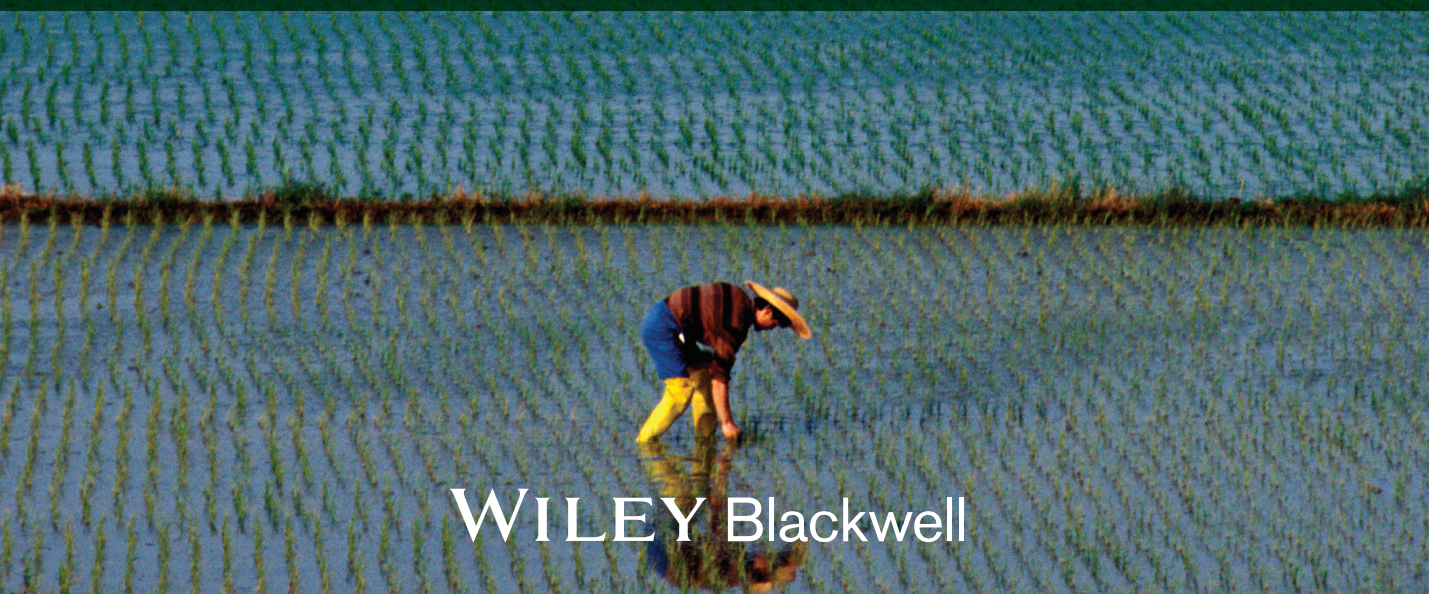
AN INTRODUCTION TO HUMAN-ENVIRONMENT GEOGRAPHY

Local Dynamics and Global Processes

William G. Moseley, Eric Perramond,
Holly M. Hapke, & Paul Laris



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This edition first published 2014

Blackwell Publishing was acquired by John Wiley & Sons in February 2007. Blackwell's publishing program has been merged with Wiley's global Scientific, Technical, and Medical business to form Wiley-Blackwell.

Registered Office
John Wiley & Sons, Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

Editorial Offices
350 Main Street, Malden, MA 02148-5020, USA
9600 Garsington Road, Oxford, OX4 2DQ, UK
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

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Library of Congress Cataloging-in-Publication Data

Moseley, William G.
An introduction to human-environment geography : local dynamics and global processes / William G. Moseley, Eric Perramond, Holly M. Hapke, Paul Laris.
pages cm
Includes bibliographical references and index.
ISBN 978-1-4051-8932-3 (hardback : alk. paper) – ISBN 978-1-4051-8931-6 (pbk. : alk. paper)
1. Human ecology–Textbooks. 2. Human geography–Textbooks. I. Title.
GF43.M67 2013
304.2–dc23

2013006409

A catalogue record for this book is available from the British Library.

Cover image: A man planting rice in paddy fields on the outskirts of Seoul, South Korea.
© Philippe Lissac/Godong/Panos.
Cover design by www.cyandesign.com

Set in 11/13pt Dante by SPi Publisher Services, Pondicherry, India

1 2014

For B. Ikubolajeh Logan (WM)
For Marshall Bowen (EP)
For my daughter, Syona, and to John Agnew (HH)
For B.L. Turner (PL)

Contents

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William G. Moseley is a professor and chair of geography at Macalester College, where he teaches courses on environment, development, and Africa. His research interests include political ecology, tropical agriculture, environment and development policy, and livelihood security. His research and work experiences have led to extended stays in Mali, Zimbabwe, South Africa, Botswana, Malawi, Niger, and Lesotho. He is the author of over 60 peer-reviewed articles and book chapters that have appeared in such outlets as *Proceedings of the National Academy of Science*, *Ecological Economics*, the *Geographical Journal*, the *Geographical Review*, *Applied Geography*, the *Singapore Journal of Tropical Geography*, and *Geoforum*. His books include: four editions of *Taking Sides: Clashing Views on African Issues* (2004, 2006, 2008, 2011); (with David Lanegran and Kavita Pandit) *The Introductory Reader in Human Geography: Contemporary Debates and Classic Writings* (Blackwell, 2007); (with Leslie Gray) *Hanging by a Thread: Cotton, Globalization and Poverty in Africa* (2008); and (with B. Ikubolajeh Logan) *African Environment and Development: Rhetoric, Programs, Realities* (2004). His fieldwork has been funded by the National Science Foundation and the Fulbright-Hays Program. He has served as editor of the *African Geographical Review*, as a national councilor to the Association of American Geographers, and as chair of the cultural and political ecology specialty group.

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Preface and Acknowledgments

This book has been a long time in the making. Like any good text, it emerged from a series of conversations, many in bars and cafés, and frequently when we met at our annual professional meeting. We had a few concerns which motivated us to write this book, foremost of which was a text that would convey geography's theoretically rich tradition and unique approach to environmental issues. Our other concern was to have a text that would be accessible to introductory students, many from allied environmental fields who were encountering geography for the first time, and others in geography for whom this was their first course on human–environment themes. While there are other environmental geography texts on the market, none (in our view) did all that we wanted. We felt that the lower level texts didn't do enough to convey geography's unique approach to the subject matter, frequently differing little from more generic environmental studies or environmental science texts. Those books that did convey the theoretical richness of the human environment tradition tended to be pitched at too high a level of student, or too narrowly focused on a particular subtheme of human–environment geography. The text that follows is our attempt to fill this niche.

You will note that the book is divided into four parts. The first part is meant to be a broad overview of the basic information needed to understand human–environment geography, from the geographic perspective, to environmental politics, to some basic physical geography and ecology. The second section explores a sampling of geography's rich theoretical traditions in the realm of human–environment geography. The third part is more thematic in nature, most closely resembling the traditional textbook approach except for a concerted effort to make connections between this material and the theoretical approaches detailed in the second section. The final part is meant to connect the book's material to the real world by showing the student how geographers undertake fieldwork and collect and analyze data. The concluding chapter makes suggestions for using the concepts in this text to understand environment-related problems and bring about change. Each of the chapters in these four sections has a similar structure. Chapters begin with an icebreaker, or a meaningful vignette which brings out the major themes of

the chapter. This is followed by a statement of chapter objectives, an introduction, and then the main text. All chapters end with a chapter summary, critical questions, key terms, and references.

While this book was very much a collective project, our varied regional and thematic expertise helped ensure that a range of material would be covered from some position of comfort and familiarity. We also hail from different types of institutions, private colleges in Minnesota and Colorado, and public universities in North Carolina and California, and thus have experience working with different types of students. All of us relied heavily on our own teaching, research, and work experience to inform this project. This book took longer to complete than originally anticipated. We particularly wish to thank Justin Vaughan and Ben Thatcher at Wiley-Blackwell for attempting to keep us on track and for showing endless patience and understanding when we fell behind. We also thank our families for their understanding and support while we labored at writing, for reading and re-reading drafts in some cases, and for patiently listening to us over meals as we shared our geographic revelations. We finally express our appreciation to the anonymous reviewers who provided feedback on various portions of this text, and to our students with whom our interactions in the classroom have informed the way we present this material.

Part I

Fundamentals of Human–Environment Geography

1

Introduction

A Geographic Perspective on Human–Environment Interactions

Icebreaker: Human–Environment Connections Across Time and Space

Before chemical fertilizers came into heavy use in the 20th century, guano (bird or bat droppings) was the leading internationally traded source of agricultural plant nutrients. It was valued because of its high levels of phosphorous and nitrogen and lack of odor. The Incas of South America understood the value of guano long before the

An Introduction to Human–Environment Geography: Local Dynamics and Global Processes, First Edition. William G. Moseley, Eric Perramond, Holly M. Hapke and Paul Laris.

Published 2014 by John Wiley & Sons, Ltd.

Europeans and regulated its extraction quite carefully. The Incan government divided up the guano-bearing islands off the coast of modern-day Peru between its different provinces. Guano had accumulated on these islands over centuries because of abundant bird life due to rich fish stocks, a uniquely dry climate which enhanced guano preservation, rocky shores for nesting, and protection for the birds from predators and humans. Rules were established concerning when and where guano could be harvested and disturbing the nesting birds which produced guano was an offense punishable by death.

The geographer and explorer Alexander von Humboldt was the first European to recognize the potential value of guano. He returned from his 1799–1804 voyage around South America with samples which he shared with two French chemists who subsequently confirmed the value of the substance. American farmers experimented with guano in the 1820s, and then British farmers in the 1840s. Despite the initial concerns of farmers that such a powerful fertilizer would upset the nutrient balance of agricultural soils, demand for guano soon surged. The United Kingdom imported over 2 million tons of guano between 1841 and 1857. The fury over the guano trade was intense. It led to the Guano War of 1865–66 between Spain and Peru. The US Navy fought with Peru to maintain access to guano. The US also colonized over 50 islands in the Pacific and the Caribbean (including Midway Island) because of their guano resources. By 1900, the world's guano resources were all but depleted.

Fast forward to the 21st century, when one of the authors of this text was traveling with a group of students along the Atlantic Coast of South Africa. Here he visited Lambert's Bay, a fishing village on the coast with a history as a source of guano which was exported as fertilizer to Britain in the 19th century. The small island in Lambert's Bay was now a bird sanctuary where nature lovers and tourists could come and observe the courting rituals and the nesting habits of the Cape gannet. The gannet was a prodigious producer of the guano that had once accumulated in vast quantities on rocky islands along this semi-arid coastline. The author had been to the island the previous year and seen large numbers of Cape gannets (see Figure 1.01). As he crossed over the bridge to the island, he noticed that something was quite different, there were no gannets. He came to learn that the entire colony had left because they were being attacked by seals. This was, in itself, highly unusual as the seals had long coexisted with the gannets and never bothered them. The problem was that the seals were competing with fishermen for the same food source and were losing. As such, it was hunger which led the seals to attack the gannets on the island and it was this atypical behavior which caused the colony of Cape gannets to leave. While some of the overfishing in this area was caused by South African commercial fishers, the bigger culprit was large international fishing fleets.

The twists and turns of this story raise a number of important issues for consideration. These include: the ability of some societies to manage their resources sustainably, the role of science in the use and management of resources, the seeming inability of the global capitalist system to limit consumption, the role that non-human actors may play in transmitting the impacts of one human action to another human group, and the limits of

Figure 1.01 A colony of Cape gannets, Lambert's Bay, Atlantic Coast of South Africa.
Source: Photo by W.G. Moseley. Used with permission.

preservation in open ecosystems and economies. All of these themes and more are central to the dynamic subfield of human–environment geography.

Chapter Objectives

The objectives of this chapter are:

1. To suggest that humans, like other animals, are able to sustainably interact with their environment.
2. To highlight the pressing nature of some contemporary environmental problems.
3. To articulate the relevance of the geographic perspective to environmental questions.
4. To outline broad elements of a human–environment geography approach to environmental questions.
5. To demonstrate what new insights may be gleaned by applying the human–environment geography approach to some basic natural resource management concepts and an example of this in US environmental history.
6. To share the general plan and logic of the book.

Introduction

The broad objective of this chapter is to introduce to students to the way that human–environment geographers look at the world. We begin by exploring how humans are similar to, and different from, other animals which manipulate the environment. We then review geography and its distinctive human–environment tradition, followed by an exploration of some broadly similar ways that human environment geographers often examine environmental questions. The chapter ends with a specific case of how the geographic lens yields new insights when trained on some common environmental management approaches, namely exploitation, conservation, and preservation.

Animals and Their Habitats

Beavers (*Castor canadensis* in North America, *Castor fiber* in Eurasia) are known for their ability to modify the landscape for their own benefit and that of other species. By damming streams, beavers raise the water level to form protective moats around their lodges. The resulting beaver ponds also create the deep water needed for winter food storage in northern climates. While other animals struggle with winter cold and hunger, beavers stay warm in their lodges with an underwater food cache of branches in close proximity (see Figure 1.02). Beavers also harvest trees and branches for food and construction purposes. This pruning stimulates willows, cottonwood, and aspen to regrow more thickly the next spring. While some beaver behavior is instinctive, they also learn by imitation and from experience. As such, we find some beavers who are very adept at building dams and others who are not. Older, more experienced beavers also tend to build better dams than younger ones. The beavers' habitat modifications also impact other species. The wetlands they create support other mammals, fish, turtles, frogs, birds, and ducks. These wetlands also provide a variety of ecological services, such as the catchment of floodwaters, the alleviation of droughts (because beaver dams keep water on the land longer), the reduction of erosion, the local raising of the water table, and the purification of water.

Figure 1.02 Sketch of beaver lodge and dam.

Humans, like other animals, also modify the landscape. We manipulate the land, for example, through burning, cutting, tilling, planting, harvesting, dam building, and home construction to meet our own objectives. Through a process of experimentation, success and failure, observation, and the sharing and stealing of ideas, humans have learned how to manipulate the environment for their own purposes. For example, through careful observation of local environmental feedback, humans often developed farming systems that were highly productive, and sustained over centuries (Figure 1.03). A case in point is shifting cultivators in Papua New Guinea who created farming systems that were over five times more efficient (in terms of a ratio of crop yield over energy inputs) than modern maize-cropping systems in the United States and supported much higher levels of agrobiodiversity (Pimentel and Pimentel 1979). Women in rural Mali (West Africa) routinely collect dead wood and coppice (trim) branches from existing trees for firewood, lessening the chances of unmanageable bush fires and encouraging regrowth. Up until recently, many American farmers planted shelter belts (or tree hedges) around their fields in order to reduce aeolian (wind) erosion and encourage the proliferation of white-tailed deer (*Odocoileus virginianus*) which they hunted for game meat.

Of course, some societies took up unsustainable practices which eventually led to environmental decline and their downfall. Sometimes, but not always, these were highly stratified societies in which those making the decisions and those working the land were separated by many layers. In other cases, new migrants failed to understand the ecology of an area and attempted management approaches

Figure 1.03 A farm in Papua New Guinea. *Source*: © WaterFrame / Alamy.

that were inappropriate for their new location. Still others developed intensive production systems which required significant amounts of human labor to maintain. When political instability or disease disrupted these labor flows, such systems quickly fell into decline and the productivity of the environment declined.

As humans societies grew and prospered, and people traveled greater and greater distances, they began to trade. While trade was initially in luxury items, food and raw materials eventually came to be traded in significant quantities. By the 20th century, even garbage was being shipped around the world. The significance of this trade, combined with urbanization, was that it gradually separated people from the sources of their food and goods and the byproducts of their consumption. We were losing our ability to productively and sustainably engage with ecosystems. Today we live in a world where many consumers in the most developed areas of the world have little to no idea where their provisions originate from and how they are produced. We also live on a planet where the consequences of such detachment from the biophysical world seem to be growing. Increasing carbon emissions, and resulting climate change, is probably one of the most disquieting, global-scale environmental challenges. Other challenges, like deforestation, ground water depletion, and the loss of biodiversity, are also of great concern.

Not all ecological challenges are a direct result of humans modifying the environment in a problematic manner. In some cases it may have more to do with how humans position themselves vis-à-vis the biophysical world. Hurricanes, for example, become more of an issue for humans when they build homes close to coastlines, or inundations are a problem when towns and cities are established in floodplains. Some biomes have naturally sparse or erratic rainfall, so trying to live in such areas without adapting to these patterns is destined to be problematic.

Clearly many of the challenges described above could be avoided if we better understood our place within, and relationship to, the biophysical world. This text helps the student explore that world and how we got to this particular point in human history. While many disciplines and fields of study examine these questions, this text helps students understand these issues from the perspective of human–environment geography. We begin this chapter with a brief introduction to geography and then a more thorough examination of some basic elements of human–environment geography.

What Is Geography and What Does It Have To Do with Studying the Environment?

Geography is so basic that we all seem to have some idea of what it is, yet curiously, many would have trouble describing the subject to another person in casual conversation. Geography comes from the Greek word meaning "earth writing" or "earth describing." Even though the emphasis in geography has changed over the years, this is still a fairly accurate statement.

While the Greeks were the first to organize geography as a coherent body of knowledge, the need for geographic knowledge is as old as humankind. For as long as people have been traveling, exploring, and migrating, they have been encountering different environments and other human societies. As such, the survival and success of human populations meant that they needed to understand other groups, faraway lands, where these were located spatially (if for no other reason than to know how to get there again), the processes that connect one human group to others, and ways in which each group is unique. In the process, such travelers, explorers, and migrants learned a lot about where they had come from, that is, it helped them to understand what was special about their own homes.

Geography is a broad discipline that essentially seeks to understand and study the spatial organization of human activity and of people's relationships with their environment. It is also about recognizing the interdependence among places and regions, without losing sight of the individuality and uniqueness of specific places. Geography is rather unique for a discipline in that it straddles the science–social science–humanities divide, using a broad arsenal of methods and perspectives to tackle questions. It is also not an armchair science (in which data is downloaded for analysis) but rather has a long tradition of fieldwork. Finally, many geographers do get excited about maps (some might call us map geeks) but it is important to remember that maps are a means to an end for most geographers. By displaying data spatially, it pushes us to ask why things are distributed the way they are, or it may reveal patterns or correlations which had not previously been seen.

While the general tenets of a geographic approach (i.e., attention to spatial patterns, human–environment dynamics, the uniqueness of place, and connections between regions and across scales) apply to all areas of geography, geography has grown over time to recognize sub-specialties within the discipline based on the subject matter addressed. At the broadest level, there is a commonly recognized divide between the study of biophysical phenomena (**physical geography**) and the examination of human or social phenomena (**human geography**). Physical geographers seek to understand long-term climate patterns and change (climatology), patterns of plant and animal distribution (biogeography), and the origin and evolution of landforms (geomorphology). Human geographers study the patterns and dynamics of human activity on the landscape, including settlement, urbanization, economic activity, culture, population, development, and disease.

Between physical and human geography, lies the vibrant arena of **human–environment geography**. The investigation of nature–society relationships lies at the heart of geography and has been one of the pillars of the discipline since the modern academic structure crystallized in 19th-century Germany. This realm of inquiry also has been an important bridge between geography and other fields. Figure 1.04 depicts the position of human–environment geography within the discipline of geography.

This textbook is focused on a dynamic and burgeoning subfield of geography known as human–environment geography. The book introduces you to the study of human–environment interactions from a geographic perspective, with

Human geography	Human-Environment	Physical geography
(e.g., urban geography, economic geography, population geography, cultural geography, development geography, political geography)	(e.g., cultural ecology, political ecology, agricultural geography, water resources, human-dimensions of global change, hazards geography)	(e.g., biogeography, climatology, geomorphology)
Techniques (e.g., geographic information systems (GIS), remote sensing, cartography, statistics)		

Figure 1.04 Human-environment geography within the discipline of geography.

a special emphasis on the role of humans in changing the face of the earth and how, in turn, this changed environment may influence humans. We will examine environmental issues in a variety of geographic contexts (developed and developing countries) and the connections between environmental problems in different locations. While we tend to think of the environment as "natural" and more prominent in areas with fewer people, we will argue that the built environment is of no less concern than many so-called natural areas, and that both are products of human action. For example, in terms of generic interactions with the environment, what makes a peasant farmer any different than a suburban homeowner? Both live in environments modified by human activity, both manipulate the landscape (the farmer tilling her field, and the suburban man tending his lawn), and both are influenced by environmental conditions (the farmer planting six different varieties of millet in her field because rainfall varies from year to year; the suburban man, driving to the grocery store because his neighborhood has no sidewalks, is removed from shopping areas and lacks access to public transportation).

Human–environment geographers working in various subfields often interact with other academics or professionals working on similar themes (e.g., political ecologists with anthropologists and development practitioners, hazards geographers with geologists and disaster relief specialists, or water resource geographers with hydrologists and watershed managers).

Geography has long been known for its techniques for presenting and manipulating spatial data, particularly **cartography** or mapping. What is important to remember is that most geographers use these techniques as a bridge to greater understanding. For example, human–environment geographers may use dot maps to present and understand population distributions, **geographic information systems** (GIS) to analyze the potential relationship between population density and soil fertility, or **remote sensing** (aerial photography and satellite imagery) to monitor change in surface biomass over time. Some geographers specialize in a particular technique, rather than a thematic area of geography. These geographers often focus on further developing such technologies, devising methods for interpreting the data produced by them, or reflecting on the social implications of their use. A few selections in this volume will focus on the use of these technologies by human–environment geographers.

A Geographic Perspective on Environmental Questions[1]

Students may wonder what differentiates an introductory-level human–environment geography course from its corollary in environmental studies or environmental science. Later in this book, we will explore a number of subdisciplines in geography that offer distinctive lenses through which to explore environmental issues (e.g., cultural ecology, political ecology, hazards geography, environmental history, and environmental justice). In this chapter we articulate more fundamental geographic perspectives that often characterize the discipline's approach to human–environment questions. While not offering an exhaustive list of such generalized approaches, here we investigate and apply four perspectives: scale-sensitive analysis, attention to spatial patterns of resource use, a conception of the human–environment system as a single unit (rather than two separate parts), and a cognizance of the connections between places and regions.

As a way of introducing these four perspectives, we apply them to three basic approaches to environmental management that you would encounter at the start of most environmental studies texts: exploitation, conservation, and preservation. We start by exploring the conventional understandings of these approaches and then show how they may be understood somewhat differently from a geographic angle. We then re-examine, using this geographic perspective, a famous case in US environmental history that has been used to illustrate the conventional understandings of conservation and preservation, not to mention an early rift in the US environmental movement.

Conventional Understandings of Exploitation, Conservation, and Preservation

The concepts of exploitation, conservation, and preservation are typically used to differentiate human management and use of renewable resources (e.g., forests, fisheries, many sources of water). **Exploitation** is the easiest of these three concepts to grasp. It refers to the use of a resource without regard to its long-term productivity, usually by over-harvesting in the short term. As such, an exploitative approach to forest management might entail clear cutting, and not replanting, large tracts of land.

While the terms conservation and preservation are sometimes used interchangeably in public discussions, environment-related fields carefully use these words to refer to particular management regimes for renewable resources. **Conservation** (sometimes also described as the utilitarian approach in environmental history, or as resource conservation in the UK) typically refers to use within certain biological limits, or within the annual growth increment of a particular resource. In the case of forests or fisheries, this annual growth increment is also referred to as the **sustainable yield**[2] or maximum sustainable yield.

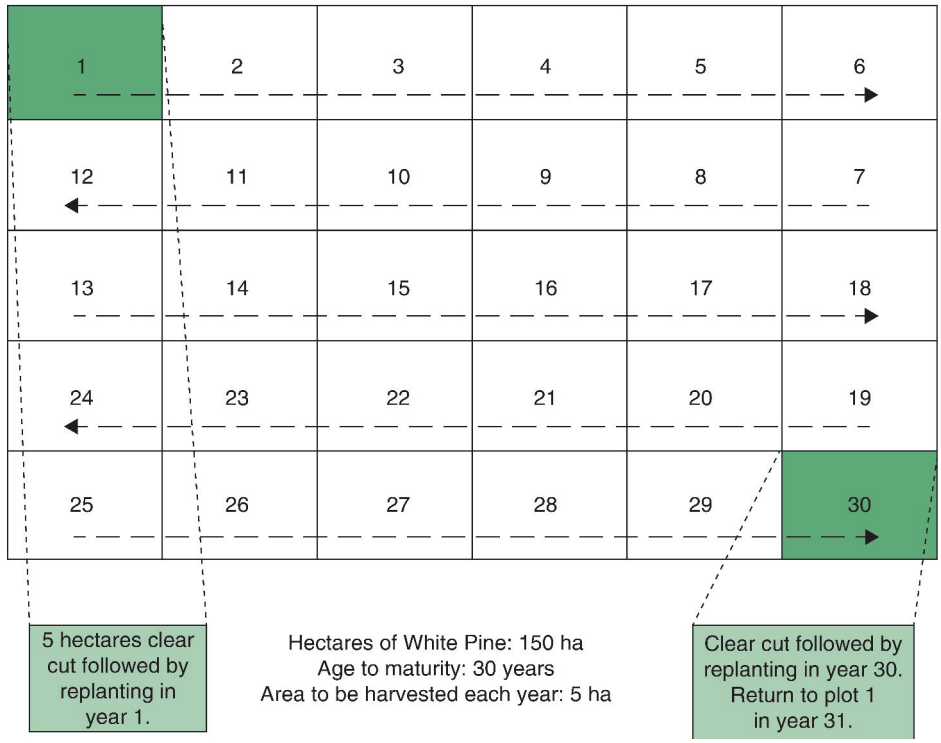

Figure 1.05 The principle of maximum sustainable yield as applied to an even-aged monoculture of white pine. *Source*: Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

The US government natural resource management agency most closely associated with the conservation approach is the US Forest Service (USFS), and the same approach is also applied by government forest agencies in many other parts of the world. Since the US Sustained-Yield Forest Management Act of 1944, the USFS has managed many of its forests under the principle of maximum sustainable yield. Typically the formula (forest area/age to maturity) is used to determine the percentage of the total forest area that may be harvested and replanted each year. Figure 1.05, for example, depicts spatially how an even-aged monoculture[3] of white pine that is 150 hectares in size, and for which the age to maturity is 30 years, would be harvested and replanted at the rate of 5 hectares per year (150 hectares/30 years).

In contrast to exploitation or conservation, **preservation** (also known as nature conservation in the UK) typically refers to the non-use or non-consumptive use of natural resources in an area. The practical expression of the preservationist approach in the North American context often comes in the form of a wilderness area or park. In some instances, an area is completely off limits to humans. More frequently, **non-consumptive uses** are allowed (e.g., hiking, camping). The rationale for preservation is that certain areas must be set aside for compelling aesthetic or biodiversity reasons. This approach to preservation has been described as the

"Yellowstone model,"[4] a model that emphasizes national parks which people may visit as tourists, but neither reside in nor exploit to support a resource-based livelihood. The US Park Service is the US government natural resource management agency most clearly identified with the preservationist approach (as is the case for government park services in many other parts of the world). The preservationist approach was introduced to developing countries during the colonial era when many parks and wilderness areas were established. Parks and preserves in the world's tropical regions have received considerable attention since the 1992 World Summit on Environment and Development in Rio de Janeiro. For example, over 10% of territory in some African countries is now managed by state and international organizations for preservation purposes.

Geographic Perspectives on Exploitation, Conservation, and Preservation

Geography's focus on scale, synergistic human–environment interactions, land-use patterns, and the connections between places and regions offers intriguing insights into the concepts of exploitation, preservation, and conservation. Attention to scale is a core geographic concern and a framing device that is profoundly implicated in any form of spatial analysis. The concept of **scale** may be used in somewhat different ways. In cartography (or the science of map-making), scale refers to the distance on the map in relation to the distance on the surface of Earth. As such, relatively small-scale maps show larger areas because the fraction of distance on the map over distance on the Earth's surface is small. In contrast, large-scale maps show smaller areas because the ratio or fraction of distance on the map over distance on the surface of the Earth is relatively large. Unlike the relatively specific idea of map scale, we can also think of this term more conceptually, e.g., local versus global scale (see Chapter 4 for further discussion of scale). As such, one might analyze a problem at the scale of a local community, or at the level of a park, or using data aggregated at the scale of a state or province (or some broader scale).

The geographer Stan Openshaw (1983) problematized a-scalar analysis in terms of the **modifiable areal unit problem**. In discussing this problem, Openshaw focused on two issues related to scale (the level at which data is aggregated and the boundaries of spatial units) to show how variation in these factors greatly affected findings.

Within geography, there is also a body of scholarship on the **politics of scale**. These studies examine the political implications of the choice of scale at which an environmental issue is articulated and conceptualized. Different groups frequently struggle over the scale at which an issue is framed. Mansfield and Haas (2006: 78), for example, discuss how "using scale as a framing device is a powerful political strategy … because focusing on a particular scale presupposes certain kinds of solutions while foreclosing others." Similarly, attention to scale complicates conventional understandings of exploitation, conservation, and preservation. We may

think about scale in at least three different ways in our case: the scale at which the approach is implemented, the scale at which the approach is analyzed, and the scale at which the approach is discussed, or discursive scale (the last point will be addressed in the subsequent section on Hetch Hetchy Valley). The scales at which an approach is implemented or analyzed are sometimes referred to as scale frames (e.g., Kurtz 2003).

In practical terms, the scale at which the preservationist approach may be implemented is limited by the need for humans to use natural resources. As such, unless an area is lightly populated, it is challenging to set aside extremely large tracts of land as preserves because people need to use some land to sustain themselves. With the possible exception of Antarctica (a continental example), most lands set aside for preservation are modest in scale. More specifically, most of the world's big IUCN (International Union for the Conservation of Nature) category Ia and Ib parks are in the high Arctic or sparsely populated tropic forests, whereas most preservation units (IUCN category IV) in densely populated Europe are relatively small. While parks appear as preservation (if the unit of analysis stops at the park boundary), this perception quickly changes at broader scales of analysis if surrounding areas are overexploited. For example, national parks in Costa Rica have been referred to as diamonds in a sea of devastation (Sanchez-Azofeifa et al. 2002).

In contrast to preservation, conservation could (at least in theory) be implemented at a much broader scale because it allows for human use of resources within biological limits. In such a situation, people in all places would be allowed to tend to their needs, yet would be required to operate within the biological limits of the environment. This is a very integrated and spatially broad vision of conservation that shares commonalities with certain (i.e., the strong or radical green) conceptions of sustainable development (see Chapter 2). In practice, such an approach would require a significant departure from current development patterns. This departure would be necessary because market economies (which tend to produce haves and have-nots) may not be able to coexist with an approach where the limits of all environments are respected. In other words, many would assert that capitalism itself promotes a patchwork of uses on the landscape, with capital accumulation in one area leading to capital depletion in another (Frank 1979; Wallerstein 1979; Harvey 1996).

In the real world, conservation (like preservation) is often implemented at a more local scale. As described earlier, foresters managing a wood lot under the principles of sustainable yield carve it up into equal-sized plots (derived via the formula: forest area/age to maturity) and then harvest and replant one such plot per year until eventually they return to the first plot that was cut and replanted. Here again, examining the situation at a variety of scale frames allows one to recognize that the management of the forest as a whole might be labeled as conservation (scale frame A in Figure 1.06). Conversely, when examined at the scale of the individual plot being harvested (often several hectares in size), the situation might more aptly be described as exploitation (scale frame B in Figure 1.06). Exploitation might be the more appropriate term at this scale because such plots are often

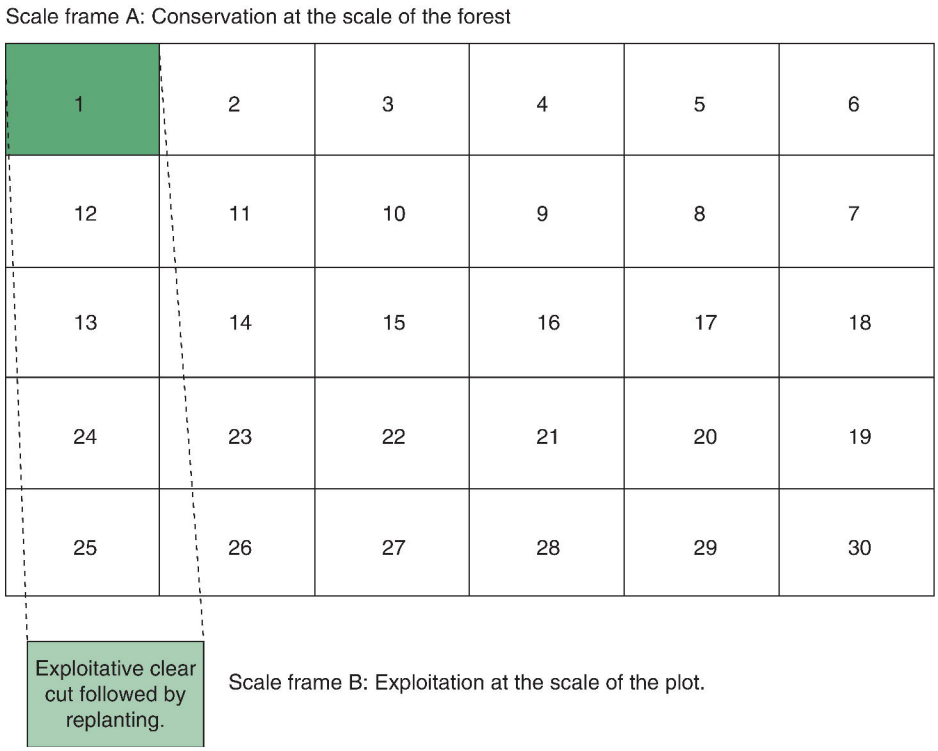

Figure 1.06 Scale analysis of forest managed under principles of maximum sustainable yield. *Source*: Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

clear-cut, and lie barren for some time before they are replanted. While such a process incrementally impacts biodiversity, soil stability, and infiltration at the scale of the forest management unit, all three of these factors decline dramatically at the plot scale after a clear cut.

Analyzing preservation and conservation at the scale of a land management unit allows one to arrive at one set of conclusions about the nature of these approaches. However, as the scale frame is narrowed or broadened, the homogeneity or heterogeneity of land-use practices changes, and the characterization of what is happening changes as well. As such, the scale at which an approach is presented or analyzed is a choice with political and ideological implications.

If one pulls back from the land management unit and begins to analyze the situation at broader scales, at least three other geographic issues begin to become apparent: (1) patterns of land use (i.e., how the landscape is divided up into different land-use units); (2) the economic and ecological connections between different areal units – and the politics of these linkages; and (3) synergistic human–environment interactions.

In the first instance, for example, preservation at a limited scale means that humans must divide up the landscape into areas designated for preservation and those for other types of land use (ranging in use from overexploitation to

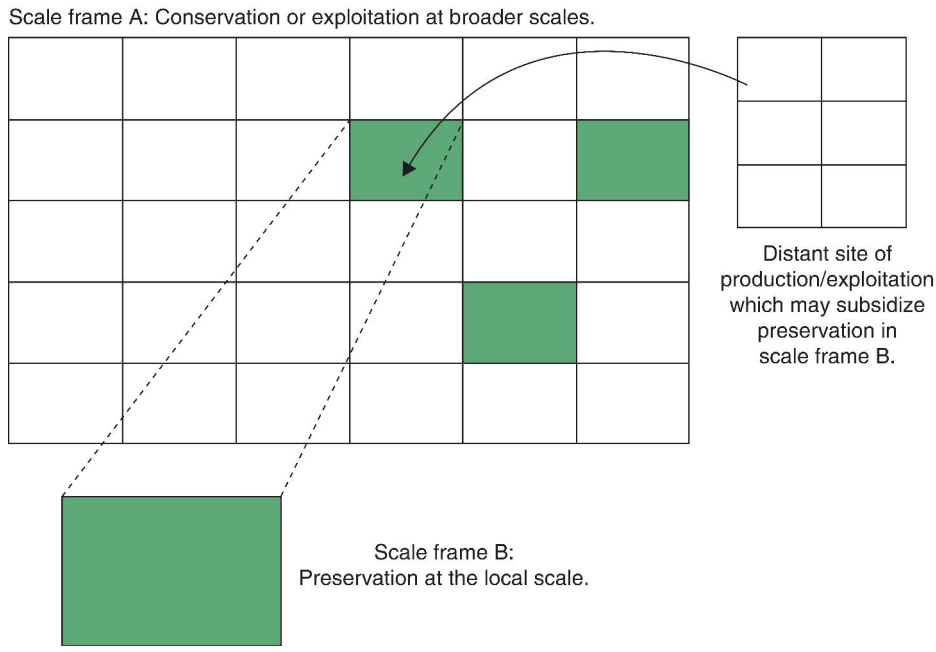

Figure 1.07 Scale/space analysis of preservation. *Source*: Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

conservation). As such, when viewed from a broader scale perspective (scale frame A in Figure 1.07), one sees a patchwork landscape of exploitation, conservation, and preservation, which (by definition) could not be considered preservation. Such patchwork landscapes, with preservation in some areas (scale frame B in Figure 1.07) and different uses in others, may represent conservation at best (use within biological limits) and (more likely) overexploitation in many instances. In other words, preservation at the local scale could violate conservation at a broader scale if it leads to overexploitation on other parcels.

Secondly, underpinning the land-use mosaic are a variety of economic and ecological linkages between preservation areas and other points on the landscape. Accounting for linkages, or chains of explanation, between local land-use strategies and the broader political economy has been standard practice in geography, especially in such subfields as political ecology, where there is an emphasis on the political economy of human–environment interactions (see Chapter 4).

At a very basic level, the non-use or non-consumptive use of resources in certain areas implies that uses that could have occurred in these areas likely have shifted elsewhere. While it is acknowledged that US national parks often were established on economically marginal lands, it is difficult to deny that these could have been sites of resource extraction. In other words, it is the "subsidy" provided by intensive use of "normal use areas" (both as sources of resources and sites of human habitation) that allows people to set aside areas for preservation. Another way to conceptualize one unit of land subsidizing preservation on another is to consider