

the efforts of ordinary, dedicated citizens living on this reordered land. We inherit a land divided by the Land Survey; how we proceed from here is up to us.

The eminent ecologist (and University of Wisconsin limnology alum) Gene Likens noted that careful, reliable, long-term observations will contribute significantly to ecology in coming decades (Likens 1989). Chapters 3 and 4 illustrate how careful observations in Wisconsin are advancing our understanding of the consequences of global warming. John Magnuson examines the duration of ice cover on Madison's Lake Mendota each winter and how this period has grown shorter, particularly in recent decades. In one recent winter, ice lasted only 95 days. Alone, this fact seems trivial. It becomes interesting, however, when viewed through the lens of history. Nina Leopold Bradley and Sarah Wright pick up where Aldo Leopold left off, examining a long time series of careful observations on when natural events occur each year. By comparing Aldo's records of when the first robin arrived each spring, and so on, with the timing of those events today, they document a radical shift in climate. Neither the first person to record Lake Mendota's ice duration nor Aldo Leopold anticipated how their records could be used to document the effects of global warming. Yet without their careful record keeping, we would be oblivious to these changes, trapped in John Magnuson's "invisible present." Fortunately, we see that efforts to collect systematic data continue to expand, including more citizen science efforts like the Audubon Society's annual Christmas Bird Count and Operation Ruby Throat (organized by the Hilton Pond Center for Piedmont Natural History). Given all the kinds of change that appear to be occurring, the data collected via these efforts seems destined to become useful in ways that we can barely imagine today.

References

- Likens, G. E. 1989. Long-term studies in ecology: approaches and alternatives. New York: Springer-Verlag.
- Russell, E. W. B. 1997. People and the land through time: linking ecology and history. New Haven, CT: Yale University Press.

2

The View from Man Mound

Curt Meine

Take Wisconsin Highway 33 to Baraboo. On the east edge of town, turn north on County Road T, and go up the hill. (The hill is the north gunnel of the canoe-shaped Baraboo Hills). One mile up you will come to a crossroad. To the west, it is called City View Road. To the east, it is Man Mound Road. Turn right. The road is straight; it follows the half-section line. Go past the farm fields, woodlots, and houses for a little more than two miles. You'll see a sign on the right for Man Mound Park.

This small roadside park protects something unique: a human-shaped effigy mound. At the time of Native/European contact in what is now Wisconsin, the landscape contained an estimated 15,000–20,000 Indian mounds. A succession of native societies had constructed the mounds over a 2,000-year period, from about 800 BC to 1200 AD (Birmingham and Eisenberg 2000). They were as distinguishing an attribute of the Wisconsin landscape as its glacial features. No other part of North America had so rich a concentration of these ancient earthworks.

Over the last century and a half, agriculture and development have obliterated at least three-fourths of Wisconsin's Indian mounds. Of just nine known mounds built in the shape of a human or humanlike figure, Man Mound is the only one that survives in a relatively intact state. A local land surveyor, William Canfield, first described it in

1859. The “man” of Man Mound measured out at 218 feet from head to foot (the head being extended by two projections variously described as antlers, horns, a headdress, or elongated ears). Increase Lapham, reporting Canfield’s find that same year, deemed it “the most strange and extraordinary [artificial earthwork] yet brought to light.” To Lapham’s eyes, the mound captured the figure “in the act of walking, and with an expression of boldness and decision which cannot be mistaken” (Lapham 1859, 365).

Man Mound has not survived whole. The public land survey marked out these six square miles of Wisconsin—Township 12 North, Range 7 East—in September 1845. The half-section boundary line that Man Mound Road now follows intersected the mound at its “legs.” As that boundary line became (presumably) a field border or perhaps a wagon trail, then a dirt road, and then a paved road, the mound’s lower legs were destroyed. Around the turn of the twentieth century the threat of the plow reached Man Mound. Local citizens and state organizations launched a campaign that led, in 1908, to creation of the park to safeguard the remainder of the mound.

The Man Mound itself is only about three-feet high. Respect demands that one not stand atop it. But the view it affords has nothing to do with its height and everything to do with its historic and symbolic significance. This figure has been surveying its landscape for perhaps 1,000 years, walking the shifting border between prairie and forest. Over its flanks plant and animal populations have ebbed and swelled. It has seen long-tenured species disappear and newcomers arrive. It has persisted through the evolving lifeways of varied human communities and cultures. It witnessed the comings and goings of its Woodland Indian builders and later bands of modern Native Americans. It watched as trappers and traders—including one Jean Baribault—worked their way up the Baraboo River. Its amputation marked the arrival of European settlers, the imposition of the land survey’s abstract order upon the land, and the rank commodification of nature. And just when further change in the form of the plow was about to vanquish the mound, an ethic of caring took hold, allowing the Man to continue along “in the act of walking.”

From Man Mound, we can look out and see that the history of Wisconsin’s natural and human communities is woven together on Wisconsin’s landscape. From here we can try to discern patterns in that relationship. We can appreciate that change is constant, but neither uniform nor random, varying by type, cause, rate, duration, scale, and impact. We can recognize the reality of ecological change over 12,000 years of human

inhabitation. We can appreciate the magnitude of the change that came with the redefinition of land over the last century and a half, and especially with the land survey’s initial reduction of the land to our possession.

Beyond History’s Horizon

In *The Contested Plains*, his study of the transformations that the clash of Native and Euro-American cultures brought to the central Great Plains, historian Elliott West writes (1998, 33): “The changes brought by Europeans were so great that they usually are called the start of history itself, the breaking of a slumbering spell. They were not that, but the consequences of that first contact came so fast and ran so deep that they made for a material and imaginative revolution.” What West describes with regard to the mixed-grass prairies of the mid-continent holds for the prairie-savanna-forest borderland of Wisconsin as well. The history of environmental change in Wisconsin did not begin when Wisconsin’s original inhabitants encountered European explorers, trappers, and missionaries. However, that moment of cultural contact remains a profound demarcation line. Man Mound, frozen in time, disfigured, yet still in motion, is an apt point from which to consider the consequences of first contact and the “material and imaginative revolution” that ensued.

Such matters are of more than passing interest. Over the last 20 years the words *nature* and *wilderness* have been corralled within quotation marks. Those quotation marks mean to say: “Your assumptions about what *nature* is, and your mythologies concerning *wilderness*, need to be revisited.” The critique reflects varied insights, claims, and contentions, offered from multiple perspectives: from environmental historians dissatisfied with environmentalism’s seeming attachment to romantic notions of a static, pristine, unpeopled, and ahistoric landscape; from ecologists and other natural scientists who have come to place greater emphasis on the dynamism of ecosystems; from environmental ethicists concerned with the causes and consequences of the strict polarization of people and nature; from Native Americans, geographers, and anthropologists frustrated that the historical role of native peoples has too often been ignored, disregarded, or misunderstood; from resource managers with a pragmatic need to rethink the context of land management decisions; and from opportunists in the culture wars who saw here a chance to drive in ideological wedges and skewer political foes. We are talking, then, about something deeper than definitions. We are dealing with fundamentals: our view of the world, our place within it, and what we ought to do about it.

The reinterpretation of the human-nature relationship and its trajectory through time has generated extensive debate (e.g., Cronon 1995; Soulé and Lease 1995; Callicott and Nelson 1998; Vale 2002). That debate revolves around our comprehension of *change* itself and our recognition of the relative importance of humans as agents of change. In the New World, these matters require critical understanding of Native American demographics, dispersal, movement and settlement patterns, resource use and management practices (especially hunting, agriculture, and the use of fire), cultural innovations, and belief systems. It inevitably entails ambiguity, since detailed knowledge of these factors often lies, and will forever remain, beyond history's horizon.

Within that circle of ambiguity, the pendulum of opinion has swung. The "myth of the pristine landscape" has been debunked and discredited (Denevan 1992). In its place, a radically different account arose, one that sees in the pre-Columbian New World, not *wilderness*, not in fact a *New World* at all, but an "omnipresent humanized landscape" (Vale 1999, 2002, 2). Thus, for example, journalist Charles Mann (2002, 41, 50)—in an article tellingly entitled "1491"—writes that "in 1492 Columbus set foot in a hemisphere thoroughly dominated by humankind." Indian-set fires "shaped" the short-grass plains over millennia into "vast buffalo farms." By implication, any notion of restoring "pre-settlement" landscapes must entail "creat[ing] the world's largest garden." In the absence of the pristine, the human rules.

Tom Vale (2002, xiii, 2) suggests that the pendulum has in fact swung too far, that we are now in fact in the thrall of a new "myth of the humanized landscape" that also fails to describe with sufficient accuracy the character of pre-Columbian America. "The debate," Vale writes, "typically focuses on the polar assertions that the continent was either a 'natural landscape' or a 'human-modified landscape.'" In contrast, Vale stresses "the logic of an intermediate position—some areas were humanized, some were not." Recognizing that human alterations of nature vary in intensity, over scales of time and space, by ecosystem type and by region, Vale has made the case for a more nuanced appreciation of "humanized effects in a mosaic over the [pre-Columbian] landscape."

That mosaic would not have been fixed. Its patches would have shifted in time and in space, and would have done so constantly, starting with the moment human beings first crossed into the hemisphere. Indeed, the arrival of people in the Americas was but a late stage in the diaspora of the genus *Homo* out of Africa. By the time *Homo sapiens* ventured across Beringia, the species had left behind it a long trail of ecosystem impacts (Tudge 1996; Diamond 1997; MacPhee 1999). Over more than

a dozen post-Beringia and pre-Columbian millennia, America's native populations waxed and waned, warred and allied, jostled for territory, expanded and contracted ranges, evolved changing technologies, adapted to new places, and adopted new lifeways. Native empires arose and receded. Across those millennia, the impact of such cultural flux on the biota and on ecological processes likewise varied by time and place (Martin and Szuter 1999; Flannery 2001). Their impacts intensified and faded. In short, "1491" is an artificial fixed end point, just as "1492" is an artificial fixed beginning point.

As we try to assess and calibrate ecological change in Wisconsin, what does our gaze beyond history's horizon suggest?

Pre-Nicolet Wisconsin

We can begin by reviewing the broad narrative of Wisconsin's past.

Here, 1634—the year that the Ho-Chunk received Jean Nicolet on the shores of Green Bay—is the operative analog for 1492. That first confirmed contact was heavy with portents for the Ho-Chunk; for the nearby Menominee, and Potawatomi; for the Ojibwe, Ottawa, Sauk, Mesquakie, Mascouten, Miami, and Kickapoo who, uprooted as conflict engulfed the East, came west to Wisconsin; and for the lands and waters, plants and animals that shared the Wisconsin landscape. But pre-Nicolet Wisconsin was hardly isolated or immune to change. As Patty Loew notes (2001, 12), "Even before their actual arrival in the western Great Lakes region, Europeans had already touched the lives of the Native people"—through the effects of the eastern conflicts, inter-tribal trade, intracontinental migrations, and disease outbreaks.

Wisconsin has always been a landscape in motion, though the relative pace and motive forces have varied. Ecological change had been a constant and continuing fact since humans first arrived in the landscape now known as Wisconsin. We may in fact look back even beyond the human horizon. The recurrent glacial advances of the Pleistocene of course refashioned our topography and altered our biota in lasting ways. But we were also home to the refugium landscape of the unglaciated Driftless Area. Its special history would have lasting consequences. Which is to say, its unusual immunity to recent geological change (in the form of glaciers) in fact made it a vital factor in subsequent ecological change.

Norman Fassett and John Curtis were fascinated by the biogeographical legacy of the Driftless Area—its rare plant communities, relict species, and special habitats. Curtis (1959, 14) identified 34 "plants endemic in the Driftless Area or whose range in Wisconsin is restricted to

that region." Evidence suggested that the Driftless Area "was at least partially covered with vegetation at all times and that it formed the source for the bulk of the plant cover which later spread out over the remaining parts of the state as these were deglaciated." We continue to learn about various biotic legacies of the Driftless Area. Kevin Rowe and others, for example, have recently determined that most of the eastern chipmunks in Illinois and Wisconsin are descendants of a population that endured the Wisconsin glacial phase in the Driftless Area and then expanded its range as the ice sheets receded.

The end of the Pleistocene brought sweeping changes to the continent. In Wisconsin, as plants and chipmunks were moving outward from the Driftless Area, people were moving in. Their arrival coincided with a changing climate and the famous disappearance of so many members of the North American Pleistocene megafauna—powerful predators like the dire wolf, giant short-faced bear, and saber-toothed cat; massive herbivores like the mastodon, woolly mammoth, and giant beaver; ground sloths, glyptodonts, cheetahs, and camels, and horses. At least 35 large mammal species went extinct in North America between 12,000 and 9,000 years ago. "This wave of extinctions," E. C. Pielou (1991, 251) writes, "is one of the most noteworthy, and most puzzling, events in ecological history."

Scientists have vigorously debated the causes of these extinctions for decades (Martin and Klein 1984; MacPhee 1999; Grayson and Meltzer 2002). In particular, their arguments have revolved around human predation as a—some say, *the*—leading factor behind the demise of the megafauna (climate and environmental change and commensal-carried diseases being the other prime suspects). Tim Flannery (2001, 205), a strong believer that these species disappeared largely at the end of the elegant Clovis spear points, notes that "regardless of whether human hunters or climate change caused the extinctions, the event is without parallel in North American prehistory." And the consequences, too, would be profound: cascading effects involving the surviving fauna; responses in ecosystem structure, function, and composition; and a changed habitat (and resource base) for the newly arrived people.

By 10,000 years before present, the ice sheets had melted back from Wisconsin, and the modern flora began to constitute itself on the opened land. Subsequent changes in climate would have a large and continuing impact on the extent of grassland and forest, and the location of the savanna between them, across the region (Davis 1977). About 8,500 years ago a warming and drying phase, the Hypsithermal, had begun. Grasslands expanded and forests contracted northeastward. Over the millen-

nia, the shifting prairie-forest ecotone would reflect the dynamic interplay of changing temperatures, precipitation and humidity levels, vegetation types, fuel production, and fire frequency and severity (Baker et al. 1992; Camill et al. 2003; Williams et al. 2004). Some of those fires were set by people. When, where, how often, and with what effects have also long been matters of vigorous research and unresolved debate.

As Wisconsin's biomes responded to its fluctuating climate, pre-Nicolet cultures also changed constantly and continually. Wisconsin is home to the oldest known site of butchered mammoths in North America, in Kenosha County (Overstreet and Kolb 2003). The remains have been dated to between 12,500 and 13,500 years ago. The butchers at this important site were pre-Clovis Paleo-Indians. For the next 5,000 years, Paleo-Indian peoples moved about the landscape in small family groups; hunted animals and gathered plants; crafted stone spear points and knives; built temporary shelters and exchanged goods; and cremated and buried their dead. Their tenure overlapped that of the people of the Archaic culture (8000–100 BC), who hunted the abundant post-Pleistocene game populations; experimented with rudimentary agriculture; traded in Lake Superior copper, Atlantic seaboard seashells, and Yellowstone obsidian; developed rituals and cemeteries; and initiated the tradition of mound building.

The Archaic cultures in turn overlapped with the early Woodland societies. The Woodland Indians inhabited Wisconsin from 500 BC into the second millennium AD. These were the mound builders, occupying more clearly defined territories, establishing Wisconsin's first villages, trading extensively, growing garden crops, cultivating corn, shaping pottery, and symbolizing their inner lives in their ceramics and mounds. Then came the Mississippian people who built the largest Native American settlement in North America, the great city at Cahokia, in what is now Illinois, and whose hinterland extended upriver into Wisconsin. The Mississippian culture in Wisconsin is best known for the large platform mounds at its outpost site at Aztalan, where activity peaked around 1150 AD. Cahokia and Aztalan would fade within a century, but the Upper Mississippian people would remain in the landscape. They are thought to be ancestors to the modern Ho-Chunk, and perhaps the Menominee and other Native American tribes (Birmingham and Eisenberg 2000).

Through 14 pre-Nicolet millennia, then, native people hunted, gathered, trapped, fished, mined, settled, farmed, and burned lands throughout Wisconsin. These activities have altered the land in ways known, unknown, and suspected, and no doubt in ways yet to be understood. But change is not uniform in time or space. We can denote key periods of intense change. We can identify other periods of relative stability.

Even if our view beyond the horizon is hazy, we can still perceive prehistoric natural phenomena and human activities that produced resonant ecological echoes. From Man Mound we can see ecological change over not just one but multiple temporal thresholds.

Bounding the Land

And yet—not all thresholds are equal. Other chapters in this book focus on the impact of the subsequent four centuries of Euro-American influence on Wisconsin's life-forms and landscapes. Change in this period has come in rapid waves, from many directions, with complex crosscurrents. But of all the events of this period, none has reordered the land and its life on such a scale, with such lasting and monumental consequences, as the one so poignantly apparent at Man Mound: the advent of the public land survey (Johnson 1976; Linklater 2002; Meine 2004).

In *Nature's Metropolis* (1991, 102) William Cronon succinctly summarized the purpose of the land survey: it aimed “to turn land into real estate by the most economically expedient method. By imposing the same abstract and homogeneous grid pattern on all land, no matter how ecologically diverse, government surveyors made it marketable.” The land survey in Wisconsin was carried out between 1833 and 1866. The actual act of surveying the grid lines had little immediate physical effect. But in subdividing and bounding the land—legally, politically, economically, and imaginatively—it would reshape the biological diversity, ecosystems, and human communities of Wisconsin in profound ways.

Because we are so accustomed to seeing the land through the survey's gridded lens, its legacies are easily overlooked. They are paradoxically both subtle and obvious, minute and extensive. They are written in the manifold stories of Wisconsin places. A few examples:

- Gaze down from the air above the Menominee Forest border and note the sharp division between tribal and nontribal lands. The survey line is an obvious ecological boundary, but it is an economic and cultural boundary as well.
- Look at early maps of the southwestern Wisconsin mining district or the French lots along the Fox and Mississippi rivers: the lands outlined in the presurvey maps and described in Indian treaties obviously had no uniform square grid lines. Lakes, streams, and wetlands were the most important features of the early maps. The geography of the Indian mounds reflects this. Almost all were located in gathering places near water.

- Wisconsin agriculture was built between the lines of subdivided property. Agricultural conversion and intensification happened rapidly in southern and eastern Wisconsin—the first portions of the state to be surveyed—as the prairies, savannas, and wetlands were turned to wheat farming, then to dairying. The fresh survey lines plainly did not cause the conversion, but it made the process far more rapid, efficient, and complete than it might otherwise have been. Even the main ditch through Horicon Marsh follows a north-south section line, an emblem of the changes that have affected wetland communities across Wisconsin.
 - Neither did the new survey lines cause the post-Civil War decimation of the northern pineries, but there too they speeded the process. The direct impacts of the white pine logging boom are the stuff of conservation legend, but the indirect environmental impacts deserve accounting as well. They would include the era's epic fires, modification of forest soil flora and fauna, extensive soil erosion and stream sedimentation, changes in the fish and stream invertebrate fauna, and widespread construction of water control structures across the northern half of Wisconsin.
 - The grid would invite its own response in the form of innovative conservation practices on the farm. The pioneering watershed rehabilitation project that began at Coon Valley in 1933 would, in effect, defy the grid. The innovations developed there—the adoption of a whole-watershed approach, working of the land along contours, the protecting and restoring waterways, the integration of farm management plans—helped to open a new phase in the conservation movement (Leopold 1935). The whole effort might be seen as an exercise in refitting rectangular land parcels into watershed-shaped realities.
 - We can read the grid in other stories out of Wisconsin's conservation tradition. Aldo Leopold's wildlife management ideas were very much a response to the fragmentation, simplification, and intensified management of midwestern farms. His appreciation of edge effects in *Game Management* (1933) derived not from any desire to *fragment* intact ecological communities but to *restore* some semblance of biological diversity along field borders and fencelines within a thoroughly converted agricultural landscape. Later, John Curtis (1956) would use the ecological history of Cadiz Township in Green County as, quite literally, the textbook example of landscape fragmentation.
- We could, of course, multiply these examples by as many lines and land parcels as the survey etched into the surface of Wisconsin. These

few serve to make a simple point: the land survey has facilitated immense changes in human activity in a relatively short period of time. Those activities over the last century and a half have affected biological diversity, ecological processes, and environmental features to varying degrees, at varied temporal and spatial scales, and the effects will forever be with us.

How might we think more critically about the role of the land survey in shaping Wisconsin's landscapes and biodiversity? We can identify an array of possible approaches:

- A *community approach* would emphasize the survey's direct and indirect effects on Wisconsin's various ecological communities, for example, the southern deciduous forests, sedge meadows, or oligotrophic lakes (following Hoffman 2002).
- A *landscape/scalar approach* would emphasize the survey's effects over a range of embedded spatial scales, for example, along a fencerow; on the farm property that contains it; along the stretch of the Wisconsin River containing many such farms; or within the Central Sands region containing many such landscape features.
- A *hierarchical approach* would emphasize the survey's effects at the different levels of biological organization, from the genetic structure to the population level, to the community and ecosystem level, and finally up to the level of landscapes and biomes.
- A *functional approach* would emphasize the survey's effects on ultimate and proximate causes and processes of environmental change (see the sidebar).

Over the last two decades, conservation biologists have used these same approaches to comprehend the challenges of conserving and restoring biological diversity in flexible and creative ways. They may also serve as diagnostic tools for understanding historic (and prehistoric) ecological change.

Gaining Perspective

We live with, and *within*, the survey's legacy. So all-encompassing are the ways in which it reordered Wisconsin, it is challenge enough just to gain perspective on it. From Man Mound, we might gain that perspective.

The task of land surveying was relatively straightforward and uncomplicated; the task of understanding its lasting impact on our land,

The Functional Analytic Approach

"First-order" effects:

- Human population growth, settlement, distribution, and movement
- Change in land tenure and jurisdiction; privatization and commodification of land
- Establishment of property lines and boundaries
- Change in land uses

"Second-order" effects:

- Parceling and fragmentation of land
 - > Changes in disturbance regimes: fire, flooding, and so on
 - > Changes in flora and fauna: for example, genetics; distribution; reproduction; behavior; dispersal, migration, and movement; species richness; extirpations and extinctions; and invasive species
 - > Changes in ecological processes: for example, pollination, grazing, and predation
- > Establishment of borders and edges
- Human resource use
 - > Facilitation of resource overexploitation: forests, fish, game species, and so on
 - > Land use: agriculture, forestry, fishing, transportation (roads), and urbanization and subdivision
 - > Land management: exploitation, conversion, protection, restoration, and planning

"Third-order" effects:

- Soil erosion and sedimentation
- Air, water, and soil pollution
- Water: alterations (ditching, draining, and damming)
- Altered lake shoreline vegetation

our lives, and our future is not. The survey was, in its original conception, an audacious act of the Enlightenment imagination. It requires a different type of imagination, one that aspires to something beyond expedience and abstraction, to see beyond the grid. It requires appreciation of the cultural harvest (to borrow Leopold's phrase) that land, in all its diverse expressions, yields.

Here, too, the story of Man Mound offers hope. Increase Lapham, in his 1859 report, cautioned that "it would be idle to attempt to speculate upon the object and the meaning of the strange mound here represented. The reader may indulge his own imagination on that subject, and he

will perhaps arrive at as near the truth as could be the most profound antiquary" (368). The meaning that Man Mound's builders invested in it is one of those mysteries that must remain beyond history's horizon. For Lapham, it suggested motion, boldness, and decisiveness. It may yet open our imaginations, and offer new meanings.

Modern students have noted that Man Mound is distinguished by more than its unique shape. As noted above, almost all other effigy mounds occur near water. Man Mound by contrast walks through uplands some distance from any permanent water. This has prompted speculation that the mound might have served some exceptional ceremonial function for its Woodland Indian engineers. Evidently they sought, and found, a cultural harvest in this special place. And in 1908, a peak year in the nascent conservation movement, a later, very different society found extraordinary cultural value in the same place.

At Man Mound, the geographies of the ancient Native Americans and recently arrived Euro-Americans intersected. At their point of intersection, damage was done. At that same point of intersection, a healing was also begun.

References

- Baker, R. G., L. J. Maher, C. A. Chumbley, and K. L. Van Zant. 1992. Patterns of Holocene environmental changes in the midwestern United States. *Quaternary Research* 37:379-389.
- Birmingham, R. A., and L. E. Eisenberg. 2000. *Indian Mounds of Wisconsin*. Madison: University of Wisconsin Press.
- Callicott, J. B., and M. P. Nelson, eds. 1998. *The Great New Wilderness Debate*. Athens: University of Georgia Press.
- Camill, P., C. E. Umbanhowar, Jr., R. Teed, C. E. Geiss, J. Aldinger, L. Dvorak, J. Kenning, J. Limmer, and K. Walkup. 2003. Late-glacial and Holocene climatic effects on fire and vegetation dynamics at the prairie-forest ecotone in south-central Minnesota. *Journal of Ecology* 91(5):822-836.
- Cronon, W. 1991. *Nature's Metropolis: Chicago and the Great West*. New York: W. W. Norton.
- , ed. 1995. *Uncommon Ground: Toward Reinventing Nature*. New York: W. W. Norton.
- Curtis, J. T. 1956. The modification of mid-latitude grasslands and forests by man. Pp. 721-736 in W. L. Thomas, ed. *Man's Role in Changing the Face of the Earth*. Chicago: University of Chicago Press.

- . 1959. *The Vegetation of Wisconsin: An Ordination of Plant Communities*. Madison: University of Wisconsin Press.
- Davis, A. M. 1977. *The prairie-deciduous forest ecotone in the Upper Middle West*. *Annals of the Association of American Geographers* 67:204-213.
- Denevan, W. 1992. The pristine myth: The landscape of the Americas in 1492. *Annals of the Association of American Geographers* 82:369-385.
- Diamond, J. 1997. *Guns, Germs and Steel: The Fates of Human Societies*. New York: W. W. Norton.
- Flannery, T. 2001. *The Eternal Frontier: An Ecological History of North America and Its Peoples*. New York: Grove Press.
- Grayson, D. K., and D. J. Meltzer. 2002. Clovis hunting and large mammal extinction: a critical review of the evidence. *Journal of World Prehistory* 16:313-359.
- Hoffman, R. 2002. *Wisconsin's Natural Communities: How to Recognize Them, Where to Find Them*. Madison: University of Wisconsin Press.
- Johnson, H. B. 1976. *Order upon the Land: The U.S. Rectangular Land Survey and the Upper Mississippi Country*. New York: Oxford University Press.
- Lapham, I. 1859. Man-shaped mounds of Wisconsin. Pp. 365-368 in *Report and Collections of the State Historical Society of Wisconsin for the Years 1857 and 1858*, Fourth Annual Report. Madison, WI.
- Leopold, A. 1933. *Game Management*. New York: Scribner's Sons.
- . *Coon Valley: An adventure in cooperative conservation*. *American Forests* 41(5):205-208.
- Leow, P. 2001. *Indian Nations of Wisconsin: Histories of Endurance and Renewal*. Madison: Wisconsin Historical Society Press.
- Linklater, A. 2002. *Measuring America: How an Untamed Wilderness Shaped the United States and Fulfilled the Promise of Democracy*. New York: Walker.
- MacPhee, R. D. E., ed. 1999. *Extinctions in Near Time: Contexts, Causes, and Consequences*. New York: Plenum Press.
- Mann, C. 2002. 1491. *Atlantic Monthly* 289(3):41-53.
- Martin, P. S., and R. G. Klein, eds. 1984. *Quaternary Extinctions: A Prehistoric Revolution*. Tucson: University of Arizona Press.
- Martin, P. S., and C. R. Szuter. 1999. War zones and game sinks in Lewis and Clark's West. *Conservation Biology* 13:36-45.
- Meine, C. 2004. *Inherit the grid*. Pp. 187-209 in *Correction Lines: Essays on Land, Leopold, and Conservation*. Washington, DC: Island Press.

- Overstreet, D. F., and M. F. Kolb. 2003. Geoaarchaeological contexts for Late Pleistocene archaeological sites with human-modified woolly mammoth remains in southeastern Wisconsin, U.S.A. *Geoarchaeology* 18(1):91-114.
- Pielou, E. C. 1991. *After the Ice Age: The Return of Life to Glaciated North America*. Chicago: University of Chicago Press.
- Rowe, K. C., E. J. Heske, P. W. Brown, and K. N. Paige. 2004. Surviving the ice: northern refugia and postglacial colonization. *Proceedings of the National Academy of Sciences* 101(28):10355-10359.
- Soulé, M. E., and G. Lease, eds. 1995. *Reinventing Nature? Response to Postmodern Deconstructionism*. Washington, DC: Island Press.
- Tudge, C. 1996. *The Time before History: 5 Million Years of Human Impact*. New York: Simon and Schuster.
- Vale, T. 1999. The myth of the humanized landscape: An example from Yellowstone National Park. *Wild Earth* 9(3):34-40.
- . 2002. Fire, Native Peoples, and the Natural Landscape. Washington, DC: Island Press.
- West, E. 1998. *The Contested Plains: Indians, Goldseekers, and the Rush to Colorado*. Lawrence: University Press of Kansas.
- Williams, J. W., B. N. Shuman, T. Webb III, P. J. Bartlein, and P. L. Leduc. 2004. Late-Quaternary vegetation dynamics in North America: Scaling from taxa to biomes. *Ecological Monographs* 74(2):309-334.

3

The Challenge of Unveiling the Invisible Present

John J. Magnuson

Change is all around us; the challenge is to see it or perhaps to remember it. Often we seem locked in an invisible present (Magnuson 1990) and an invisible place (Swanson and Sparks 1990), oblivious to long-term changes occurring across the landscape. Even qualitatively our memories are fallible. Were hickory nuts less abundant this year than last? How abundant were they a decade ago, or when we were children? Quantitatively our sense of change is usually just plain wrong. Consider the statement: "In winter 1999-2000 Lake Monona in the Madison area did not freeze over." Is that correct? Actually the shortest recorded ice duration to date on Lake Monona was 47 days, and it occurred in the winter of 1997-98. It was actually Lake Mendota (figure 3.1) that some allege did not freeze over. In fact, it was ice covered for only 21 days in the winter of 2001-2.

Lake Mendota Ice Example

We can recall the past and sense change only when we keep records. Lake Mendota's ice cover provides a good example (Robertson 1989; Magnuson 1990; Magnuson et al. 2003, 2006b). Recently, in the winter of 2005-6, ice cover persisted for 95 days (figure 3.2, top). By itself,