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Deep Mapping the Biome: The Biology of Place in Don Gayton's *The Wheatgrass Mechanism* and John Janovy Jr.'s *Dunwoody Pond*

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SUSAN NARAMORE MAHER

THE DEEP MAP AND GREAT PLAINS WRITING

In his influential review, “Deep Maps in Eco-literature,” scholar Randall Roorda argues that the deep map deserves status as an “incipient genre of environmental literature,” noting its “ambitious . . . self-reflexive” nature and its innovative narrative architecture.¹ The term “deep map” itself is the invention of writer William Least Heat-Moon, whose extended essay *PrairyErth* (*a deep map*) has given definition to this form. Deep-map writing is marked by its intertextual, interdisciplinary, and multivocal nature. It is also self-consciously cartographic, presenting maps, following maps, and redrawing maps. Deep mappers “both distrust maps and rely on them,”³ or as Heat-Moon puts it, they “test the grid.”³ As he follows the twenty-five United States Geological Survey maps of Chase County, Kansas, Heat-Moon plumbs natural and human history, seeking the vestiges and expressions of this deep history in his walks around the county, but also seeking from others’ published texts, scientific inquiry, and oral history an exhaustive accounting of place. Prompts from his own dreams and visions also inform his narrative. Heat-Moon’s accomplishment in *PrairyErth*, reminiscent of Henry David Thoreau’s *Walden*, has earned him much praise. Lawrence Buell proclaims *PrairyErth* “perhaps the most ambitious literary reconstruction of a small portion of America ever attempted in a single volume.”⁴ This textual achievement has provided an emerging form of environmental writing, created an alignment among essayists experimenting with intercalated form, and inspired Heat-Moon’s contemporaries to attempt their own deep maps.

Key Words: Deep mapping, ecocriticism, Grasslands ecology, landscape, natural history

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Yet Heat-Moon did not invent the form. Another Plains writer, Wallace Stegner, prepared the ground for the deep-map years earlier with the 1962 publication of *Wolf Willow*, the urtext of all deep maps. In a sweeping narrative that encompasses geology, climatology, botany, political and settlement history, fiction, memoir, and myth, Stegner chronicles the Cypress Hills, fictional Whitemud, Saskatchewan (Eastend), and the Medicine Line. If the deep map is only now “incipient,” it has had a long gestation, and its origins lie in the Great Plains straddling both sides of the forty-ninth parallel. Between 1962 and 1991, nonfiction writers were experimenting with the representation of place, and the deep map gave them both a new aesthetic and a land ethic. The significant features of this genre include its multivalent, cross-sectional understanding of history; its attention to the environment and advocacy of bioregionalism; its amalgamation of genres (e.g., Stegner’s subtitle *A History, a Story, and a Memory of the Last Plains Frontier*); and its interest in a specific place, a particular biome, or a unique landscape. The deep-map genre claims practitioners from many disciplines—journalism, poetry, science, and ranching, for instance—for a reason: the flexibility of a cross-genre, cross-sectional narrative provides a format that revels in the nuances and variables of idiosyncratic experience, training, and appreciation of landscape. This form of literary stratigraphy shapes a distinctive kind of “articulated geography.” That writers as diverse as Barry Lopez, John McPhee, and Sheila Nickerson, for instance, stand alongside Stegner and Heat-Moon as deep mappers, signals the growing appeal of this genre. Buell has argued that environmental literature in general “increases our feel for both places previously unknown and places known but never so deeply felt.” The deep map makes the “deeply felt” its forte.

Roorda and Buell are part of a growing group of scholars now attempting to define the deep-map genre, to survey its growing body of titles, and to connect it to the larger world of bioregional and environmental writings. Preceding Buell’s landmark efforts, the publication of Kent C. Ryden’s *Mapping the Invisible Landscape* (1993) has generated a lively interest in literary deep mapping. O. Alan Weltzien’s work on Heat-Moon has introduced the useful term “participatory cartography” to the larger discussion of deep mapping, to demonstrate the “readerly,” interactive nature of the genre. Proposing the concept of the “somatic mind,” Kristie S. Fleckenstein offers a challenging philosophical perspective that connects mind, body, and place in the analysis of environmental literature and thus privileges deep-map writing. The somatic mind of the writer responds to a particular place, offering “a permeable, intertextual territory” and recognizing “the cultural, historical, and ecological systems that penetrate and reconstitute these material places.” In his recent study *Surveying the Interior: Literary Cartographers and the Sense of Place*, Rick Van Noy eloquently guides readers through a literary method that begins with a map and proceeds to the imaginative, symbolic recesses of language, “making a ‘deep’ space in the mind, evoking the ‘sense of place’ in ways the surveyor’s maps never can.” These scholars have provoked a significant discussion of literary cartography and the deep map in academic circles. In response, a deep-map canon is beginning to form, aligning such achievements as *Wolf Willow, PrairieErth, Arctic Dreams, Annals of the Former World*, and *Disappearance: A Map into a Singular Tradition*. Increasingly important to scholars of the deep map are the innovative, extended essays by professional scientists whose fieldwork gives them a unique understanding of a significant layer of the deep map, the biology of place. Laurie Ricou has argued that “[s]tudents of literature interested in writing about place . . . need now to be students of ecology at some level,” an argument echoed in historian Dan Flores’s search for “tangible ecologies of place.” In modern environmental nonfiction, the participation of men and women trained in biology and blessed with writing talent has added considerably to our understanding of
place and of life’s interconnectedness. Aldo Leopold’s lyrical celebration of Sand County and cogent argument for the land’s inherent value in *A Sand County Almanac* is a watershed moment in American letters. Loren Eiseley’s powerful, artful musings in *The Immense Journey* and other collections have profoundly shaped modern science writing in its efforts to translate deep time and evolution. Rachel Carson’s *Silent Spring* galvanized environmental writing, added urgency to the environmental movement, and changed the political landscape. In more recent years, Wes Jackson has attempted to redefine stewardship of the land in influential essays like * Becoming Native to This Place*, arguing that the art and science of agriculture must bend to the “realities in nature.”

The *Rites of Autumn* and *Buffalo for the Broken Heart* have made Dan O’Brien a significant voice in restoration efforts, as communities across the American and Canadian Plains attempt to heal broken land. Biologist Terry Tempest Williams’s poetic essays spiritualize the science of ecology, blending the intangible with the tangible. This brief catalogue of scientist writers is but a sketchy outline of the invaluable contribution science writing has made to environmental writing.

Only recently, have people who make their living as scientists, (as opposed to a writer like John McPhee who writes about geological science in *Annals of the Former World*) experimented with the deep-map genre. Drawn to the genre’s hybridity, these scientists delve into biological mechanisms of place, presenting the interaction of natural forces (climate, geological history, and other evolutionary stresses) upon flora and fauna; recreating lost worlds, extinct creatures; musing about the present and its effects on the future; and positing the imposition of human activity on a living place. Science is at the heart of this literary enterprise, but the art of translation, the memorable strokes of metaphor and analogy, the panache of the well-turned phrase and lyrical moment are not lost on these writers. Intellect, imagination, and passion fuse in their deep maps. Once again, Great Plains writers have led the way. Contemporaneous with *Heat-Moon*, plant ecologist and Canadian writer Don Gayton has experimented with deep-map form in his groundbreaking analysis of grasslands ecology and homage to Wolf Willow, *The Wheatgrass Mechanism: Science and Imagination in the Western Canadian Landscape*. In the same years, parasitologist and celebrated essayist John Janovy Jr. was drafting his own deep map, a sustained examination of Sandhills country to be entitled *Dunwoody Pond: Reflections on the High Plains Wetlands and the Cultivation of Naturalists* (1994). Their originaive, influential mappings of the Plains biome have provided us with memorable, informative, “tangible ecologies of place.” In deep mapping the wheatgrass mechanism and Dunwoody Pond, these biologists guide readers through the mysteries and wonders of evolution and adaptation, through multilayered, bewildering matrices of place. Focusing on the science of plant ecology and parasitology, rooting in specific locales, these two writers open up to a larger biological canvas that forces us “to think about ourselves as inhabitants of places, of watersheds and topographies, of an evolving piece of space (with an evolving set of fellow inhabitants) different from every other one.”

Mapping the Great Plains biome, these trained biologists illuminate the ways in which we are native to place at a basic cellular level and at a larger mythic one. They bring us into a microscopic world that escapes the unaided human eye; yet this microworld is fundamental to life and to place. Their biological deep maps demonstrate ways in which “the inner landscape is symbiotic with the outer.” In so doing, Gayton and Janovy force us to decenter the human, to reconsider the primacy of a larger biological reality, and to reexamine the political and cultural precepts that attempt to control natural systems. They add vital pieces in the ongoing effort to reimagine and revalue a biome that, in writer John Price’s words, “has suffered such an enormous loss of life with so little protest.” “Topophilia” as necessary affiliation anchors the narratives of both Gayton and Janovy.
“LANDSCAPE LESSONS”
OF THE BIOLOGICAL DEEP MAP

Gayton’s exploration of the western Canadian interior and Janovy’s decades’ long examination of Sandhills country in Nebraska serve to engage readers in central issues of evolutionary biology, habitat destruction and transformation, human choices and their effects on the biome, and the need for a sustainable economy and ecology of the Plains. These “landscape lessons,” to use Gayton’s phrasing, combine science, history, polemic, and myth in an effort to map the flora and fauna of a region. Such scientific mappings “inaugurate new grounds upon the hidden traces of living context,” bending to the physical place but also seeking the invisible, “the various hidden forces that underlie the workings of a given place.” The materiality of place—landscape as a living body—incorporates a textual “fusion of flesh, ecology, and culture,” an immersion into life forms that fine-tunes each writer’s moral response to a changed and changing land. Each writer guides us through a specific landscape or site of engagement, often providing maps or highway directions, directly or indirectly inviting readers to make a physical journey to the grasslands, to study them for themselves. Somatic, sensuous connection to land, sky, and climate of each locale receives considerable attention. Eastend, Saskatchewan, and Keith County, Nebraska, are sites of fieldwork and nature is the laboratory, or in Wes Jackson’s words, “a standard.” The work of a plant ecologist and a parasitologist depends on supplementary lab work, but first and foremost, each scientist must become intimate with the laws of integration that operate in real ecosystems.

Gayton walks and bikes through prairie sites in Saskatchewan and Manitoba; Janovy and his students muck about in ponds, wade into rivers, enter into malarial canyons. Bodily and intellectual immersion guides their experiences in these places. In his essay “The Lady Whitetail,” Janovy explains, “The biologist approaches nature in the form of a plant or animal and immediately begins asking questions about the innermost soul, the innermost characteristics, the true spectrum as well as the immediate traits, of the living thing.” Perhaps then, too, places “have innermost characters, innermost souls, and whether by simply peeling off the layers one might find that innermost nature that dictates not only our impressions of the place, but indeed our way of approaching and regarding and treating that place.” Gayton admits to an “urgency”—what Fleckenstein would call a “permeable materiality”—in a “heart-rending landscape . . . wanting to embrace the land, to couple upon it, to quickly learn the meaning of its antelope and its burrowing owls, and to understand how living things were made from the brittle bunchgrasses” (18). In both authors’ works, the desire to know intimately, to interpenetrate the thing or the system, comes first, before a study is constructed, before lab work is planned and equipment organized. From the singular and specific—a species, a field, or a pond—these biologists trace the larger system. Dragonflies of the genus Anax, for instance, can help map evolutionary and geologic history. Western wheatgrass connects one to “genetic identity” and to “a very fundamental prairie timeline” (23).

To borrow from cartographer James Corner, Gayton and Janovy present “grounded sites” that help map “a multiplicitous and complex affair, comprising a potentially boundless field of phenomena, some palpable and some imaginary.” Their literary cartography—deep mapping genetics and geology, charting ecologies of place, and situating human history and mythology—models “a fertile heterogeneity.” Terrain, then, from this perspective, expresses “a complex and dynamic imbroglio of social and natural processes.” As bioregional narratives, their essays depict particular landscapes as rich sites of “interpenetration,” in Dan Flores’s terms, that expose layers “of toponography, climate, and evolving ecology.” The inclusion of science has become de rigueur
in literary deep maps; but in the hands of scientists, this layer gains the foreground. Through the deep-down realities of Plains life—root systems, cellular structures, DNA—readers gain a profound understanding of time's passage and life's pageantry, and of human interference with a biome's integrity. This knowledge embodies, as Yi-Fu Tuan has eloquently phrased it, "place as time made visible, or place as memorial to times past."31

GAYTON AND THE DEEP MAPPING OF MECHANISM

In 1990 Don Gayton published The Wheatgrass Mechanism: Science and Imagination in the Western Canadian Landscape, a milestone in Great Plains nonfiction essay writing and a significant contribution to an evolving genre, the deep map. Western wheatgrass provides his central metaphor in this examination of grasslands ecology. As a native species of grass, western wheatgrass helps define the larger natural system of the Great Plains, a region that extends through much of North America, crossing political boundaries in its expanse. Its plant mechanisms have evolved in a hostile climate that is bitterly cold in winter months and subject to cyclical drought in scorching summers and freeze-drying in snowless winters. Western wheatgrass has evolved "multiple systems of endurance and individual survival" (22). When stressed by drought and heat, western wheatgrass will curl its leaf edges, "allowing the leaf to function but reducing drought exposure" (22). Miniscule wax plates on its leaves "help seal off water loss" (22). Even in extreme conditions, western wheatgrass functions and reproduces itself. Rhizomes extend under the soil, eliminating the need to reproduce by seed, a riskier proposition "in the ever present summer sun" (22). Western wheatgrass is a survivor in a "ravaged" Plains landscape: "Between plowing and overgrazing, it is perhaps the most extensively altered biome on the planet, and we know very little of its original ecology and function," Gayton laments (25). Yet lowly grass extends our understanding of the larger "architecture of grass and forb and rock and sky" (13), of a landscape "ancient and silvery" (9). If grasslands were the original habitat of hominids, then the western wheatgrass also connects us to our earliest, most primal cultural memories. In linking a native species to a larger nexus of natural history and human occupation, Gayton creates a thickened, layered narrative as dynamic as the landscape he analyzes.

The Wheatgrass Mechanism, empirical and lyrical, presents a wealth of information on grasslands ecology to counter indifference, to provoke concern, and to encourage "earth-bonding" (143). The deep map of place, from Gayton's viewpoint, contains a database both genetic and mythic necessary for a continued human presence on the prairie. At Lethbridge, Alberta, with stiff winds buffeting him, Gayton surveys deeper history that underscores contemporary loss. The tallgrasses "are history" (41). The introduced earthworm has made native soils less stable. European colonization "nearly extinguished" indigenous peoples (42). Farmland has obliterated traces of their cultures as quickly as it has changed the soil structure and original biome:

Teepee rings, dream beds, buffalo jumps, turtle effigies. Marks on the land: myth. These things are not found on farmland, only on the dwindled remnants of native prairie, along with the burrowing owl, the crocus, and the horned toad. The symbols and essences of our natural bioregion are slowly being traded off in our dubious quest to be the world's breadbasket. Somehow we must find room for both the natural essences and the wheat. They need each other. (44)

Yet the severity of weather, the cycles of drought, the rising cost of machinery and repairs, the stagnation of market prices, and a complex of other factors economic, social, and natural, keep many Plains people living, in Donald Worster's phrasing, "on a thin edge."32
Without substantial adaptation, without attending to the lessons of the Plains’ past, chronicled in its soil, its remaining native remnants, and its cultural artifacts, modern Plains culture could face its own diminishment.

Grasslands challenge historical ecologists in their attempt to reconstruct the evolution of a landscape. Transformed so irrevocably in 150 years, the Plains elude scientists who have had little time to understand “its original ecology and function” (25). But research to encourage sustainable economies and restored cultures on the Plains depends on scientific rooting in many fields. Gayton’s narrative weaves together the knowledge of diverse scientists, but like Stegner in his definitive deep map, he also follows the imperative of his own instincts and desires, and listens to the experience of long-time inhabitants. He, too, imbibes the touch, color, and smell of place, kneeling down into the grass to gain perspective that “opens up and fills in the prairie” (10). From the microscopic view of prairie to panoramic sweeps of grassland history, Gayton seeks the patterns of place, “scans for lines of landscape, patterns of rock, assemblages of vegetation” (14), and decodes the smallest cellular functions. His quest is restorative.

Richard Manning tells us that the term biomass “describe[s] the weight of life of a place.” In a grasslands ecology, the roots represent the major part of biomass, engendering “the center of the life of the place” from which “all else flows.” Indeed, Elliott West tells us that “a square yard of grass might have twenty miles of roots in a foot of its topsoil.” In the prairies that Gayton has studied, the harsh climate has encouraged “tough, minimalist above-ground structures” balanced by “massive root systems” (21). A fundamental mathematics drives life in the grasslands: the moisture that the sun evaporates must be replaced by the moisture
that the deep roots suck out of the soil. Without this exchange of water, the plant cannot survive. Wheatgrasses become index species on sustaining life in dry land. To deep map plant phylogeny, one must unravel one essential “mechanism of landscape,” phloem. “It is,” Gayton asserts, “the heart, vessel and living sap of all regional floras. A journey toward understanding forest, desert, grassland or wetland,” he concludes, “must ultimately pass through phloem” (30). Inside any plant is “an extensive trade of liquids and nutrients across membranes, down gradients of concentration, and through changes of physical state,” he explains (31). In the earth, roots search for water that will then circulate like a cooling system through the plant’s surfaces. Without such plumbing run through the xylem of a plant, it could not proceed successfully with photosynthesis. Phloem, on the other hand, “transports the sap plants produce for their own further growth” (32). In the main stem of wheatgrass, phloem “nourishes new shoots, or tillers” (32). How this happens exactly, Gayton remarks, remains a mystery, one of the hidden things of the landscape that even the electron microscope has yet to solve.

A plant’s full functions are complex. “A grass leaf,” Gayton proposes, “is essentially a four-story, double-sided, solar-driven manufacturing plant, suspended in space” (89). Extending this metaphor, Gayton limns the plant factory: cuticle cells make the roof; just below, in “a palisade layer,” photosynthesis proceeds; spongy mesophyll, the third floor, oversees transpiration; the next two levels are the leaf undersides; stomata, up and down the roof, “vent gases and vapors to and from the mesophyll layer to the outside” (89). In the “utility space” between the second and third levels, xylem and phloem run “liquid supply lines” (89). Water evaporates, carbon dioxide is fixed. Rarely is this manufacturing plant idle: “Except in periods of prolonged drought, cold, and darkness . . . there is nearly always something to do” (91). In a review of Gayton’s work, Heather Pringle writes, “In the study of tiny details, ecologists, biologists, geologists perceive the underlying order of nature.” The minuitiae of grass, their dynamic particulars, allow Gayton to sample the pulse of the larger biome. Yet he must do so understanding that “a definition of plant growth is elusive” (92). Repeatedly Gayton reminds us that at the heart of any deep map is mystery. Imagination, one of the key words in Gayton’s subtitle, “in this deep-time travel . . . is almost all we have.”

Imagination guides us through the multiple functions of grass, through the complex of symbiotic grasses, forbs, and legumes on the prairie, and through the fractal reality of landscape. Patterns both minute and grand, the micro and macro mechanisms of place, capture Gayton’s imagination and structure his text.

Among the formative patterns Gayton traces is that of erasure; loss, too, leaves a mark. An ancient landscape underlies Gayton’s modern, “ravaged” prairie. The Late Pleistocene in particular attracts him, a period spanning 30,000 to 9,000 years ago: “The late Pleistocene was a curious and changeable time, just on the cusp of recorded history, simultaneously ancient and modern” (126). Ice sheets scraped over the western Canadian interior “at least three times” in these years, producing vastly different landscapes of tundra, spruce forest, and “a new phenomenon,” prairie (126). Advancing ice sheets drew down ocean levels, creating land bridges over which “shadowy human figures” crossed (126). With the entrance of humans to the North American continent, species extinction accelerated. The dynamic nature of this period animates paleontologists, anthropologists, glacial geologists, and historical ecologists: “The Late Pleistocene is essentially a lost memory to us, one that begs re-creation” (126). Adding to the challenge of piecing together this interdisciplinary narrative is the reality of glaciers, enormous grinding machines that build and destroy “on a continental scale” (127). Little evidence survives of early human settlements in North America. “With one or two notable exceptions,” Gayton informs us, “the North American new and old have been relentlessly ground together” (127). If the glaciers erased evidence
left on the ground, pulses of human migration added to the destruction. Like “Hells Angels on a church picnic,” human newcomers descended “fast, destructive, and unexpected” (132). Megafauna—“mastodon, woolly mammoth, short-faced bear, ground sloth, super-bison, saber-tooth tiger”—disappeared “almost overnight” (130).

Fast forward to the eighteenth and nineteenth centuries, when exploration into the interior regions of North America had accelerated, and a new era of species diminishment and disappearance began. This time waves of European settlers followed their own mandates of survival. Fauna continued to diminish—the bison being the most famous species brought to its knees—but the introduced technology of the plow, far more destructive than the technology of fire, overturned ancient roots, the heart’s blood of the prairie, and in a heartbeat—150 years—99 percent of the grasslands ecosystem disappeared. One million square kilometers of tallgrass prairie were rubbed out in a nanosecond, existing now only in the imagination, a haunting presence in the centers of Canada and the United States. Along with this change came the erasure of Indian cultural artifacts, “thousands of [teepee] rings, wheels, pictographs, and boulder effigies,” now “victims of our continuing need to consume land” (42). Such losses are profound.

Lording over this once vital landscape was the bison, the “ur-creature of Western North America,” Gayton suggests. “His time was from the last of the glaciers until the first of the white men. That era is like a distant symphony for us; we hear a phrase here, a chord there. When that music is finally reconstructed, buffalo is sure to be the coda,” Gayton laments (99). The vestiges of buffalo trails, though “disappearing through cultivation,” slash through “ridges and river valleys” (100). Aerial photography arrests their fading. The sizes of the original herds can only be guessed: 25 million? 50 million? Buffalo once held up “a westward train trip . . . for three days” (100). The remnant herds now cannot escape their genetic history. Gayton writes, But 10,000 years loose on the prairies have left their stamp. Corrals and holding pens must be made from telephone poles and two-by-tens. Calves that are tied up frequently kill themselves trying to get free. The genes for this wildness run deep: it takes two and three crosses with domestic cattle before the offspring—beefalo—are tractable. (101)

Extant photographs from the nineteenth century provide us as intimate a look as we will ever get into the process of near extinction. Among the most haunting of these scenes are the “fuzzy photographs” of a bone depot near Regina, Saskatchewan, “a place that became known as Pile o’Bones” (101). Bone piles, stacked “neatly,” contrast with dark freight cars. “The scene,” Gayton tells us, “is strongly reminiscent of Dachau” (101). The year 1891 marks the fatal culling of the final free-ranging herd in the United States. Of the millions of bison that once roamed the Great Plains, Gayton writes in 1990, only 100,000 remain, and these are all captives.

The grasslands evolved together with the bison, their relationship symbiotic, mutually enhancing. As Elliott West has written, “The story of the buffalo, like that of its homeland, is one of seemingly unconnected parts that turn out to be inextricably bound together.”9 Part of western wheatgrass’s original mechanism—and that of other forage species—would have been periodic grazing by bison. Western wheatgrass undergoes a period of rapid growth during spring months (103). Bison would have arrived to graze in the summer months, making little impact as the grasses “coast toward maturity and senescence” (103). The cool-season grasses would sustain the herds, allowing warm-season grasses to grow undisturbed until needed later in the year. Migration patterns of regional herds, scientists speculate, would have taken advantage of shelter, insulating snow, seasonal forage, and running water. The replacement herds of cattle and sheep evolved in a different landscape, where grasses evolved to withstand the stresses of year-round grazing. The “indigenous consumers” of North
American grasslands were once “buffalo, grass-hoppers, and fire,” a triad that helped develop “a subtle bioregional transaction” (106). The genes of both “grazed and grazer” evolved together and faced diminishment together (106). Some grasslands fell to the plow, others to the cutting hooves and persistent grazing of cattle or sheep. Introduced grasses, invasive grasses, and opportunistic weeds now prevail on North America’s rangelands. Speaking of the fate of one native grass species, Gayton informs us that “[the] bluebunch has given way, gradually but profoundly, to the invading cheatgrass, another Eurasian alien. Now bluebunch is a pathetic remnant, and cheatgrass dominates some 40,000,000 acres of its original range. Knapweed, a thistle-like European broadleaf, commands another 2,000,000” (108). Deep-time natural processes and historic waves of migration and colonization that have transformed the Canadian interior must be understood, Gayton argues, if restoration efforts on this landscape are ever going to succeed.

Patches of prairie are all that remain, comparable to the “fossil landscapes,” the “small prairie ‘islands,’” that survived in Ontario after boreal forests reasserted themselves following the Altithermal period circa 5,000 years ago. Such remnants, Gayton argues in his essay “Tallgrass Dream,” exist under “the imminent threat of losing entire ecotypes” (98). These fossil landscapes hold on tenaciously amid fields and rangeland, prospering particularly near railroad rights-of-way and cemeteries. They exude “a buffalo energy” not felt on “the grid roads and wheat fields” (108). No longer wild or free-ranging, buffalo wander no more “the old trails” nor roll on the “rubbing stones” that “mark one of the world’s greatest migration cycles” (108).

The diminishment of the North American bison has discernable if complex causes and provides one kind of moral tale in Gayton’s bioregional analysis. But nature can throw some wild, nasty punches that defy clear understanding. Old Wives’ Lake, the fourth largest saline water body in North America, dried up in 1988 (45). No one could remember if it had disappeared in the Dirty Thirties. Scientists debated possible causes: diverted water from its only water source, Wood River, or “[a] shift in weather patterns, excessive summerfallow in the region, a cycle of dry years, slough drainage, the greenhouse effect” (46). All were candidates, but none were clear picks. This seemingly random event brewed huge “greasy clouds,” sickened cattle, and damaged already “drought-stunted grain crops . . . by the salty deposits” (45). To communities it “was a politician’s nightmare” (46), but to a plant ecologist it was a unique opportunity to study “a brand new and absolutely empty niche” (46). From a singular event in a particular grounded site, biologists could learn lessons as old as “the beginning of life” itself on “a cooling, juvenile earth” (46). Old Wives’ lakebed became a field laboratory “for natural
plant succession, from the earliest pioneer species up to stable climax” (47). With a salinity of 90 units, Old Wives’ lakebed was an inhospitable foundation for life. Excess and extremity marked its boundaries. In a landscape already minimal, Old Wives’ projected a “profound emptiness” (50). Its detritus evoked a complex history:

It has swallowed buffalo herds and World War II military aircraft. Some say the cackle of the old wives can be heard in the wind. A derelict sodium sulfate extracting plant molders on its southeast shore, the corrugated tin of its decrepit buildings flapping loosely in the ever present wind. The few farmsteads along the shoreline are mostly abandoned, recalling Palliser’s dictum that the area was uninhabitable. (50)

Yet a grass species had found a toehold, a niche. Niche, Gayton explains, is fundamental to understanding ecology: “It is the multidimensional space that a plant (or any other living organism) fills” (46). Niche, in a flourish of metaphor, “can be thought of as the abstract address at the intersection of a hundred biophysical streets” (46). In this tangible, saline ecology, Gayton connects the landscape lessons of Old Wives’ to wheatgrass, bison, human adaptation and maladaptation, and invisible evolutionary directives.

A pioneer annual species, kochia, took root at Old Wives’. Then suada, “a salt-tolerant perennial forb,” found its place. Desert saltgrass began to form a mat of vegetation. Bit by bit, over a few years, the less-stable annual grass kochia gives way to perennials, but its presence has reduced wind speed, cycled soil-to-plant nutrients, slowed down salt accumulation, moderated soil temperature, and held snowfall (51). The pioneer kochia has sacrificed its reproductive energies to form the surface of a new landscape. Such adaptations display “a certain elegance and forward harmony” and reveal “the technologies of a niche-based ecological engineering . . . that we would do well to study” (52). From the micromap of Old Wives’ lakebed, Gayton extends his vision to the mechanisms of a larger grasslands ecology, the deepness of evolutionary history, and the troubling short-sightedness of modern human solutions and economic contingencies.

Niche thus operates as metaphor for the deep-map process itself, a form that represents a multistoried place. The Wheatgrass Mechanism highlights a number of unique, niched places in the western Canadian interior that illuminate multiple measures and layered histories: Bragg Creek, Alberta, an ecological “zone of tension”; the Cypress Plateau and its hidden near-monoculture of lodgepole pines; Don and Dorothy Swenson’s farm in sandy land near Moose Jaw; Roy La Motte’s rangeland near the Okapan. The Great Plains biome is a composite of rich, interesting microenvironments worthy of study and storytelling. In the heart of his text, Gayton pays tribute to Wallace Stegner’s formative deep map, Wolf Willow, by traveling to the Cypress Hills and Eastend, Saskatchewan. In a chapter that dis-
tills much of Stegner’s own cartography, Gayton muses over geologic history from the Cenozoic to the Pleistocene; ranges over John Palliser’s “Report to Her Majesty” of 1860 and his considerable surveying accomplishments; and studies a modern hydrological map in an effort to trace the divide. His chapter “Analogues and Desire” layers map upon map in an effort to reexplore a landscape both “physically and symbolically” (82).

The Cypress Plateau seams together as a “geographical clasp ... the Gulf of Mexico to the Arctic Ocean, and the Rockies to the prairies” (82). Here once grazed Canada’s last wild bison together with “the last of the non-reservation Indian bands” (82). The Cypress Plateau escaped glaciation, adding to its uniqueness within the larger grasslands biome.

Choosing a bicycle to convey himself over the landscape, Gayton straps a topographical map to his handlebar, “following its sinuous isolines” into an immersive exchange between place, imagination, and body. “There was much to experience,” Gayton relates, “not the least of which was the simple passage of rough grid road underneath my front wheel. I was totally alone on the landscape” (85). The plateau represents a classic zone of tension, the interface between forest and grassland, what Gayton calls “the dynamic edge” (139). Up in the Cypress Hills, one finds the “[d]eep green of lodgepole on north faces” and white spruce (84). Descending the plateau, he enters “plains rough fescue country, with admixtures of silver lupine, cinquefoil, and prairie sage” (85).

He joins the Frenchman River at Ravenscrag, entering yet another landscape, “a glacial meltwater channel that had cut deeply into the prairie” (86). Erosion has exposed “Cretaceous shales and Jurassic coal seams” (88). Echoing Loren Eiseley’s famous somatic immersion in his essay “The Slit,” Gayton offers his own metaphor for the deep time etched on the slopes: “these valleys are the intimate labia of the earth itself” (86). In a symbolic gesture, he detours off of Eastend’s main street to see Wallace Stegner’s old home, connecting his chapter to the work “rooted in land” that Stegner produced. As he rubs against the physical remains of other eras and eons, Gayton’s language enters into an intertextual intimacy of its own.

The dynamic edge takes on extra meaning from such encounters in The Wheatgrass Mechanism. In the meeting of forest and grass, humans were cradled (139). Something about the juxtaposition of open and closed spaces “feels right” to Gayton. The creative juxtaposition of histories embracing the natural and cultural realms becomes yet another edge, a textual one from which his deep map evolves.

Within a narrative’s embrace, other, older texts and oral tales edge in, furthering the dynamic tension and interface. In his introduction, Gayton speaks of creativity as a “catarhesis for scientists” (12). “These aged realms of ‘science’ and ‘the humanities’ hide a very fertile ground at their mutual border, a narrow seam that may someday blossom into a domain itself” (12). Into such fertile ground has blossomed a narrative domain, the deep map, and Gayton’s book demonstrates that even humble grass rooted in a prairie soilscape lives within a historical matrix as deep and complex as the original grasslands biomass itself.

In the emergence of contemporary deep-map writing, Gayton’s text complements Heat-Moon’s PrairyErth. If Heat-Moon foregrounds human acculturation over natural history, Gayton inverts this positioning. In his narrative, the imperatives of natural processes ultimately determine the viability of human communities.

JOHN JANOVY JR. AND THE FAUNAL DEEP MAP

Toward the end of The Wheatgrass Mechanism, Don Gayton considers the forty-ninth parallel and the range of reptiles and amphibians. Though the political border remains an artificial construct in examining the Great Plains biome, it does provide “a real boundary in the West” when considering geography and fauna: “it tracks the southern extent of continental glaciation, and it is close to the
northern limit of range for nearly all reptiles and amphibians” (109). The very existence of tiger salamanders, western painted turtles, horned toads, and other “saurian personalities” seems a bonus to Gayton. “They are not pests,” he asserts, “they have no real economic value, they are just there as quirky and vastly distinct lifeforms” (115). If we can somehow not harm them, perhaps, Gayton suggests, “we will have achieved a sort of wisdom” (115) and gained what Buell has called “environmental consciousness and commitment to place.”

John Janovy Jr.’s central works on Great Plains fauna, Keith County Journal (1978), Back in Keith County (1981), and Dunwoody Pond (1994), concur with Gayton. “If we are ever going to place the kind of value on our world that is required to preclude its total destruction as a planet, then we must be able to find the love and joy in a dickcissel,” Janovy argues. As a parasitologist, he could have also added the multitude of microscopic animals that live inside even the smallest of animals. The “earth-bonding” these writers seek leads them to both widen and narrow their focus. Janovy boasts, “We have seen the world through a quarter-inch seine and have been impressed with what we’ve seen.” Following a spore through a single amoeba as it waits “to receive the environmental cue that will unleash its genes” proves as elegant in its way as following a lonely highway to a rare vista of wide Sandhills country. Scales small and large stretch the imagination and help unravel the primal bond between organism and environment, between body and place.

From his earliest work, Janovy has been fascinated with deep mapping place, in particular how fauna reveal the essence of a place. “A site,” he explains in Keith County Journal, “can preempt our thoughts and direct them to the animal, just as the animal can preempt our thoughts and direct them back to some place in space or time.” Keith County itself “has a way of inundating the human with nature,” of provoking immersion and curiosity. But as Gayton has insisted, even the deepest inquiry leads to mystery. In Janovy’s words,

There may be some unwritten rule that says a biologist is forbidden to know everything about a creature, and that rule may be what follows from the ever-enlarging interface between known and unknown that is generated by the study of even a single one of these inhabitants of the Sandhills.

Yet experiencing ineffable, unknowable things does not negate what one does discover. The intestine of an animal is a record of encounters, a series of environmental “memories.” A one-celled gregarine in a grasshopper’s intestine illuminates “not only the animal but the obvious significance of that animal’s position in nature,” Janovy relates. The body of a grasshopper is a micro-landscape, “a veritable community, with other insects’ larvae in their bodies and external parasites of all kinds.” The context of this community extends out to the grasslands that grasshoppers eat and to the birds that eat grasshoppers. An ecosystem, and all of its interconnections, is mind-boggling the farther one tracks the spores of a one-celled animal.

Buell has pithily argued that “[there] never was an is without a there.” To understand creatures’ destinies, one must discern that “their bodies are physically located somewhere, in particular locations.” Stagnicola elodes, a snail species, require calm, warm waters. Killifish in the Platte River thrive in “a perfect combination of shallowness, warmth, current.” Herbivore dung provides the moisture and darkness termites need, who might otherwise perish on the dry Sandhills. Survival has “everything to do with being in your own place, the place that is for you at the time that is for you,” to do with “a built-in mechanism for finding one’s place in the world.” Over the years, in trying to discern an animal’s place and point of view, Janovy has also learned to feel like the animal. Walking the waters of the Platte, for instance, he “stopped looking for
the killifish compartment and began feeling for it." His legs pick up the right warmth, the exact speed and shallowness of water that killifish inhabit. Fine-tuning his own somatic responses, Janovy lets his body select the place most likely to yield specimens.

In his famous encounter with swallows in the essay "Swallows," he inches down into the colony to "intrude deep within an organism." Immersed in the motion, smell, and sensuous feel of the colony, Janovy realizes he is touching "one part of a naked flowing animal," much like "the feeling of having depolarized a three-hundred-foot-long nerve cell with one's finger." Face to face with the swarming, complaining colony membrane, Janovy senses "having been here before." The encounter, though strange, even "surreal," provokes a distant, perhaps cellular connection. A cliff swallow colony underneath a twentieth-century highway bridge leads back in evolutionary time to "something vaguely familiar." In rivers, under bridges, or exposed in higher country, Janovy relies on experience, imagination, and instinct to understand the multiple dimensions of a being's emplacement. The writer himself is part of this logic. Janovy's writing confirms Fleckenstein's assertion that "[as] writers and as knowers, we come to be only by our engagement with(in) a multilayered corporeal scene."

Janovy's early Keith County essays establish his interest in deeply plumbing a particular ecology of place. Dunwoody Pond: Reflections on the High Plains Wetlands and the Cultivation of Naturalists is his most sustained effort at deep mapping and a foremost effort in the genre. In its range through time, its concern with evolutionary and cultural change, its illumination of one microenvironment's mechanisms, and its presentation of what Dan Flores calls "an occupied landscape," Dunwoody Pond stands as Janovy's highest literary achievement thus far. Published after such works as John McPhee's four volumes of Annals of the Former World, Gayton's The Wheatgrass Mechanism, and William Least Heat-Moon's PrairieErth: (a deep map), Dunwoody Pond shares with these texts the experimental, cross-sectional narrative of the deep map as well as its attention to science, social history, and environmental ethics. What Janovy brings to the deep-map genre, however, is a remarkable clarity about the enduring yet fragile genetic, evolutionary undergirding of a biome's identity. Moreover, the acute sense of life's impermanence and of time's irreversible nature that marks Janovy's early writings becomes amplified in Dunwoody Pond. One senses as well Janovy's profound connection to place after years of fieldwork, his increasing moral concern about human practices and politics, not unknown in his earlier works but certainly intensified in this later text. Science teaches us that nature is not static, nor is an ecosystem closed; still, shortsighted human policies are promoting changes that are not all benign. Janovy laments,

There was a time when I would see a sandpiper and feel excited, pleased. Then there came a time when I would see a sandpiper and feel privileged. Nowadays, as often as not, when I see a sandpiper I feel sad. Where have they gone, I wonder, those Dunwoody Ponds, Martin Bay Ponds, Nevens well tanks, Roscoe river beds, Monkey Rocks, and Ackley Valley Souths? Reflecting the tone of much deep mapping, Janovy is at times elegiac, keening the loss of biodiversity, the narrowing of vision, and the imperatives of land "use" in an extractive economy. The "vast wilderness of everyday biology one finds anywhere," Janovy argues, "has no immediate political or economic importance" (277). Yet in devaluing the intricacies of biological mechanisms, we stand to lose our own humanity. The Platte River, a legal and environmental battleground, no longer resembles the river of centuries past. Imagining its killing, Janovy projects a Platte that "is finally dry, when Denver's sewage is washed away with water that once flowed past Roscoe, when the cranes no longer darken Nebraska's..."
March skies” (265). A plaster cast he made of killdeer tracks along the river suggests just one species facing possible extinction if the Platte dies because “we let the wrong people tell us what we were wasting” (265). Thus Dunwoody Pond weaves in many stories, some of science, some of scientists, some of the land that inspires their quest for understanding. Its reflections reveal the formative nature of deep-time history, much of it still alive in the genes of organisms, and ponder the changes brought to the land by climate and human migration. A celebration of topophilia, its deepest current is a love of this place, a unique biological site in beautiful country. Dunwoody Pond provides a peephole into life itself. On its shores, one finds that “[the] mystery of the universe, written small and near, surrounds you, crawls up your leg, flies into your ear, bites you on the neck, and leaves black muck under your toenails” (12). In entering its space, in interpenetrating its intricacies, Janovy and his students come into contact with “an extraordinary array of life in constant motion” (10), part of “the deep prairie and the microscopic worlds that occupy its seeps” (62).

In the spirit of deep mapping, Janovy represents the truths of place cartographically. Movement, migration, and road systems convey the compass points of scientific exploration. Building upon patterns of roads, towns, and fieldwork in the Keith County books, Dunwoody Pond’s narrative literally moves over the physical landscape. To find the pond, one travels “[t]wo miles down a sand and gravel road, north of a town with no grocery store, in
the middle of the sixty-eighth most populous county of the thirty-fourth most populous state" (4). Another field site near Nevens Ranch requires particular attention to roads. In Keystone, Nebraska, blacktop changes to gravel road and deteriorates from there until "the washboards become brutal and dangerous" (46). At Buckthorn Springs ranch gate, the road narrows, a devolving structure that leads to a well tank teeming with microscopic life. Similarly, to study the Platte River and its branches, one must follow specific state highways and Interstate 80 to find access. Janovy's text marks bridges, access roads, county highways, and roadside ditches; he even revisits Highway 61 in his closing chapter, "The Blue Mustang," to interpret an earlier symbolic journey in Keith County Journal. With a detailed Nebraska map, the reader can literally follow the author, his colleagues, and his students as they stake out study sites in the vicinity of Cedar Point Biological Station.

This contemporary map, however, tells only part of the story, for blacktop and gravel lead back in time, shadow migratory routes, and cover the tracks and footprints of other eras. The hydrologic map takes us into an ancient world of "[volcanoes], meandering streams and rivers, wandering underground seeps and springs and eastern glaciers" (195). Ditches and access points give way to genetic maps that allow a glimpse into "the intertwined mass of causes, effects, and evolutionary histories" (184). Duane Dunwoody's pond exists on land that came to be through ancient winds, far-off volcanic activity, and lifted, airborne sands.
Megafauna once lived here. Modern landscapes overlap the ancient. Fossil water “lies in a porous sandstone, filled with cold and crystal water . . . left behind when the glaciers melted and the mastodons died” underneath Janovy’s feet, an “underground freshwater ocean” extending all the way to Texas (54). The Platte River, north and south, carries ancient orogenies and cultures in its waters. The North Platte, with its “granite, basalt, quartzite and slate slivers,” tells the story of the Laramide Revolution, “one of America’s most persistent geological anomalies” (60). The South Platte sands are interspersed with cultural detritus, “stone points and ceremonial knives, deer bones, patent medicine bottles, bison teeth and rusted out early seventies car bodies” (61). Each site of study plumbs deeper, connects to other maps, and links to “[u]ltimate questions . . . of phylogeny, of evolutionary relationships, in which deep causality is sought in the unique geological history of the planet” (160). Such ancestral connections may be disturbing to those who want “safe and servile science,” but they lie at the heart of Janovy and his students’ quest (160). The heterogeneous environments studied in Dunwoody Pond parallel the heterogeneous histories of place. Janovy’s complex narrative reiterates Gayton’s insight that the deep map, as generic niche, can connect “a hundred biophysical streets.”

Dunwoody Pond, then, is a matrix in all the meanings of the word. The pond is an archetype, a mold, so to speak, of primordial dimensions; it is embedded with natural forms;
it is the material enclosing objects of study. It originates, embeds, and embraces life forms. As a matrix of study, Dunwoody Pond becomes Janovy’s central metaphor in his far-ranging narrative. Though other places receive attention, all these storied paths lead back to Dunwoody Pond. Janovy lyrically celebrates the pond’s profuse energies:

There is a movement; the sunfish strikes. Death comes to another larval dragonfly, as swiftly and unemotionally as it comes to the hundreds of smaller scuds and wigglers consumed by the dragonfly over the past months. Sunlight pierces a small gap in the vegetation, a ray slices down into the weeds. Fine particles and diatoms drift in clouds throughout the light shaft; along a *Ceratophyllum* leaf, a busy, microscopic, telescoping rotifer swirls a tiny current around its head, sucking in the diatoms; worms, smaller than bits of thread, pack the dense leaf tufts at the end of a stem, secreting mucous tubes, and pulsating, always pulsating, pushing, swallowing, pushing, swallowing, eating the drifting dirt from Dunwoody Pond. (9)

It is a world of constant “grabbing, gnawing, sucking, stabbing, swirling, licking, biting, chewing, rasping, and scraping” (9). The biologist’s imagination takes such seemingly chaotic life forces and abstracts measurements, ponders theories, and seeks partial answers for “complex mysteries” (10). Science and art converge at Dunwoody Pond. Scientific problems “originates inside a human mind; they are made of experience and curiosity mixed in with a dash—sometimes a sizeable dash—of naïveté and aesthetics, the building blocks of wonder” (12). Thus Dunwoody Pond, like Gayton’s grasslands, becomes the matrix of imagination and query, of the “digging and netting for questions” that fires a scientist’s career. “All we need is a source of exotic puzzles,” Janovy confides. “A Dunwoody Pond” (15).

Such a matrix, however, serves at the behest of climate and human desire. Dunwoody Pond could dry up or become contaminated, reminding us that the landscape body is not timeless. “Nothing’s permanent except the memories and the meanings,” Janovy concedes (230). A rich field site, Ackley Valley South on Highway 61 was once “a perfect classroom” (281). But when it began to dry up, life receded. A sandpiper, looking for its kind, calling and circling “thirty or forty times,” must give up its search and fly on. Change and movement, the rise and fall of species, the passing of eons and landscapes find their mark in Dunwoody Pond. It, too, is mortal. The Sandhills landscape lessons capture this poignancy: the deep structure of place lies under surface ephemerality. The Platte River waters, bearing down on the wader’s feet, announce, “deeply and powerfully, that the passage of time like the passage of sand and water, is completely, totally, and finally, irreversible” (250).
Scientists work to capture this matrix in experimental form, gaining partial knowledge of the deeper biological mechanisms. Janovy’s student Rich Clopton attempts to reproduce in his city lab some of the High Plains conditions that influence the lives of darkling beetles and their corresponding parasites. His surrogate environment duplicates the dark, murky, moist realms of the beetles’ homeland. If Rich combines the right properties, he will be rewarded with chains of parasite spores: “[F]or a parasitologist seeking to control a wild animal, spore chains might be a gift from God” (226). An early photograph of Rich in the field “shows him alone, on his knees, in a vast sea of mixed grass prairie, nothing behind him but a flat line and empty sky. His face is low, almost down in the ground, and his hands are hidden” (215). In this posture, Rich is emblematic of the creative, somatic encounter that guides Janovy’s and his students’ science. Immersed in the beetles’ ground, Rich learns to feel like the beetle and thus solves a puzzle that has “baffled science for a century and a half”: controlling the production of spore chains (226). He has tapped into an evolutionary mechanism, sensitive to select environmental cues, that has allowed parasites to “blow with the wind and wash with the rain across vast reaches of the continent” (221). He has uncovered a little of the mystery of one kind of body, the darkling beetle, in its place, the High Plains, over time.

Incredibly powerful tools now aid the ecologist in exposing the features of the smallest structures: the scanning electron microscope (SEM) and the transmission electron microscope (TEM). SEM pictures produce a “shocking” enlargement of familiar features, reminding Janovy of Gulliver’s travels to lands big and small (204). TEM pictures reveal the “ultrastructure—the finest, most minute, cellular architecture observable by existing technology” (205). The ultrastructural views are abstract art: “In the TEMs we see the various granule types, deep invaginations of epithelial linings, mitochondria, folded cell membranes, cellular junctions, ultrathin slices of secretory granule-packed salivary cells looking like flagstone-paved floors” (205). TEMs expose a colorful, textured landscape that is “living tissue” (204). They extend our knowledge of the biome’s deep map in important new directions.

Both kinds of microscopic images reveal the deepest internal structures of life itself. Miles from Dunwoody Pond, Janovy and his students explore these miniscule surfaces, yet “the memories of prairie wetlands remain” (205). The abstraction of living forms still has a potent connection to the “ever-fluctuating matrix of water, mud, worms, fish, and algae” (186). To represent this matrix, Janovy shares the narrative strategies of other contemporary nonfiction writers of place. In Kent Ryden’s words,

Instead of adopting and adapting a ready-made history, they continually construct the past anew from the materials at hand, thinking not of the entire region and its abstract history but of the places most immediate to their lives, looking and listening and remembering and then filling the emptiness by applying their own imaginative overlays to the landscape, locating regional identity not in a spot in the past but in the spot on which they stand.59

Dunwoody Pond ranges over many landscapes, some corporeal, some earthbound, to construct the past from cellular memory, geological remains, cultural traces, and the lingering of potent moments in a scientist’s imagination. But Janovy, located in a spot in process, emphasizes the present and the future as well. His backward glances are balanced by projection: What is the future for curious young scientists? Will basic research lose out to economically motivated science? What human use pressures will exacerbate environmental crises in the Plains? What next will be discovered about this “Camelot” of landscapes (xvi)? Janovy defends science as “a state of mind, ‘a way of knowing’” (xv). To seek understanding of life, Janovy gives this advice: “Follow a piece of the natural world in order to find out where
it goes. Period. For no other reason" (281). Dunwoody Pond gives testament to this scientific journey, charting the “looking and listening and remembering” that lead to informed and inspired deep mapping.

**CONCLUSION**

Nebraska biologist Paul A. Johnsgard points out that at 75 miles per hour, a person traversing I-80, a main artery across the Great Plains, need not “[pause] to think of the state’s geological history” nor consider “the many ecological zones and habitats” one passes through. In Nebraska, as in other Plains states and provinces, a complex story hides among the head-high prairie grasses and wildflowers that bison once tramped through and slept in as they rested from their long migrations to and from the Platte and Republican river valleys. It is present in the gently waving grasses of the green-capped loess hills and the yucca-peppered Sandhills that are easily visible from the noisy interstate, beckoning one like quiet oases in a cacophonous bedlam. It silently calls out in the smell of ponderosa pines among the Wildcat Hills, along the Pine Ridge, and on the crest of Scotts Bluff. The story is there and always has been. Yet the larger biome of Nebraska, its system of diverse ecosystems, now faces “fragmentation” and “degradation.” Its story, along with that of the entire Great Plains, has been complicated by urban growth, industrial agriculture, and other economic pressures. Biome, as Johnsgard defines it, is “[a] major regional ecosystem, including both the plants and animals,” the flora and fauna emphasized in Gayton’s and Janovy’s deep maps. Assessing such large-scale changes in the biome, Johnsgard comments, can cause a “jaundiced” eye. But sanctuaries, wildlife refuges, wild river protections, prairie preserves, and other acts of conservation, protection, and restoration are increasing across the Great Plains. Hope lies in those places “where one can lie back on a fragrant bed of last year’s bluestem in early April, with the half-intoxicating odor of freshly germinating grass invading one’s nose, with the shrill but majestic music of cranes almost constantly overhead.” Such “tangible objects”—bluestem, bison, cranes—inspire “the passion for preservation” that is itself a quest for “a sense of identity” rooted in place.

Learning how to live in and with the land is an imperative more Plains dwellers are hearing. Gayton’s and Janovy’s deep maps, though critical of human decisions and desires, endorse Dan Flores’s assertion: “[W]e remain biological even with all our bewildering array of cultural dressings.” Humans are not outside the biome; they are part of it. Biological deep maps can help guide human inhabitants toward wiser adaptation, toward “earth-bonding,” toward their niche in this landscape. Don Gayton celebrates the farming practices of Don and Dorothy Swenson, the farmers of one possible agricultural future, where management is focused on living and microbial systems, where recycling is not a frill but a serious undertaking, and where the land is not continuously besieged by chemical inputs and the heavy metal of large-scale tillage implements. Janovy acknowledges the local ranchers in Keith County, residents like Duane Dunwoody, who know and love their land and “remain incredibly generous people” to the biologists who want to study upon it (292). Such men and women, “survivors in the strongest sense of the word,” have become part of their place, “not easily dislodged” (14-15). As an integral part of the modern Plains landscape, they are, in Wes Jackson’s memorable phrasing, “native” to the land, a part of the biome. If human communities are to last on the Plains, they too must follow biological imperative and adapt. The landscape lessons offered in The Wheatgrass Mechanism and Dunwoody Pond weld science and imagination, pulling us into the living tissue of place, into
the storied past, into the dynamic edge, as Gayton puts it, of “myth and mechanism” (15). Both authors push us to see anew, “expanding the notion of community so that it becomes situated within the ecological community.”

These two deep maps chart multiple levels of knowledge and experience; they delineate the vertical and horizontal axes that geographer Yi-Fu Tuan has argued define archetypal dimensions in space—the human desire for emplacement that is both sacred and profane, transcendent and imminent. The many questions and mysteries these narratives raise serve to provoke, inform, and inspire the readers’ own cartographic explorations of place. In the end, Gayton and Janovy leave us our humanity to ponder, and the possibility that we as a species are at a crossroads.

NOTES


6. In his chapter “The Land Ethic” in A Sand County Almanac (Oxford: Oxford University Press, 1987), Aldo Leopold defines the land ethic as a philosophical shift changing “the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it” (204). He further argues that “[w]e can be ethical only in relation to something we can see, feel, understand, love, or otherwise have faith in,” adding emotional and spiritual dimensions to this ethic (214). Deep mappers as a group endorse Leopold’s arguments for a land ethic.

7. Buell, in The Environmental Imagination, has coined the important term “bioregionalism” to signify writers who encourage us to “reinhabit” a place, to “refamiliarize” ourselves with the physical environment that our preindustrial forebears perchance.

8. Yi-Fu Tuan, Space and Place: The Perspective of Experience (Minneapolis: University of Minnesota Press, 1977), 83.


13. Laurie Ricou, “Imprinting Landscapes,” Canadian Literature 157 (1998): 187. Dan Flores, in The Natural West: Environmental History in the Great Plains and Rocky Mountains (Norman: University of Oklahoma Press, 2001), attests that post-modernism, while “showing us very well the roles that culture, imagination, and words have played in creating the world,” has not attended enough to the tangible world. Flores seeks narratives that provide perspective on what he calls “tangible ecologies of place.” As he eloquently states, “we remain biological even with all our bewildering array of cultural dressings” (92). Gayton and Janovy are the first science writers in the deep-map genre to chart the ecological mechanisms of place, illuminating the genre’s potential in representing the biological underpinnings of a living landscape.

14. Wes Jackson, Becoming Native to This Place (Washington, DC: Counterpoint, 1994), 78.

15. Flores, Natural West, 106.

16. Jackson, Becoming Native, 78.


19. Yi-Fu Tuan, Topophilia: A Study of Environmental Perception, Attitudes, and Values (New York:
Columbia University Press, 1974), 113. Yi-Fu Tuan defines topophilia as a term that “couples sentiment with place.” He also asserts that topophilia itself “is richly informed by the reality of environment when it combines with religious love or scientific curiosity” (124). The spiritual and scientific are among the salient impulses that inform Gayton’s and Janovy’s evident topophilia.


23. Jackson, Becoming Native, 44.


28. Ibid., 226.

29. Ibid., 214.

30. Flores, Natural West, 91.

31. Yi-Fu Tuan, Space and Place, 179.


34. Manning, Grassland, 40.


37. Manning, Grassland, 55.


39. West, Way to the West, 52.


41. Buell, Environmental Imagination, 262.


44. Ibid., 132.

45. Ibid., 130.

46. Ibid., 114.


48. Ibid.

49. Ibid., 90.


55. Ibid., 66.


57. Flores, Natural West, 173.


62. Ibid., 20.

63. Ibid., 189.

64. Ibid., 191.

65. Yi-Fu Tuan, Space and Place, 197.

66. Flores, Natural West, 92.

67. Buell, Environmental Imagination, 266.

68. Yi-Fu Tuan, Topophilia, 129, argues that the vertical dimension expresses “something more than a dimension in space. It is charged with meaning. It signifies transcendence.” The horizontal dimension signifies the ground, the here and now, the quotidian. I would argue that Great Plains deep mapping conjures these symbolic dimensions, the omnipresent, overarching sky dome articulating the elegance of transcendence and the horizontal dimension of plains articulating the complexity of the lived landscape. Gayton and Janovy guide readers through places that express both dimensions.