of conservation contestation.

Jessica Dempsey (2010) disagrees. From her research on the political ecology of the "Great Bear Rainforest" in British Columbia, long a site for struggles between conservations, First Nations, and corporate forestry and mining firms, she concludes that bears themselves matter to how things turn out. As in many such conflicts, the core issues here surround whether historic productive uses of the land like mining and forestry will persist, who will get to practice them, whether land be set aside for exclusive conservation, how much, and where. But bears alter the resolution of these questions in complicated ways. First, there is the physical reality of bears themselves, which Dempsey documents have the capacity for violent altercations with people as well as long-term coexistence. The terrific violent potential of the animals and their enormity collide with their charismatic morphological qualities (human-like, furry). These produce what Dempsey describes as an *affective* (pre-cognitive, visceral, or emotional) response from many communities; it also ratchets up the stakes of the debate, making them a "focal species," adding heat to the political fire.

Second, the specific ecology of the bear and its habitat means that it stakes out particular terrains, areas, and parts of the landscape. As resolution of the conservation question came to center specifically on areas of grizzly habitat in the early 2000s, therefore, the bear came to stand in, as a surrogate, for biodiversity more generally. Where bears went, in a sense, is where financial conservation resources would flow. Bears, in their movements, eating, and living patterns, draw the map of conservation in the region.

North American bears are not unique in this sense. Kersty Hobson's (2007) research on the Asiatic black bear (*Ursus Selenarctos thibetanus*) or "moon bear" suggests similar complexities. Here, an animal long prized for its bile, which is harvested through the brutal permanent catheterization of unhygienically caged, captive animals, has become the political focus of a struggle between international NGOs, the Chinese state, and local bile farmers. For Hobson, the aesthetic characteristics of the bears play a significant role in their importance for conservationists ("fluffy coats, large 'Mickey Mouse' ears, and big brown eyes," p. 261). Admitting that these attributes are activated largely by cultural (i.e., discursive) systems, she adds that the bear's bile itself, the material technology that allows their feeding, and the technology of caging and harvesting are all key to the conflict. The material system of bear exploitation and captivity impinges heavily on the urgency of the political struggle over their fate. But the bear attributes Hobson identifies as most important are the unusual characteristics of the bear's ethology in captivity (its tendency to perform "rocking" and self-mutilation) and its remarkable ability to recover and be "rehabitable" after release, which together make them viable conservation targets. As she explains, "the bears' playful, seemingly healthy and inquisitive behavior is the end story that animal welfare campaigners need to support their claims that the caging of bears goes against their 'nature'" (p. 262). As in the case of the grizzly bear, the material characteristics of bears, it

would seem, both enroll them in conservation networks and cause them to resist certain forms of control.

Evaluating the Thesis

The serious introduction of non-human influences on politics is terrifically refreshing in many respects. It forces political ecology to consider more seriously the known ecology, mechanics, genetics, engineering, and physics of the world in which struggles are enmeshed. The case of genetically modified crops is clear in this regard, since a firm understanding of corporate, government, and farmer behavior and interaction depends on a clear understanding of crop breeding, ecology, and genetic characteristics. For living things, especially animals, this approach also allows serious consideration of ethics that surround political ecologies. The case of bears, and the undeniably brutal economy that surrounds them, clearly compels us to pause and think about the suffering and labor of things that are not people.

What counts as evidence of non-human agency?

But a great many problems remain. As this brief review of only two cases shows, much of the struggle over things continues to occur in the language and imagination. In the case of agricultural biotechnology, genetically modified biotechnologies are similar to biotechnologies of the past but also different. They are similar in that they are the products of experimental intention and they diverge from their wild relatives. They differ, however, in the specific codes that underlie them and the speed and mode of their introgression. To argue about genetically modified (GM) crops, therefore, is in part about slicing differences, about creating and policing ideas and categories. Plants are both material and discursive.

The conservation case is even more ambiguous in this regard. As both Dempsey and Hobson concede in their work, bear behaviors and characteristics, no matter how "affective," are also always interpreted. The language of their political ecologies is undeniably littered with discursive text, in this regard. Consider Hobson's insistence (from the quote above) that, for example, moon bears are *seemingly* healthy and inquisitive and that what welfare campaigners need is an end *story* to support their *claims* that what is happening is *unnatural*. Doesn't this all look a lot like a struggle over representation?

And what would be wrong if it were? Certainly by denying the bear's role in all of this, it may be easier to forget about their very real suffering. So too, by decentering the bears, we become less able to consider their ecology in the political relations we observe. But acknowledgment of the simultaneously discursive and material qualities of these interactions is poorly served by arguments for the physical world so shot full of discursive claims.

This raises questions about the choice and advancement of evidence in political ecologies of "materiality." It would seem crazy not to admit that bears are themselves important to their own conservation, but the evidence mounted in defense of this remains surprisingly underdeveloped. More importantly, if research points to evidence of a struggle over ideas and language, it is probably a mistake, in terms of both explanation and political practice, to selectively amass evidence of how "material" components of the problem

matter. What matters most to an outcome? How would we know? Acknowledging and insisting on the importance of objects and actors, though unquestionably desirable, does not solve longstanding questions in epistemology (Chapters 5–7), nor does it make any given explanation more convincing.

The banality of the obviously material

Finally, it isn't hard to conclude that the insight that "non-human things matter" is, in and of itself, not very important or revelatory. Certainly the physical world is always relevant to human history. The characteristics of steel and plastic, one can confidently assert, for example, impinge on industrial production of automobiles. Saying so, however, does not require a great deal of research, nor does it provide us much insight into why workers in a plant are paid poorly or exposed to hazards, why some product lines circulate more widely than others, or how regulatory conditions impinge on the efficiency or energy source of vehicles. In other words: so what?

To proceed constructively in political ecology with an acknowledgment of non-human influences should not *begin* from the urge to demonstrate such banalities. Instead, it should simply open its explanatory lens to allow the possibility of their significance. So too, just because certain non-human actors or characteristics are important to the history of an outcome or condition, it should by no means force a researcher to conclude that they have an ultimate, primary, or central role, nor that all such objects and conditions impinge equally on every situation, a limitless cast of equally powerful players, each with coherent intentions (Robbins and Marks 2009). Instead, as Timothy Mitchell observes, "it means making this issue of power and agency a question, instead of an answer known in advance . . . " (Mitchell 2002, p. 53).

In the Field: Do Mosquitoes Manage Bureaucracies?

My own recent sorting through these tensions grows from the increasing concern about vector-borne disease in my home state of Arizona in the United States. Here, an outbreak of West Nile Virus in the early 2000s led to a massive mobilization of state resources to deal with the disease, but also to evaluate the possibility of more serious future disease outbreaks like dengue fever, which is present over the border in northern Mexico.

What foils health managers in this case, and makes the problem especially interesting, is that the vectors for these diseases are lowly common mosquitoes (*Culex quinquefasciatus* and *Aedes aegypti*), creatures which have co-evolved exquisitely with humanity and whose life cycles complicate priority-making for state managers. The female mosquito, which in its search for a blood meal in aid of reproduction becomes the central threat for transmitting disease (relative to the nectar-subsisting males), lays rafts of eggs in still water. These hatch into larvae that hang submerged, clinging with their snorkel-like tubes to the surface tension of water pooling in sites as diverse as disused swimming pools, the insides of tires, or scattered paper cups. The larvae emerge as pupae and then as adults, which take to the air to start the cycle again.

Figure 12.2 A mosquito feeding from a human finger. The capacity of the insect to carry disease, along with its complex life cycle and ecology, cause it to have a dramatic influence on state institutions. Photo © Henrik Larsson.

The specificity of this cycle is confounding in several ways. First, the direct vector of the disease is the airborne female insect, a flying fugitive that seeks people and other warm-blooded animals. These mosquitoes are the direct cause of disease, and they garner the most complaints for citizens. They are a visible target, and so an attractive one. For managers, then, the key becomes killing adult mosquitoes wherever they cluster and thinking with the "logic" of an adult mosquito, along with its habitat and drive for food.

The *source* of these adults, however, is the less visible larvae, which are scattered across urban landscapes in drainages, flooded front yards, under eaves, in swimming pools and abandoned hot tubs, and in the detritus of consumer society, plastic and rubber waste where water pools. To get at the root of the problem would require the state to adopt a very different tactic and optic; one that operates on the logic of larvae.

Working with climatologists, modelers, remote sensors, biologists, and other specialists, then, we set as our task to model the urban areas of Tucson and nearby Phoenix from the point of view of mosquitoes, to imagine and project what changing rainfall and temperature (in the event of global climate change) would do to their geographic and spatial distribution, and come to understand how state agents and the wider public imagined these animals and diseases, and how they acted (Robbins, Farnsworth, and Jones 2008; Shaw, Robbins, and Jones 2010).

Among the many stories that emerged from this research, some are certainly the stuff of political ecology. It became increasingly apparent, for example, that districts and cities that invested in certain kinds of technologies (e.g., sprayers and adulticides) came to think about the insect threat precisely through the habits of practice and logics imposed by their equipment. In many cases, moreover, training in the use of such equipment is provided directly by private companies that supply the materiel. In other words, the logic of mosquito abatement was not entirely free of the logics imposed on the problem by profit-seeking entities with exclusive access, at least relative to the public, to managers and technicians. There are grim implications of this situation for democratic decision-making around hazards, around the selection of equipment and pesticides, and around the prioritization of areas for control and treatment (Robbins and Miller 2011, forthcoming).

At the same time, it is unclear how much, if at all, mosquitoes themselves are the driving actors in the political ecology of vector disease control. In one sense, the endless cycle of the mosquito's life presents a sort of circular challenge for state actors, who must "chase" the bug through its various instars, all the while negotiating their relationships with capitalist firms and a defiant public. In this sense, mosquitoes "manage" bureaucrats, or at least – through the specificity of their reproductive habitats – set the terms in which they must act. A stubborn a priori insistence on the importance of the bug, however, relative to state budgets, public perception, and recent consolidations in the global pesticide industry, for example, might very well *lead us away* from things that matter a whole lot to putting people at risk of contracting disease: political ideologies of personal responsibility, discourses of risk, or the power of corporate entities over state actors. The mosquito matters materially, no doubt, but surely other things do too . . . maybe more so.

Having said this, by beginning from the mosquito itself (instead of, say, stories about the mosquito) there are also myriad other avenues to pursue, I find, and new questions we can ask. By starting from the object, in this case, the door is immediately open to collaborations with climatologists, notably, especially those interested in how microclimatic conditions (which become habitats for bugs) might change in the case of global warming. By mapping these in the urban landscape, as they proliferate around cisterns, certain forms of sub-developments, or around artificial wetlands or amenity landscaping, it becomes possible to hopscotch to whole new political ecologies. What internal political logic of state action leads to development of cisterns in certain neighborhoods? How does real estate development occur in and around wetlands? What are the class structures, investments, and labor systems that dominate landscaping, and to what degree do they result in mosquito-relevant outcomes?

So, just as thinking with objects is a method that may close off certain avenues of thinking, it is one that opens new scientific collaboration with others. Following the admonition of Timothy Mitchell to make "agency a question," I find myself approaching the influence of bugs with critical caution, trying to keep my eyes on questions and hypotheses that matter. It becomes essential, therefore, in weighing the methodological usefulness of "object-based" thinking, to scrutinize when following things around the landscape takes us into open vistas and when, conversely, it leads us into dead ends.

Part IV
Where to Now?

In which we consider some of the limits of the field, especially its focus on discrete cases that are either too "small" to encompass worldwide connections or too "large" to encourage immediate action. Reviewing two very different environmental questions, the case is made that a place "beyond political ecology" lies straight through the challenges of the field, not around them, and the very high stakes of all this work are briefly reviewed.

Chapter 13

Beyond Political Ecology?

- Reaching Out: The Case of Climate Change
- Reaching In: The Case of School Gardens
- In the Meantime . . .

I am standing amidst sagebrush in the Rosemont Valley of the Santa Rita Mountains in the Coronado National Forest in Arizona, looking south towards Mexico. The land is dense in brush, which provides habitat for hundreds of species of birds, including at least a dozen species of hummingbirds. The remarkable, raccoon-like Coati and the rare nocturnal Ringtail "cat" are native to this area as well. The valley is an emblematic stretch of red and brown banded landscape, a cactus-spiked, Sonoran vista, quiet on a late spring morning.

None of this is what brings me here, however.

Instead, I have been invited here to imagine an enormous hole.

As I step out of our van, provided by the company seeking to dig a copper mine in this valley, I am asked to picture a vast open pit in the ground, with piles of excavated materials crushed and sifted for minerals and then unloaded nearby in a long artificial set of waste hills: 3,500 acres of dumped rock and dirt. The pit, when it is finished, will be a mile wide, steeply sloped, and resemble the open pits of countless other nearby mines, but built on a scale to rival some of the largest; it will remain carved deep into the land in perpetuity. The hills of slag will be planted in grasses and arranged "just so," such that the huge hole will be invisible from the nearby highway. Out of sight and out of mind.

The hole is said to be likely to provide as many as 2,000 jobs over the next several years. In southern Arizona, captured in the grip of a real estate bust and rapid economic contrac-

Political Ecology: A Critical Introduction, Second Edition. Paul Robbins.

tion, the allure of jobs is unquestionable, even if they do not represent long-term employment by any means. As our hosts are also quick to point out, copper is essential to the new "green" economy. Hybrid cars require twice as much copper in their manufacture as their antiquated gas-guzzling cousins. A wind turbine contains a ton of copper. How can one oppose the ecological and economic good sense of such an otherwise messy undertaking?

Startlingly, the law under which access to the land will be made possible is the infamous United States General Mining Act of 1872, a law unchanged in 140 years, which stipulates that anyone can lay claim to the minerals on public lands with the payment of a fee ranging from $2.50 to $5.00 per acre. With few legal obstacles to resource development, how could opposition to the Rosemont Mine be mounted?

Even stranger, I am standing amidst of gaggle of professors and administrators from my nearby university, who are eager to see – in this era of declining public funding for education and research – whether the mine can provide resources for the beleaguered institution: student internships, grants for studying impacts, endowed chairs of minerals engineering . . . handouts. With the natural resource "experts" of a major state university in support of such a plan, who would oppose it?

As I climb back into the company-sponsored minivan and crane my neck backwards to watch the receding ridgeline of the Santa Ritas, I am haunted by the economic, intellectual, and ideological conditions and contexts that make this plan, to brutally tear open this serene corner of the earth, seem ironically quite "logical." The political ecologies that might be researched and written on the mine site, and the contestation for its creation or demise, are numerous.

We might ask what the structure of the political economy of my community is, which makes the provision of a handful of short-term jobs seem like a pretty good trade for an ecological scar that will persist across geologic time? So too, who had to be removed from this land over the centuries – native communities, Mexicans, ranchers, and workers – to eventually make way for this decision? How is it that the political enthusiasm for green technologies, fostered both by car companies and foes of global warming (like me!), drops a veil over the holes in the ground that environmental progress will leave in its wake? Through what political machinations has a local *public* university become enrolled in supporting and offering human resources to a project that will largely fill the *private* coffers of investors living far away? In short, how did it come to this?

Even so, thinking back on my encounter with the waste processers of Agbogbloshie Ghana (in the Introduction), there is a great deal that such political ecology could not do. First, it would not span the more wide-reaching system in which the mine operates. Copper is being extracted from the ground here only to find its way, after all, into unused radios whose wires are melted down for scrap by workers halfway across the world. How can the fate of rural landscapes in southern Arizona be politically linked to those of urban Accra? Political ecology as case study seems too *small* to tackle such a question, which requires connecting the trash pickers of Ghana with the hiking clubs of Tucson. Can we reach up and out?

On the other hand, neither would a political ecology case study of the Rosemont Mine necessarily do much to immerse a researcher in transforming the polities of consumers who drive the cars and use the computers that this copper makes possible. What kinds of alternative community economies and knowledges are possible, which might make such a

mine irrelevant? Political ecology as case study seems too *large* and abstract to tackle a question like that, which must address people in their daily lives. Can we reach down and in?

Reaching Out: The Case of Climate Change

Owing to the radiative forcing of anthropogenic greenhouse gases (especially CO_2), it is reasonable to predict an average increase in global temperatures between 1 and 4 °C in the next century. This will necessarily be accompanied by an unpredictable range of regional changes of climate and weather, including increased drought in some places and increased flooding in others, decreasing sea ice, rising sea levels, and the potential collapse of circulating ocean currents that regulate continental conditions. The economies and communities that benefit from a regime that thrives on combustion of fossil carbon are often not those at greatest risk for the impacts of their effects. The unevenness of these impacts in terms of geography and vulnerable populations includes the inundation of Pacific Island nations and the expansion of drought in sub-Saharan Africa, where subsistence populations depend on rainfed agriculture. The plant and animal species at risk around the world are countless, with deeply systemic impending crises if species deeper in the global food and energy web are eliminated; loss of key insects, plant, and marine plankton portend the collapse of whole ecosystems (Intergovernmental Panel on Climate Change 2007).

The reality of global climate change is therefore one with such clearly political ecological portent that it presents urgent opportunities for investigation. Indeed, several elements of the global climate change puzzle avail themselves to "traditional" political ecology quite logically. The expansion of governmentalized power through municipal climate regimes has received scrutiny in places like Seattle (Rice 2010), as has the structured vulnerability of communities to global change in places like southern Africa and elsewhere (Eakin and Luers 2006; Thomas and Twyman 2005), and the colonial legacy of urban development that produces flood-prone cities in places like Guyana (Pelling 1999).

In terms of the politics of mitigating climate change, political ecology stresses the constraints acting on strategies that are imagined and promulgated by powerful states and think-tanks, and the degree to which these solutions parallel, and do not challenge, the regime of accumulation that produced the climate crisis in the first place. In the United States, for example, agrofuel initiatives sit at the heart of mitigation plans. These purport to offset petroleum use and production with renewable energy sources, but only reinforce already burdensome inequalities in the agro-industrial system, and substitute an "environmental fix" for substantive changes in the economy, resulting in new ways for investors to produce profits (especially in processing) at the cost of rural residents and livelihoods (Gillon 2010).

Similarly, in poorer nations, the rise of forestry-based solutions for capturing carbon through environmentally focused development also reflects deeply constrained relationships, most notable in the United Nations program for Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD). Here, countries and producers are to be compensated for keeping forests on the land. As Sandbrook et al. (2010) have noted, however, and in agreement with political ecological case histories of forestry throughout the world, the effort to increase the value of standing forest stocks

invites unjust results (Robbins 2006b). These might be avoided through clever institutional innovation but this paradox looms large in the logic of offsets.

At the same time, consumers across the world continue to embrace and purchase these voluntary offsets, ostensibly easing the extent of their carbon footprint. Lovell, Bulkeley, and Liverman (2009) conclude, however, that the resulting economic regime is by no means driven by concerned consumers, and is instead dominated by offset organizations, corporations, NGOs, and governments, who disproportionately control and define what constitutes ethical consumption. These reinforce the role of citizens as consumers, separated from understanding or altering the conditions of carbon production or even the sites where mitigation is supposed to occur (through forestry projects, for example) around the world. Like the other cases, then, this agenda sets the priorities of the climate agenda by economically connecting urban consumers to rural producers and forest dwellers, but simultaneously disconnecting them politically.

What these political ecologies cannot and do not do, in and of themselves, is *bridge* these worldwide communities in an effort towards galvanizing less perverse outcomes. How might we practice research and writing that connects ethanol producers and rural agro-industrial communities in Iowa with consumers of offsets in the United Kingdom and forest citizens in India or Brazil? How might we participate in reaching out across these networks, which ecologically link but politically isolate discrete communities like these? As it is currently constituted, the field cannot answer this question. To do so would necessarily mean *reaching out* beyond the confines of political ecology.

Reaching In: The Case of School Gardens

Much the same can be said the problem of urban health and obesity, and the position of consumers along the nutritional commodity chain. The problem of basic childhood nutritional problems and inequity in health conditions and access for disadvantaged social groups, especially though not exclusively urban children, is well documented (Braveman 2006), as is the widespread tendency towards obesity in the United States (Flegal et al. 2002).

One response from horticulturalists and educational specialists has been to incorporate the growing of food directly into school curricula (Rahm 2002; Graham et al. 2005). By digging school gardens, which is by no means a new idea (Anon 1910), advocates suggest people's environmental knowledge and habits can be transformed from an early age (Parmer et al. 2009) and obesity can be tackled (Domenghini and Shoemaker 2009).

And yet, thinking in terms of political ecology, problems with this approach can be anticipated. Julie Guthman's examination of food and health in the creation of the obesity "epidemic" has pointed out that the obsessive focus on personal responsibility, tied to diet and exercise, is part and parcel of the production of individuated, neoliberal, consumer-subjects (Guthman and DuPuis 2006). While acknowledging the very real and hardwired parts of the problem located in the political economy of food (and the diet industry), Guthman points out that the obsession with obesity and health is itself insidious. "Consumer choice, personal responsibility, and empowerment," she suggests, "circulate in tandem with discussions of obesity" (Guthman 2009, pp. 1114–1115). In this sense, gardens might be

viewed more critically as the pernicious inculcation of certain kinds of responsible consumer subjects.

So too, the garden does little, in and of itself, to overcome structural problems in the food deserts of inner cities, where healthy foods are infamously unavailable (Walker, Keane, and Burke 2010). Given that many students coming from low income communities are seeking education in contemporary skills, in computing, mathematics, and other fields, to compete on an already unfair playing field, it also may seem odd that schools are teaching gardening. Popular and politically conservative criticisms of school gardens follow some of this line of thinking (Flanagan 2010), but even a more critical materialist assessment might ask whether the recent, culturally privileged, largely white, middle-class focus on "good" foods necessarily translates into useful, critical, and transformative environmental pedagogy in violently underfunded and marginal school systems.

This only causes questions to proliferate. How might teachers with constrained budgets and time schedules incorporate living food into local knowledge production? What kinds of encounters are encouraged by confronting children with vegetables, livestock, and the far end of their consumption cycle? Do school gardens reproduce the structural inequalities of racist and classist capitalism or subvert them? Arguably, political ecology case studies might give us some necessary insight. Critical comparisons of school experiments across the country might be conducted through participant observation, exploring key variables like race or class, and resulting in qualitative (oral historical) and quantitative (multivariate regression) analyses of school programs. Another alternative, however, closer to the spirit of political ecology, though not necessarily its practice, might simply be to plant gardens and find out.

Collaborators Sallie Marston and Sarah Moore are doing just that. Along with their graduate and undergraduate students, and working in tandem with Tucson Unified School District, they are developing relationships with teachers and students, providing support and labor during the growing season, and evaluating outcomes with a critical sensibility of the potentiality and structural limits that inform these efforts. Gardens are *not* assumed, in this case, to solve problems (indeed they arguably only create new problems for instructors, advisors, and students to solve!); instead the gardens themselves become a living lens for better seeing local ecologies, nutrition, food politics, and the fraught, raced, and classed social dynamics of community participation. As they also stress in their work, many projects have the potential to create community connections, but gardens have the ability to sustain them, precisely owing to the material quality of their growing cycle, their ecological needs, and their productive capacity. This suggests that a highly local, fully immersed practice – a kind of *reaching in* – does the most powerful analytic work precisely because its results cannot be predicted in advance, its methods are themselves a social process, and the goal is largely about building relationships.

This kind of experiment arguably differs from more naïve interventions of a similar kind, at least insofar as it acknowledges the political ecologies of this sort of work: the deeply structural conditions under which the capitalist food system operates (Goodman and Watts 1997), the expert knowledges that abound in the traditional fields of nutrition (Guthman and DuPuis 2006), and the dangerous raced and classed pastoral romances that have long haunted efforts to "renaturalize" the city (Sandberg and Wekerle 2010). It shares with those interventions, however, an immersive insistence that the process of planting

itself represents a potentially transformative political encounter. It is rooted in political ecology, but clearly does something else as well.

These two very different cases, climate and gardens, give us a view onto places beyond political ecology. As a kind of worldwide community of skeptical practice united by certain kinds of critical texts, political ecology is not sufficient by itself to address the problems of global climate change or urban food and health, which demand the bridging of new communities of diverse concern and the immersion of researchers into spaces of practice. But it is also unquestionably the case that the insights of political ecology, the power of its text, and the theoretical traction it provides are prerequisite to meaningful engagement with problems like these, which are so deeply rooted in power and privilege, dialectical relationships between humans and the world, and the contradictions born of persistent political economies. People who engage political ecology (among their many other tasks in the world) believe that the key to understanding environmental problems, struggles, crises, and opportunities lies in being able to read and write the contradictions, the ironies, the winners and losers, and the simultaneously real and represented natures of the world. Sadly then, political ecology is a not a roadmap, a recipe, or a theory or technique you can apply to solve whatever problem might be bothering you. Happily, it is a great deal more.

In the Meantime . . .

In the meantime, however, global temperatures are on the rise and species, communities, and environments are already vanishing as a result. Each US citizen consumes 1,600 liters of gasoline every year, with obvious implications for this grim trend. Petroleum-exporting countries like Nigeria remain some of the world's poorest.

Between 1997 and 2007, an estimated 500 million computers in the United States became outmoded, leading to the dumping of more than a billion pounds of lead, two billion pounds of cadmium, and six billion pounds of plastics at sites across Africa and Asia (Puckett et al. 2002).

Total forest cover is decreasing around the world, while the amount of plantation forest has grown dramatically – rising from 124 million hectares in 1990 to 187 million hectares in 2000 (World Resources institute 1991, 2010). Those who plant new forests control the character, diversity, and habitats (and their absence) of the global forest.

Consolidated corporate global media have come to dominate the nature imagery, views, practices, and environmental imaginary of people and communities worldwide. Discovery Communications, a company that owns the Discovery Channel, Animal Planet, and the Learning Channel, among others, made $372 million dollars in the second quarter 2010 alone, a figure representing as much as Fox film studios, Paramount Pictures, and Warner Brothers combined (*The Economist* 2010).

Migrant workers exposed to agricultural chemical pesticides experience daily bouts of weakness, fatigue, nausea, muscle pains, and cramps, while living with a grossly heightened risk of leukemia. Voluntary applications of similar organophosphate pesticides on middle-class lawns put children and ambient ecosystems at risk. Together these uses fuel a multi-billion-dollar global industry.

During the past century 90 percent of global agricultural crop diversity has been lost, even while pests and diseases are mutating and expanding at an accelerating pace. Even so,

introgressed transgenic maize has been introduced into central Mexico, the original center and origin of native maize landrace diversification, risking serious genetic decline. Every day more than 10,000 children die from hunger-related maladies, even while global food production and trade outpaces demand.

Recent best-selling books that address these issues, on the other hand, insist that the disparity of nations is a product of either the shape of continents (Diamond 1997) or the superiority of western cultures (Landes 1998), that environmental crises are statistical fictions (Lomborg 2001), and that global conflicts are rooted in essential cultural differences between peoples (Huntington 1998) rather than the violent ecologies that connect them.

If political ecology has taught us anything, it is that we can do better than that. We can do better than that.

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