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Introduction

A Geographic Perspective on Human–Environment Interactions

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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

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.

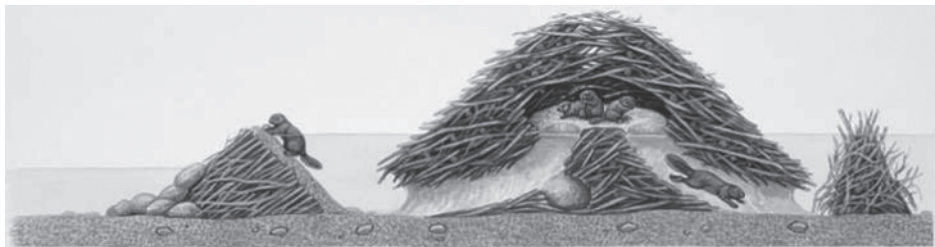


Figure 1.02 Sketch of beaver lodge and dam.

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 human 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

<p style="text-align: center;">Human geography</p> <p>(e.g., urban geography, economic geography, population geography, cultural geography, development geography, political geography)</p>	<p style="text-align: center;">Human-Environment</p> <p>(e.g., cultural ecology, political ecology, agricultural geography, water resources, human-dimensions of global change, hazards geography)</p>	<p style="text-align: center;">Physical geography</p> <p>(e.g., biogeography, climatology, geomorphology)</p>
<p style="text-align: center;">Techniques</p> <p>(e.g., geographic information systems (GIS), remote sensing, cartography, statistics)</p>		

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 Questions¹

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.

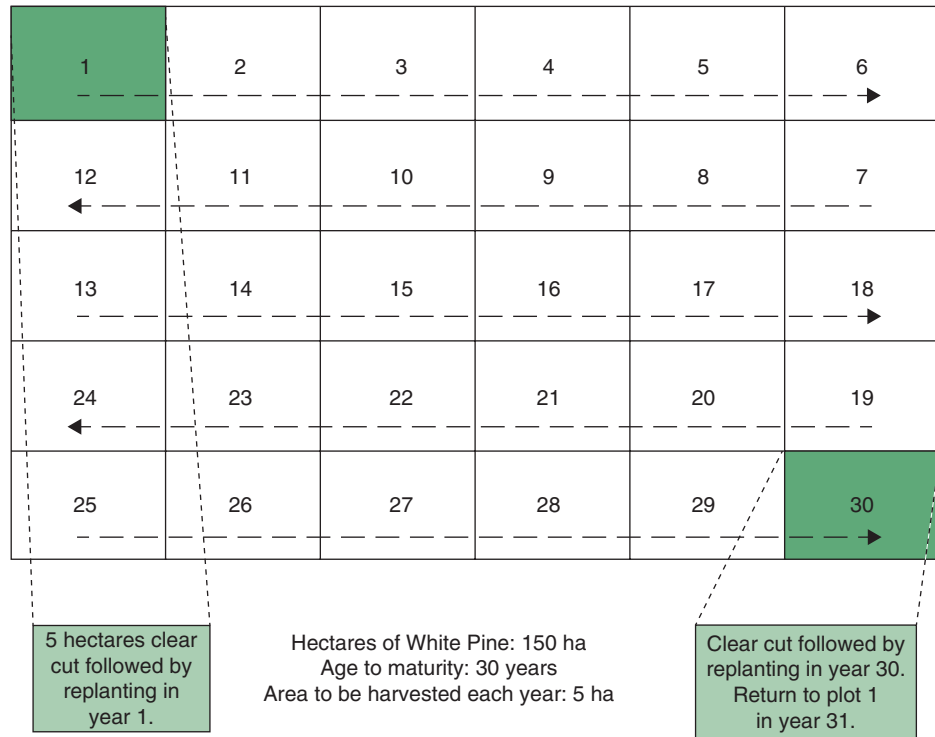


Figure 1.05 The principle of maximum sustainable yield as applied to an even-aged monoculture of white pine. *Source:* Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

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 monoculture³ 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

Scale frame A: Conservation at the scale of the forest

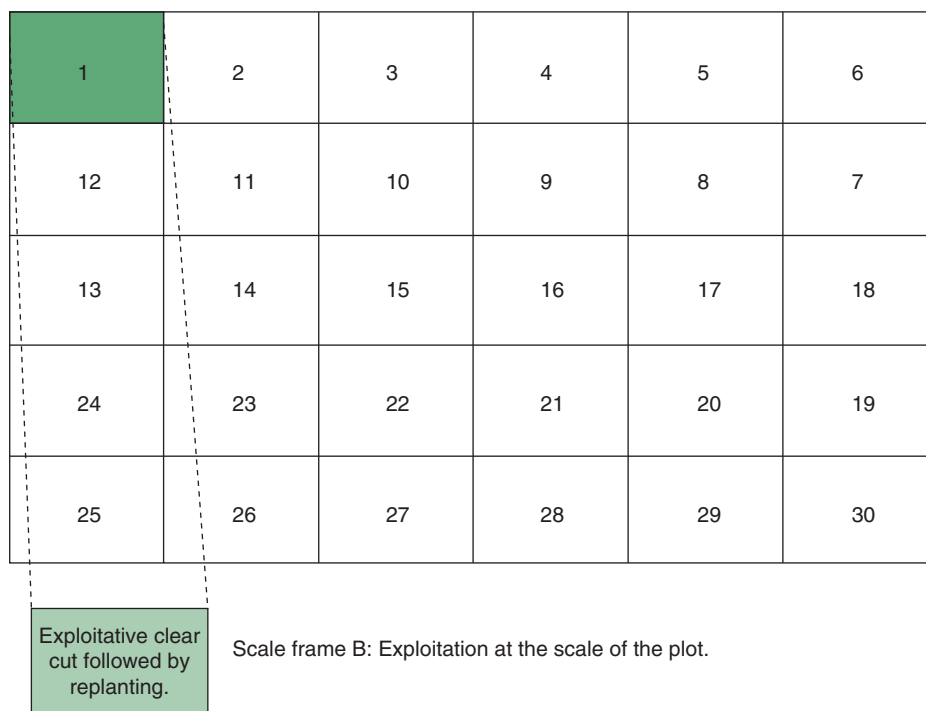


Figure 1.06 Scale analysis of forest managed under principles of maximum sustainable yield.
 Source: Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

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

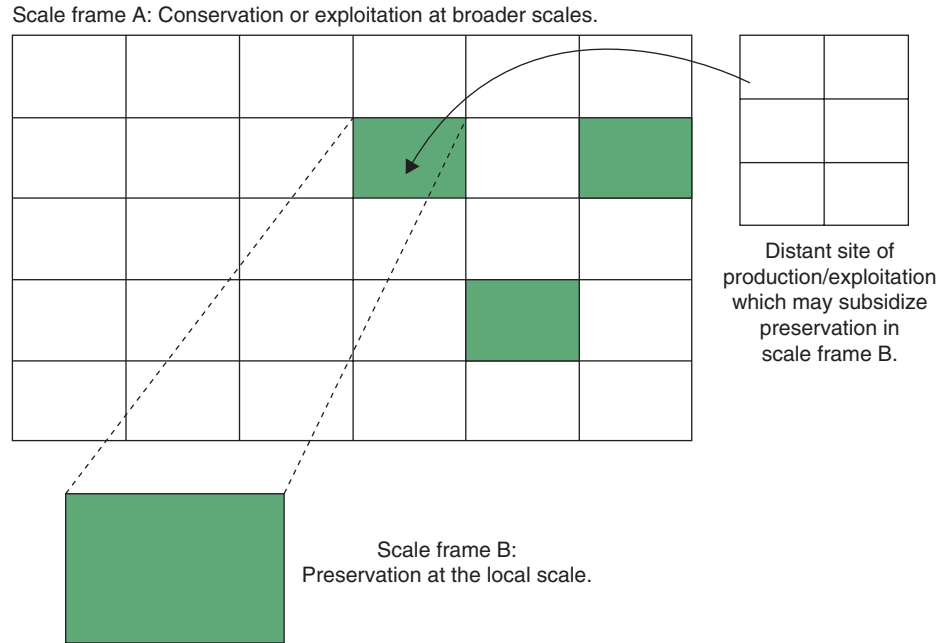


Figure 1.07 Scale/space analysis of preservation. *Source:* Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

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

the **net primary productivity**⁵ (NPP) of any ecosystem. If a human population was to consume a large portion of an area's NPP per year, and then half the land was turned into a preserve, then the human population would need to look elsewhere for the resources it needs to survive. These resources (garnered from unpreserved land) then support or subsidize the preserve. The subsidy provided to preserves from normal land-use areas may come from inside or outside the country (see Figure 1.07 showing the subsidy provided by a distant site of production or exploitation). For example, a reduction in US timber harvests from 1990 (because of stricter requirements to sustain biodiversity and other ecosystems functions) was possible in the face of growing US demand for wood products because of increasing imports from Canada (Martin and Darr 1997) and several tropical countries (Tucker 2002). The global economic system, with its increasingly global set of commodity chains, is sufficiently opaque to prohibit most people from seeing the impact of resources they may be drawing on from overseas (Princen 2002).

Beyond shifts in resource extraction, a second connection between preserves and other points on the landscape may be the dislocation of peoples. A large body of geographic scholarship on parks and peoples has documented how the creation of parks in developing countries often implies the relocation of peoples to other areas (see Chapter 11). For example, Guha (1997) describes an on-going controversy in Nagarhole National Park in Karnataka Province, India, where the Forest Department has been trying to relocate 6000 local people. Relocated peoples, while (arguably) lessening impact within the preserve, often augment impact elsewhere (another dimension of outside areas "subsidizing" preserves). Furthermore, displaced peoples often bear considerable costs for the creation of such preserves in terms of compromised livelihoods. While a lesser-known phenomenon, the establishment of national parks in the US (and other areas of the Global North) often involved the displacement of native peoples (Burnham 2000; Braun 2002). While most proposed US national parks were described as economically worthless and uninhabited by their proponents in the early 20th century in order to avoid conflicts with economic interests, many of these areas were far from uninhabited. The environmental historian Philip Burnham has described the role of public agencies in removing Native Americans from lands that were to become Glacier, Badlands, Mesa Verde, Grand Canyon, and Death Valley national parks (2000).

A third connection exists to outside areas when preserves are supported by the fees of ecotourists, increasingly the case in many developing countries. These fees represent real financial transfers that may offset the resources forgone when an area is set aside for a preserve. However, those bearing the costs of the park (often local people in terms of compromised livelihoods) and those benefiting from user fees and tourist revenues (e.g., national governments, tour companies) are often different. Globetrotting ecotourists also generate significant environmental externalities when they consume large amounts of resources to travel across the world to visit wildlife preserves and parks in Africa, Latin America, and Asia.

What the above examples suggest is that preservation is only preservation (non-use or non-consumptive use) at the scale of the preserve. When such

a preserve is viewed at broader scale frames, we see that this is not really preservation because non-use/non-consumptive use in one area is almost always subsidized by use in surrounding areas (or even distant centers of production and consumption). In either instance (conservation or preservation), we suggest that the distinctions between exploitation, conservation, and preservation begins to become blurred when they are analyzed at multiple scales. Key to understanding this multi-scaler analysis is attention to how humans divide up space to apply either principle (conservation or preservation) and to socio-economic and ecological connections that exist between regions and places.

Another issue which becomes clear when discussing approaches to resource management (exploitation, conservation, and preservation) is a tendency to separate humans from nature, rather than viewing humans as part of nature (that is, just another animal among many). As the story about beavers at the beginning of this chapter suggests, humans are not really all that different from other animals who manipulate their environments to achieve certain ends. This is not to insinuate that, if humans are part of nature, then anything goes. Rather, the idea is to acknowledge that we are not all that different from other actors in the environment and that it is problematic to think of ourselves as being able to operate outside of such systems. If humans are a part of nature, then the preservation approach in particular becomes problematic as it operates from a position that humans are (or ought to be) outside of natural areas if these are to be considered natural. The approach also ignores that fact that preserves are a product of human action as these are areas where we have deliberately chosen not to pursue certain types of activities.

Gifford Pinchot, John Muir, and Conventional Interpretations of the Hetch Hetchy Valley Controversy

In the US, the conservationist and preservationist philosophies evolved quickly in the wake of large-scale deforestation (i.e., exploitation) in the post-Civil War period as American cities and industry boomed (Williams 1989). Along with this destruction came the realization by some that America's vast natural resource base was not inexhaustible.

Two iconic figures, Gifford Pinchot and John Muir, are used in many texts to help illustrate the two approaches to resource management (Miller 1990; Cunningham and Saigo 2001; Holechek et al. 2003; Chiras and Reganold 2005; Righter 2005). **Gifford Pinchot**, a German-trained forester who established the Yale School of Forestry (the first school of forestry in the US) and the founding head of the US Forest Service, was probably the most visible early 20th-century proponent of the conservationist approach in the US (Miller 2001). Pinchot did not see conservation and development as incompatible. In fact, Pinchot saw the wise use of natural resources as the key to sustained development and production over time (not all that dissimilar from the sustainable development discourse

that would rise to prominence in the late 1980s and 1990s (see Chapter 2)). Pinchot wanted to maximize human benefit from the resource base over time (instead of just maximizing human benefit in the short run). According to Pinchot, resources should be used “for the greatest good, for the greatest number for the longest time” (quoted in Cunningham and Saigo 2001: 18). Pinchot’s portrayal of forestry practices (especially sustainable yield) as “scientific,” allowed him to build the US Forest Service into a powerful and well-resourced agency (Clarke and McCool 1985).

John Muir played a key role in the establishment of some of the first national parks in the US and was one of a handful of American intellectuals who began to write about the aesthetic beauty of the American wilderness in the late 19th century (Runte 1987). Muir, a Scottish immigrant, spent his early years in Wisconsin and then traveled to California where he helped establish and became the first president of the Sierra Club. Muir and others (e.g., Ralph Waldo Emerson, Henry David Thoreau) often described the American wilderness in quasi-religious terms. This sentiment is reflected in Muir’s description of the Hetch Hetchy Valley. He wrote that to dam the Hetch Hetchy one “may as well dam for water-tanks the people’s cathedrals and churches, for no holier temple has ever been consecrated by the heart of man” (Muir 1908). As others have noted (most notably Cronon 1996), “nature” for these writers was a place without humans. As such, the preservation of nature not only entailed limits on the consumptive use of resources, but a prohibition on people living in these spaces. Wilderness eventually came to be defined as a place “where man himself is a visitor who does not remain” (US Wilderness Act 1964, section 2c).

The early 20th-century conflict between Gifford Pinchot and John Muir over the decision to dam or not dam the **Hetch Hetchy Valley** in California is used by many texts to starkly differentiate between conservation and preservation. Hetch Hetchy Valley was reported by many, including Muir, to be more beautiful than Yosemite Valley. Both of these valleys, Hetch Hetchy and Yosemite, are found within Yosemite Park, which was established as a California state park in 1864 and then became a US national park in 1906. Figure 1.08 shows Yosemite National Park and its position within the state of California. The conventional wisdom is that Muir favored preserving the valley for aesthetic beauty whereas Pinchot advocated damming the valley to provide water and hydroelectric power for the city of San Francisco.

Muir and the preservationists eventually lost the battle with Pinchot and the conservationists when the US Congress passed the Raker Bill in 1913 allowing flooding of Hetch Hetchy Valley. The Hetch Hetchy Valley was submerged in 1923 when construction of O’Shaughnessy Dam was completed. Figure 1.09 features historical photos of Hetch Hetchy Valley before and after the dam was built. As demonstrated by the two quotes below, readers of texts using the Hetch Hetchy case in this context are led to conclude that conservation is a highly problematic approach that ends in the destruction of beautiful sites.

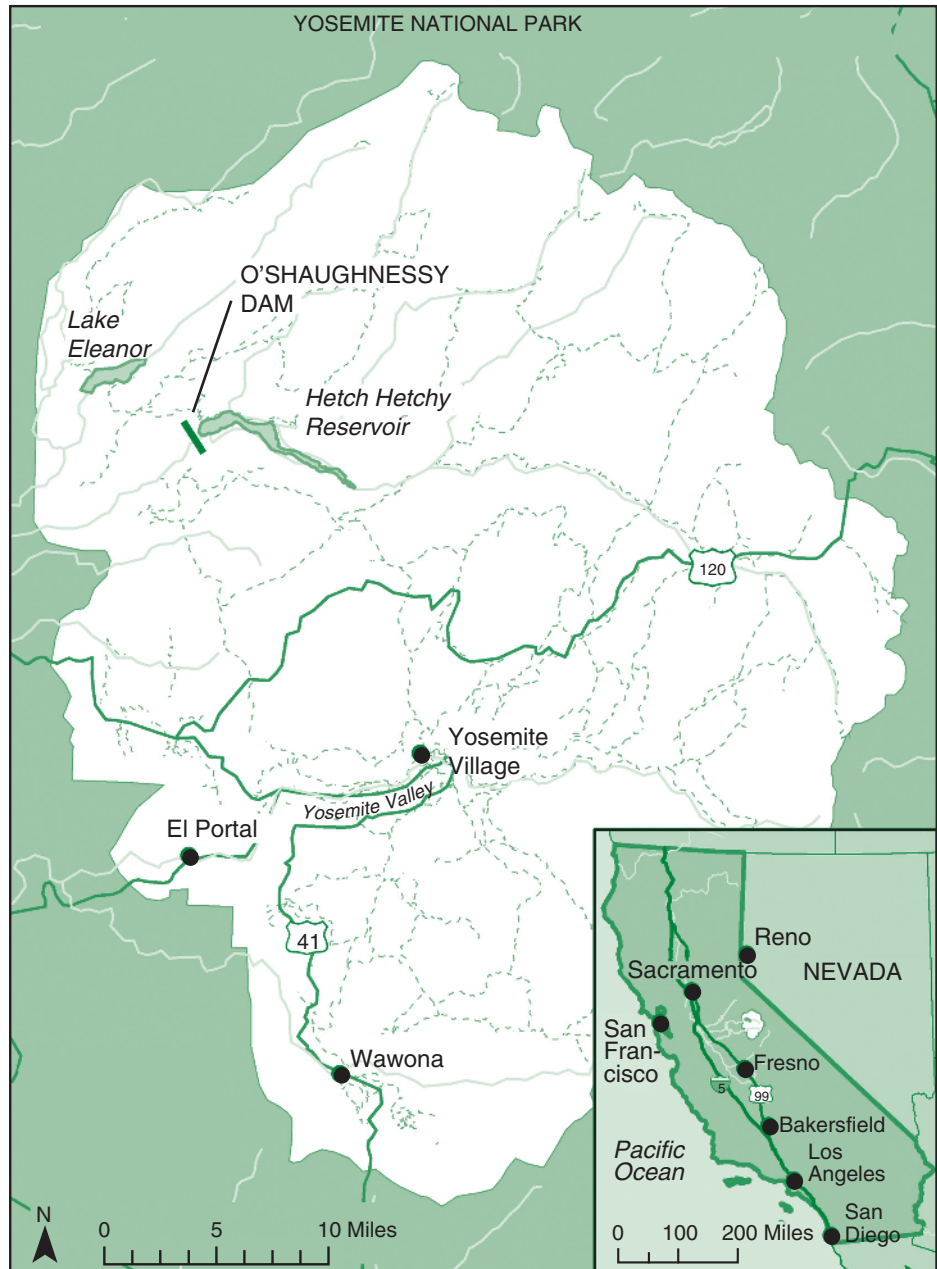


Figure 1.08 The location of Hetch Hetchy Reservoir (formerly Valley) and Yosemite National Park. *Source:* Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.



Figure 1.09a Hetch Hetchy Valley before the O'Shaughnessy Dam. *Source:* F.E. Matthes/United States Geological Survey Photographic Archive.



Figure 1.09b Hetch Hetchy Valley after the O'Shaughnessy Dam. *Source:* © Anthony Dunn/Alamy.

Scientific conservationists, led by Gifford Pinchot, wanted to build a dam and flood the valley to create a reservoir to supply drinking water for San Francisco. Preservationists, led by John Muir, wanted to keep the *beautiful spot* from being flooded. After a long and highly publicized battle, a dam was built and the valley was flooded. (Miller 1990: 39; emphasis added)

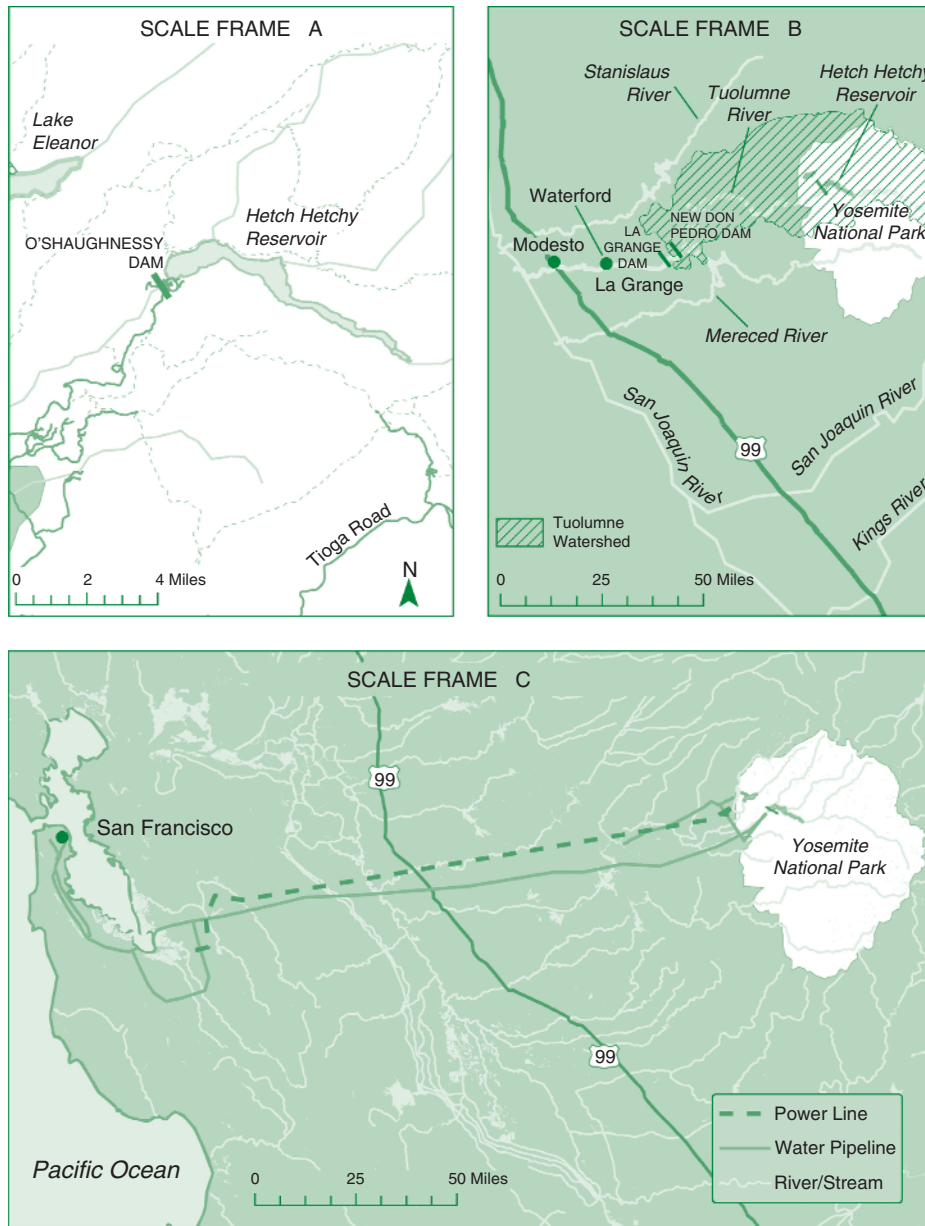
One of the first and most divisive of these battles was over the flooding of the Hetch Hetchy Valley in Yosemite National Park. In the early 1900s, San Francisco wanted to dam the Tuolumne River to produce hydroelectric power and provide water for the city water system ... Muir said that Hetch Hetchy Valley rivaled Yosemite itself in beauty and grandeur and should be protected. After a prolonged and bitter fight, the developers won and the dam was built. (Cunningham and Saigo 2001: 439)

Hetch Hetchy Valley Reinterpreted

So how does an alternative, geographic perspective change our understanding of how this controversy is often presented? Many writers, and the mainstream environmental movement more broadly, depict this narrative from a certain scale perspective in that they tell a story focused on changes in the valley (rather than at another scale such as the river basin).

Early in this century conservationists disagreed over how *the beautiful Hetch Hetchy Valley* in what is now Yosemite National Park was to be used. This controversy split the American conservation movement into two schools of thought, the preservationists and the scientific conservationists. (Miller 1990: 41; emphasis added)

Given that the story is presented at the scale of the valley (scale frame A in Figure 1.10), is what happened in the valley after the O'Shaughnessy Dam was built a reasonable and fair example of conservation? We would argue that this story misrepresents the true meaning of conservation (use within biological limits) by focusing on a particular scale frame where the result is really one of total destruction or exploitation (as the valley was completely flooded). In other words, the story, as conventionally told, is focused on the area submerged following construction of the O'Shaughnessy Dam, i.e., the destroyed riparian zone and upper reaches of the valley floor. For example, Philp (2002) notes that the "Hetch Hetchy is submerged under 117 billion gallons of water. In one of the great contradictions of all time, Congress decided ... in 1913 to drown Hetch Hetchy to supply water for San Francisco." Interestingly, and further proof that the environmentally minded public is most concerned about the impact of the dam on the valley itself (rather than the larger river basin) are contemporary efforts to remove the dam (see Restore Hetch Hetchy 2006). By manipulating the discursive scale, conservation (operating at the scale of the watershed) is presented as exploitation (operating at the scale of the valley). As such, the case study as conventionally told conflates conservation and exploitation (making it a poor example of the difference between conservation and



Cartographer: Birgit Mühlenhaus, 2008
 Macalester College, Geography Department

Sources: USGS National Atlas (nationalatlas.gov), National Park Service,
 and the San Francisco Public Utilities Commission (SFPUC).

Figure 1.10 Hetch Hetchy Reservoir and Yosemite National Park as viewed from three different scale-frame perspectives. *Source:* Macalester College cartographer Birgit Muhlenhaus/Moseley 2009.

preservation) and leaves most environmentally minded students thinking that conservation is a bad approach because it led to the destruction of the “beautiful Hetch Hetchy Valley.” Preservation, in contrast, is held up as the better (if not more ethical) method.

Furthermore, the full story of the preservation efforts in Yosemite National Park is not discussed in conventional presentations of the Hetch Hetchy Valley controversy. As noted previously, when a preserve is created there are often knock-on effects (or connections) in terms of impacts on local livelihoods and resource extraction on nearby and faraway lands. Interestingly, in contrast to the situation in other national parks, Native Americans were allowed to continue living in Yosemite National Park (in a central Indian village) because they provided valuable labor and served as a tourist attraction. However, as Burnham describes, John Muir found the local Yosemite people “distasteful.”

Muir ... found the Yosemite people dirty and indolent during a park visit in 1869, remarking with distaste their fondness for imbibing ant and fly larvae. In his search for the pristine, there was little room for hunter gatherers who “seemed sadly unlike Nature’s neat well-dressed animals.” ... Muir decided that the worst thing about them was their uncleanliness, adding that, to his way of thinking, “nothing truly wild is unclean.” (Burnham 2000: 21)

Unfortunately, John Muir’s and the National Park Service’s passive-aggressive attitude towards Native Americans (fueled in part by a conception of nature as a place without humans) undermined their existence in Yosemite. Eventually the Yosemite people left the park as the Park Service progressively raised rents over time. By 1970, the Indian village had been razed.

While dams are clearly problematic in most instances, the Hetch Hetchy story would take on a different tenor if it were presented at the scale of the Tuolumne River or the Tuolumne River Basin (scale frame B in Figure 1.10). At this scale, the dam might be viewed only as impacting a portion of a much larger river or river basin. Of course, it is known that dams can significantly impact upstream and downstream environments (see Chapter 12), that is, an area that extends well beyond the flooded zone. However, unlike the flooded Hetch Hetchy Valley, such a system does continue to function, albeit in a different manner. While contentious, it must also be said that if one accepts that “nature” is socially constructed (see Chapter 2), then the “impacted” Tuolumne River system may be no more shaped by human action than the idealized “pristine” wilderness we so cherish.

Finally, we could also tell the story at an even broader scale (scale frame C in Figure 1.10) which encompasses the Hetch Hetchy Valley, Yosemite National Park, the Tuolumne River Basin, as well as a distant site of consumption, the San Francisco metropolitan area where the power and water from the Hetch Hetchy Reservoir is delivered. A discussion at this final and broadest scale frame challenges the reader to confront the relationship between urban America and dams and parks in the surrounding hinterlands. It brings into sharp relief the tension between urban Americans’ desire for wilderness amenities and their consumption of water and power resources. As such, the pedagogical value of Hetch Hetchy Valley controversy does not lie in its ability to illustrate the difference between conservation and preservation (it is a poor example of this if we focus on the story at the scale of the valley),

but rather as one of the first cases where the tension between urban America's dichotomous impulses to consume resources (see Chapter 9) and to preserve natural areas occurred in the same place (making this an inherently spatial story). In most cases, we have continued to "have our cake and eat it too" by spatially disaggregating sites of exploitation and preservation across the landscape, rather than opting for the much more challenging option of living within biological limits (read conservation). In the end, one might still think that the dam was a bad idea, but the point is that by presenting the story at the scale of the Hetch Hetchy Valley, writers: (1) obscure the complicated social history and economic linkages involved in creating and sustaining Yosemite National Park and the O'Shaughnessy Dam; and (2) discursively equate conservation with the complete destruction of an area.

Plan for the Rest of the Book

The explanations and story above have, we hope, illustrated how geographers might look at a human–environment question in a slightly different manner than other environmental scientists. The main goal for the rest of this book is to present human–environment geography's rich tapestry of theoretical approaches and then to demonstrate how these may be productively engaged to understand human–environment interactions. After explaining some fundamental concepts in Part I of the book, Part II details the major theoretical traditions within human–environment geography. Part III reviews major thematic issues within the field (e.g., population, food and agriculture, water resources). Part IV aims to connect the book's material to the real world by showing the student how geographers undertake fieldwork and collect and analyze data. It also makes suggestions for using the concepts in this text to understand environment-related problems and bring about change.

While the text deliberately seeks to explicate the theoretical underpinnings of human–environment geography, it also seeks to relate these insights to real-world policy questions. To make these connections as explicit as possible, many chapters contain one or more text boxes featuring op-eds from the world's major newspapers that have been published by nature-society geographers. We also emphasize geography's strong tradition of fieldwork via guest field notes and critical case studies focused on pressing human–environment issues and challenges. These field notes are deployed as examples to illustrate how geographers have gone about conducting fieldwork to answer key human–environment questions.

Part I: Fundamentals of Human–Environment Geography

Following this introductory chapter, this section has two more chapters focused on broad introductory themes. Chapter 2 is about the politics of nature. It seeks to explore human conceptions of nature to examine the contemporary environmental movement in historical and global context. While the question "What is nature?"

may seem simple, most geographers would tell you it is not. As such, this chapter begins by exploring the social construction of nature and resources – and the implications of this for policy and praxis. The chapter then examines the history of contemporary environmentalism in the Global North and Global South. Particular emphasis will be given to the rise of the conservation, preservation, and environmental movements in the Global North (from the mid-19th century onward), the different phases of these movements, and their spread to other world regions. We will also explore environmental ethics from different cultural perspectives. Throughout the discussion, we will attempt to create a healthy tension between need for conservation and the often problematic way in which it has been implemented. Chapter 3 is about the biophysical environment. It reviews key concepts in ecology and physical geography. Its purpose is to impart some basic knowledge of biophysical processes and to introduce the spatial perspective that physical geographers often bring to these issues.

Part II: Contemporary Perspectives in Human–Environment Geography

Each of the chapters in this section explores a different conceptual perspective within geography on human–environment interactions. The goal is to get readers to think about the environment in terms of its “relationship” to people and to examine how different social science and humanities perspectives are useful for explaining human environmental phenomenon and processes. Chapter 4 explores the lens of cultural and political ecology. The interdisciplinary field of cultural ecology came to prominence in the 1960s and 1970s largely in reaction to modernist interpretations of development in the Global South. The field played an important role in the decolonization process by documenting and explaining local agricultural and resource management practices. In reaction to a series of critiques leveled against the field in the 1980s, it eventually came to view local human–environment interactions within the context of a broader political economy. This new field is now known as political ecology. Chapter 5 examines environmental history. This highly interdisciplinary field is a key reference point for many human–environment geographers. The chapter examines important environmental histories from the post-industrial era as well as the growing literature on paleoclimatology. Chapter 6 explores the evolving subfield of hazards geography, which has shifted over time from a technocratic concern with risk to the political economy of natural hazards. Geography’s hazards tradition will be presented, as well as an analysis of various natural hazards (e.g., drought, tsunamis, earthquakes, floods, etc.) and related societal vulnerability around the world. The final chapter of this section examines environmental justice, or the uneven distribution of pollution and environmental opportunity. This tradition bears some resemblance to political ecology, but has a separate history and an increasing number of practitioners who are geographers. While historically focused on the disproportionate burden of

pollution borne by minority communities in the USA, environmental justice is now being used as a lens to understand problems in the Global South.

Part III: Thematic Issues in Human–Environment Geography

The goal of this section is to explore major environmental themes and apply some of the theoretical perspectives described in Part II to these issues. Chapter 8 examines climate, atmosphere, and energy. Here, energy resources will be discussed in relation to their impact on climate and the atmosphere. Local atmospheric issues will be reviewed, followed by an examination of the big three global climate issues (acid deposition, stratospheric ozone depletion, and global warming). Chapter 9 examines the nexus of human population, consumption, and technology in terms of their environmental impacts. Chapter 10 looks at agriculture and food systems. This topic has a long history of study within human–environment geography. This chapter explores agricultural systems around the world as well, and the impact of global markets for various products. Chapter 11 examines biodiversity, wildlife, and protected areas. Building on discussions in Chapters 2, 3, and 4, this chapter introduces more sophisticated biodiversity concepts and examines conservation efforts in this realm. Water resources and fishing livelihoods are explored in Chapter 12. The chapter examines basic water concepts, freshwater and marine resources, as well as fishing livelihoods.

Part IV: Bridging Theory and Practice

The final section articulates the connections between theory and practice. Human–environment geographers' approach to research is detailed in Chapter 13, as many introductory students have a limited understanding of how geographers actually conceptualize research projects and collect and analyze data to arrive at certain conclusions. This chapter details a number of approaches to collecting and analyzing information as examples of how some human–environment geographers practice their craft. In the concluding chapter (14), we examine how the many ideas in this book may be employed in the real world to understand environment-related problems and bring about change. It is suggested that the way we understand the world has important implications for how we act in the world. Furthermore, human–environment geographic research need not necessarily be an activity isolated from “real-world” policy and change. There are many examples wherein the actual process of research (particularly action-research) is a vital component of the change process. Finally, there are strains of human–environment geography which are quite applied in nature (meaning used in the everyday work environment, be it consulting firms or government offices) and there are a number of geographers who have worked directly on policy issues. As such, 21st-century geography students are well positioned to bridge the worlds of theory and practice by being thoughtful practitioners and engaged scholars.

Chapter Summary

This chapter began by giving students a sense of how humans, like other animals, have manipulated the environment in order to encourage the production of certain types of resources. Sometimes people have been successful at doing this over time and on other occasions we have exhausted the resource base with unwelcome consequences. We then introduced the field of geography and its relevance to environmental questions. We outlined some generalized perspectives that human–environment geographers often take when examining resource questions. These perspectives included attention to: scale, spatial patterns of environmental use, a conception of the human–environment system as a single unit (rather than two separate parts), and the connections between places and regions. In order to illustrate such perspectives, the second half of the chapter applied these to develop a revised understanding of three resource-management approaches as well as to a famous case in US environmental history, the Hetch Hetchy Valley controversy. The last part of the chapter simply described the plan for the rest of the book.

Critical Questions

- 1 Is human manipulation of the landscape necessarily a bad thing? Explain.
- 2 Are humans unique in their ability to manipulate the physical environment? If not, what may distinguish humans' ability to manage the environment from that of other animals?
- 3 How might you describe geography to a friend? If this is your first geography class, how has your understanding of geography changed since you started this course and read this chapter?
- 4 What are some fairly general, yet distinctive, elements of the way human–environment geographers approach natural resource questions?
- 5 Why, according to geographers, is the Hetch Hetchy controversy in US environmental history not a very good example of the difference between conservation and preservation?

Key Vocabulary

cartography	modifiable areal unit problem
conservation	net primary productivity
exploitation	non-consumptive use
geographic information systems (GIS)	physical geography
Gifford Pinchot	politics of scale
Hetch Hetchy Valley	preservation
human geography	remote sensing
human–environment geography	scale
John Muir	sustainable yield

Notes

- 1 Much of the material in this section is based on: Moseley 2009.
- 2 This is the amount of a renewable resource that could be safely harvested each year without reducing its long-term productive potential.
- 3 Monoculture refers to a farm field or forest stand that is planted with one crop or tree as opposed to a variety of such plants.
- 4 As Yellowstone National Park in the USA was the first expression of a preserve in the modern era.
- 5 For terrestrial ecosystems, net primary productivity (NPP) refers to the total amount of biomass generated for a given area (usually per square meter) for a given time period (usually a year).

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