Placing Nature

Culture and Landscape Ecology

EDITED BY JOAN IVERSON NASSAUER

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Acknowledgments

Each of the authors whose work is included in this book engaged in a process of discussion and mutual review of each other's work, exemplifying the possibilities for working across boundaries in landscape ecology. I am most grateful to my colleagues for their endeavor in writing this book. I learned a great deal from them and from our process of working together.

The Graduate School of the University of Minnesota made this book possible by awarding a grant to Deborah Karasov and me to organize a multidisciplinary project about culture and landscape ecology. I thank Dean Mark Brenner and Associate Dean Charles Louis for their faith in the project throughout its evolution.

The topic of our exploration grew out of the conclusions of the Blue Ribbon Panel at the ninth annual United States landscape ecology symposium. I thank Tom Crow for organizing the panel and all of my colleagues in the International Society for Landscape Ecology (IALE) for their work, from which I have learned so much. I also thank Margaret Moore, IALE program chair, with whom I worked as local program chair to organize the tenth annual national landscape ecology symposium, "Working in a World Dominated by Humans." The symposium allowed the authors of these essays to practice a multidisciplinary critique of applied landscape ecology. Special thanks to David Tilman, who first suggested our symposium theme, and to Lucinda Johnson, who suggested that we begin critical analysis of case studies as part of the national symposium. Those case studies became important touchstones that allowed us to communicate across disciplines by reference to real places. I thank Don Wyse and Helene Murray of the Minnesota Institute for Sustainable Agriculture, and Dan and Muriel French for allowing us to visit and review their farm and for participating in our critical review of applied landscape ecology. I also thank Sherri Buss, director of the Phalen Watershed Project; the Board of the Project; and Cliff Aichinger, director of the Ramsey-Washington Metro Watershed District, for generously organizing our visit and participating in our critical review of the Phalen Watershed.

I am also grateful to the McKnight Fund for the Arts and Humanities of the University of Minnesota, which made a pivotal contribution to the symposium. In addition, the USDA Forest Service; USDA Natural Resources Conservation Service; the USDI Fish and Wildlife Service; the University of Minnesota's Colleges of Agriculture, Natural Resources, and Architecture and Landscape Architecture, and the Center for Urban Affairs; and the Minnesota Institute for Sustainable Agriculture all joined in sponsoring this symposium.

The central activities leading to this book were seminars for scholars and graduate students in the humanities; design; and biological, physical, and social sciences in the winter and fall of

1995. Deborah Karasov and I organized these two experiences, where we shared, developed, and tested our ideas about landscape ecology. Special thanks go to Deborah for her work in organizing that first seminar, teaching the associated graduate course, and organizing the weekend and summer retreats for authors and visiting critics—all of which were essential to the authors' work.

Among those whose names do not appear as authors in this book but whose insights and questions were critical to its evolution are the students in geography, landscape architecture, architecture, and philosophy who participated in the seminar and retreats. Each of the authors is also indebted to our colleagues in the arts, sciences, humanities, and design, whose thoughtful participation in the discussion brought and tested important ideas. I thank Kinji Akagawa, Julie Bargmann, John Carmody, Roger Clemence, Edward Cushing, Susan Galatowitsch, Harrison Fraker, Mierle Ukeles Laderman, Roger Martin, Lance Neckar, Patrick Nunnally, David Pitt, Peter Reich, Earl Scott, Robert Sykes, and John Tester. Finally, Richard Forman and Frank Golley visited and participated in discussions at critical times in the project. Their insights as scholars and as fathers of landscape ecology provided important tests of the cultural principles for landscape ecology that we discussed, and their experience energized our work.

All of the authors hope that this book will speak to you if you are, or are preparing to be, a citizen who can speak for ecological health in your own community. We also hope it will speak to you if you are, or are preparing to be, a landscape ecologist—ecologist, ecosystem manager, watershed manager, conservation biologist, land developer, designer, planner, or engineer—who will directly make future landscapes. If this book does speak to you, it will be largely because of the skillful editing of Mary Keirstead, who worked with me on the final manuscript of the book. I am extremely grateful to her for her clear thinking and professionalism.

A Note about the Photographic Essay by Chris Faust

Chris Faust's photographs, which begin on the cover and appear throughout this book, were important catalysts in the discussion among the contributors to this book. In the project, experts in disciplines ranging from art to ecology and from geography to philosophy worked together to understand how culture can be activated as part of landscape ecology. Learning to listen to the languages of other disciplines and learning to recognize what each of us noticed when we looked at the landscape were essential to the way that we worked. Looking at real places as portrayed in Faust's photographs helped us talk and make common discoveries about the effects of culture. In his travels around the world to photograph landscapes, Faust finds that his photography punctuates the continuum of what he sees. The photographs he makes by this way of seeing remind us of places that we all can recognize. At the same time, they point out what Faust sees in particular. The son of a historian and a watercolor painter of landscapes, he captures the landscape at key points in the process of change. In the photographs that follow, look for reminders of your own experiences and also look for ways in which the combinations of these photographs speak to aspects of landscape ecology discussed in the written essays. This is what the authors of the essays did as we worked together.

JOAN IVERSON NASSAUER

About Island Press

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INTRODUCTION

Culture and Landscape Ecology: Insights for Action

JOAN IVERSON NASSAUER

OVERLEAF

Allee of Trees, on the Way to Warsaw, Poland (September 1994).

THOUGHTFUL OBSERVERS of global ecosystems cannot fail to see that we live in a world dominated by humans. We cannot stand apart from nature, and now nature as we know it cannot stand apart from us. Faced with dawning clarity about this new relationship, we are uncertain of what to do. What is our appropriate role in nature? How might the tremendous momentum of postindustrial technology and global economics be channeled or transformed in response to ecological fundamentals? How can ancient assumptions of Western culture and ingrained traditions be placed in a new context of ecological knowledge? What should our goals be? What should our strategies be? How should we live?

The authors of the essays in this book asked themselves these questions. Our different backgrounds in ecology, philosophy, art, literature, geography, landscape architecture, and history—and our varied experiences with nature and the landscape—led us to look for answers in different spheres of human experience. Jane Smiley was awarded the Pulitzer prize for her novel *A Thousand Acres*,[1] which revealed the overpowering necessity of an Iowa farm family's relationship to the land. In this volume, she probes the assumptions of agriculture, concluding that "agriculture not only has the ability to make civilization, it has the power to unmake it." As a child, Eville Gorham loved the peat bog landscapes of his native Nova Scotia. Today he is known around the world for his research on boreal wetland ecology and the effects of acid rain. Here, he brings his wealth of ecological knowledge to bear on what he sees as the more complex problem of restraining human impacts on ecosystems. Judith Martin, as a geographer, has analyzed urban settlements across the northern hemisphere and, as a planning commissioner, has directly affected the urban pattern of Minneapolis, the largest city in a metropolitan area of 2.5 million people. Her essay with urban historian Sam Bass Warner probes the dynamics of development decisions that in the past have rarely been evaluated for their landscape ecological

effects. Chris Faust's photographs are informed by his experience as a biologist. His photographic essay, which runs throughout the book, aptly juxtaposes the most crass and mundane details of using the land with the poetic power of all landscapes.

Together these essays, with the others in this book, suggest widely varied approaches for bringing human-dominated landscapes into intentional relationships with nature. However, all of the essays hinge on a shared assumption: we must use culture to advance ecological health, or we risk removing ourselves altogether from the ecosystems we know. Our shared recognition that new relationships with nature are necessary to human survival brings an urgency to our exchange.

Landscape Ecology: An Amalgam of Many Disciplines

Landscape ecology drew the authors of these essays together to discuss what we know and what we need to know about culture. Within landscape ecology, knowledge of biological and physical phenomena has grown rapidly, so rapidly that many landscape ecological solutions to landscape-management problems have been offered only to be impeded or disregarded because they did not fit their cultural context. As both federal and state resource-management agencies across the United States have striven to implement a new, more holistic approach, ecosystem-management stories accumulate of good science that has been submerged in conflict for lack of cultural knowledge. Whether the issue has been logging of old-growth forests in the Pacific Northwest, selecting cultivated fields for habitat reserves, or creating habitat corridors across a metropolitan landscape, ecological solutions have been realized to the extent that they fit culture. The authors of these essays recognize that cultural insights have not kept pace with the clear need for understanding human perceptions, behavior, and communities, even when such insights have been critical to achieving ecological health.

From its beginnings in Europe, landscape ecology was conceived as an approach to understanding landscapes that drew upon both cultural and ecological knowledge.[2] The first president of the International Association for Landscape Ecology, the Dutch ecologist I. S. Zonneveld, answered the question "Who is a landscape ecologist?" this way:

> Any geographer, geomorphologist, soil scientist, hydrologist, climatologist, sociologist, anthropologist, economist, landscape architect, agriculturist, regional planner, civil engineer—even general, cardinal, minister, or president, if you like, who has the "attitude" to approach our environment—including all biotic and abiotic values—as a coherent system, as a kind of whole that cannot be really understood from its separate components only, is a landscape ecologist.[3]

The authors of the essays that follow are persuaded by our work together that landscape ecology must be a disciplinary amalgam cemented by the attitude that Zonneveld described. The defining concepts of landscape ecology set our course as we met together with other colleagues over the duration of a year. Landscape ecology opened ecological thought for critical discussion across disciplines because it goes beyond investigation of pristine ecosystems and beyond concerns for habitat restoration to consider the entire landscape of human settlement in all its sullied complexity. Landscape ecology investigates landscape structure and ecological function at a scale that encompasses the ordinary elements of human landscape experience: yards, forests, fields, streams, and streets. From the beginning, it has included the insistent and frequently destructive behavior of human beings as essential to understanding.[4]

Landscape ecology forced the authors to recognize the incompleteness of ecological knowledge and to confront the primary effect of culture in determining ecological function. The

key landscape ecology concept that human beings and the landscapes we make are influential parts of ecosystems led us to realize that we could not prescribe what future landscapes should be without consulting human values. Every possible future landscape is the embodiment of some human choice. Science can inform us; it cannot lead us.

When the German geographer Carl Troll coined the term *landscape ecology* in 1939, he was responding to a new technology, aerial photography, which displayed patterns of fields, forests, streams, and roads from a distance.[5] Aerial photographs made the landscape look like an enormous puzzle, and Troll believed that the shapes, sizes, and arrangement of the pieces made a difference in the overall ecology of the landscape. Although people did not make the landscape, they did craft much of the pattern. Today landscape ecology questions the effect of the pattern and looks to culture as one means of change. The authors of these essays struggled to find the ideas that could activate culture as part of a constructive working system of landscape ecological principles.

Urgent Realities: Population, Energy, Biodiversity

To view humans solely as a cause of ecological problems is to surrender to the most damaging aspects of culture. However, examining culture for solutions did lead some of us to underscore the urgent need to reexamine cultural assumptions and to reject some pervasive elements of Western culture. Curt Meine works from his knowledge of environmental history to conclude that the parceling of land in the United States by the rigid rectilinear geometry of the Public Land Survey has altered the patterns and processes of biological diversity within the landscape and continues to undermine our perceptions of those patterns and processes. Eville Gorham, working from his knowledge of ecosystem function, and Jane Smiley, working from her observations of farming in the Midwest, each describe how contemporary agriculture can overtake the ecological capacities of the landscape. This critique is not one that matters only if you live on a farm. Gorham describes the radical enhancement of the nitrogen cycle through the atmosphere by modern fertilizer manufacturing and the high proportion of energy inputs required for production of crops in industrial agriculture. Smiley believes that "What will or can be done with farming goes to the heart of what will or can be done with the rest of the earth."

Gorham's essay emphasizes the conclusion of many ecologists and observers that population growth is the fundamental global ecological challenge. Paired with postindustrial economic systems and proliferating Western consumer expectations, our soaring human population may already have exceeded the capacity of the global ecosystem to support it. Gorham describes the ecological effects of humanity's relatively new cultural habits of using fossil fuels, synthetic fertilizers, and pesticides and herbicides. He shows that the mammoth scale of earth moving and habitat destruction that accompany human settlement at the turn of the millennium casts a shadow over the entire planet and threatens the biodiversity necessary to human existence. Smiley sets these phenomena firmly in the context of culture and delves into the unexamined habits that reflect our Western concept of civilization. That the detached intelligence of a great ecologist, Gorham, and the synthetic intelligence of a great novelist, Smiley, both clearly envision ecological catastrophe in the absence of profound cultural reform injects a convincing urgency into the ideas that follow. They must be ideas that can launch us into action.

The Place of Nature: In Culture and on the Land

Where nature *should be* in settled landscapes to improve their ecological function is a critical question for which landscape

ecology suggests answers.[6] Where nature *can be* in the enormously complex but fundamentally pragmatic cultural process of making places is equally fundamental. Science may give us normative criteria for new landscape patterns, culture will give us the realized design. The essays in this book work from scientific knowledge of ecological function to posit cultural ideas about landscapes so that concrete ecological function and tangible human experience can simultaneously make a place for nature on the land.

Ecological Concepts

In his essay, ecologist William H. Romme summarizes landscape ecology concepts related to biodiversity, energy and material flows, disturbance, and cultural systems, applying each of these to investigate the place of nature in his home landscape, La Plata County, Colorado. The concepts he describes have direct implications for landscape patterns in any settled landscape. We are likely to maintain greater biodiversity if large patches of native ecosystems are protected and if additional large patches are restored. The plants and animals that depend on these ecosystems are more likely to survive if these patches contain a variety of related types of ecosystems and if the patches are connected. Large patches are increasingly rare because human settlement nearly always fragments large native ecosystems into smaller parcels. While large patches are often essential to ecological health, smaller patches also can support the movement and survival of species.[7]

Not only native ecosystems have ecological value. Different types of fields, yards, and even parking lots can support ecological health to different degrees depending on their function. For example, the pioneering landscape architecture practice of Andropogon Associates showed that parking lots can be designed to infiltrate or store rainwater rather than sending it to flood downstream.[8] Residential sites and farm fields can be designed to prevent soil from eroding, to require little or no addition of water or nutrients or use of pesticides or herbicides, and to prevent pollutants from moving off the site. They can even be designed to include relatively diverse habitats that connect to the surrounding landscape pattern.

Cultural Conceptions

Whether the opportunity is to protect the pristine or restore some aspect of ecological function to the settled landscape, as Romme describes, we live with the very real artifacts of cultural conceptions in the landscapes that make up our everyday experience. Every park, shopping center, field, or highway connotes our cultural conception of nature. Landscape patterns begin in the mind.

Gorham reminds us of Donald Worster's insight that even ecologists, who have scientific knowledge of ecosystems, hold widely varied views of nature, ranging from an unspoiled paradise to a resource for exploitation. The authors of the essays in this book see—and, to a degree, embody—this same spectrum of views in North American culture. While they agree with the landscape ecology concept that humans are a part of nature, they differ on the question of how humans, settlement, and economic activity fit into nature.

The landscape patterns that now are familiar to us in North America tend to isolate nature from settlement. Gorham advocates that nature should be protected separate from settlement and builds upon Eugene Odum's four compartment zoning model of landscapes, including urban–industrial, productive, protective, and compromise environments. Gorham insists on the ethical and biological necessity of protective environments but also describes the cleansing functions that compromise environ-

ments can perform. He also finds value in nature in the city, describing urban wetlands as "the closest approach to wild nature that the city can offer," and suggests that they "deserve protection as a reminder of the natural world."

In contrast, Smiley's essay evokes the possibility of a wholly new landscape pattern, one in which nature is not protected because it is not isolated. Instead nature dominates. She questions whether civilization as we know it can support nature and calls for radically new models for living on the earth. Continuing with our civilization as exemplified by agriculture "will undermine rather that enhance the landscape's capacity to support itself and us," she asserts.

A third view expressed in several of the essays is that nature can be more completely integrated with settlement than zoning or a wholly new landscape pattern implies. While pristine landscapes must be protected, zoning alone may divide the landscape into patterns too discrete to accommodate its overall ecological function. Romme suggests many strategies for integrating ecological function within development patterns of rural communities. Warner and Martin, and I too, report possibilities for, and recent experiments in, integrating ecological function back into the city.

Integrating nature into settlement increases contact and friction between people and ecologically rich landscapes. People threaten streams, lakes, wetlands, woodlands, and prairies by changing the flow of energy or material into these habitats and by actually encroaching on them with development. These flows may be as apparently innocuous as a pet cat prowling a nearby meadow, as invisible as the flow of herbicides carried in rainwater from lawns to lakes, or as dramatic as a massive fish kill in a poisoned stream. In a way that demonstrates the subtle power of culture to shape landscapes, people sometimes feel threatened by natural habitats as well. Where plants or wildlife are perceived to be out of control, whether by virtue of a messy appearance or by real losses—of homes to fire or of desired plants to weeds or hungry wildlife—nature is not wanted.

The Culture of Nature

Nearly every aspect of culture affects ecological health. For example, diet, childbearing, public health, and transportation by private cars all affect human consumption of resources in momentous ways. While the discussion among the authors of these essays recognized these fundamental effects, it focused on Western cultural assumptions about nature, not because the culture of nature is more important than resource consumption, but because the culture of nature may be an immediately tractable means of affecting landscape ecological function. Where landscape patterns are the products of our cultural norms of the landscape, probing cultural images may suggest strategies to finesse apparent conflicts, which may be as much the product of unrecognized cultural norms as of different ecological goals. Several essays in this book describe how aesthetic experience, ecological knowledge, or landscape care are at the heart of cultural images of nature.

Aesthetic Experience

Aesthetics is explicitly about nature. Representations of landscapes decorated ancient Roman homes, preoccupied the wealthy in eighteenth-century England, and span the range from high art to kitsch in North America today. Equally important as representations of landscapes, whether in poetry, painting, or environmental art, is the fact that landscape viewing is a popular pastime. Whether the everyday aesthetic value of the landscape is expressed by a pause to look out the window of your house or by

a drive to see fall leaves, varieties and levels of connoisseurship abound in landscape aesthetics. As Marcia Eaton and Eville Gorham tell us, even scientists experience nature aesthetically. Because aesthetic experience has so deeply and persistently influenced nearly every culture's conception of nature,[9] thinking about aesthetic experience can provide penetrating insights into why people make certain landscape patterns. As Eaton describes, aesthetic experience is of the moment. We know what we like. In the landscape, we act on what we like. For this reason, aesthetics may give landscape ecology a strategic lever for changing landscape patterns. Eaton and I detail how art, design, and planning that incorporate the deep aesthetic satisfaction people find in nature can help to overcome problems of perception that obstruct applications of landscape ecological knowledge. We see aesthetic tradition as the embodiment of community values and, consequently, the basis for a language that can be used to provoke change and sustain ecological quality.

Ecological Knowledge

Several authors suggest that greater ecological knowledge will promote cultural change. Gorham, Eaton, and Meine each describe how understanding of nature will not only change the landscape but enrich human experience. Eaton analyzes how ecological knowledge will help to sustain aesthetic attention to landscapes over time and continually motivate a desire for more ecological knowledge. Ecological knowledge will also lead to more discerning human experiences, in which ecologically destructive phenomena are not mistaken for beautiful nature. Deborah Karasov, Gorham, and I describe how the landscape itself can be a means of environmental education, exemplifying aspects of more pristine places or portraying the ecological functions of even the most densely settled landscapes. Romme's and Karasov's accounts of cases of land-planning dilemmas and their potential resolution support the possibility that people can make nature part of human settlement if they know how.

Landscape Care

Gorham begins by telling us that "during early human history, caring for the land was unnecessary; as a part of the natural world it took care of itself." But now, he says, "human societies must care, and care deeply, for the planetary ecosystem as an integrated whole if they are to survive." Smiley has a different view, that "our goal should be not to care for the earth but to enable it to have sufficient complexity that it can care for itself." The difference may lie in how we interpret care. I have emphasized the beneficence of landscape care as a cultural attitude despite its frequently damaging ecological effects in the form of clean, weed-free lawns, fields, and forests.[10] Care is beneficent when it means watching over a landscape and intervening in change rather than asserting absolute control, because, as I say in chapter 4, "landscapes require tending not making." Settled landscapes are enjoyed, and the people who inhabit them are judged, to the degree that landscapes exhibit care. We can take advantage of the ready-made cultural necessity of care by attaching ecological health to its lawlike aesthetic conventions, and if we combine greater ecological knowledge with our cultural need to display care, we can provoke new forms of intelligent gardening and farming.

Traditions of Land Ownership and Development

Cultural traditions that may appear to have little relationship to ecology may actually have profound cumulative or insidious effects. Meine tells us that "exploration of the new requires assimilation of the past." He suggests that the grid land-division pattern of the Public Land Survey is emblematic of our blinkered

cultural attitudes about land ownership and concludes that it is our attitudes that must change. Smiley's lesson of the medieval Scandinavian settlement in Greenland, related to her novel *The Greenlanders*,[11] warns that we may have difficulty achieving sufficient distance from our own cultural condition to see its consequences. By questioning our means of agriculture, she digs at the roots of our own cultural condition and sees traditions that obscure destructive ecological realities.

To both Meine and Smiley, the omnipresent, inflexible pattern of land ownership and the driving exigencies of market economics pose profound obstacles to change. As vivid evidence, Romme describes the tragic contradiction between the wish to be closer to nature that is evident in hundreds of new householders living on large lots in the unincorporated areas of La Plata County, Colorado, and the effect of those same large lots as barriers to the migratory paths of elk and mule deer. Karasov describes the way in which conceptions of private-property rights have underpinned virtually all discussions of the future of a suburban trout stream. She says, "most state regulatory agencies understand that developers who purchase property and act in accordance with zoning and environmental regulations have a right to pursue development of their property."

I argue that in our culture, where land ownership fragments ecological patterns, owning land has also been the only reliable way to protect it. Meine describes how Thomas Jefferson prescribed the Public Land Survey to embody his ideal of a democratic populace of small land holders. While land ownership in the United States is increasingly concentrated among fewer owners, the ideal of land ownership retains enormous cultural power. I describe how only ownership by the public or by a wealthy, enlightened family has protected the last remaining large patches of indigenous habitats in the most urbanized county in Minnesota. As Smiley points out, decades of warning about the damage caused by soil erosion on private land has not stopped soil erosion. Despite widespread knowledge and massive incentives to conserve, in our system only individual farmers can decide to prevent erosion. Similarly in metropolitan areas, only public or private owners of land, homes, and businesses can decide to design and manage their landscapes to contribute to ecological quality. Romme tells us that private landowners and developers play a pivotal role in the future biodiversity of La Plata County. I suggest that our landscape ecology strategies should use the cultural power of ownership to achieve ecological ends.

Judith A. Martin and Sam Bass Warner Jr. describe how limitations imposed by public regulations, as well as developers' perceptions of market demands, may prevent individuals from having the choice of more ecologically sound landscapes. Perceptions of what people want and will buy may be more limiting than what they would actually find attractive if they were given the choice. Martin and Warner relate developers' perceptions that the market for environmentally innovative residential development is very limited. Developers feel restrained by the market rather than by their own abilities to imagine more ecologically appropriate development patterns. In the words of one developer, "What we have is what we are." Whether for reasons of perceived real estate market or for short-term gain in production agriculture, or simply for reasons of tradition, change to increase the ecological health of the land has not come easily. The question looms large: How do we act to change landscape patterns?

How to Act

Acting with Humility

All of us who contributed to this book agree that our ability to act is severely limited by our knowledge. The intelligent tending that I advocate requires that we see each new adjustment in

our landscapes as experimental, and that we remain watchful for the response. Smiley argues that we should draw from knowledge rather than belief when we consider actions on the land, because "knowledge tends . . . toward putting the knower in his or her rightful, and limited, place." She warns that "as our millennium ends and our population grows, the margin once allowed for survival by the abundance of nature and the expanse of geography grows smaller and smaller. Mistakes, even sincere mistakes of sincere belief, have ever more serious consequences."

In the seminars that led to this book, Gorham frequently reminded participants of Aldo Leopold's dictum: "To keep every cog and wheel is the first precaution of intelligent tinkering."[12] Gorham himself adds the following, even more succinct watchwords, "If you don't know, go slow." The contributors to this book, some of whom have spent their careers learning about ecology, agree that we generally do not know—at least not enough to keep up with the accelerated rate and landscape scale at which human-induced change has overtaken familiar places and creatures over the past century.

Acting across Scales

Carl Troll discovered essential characteristics of landscapes by looking at them at a new scale made apparent by a new technology, aerial photography. Landscape ecology opened the door to the discussion recorded in these essays partly because it directs our view of nature to a new scale. Meine calls for us to "somehow achieve the capacity to step away from the artificial order in which our lives are embedded. We must appreciate the varied scales of time and space in which we exist. We must read well the character of the earth and know how culture has influenced the view from within."

The authors of these essays have come to agree that we must work across scales as we anticipate the effects of our actions. Working across scales means considering global effects like climate warming, consulting the ecology of the watershed, and noticing patterns of species movement before we change a single site. It also means consulting the cultural interpretation of the larger landscape before designing a single site. Cultural interpretation begins with looking *at* the landscape to see the way we ordinarily look through it, in precisely the way that Meine demonstrates by looking at the land-ownership grid. Cultural interpretation is coming to grips with our attachment to life inside our automobiles in the way that Martin and Warner describe. It is using cultural meaning strategically to provoke awareness of ecological health in the way that Eaton and I describe. Finally, working across scales means critically examining the time scales of our own immediate experience. Romme's work in fire ecology has vividly demonstrated the ecological consequences of past obliviousness to the time scales of natural disturbance by fire in the landscapes of the mountain West.[13] In this book, he details how cultural blindness to annual migration paths may threaten the elk population in La Plata County.

In addition to working across scales, we must match scales of ecological and cultural phenomena. That means tuning our actions in the landscape to time and space scales that operate beyond everyday experience. As a strategy for bringing ecology into our conscious awareness, Eaton lays out categories for matching ecological scales with aesthetic experience in design. Gorham concludes that "imbalance in the pace of technological and social change may become . . . the cause of . . . ecological catastrophe." Acknowledging the disjuncture between ecological and cultural scales encourages us to look ahead and should provoke us to act.