The Naming, Identification, and Protection of Place in the Loess Hills of the Middle Missouri Valley

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It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course mean something broader than mere economic value; I mean value in the philosophical sense.

Aldo Leopold[1]

[1] Aldo Leopold, *A Sand County Almanc and Sketches Here and There* (New York: Oxford University Press, 1949), 223.

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A Personal Note: Geography and a Shotgun

A shotgun is a remarkable tool for field work in physical geography. The only time I have carried a gun with lethal intent was in the Loess Hills of northern Missouri. A coworker and I drove into the hills just south of St. Joseph and walked, on a crisp fall morning, up the ridge away from the road. We followed an old farm road, two tracks with grass growing between them, until it faded to just a path, then disappeared in the sparse forest.

The Hills south of St. Joseph are forested, predominantly with oaks, and are home to red squirrels. That's what we had come to hunt. As we walked, every step was thunderous with the sound of leaves being crushed under our boots. The sound seemed contained by the steep hills rising above the small draw up which we climbed.

My companion was an experienced hunter, and had loaned me a single-shot gun. It was a crude weapon, one that could be purchased at the time for $50 in a discount store and considerably less in a pawn shop. It opened to allow insertion of a single plastic and brass shell no bigger around than a dime. It could be fired by cocking an exposed hammer and then pulling the trigger to let that hammer fall. It had a nineteenth-century quality about it, but that seemed appropriate for a hunting instrument.

My companion told me to sit with my back against a tree at a spot that provided a vista across the draw to the hillside opposite. He told me that the gun would reliably kill a squirrel at distances of up to twenty yards and that he would hike over a ridge and keep a similar vigil for about a half hour. If neither of us saw a squirrel in that time, he would come back for me and we would move to a different part of the woods.

Sitting still, back against a tree, looking for signs of squirrel, is a good way to focus on landscape. This was classic Loess Hills country. The little draw over which I looked had steep sides, perhaps as much as thirty degrees at the bottom where an intermittent stream would flow in the spring and tapered off to a rounded ridge line. The draw itself tilted down toward the road and the year-round stream that it paralleled. The soil on which I sat was dry and dusty. Loess drains quickly as moisture percolates around its quartz grains, so the surface is almost always dry.

Loess supports a sparse forest of drought-tolerant oaks. On the western flanks of some neighboring ridges, the land was covered with prairie. The three elements: steep slopes, dusty soil, and dryland vegetation come together to mark the Loess Hills. Exactly how much of each is required before a parcel of land can be included in the definition is open to argument. The very words "Loess Hills" emphasize the combination. The place must be hilly, and not all areas of loess are hilly. It must be made of loess, and not all Midwestern hill country is loess. Finally, the combination of soil and terrain gives rise to dryland vegetation that differs from the adjoining land.

I sat against my tree for ten or fifteen minutes before I heard a squirrel. It rustled through the leaves, sounding like something much larger than it was, then jumped on a downed tree at the base of the draw. I measured the distance between him and me by comparing it to three times the length of my twenty-foot apartment, and tried to lay those three apartment lengths down the hill toward the squirrel. He seemed to be within the requisite twenty yards and so I raised the shotgun to my shoulder, moving slowly to avoid rustling the fabric of my jacket. I looked along the barrel toward the squirrel and pulled back the ancient-looking hammer.

Carrying a gun into a landscape changes that landscape. A gun and a shell transform the person carrying them from a spectator into an actor. A gun and a shell demand a heightened awareness. Suddenly it is not sufficient to know that the bottom of the draw is about fifty feet away; the difference between fifty and eighty feet becomes monumental. It is not sufficient to know that the land rises on the other side of the draw; it is important to know precisely how high and how fast because that rise of land will stop any shotgun pellets that fly past the squirrel. A gun and a shell transform a walk in the woods into something much more.

While I wondered about the quality of my measurement, the squirrel disappeared. Squirrels can do that. At one instant, they are sitting perfectly still. At the next, their muscles twitch simultaneously and they leap away. I eased the hammer back to its resting position, lowered the gun, and lay it across my legs. I was relieved. I did not want to be wrong about my measurement or my aim, wound the squirrel, and see it limp away. I was not even sure I wanted to kill it at all and thus bear the responsibility for changing the landscape that much.

A few minutes later, my companion came back. He declared the area empty of squirrels, "hunted out" by other guns that had come before us. We hunted a different ridge for another half-hour or so, then left the Hills for the day.

I loved that day in the Loess Hills, and though I have never gone back with a gun, that day may be the most intimate I have ever spent there. I have returned with cameras, Brunton compasses, GPS receivers, and notebooks. I have looked at them through aerial photographs and satellite sensors. Each of these tools of observation provides a different

view of the Hills. What follows, then, is one person's effort to assemble a bunch of those views into a single narrative.

A strategy for understanding the Loess Hills

The story that follows will draw on the broad traditions of geography, taking into consideration the physical, cultural, and historical nature of the Loess Hills. It will use cartography and geographic information systems to analyze and represent the area. The spatial scope will be similarly broad, including parts of Iowa, Missouri, Kansas, and Nebraska.

The Hills are more than a set of physical features. They are a place in which people live and about which people have beliefs and feelings. They are also a place over which people dispute issues of public policy, particularly concerning who should own the land and how it should be used. This story will therefore go beyond cataloging physical features to take into account how people feel about the Hills, how those feelings have changed over time, and how they are reflected in contemporary policy choices. The story will therefore be one of place perception. It will owe a great debt to the work of geographer John K. Wright, who called attention to the distinction between the geography that exists on the ground and the geographical knowledge that people carry in their heads. Wright called this subjective knowledge geosophy[1] and called on geographers to heed it at the same time we attend to the soil, climate, and other physical characteristics of the places we study. Personal and political decisions about places, however, flow not so much from the physical traits as they do from human perceptions.

[1] John K. Wright, "Terrae Incognitae: The Place of Imagination in Geography," *Annals of the Association of American Geographers* 37, no. 1 (1947): 11.

One part of the perceptual story about the Hills is their location. This study will approach that question from two perspectives. It first will offer a traditional analysis using physical data on soil, bedrock, elevation, and slope in combination with cultural markers of where the Hills may be, considering features such as road networks and place names. Then, in keeping with the tradition of geosophy, I will also attempt to identify a vernacular Loess Hills region as understood by people who live in and near the Hills. This effort owes a debt to studies of vernacular regions by authors such as James Shortridge and Wilbur Zelinsky.[2]

Later chapters will explore how historical and political forces have determined the extent to which the Hills would be protected by parks, reserves, and other forms of public control. This discussion will draw on perspectives of environmental history, particularly the efforts of William Cronon and Donald Worster[3] to combine the ecology of places with a consideration of the historical and political forces that shaped them.

The Hills, as we will see, have challenged traditional public-policy approaches to protecting noteworthy places. Although they were once considered for inclusion in the National Park system, they do not fit comfortably into American conceptions of worthiness for such recognition and protection. They are not staggeringly stunning (like Yellowstone), deeply historic (like Valley Forge), or a playground of the haughtily aristocratic (like Acadia). They are neither some leftover and unused part of the public domain from which a park could be carved at low cost nor home to a single benefactor

[2] James R. Shortridge, "Vernacular Regions in Kansas," *American Studies* 21, no. 1 (1980): 73-94; Wilbur Zelinsky, "North America's Vernacular Regions," *Annals of the Association of American Geographers* 70, no. 1 (1980): 1-16.
[3] William Cronon, "Modes of Prophecy and Production: Placing Nature in History," *The Journal of American History* 76, no. 4 (1990): 1122-1131; Donald Worster, *Under Western Skies* (New York: Oxford University Press, 1992).

who might donate the core of a park in one grand gesture. Instead, like many other beautiful and distinctive (but somewhat subtle) places in the country, they are held in a mix of private and government ownership. They are protected in some places while open to destructive use in others. My story will conclude with a consideration of how current public policy toward the Hills grew out of an evolving history of land management in the United States, and what that history suggests for the future of this and similar locales across the country.

Chapter 1. The Loess Hills

The Loess Hills are immediately apparent to any motorist on Interstate 29 who travels between Kansas City and Sioux Falls. A band of steeply sloped, wind-deposited sediments, they form an abrupt ridge line to the east, rising about two hundred feet above the floodplain of the Missouri River and the level of the Interstate. To the west, a similar ridge line rises on the far shore of the Missouri River (figure 1).

Figure 1. Loess Hills at Brickyard Wildlife Area, Missouri. Photograph by the author.

Formally, the Hills are defined by their relief and their sedimentary composition: loess. Loess is a German word that most English-speakers pronounce to rhyme with

"fuss." A more authentic pronunciation lengthens the "u" sound, but not quite to the extent of the English long u. The word translates roughly as "loose,"[1] a reference to the poorly consolidated grains which constitute it.

Compositionally, loess is compacted particles of wind-blown silt mixed with a small amount of both coarser (sand) and finer (clay) sediments. Most of the particles, up to eighty percent in some places, are quartz (crystalline SiO_2) mixed with lesser amounts of calcium carbonate ($CaCO_3$) and other minerals.[2] The sediment of the Hills is generally a tan color. In some places it is so bright that nineteenth century naturalists, seeing it for the first time, called it yellow.[3]

In spite of being made up primarily of quartz grains, the Loess Hills are occasionally referred to as "calcareous"[4] and one nineteenth-century name for the Hills was siliceous marl. Both labels suggest that the Hills are distinguished by calcium carbonate. However, the word calcareous in this context refers not to the primary constituent of the loess (which remains crystalline SiO_2) but to the fact that some calcium carbonate (up to about ten percent of the total mass of the loess) is present to cement the quartz grains together. The amount of calcium carbonate is variable; it is easily leached out by percolating rainfall.[5]

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[1] Dean M. Roosa, "A World Treasure: the Loess Hills of Iowa," *Iowa Conservationist,* April 1984, 2.
[2] Jean Prior, *Landforms of Iowa* (Iowa City: University of Iowa Press, 1991), 2; John Frye, Norman Plummer, Russel Runnels, and William Hladik, "Ceramic Utilization of Northern Kansas Pliestocene Loesses and Fossil Soils," *Bulletin of the State Geological Survey of Kansas* 82, no. 3 (Oct. 1949): 72; C. A. White, "The Bluff Deposit," *Report of the Geological Survey of the State of Iowa* 1 (1870), 105.
[3] Benjamin O'Fallon, "Copy of William Clark's Map" Manuscript copy, collection of the Joslyn Museum of Art, Omaha, Nebraska, nd.
[4] H. B. Willman, Elwood Atherton, J. C. Buschbach, Charles Collison, John Frye, M. E. Hopkins, Jerry A. Lineback, and Jack A. Simon, *Handbook of Illinois Stratigraphy* (Urbana: Illinois State Geological Survey, 1975), 227.
[5] Willman et al., *Handbook*, p. 228.

The most remarkable visible trait of the loess, however, is that its particles are bonded together so tightly that, if cut by a stream or a road-building crew, it can form perfectly vertical cliffs over fifty feet tall. This characteristic would not be noteworthy if the loess was rock, but it is not. The loess is much too young, and has been subjected to none of the geological forces that are required to turn sediment into rock.

Loess cliffs are fragile, temporary features. Only dry loess can maintain a vertical face. If the ridge above a cliff is sloped and well-covered with vegetation, so that moisture runs off instead of sinking in, the loess face will endure. However, if the cliff-top vegetation is disturbed and rain is able to percolate into the loess itself, the saturated weight will be more than the sediment can support, and the cliff will collapse. Most roads in the Loess Hills are bordered at some point in their length by just such a waterlogged and collapsed cliff.

Exactly why loess grains stick together to form cliffs is not well understood. The calcium carbonate cement may account for some of the strength, but even loess from which all carbonate has been leached can maintain a vertical face so long as it does not absorb too much moisture. This can be seen in road cuts throughout the Hills: the top foot or so of the loess being pitted from slowly seeping water that washed out the calcium carbonate yet left in a vertical face. Other explanations for the cliff-forming capacity include the adhesive power of small amounts of moisture holding individual grains together, tiny particles of clay acting as a cement between larger and more jagged grains of quartz silt, and, at a molecular level, van der Waals force holding tiny particles together.[6]

[6] Kenneth Pye, *Aeolian Dust and Dust Deposits* (London: Academic Press, 1987), 220.

The word "sediment," used extensively here, is chosen deliberately. Although loess is not a rock, neither is it a soil. Soil is the combination of bits of mineral material (typically rock that has been crushed, ground, or weathered into small particles) with organic matter (usually plants and microorganisms in various states of decomposition). Loess is only half of this combination, just the mineral part. Soil scientists often speak of loess soils, for which a more precise term would be loess-*derived* soils, or soils that were formed by combining loess with organic matter. Throughout this book, the word loess will refer to the raw sediment, not to soils derived from that sediment.

The rocks of the Midwestern United States are generally sedimentary; that is, they were formed from older rocks that eroded to produce sediment that was then buried long enough to allow fusion of the grains. Such a process is slow. Most of the rock immediately under the Loess Hills is Pennsylvanian-age limestone and shale, a little more than 300 million years old. At the northern end of the Hills, it is an only slightly younger Cretaceous limestone.[7]

The loess, in startling contrast, is only 15,000 to 150,000 years old. Although calcium carbonate cements loess grains together, those bonds are not nearly strong enough to qualify the product as rock. A sample of loess taken anywhere in the Hills can be broken in half just by snapping it by hand. At some locations, such as Brickyard Hills in northern Missouri (named for a loess particularly well-suited to making bricks), a sample of loess will crumble in your fingers as you try to break it off a cliff face.

Apart from youthfulness and not-quite-rock status, the Loess Hills are remarkable for their depositional history. The sedimentary rocks of the Midwest were all deposited

[7] Jean Prior, George Hallberg, and Arthur Bettis, "Loess Hills Geology," *Iowa Conservationist,* April 1984: 3-4.

under water, compacted under the bottom of shallow seas while they solidified and then lifted hundreds of feet to their present elevations. In contrast, the Loess Hills were deposited by wind at their present locations well above sea level.

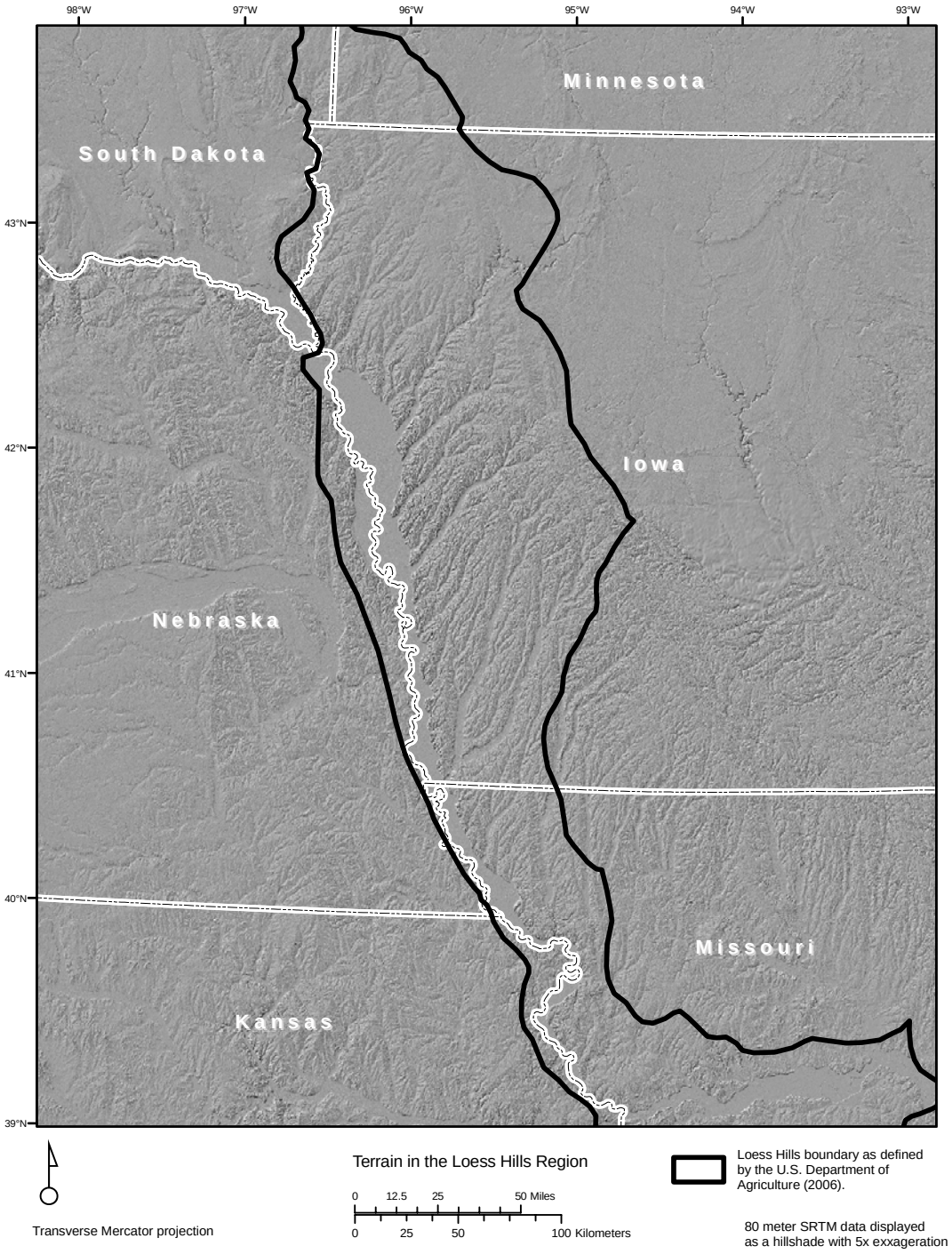
The sediments themselves are thought to have been produced by Pleistocene-era glaciers grinding across quartz-rich rocks at the center of the continent.[8] The precise count of glacial advances and retreats is disputed,[9] but most deposition in the Missouri valley is thought to date from the Late Wisconsin (24,000 to 14,000 years ago) and Illinoian (300,000 to 130,000 years ago) glacial stages. Tremendous amounts of silt were washed out from the edge of these glaciers by meltwater and then deposited along the stream courses. Every winter, over several thousand years, melting stopped and water levels fell, exposing vast plains of silt to the wind.

The flowing water of these glacial-edge streams left behind well-sorted bands of sediment including gravel bars, sand bars, and beds of silt and clay. Such annual runoff was essential to the Loess Hill formation because it consistently renewed beds of well-sorted clay and silt that the winter winds could lift and transport toward the east.[10] When the winds were obstructed by the edge of the Missouri River valley, their deposition created growing hills.

The prevailing winds concentrated loess deposition on the east side of the Missouri Valley, although swirling and turbulence left significant deposition on the west as well (map 1). Once deposited, the sediments were vulnerable to rapid erosion. This

[8] Jean Prior, *A Regional Guide to the Iowa Landforms* (Iowa City: Iowa Geological Survey, 1976), 32.
[9] Wakefield Dort, *Pleistocene Geology of Doniphan County Kansas* (Lawrence: University of Kansas, 1969), 15.
[10] Pye, *Aeolian Dust*, p. 239.

not only lowered the top of the ridge but also carved it into a network of spurs, valleys, and isolated peaks that give the terrain its distinctive crinkled appearance today.



Map 1. The terrain of the Loess Hills

Loess deposition is not limited to the Missouri Valley. It blankets virtually the entire state of Iowa and much of the northern half of Missouri. Dramatic bluffs are found along the Mississippi valley as well. In fact, the uppermost band of Missouri valley loess--Peoria-- takes its name from a site hundreds of miles away in Illinois that was thought to provide the best example of that sediment.[11] Cliffs of loess can also be found between the Mississippi and Illinois rivers, in Calhoun County, just outside St. Louis, and south as far as Mississippi.

The concentration of calcium carbonate in the Hills creates another distinct feature: loess kindchen. The kindchen are nodules of carbonate-rich material, cemented together almost to the strength of limestone. Most kindchen are tiny, dime-sized lumps buried in the loess. Some, however, approach the size of a newborn infant and assume shapes that vaguely suggest a human torso with arms. Hence their German name, which translates as "loess children" (figure 2).

The inside of some kindchen are hollow and trimmed with jagged bands of carbonate material, similar to geodes though without vividly colorful mineral deposits. Kindchen form by a leaching process in which water percolating through the loess becomes rich in calcium carbonate. When such water encounters a root or other surface, the carbonate can precipitate out to form a nodule. Occasionally, when the root is forked, a torso-and-arms shape may emerge.[12]

[11] Willman, et al., *Handbook*, p. 227.
[12] Pye, *Aeolian Dust*, pp. 234-235.

Figure 2. Loess kindchen. Photograph by the author.

Kindchen are not uniformly distributed throughout the loess. It is possible to explore miles of loess outcrops and see none, then encounter dozens within ten feet of each other. Freshly exposed cliff faces are particularly good places to look.

The shape of the Hills

Although loess is found across much of the Midwest and up to ten percent of the earth's surface is covered with loess or loess-derived soils,[13] Loess Hills exist on only a small subset of those sediments. In the Missouri Valley those hills have a distinctive shape that sets them apart from typical river bluffs. Unlike the escarpment that results when a river cuts its path through soil or bedrock, the Loess Hills form a band of rounded hills and knobs. Ridges, where they exist, typically have many projections jutting out at

[13] Kenneth Pye, *Aeolian Dust and Dust Deposits* (London: Academic Press), 9.

near right angles to the main ridge line. Occasionally those side ridges have been cut off by the Missouri River as it meandered across its valley, creating abruptly truncated spurs rising above the floodplain.

One of the earliest written descriptions of the Hills comes from William Clark on his famous trip with Meriwether Lewis. Clark, whose spelling was notoriously erratic, called them "ball-pated prairie" and "ball hills."[14] Most modern readers assume he meant to write "bald-pated" and "bald hills."[15] Bald-pated certainly fits. At what is today known as Brickyard Hills, just south of the Iowa line and the place where Clark wrote his description, one can still see distinct domes that look remarkably like the tops of individual heads.

Elsewhere in the Hills, the shape of the land is more a network of ridges than a line of bald pates. Just twenty miles north of the place Clark described as bald-pated, the Hills in Waubonsie State Park form a grid of ridges, with major lines running north-south, parallel to the Missouri River, and side spurs jutting out on an east-west axis.

The edges of the Hills

The edges of the Hills along the Missouri floodplain are abrupt. They rise in slopes that occasionally exceed thirty percent and soar about a hundred feet above the river valley. In places where the Missouri River once flowed against the Hills, perfectly vertical cliffs of loess are exposed.

[14] William Clark 1804. Journal entry http://lewisandclarkjournals.unl.edu/hilight.php?id=239&keyword=mrr&keyword2=&keyword3= (accessed August 12, 2008).
[15] James Scheffler, *Waubonsie State Park Ecological Management Plan* (Des Moines: Iowa Natural Heritage Foundation, 2007), 16.

Figure 3. Bald pated hills in northern Missouri. Photograph by the author.

Figure 4. Loess Hills at Pisgah, Iowa. Illustration by the author.

Layers of limestone and shale underlie the Hills. The amount varies depending on erosion rates by rivers and glaciers before the loess was deposited. A traveler crossing westward from Sidney, Iowa, to Nebraska City, Nebraska will descend pure loess hills that reach the Missouri River floodplain without encountering any bedrock at all. Ascending from the river on the Nebraska side, however, the traveler will climb a limestone and shale cliff of about seventy-five feet before reaching another seventy-five feet of loess hills perched atop that bedrock (figure 5).

The presence or absence of bedrock affects the shape of the Loess Hills. Where bedrock is absent, or where it only appears at the base of the Hills, the Hills are cut by numerous steep valleys that extend almost to the level of the floodplain. Where the loess is underlain by thick beds of limestone or shale, those erosion-resistant rocks prevent the formation of a dense network of steep valleys.

The Loess Hills and the rivers

The Loess Hills landscape is riverine as much as it is wind-blown. This statement is true but seems intuitively wrong to visitors because water is not particularly evident there. *Yucca glauca*, a plant that thrives on the dry central plains, grows well on the porous sediment (map 2).[16] Trees easily lose the ability to survive and the plant cover shifts to drought-tolerant grasses, sedges and forbs. A walker on a Hills prairie will come home with socks and boots covered with fine dust. Still, although the Hills may feel like a desert, they are nonetheless a product of water. To make sense of them, we need to consider the adjacent rivers.

[16] U. S. Department of Agriculture, "Plants profile," http://plants.usda.gov/java/profile?symbol=YUGL (accessed July 22, 2008.).

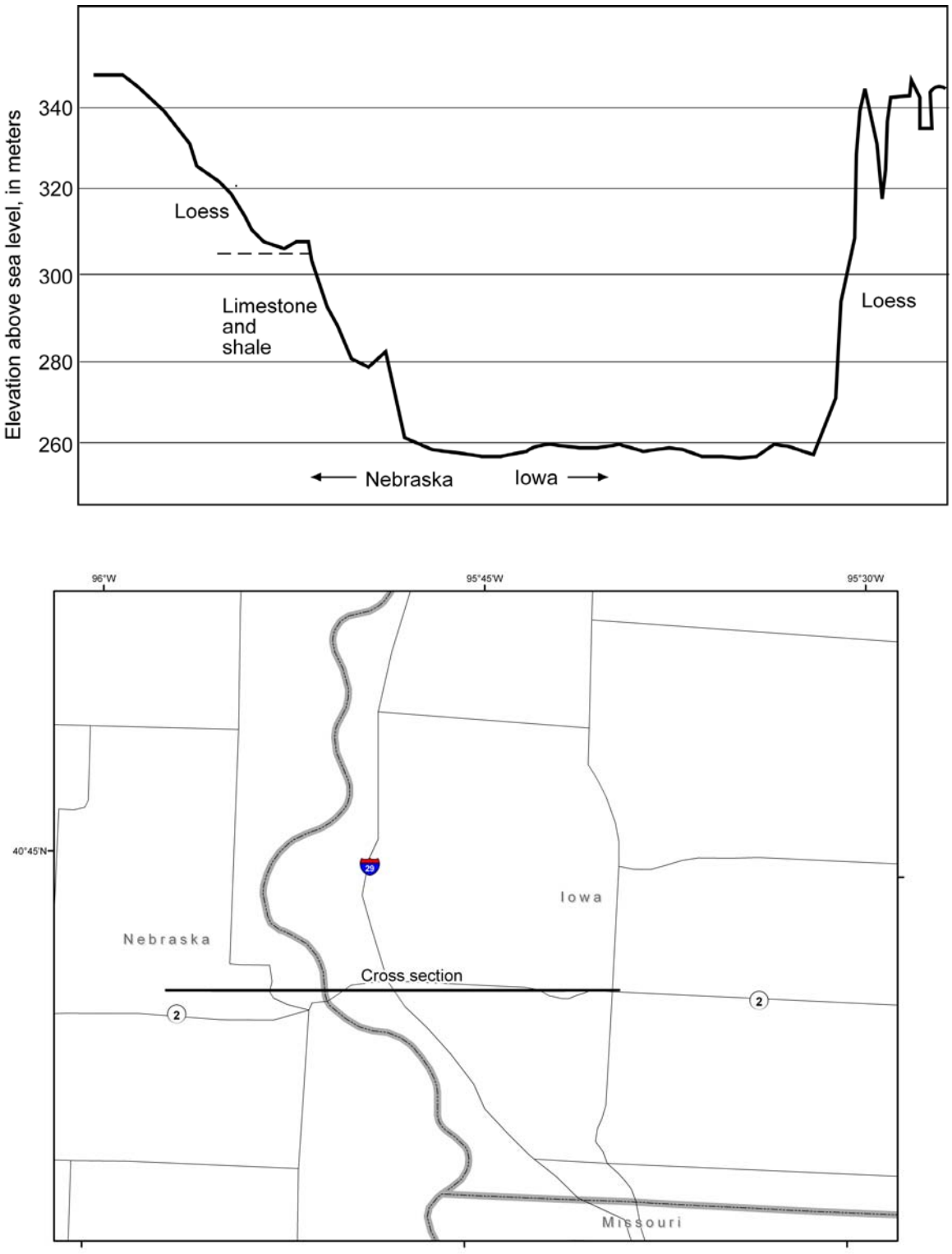
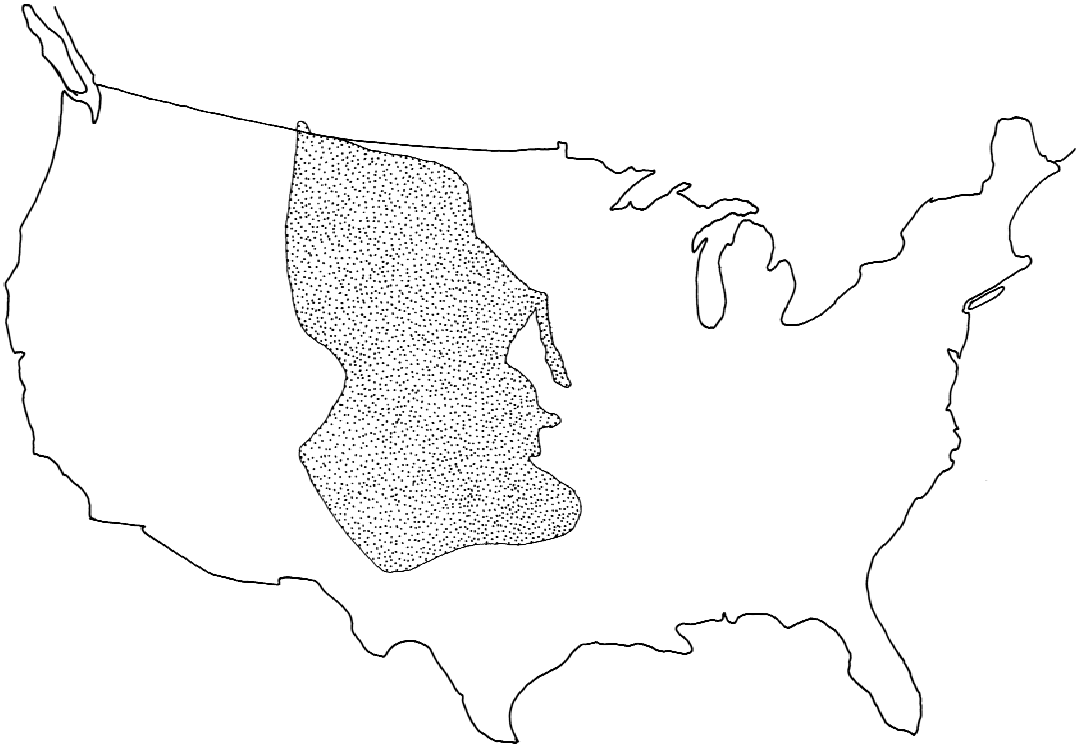


Figure 5. Cross section at Highway 2.



Map 2. Distribution of *Yucca glauca*.

The sediment of the Hills made the last few miles of its journey by wind, but the first hundreds of miles were by water. Frozen water created the sediments by grinding silicate-rich rocks from the continental shield into dust. As the ice melted, that glacial dust traveled by meltwater streams into the valley of the modern Missouri River, from which winds could lift it to its place in the budding Hills.

The Missouri continued to shape the Hills even after the sediments were in place. Until 1927, the stream was a web of channels more than a single river. That web shifted back and forth across the entire valley, cutting back the edge of the upland where the water encountered the piles of sediment. Karl Bodmer's paintings of the river bluffs,

made from the deck of a boat at river level in 1832, often show the Hills ending at abrupt cliffs at river's edge (figure 6).

Today the Missouri is contained in a narrow channel and has relatively little opportunity to cut at the edge of the Hills. This channel results from a series of huge reservoirs upstream coupled with laws that authorize maintenance of a single Missouri River barge channel.

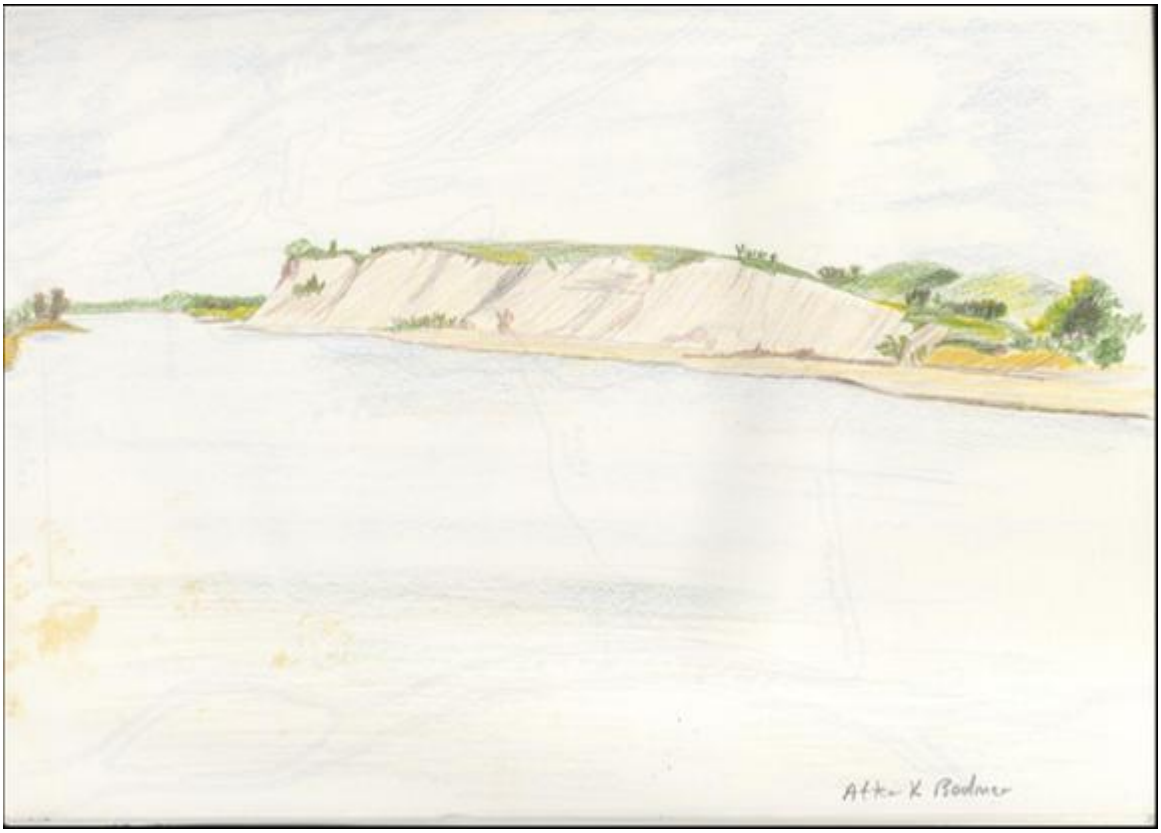


Figure 6. Truncated ridges along the Missouri River. Sketch by the author after a watercolor by Karl Bodmer.

In the 1910s, business leaders in Kansas City lobbied for, and won, Congressional approval for a six-foot-deep barge channel connecting Kansas City and St. Louis. World War I interrupted this construction, but in 1927 Congress authorized a six-foot channel all the way to Sioux City. This scheme was augmented in 1944. The two major dam-

building agencies of the federal government, the Bureau of Reclamation and the Army's Corps of Engineers, agreed on a single plan to build a series of dams upstream. These dams regulate flow of the river to provide water for barge traffic throughout the dry summer and autumn months.[17]

The 1944 compromise was named the Pick-Sloan plan in recognition of the work of Colonel Lewis Pick of the Corps of Engineers and William Sloan of the Bureau of Reclamation in negotiating the compromise that allowed their agencies to manage the river together. For all practical purposes, Pick-Sloan separated the Missouri River from the Loess Hills for the first time in ten thousand years. The navigation channel is maintained with a series of wing dikes, walls of rock that project from the river's banks and confine the water to a single narrow channel. Those dikes also keep the river from changing its course or cutting away at the outside of bends that come close to the Hills (figure 7).[18]

Today, in the wake of Pick-Sloan, if one stands at water level along the Missouri, it is difficult or impossible to see the Hills. The river has now cut its channel so deep that riverbank willows block most views. Similarly, it is difficult to see the river from the crest of the Hills, so deeply does it nestle into its channel. From many ridges, the only evidence of the river is the trees that grow on the far bank and the superstructure of bridges that cross over it. Karl Bodmer, if he were to travel the Missouri River today, would not be able to duplicate his paintings.

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[17] National Research Council, *The Missouri River Ecosystem* (Washington, D.C.: National Academy Press, 2002), 27.
[18] Interagency Floodplain Management Review Committee, *Sharing the Challenge: Floodplain Management Into the 21st Century* (Washington, D. C.: IFMRC, 1994), 38.

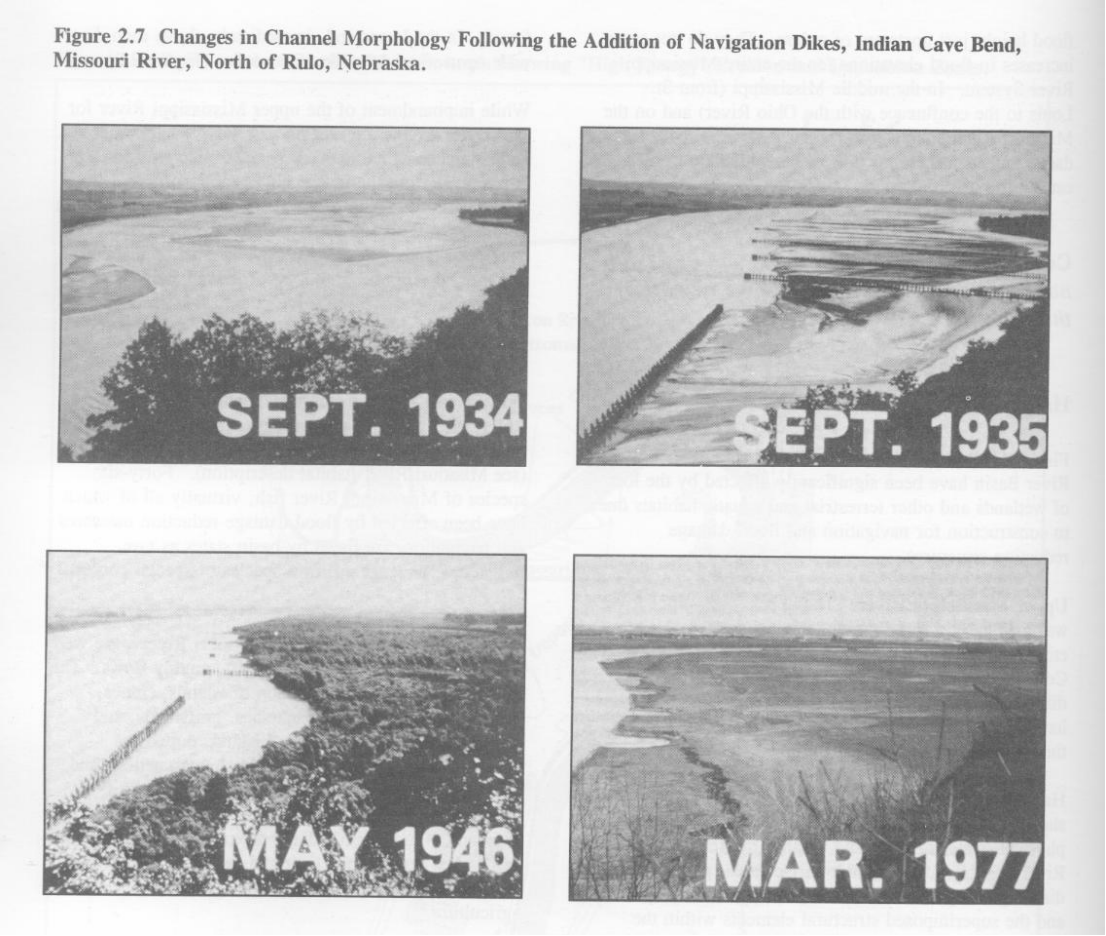


Figure 7. Changes in the channel of the Missouri River north of Rulo, Nebraska. Source: Public domain photo from Interagency Floodplain Management Review Committee, 1994, p. 54.

Following catastrophic flooding along the Missouri River in the summer of 1993, federal government policy toward the river began to shift in subtle ways. Big Muddy National Fish and Wildlife Refuge was created and authorized to buy parcels of river bottom land. This acquisition process has been painfully slow, however, for the Refuge does not have authority to use the power of eminent domain, and can only buy from willing sellers. Immediately following the floods, enough farmers were eager to sell that the Refuge acquired four large parcels. Since then, as the memory of the flood has faded, offers to sell have declined.

Refuge officials want to connect the river to the surrounding land by removing some of the levees that keep the river confined to its narrow channel. These efforts would allow the river to occasionally spread from bluff to bluff. Not only would this partially restore some of the natural cycles of erosion and deposition in the Missouri valley, it also would reduce the flooding of homes, industry and transportation infrastructure. The process of levee removal is impossible, however, unless every landowner in an entire levee district is willing to sell out. Until then, the Fish and Wildlife Service must support the maintenance of the levees

In addition, the federal government remains committed to a barge channel on the Missouri River, so cannot remove levees needed to support the channel. For more than a decade, a debate has raged through court cases, interagency committees, and the environmental-impact-statement review process over the relative importance of maintaining a barge channel versus the ecological benefits of allowing the Missouri to return to a more natural channel. Agricultural interests, which exert considerable political power in the Missouri Valley, have argued that barge service provides an alternative to railroads for moving grain to market and therefore holds down freight rates.

In spite of these powerful impediments, Big Muddy National Wildlife Refuge has enjoyed some success. By the mid-1990s, this group finally acquired enough land in Missouri that they could permit the river to cut a new channel, creating the first new island in the river since channelization began.

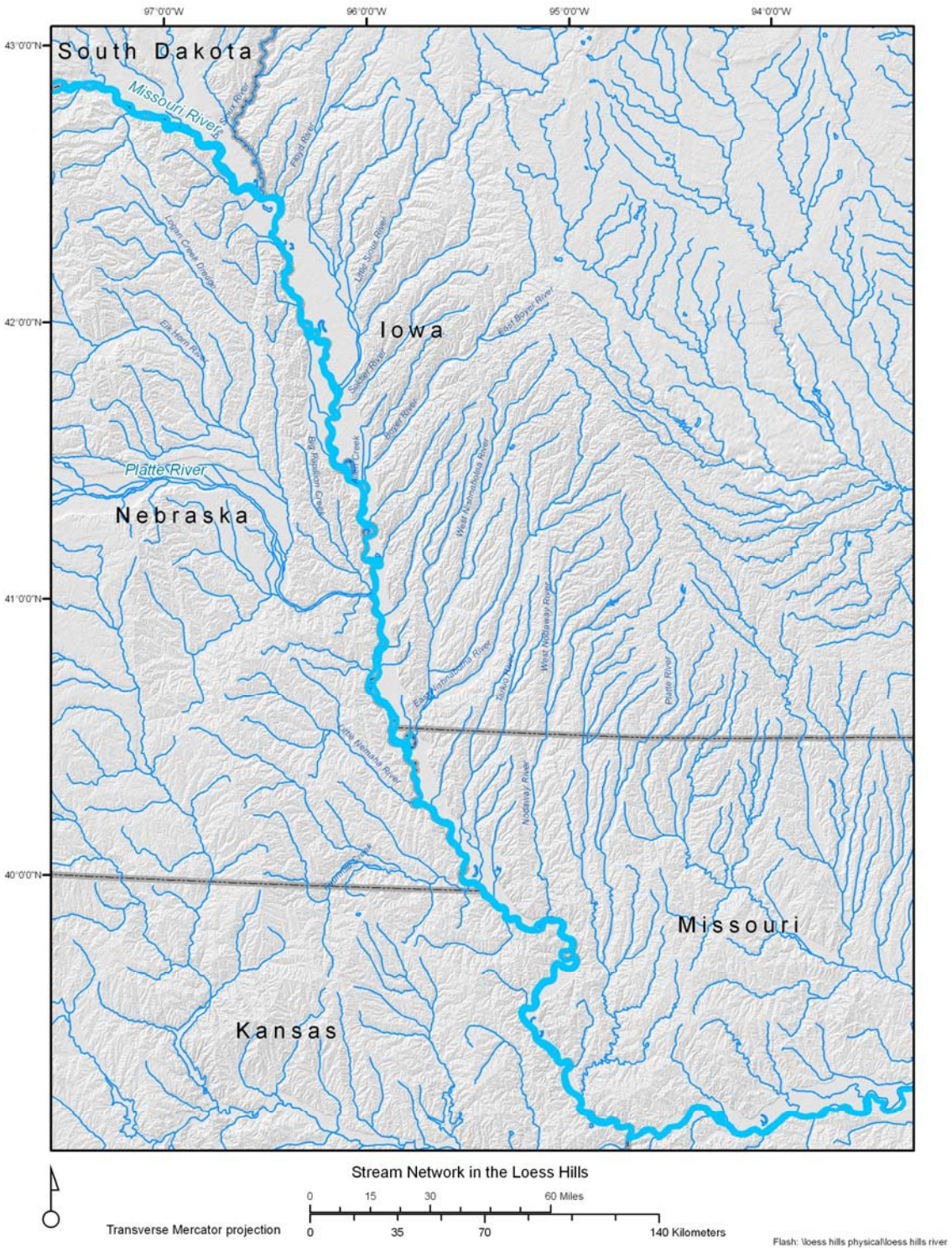
Smaller rivers also play a part in shaping the Hills (map 3). On the eastern side of the Missouri, the loess is cut by a southwest-flowing river every twenty miles or so. From the Platte at the southern end of the Hills (i.e., the Platte of Missouri, not the more

famous one that flows across Nebraska) to the Floyd at the north end, these streams cut deep gaps, the floors of which are just marginally above the height of the Missouri River floodplain. Because the Hills offer so little resistance to erosion, these streams are able to effectively cut the Hills into a series of discontinuous uplands, each about twenty miles long, from north to south.

In Nebraska, a similar pattern exists south of the Platte, where the Nemaha and the Big Nemaha cut through the hills en route to the Missouri. The Platte severs the Hills at Plattsmouth, just south of Omaha. Southeastward flowing streams north of the Platte generally drain into the Platte and not directly into the Missouri, so no major cuts exist north of Omaha. Instead, limestone and shale outcrops are more common on the Nebraska side and result in a loess plateau between the Platte and the South Dakota border.

The Hills are also carved by hundreds of intermittent creeks that flow furiously during a rainstorm or snow melt, but dry up just hours after the rain stops. I hiked along one such a creek in southern Iowa the day after a torrential overnight thunderstorm. Early in the morning, it was flowing high and carrying a load of gray sediment. By early afternoon it was down to a trickle at the bottom of a fifteen-foot deep gulley. These small streams, spreading like the veins of a leaf though the Hills, dissect the area and keep it a constantly changing landscape. New gulleys are cut, loess erodes, and deposition occurs along the banks to form small terraces.[19]

[19] Dean Thompson, Arthur Bettis, and David Benn, "Archaeology of the Loess Hills," *Iowa Conservationis*,(April 1984): 6-7.



Map 3. Stream network in the Loess Hills

Chapter 2. Loess Hills Biogeography

The Loess Hills are covered with a mosaic of vegetation that blends prairie, woodland, and farmland. This patchwork is revealed in the names of local parklands. Bluffwoods Conservation Area in Missouri and Fontenelle Forest Nature Center in southeast Nebraska announce the prevalence of forest. Five-Ridge Prairie and Sioux City Prairie, in the northern Hills just outside Sioux City, Iowa, call attention to prairie. The Hills are an ecotone, a boundary zone along which biomes meet and grade into one another.[1] They also lie at a border in time, as the long-term cooling during glaciation episodes and warming between glaciers causes vegetation and animal life to change.

Changing plants and animals

From the moment Lewis and Clark made the big right-hand turn of the Missouri River at what is now Kansas City, headed north, and encountered their "ball-pated hills," the Loess Hills have been seen as a place of prairie. However, this connection with grass is more complex and tenuous than Clark's clever label would suggest. The Loess Hills exist, and have always existed, on a sharp edge, balanced between prairie and woodland.

In their earliest days, the Hills were a cold and wet place, chilled and soaked by retreating glaciers. Then, between 10,000 and 18,000 years ago, they were covered by taiga forest. Studies of charcoal and pollen, the standard tools for reconstructing historic

[1] Peter Reich, David Peterson, David Wedin, and Keith Wrage, "Fire and Vegetation Effects on Productivity and Nitrogen Cycling Across a Forest-Grassland Continuum," *Ecology* 86, no. 6 (2001): 1703-1719.

vegetation, have indicated woodlands of white pine, blue spruce, aspen, and poplars growing immediately west and north of the Hills.[2]

Evidence of a colder and wetter Loess Hills also comes from fossils of land snails that inhabit only deciduous forest, where they feed on rotting leaves and other wastes. One such species, *Discus shimekii*, named for the Iowa geologist Bonhumil Shimek who contributed much to the modern understanding of Loess Hills historical geology, is found from Sioux City to Kansas City and in the loess mounds that border the Missouri River as far east as Jefferson City, Missouri.[3]

Only relatively recently has prairie come to the Loess Hills. The exact mechanism of this transition is in dispute, though the warming and drying following the last wave of glaciers obviously provided a setting conducive to prairie. Researchers have used stable isotope techniques to document historic plant combinations. These techniques take advantage of the fact that different types of plants use chemically different photosynthetic reactions. The two most common kinds of photosynthesis, called C3 and C4 for the number of carbon atoms involved in the reaction, capture and store atmospheric carbon differently. By measuring the relative amounts of different carbon isotopes in area charcoal deposits, one can determine the relative concentration of C3 and C4 plants in past environments.

Studies adjacent to the Loess Hills suggest that relatively modest warming as the glaciers melted, an increase of as little as one or two degrees Celsius, was enough to

[2] P. V. Wells and J. D. Stewart. "Cordilleran-Boreal Taiga and Fauna on the Central Great Plains of North America, 14,000 to 18,000 years ago," *American Midland Naturalist* 118, no. 1 (1987): 94-106; James Clark, Eric Grimm, Jason Lynch, and Pietra Miller. "Effects of Holocene Climate Change on the C4 Grassland/Woodland Boundary in the Northern Plains, USA," *Ecology* 82, no. 3 (2001): 620-636.
[3] Wells and Stewart, "Cordilleran-bordeal Taiga," p. 103.

increase the presence of C4 plants by forty percent.[4] C4 plants are generally warm-season grasses, and the C4 style of photosynthesis is better suited than is C3 to warm and dry climates in which atmospheric moisture is at a premium. So, as temperature increased, C4 plants such as big and little bluestem replaced the C3 plants such as trees, shrubs and cool season grasses.

Vertebrate fossils collected in the Loess Hills provide another window on the ecology of the Hills over time. The fossil mix includes distinctly northern species such as barren-ground muskox, caribou, arctic shrew, northern bog lemming, and yellow-cheeked vole. All of these species are at home on the boundary between tundra and boreal forest, not on the prairie-hardwood forest ecotone that currently describes the Hills. They are a mix of grazers and browsers, indicating that, until about eight thousand years ago, the Hills were covered with a mix of shrubs, trees, and grasses. Then the climate became considerably dryer and grassland began to displace forest.[5]

The transition of the Hills from woodland to grassland actually required more than retreat of the glaciers and a spell of global warming. The plants of a modern Midwestern prairie must have fire if they are to endure.[6] Prairie soils are rich and fertile. Moderate amounts of rainfall mean that nutrients are not leached away from surface layers. Because such soils could also sustain trees, fires are necessary if prairie plants are going to compete effectively.

An occasional prairie fire is sufficient to tip the ecological balance from trees to grass. Prairie plants are famously resilient in the face of fire. Above-ground growth is

[4] JamesClark, et al., "Effects of Holocene Climate," pp. 620-636.
[5] R. Sanders Rhodes and Holmes Semken, "Fossil Mammals of the Loess Hills," *Iowa Conservationist* (April 1984): 9.
[6] Michael Stambaugh, Richard Guyette, and Erin Murray, "Fire History at the Eastern Great Plains Margin, Missouri River Loess Hills," *Great Plains Research* 16 (Fall 2006): 150.

burned away, but roots survive and quickly set new growth. A woody tree, in contrast, is either killed outright by burning or, if its roots survive, loses many years of slowly grown wood.

A walk on a recently burned prairie reveals the biology of fire tolerance. The plants themselves are reduced to a crisp stubble three or four inches tall, so every step you take has a two-part landing: the initial contact with the stiff, hollow stub of burned stalks, then contact with the soil as the stalk collapses. It's a bit like walking on crusted snow that breaks through with each stride. Stubble reveals how prairie fire burns. The fuel and the fire are all up high on the plants, in the dried-out stems and leaves. Down at soil level, the fire has less fuel, so roots are not harmed. In spring, those roots send up new shoots.

The absence of trees in a recently burned prairie is striking. Cedars, often the first woody invader, burn back to nothing more than a dead trunk with a few charred twigs. I was struck by their absence when I hiked a burned prairie during a spring thunderstorm. The rain started to turn to hail when I was still a half-mile from my car. In a bit of a panic, I looked around for a tree to hide under and realized that the tallest plants within view were four-inch shoots on new growth prairie grasses. Luckily, the hail stopped before I was pummeled.

Modern prairie preservationists work valiantly to provide the fire that maintains Loess Hill prairies. Burning a prairie is hard work, requiring teams of people to cut firebreaks, watch the wind, and actually set the fire. Considerable risk exists for injury and property damage. While fire is the preferred tool of prairie maintenance, prairie

preservationists also resort to chainsaws and even bulldozers to eradicate woody vegetation.

Prairie fire can come from several sources. Lightning, in theory, can start prairie fire under a narrow set of conditions. A fuel load of dormant and dead grasses must be present and the lightning must occur in the absence of rain. In the Missouri valley, however, lightning is most common in the spring, when the prairie grasses are green and too wet to burn, or during drenching rainstorms.[7] In contrast, a long and well-documented history exists of Native Americans deliberately burning grasslands. They set fires to drive game animals to slaughter, to confound enemies, to clear forest understory for travel, to deny concealment to approaching enemies, to encourage growth of forage for game animals, and/or to make harvesting of nut crops easier.[8] Observers writing in the late 1800s, not long after the Indians were removed from the Hills, attribute burning of the prairies to the action of "careless (Indian) hunters."[9]

In a time before the prairie was divided by roads, plowed fields, and railroads, a prairie fire could burn for days and consume miles of terrain before being constrained by a major river, a shift in winds, or a rainstorm. The combination of one deliberate human action (the setting of fires) with the absence of another (no constructed fire breaks) allowed prairie to be so common in the Loess Hills landscape prior to Euroamerican settlement that Lewis and Clark could be struck so dramatically by the appearance of "ball-pated hills."

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[7] Joy Wolf, "A 200-year Fire History in a Remnant Oak Savanna in Southeastern Wisconsin," *The American Midland Naturalist* 152, no. 2 (2004): 208.
[8] Glenn Martin, "Keepers of the Oaks," *Discover*, (August 1996): 45-50.
[9] A. Warner and Company, *History of the Counties of Woodbury and Plymouth, Iowa* (Chicago: A. Warner and Company, 1890), 291.

The association of the Loess Hills with prairie landcover is deeply seated among some students of the area. This became particularly clear in a conversation with a biologist in northwest Missouri. When I asked a series of questions in which I spoke of the "Loess Hills," the biologist answered back about the "loess balds." For him, the very existence of the Hills was tied to their being a place of prairie, characterized by grass-topped mounds. He went on to exclude the terrain south of St. Joseph, Missouri, from his definition of Loess Hills because those places were forested even prior to Euroamerican settlement.

Prairie preservationists advocate the use of active management, including deliberately set fires, to steer the Loess Hills landscape back to prairie. Cornelia Mutel, for example, has lamented that "woody plant invasion will obliterate bluff prairies by the year 2060 if a proper prairie management plan is not established."[10] She is correct, of course, but prairie is only one of the many landcovers that the Hills have had over the last fifteen thousand years. It is also a particularly human-engineered landscape.

Just because the humans who burned the Loess Hills were Native Americans does not mean that the landscape was any less engineered. The ability of Native Americans to modify a landscape on a regional scale was equal to that of the Europeans who displaced them. The journalist Charles Mann, reporting on the work of Bill Woods, Clark Erickson, William Balee, and others, has described landscape modification projects of indigenous Americans on a vast scale, including thirty thousand square miles of drained and leveed floodplain in Bolivia and an area of deliberately enriched soils as big as France.[11]

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[10] Cornelia Mutel, *Fragile Giants* (Iowa City: University of Iowa Press, 1989), 107.
[11] Charles C. Mann, "1491," *Atlantic Monthly* (March 2002): 41, 52.

We should recognize that allowing the intrusion of shrub and forest species into the prairies of the Hills may be a perfectly natural process of succession, or as natural a process as can operate on a planet inhabited by six billion humans. The very idea of any natural succession leading to an ultimate and stable landcover for an area is now open to question. As the history of the Hills indicates, the direction of plant succession changes over time, as even small changes in climate force movement of boundaries between ecological regions. As well, since human occupation and use of the Loess Hills is almost as old as the Hills themselves, we have to consider this use as part of their long-term ecology.[12]

The argument advanced here, that Native Americans were capable of manipulating the landscape on at least a regional scale is hardly new. William Denevan set the terms of the debate by calling the idea that the North American landscape as first encountered by Europeans was, by definition, natural "the pristine myth."[13] Similarly, Donald Worster's "agroecological perspective"[14] recognizes that agriculture (of which Native Americans were avid practitioners) has shaped the land and its biota on a vast scale, while William Cronon has demonstrated how Native Americans engineered a landscape of open forest, more or less devoid of understory, throughout New England.[15]

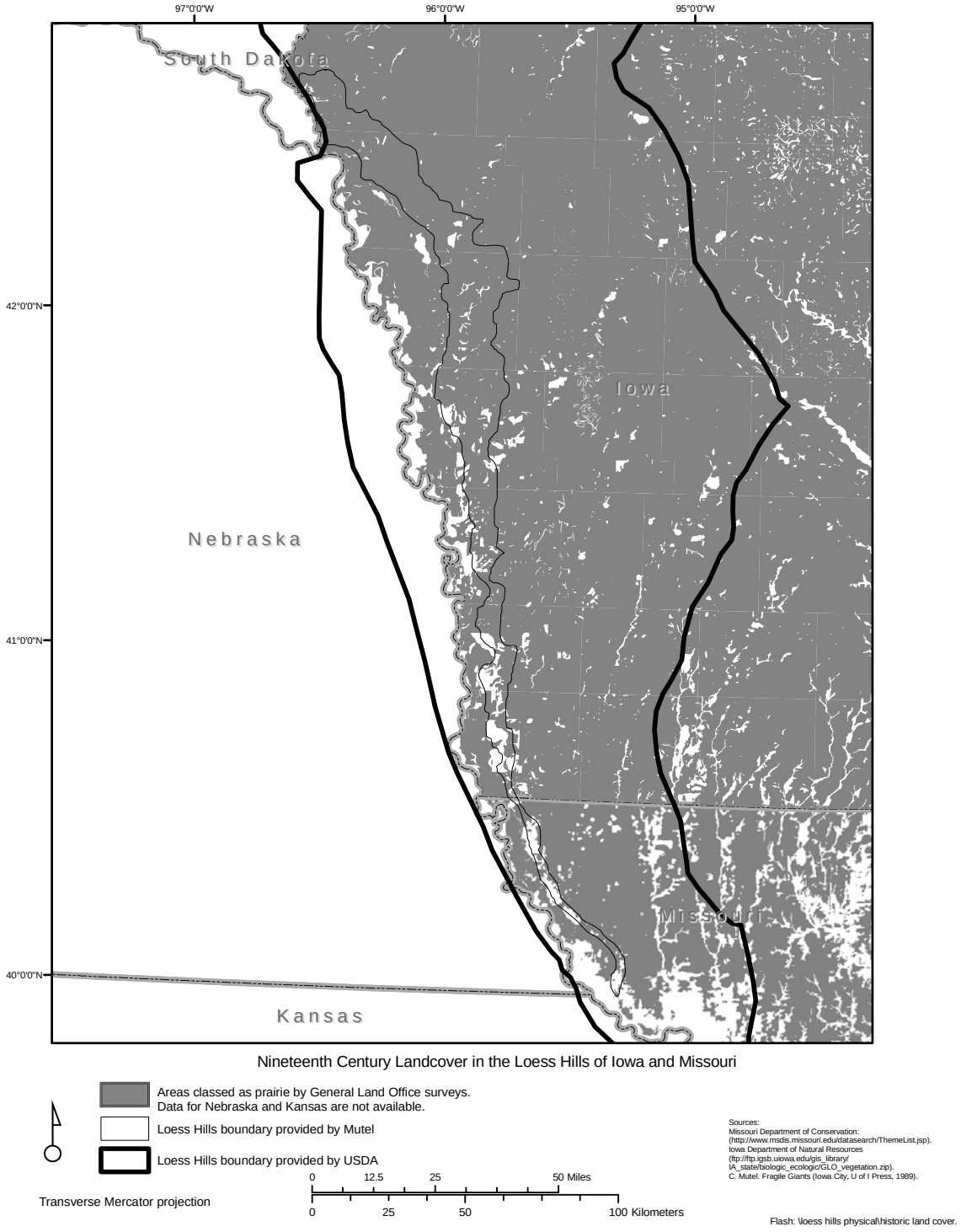
[12] Carl O. Sauer, "Grassland, Climax, Fire and Man," *Journal of Range Management* 3 (1950): 16-22.
[13] William Denevan, "The Pristine Myth: The Landscape of the Americas in 1492," in *American Environmental History*, ed. Louis Warren (Oxford: Blackwell, 2003), 5.
[14] Donald Worster, "Transformations of the Earth: Toward an Agroecological Perspective in History," *The Journal of American History* 76, no. 4 (March 1990): 1087-1106.
[15] William Cronon, *Changes in the Land* (New York: Harper Collins, 1983), 20.

Documenting the advance of woodland

Documentation on the extent of prairie in the Hills prior to Euroamerican settlement comes from a variety of sources. Field surveys using tree-ring data have established a slight decline in the incidence of wildfire coinciding with the arrival of Euroamerican farmers.[16] Notes and paintings made by fur traders and exploring parties suggest substantial prairie landcover. Lewis and Clark made thorough notes on their way upstream in 1804. Artists including Karl Bodmer, Titian Peale, and George Catlin, traveling through the Loess Hills on the Missouri River, brought back images of a landscape covered more in grass than trees.

The most precise historical record of Missouri Valley landcover from the early years of Euroamerican settlement comes from notes made by surveyors working for the U. S. General Land Office. Beginning in the early 1800s, these surveyors made their way across Missouri, and later Iowa and Nebraska, dividing what the federal government considered to be the public domain of into townships and sections on which settlers could establish their claims. Although these surveyors were primarily interested in marking corners of sections from which later farms and townsites could be defined, they were also charged with recording the landcover and availability of timber, since this information would help determine the value of particular tracts. These surveys suggest that, in the early 1800s, prairie was much more extensive in the Loess Hills than it is today (map 4, table 1).[17]

[16] Michael Stambaugh, et al., "Fire History," p. 150.
[17] Walter Schroeder, *Presettlement Prairie of Missouri* (Jefferson City: Missouri Department of Conservation, 1982), 10-11.



Map 4. Nineteenth century landcover in the Loess Hills Region.

Historic land cover of the Loess Hills		
	Land cover	Percent
Iowa	Prairie	89
	Non-prairie	11
Missouri	Prairie	52

Table 1. Nineteenth-century landcover in the Loess Hills.[18]

The notes taken by early surveyors are not always reliable, however, and are subject to definitional problems and observer bias. Speculation exists that areas containing a mixture of forest and grassland were often listed as grassland, leading to an overreporting of the presettlement prairie.[19] This bias is easy to imagine if we put ourselves in the place of a surveyor trained on the east coast or the Ohio valley, who first encounters the forest-prairie margin near the Missouri River. To such an observer, an area of broken woodland that is open enough to allow grasses to grow profusely on the forest floor might look so different from the wet and lush forests of his experience that it would demand a name other than forest or woodland.

Perhaps the most famous example of observer bias comes from the work of Major Stephen Long of the U. S. Army Corps of Topographical Engineers, the man who put the words "Great American Desert" on the map of the West. Long was from New Hampshire where his father earned a living making wooden barrels. His youthful experience was one of lush dense forests. In the late summer and fall of 1823, Long

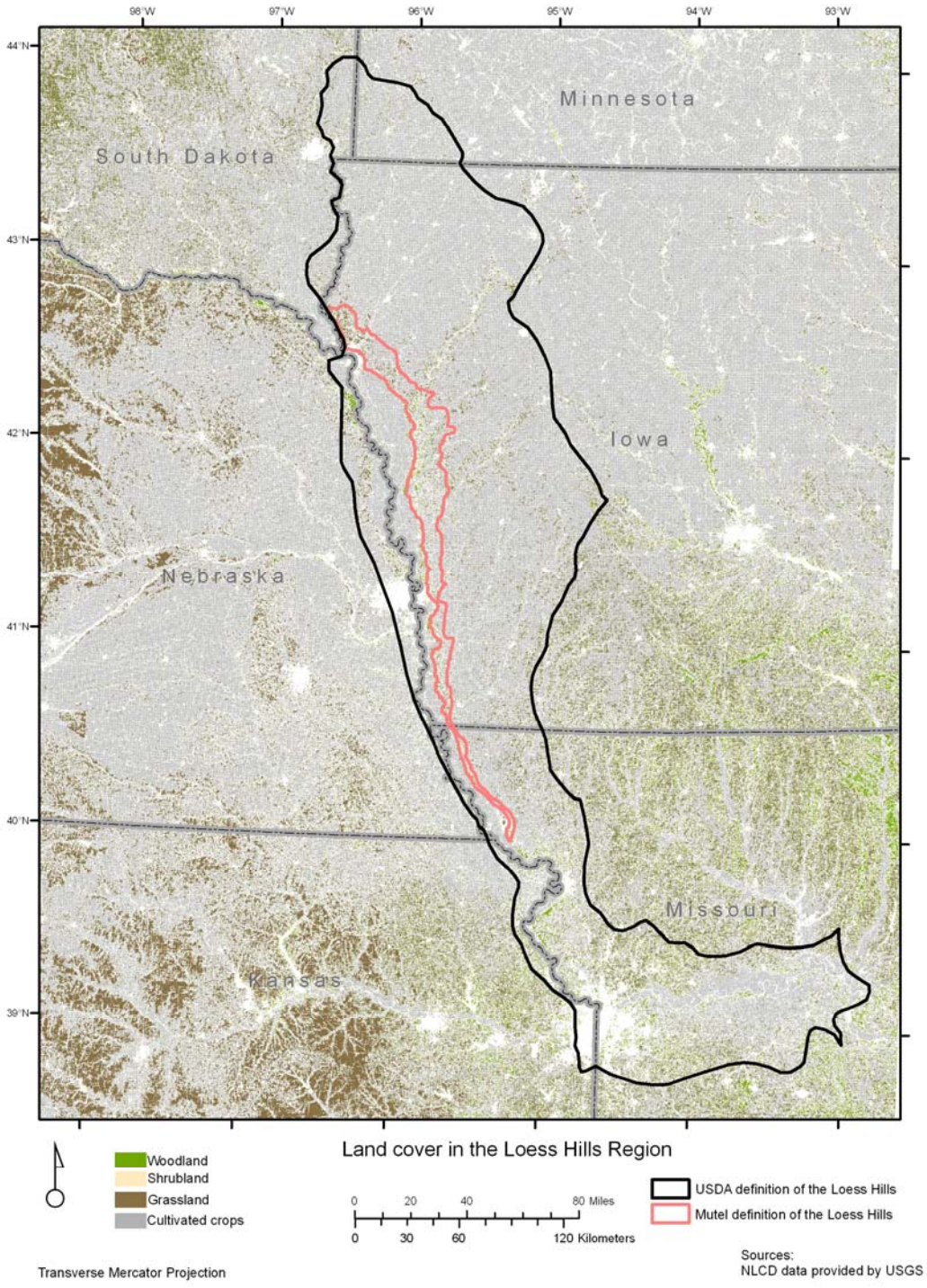
[18] Missouri Department of Conservation GLO data, online http://www.msdis.missouri.edu/datasearch/ThemeList.jsp (accessed May 2007); Iowa Department of Natural Resources GIS data repository, online at ftp://ftp.igsb.uiowa.edu/gis_library/IA_state/biologic_ecologic/GLO_vegetation.zip (accessed May 2007).
[19] Victorio Nuzzo, "Extent and Status of Midwest Oak Savannas," *Natural Area Journal* 6 (1985): 6-36. Reprinted in *Proceedings of the North America Conference on Savannas and Barren*, http://www.epa.gov/ecopage/upland/oak/oak94/proceedings/nuaao.html (accessed May 30, 2008).

traveled across the plains from Colorado to the Mississippi River. The trip was arduous. For much of the time he was lost and his party did not have enough food. It left Long with the feeling that the land he had crossed was, in fact, barren, despite the facts that it clearly supported grass, seasonal grazers such as bison, and Native American populations from whom Long feared attack.[20] The land was not empty or barren, but Long saw and labeled it that way. His famous map colored public policy for decades.

Today the Loess Hills are no longer dominated by prairie. Depending on how one chooses to define their limits (a topic that will be explored in greater detail in the next section), the Hills today are between 4.8 and 15.5 percent grassland (table 2, map 5). By comparison, grassland covers 14.0 percent of the area that borders the Hills for a hundred miles to the east and west. Even using a very restrictive definition proposed by Cornelia Mutel,[21] the Hills have only marginally more prairie than the surrounding area and almost twice as much deciduous forest (10.7 versus 5.9 percent) as the surrounding hundred miles of the Midwest.

The blend of biomes is immediately apparent on almost any walk or drive in the Hills. A climb in Iowa's Waubonsie State Park, for example, starts in a hardwood forest of elms, ashes, and hackberries at the edge of the Missouri River floodplain, then ascends through oak-hickory forest into burr oaks and scrub near the ridge top. One finally emerges into a tallgrass prairie at the crest of the ridges. Across the river in Kansas and Nebraska the change is even more dramatic. The Hills descend right to the banks

[20] Roger Nichols and Patrick Halley, *Stephen Long and American Frontier Exploration* (Newark: University of Delaware Press, 1980), 115-170.
[21] Mutel, *Fragile Giants*, p. 7.



Map 5. Land cover in the Loess Hills region.

Land cover in the loess hills		Within USDA MLRA definition of the Hills		Within the Mutel definition of the Hills		Within the entire map area	
NLCD Code	Description	Area in square km	Percent	Area in square km	Percent	Area in square km	Percent
11	Open water	573.6744	1.0	12.0141	0.3	4358.322	1.2
21	Developed open space	3428.601	5.9	211.2183	6.1	16489.8801	4.7
22	Developed, low intensity	1463.968	2.5	39.1599	1.1	4916.6145	1.4
23	Developed, medium intensity	418.5162	0.7	6.6357	0.2	1183.7349	0.3
24	Developed, high intensity	189.072	0.3	1.782	0.1	444.3975	0.1
31	Barren land, rock, sand, clay	28.3473	0.0	0.5697	0	183.5388	0.1
41	Deciduous forest	3427.424	5.9	374.1012	10.7	20722.9428	5.9
42	Evergreen forest	17.4519	0.0	6.2622	0.2	187.1721	0.1
43	Mixed forest	40.4325	0.1	0.5391	0	459.5706	0.1
52	Shrub, scrub	62.9784	0.1	1.0467	0	580.1598	0.2
71	Grassland, herbaceous	2807.3	4.8	538.3107	15.5	48992.0526	14.0
81	Pasture, hay	6626.219	11.4	402.2271	11.5	50238.3159	14.4
82	Cultivated crops	38142.33	65.7	1870.833	53.7	194489.145	55.7
90	Woody wetlands	517.7439	0.9	5.1057	0.1	3513.4902	1.0
95	Emergent herbaceous wetlands	324.9198	0.6	13.8096	0.4	2563.0722	0.7

Table 2. Land cover in the Loess Hills area. Source: U. S. Department of Agriculture National Land Cover Database (NLCD), calculations by the author.

of the Missouri River at places such as Indian Cave State Park in Nebraska and the Iowa Indian Reservation in Kansas, so a walk begins in a bottomland forest of willows and huge cottonwood trees, ascends through a mixed hardwood forest, and emerges in tallgrass prairie of big bluestem and Indian grass fringed by invading eastern red cedar.

A traveler by car can see the progression operating across a bigger expanse of landscape. In the southern Hills, extensive wooded areas are the norm. Missouri's Bluffwoods Conservation Area is an example: 2,344 acres of almost uninterrupted hardwood forest. By the time a motorist reaches Loess Hills Pioneer State Forest near Pisgah, Iowa, entire hillsides are covered with little bluestem, sideoats grama, and other mixed-grass prairie. Woodland is limited to relatively moist sheltered areas and creek valleys. Outside Sioux City, Iowa, in the northernmost Hills, the entire terrain, from creek valley to ridge line, is covered in prairie. Not only does woodland give way to prairie as one travels north, but the composition of the prairie also changes. In the

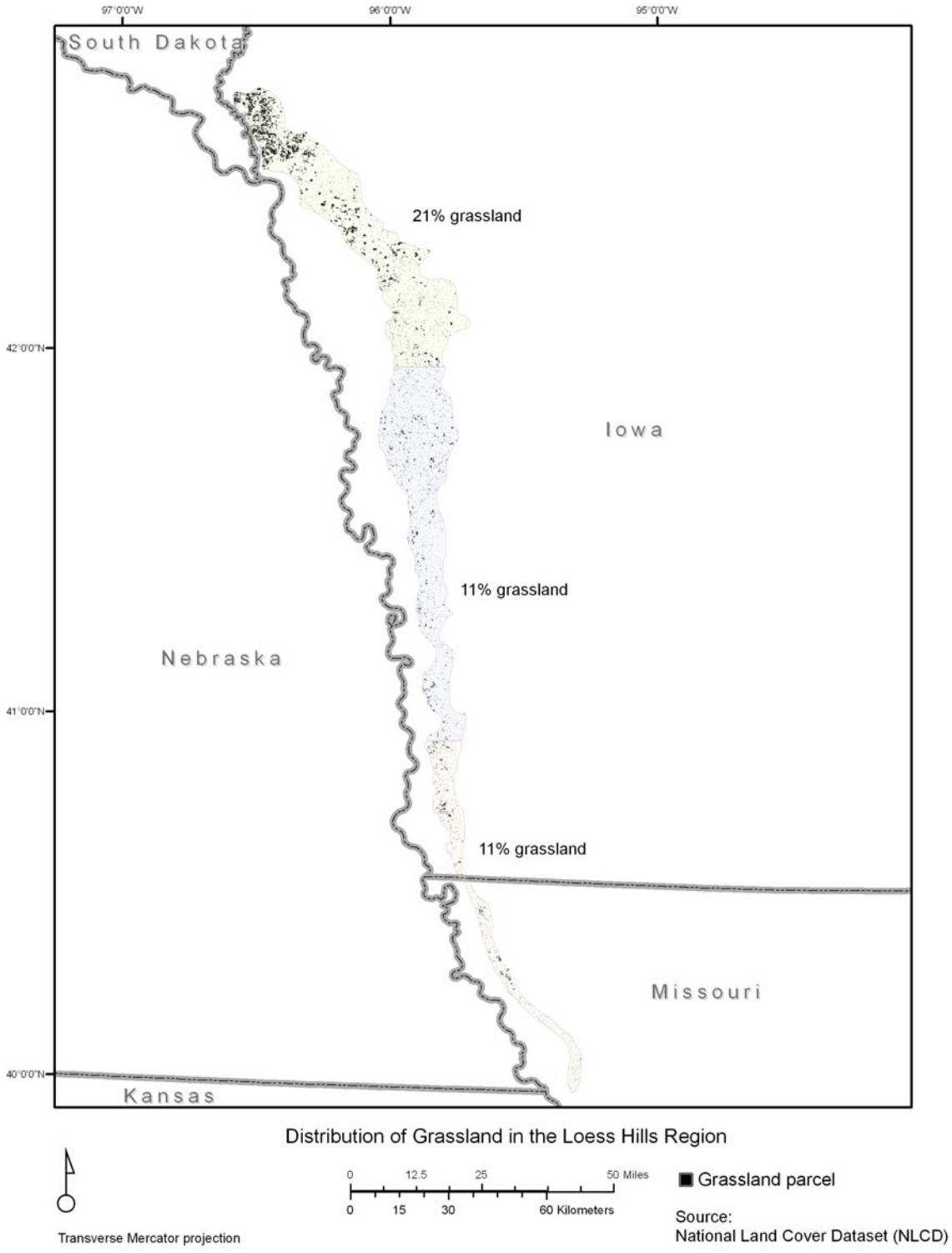
southern Hills, prairie fragments are likely to contain tallgrass species, including dramatic big bluestem that towers over a person's head. In the dryer northern Hills, the prairie tends toward the shorter and more drought-tolerant mixed-grass species.

Travelers' experience is echoed in vegetation maps. Again using a conservative definition of the extent of the Hills, map 6 shows that only eleven percent of the southernmost Hills (the thin band south of Omaha) are covered with grass. In the middle range, between 41° and 42°N, the band of Hills becomes wider but the fraction covered by grassland remains at eleven percent (table 3). North of 42°N, however, the amount of grassland percentage almost doubles, reaching twenty-one.

Conventional wisdom[22] and a drive through the hills suggest that grasslands are concentrated on the driest slopes of the Loess Hills, typically western and southern exposures that face the sun and the prevailing summer winds. Actual analysis of the landcover, however, done via tabulations for every cardinal direction of slope, reveals that grassland is distributed almost equally across all slopes (table 4).

The apparent discrepancy between conventional wisdom and observed result might possibly be resolved by looking at the distributions of slope and landcover at a larger scale. To accomplish this, the definition of the region must be expanded to include the Hills on the west side of the Missouri, a definition that will be presented in detail in the next chapter. This expansion removes a bias that exists when only using the east side of the river: on the east side of the valley, west-facing slopes (those that rise precipitously from the floodplain) are also the steepest slopes and therefore the ones

[22] Kenneth R. Robertson, Mark W. Schwartz, Jeffrey W. Olson, Brian K. Dunphy, and H. David Clarke, "50 Years of Change in Illinois Hill Prairies," *Erigenia: Journal of the Illinois Native Plant Society* no. 14 (November 1995): 41-52; Paul A. Johnsgard, *The Nature of Nebraska: Ecology and Biodiversity* (Lincoln: University of Nebraska Press, 2005), 65.



Map 6. Distribution of grassland in the Loess Hills region.

Distribution of landcover by subregion within the Loess Hills						
	Northern		Central		South	
Landcover	Cells	Percent	Cells	Percent	Cells	Percent
Water	8432	0.4	4243	0.2	3601	0.6
Low-density residential	123932	5.9	107640	5.9	40978	6.4
High-density residential	19231	0.9	19633	1.1	10963	1.7
Commercial	4709	0.2	2635	0.1	1150	0.2
Deciduous forest	154775	7.4	203225	11.2	129463	20.2
Evergreen forest	3038	0.1	4659	0.3	639	0.1
Grassland	434968	20.9	194803	10.7	71668	11.2
Pasture	205069	9.8	210432	11.6	110941	17.3
Row crops	1119375	53.7	1061741	58.5	270014	42.2
Wetland	11683	0.6	5941	0.3	627	0.1

Table 3. Distribution of landcover by subregion within the Loess Hills. Source: USDA NLCD.

Landcover by slope direction, percent				
	Direction of slope			
Landcover	North	East	South	West
Water	0.4	0.1	0.3	0.6
Low-density residential	5.6	6.2	6.4	5.9
High-density residential	1	1.2	1.2	1.1
Commercial	0.2	0.2	0.2	0.2
Deciduous forest	15	10.7	6.5	10.8
Evergreen forest	0.2	0.2	0.2	0.1
Grassland	16.1	15.3	16.2	14.4
Pasture/Hay	10.8	13	11.7	10.6
Row crops	49.9	52.3	56.7	55.5

Table 4. Landcover and direction of slope in the Loess Hills region. Calculations by the author from USGS elevation data.

most likely to suffer mass wasting and landslides that would remove trees.

Surprisingly, the expanded approach confirms the earlier result: grassland is distributed relatively equally across all aspects. A south or southwest-facing slope is no more likely to be covered in grass than an east or northeast-facing one (table 5).

Area and aspect of grassland in the Loess Hills		
Direction of slope (degrees)	Area in sq. mi.	Fraction of the area of indicated aspect covered with grassland
Flat	9	7
North (337.5-22.5)	39	20
Northeast (22.5-67.5)	48	20
East (67.5-112.5)	68	19
Southeast (112.5-157.5)	41	19
South (157.5-202.5)	51	20
Southwest (202.5 - 247.5)	60	21
West (247.5-292.5)	36	10
Northwest (292.5-337.5)	76	37

Table 5. Grassland in the Loess Hills. Source: U. S. Department of Agriculture National Land Cover Database (NLCD), calculations by the author.

However, north and east-facing slopes are somewhat more likely to be forested than those oriented to the South or West (table 6). Twenty to twenty-eight percent of the north and east-facing hills are covered with trees, while only fourteen to eighteen percent of the west and south-facing hills are wooded.

Area and aspect of woodland in the Loess Hills		
Direction of slope (degrees)	Area in sq. mi.	Fraction of the area of indicated aspect covered with woodland
Flat	7	5
North (337.5-22.5)	55	28
Northeast (22.5-67.5)	61	25
East (67.5-112.5)	73	20
Southeast (112.5-157.5)	34	16
South (157.5-202.5)	36	14
Southwest (202.5 - 247.5)	42	15
West (247.5-292.5)	70	18
Northwest (292.5-337.5)	49	24

Table 6. Woodland in the Loess Hills. Source: U. S. Department of Agriculture National Land Cover Database (NLCD), calculations by the author.

Before fully accepting the argument that woodland intrusion into the prairie is concentrated on the north and east slopes, the role of agriculture needs to be considered. Row crops are much more common on south and west-facing slopes than they are on north and east-facing hills (table 7). Both cropland and woodland are displacing prairie, with crops accounting for considerably more acres of lost prairie than woods do.

Area and aspect of cropland in the Loess Hills		
Direction of slope (degrees)	Area in sq. mi.	Fraction of the area of indicated aspect covered with row crops
Flat	85	66
North (337.5-22.5)	63	33
Northeast (22.5-67.5)	85	35
East (67.5-112.5)	138	38
Southeast (112.5-157.5)	91	42
South (157.5-202.5)	112	43
Southwest (202.5 - 247.5)	118	42
West (247.5-292.5)	151	40
Northwest (292.5-337.5)	76	37

Table 7. Cropland in the Loess Hills. Source: U. S. Department of Agriculture National Land Cover Database (NLCD), calculations by the author.

Agriculture in the Hills exists along what might be described as an ecotone between row crops and rangeland (stretching the concept to apply to human-engineered landscapes). East of the Hills are the magnificent corn and soybean fields of Iowa and northern Missouri, farmland of such dramatic productivity (and beneficiary of such enormous federal subsidies) that it costs in excess of $4,000 per acre.[23] To the west is the rangeland and pasture of the plains where corn and soybean farming increasingly demands irrigation and winter wheat replaces the summer grain crops.

[23] Michael Duffy and Darnell Smith, *2007 Farmland Value Survey, File C2-70* (Ames: Iowa State University Press, 2008), 1.

In the Loess Hills, the eastern and western regimes come together. Corn and soybeans grow in the bottoms, on flat patches of ridgetop, and on gently sloping or terraced fields. Hillsides are typically used for pasture or hay fields, but orchards are common, too, taking advantage of well-drained loess soils and steep slopes that protect trees from early frosts that tend to be most severe in bottomlands.[24]

A note on methods

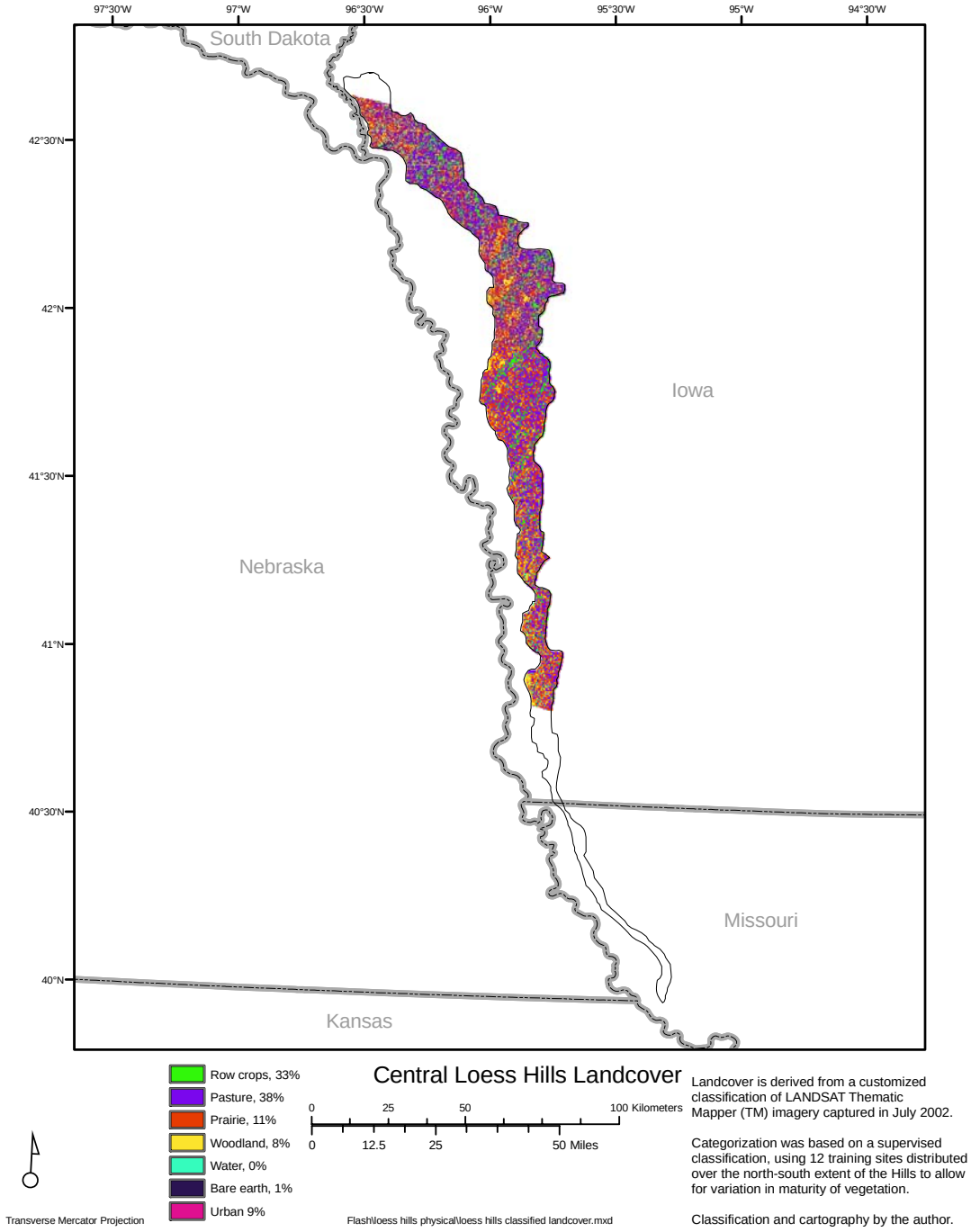
The data on land cover used here are a product of the National Land Cover Database (NLCD),[25] published by the U.S. Geological Survey. They are developed from satellite images, using classification techniques that have been refined for decades. Tabulations for the two alternative definitions of the Loess Hill and the surrounding region were produced by extracting those regions from the overall database, counting the number of 30 x 30 meter cells of data for each land use type, and converting these areas to percentages.

Although generally reliable, satellite data have weaknesses when applied to grasslands. Part of that weakness comes from the NLCD trying to tabulate both land use and land cover, fundamentally different phenomena. Suppose, for example, a farmer owns a parcel of prairie. This piece of land should be classified as NLCD class 71, herbaceous grassland. Yet if this farmer turns her cattle out on the prairie (a fairly typical farming practice[26]) that land should be coded as pasture, NLCD class 81. Classifications

[24] Clarence W. Olmstead, "American Orchard and Vineyard Regions," *Economic Geography* 32, no. 3 (July 1956): 189-236.
[25] Mid-resolution Land Characteristics Consortium, "National Land Cover Datbase," http://www.mrlc.gov (accessed June 23, 2008).
[26] Walter M. Kollmorgen and David Simonett, "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas" *Annals of the Association of American Geographers* 55, no. 2 (June, 1965): 260-290.

based on satellite data cannot discern whether our farmer's cattle have begun to graze on a particular parcel. Over time, of course, extensive grazing will change the composition of plants on that land, and satellite images will more reliably be able to discern prairie from pasture.

To double-check the applicability of national landcover classifications to the unique mix of landcover in the Loess Hills, I obtained Landsat imagery of the area--a raw satellite photograph separated into seven distinct spectral bands--and did my own classification. In this analysis, called supervised classification, I first identified locations in the study area that represent the types of landcover that are of interest. Software then classifies the entire image based upon how well any location conforms to the unique combination of visible and invisible radiation that is reflected from the test sites. Using this method, I found that prairie accounts for 11 percent of landcover in the central part of the Hills for which imagery was available and pasture another 38 percent (map 7). Since the NLCD data found a somewhat lower value of 26 percent of the Hills covered with either grassland or pasture, they seem, if anything, a conservative estimate. My customized analysis also provides opportunity to check the measure against actual landcover by randomly selecting points from the area-wide classification for comparison. This procedure suggests that my classification techniques are successful at distinguishing between grassland and woodland, but less so at distinguishing grassland, prairie, and row crops from one another (table 8).



Map 7. Central Loess Hills landcover derived from Landsat imagery.

Accuracy assessment of landcover classification from LandSat imagery	
Landcover derived from supervised classification of LandSat imagery	Actual land cover determined from NAIP imagery at random test points
22 - pasture	pasture
21 - row crop	riverbank grassland
23 - prairie	woodland
22 - pasture	row crop
21 - rowcrop	grassland
25 - woodland	woodland
22 - pasture	pasture/hayfield
22 - pasture	pasture/hayfield
23 - prairie	pasture/hayfield
23 - prairie	pasture/hayfield
25 - woodland	woodland
22 - pasture	pasture/hayfield
25 - woodland	pasture/hayfield
21 - rowcrop	scrub/woodland
22 - pasture	pasture
21 - rowcrop	row crop
25 - woodland	woodland
21 - rowcrop	grassland (abandoned row crop field)
26 - urban	pasture/hayfield
25 - woodland	woodland

Table 8. Accuracy assessment of land cover characterization in the central Loess Hills. Source: authors tabulations from USGS data.

Chapter 3. Defining the Hills

The exact location of the Loess Hills is both clear and unclear. A traveler heading east across the middle reach of the Missouri River, the part that flows in a roughly north-south direction, will immediately recognize their western edge in Iowa and Missouri. They rise abruptly from the floodplain, forming a clear border. Similarly, a traveler along Interstate 29 will see the edge of the hills out her eastern car window for much of a drive from northern Missouri to Sioux City, Iowa. The northern, southern, and especially the eastern boundaries are much more debatable. If our traveler were to proceed eastward into the hills no more than a few dozen miles, the hilly terrain would be left behind and the loess replaced by the rich, dark loams of Midwestern farmland. Simultaneously, the woods and prairies of the hills give way to row crops. Another border has been crossed, but this time the exact position is less obvious.

An intuitive approach to regional boundaries, although useful, cannot suffice for mapping, environmental protection planning, or government policy. This chapter presents a more systematic effort to delimit the Hills. Such a definition is a prerequisite for serious research. It is also important as public policy debates over use of the region intensify. At the state and local level, the Loess Hills are becoming a region for economic development efforts by a variety of agencies. These debates were accelerated when federal legislation compelled the National Park Service to study the feasibility of creating a unit of the park system there.[1]

[1] H.R. 3423, Interior Appropriations, which became Public Law 106-133, Nov. 29, 1999.

The shrinking hills

Government and scholarly definitions of the extent of the Hills have contracted over the last century and a half. In the late nineteenth and first two-thirds of the twentieth centuries, the term was applied to wide swaths of eastern Nebraska and northern Kansas, as well as the Iowa-Missouri core.[2] The apex came in the 1960s, when the U. S. Department of Agriculture published a sweeping definition that places the Loess Hills in parts of six states. Thereafter, more restrictive definitions came into fashion, gradually limiting the Hills to a narrow band, sometimes contained entirely within the state of Iowa.

The discussion that follows will be roughly chronological, beginning with some of the broader early definitions and proceeding toward modern depictions. It will examine separately the changes in definitions expressed by government agencies, scholars, and economic development associations.

Government definitions

The U. S. Department of Agriculture's Natural Resource Conservation Service published a widely cited regional definition in 1965. It identified an Iowa-Missouri Deep Loess Hills Major Land Resource Area (MLRA) that extends from Minnesota to central

[2] C. A. White, *Report of the Geological Survey of the State of Iowa* (Des Moines: Mills and Co., 1870): 105; B. F. Bush, "Notes on the Mound Flora of Atchison County, Missouri" *Missouri Botanical Garden Report* 1 (1895): 121-134; Harold Hopkins, "Native Vegetation of the Loess Hills-Sandhills Ecotone in Central Nebraska," *Transactions of the Kansas Academy of Science* 55, no. 3 (1952): 267-277; John Frye, Norman Plummer, Russell Runnels, and William Hladik, "Ceramic Utilization of Northern Kansas Pleistocene Loesses and Fossil Soils," *Bulletin of the State Geological Survey of Kansas* 82, no. 3 (Oct. 1949): 49-124; George David Koch, "The Loess Hills Region of Northeastern Nebraska; A Geographic Study of the Land Utilization and Attending Conservation Programs" (Ph.D. diss., University of Nebraska, 1938), 5.

Missouri and from up to fifty miles east of the Missouri River and ten miles west, including parts of Nebraska and Kansas (map 8). [3]

MLRA definitions combine information on soils, natural vegetation, climate, and agricultural potential into a single classification. It is an amalgamation of a variety of factors related to crops, as one might expect from a government agency devoted to agricultural policy. The MLRA definition includes, for example, the rolling hills along the Missouri River east of Kansas City. These hills are a line of limestone bluffs blanketed by deep loess deposits, and are home to orchard agriculture similar to that found in the Loess Hills core. The entire region is characterized by small farm fields interrupted by woodland and pasture. Agriculturally speaking, it is an internally consistent place and one distinct from the dryland corn and soybean agricultures immediately to the east and from the irrigated grains, winter wheat, and grazing agriculture to the west. Although useful, a focus on plants is by no means the only perspective possible and appropriate for the Hills. For example, the MLRA definition does not encompass the look of a landscape and thereby distinguish between the most dramatic Loess Hills immediately adjacent to the Missouri River and the less dramatic uplands back from the river's edge.

The National Park Service, an agency of the U. S. Department of the Interior, defined a much narrower band of Loess Hills (map 9). The Park Service definition was constrained by Public Law 106-113 that obliged the agency to limit its consideration to Iowa. Still, even with this legality taken into account, the contrast with the

[3] U. S. Department of Agriculture, Natural Resource Conservation Service, *Major Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin* (Washington D. C.: USDA, 2006), vii.

Map 8. U.S. Department of Agriculture definition of the Loess Hills.

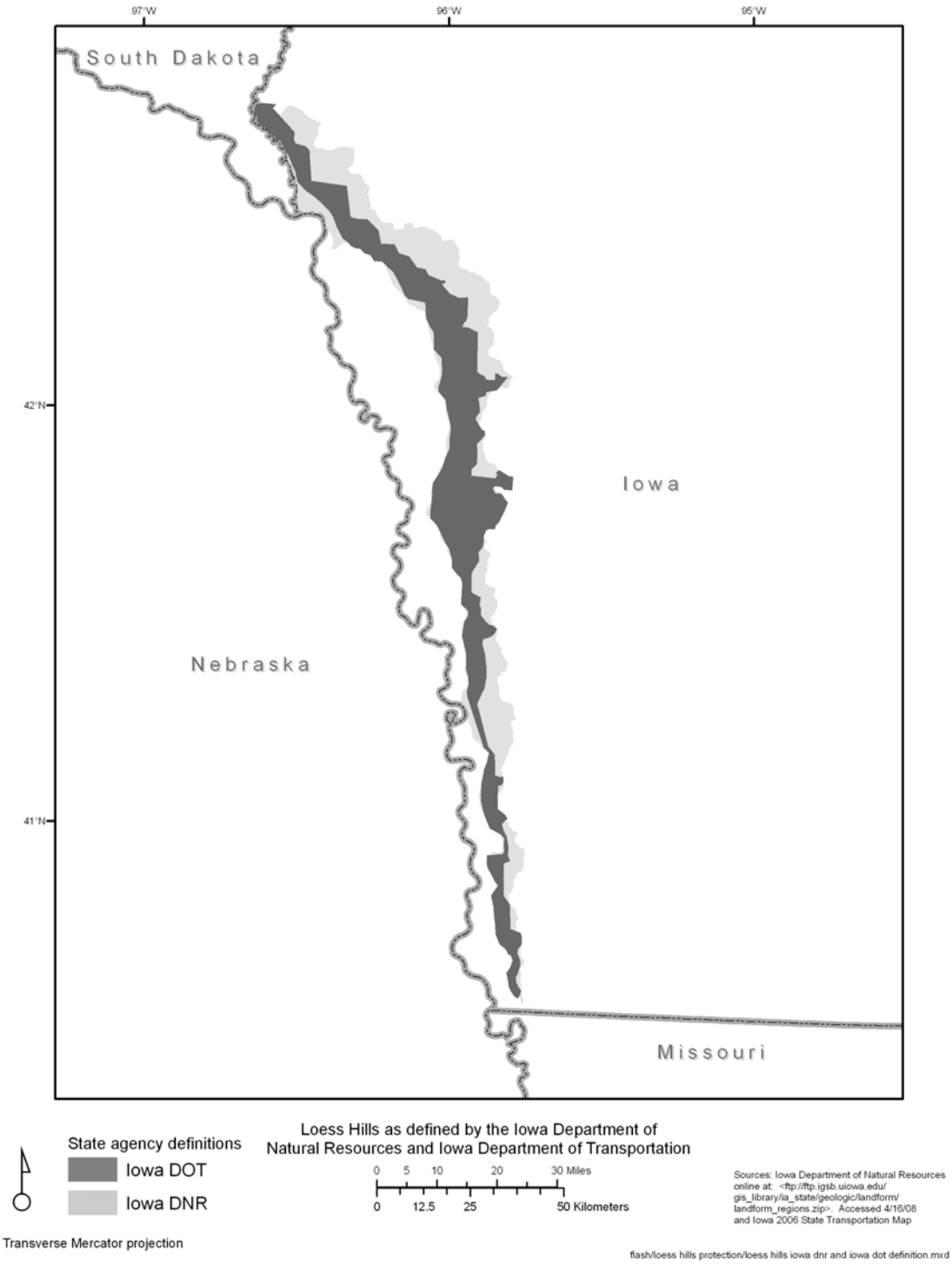
Department of Agriculture definition is striking. Areas that are covered with deep loess deposits, but which do not show dramatically steep terrain, are excluded from the Park Service definition.

Recent maps of the Hills published by state government agencies within Iowa also use a restrictive definition (map 10). When these maps are compared with the MLRA and older maps, a reader begins to wonder about the underlying assumptions and purposes of the various cartographers. Since the Hills themselves are a constant, the different delimitations obviously are products of different political purposes and interests. As such, they are case studies of a larger phenomenon known as the social construction of nature. This umbrella term covers a variety of different perspectives on the physical reality of places. Theorists argue convincingly that no place exists apart from human understanding. The Loess Hills from this perspective are a purely human definition imposed on the landscape by individuals who have particular interests they wish to serve. The resulting definitions, therefore, are as much a product of those interests as of the landscape itself.[4]

In the particular maps discussed so far, the definitions offered by the different organizations can be traced back to the interests of their constituencies. Such biases exist even within the federal government. The Department of Agriculture, which focuses on productive resources and the conditions that make a particular soil or terrain conducive to particular kinds of forestry or farming, defines the Loess Hills as a band suited to a mixed agriculture of forestry, orchards, vineyards (on the sloping, well-drained soils), grazing, and row crops.

[4] David Demeritt, "What is the 'Social Construction of Nature'? A Typology and Sympathetic Critique," *Progress in Human Geography* 26, no. 6 (2002): 767-690.

Map 9. Loess Hills as defined by the National Park Service.



Map 10. Loess Hills as defined by the Iowa Department of Natural Resources and the Iowa Department of Transportation.

The National Park Service, in contrast, would favor a compact region so as to yield a park that is easy to explain to the public and to administer. A definition that crosses major rivers, state lines, or types of terrain would not suit its interests. Similarly, expansiveness would not match the interests of park promoters, including editors at the influential *Des Moines Register* newspaper. By championing the Loess Hills as a distinctly Iowa landform, these people hope to raise state identity and promote economic development.[5]

Some of the differences between the boundaries offered by the U. S. Department of Agriculture and the Iowa Department of Natural Resources can be attributed to differing geographical perspectives. In particular, the Iowa DNR has responsibility for park and recreation planning and the USDA does not. The Iowa DNR's definition, as a result, is obviously informed by consideration for where the most dramatic Loess Hills scenery can be found.

Scholarly and economic development definitions

Three regional agencies and outside observers have proposed boundaries for a Loess Hills region even more divergent than the ones sampled so far. Consider first a rendition by the Nebraska Loess Hills Resource Conservation and Development Council, a regional planning agency supported by the U. S. Department of Agriculture. Its Nebraska Loess Hills region extends over fifty miles west of the Missouri River from just north of Omaha to the South Dakota border (map 11).[6] Geographer George Koch,

[5] Peggy Petrzelka, "The New Landform's Here! The New Landform's Here! We're Somebody Now!! The Role of Discursive Practices on Place Identity," *Rural Sociology* 69, no. 3 (2004): 386-404.
[6] Nebraska Loess Hills Resource Conservation and Development Council web site. Online at http://www.nercd.com/region/c/11/ Accessed Oct. 1, 2008.

writing a dissertation on destructive farming practices in the 1930s, was more expansive still (map 12). His Nebraska Loess Hills region extends a hundred miles west from the Missouri River and follows the Nebraska-South Dakota border for over sixty miles.[7]

Cornelia Mutel, whose 1989 book *Fragile Giants* is the only broad natural history of the Loess Hills region in print, offered still another variation on the region (map 13). She first limited her definition of the region to the east side of the Missouri River, excluding Nebraska. East of the river her northern border is less aggressive than that of the USDA. But she does extend her definition some forty miles south of Iowa, adding in a narrow band of hills in northern Missouri. Mutel's lines yield a very thin Loess Hills region, corresponding closely to the scenic hills as defined by the National Park Service

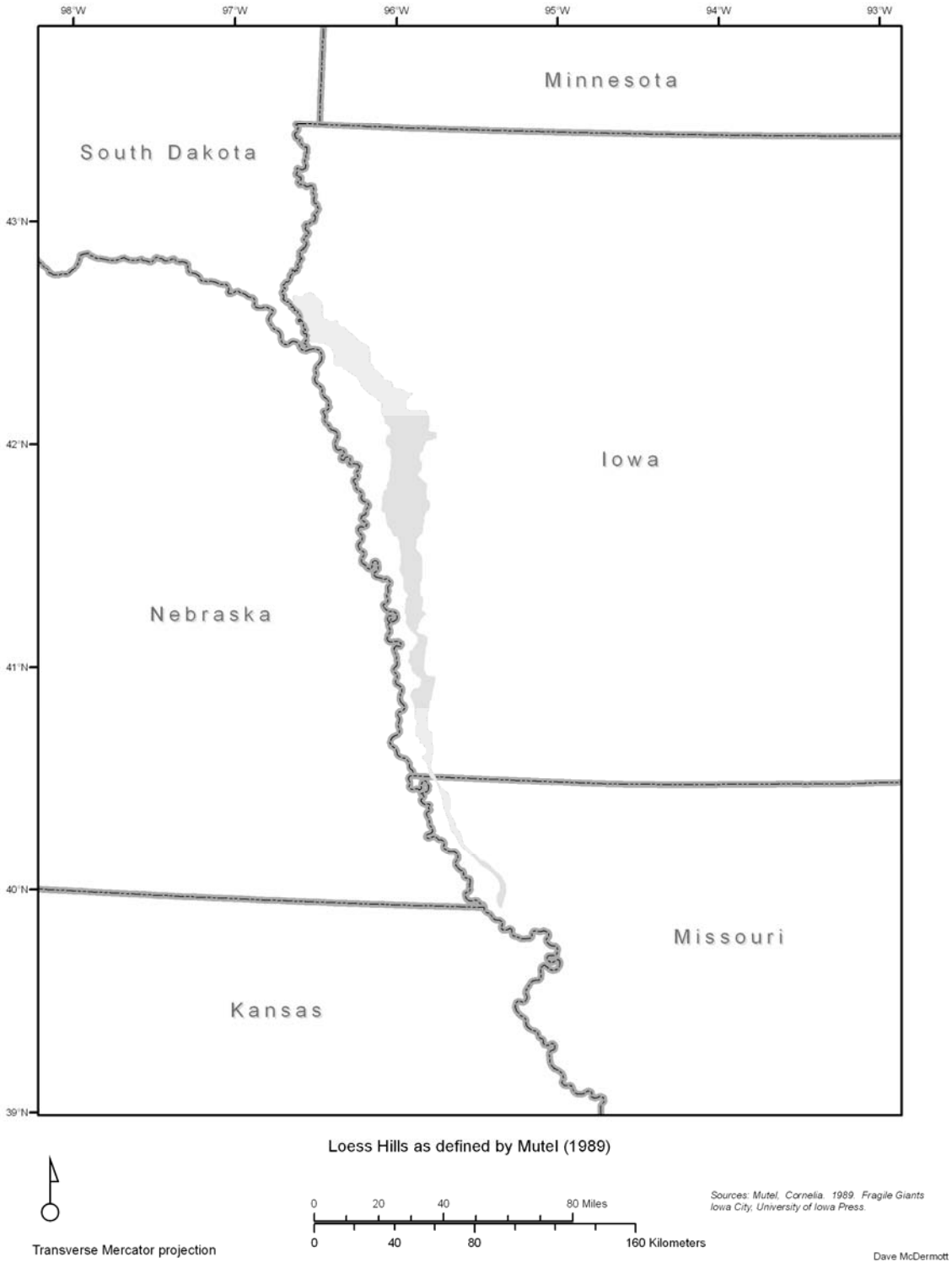
[7] Koch, "The Loess Hills Region," 5.

and the Iowa Department of Natural Resources[8] (map 13).

Map 11. Loess Hills as defined by the Nebraska Loess Hills Resource Conservation and Development Council.

[8] Cornelia Mutel, *Fragile Giants* (Iowa City: University of Iowa Press, 1989), 7.

Map 12. Loess Hills as defined by Koch



Map 13. Loess Hills as defined by Mutel.

The presence of conflicting definitions, some serving specific political or economic agendas, is not sufficient to deny the physical reality of the Loess Hills. That reality, which the photographs and maps in this book have attempted to demonstrate, is obvious to anyone who travels Interstate 29, and is not undermined by disputes over exact boundaries. The applicability of social-construction thinking to an understanding of the Hills can go too far. Although it is useful to consider how the political or economic interests of observers can color our observations, one should not despair from making observations.

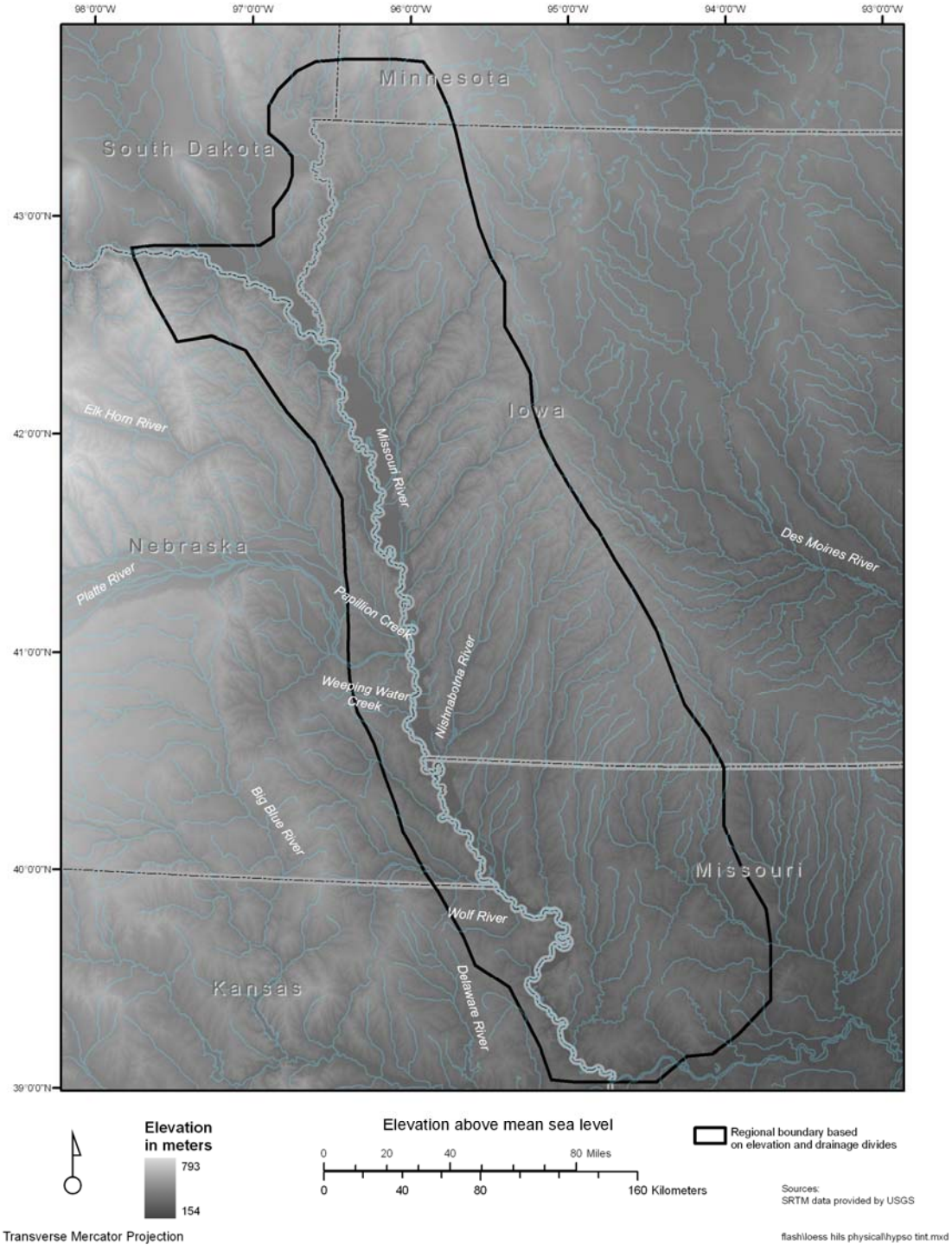
Given that a person's definition of the Hills is going to be a function, at least in part, of the perspective (e.g. agriculture, recreation, economic development) brought to the analysis, we have to expect conflict and ambiguity. The rest of this chapter proposes still another definition for the region. It is based largely in physical geography and I hope it is fair-minded. At the least, its component parts will be clear, so that any reader whose perspective differs from mine can reassemble the parts in a way that more closely suits his or her interests. Some of the components are based on a visual inspection of maps. In those cases, I provide the maps and show my interpretation of the features they reveal so that other researchers can offer their own interpretations of my data. Then, the next chapter will extend my exploration to subjective matters and will introduce vernacular mappings of the Hills. This will include a more detailed discussion of the inevitability of uncertainty in any cartographic representation.

Elevation

The Loess Hills are clearly an upland, rising several hundred feet from the Missouri River floodplain. This suggests that elevation may be a useful measure with which to define the hills. Map 14 is derived from data collected by NASA from the Shuttle Radar Topographic Mission and provided by USGS. Using cells about eighty meters on each side, these data provide the average elevation within each unit.

Elevation data clearly show a front along which the Hills rise from the floodplain. They also reveal an interesting pattern to the landform's structure. To the east of the Missouri, the land continues to rise for fifty to seventy-five miles until it reaches the drainage divide between the Missouri and Des Moines rivers. This divide corresponds roughly to the eastern edge of the USDA definition of the Hills, but is far to the east of the edge proposed by Mutel and the National Park Service.

West of the Missouri River, elevation rises steadily all the way to the high plains. No nearby drainage divide exists, so identification of a western edge of the Hills is more difficult and subjective. The best one can do is to map a tentative and broken divide on the west. This line follows the upland between the Elk Horn and Missouri rivers north of the Platte. South of the Platte, the boundary follows the divide between the Delaware River, which flows south to the Kansas River, and smaller streams such as Wolf River, Weeping Water Creek, and Papillon Creek, which drain directly to the Missouri.



Map 14. Elevation in the Loess Hills region**.**

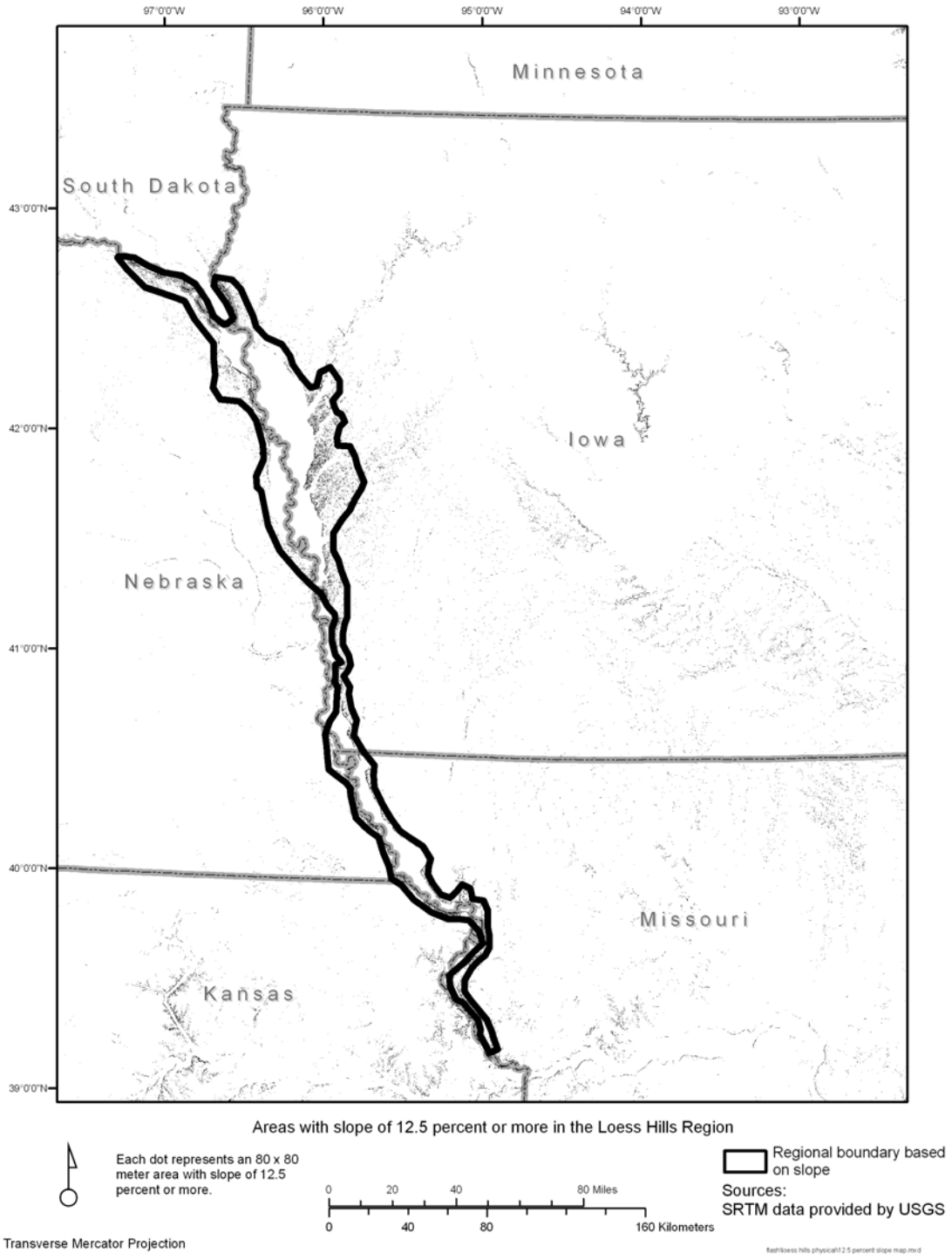
Slope

Slope, a direct measure of an area's steepness, would seem to hold more potential than elevation for identifying the Loess Hills. Map 15 illustrates land with a slope of 12.5 percent or more. It is derived from the same eighty-meter SRTM data used for the elevation map. Each cell was converted to a slope, the entire region reclassified to show only those cells with a slope of 12.5 degrees or more, and the area in which those steep slopes predominate were identified visually.

This definition identifies areas of dramatic scenery in the Hills. The region includes the bluff face along the Missouri River and a zone of steep hills almost twenty-five miles wide in west-central Iowa. This area continues south almost as far as Kansas City. Steep slope also identifies a narrow band of hill country in Nebraska from just north of Omaha to the South Dakota border. A patch of hilly country appears along the Missouri in northeast Kansas as well. Some of these hills, as we saw in chapter one, result from a combination of eroded bedrock and loess.

Relief

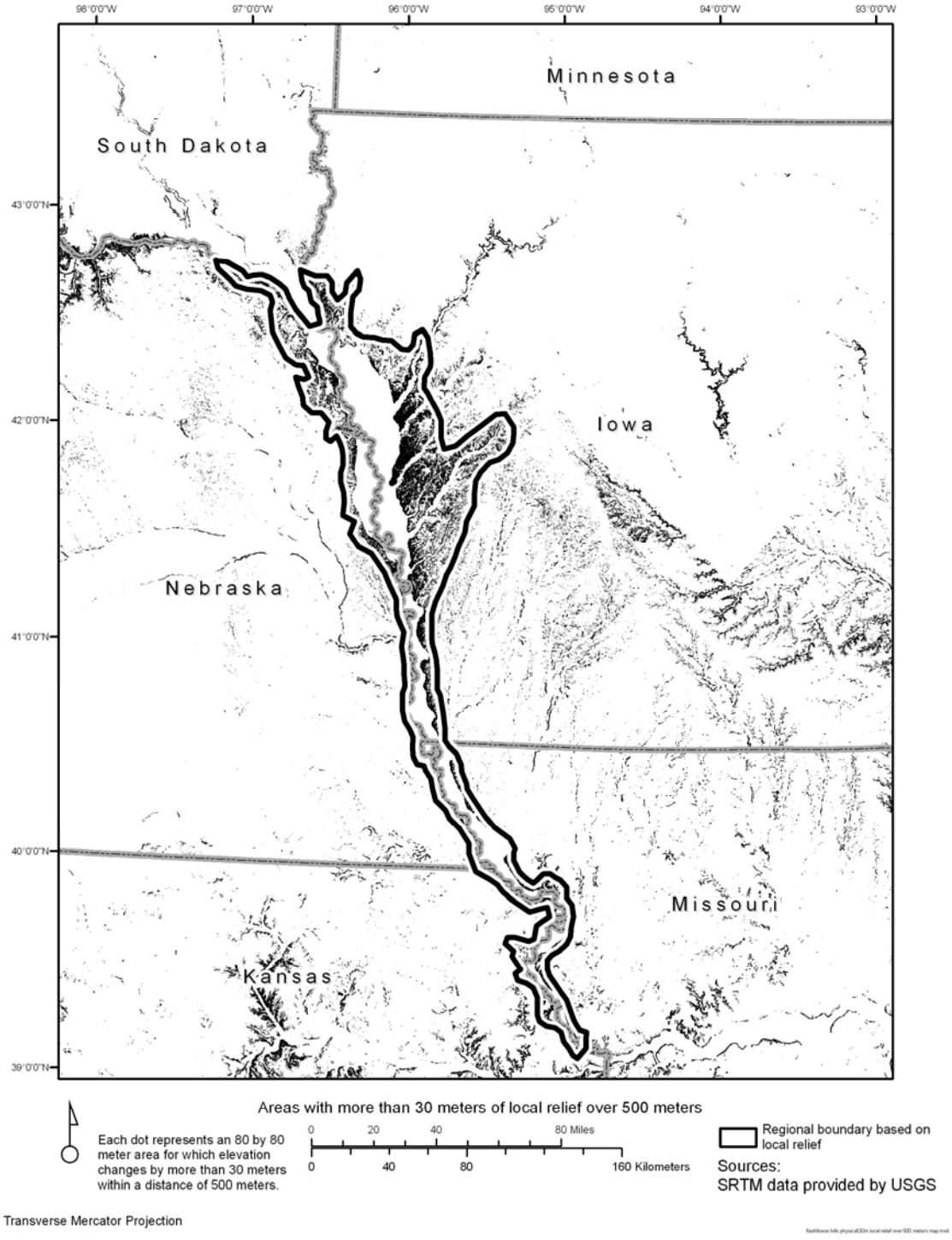
Local relief combines elements of elevation and slope. As a measure, it has the effect of eliminating areas that are steep but not very high, such as the banks of small streams, and areas that are high but not very steep, such as the crest of the drainage divide between the Missouri and Des Moines rivers.



Map 15. Areas of steep slope in the Loess Hills region. Steep is defined by an average slope of 12.5 percent, or about 12.5 meters of vertical change over 100 meters horizontally.

For mapping purposes, I selected a threshold of thirty meters of relief over a distance of five hundred meters (map 16). This number came out of inspection of an area of the Loess Hills in northern Missouri that, to me, had the look of a classic Loess Hills landscape. The hills were tall, steep, and sculpted by many small valleys. I walked across the terrain carrying a portable global positioning system receiver, noting the horizontal and vertical dimensions of typical hills. A hill rising about thirty meters over a distance of five hundred meters was typical of this area.

Map 16 shows areas that meet the thirty-meter threshold, or steep hills at least hundred feet high. I visually identified a region in which this relief prevailed, and marked it with the black line on the map. This measure outlines a region that is bigger than that identified by slope alone, including a relatively thin band along the Nebraska side of the Missouri River and a thin band in northeastern Kansas. It also captures an area in northeast Nebraska up to fifteen miles wide extending through the Blackbird Hills on the Omaha Indian Reservation and the hilly country of Ponca State Park. This measure excludes hills immediately north of Omaha. The Hills there are low and roll gently back from the Missouri River, with little of the dramatic relief typical of the Loess Hills elsewhere in the region.



Map 16. Areas of high local relief, defined as places with more than 30 meters of local elevation change over a horizontal distance of 500 meters.

Soils

Terrain alone cannot identify the Loess Hills. The Midwest has many areas of significant hills that no observer would include in this region, including the Ozarks in Missouri, the Sand Hills in Nebraska, and the Flint Hills in Kansas. Even the steep river-valley hills of northeast Kansas are clearly different landforms. Beyond hill size and shape, we need to consider the material of the Hills.

Although loess itself is a distinct sediment, most soil classification schemes do not place it in a single category. U. S. Department of Agriculture systems make distinctions based on the entire soil column, from humus at the surface down to bedrock. Loess, as a sediment, is only one part of this column. Still, soil surveys can be used to identify places that have characteristics typical of the Hills.

My analysis uses Soil Survey Geographic (SSURGO) data provided by the U. S. Department of Agriculture.[9] I first identified a line of unambiguous Loess Hills terrain, verified by field observations, near where the Loess Hills meet the Missouri River. Next, using software, I identified all soil types that occur along this line of unambiguous Loess Hill terrain. Finally, I identified all other locations at which these same typical Loess Hill soils occur.

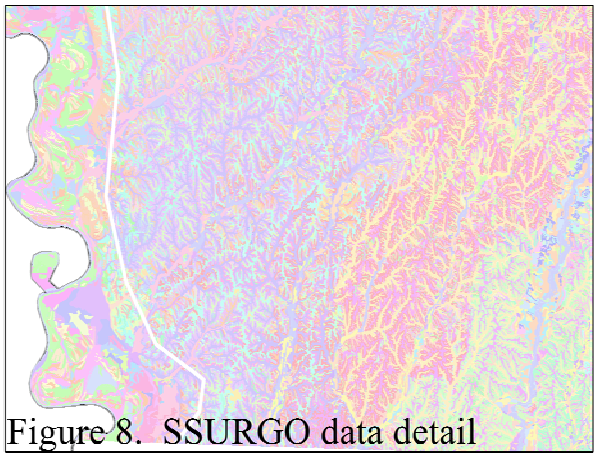


Figure 8. SSURGO data detail

[9] U. S. Department of Agriculture, "Soil Survey Geographic Database," http://soils.usda.gov/survey/geography/ssurgo/.

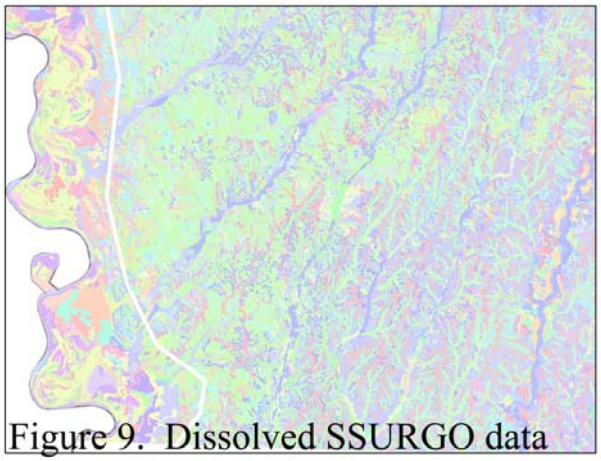


Figure 9. Dissolved SSURGO data

The analytical method is best demonstrated in a large-scale illustration spanning a single county. Figure 8 shows the detail at which SSURGO data are developed. The individual mapping units are as small as part of a farm field, or one side of a single hill. They thus permit analysis with dramatically more precision than the corresponding statewide (STATSGO) data allow. These SSURGO map units were then dissolved, so that each map unit with the same soil type could be treated as a single analytical unit (figure 9).

Figure 10. Identifying a line of unambiguous Loess Hills

Next, I drew a line of unambiguous Loess Hills terrain across the soils map (figure 10). By positioning this line close to the scarp where the Loess Hills rise from the Missouri River floodplain, I made sure that it cut across the particularly deep loess soils that are typical of the Hills. The line does not cross major river valleys, such as the Nishnabotna, Platte, and Big Sioux, to avoid including river-bottom soils in the analysis.

Using the select-by-attribute function of ESRI's ArcGIS software, I selected all soil units that were present along the line of unambiguous Loess Hills terrain (figure 11). Representing these units in light gray, I then drew a boundary between the area where

almost all soils are typical of Loess Hill terrain and that where fewer than half the soil units were typical of the Hills (figure 12). A total of 258 separate soil units were selected. (see appendix 1.)

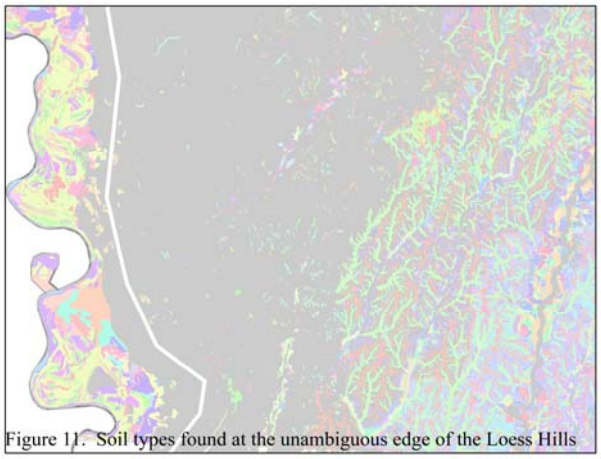


Figure 11. Soil types found at the unambiguous edge of the Loess Hills

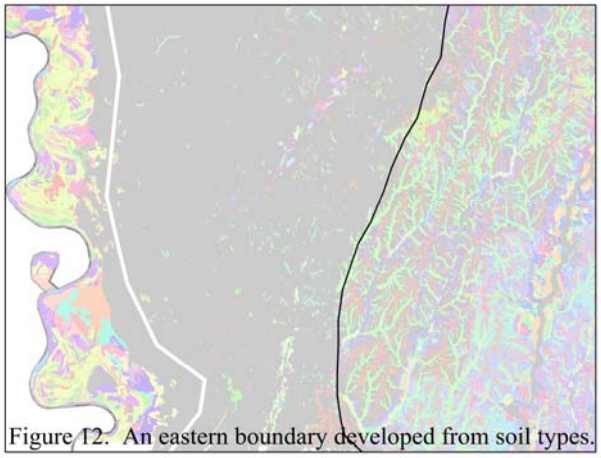


Figure 12. An eastern boundary developed from soil types.

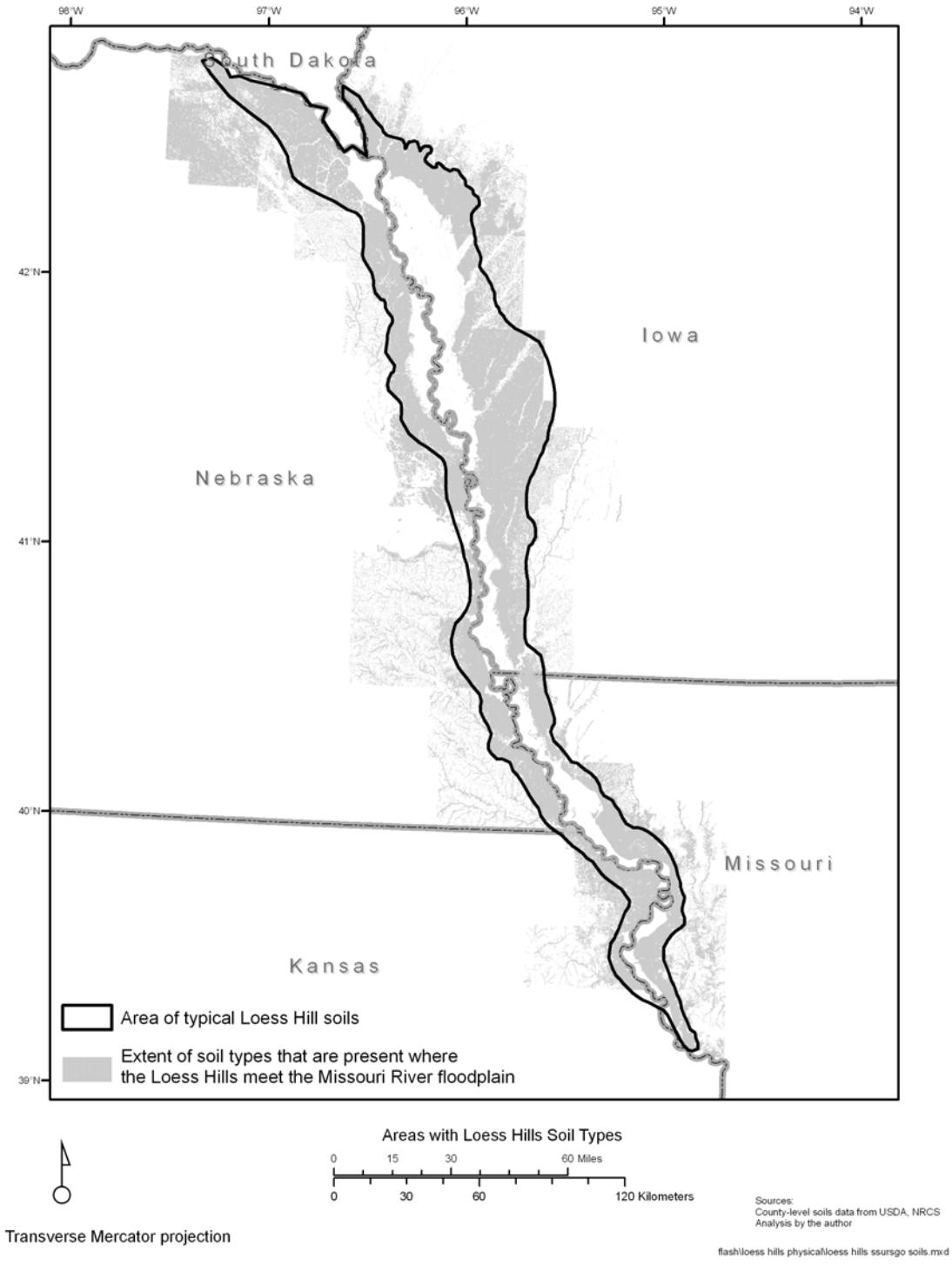
The result is map 16, showing a distinct area along the Missouri River valley in which almost all of the soils are typical of Loess Hills terrain, bordered by an area in which typically less than half of the land is covered by these same soils. The boundary between these two areas is visually clear and is represented by the black line on the map.

Landcover

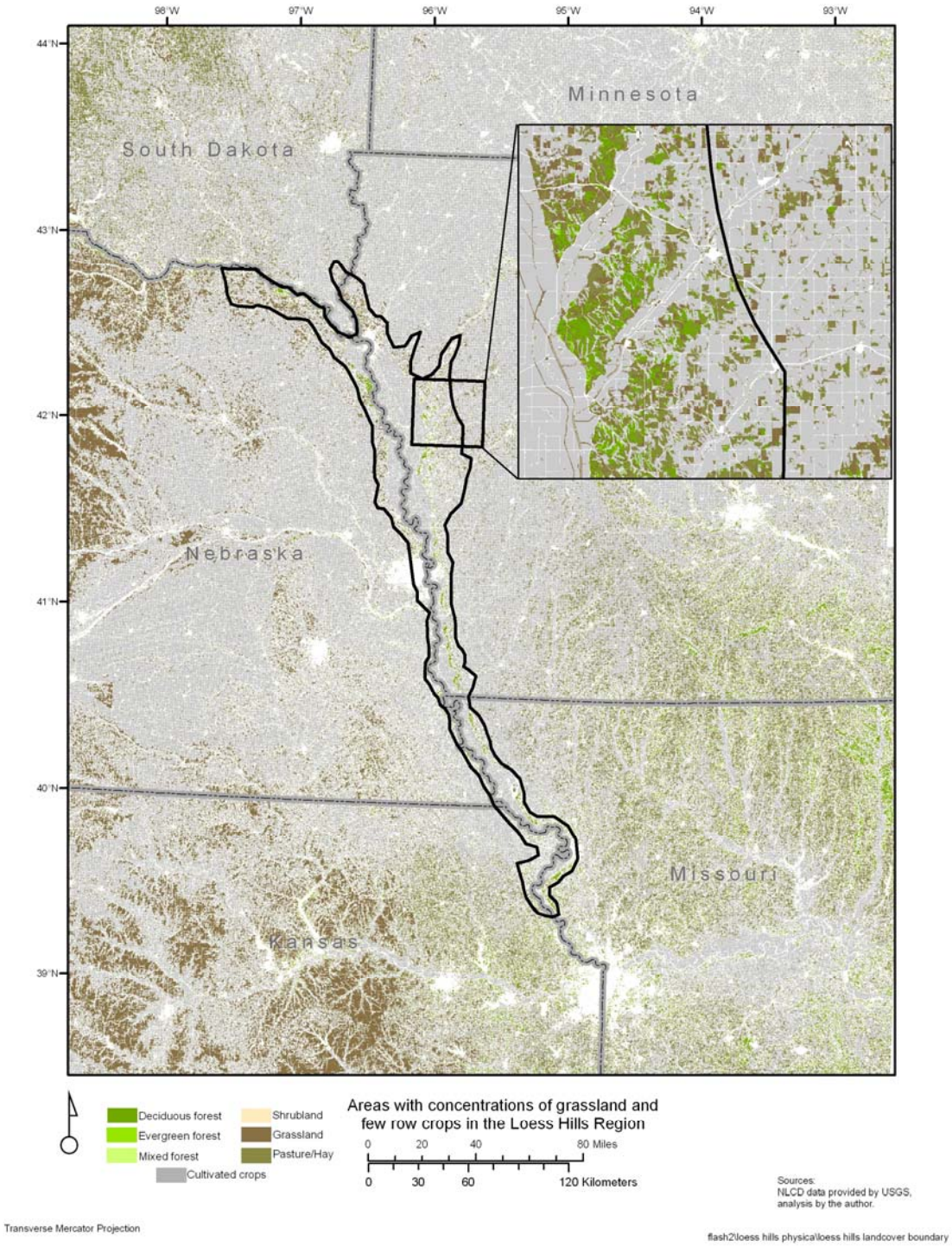
From the time of the earliest exploration by European and Euroamerican naturalists, the Loess Hills have been mantled by prairie grasses. Over time, that grassland has given way to incursion by woody plants, first cedars then hardwood trees. This history, discussed in more detail in chapter two, suggests that vegetation might be a

useful measure of the Hills. Using the National Land Cover Database,[10] I identified those areas adjacent to the Missouri River valley that primarily covered primarily by woodland, grassland, or prairie (map 18). As discussed earlier, the Loess Hills certainly

[10] Multi-resolution Land Characteristics Consortium, "National Land Cover Database," U. S. Environmental Protection Agency, http://www.epa.gov/mrlc/nlcd.html.



Map 17. Areas with typical Loess Hills soils.



Map 18. Loess Hills landcover. Inset shows boundary detail for a small section to illustrate the change from grassland and woodland to row crops.

are not the exclusive home to woods and grassland in the Midwest. Still, the boundary between the grassland/woodland world of the Loess Hills and realm of row crops immediately surrounding them can be visually identified (see the inset on map 18) and used as a marker of regional distinctiveness.

Cultural markers of the Loess Hills

Human-created features can also be used to delimit the Hills. Placenames, for example, allow us to look for either very specific names (such as those containing the word "loess") or more generic indicators such as "hill." This sounds promising, especially given the availability of a vast database called the Geographic Names Information System (GNIS) compiled by the U. S. Geological Survey. However, the word "loess" appears only infrequently along a line from north-central Missouri to west-central Iowa, and does not enclose a region (map 19A). Still, it does show a concentration of identity within the region.

Placenames referring to hilly terrain (map 19B) similarly show no particular concentration along the Missouri valley. Even names that one might expect in association with the distinctive shape of the Hills such as "mound" or "knob" are not concentrated in any part of the general region.

Patterns of roads reveal a measure of human response to the presence of the Hills. Midwestern roads generally follow cardinal compass directions, having been established to follow section lines laid down by nineteenth-century surveyors from the General Land

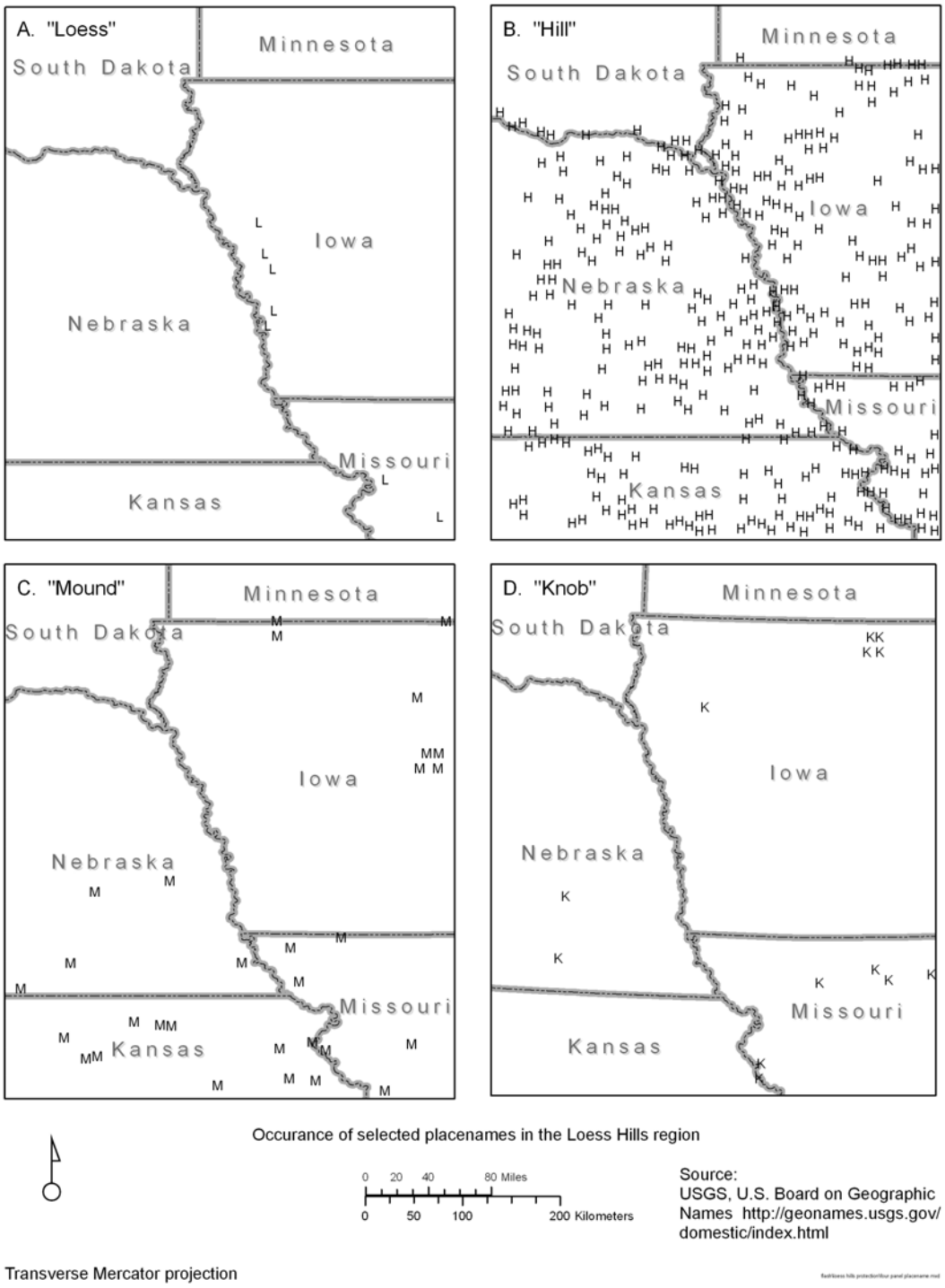
Office. This road network serves the region well, providing routes between farms and market towns while not intruding on efficient rectangular farm fields. Any place that compelled road-builders to depart from their grid must be either topographically or culturally special.

An area of crooked and diagonal roads can be visually identified in the Hills on both sides of the Missouri River valley (map 20, 21). This region, drawn in black on the map, extends from the outskirts of Kansas City to the northern border of Nebraska, and ranges from ten miles wide at its narrowest point near St. Joseph, Missouri, to more than fifty miles wide just north of Omaha. The area of crooked roads ends abruptly at the Missouri River flood plain, where the strict General Land Office grid reappears.

Combining the boundaries

The measures offered thus far combine themes that are traditionally within the scope of physical geography, such as relief and soils, along with some from the domain of cultural geography, such as road networks and place names. All are concrete; they represent actual objects that can be observed by an objective traveler passing through the area. Missing from our discussion are measures that exist only in the minds or the cultures of people who think about the Hills, things such as beliefs, folk tales, and mental maps. Those will be addressed in the next chapter.

The concrete measures presented here can be combined into a single Loess Hills definition without much difficulty. Each map (with the exception of elevation) reveals a comforting consistency with the others. The measures used as criteria are as follows: elevation, slope, relief, soil, landcover, and road network. An area defined by the

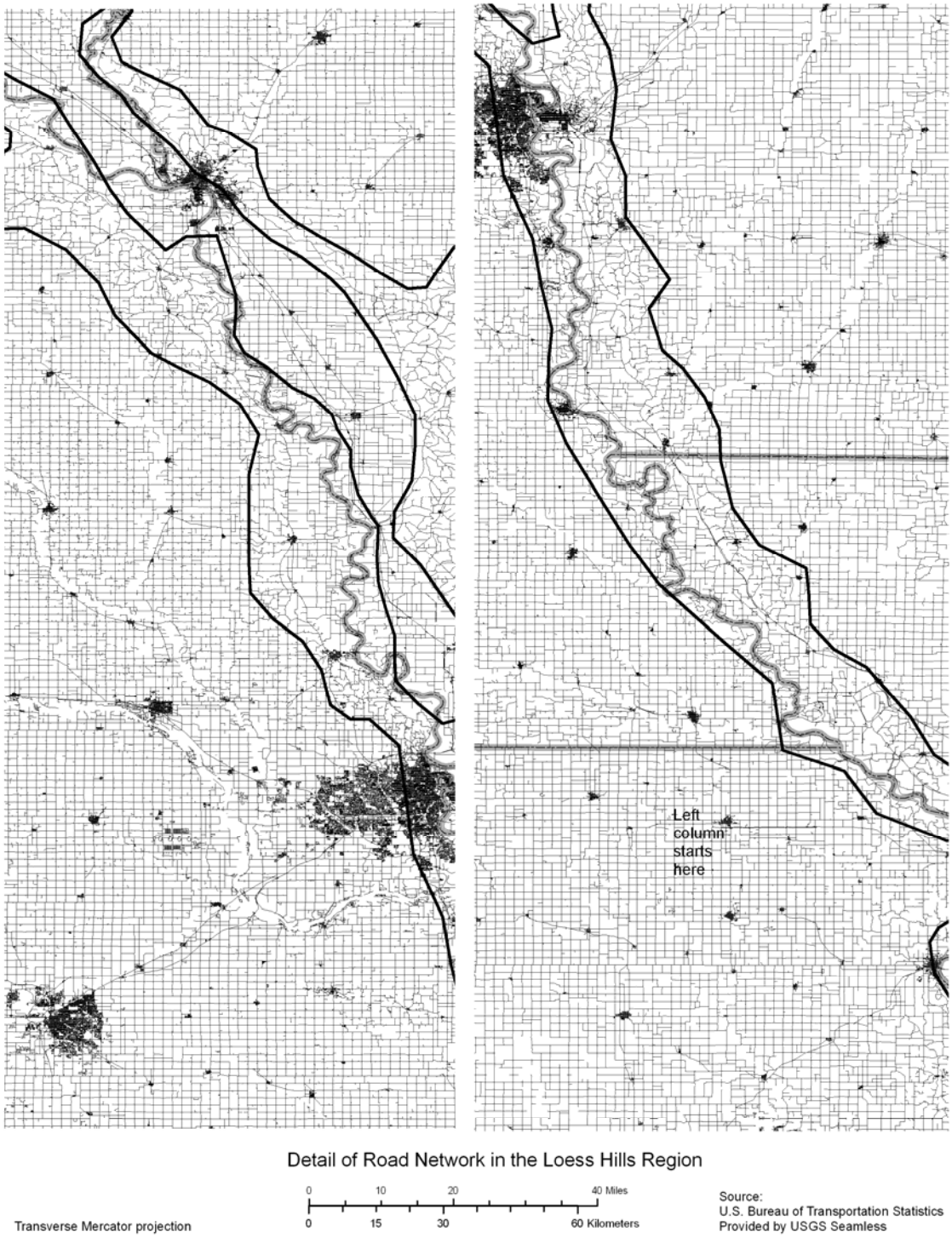


Map 19. Placenames in the Loess Hills.

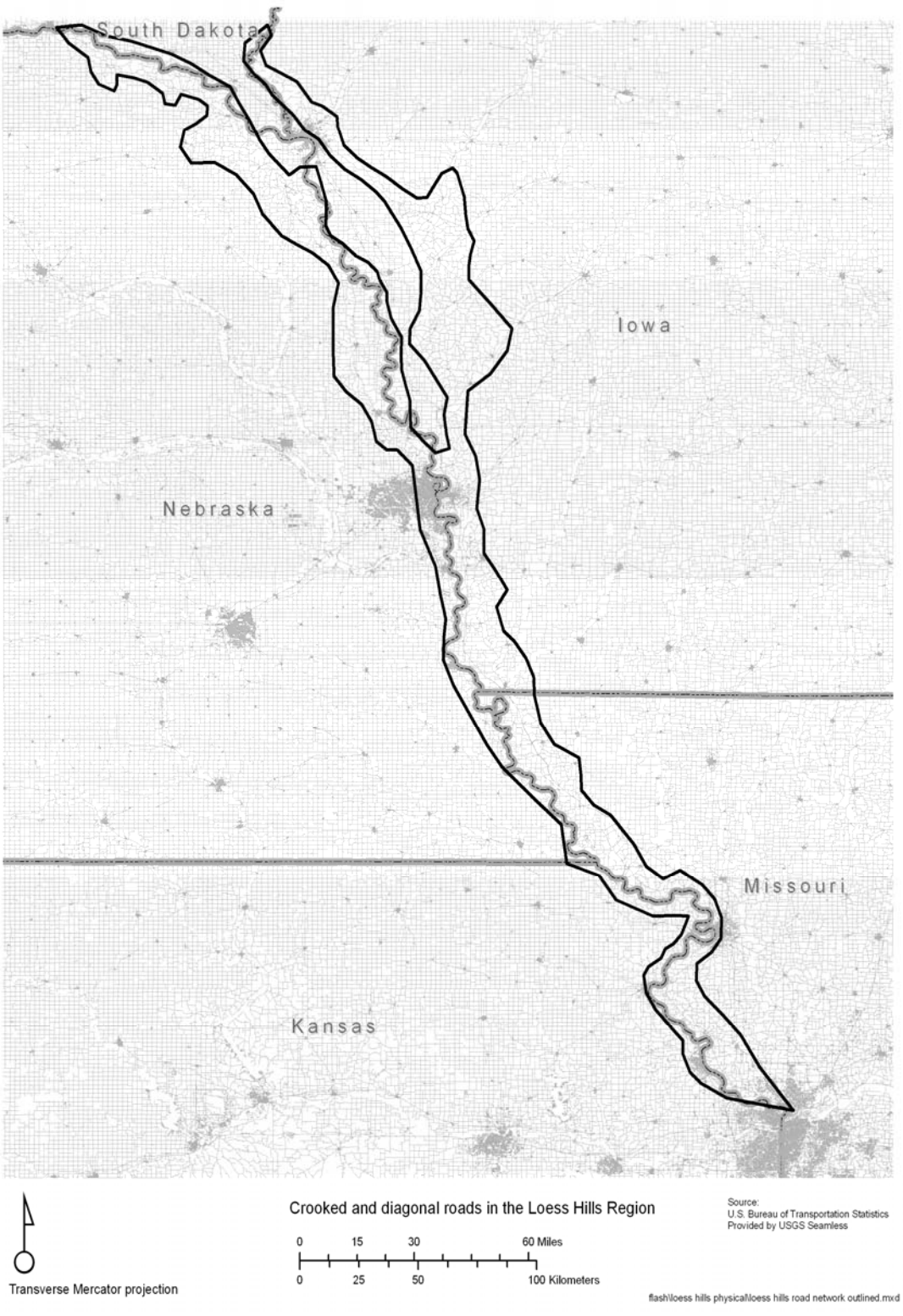
presence of at least half of these criteria extends from immediately north of Kansas City to the southeastern part of the Nebraska – South Dakota border (map 22). This region is about twenty-five miles wide at its thickest point, and includes the river bluffs in Nebraska, Kansas, Iowa, and Missouri. The inclusive area also holds fairly steady if we increase or decrease the number of criteria that must agree. If we allow the presence of only two criteria to define the region, the result is an area no more than five miles wider than the initial outcome. Similarly, if we insist on the presence of four criteria to define the region, the result is less than five miles narrower. The consistency found with these data suggests that, even if other criteria had been chosen, the result would not be dramatically different (map 23).

The definition of the Hills developed here is slightly larger than those used by the several agencies of the State of Iowa or the U. S. National Park Service. It is also slightly larger than that proposed by Cornelia Mutel, and includes the narrow band of loess-mantled hills in Kansas and Nebraska that most other sources exclude. It is dramatically smaller than the definition used by the U. S. Department of Agriculture.

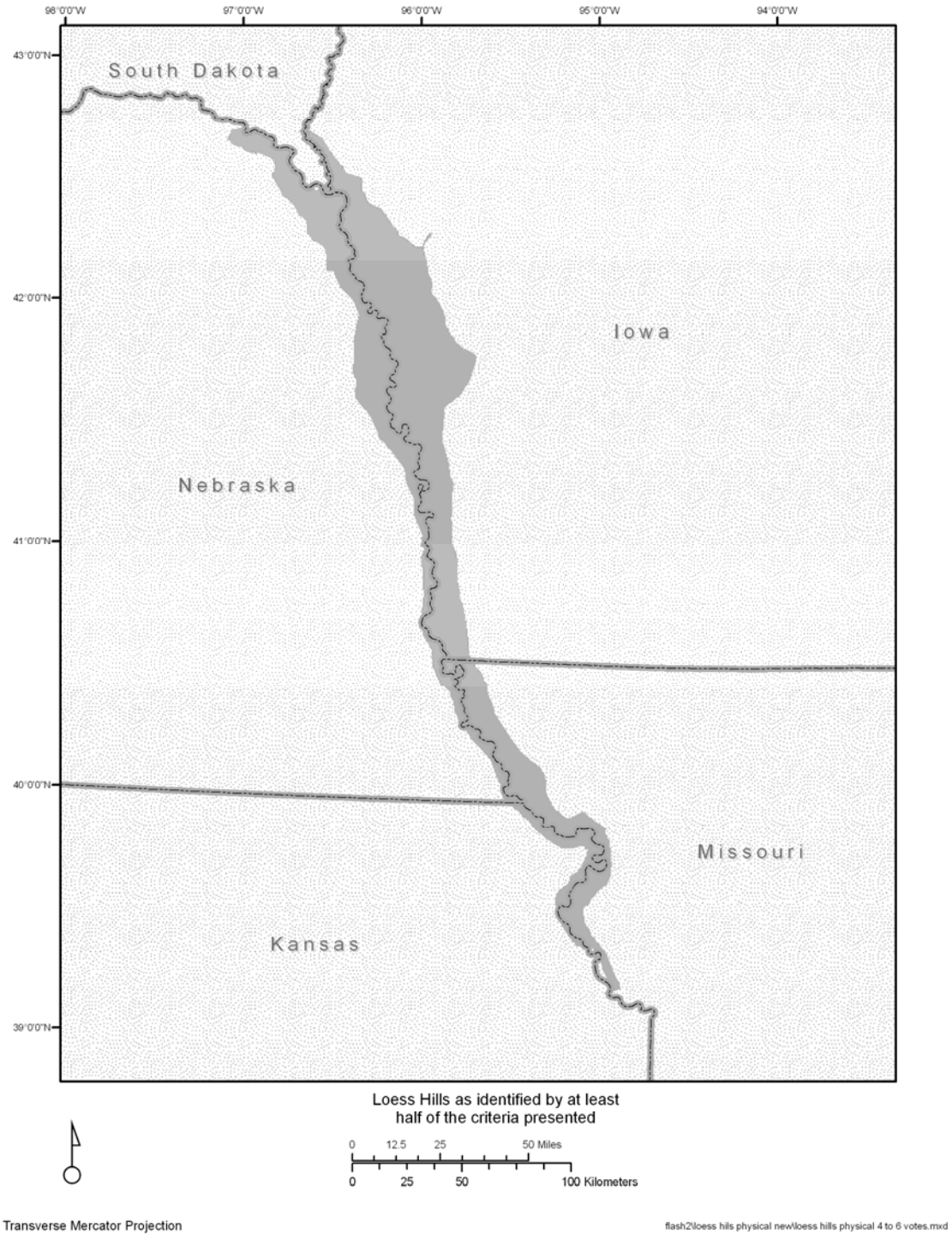
Although a definition of the Loess Hills derived from measurable traits on the ground has the trappings of objectivity, in fact it is partially subjective. As with any scientific endeavor, the outcome derives both from the completely objective process of arithmetic and the subjective choice of which potential explanatory variables



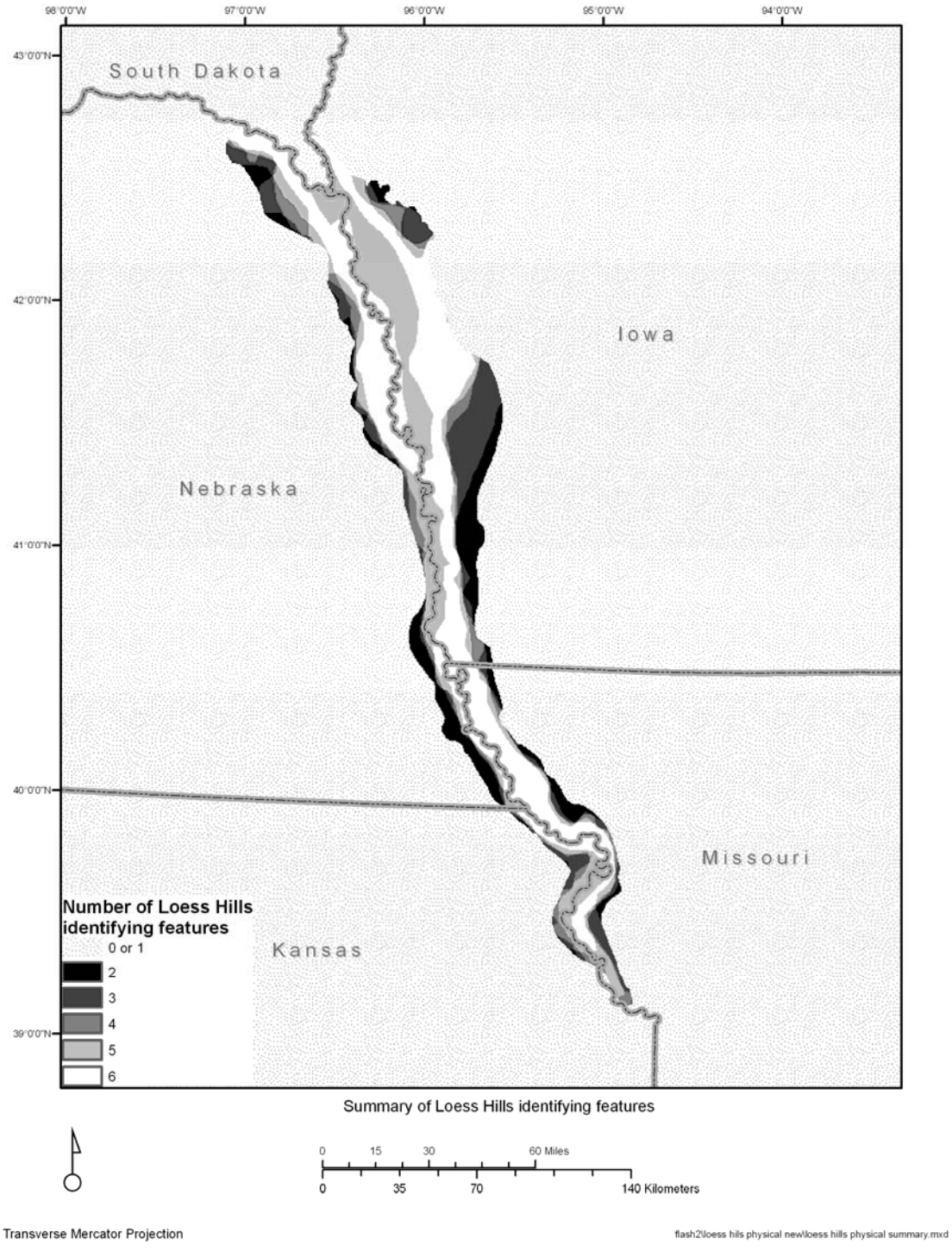
Map 20. Detail of the road network in the Loess Hills.



Map 21. Area of crooked and diagonal roads in the Loess Hills.



Map 22. The Loess Hills as identified by a majority of possible definitions.



Map 23. The Loess Hills as defined by each of six possible criteria.

to consider. I have argued that shape, soil, and roads are important indicators, but another author might consider climate and agricultural potential more relevant, as did the USDA when defining its Loess Hills Major Land Resource Area. A potentially unlimited number of other factors exist as well, including soil depth, Indian Nation settlement patterns, distinctive architecture, urban structure, stream drainage networks, and faunal distributions.

Chapter 4. A Subjective Cartography of the Loess Hills

Having developed a definition of the Hills based on features that can be observed on the ground, we can now consider the question of whether this physical boundary conforms to popular understanding of the place. Efforts to capture perceptual regions with participatory mapping tools have a rich tradition within geography. Karl Raitz and Richard Ulack studied perceptions of Appalachia by asking students to draw the boundary of the region on maps that indicated only state boundaries.[1] James Shortridge explored perception of the Middle West and of smaller regions within Kansas using survey data.[2] Terry Jordan asked respondents to identify the names of places in Texas, categorized these naming strategies, and then developed a set of maps of vernacular regions in the state.[3] Alan Dean, a graduate student in computer science, developed an online survey tool to elicit opinions about regional identities.[4]

Another vein of research involves mining existing data for perception of regions. This is only arguably participatory, of course, because survey respondents do not know they are taking part. Wilbur Zelinsky explored regional labels throughout the United States by counting such labels as parts of business names in telephone directories.[5] John Shelton Reed used similar telephone directory data to define vernacular boundaries of different conceptions of the South.[6] James Shortridge developed a novel survey method

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[1] Karl Raitz and Richard Ulack, "Cognitive Maps of Appalachia," *Geographical Review* 71, no. 2 (1981): 201-213.
[2] James Shortridge, "The Vernacular Middle West," *Annals of the Association of American Geographers* 75 no. 1 (1985): 48-57; James Shortridge, "Vernacular Regions in Kansas," *American Studies* 21 no. 1 (1980): 73-94.
[3] Terry Jordan, "Perceptual Regions in Texas," *Geographical Review* 68, no. 3 (1978): 293-307.
[4] Alan Dean, "The Regions Project" website, http://regionsproject.org/index.php. (accessed Jan. 21, 2009).
[5] Wilbur Zelinsky, "North America's Vernacular Regions," *Annals of the Association of American Geographers* 70, no. 1(1980): 1-16.
[6] John Shelton Reed, "In the Heart of Dixie: An Essay in Folk Geography," *Social Forces* 54, no. 4 (1976): 925-939.

by tabulating regional identities as they were revealed by people filling out warranty cards for citizen's band radios.[7] All these studies have a distinctly humanistic perspective, focusing on how regions came to be perceived as they are.

Another style of participatory mapping takes a more social science perspective and focuses on the political empowerment that accompanies mapmaking. Peter Herlihy used specially trained representatives of community organizations to collect land-use and land-tenure data on paper maps in Darien, Panama.[8] With the advent of hand-held computers, researchers modified his approach by asking respondents to draw maps on a computer screen.[9] Justin Wood put mapping software in the offices of community organizations to help them document places that are culturally or environmentally noteworthy.[10] Research of this sort does more than collect vernacular data; it often has an explicit social agenda to equip small communities with the technologies necessary to take part in naming and describing their areas.

In an effort to capture how people living in and near the Loess Hills delimit the Hills, I used three different data collection tools. I created a small computer program that allows internet users to draw and send me a map of where they believe the Loess Hills to be. Second, I enlisted the help of college instructors throughout the region to administer a survey asking their students to identify the Hills. Finally, while traveling in or near the

[7] James Shortridge, "Changing Usage of Four American Regional Labels," *Annals of the Association of American Geographers* 77, no. 3 (1987): 325-336.
[8] Peter Herlihy, "Participatory Research Mapping of Indigenous Lands in Darien, Panama," *Human Organization* 62 (Winter 2003): 315-331.
[9] Michael McCall, "Seeking Good Governance in Participatory-GIS: A Review of Processes and Governance Dimensions in Applying GIS to Participatory Spatial Planning," *Habitat International* 27, no. 4 (2003): 549-573.
[10] Justin Wood, "'How Green is My Valley?' Desktop Geographic Information Systems as a Community-Based Participatory Mapping Tool," *Area* 37, no. 2 (2005): 159-170.

Hills, I made a practice of asking people--both land classification experts and residents--whether the place where our conversation took place had a name.

All survey methods have limitations, but the use of three allows each method to compensate somewhat for the weaknesses of others. The computer-based survey tool had potential to elicit input from a broad set of respondents and ensured that all of them had an identical experience with the survey instrument. Unfortunately, response was low and biased toward the young and technologically savvy. My face-to-face conversations in the field were necessarily limited as well, given the time and expense of travel. They have the advantage, however, of reaching a broad cross section of respondents and providing a chance to follow up on interesting or surprising answers. The paper survey yielded the largest number of responses and supported tabulations of how variation in beliefs about the Hills changes from one location to another. The respondents, however, were of college age, so may not reflect attitudes of the entire population.

Computer-based participatory mapping

In order to allow a wide variety of individuals to provide data on where they believed the Hills to be, using a consistent data-collection method, I built a small computer application that allows respondents to sketch a map of an area and then to email that map to me. The computer program is a body of JavaScript code that makes calls to the Google Maps Application Programming Interface (API). The use of the relatively simple Google Maps API, in contrast to the more complex Google Earth, meant that the application could be used even by respondents with low-speed, dial-up internet connections and out-of-date web browsers. The application runs on a web server

maintained at the University of Kansas. No software is downloaded to the respondent's computer, so respondents had no fear that the application might bring viruses to their computers.

The program (figure 13) presents the user with a map of the Missouri Valley showing state boundaries, major cities, and major roads. I deliberately did not display the aerial imagery that is available from Google Maps to avoid biasing responses with cues from those images. The instructions ask the user to draw a boundary around the area he or she considers to be the Loess Hills on the computer screen. An option is available to start over if errors occur and, when the user is satisfied with the finished boundaries, I explain how to send the coordinates to me. This design is different from Dean's online survey in that it uses vector representations--actual lines--of the user's boundaries, instead of square raster cells.[11] The use of the Google Maps API is also a substantial design difference. It allows the data-collection tool to run on almost any computer and presents the participant with a familiar user interface.

In order for a participatory mapping tool to be effective on the web, potential respondents must be drawn to the site. I attempted to attract respondents by providing photographs of the Loess Hills, a tour guide, and an unpublished article about the area. My hope was that individuals with an interest in the Hills would find my site through standard internet searches, where they would encounter the participatory map application. In practice, this did not work. Although evidence exists that some users found their way to the site (the tour guide is cited by Wikipedia, for example),

[11] Dean, "The Regions Project."

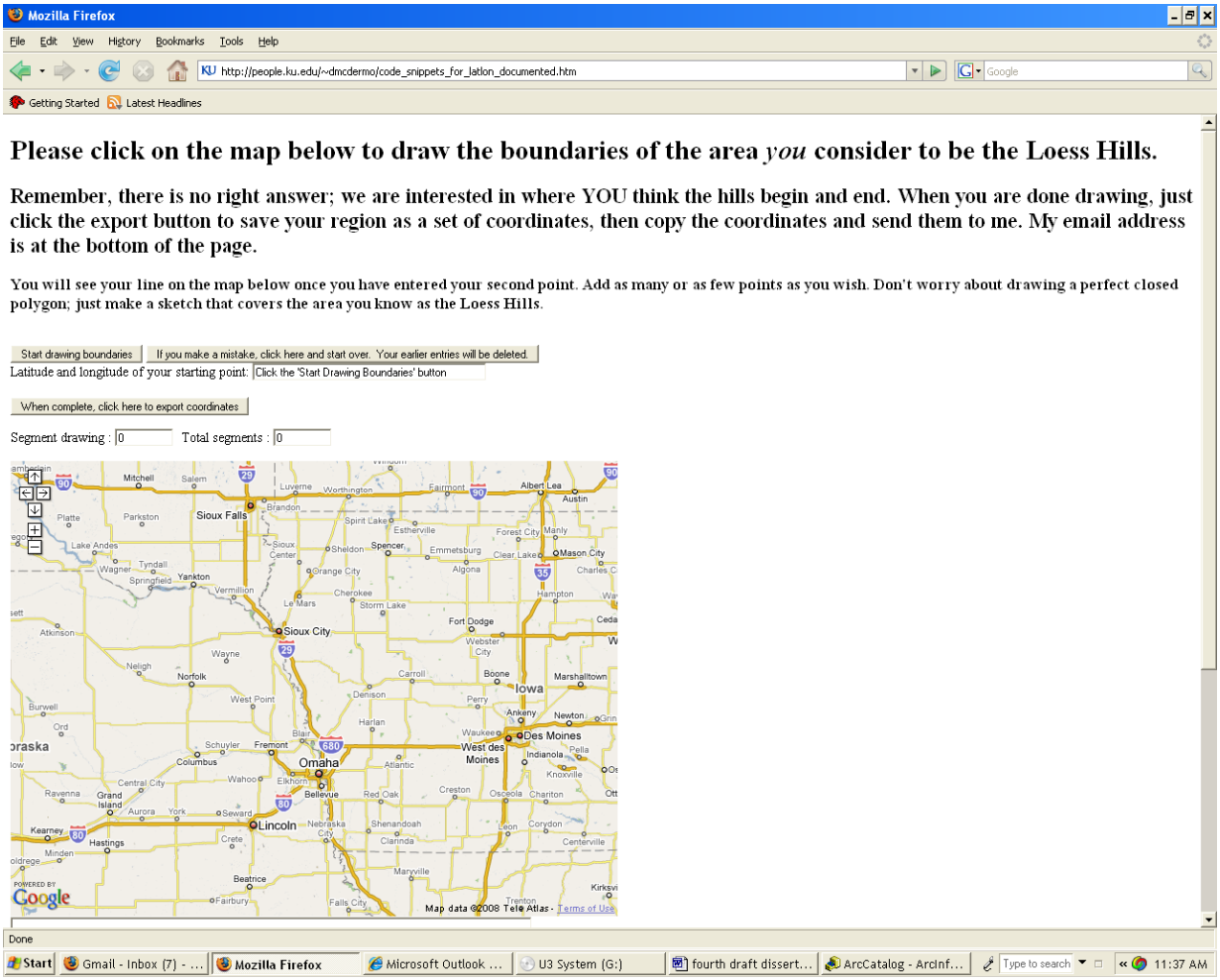
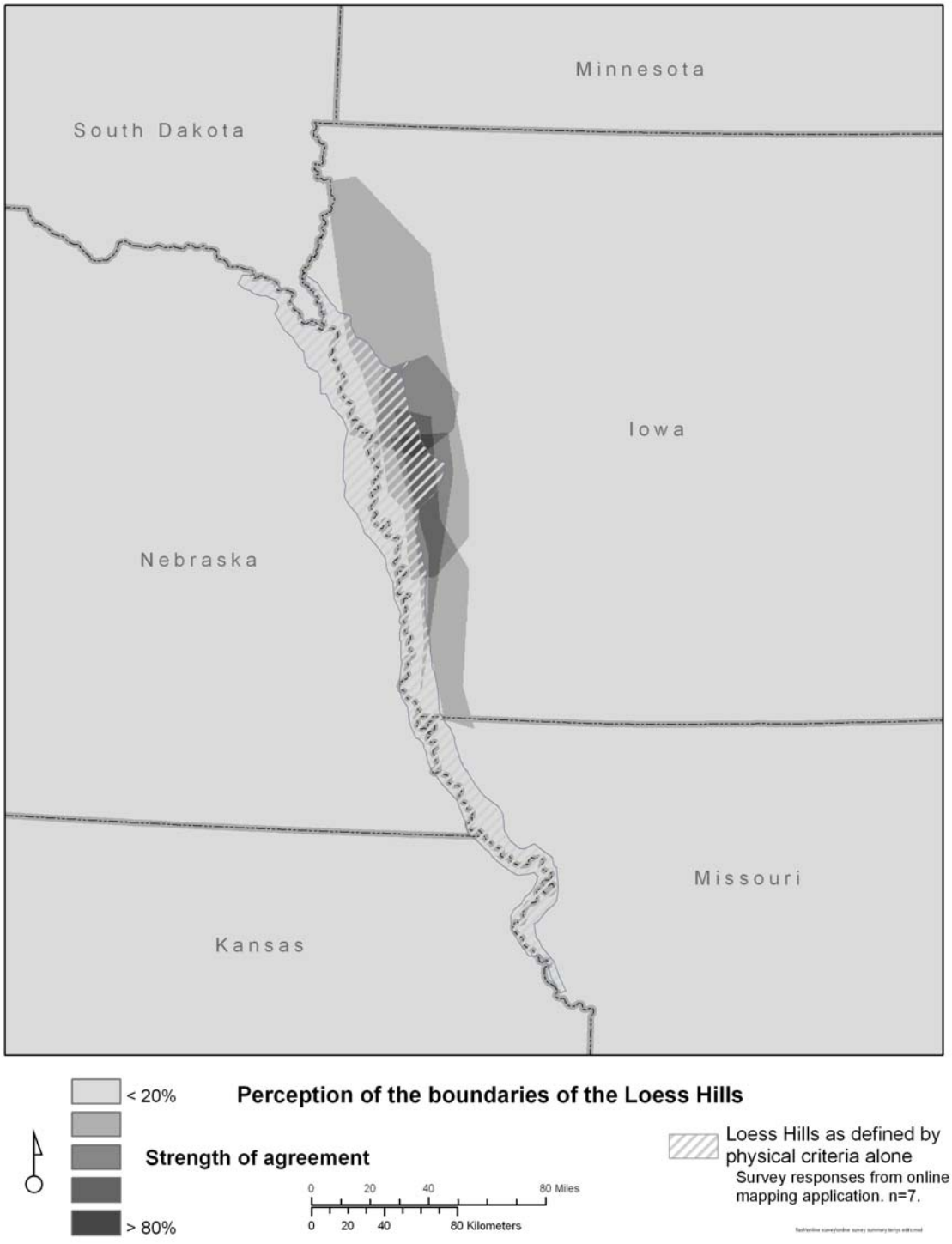


Figure 13. JavaScript application for web-based participatory mapping

only seven people, avid computer users who seemed interested in the technology of the survey instrument, took part. I also asked several other individuals to participate in the survey, typically by emailing them the internet address of the survey along with a request to participate.

The few responses I received conform reasonably well to the physical definition of the Hills (map 24). They generally excluded the Hills of Nebraska and Missouri from the region, and extended the Hills farther east than the physical definition would suggest.



Map 24. The Loess Hills as defined by internet respondents.

Although the response to the online mapping tool was disappointing, I believe the technology has promise if it could be paired with more attractive web content. With this hope, I have appended the JavaScript source code for the participatory mapping application for other researchers to use (appendix 2). It can be adapted for use in other geographic areas simply by changing the latitude and longitude coordinates provided to the API. Instructions for making this change are included in the source code; I invite other researchers to use my code in their applications.

Pen-and-paper surveys

The most detailed data on perception of the Hills boundary came from conventional pen-and-paper surveys. I contacted eleven college instructors in the Midwest, of whom eight, representing seven Midwestern colleges, agreed to administer a questionnaire to their students (appendix 3). The respondents were enrolled in introductory geography or environmental science classes. The sample of colleges concentrates on institutions in or near the Hills, but with the addition of two institutions several hundred miles away, which I included as indicators of how awareness of the Hills deteriorates with distance (map 25). Most of the colleges were small institutions or branch campuses of state university systems that drew most of their students from near the campus. Therefore, they can provide insight into how perception of the Hills varies as one observes from different locations throughout the Midwest.

The survey instrument was simple: a single question asking whether the respondent was familiar with a place in the American Midwest called the Loess Hills. If the response was "yes," the participant was asked to sketch the boundary of the Hills on a

map of the Midwest that included only state and county boundaries. The instructions emphasized that no right or wrong answer existed and that any opinion concerning the boundaries was valid. This survey instrument is in appendix 4.

Student respondents were not particularly aware of the Loess Hills. Sixty-five percent of the 386 students polled lacked sufficient familiarity with the Hills to attempt to locate them on a map (table 9). Even at schools located within the Hills, such as the University of Nebraska at Omaha and Northwest Missouri State University, the majority could not identify the Loess Hills. As I will discuss in the next chapter, this low awareness exists despite ambitious efforts by school districts, state agencies, and departments of education to incorporate teaching about the Loess Hills into the school curriculum. The one school at which all respondents could identify the Hills may reveal a bias that is built into survey methods like this; the instructor was an avid student of the Hills, and probably included material on the region in his classes.

Popular perception of the Loess Hills, as described by my total of 393 computer and pen-and-paper survey respondents, generally locates the Hills on the Iowa side of the Missouri River (map 26). Respondents perceive the region as being wider than physical measures would suggest, particularly in the south. A majority of respondents extend the region into northern Missouri, though only a minority include parts of Nebraska.

More interesting than the composite view, perhaps, is that the boundaries offered varied considerably depending upon where the students were enrolled (map 27). Students at Northwest Missouri State University, for example, unanimously agreed that

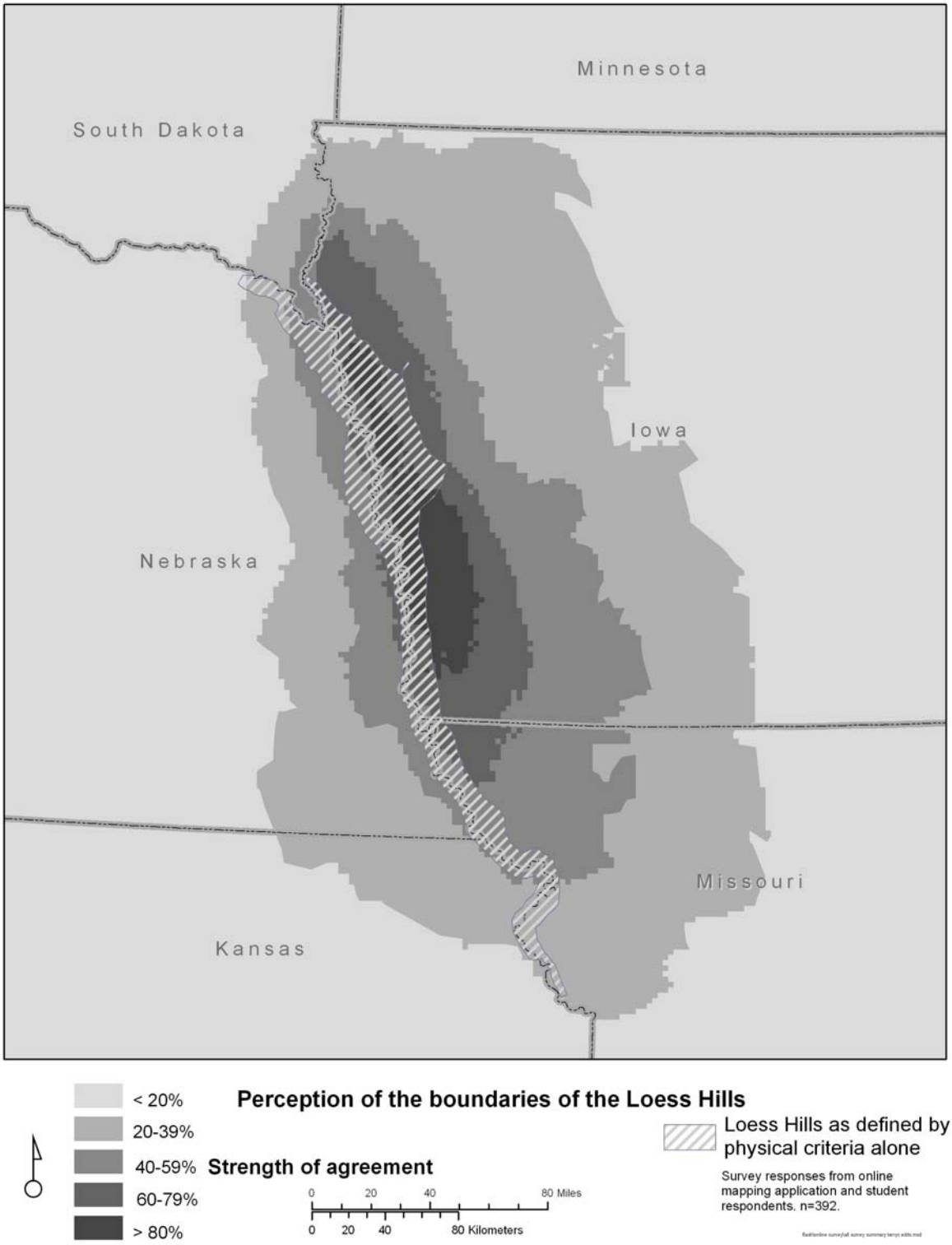
Map 25. Colleges and universities participating in the survey.

Table 9. States identified as being within the Loess Hills by paper survey respondents								
Survey population	Total Partic-ipants	Iowa	Nebraska	Missouri	South Dakota	Kansas	Minnesota	Could not identify the area
Northwest Missouri State University	115	21	15	22		11		88
University of South Dakota	65	28	19	7	20	6	2	35
Illinois State University	41	1	1	1		1		40
University of Nebraska at Omaha	78	24	15					54
University of Nebraska at Kearny	59	11	6	7		4	5	46
Wayne State College (Nebraska)	28	8	2	2				20
Briar Cliff University (Iowa)	8	8	1	0	2	0	0	0
Total	386	101	59	39	22	22	7	249

the Loess Hills included northwest Missouri, but only a minority of them extended the Hills north of central Iowa and almost none included the hills around Ponca State Park in northeast Nebraska. Conversely, most students at South Dakota State University believed that the Hills were centered in northwest Iowa and northeast Nebraska, just across the Missouri and Big Sioux rivers from their campus. Few of them extended the boundary south of Council Bluffs, Iowa, and almost none acknowledged the existence of loess hills in Missouri.

Students at Omaha and Wayne, Nebraska, centered the Hills on west-central Iowa. Omaha is about seventy-five miles south of Wayne, and the definition of the Loess Hills offered by Omaha students was centered south of that offered by Wayne students by almost that same distance. Students at Briar Cliff University in Sioux City defined the center of the Hills around Sioux City and extended the border no farther south than Council Bluffs.

By defining the Hills as being close to where they live, students suggest that they view them positively. The act of depicting the Hills as close to their homes allows respondents to associate themselves with the Hills. The responses seem to say "My campus must be a good place, see how close we are to this famous landform?" The process by which the landform came to be somewhat famous is one I will explore in the next chapter.



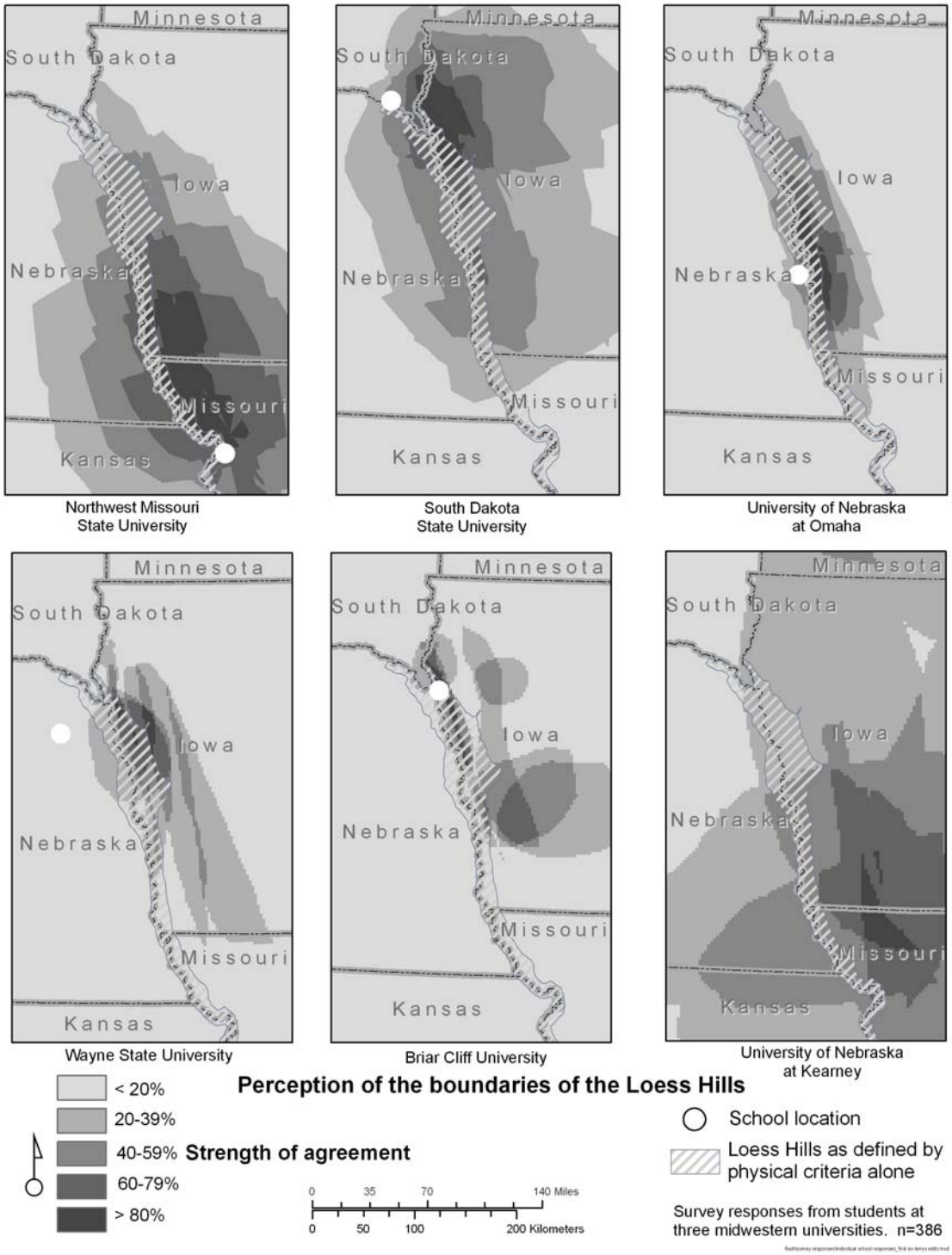
Map 26. Loess Hills as located by college and internet respondents.

Students at the three institutions near the center of the Hills--Nebraska-Omaha, Wayne State, and Briar Cliff--defined the Hills as a relatively narrow band east to west, and located primarily east of the Missouri River. In contrast, students at the northern and southern ends of the Hills extended their definitions well to both the east and west, variously including wide swaths of Kansas, Nebraska, Missouri, and Iowa.

Awareness of the Hills drops off precipitously as one moves away from the middle Missouri Valley. Students at Kearney, some two hundred miles west of the Hills, were largely ignorant of the subject. Those few who knew something of the Hills placed the site only vaguely, well east of their campus. Similarly, only one respondent from Illinois State University in central Illinois was aware of the Hills. That student, however, located them remarkably close to the physical boundaries presented earlier.

Conversations

The interview information I received proved to be most useful for explaining places that respondents do not consider part of the Hills. As the maps in chapter three illustrate, defining the southern limit of the Hills is particularly difficult because the band of dramatically hilly terrain narrows in northern Missouri. This narrowness makes it easy for individuals to find small discontinuities in the Hills that they can use as an end point. Conveniently for those who believe that the Loess Hills stop at the southern boundary of Iowa, the Nishnabotna River cuts through the Hills just a few hundred yards north of the border. Its valley, of course, contains no hills, and so reinforces the idea that the Hills end at the Missouri border.



Map 27. Perception of the Loess Hills from individual colleges.

Similarly, the narrowness of the Hills in northern Missouri allows some people to dismiss them as insignificant. One park naturalist in Missouri explained that the band of

Hills in Missouri was so narrow that no road could follow its crest, limiting the potential as park land. Narrowness of the Hills also may explain another response I received from Missourians. They regularly identified the hills of northern Missouri as "the Bluffs," or "just the Bluffs," a wording that suggests the Loess Hills in this region are thought of as another form of riverfront escarpment. They do not necessarily constitute a significant physiographic feature on their own.

"The Bluffs" as used in northern Missouri is also, at least in part, a proper name rather than a generic descriptor. Particularly around Weston, Missouri, "Bluffs" is used in business names and is cited by economic development officials as a distinct region.

Not surprisingly, the Hills around Mound City, Missouri are often called "mounds" or "the Mounds." After more conversation, local respondents generally acknowledge that this area is also part of the Loess Hills. The meaning attached to "mound" is variable; sometimes it is applied to the rounded shape of the Loess Hills themselves and sometimes it refers to Native American burial sites that residents believe to exist immediately outside town.

The Nebraska bluffs are another area where some respondents have chosen not to adopt the Loess Hills label. One respondent in southern Nebraska explained that the Loess Hills existed across the river in Missouri, but not where our conversation was happening. "You are in Nebraska," she emphasized, as if that were explanation enough. Similarly, a park manager in southeast Nebraska, whose park includes some of the most dramatic loess hill exposures in the entire region, spoke at length of bluffs, ridges, hills, and valleys but never used the word loess. In contrast, two naturalists at Ponca State Park, in northeast Nebraska, emphatically asserted that their park was part of the Loess

Hills, and pointed as evidence to an area in which porous loess had caused a small dam to collapse and undermine a park road. On the Winnebago Reservation in northeast Nebraska a great reverence for the hills and the dramatic vistas they provide clearly exists, but local respondents only identified the landscape as part of the Loess Hills after I prompted them with that name.

All of these responses fit a common pattern and illustrate a common point: parts of the dramatic landscape that professional naturalists call the Loess Hills may be recognized by people who call them by other names. This theme, not unexpected upon reflection, is one that will be explored further in a later chapter.

Finding a consensus

The data from the interviews and the paper and computer-based participatory mapping tools suggest no clear consensus concerning the boundaries of the Loess Hills; opinions also vary depending on where the survey respondents live. This situation raises the question of how we might get closer to identifying an agreed-upon boundary.[12]

Cartographer Dennis Wood has provided a set of concepts for understanding this challenge. He suggests that we divide the process into three steps, recognizing first that all individuals carry around their own mental maps of places, wholly independent of any printed or official graphics. These mental images can be assembled and compared to reveal levels of agreement among the individuals through a process Wood labels "interpersonal validation."[13] Such consensual maps can then be made official, typically

[12] This discussion is inspired by a challenge and intriguing suggestions from Professor Terry Slocum.
[13] Denis Wood, "What Makes a Map a Map," *Cartographica,* 30 nos. 2 and 4 (1993): 84.

through publication by an authoritative cartographic firm or a government, yielding what Wood calls "standard" maps.[14]

The challenge, of course, lies in finding the consensus amidst all the individual mental maps. Ideally, one would assemble the people together in one place and conduct some kind of negotiation to yield an agreed-upon conception. This is clearly impractical for all but the smallest groups. Alternatively, using the U. S. Congress as a model, representatives of separate interest groups might negotiate to create a compromise view.

With survey data no genuine consensus can be produced, so we have to content ourselves with lesser measures of agreement. The simplest way to derive a summary map from a collection of mental maps is to apply an arithmetic threshold. We could, for example, declare the Hills to be only that area where a majority of survey respondents agree is part of the region. This simple majority test is intuitively appealing, and suggests the familiar practice of resolving disputes by majority vote. The process yields a definition of the Hills that is considerably wider than the physical measures have suggested and that includes the Hills of Nebraska and Missouri, along with those of Iowa (map 28). Kansas is ruled out by the fifty percent threshold, as is the area of northeast Nebraska near Ponca State Park.

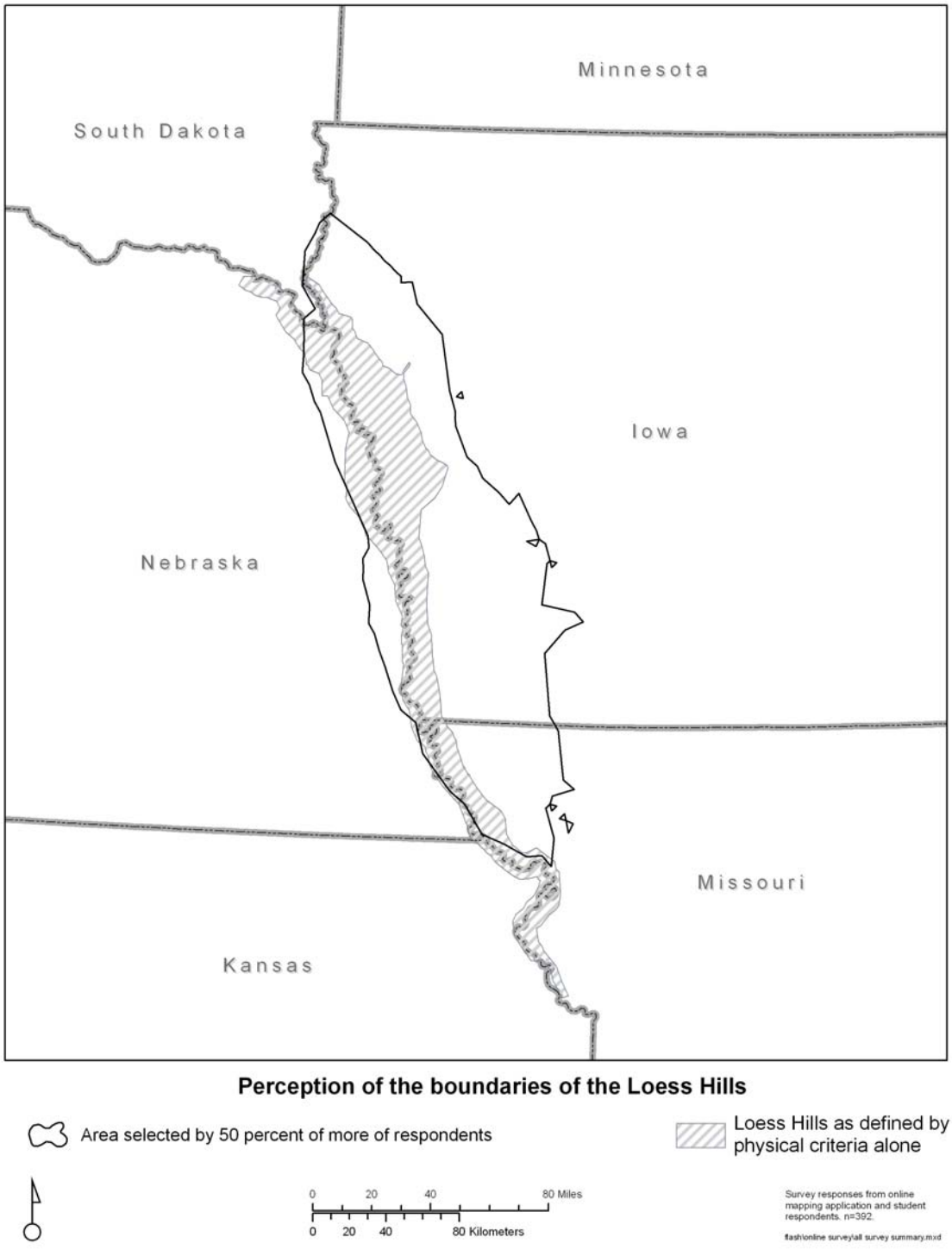
Although intuitively appealing, a fifty-percent threshold is still arbitrary. An alternate tactic is to look to the data themselves to find a more appropriate cutoff. We can display the survey responses in three dimensions, with the vertical axis representing the number of respondents voting for inclusion of any place in the Hills, and call this display a "surface of agreement." In this representation, areas of low slope are those in which the amount of agreement builds slowly. Places with high slope are those in which

[14] Wood, "What Makes a Map a Map," p. 81.

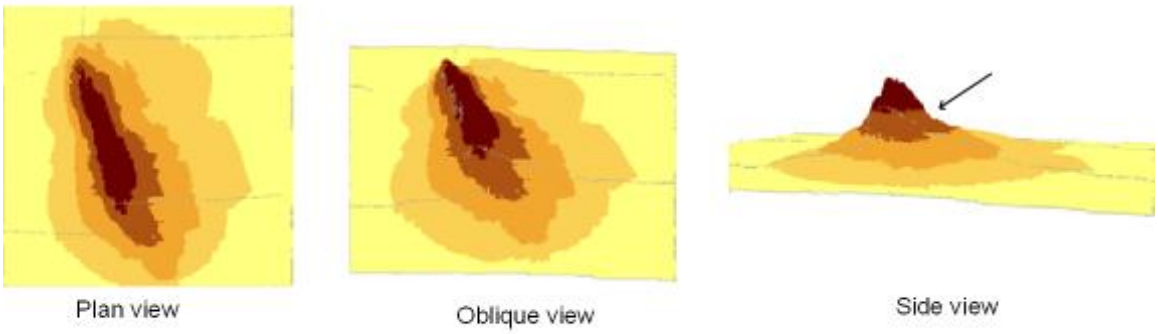
agreement builds rapidly. If we were to find a vertical face, rising from zero to one hundred percent, it would indicate complete consensus. Any point outside this hypothetical vertical face would be outside the Loess Hills; any point inside the face would be inside the region.

In three-dimensional visualization, increased steepness of the face is meaningful in that it represents the place where the pace of agreement begins to build. Looking for these changes may reveal important patterns to the agreed-upon boundaries of the Hills (map 29). The left panel displays a conventional map view, whereas the middle panel looks at agreement obliquely (with height indicating the amount of agreement) and the right panel depicts the surface in cross-section as if viewed from the south. The data show a steepening of the slope between sixty and seventy percent, suggesting that, at this level of consensus, the intensity of agreement builds rapidly. Using this refined threshold, we can propose a boundary of the Loess Hills based on popular agreement at the restrictive threshold of seventy percent.

The restrictive popular definition sets boundaries for the Hills almost completely within Iowa (map 30). Only a tiny area of northern Missouri is included and virtually none of Nebraska. The region is uniformly thirty miles wide and extends well to the east of the region as defined by physical characteristics in the south. It conforms well to the physical boundaries in the north.



Map 28. The Loess Hills as defined by fifty percent of survey respondents.

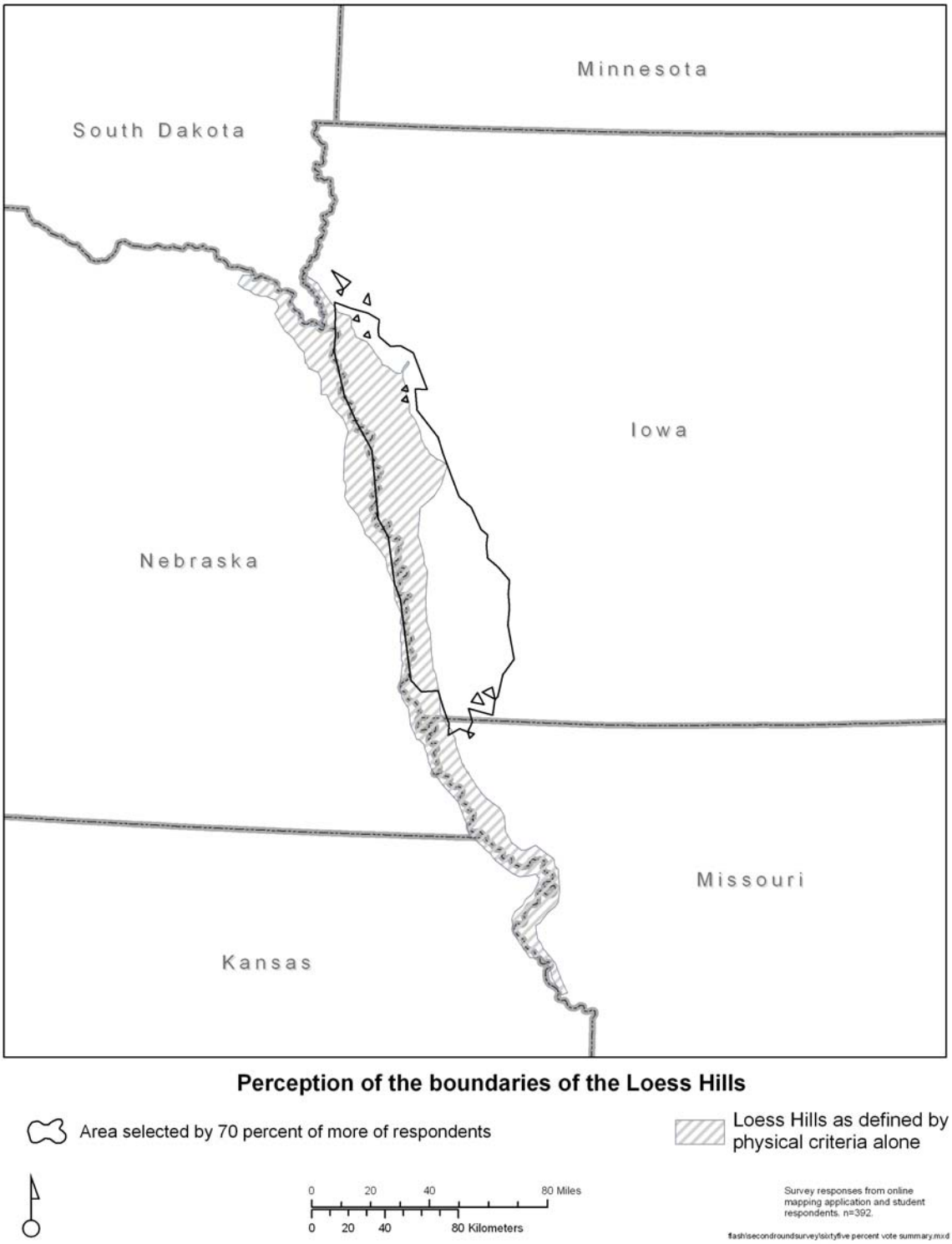


Map 29. Use of a three-dimensional surface to identify consensus opinion.

Whether defined by fifty or seventy percent of respondents, the perceptual Loess Hills include isolated fragments that are not attached to the main region and excludes small areas within the main region. These small inliers and outliers are typically triangular on the maps presented here, the shape being a geometric artifact of the process of deriving boundary lines by connecting the centers of square map cells.

Comparison with similar studies

Further insight into the intensity of awareness of the Loess Hills can be developed by comparing its levels to recognition of those of other landforms. The theory is that, if a landform is well understood and popular perception of its extent approaches a consensus, then the difference between its area as understood by, say, seventy percent of the respondents will be similar to that mapped by those who hold relatively extreme views.



Map 30. The Loess Hills as defined by survey respondents

For example, if we had complete popular agreement about the boundaries of a region, the area defined by twenty, thirty, or forty percent of respondents would exactly equal the area included by seventy or eighty percent. Conversely, if the boundaries of an area are poorly understood, we should expect the core area agreed upon by seventy percent of respondents to be small and the area on which as few as thirty percent of respondents agreed to be large. Using this concept and employing somewhat arbitrary percentages to create a test measure, we can define a coefficient of consensus as:

area agreed upon by seventy percent of respondents /

area agreed upon by thirty percent of respondents

and then compare coefficients across multiple study areas.

For the Loess Hills, the area agreed upon by seventy percent of respondents covers 3,964 square miles, whereas that agreed upon by thirty percent is 25,515 square miles, yielding a coefficient of consensus of fifteen percent. An unpublished study of the Ozark Mountains by Micah Schilling produced maps that gave that region a coefficient of consensus of sixteen percent.[15] Another example, James Shortridge's study of perception of the American Middle West, produced maps that yield a coefficient of twenty-nine percent for that large region.[16] Shortridge's study of vernacular regions in Kansas yielded a coefficient of twenty-five percent for that state's Flint Hills.[17] The data collection used for these last two surveys was different from mine and Schilling's, in that Shortridge asked respondents to provide vernacular names for their home counties rather

[15] Unpublished maps provided by Micah Schilling and in my possession.
[16] Shortridge, "Vernacular Middle West," pp. 48-57.
[17] Shortridge, "Vernacular Regions in Kansas," pp. 73-94.

than asking them to draw boundaries for the region that coincides with particular names. So, though comparisons must be made with caution, it still appears that agreement for the Loess Hills boundary is roughly similar to that of other vernacular regions in the central United States.

Cartographic uncertainty

The maps and discussion here, in addition to illustrating the ambiguity of any proposed boundary of the Loess Hills, also reveal a more general problem. Most maps depict features about which some doubt exists as to location or scope, yet these maps rarely indicate that doubt. Maps look certain, and map readers typically accept their depictions as truth even though, as our discussion has shown, boundaries of both physical and vernacular regions can be highly variable.

The reification of maps is illogical and unexpected in some ways, because in most other areas of positivist science, speakers and listeners are accustomed to statements of uncertainty. The classic statement of confidence intervals, along the lines of: "with 95% confidence, the value of x is between a and b," recognizes that the value being measured probably falls within some range, but that even that range is subject to error. Although the various disciplines within the social and natural sciences use different conventions for expressing statistical uncertainty, the components are generally the same.

Even simple statistics require complex consideration of error. The report that announces the federal government's monthly measure of inflation, for example, includes a sixteen-page description of the error range for a number that citizens routinely use.[18]

[18] Owen Shoemaker, "Variance Estimates for Price Changes in the Consumer Price Index," http://www.bls.gov/cpi/cpivar2005.pdf (accessed Sept. 2, 2008).

Even in everyday news reporting, readers and listeners expect election poll results to include a rough statement of accuracy, typically along the lines of "the margin of error for this survey is x percent."

Even though one lesson of the quantitative revolution in geography was the necessity of specifying degrees of uncertainty in our surveys and data analyses, the subfield of cartography somehow largely exempts itself from this obligation. This is not to deny, of course, that a cadre of dedicated authors has challenged this trend. Rossum and Lavin, for example, demonstrated the power of overlapping monochrome lines to indicate a dispute over the boundaries of the Great Plains.[19] Pang suggested the use of broken lines to indicate doubt about boundaries, and variation in the size of the break to suggest the degree of doubt. He also used glyphs (distorted arrows) to show variation in the magnitude and direction of flows, a device he found particularly useful for representing uncertainty in wind and water currents. His glyphs are long and narrow where little error exists, but short and squat with projections pointing to the sides in places where the flow is highly variable.[20] In still another example, Slocum and his colleagues have experimented with hue and transparency as indicators of uncertainty in models of global water output, with unsaturated and highly transparent colors indicating areas of high uncertainty.[21]

However, despite the works just cited, a look at any atlas or map collection proves that most maps indicate no uncertainty about the objects represented. A newspaper map

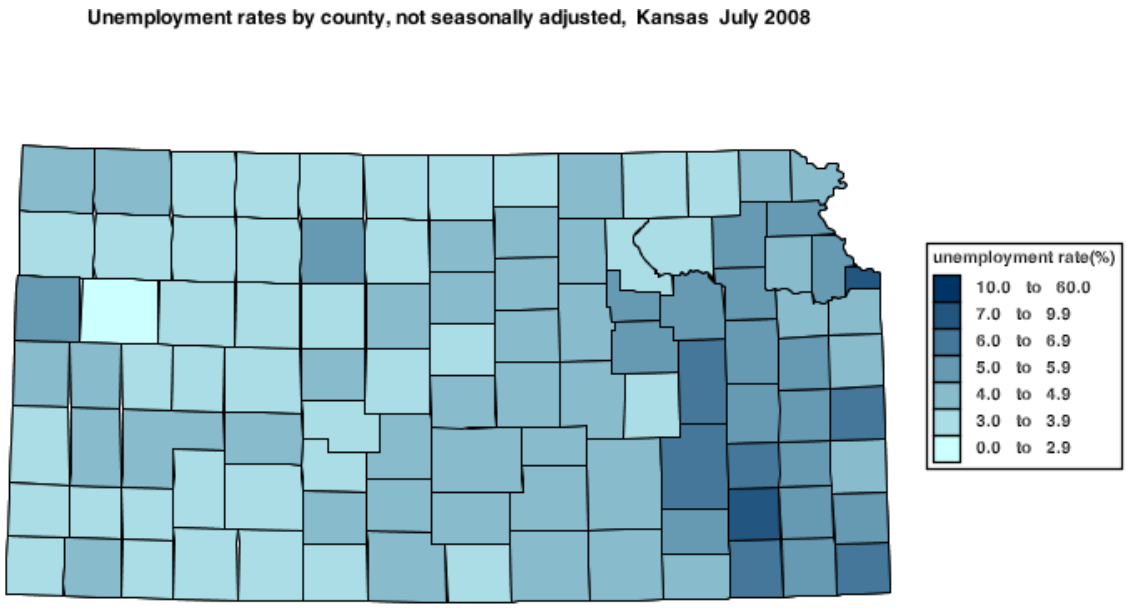
[19] Sonja Rossum and Steven Lavin, "Where Are the Great Plains: A Cartographic Analysis, " *Professional Geographer* 52, no. 3 (2000): 543-552.
[20] Alex Pang, "Visualizing Uncertainty is Geo-spatial data," unpublished paper prepared for the Computer Science and Telecommunications Board (2000).
[21] Terry Slocum, Daniel Cliburn, Johannes Feddema, and James Miller, "Evaluating the Useability of a Tool for Visualizing the Uncertainty of Future Global Water Balance," *Cartography and Geographic Information Science* 30, no. 4 (2003): 299-317.

of unemployment by county, a topographic map showing elevations, or a landcover map all suggest absolute certainty. Yet, upon reflection, any observer would recognize that unemployment rates, elevations, and landcovers are all subject to error, both in terms of where they occur and what they are.

Cartography and statistical uncertainty

Statistical uncertainty contributes to cartographic ambiguity. The example of a choropleth map of unemployment for individual counties illustrates this concept (map 31). Such maps are developed from sample surveys of employment, unemployment, and the size of the labor force, adjusted by related data. The statisticians who produce such information caution users to treat values within one percentage point of each other as indistinguishable. The map provided by the Bureau of Labor Statistics, however, does not acknowledge this statistical uncertainty and regularly displays counties with values only one percentage point apart in dramatically different shades. Such values, of course, being within the one percent confidence interval, are statistically indistinguishable.

Errors in the data could also derive from poor definitions, poor communication between enumerator and respondent, or miscalculation. For example, continuing with the unemployment map as an illustration, one could easily take issue with the definition of employment used in developing the data. This definition fails to acknowledge underemployment, for example, and certain map-readers will find this a serious problem. No amount of additional sampling, so long as the underlying definitions remain unchanged, will ever remove that error.



Map 31. Example output of U.S. Department of Labor online mapping application[22]

Error in maps actually goes far beyond statistical issues. The most challenging problems are those that arise from attempting to map phenomena that are, by their very nature, ambiguous. The location of a region is an example of such a phenomenon. Although we can put together a variety of physical measures for a place like the Loess Hills, and even develop arithmetical rules by which those different measures can be combined, perceptions of the region will not submit to this kind of tabulation. A belief about a place is just that: a belief. Only if the location of the place were known with certainty could we produce a measure of the accuracy of these beliefs. But, as this entire chapter has attempted to show, not only do we have no objective measure of the location

[22] http://data.bls.gov/map/servlet/map.servlet.MapToolServlet?state=20&datatype=unemployment&year=2008&period=M07&survey=la&map=county&seasonal=u. Accessed August 20, 2008.

of the Hills, we also cannot assume that beliefs will follow any particular statistical rules of distribution or variation. The challenge is to represent a set of spatial votes about where the Loess Hills are, even knowing that no ground rules exist for putting them together or for declaring that any particular number of votes constitutes a consensus agreement.

Brandon Plewe has provided a particularly useful schema for considering the range of errors to which all maps are vulnerable, but particularly maps of a disputed place. He makes a distinction between ambiguity and fuzziness. Statistical data are ambiguous. They have errors, but with more and better observations of the data, we can expect those errors to approach zero. Fuzzy phenomena are those in which uncertainty is an essential attribute of the object itself, not a result of any failure of measurement.[23]

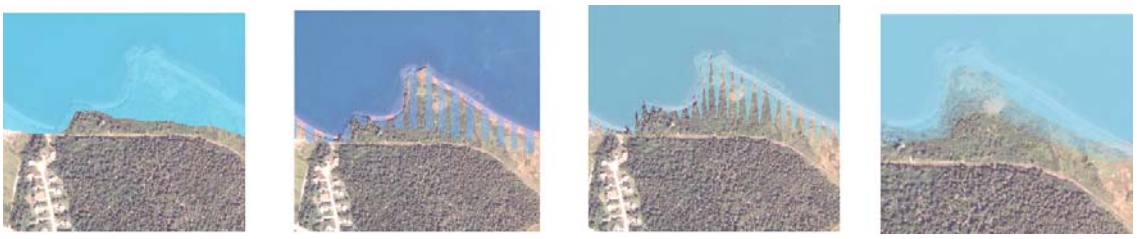
Ambiguity in spatial data can come from a variety of sources. The simplest is spatial uncertainty, the situation in which we know that an object exists in physical space but our measurements of it are uncertain. If our measurement errors do not have a systematic bias, then additional efforts at measurement will produce increasingly accurate estimates of that object's location. A trickier problem, and one that is increasingly important as animation tools make the production of dynamic maps more common, is that of temporal uncertainty. For example, we may know that sea levels fluctuate, in part, in conjunction with changes in ice sheets, but predictive models for future ice sheet melting are, at best, uncertain. Animations of sea level rise are relatively common, but none of them indicate the uncertainty associated with those predicted changes.

[23] Brandon Plewe, "Representing Datum-level Uncertainty in Historical GIS," *Cartography and Geographic Information Science* 30, no. 4 (2003): 319-344.

Representing fuzzy phenomena

Maps of fuzzy phenomena, in contrast to the examples of statistical ambiguity described above, cannot be made clear by more or better data. Such maps include speculative situations plus the kind of geosophical inquiry that I focused on earlier in this chapter.

Speculative phenomena include situations that are counterfactual, but still worthy of inquiry. For example, one might produce a map to indicate that, *if* sea level were to rise three meters, a certain area would be flooded. Similarly, we could map the area of the Loess Hills prairie that would be lost *if* woodland incursion were to continue at its current pace for another decade. In both cases, the resulting map would be analytically useful, but responsible cartography would demand a notation to users that the condition mapped has not occurred and may never occur. Cartographic techniques to communicate this kind of counterfactual condition include unsaturated hues, elevated transparency, and sawtooth or piano-key style boundaries on regions (map 32).



Map 32. Cartographic techniques for illustrating speculative phenomena. A. reduced color saturation. B. piano key boundary. C. sawtooth boundary. D. increasing transparency.

Maps of geosophy also represent fuzzy phenomena. No amount of additional data or more refined survey instruments can be expected to reduce differences of opinion over the boundaries of the Loess Hills or any other region. Nor can the differences among

boundaries be considered any kind of variation around a true boundary. The facts that people in Missouri are likely to include northwest Missouri within this region and that people in South Dakota are likely to include northeast Nebraska does not indicate a variation around some true definition of the Hills. Such variation, or uncertainty, among observers is inherently interesting, however, because it illustrates how people from different places or with different life experiences view the same landscape. They illustrate perfectly Helen Coucelis's argument with respect to GIS data that "uncertainty is an intrinsic property of knowledge and not just a flaw that needs to be excised."[24] The variation among individual respondents and among groups of respondents, as discussed earlier and presented in map 27, is as meaningful as the average of even the largest possible sample of respondents.

[24] Helen Coucelis, "The Certainty of Uncertainty; GIS and the Limits of Geographical Knowledge," *Transactions in GIS* 7, no 2 (2004): 166.

Chapter 5. Creating the Loess Hills

Places are not just the product of characteristics that can be derived from surveys, soil samples, or plant censuses. Instead, they contain such traits augmented by human attitudes toward those characteristics and human behavior in those locations.[1] If we are to define the Hills accurately and make sense of them as a place, we must explore the history and components of beliefs about the Hills. In addition, the places about which a community of people, their elected representatives, and their appointed agents make decisions are not those that exist on the ground. Instead, our behavior toward a place is based on what we understand about it, to use John K. Wright's word, by the geosophy of the place.[2]

Consideration of geosophy, or the accumulated understanding of the geography of the Hills, is not intended to point out popular geographic ignorance of physical features of the Earth. Nor is it meant to illustrate the failure of professional geographers to reflect the knowledge of people who live in a place. Instead, it acknowledges that places as they exist in any person's imagination are only loosely connected to places as they exist either on the ground or in any other person's imagination.

Both public and private actions are driven by the geosophy of a place. When a farmer decides to grow soybeans, graze cattle, or let cedars invade, he does so based on his understanding of the farm. When a government decides to create a park, a highway, or an industrial district, it does so based on its understanding, or its geosophy, of the

[1] Robert Sack, "The Geographic Problematic: Empirical Issues," *Norwegian Journal of Geography* 55, no. 1 (2001): 107-116.
[2] John K. Wright, "Terrae Incognitae: The Place of Imagination in Geography," *Annals of the Association of American Geographers* 37 no. 1 (1947): 1-15; John K. Wright, *Human Nature in Geography* (Cambridge: Harvard University Press: 1966).

place. Given that it is our understanding of a place, not the location's physical characteristics, that will guide our behavior, we need to consider both what that understanding is and how it was created.

Studies of the creation of place owe a debt to the work of Yi-Fu Tuan. His *Space and Place* provides a theoretical underpinning to the consideration of human experience as the defining characteristic of places.[3] In a more concrete way, James Shortridge's study of vernacular regions in Kansas dealt with geosophical questions at the same general scale as the Loess Hills: that of regions that are larger than counties or metropolitan areas but smaller than states. He explored how people named and defined places, and found examples such as the so-called Red Hills of southern Kansas, a term that is used by geomorphologists but is largely unrecognized by residents of the area, who know their region as the Gyp (for gypsum) Hills.[4] Similarly, Walter Kollmorgen and David Simonett noted considerable differences among definitions of the Flint Hills based on different physical characteristics and between any of those definitions and behavior toward the region as demonstrated by the road network.[5] At a broader scale, Wilbur Zelinsky explored multistate vernacular regions that had relatively little connection with any underlying physiography.[6]

At the same time, other authors have explored issues of the creation of what might be called pseudovernacular landscapes, those that hearken back to some vernacular tradition but are, in fact, deliberate creations meant to be marketed to visitors. Steven

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[3] Yi-Fu Tuan, *Space and Place: The Perspective of Experience* (Minneapolis: University of Minnesota Press, 1977).
[4] James Shortridge, "Vernacular Regions in Kansas," *American Studies* 21, no. 1 (1980): 73-94.
[5] Walter M. Kollmorgen and David Simonett, "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas," *Annals of the Association of American Geographers* 55, no. 2 (1965): 260-290.
[6] Wilbur Zelinsky, "North America's Vernacular Regions," *Annals of the Association of American Geographers* 70 no. 1 (1980): 1-16.

Schnell's essay on Lindsborg, Kansas[7] and Steven Hoelscher's treatment of the Wisconsin Dells[8] fall in this tradition. The Loess Hills, as we shall see, are something intermediate between a deeply vernacular and totally fabricated region. They derive from a long-standing history of responses to a striking landform, but are also a product of contemporary management of their image.

This chapter will first consider expressions of the geosophy of the Hills that can be quantified, such as distributions of business names or representations of the Loess Hills in hundreds of newspaper articles. It will then explore the extent to which the Hills are the product of a recent and deliberate effort at place creation. Rejecting the adequacy of this explanation, the chapter will then consider how conceptions of the Hills evolved during the last two centuries, paying particular attention to the contribution of nineteenth-century landscape painters.

A place in the imagination

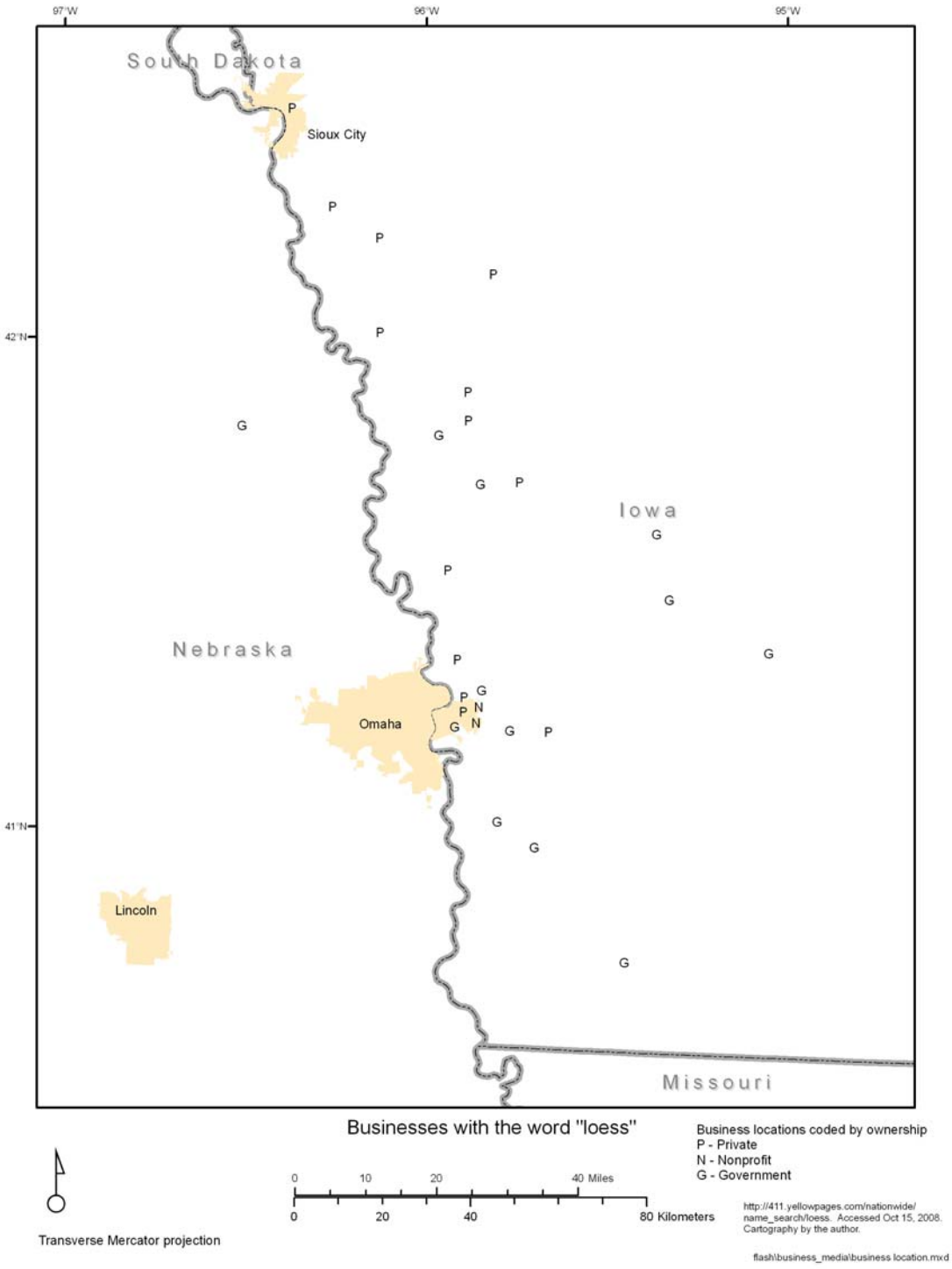
Although the Loess Hills may extend a great distance on the ground and in the imagination of residents, promotion of the Hills as a distinct place is considerably more limited. From its beginning point in Kansas City, Interstate 29 runs more than ninety miles along or through the Loess Hills to the Iowa-Missouri line. Nowhere along these miles is there a single sign mentioning "loess hill," not on a single business, not promoting a single tourist destination, not announcing a single park. Immediately inside Iowa, in contrast, at the first exit north of the state line, a promotional billboard for the

[7] Steven Schnell, "Creating Narratives of Place and Identity in 'Little Sweden, USA'," *Geographical Review* 93, no. 1 (2003): 1-29.
[8] Steven Hoelscher, "The Photographic Construction of Tourist Space in Victorian America," *Geographical Review* 88, no. 4 (1998): 548-570.

town of Hamburg proclaims itself the "Gateway to the Loess Hills Scenic Byway." From that point northward, a visitor is assaulted with signs calling attention to the Loess Hills. Throughout Iowa, the words "Loess Hills" are used much more often to promote businesses or organizations than they are in Missouri or Nebraska (map 33). A Yellowpages.com[9] search on the word "loess" returned forty business names and addresses, thirty-eight of which are in Iowa, one in Nebraska, and one in Hawaii. The list includes schools, realtors, landfills, candle stores, dentists, financial services, resorts, massage centers, and tanning parlors. The use of "loess" or "Loess Hills" in the name of a business reveals a level of attachment to the label and a belief that it is both understood and viewed favorably within the community. When a businessperson calls his enterprise "Loess Hills Plumbing and Heating," he is betting his family's income on the belief that "Loess Hills" carries positive meaning to customers. Business names thus show an intensity of belief in the existence of a place that broad survey research of the kind offered in the previous chapter may not detect.

When Zelinsky advocated the use of business names as a way of measuring vernacular regions, he deliberately excluded names applied to government entities on the grounds that such names were imposed from an administrative authority and did not spring from the language of the people.[10] His warning provides a useful insight into the use of "Loess Hills." The majority of the uses of the term are applied to government entities. This supports the argument that the Loess Hills are not a genuinely vernacular region, but one that has been created, to a greater or lesser extent, by the action of outside

[9] Yellow Pages web site. http://411.yellowpages.com/nationwide/name_search/loess, (accessed Oct 15, 2008).
[10] Zelinsky, "North America's Vernacular Regions," p. 4.



Map 33. Distribution of businesses using the word “loess” in the business name.

elites. At the same time, the use of "Loess Hills" in the name of tanning parlors, dentists, and massage centers suggests that the words and the region are certainly entering vernacular usage. The use of Loess Hills in the names of private businesses is concentrated in the area from Council Bluffs to Sioux City, and excludes the southern Hills completely.

Press coverage can also be used to gauge the intensity of belief in the existence of a place and its location. Journalists will only use a place name if they believe it is meaningful to their readers, or if its use is expected by the managers, editors, or advertisers who control the press outlet. To measure the use of the words "loess hills" in the press, I asked the Google™ "Personalized News" service to send me all newspaper articles that mention "Loess Hills" for two and a half years. This service promises to provide any content from their sample of 4,500 English-language news sources that meet a user's search criteria.[11]

The Hills are frequently mentioned in news coverage, with almost five hundred articles during the period (table 10). Most of these were not about the Loess Hills themselves, however, but mentioned them in passing or referred to a business or organization with the words "loess hills" in its name. A large number, for example, discussed the fund-raising and community service work of the Loess Hills Red Cross chapter. Such a reference suggests a vernacular use of the words "loess hills" but not necessarily a powerful awareness of the Hills as a place. It also reveals a potential bias in

[11] Google, Inc., "About Google News," http://news.google.com/intl/en_us/about_google_news.html (accessed March 4, 2009). This tool seems considerably more reliable than the archival search tools discussed later. I have used it for other searches, in fields in which I have some experience, and have never found it to miss a source that I could find via other research methods.

such data: one particularly effective press agent or public affairs office in an organization can generate enough media coverage to create the impression of much more public awareness than, in fact, exists.

More than eighty-seven percent of the articles featured information about Iowa; followed distantly by four percent describing places in Nebraska and three percent about Missouri (table 10). More than seventy-seven percent appeared in an Iowa newspaper, despite the wide readership in the Hills of large circulation papers from Kansas City, Missouri and St. Joseph, Missouri that are widely read in the Loess Hills. Seven percent of the articles appeared in Nebraska papers, led by coverage in the Omaha *World-Herald*, which competes with the Council Bluffs *Nonpariel* for readers on the Iowa side of the Omaha metropolitan area and frequently runs stories on the Iowa Hills but rarely about the Hills of Nebraska. Outside the Missouri valley, the term Loess Hills is most often applied to locations in the Peoples Republic of China, and occasionally to locations in Washington (the Palouse) and the Mississippi River valley.

Table 10. News reports of Loess Hills from March 22, 2006 to Oct 15, 2008

	Place of publication	Subject
Iowa	384	422
Nebraska	37	21
Missouri	12	15
Kansas	1	
South Dakota	3	3
Other US	41	7*
Outside US	17	17**
Total	495	485
		*WA, LA, MS, AK **mostly China

Source: Google Personalized News

The LexisNexis database reveals a similar usage pattern of the word "loess" in news reports. A search conducted on May 6, 2006, returned 29 articles. Of these, 8 were about loess overseas, typically in China. The remaining 21 were about Iowa or Nebraska. Not one came from a Missouri newspaper or was focused on the Missouri Loess Hills.

These results reveal the unreliability inherent in computer search tools. On several occasions, searches of databases of newspaper and magazine articles have not returned articles I know to exist. A research librarian speculates that such failure might result from limitations of optical character recognition software used to catalog articles. The software, encountering an unrecognized word such as "loess" in a printed article might convert it to a recognized word, such as "loss" and thereby fail to yield a reliable search. Results based on computerized catalog searches must, therefore, be interpreted with caution.

Government-sponsored geosophy

Published tourist literature from the State of Iowa has made a valiant effort to define the Loess Hills as an exclusively Iowa landform. Maps of the Loess Hills Scenic Byway emphatically mark the southern terminus of that route at Hamburg, Iowa.[12] The official Iowa Department of Transportation road map shows the Loess Hills in a gray tint, the only landform in the entire state to be mapped. Naturally, the Loess Hills Scenic Byway is featured on the map as well. The official map from a decade earlier contains no similar indication, suggesting a growing awareness of the hills as a feature worth

[12] National Scenic Byways, *Loess Hills Roadmap*, (2006), http://www.byways.org/library/display/18339/LoessHills_Roadmap_web.gif (accessed April 23, 2006).

promoting to travelers.[13] Chad Greave, a naturalist at the Hitchcock Nature Center just outside Council Bluffs, interviewed in 2006, expressed satisfaction that the state decided to include the hills on the official road map, but was dismayed that the addition was not made earlier. The states of Missouri and Nebraska, in contrast, do not depict the Loess Hills at all on their official highway maps, though Nebraska does indicate a region of rolling hills along the eastern margin of the state.[14]

Other official state tourist literature illustrates differences in emphasis among the neighboring states. The 2006 travel guide from the Iowa Department of Economic Development features two photographs of Loess Hills locations and several listings for events in the area. It also calls attention to the Southern Loess Hills Interpretive and Welcome Center at Percival, Fremont County.[15] Missouri, in contrast, makes almost no mention of the Loess Hills in their vacation planner publication. Nebraska, as well, virtually ignores the Hills in their large and slick tourist guide. The words Loess Hills appear only once, in a lodging advertisement. The actual text of the publication never mentions the Loess Hills, even while describing the dramatic rolling hills of the Missouri valley in other, glowing language.[16]

A cynical observer might suggest that the attention paid to the Loess Hills in Iowa tourist literature reflects a statewide scarcity of tourism opportunities relative to its

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[13] Iowa Department of Transportation, *1995 Transportation Map,* (Ames: Iowa Department of Transportation, 1995); Iowa Department of Transportation, *2006 Transportation Map* (Ames: Iowa Department of Transportation, 2006).
[14] State of Nebraska, Department of Roads, 2007 Highway Map, online at http://www.dor.state.ne.us/maps/state-map/current/pdf/front.pdf (accessed 1/13/2009); Missouri Department of Transportation, *Official Highway Map 2001-2002* (Jefferson City: Missouri Department of Transportation, 2001); Missouri Department of Transportation. *Official Highway Map 2005-2006,* (Jefferson City: Missouri Department of Transportation, 2005).
[15] Iowa Department of Economic Development, *Iowa: Life Changing – 2006 Travel Guide* (Des Moines: Iowa Department of Economic Development, 2006).
[16] State of Nebraska, Department of Economic Development, *Nebraska 2009 Official Travel Guide*, (Lincoln: Nebraska Department of Economic Development, 2009).

neighbors. Such an observation is factually disputable. Iowa is a remarkably beautiful state, well endowed with natural and cultural tourist destinations. The 2006 travel guide from Iowa is highly crafted publication that leaves a reader thinking Iowa is a major tourist destination, with cultural and recreational attractions to rival those of any state.

Government promotional efforts are not limited to tourism agencies or to state agencies. Much important work has been done at smaller organization scales. The Western Hills Area Education Agency (whose choice of name is, in itself, noteworthy for the absence of the word "loess") has hosted a Loess Hills Prairie Seminar in Iowa every spring since 1977. This event is marketed to teachers, recreation professionals, and the general public, though, because it is sponsored by what is essentially a regional school district, it has always been of particular interest to educators.[17] By educating between 250 and 300 individuals about the Loess Hills as a distinct place every year for more than thirty years, including a large number of teachers who might be counted on to spread the word, the Loess Hills Prairie Seminar may have done more than any other institution to advance a vernacular awareness of the Hills within Iowa.

The public and private partnership leading to designation of the Loess Hills Scenic Byway can also be credited with advancing vernacular awareness of the Hills. That effort can be formally dated to 1989, though one of the lead agencies, Golden Hills Resource Conservation and Development, Inc. has been working to promote the region since 1981. The partnership includes seven county governments and area-wide regional tourism organizations.[18] Again, as with the Western Hills Area Education Agency, the

[17] Diane Blankenship, Making Friends with Giants. In *Land of the Fragile Giants*, ed. C. Mutel and M. Swander (Iowa City: University of Iowa Press, 1994).
[18] Federal Highway Administration. Undated. *Iowa's Loess Hills National Scenic Byway*. No place of publication noted: United States Federal Highway Administration.

Golden Hills RC&D chose not to use the word "loess" in its name. Curiously, a Loess Hills Area Education Agency exists in southwest Iowa, but is not particularly active in promoting the region. The Western Hills Area Education Agency has recently merged with an adjoining district under the name Northwest Area Education Agency, thus further distancing their name from the Hills.

Two parks that have been particularly active in interpreting the Hills, Hitchcock Nature Center and Dorothy Pecaut Nature Center, are administered by county governments. Their trails and interpretive centers are considerably more developed than those of the state-run Loess Hills State Forest and of several state parks. The county nature center staff argue that Iowa's system for managing public land, which gives considerable funding and autonomy to county conservation boards, provides a unique opportunity for local-scale agencies to decide which natural features are worthy of protection and promotion to the public. This autonomy is further supported by funding from the state's Resource Enhancement and Protection (REAP) grant program, which distributes proceeds from gambling revenues and the sale of specialty license plates, plus some general state funds directly to local government agencies.[19] Local control allows promotion of features that may not be high priorities for state officials, but runs the risk of creating a fragmented program of public lands without a common strategy, a peril that even county-level officials admit in conversation.

Historical Development of the Loess Hills as a landscape of imagination

If we agree that the Loess Hills, as a vernacular or popular landscape, exist primarily in Iowa, the question arises of how Iowa came to be the popular home of these

[19] Chad Graeve, Park Naturalist, Hitchcock Nature Center, Personal Interview, October 12, 2007.

hills. The efforts of organizations such as Western Hills AEA, Golden Hills RC&D, and the Des Moines *Register* newspaper suggest that Loess Hills awareness is a project of the last quarter of the twentieth century.[20] This is not true. The area was discussed in the technical and popular press throughout the nineteenth and early twentieth century, at which time it often was characterized as being considerably larger than in recent conceptions (appendix 5). Awareness of the Hills even predates Euroamerican arrival in the Hills and grew steadily throughout the two hundred years of their modern occupation. The rest of this chapter will explore the development of perception of the Loess Hills.

Don Reese, who grew up on a farm in the Loess Hills, wrote in 1994 that he "lived in the Loess Hills fifty years before I knew that I was living in the Loess Hills."[21] His experience captures the developing sense that the region is a distinct and special place, different from other river-edge bluffs. That sense of place grew slowly, however.

The Hills have long been home to Native American communities. Archaeological evidence indicates occupation at least on an intermittent or seasonal basis, for the last twelve thousand years. The evidence is scanty--primarily spear points and bones of prey--but suggests that so-called Paleo-Indians hunted large game throughout the Hills. Archaic Indians were also clearly active locally from about 8,500 to 2,500 years before the present, as indicated by excavations of camps and burial sites. These sites suggest somewhat greater attachment to specific places, and occupation for long enough to repair equipment and bury the dead.[22] The youngest layers of Loess Hills sediment were

[20] Peggy Petrzelka, "The New Landform's Here! The New Landform's Here! We're Somebody Now!! The Role of Discursive Practices on Place Identity," *Rural Sociology* 69, no. 3 (2004): 386-404.
[21] Don Reese, "The Reese Homestead," in *Land of the Fragile Giants*, ed. C. Mutel and M. Swander (Iowa City: University of Iowa Press, 1994), 48.
[22] Cornelia Mutel, *Fragile Giants* (Iowa City: University of Iowa Press, 1989).

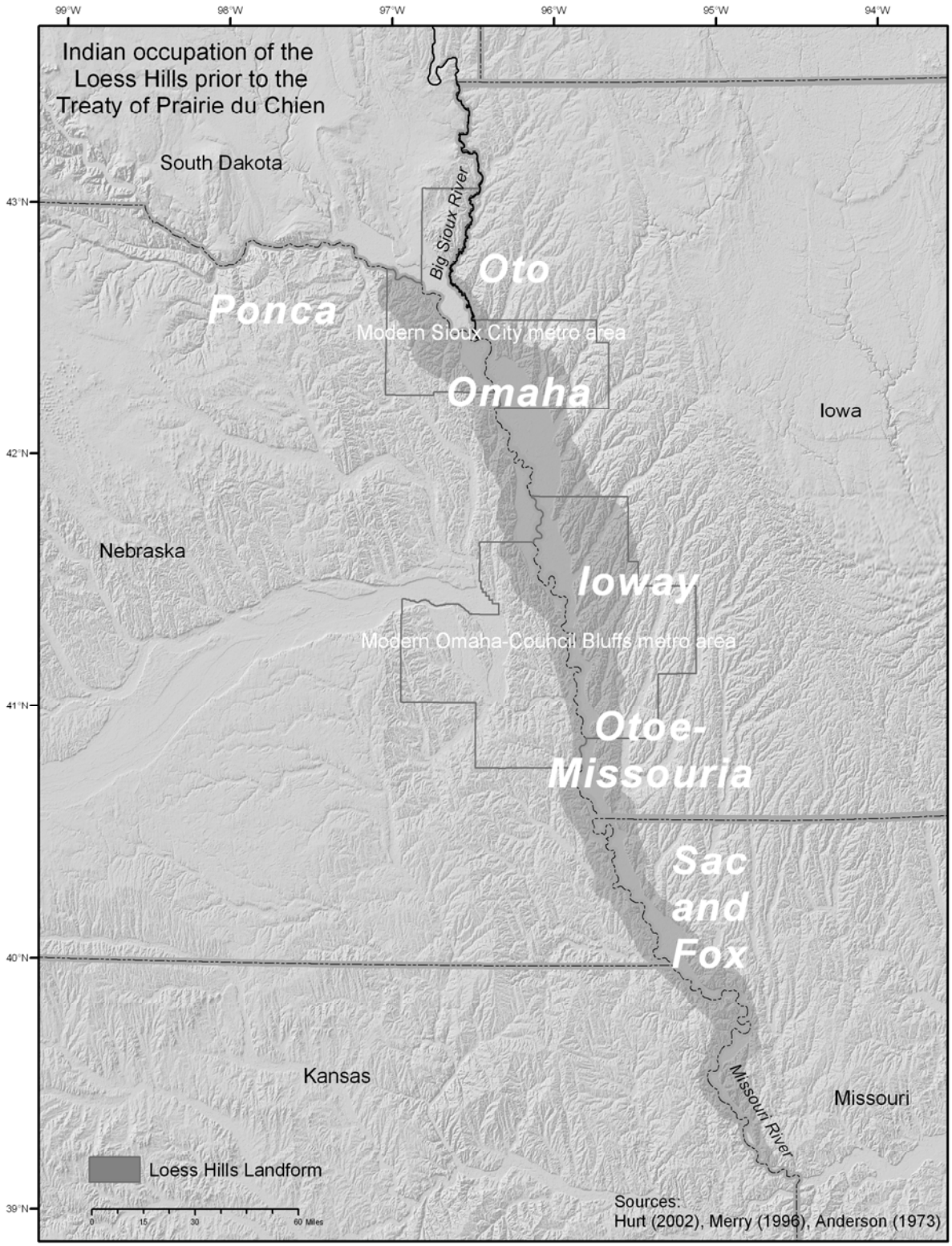
deposited between 10,000 and 15,000 years ago, so Indian occupation of this place is almost as old as the terrain itself.

From about 2,500 to 1,000 years ago, burial mounds the Loess Hills were occupied by Indians of the Woodland culture. Although these Woodland peoples were seminomadic, they did return seasonally to the same town sites for hundreds of years, so can be said to have been closely attached to the Hills. The Woodland culture, in turn, gave way to traditions that made greater use of agriculture, particularly the Nebraska and Glenwood cultures. These peoples prospered until about 1300 when, perhaps under pressure from Oneota combatants, their presence faded. The Oneota are considered ancestors to the Siouan people, including the Ioway, Omaha and Missouri, who were present in the Hills at the time of Euroamerican exploration.

At the time of contact with Euroamericans, the Ioway and Oto had established villages on both sides of the Missouri River (map 34). The Dakota were just north of the Hills and traveled the Missouri River corridor. The Pottawatomie were driven into the Loess Hills, from Michigan, in the early 1800s.[23]

A quotation attributed to the Omaha Chief Blackbird suggests great Native American attachment to the Hills: "When my spirit is gone, take me to the Big Muddy

[23] Carl Merry, "The Historic Period," Online publication of the Office of the State Archaeologist, University of Iowa, at http://www.uiowa.edu/~osa/learn/historic.hisper.htm (1996) , (accessed Oct. 28, 2008; Shirley Schermer, William Green, and James Collins. "A Brief Cultural History of Iowa," Online publication of the Office of the State Archaeologist, University of Iowa, at http://www.uiowa.edu/~osa/learn/prehistoric/overview.htm (1995), (accessed Oct. 28, 2008); "Iowa Indian Tribes," *Access Geneeology*. Online at http://www.accessgeheology.com/native/iowa/index.htm. (2007), (accessed Jan. 31, 2007).



Map 34. Pre-1830 Indian occupation of the Loess Hills

where the yellow hills rise."[24] The site of his burial was later recorded in paintings by George Catlin and Karl Bodmer, and exists today as a shrine along U. S. Highway 75 in Thurston County, Nebraska.

Lewis and Clark, traveling up the Missouri along the edge of the Loess Hills in 1804, were struck by the peculiar look of the hills they encountered. They named them the "ball-pated prairie" and Lewis remarked that this landform extended "as far upstream as I can see" from their camp in northern Missouri, just south of the valley of the Nishnabotna River.[25] Sergeant Charles Floyd, a member of the Lewis and Clark party, was similarly impressed, remarking that the Hills were "one of the Butifuls Praries I ever saw, open and butyfully Divided with Hills and Vallies all presenting themselves."[26] Meriwether Lewis also left a cartographic response to the Hills by representing them as a line of chevrons on both the east and west sides of the Missouri in modern Missouri, Iowa, and Nebraska. He labeled his map with local names such as "Hot Bluffs" and "Miner Bluffs."[27]

Twenty years later, beginning with Major Stephen Long's ascent of the Missouri in the steamboat *Western Engineer*, the Missouri was open to limited commercial navigation, allowing naturalists to see the area. Maximilian, Prince of Wied, traveling the Missouri in 1833 remarked on the hills at the Nishnabotna River, near the present

[24] Iowa Writers' Project, *Woodbury County History* (Sioux City: Woodbury County Superindendent of Schools, 1942), 8.
[25] Meriwether Lewis and William Clark, *The Journals of the Lewis and Clark Expedition*, ed. Gary Moulton (Lincoln: University of Nebraska Press, 1987), 384.
[26] Floyd, quoted in Dayton Duncan, *Scenes of Visionary Enchantment* (Lincoln: University of Nebraska Press, 2004.) The spelling and punctuation are Floyd's.
[27] Samuel Lewis, *A Map of Lewis and Clark's Track* (Philadelphia: Bradford and Inskeep, 1814).

location of Hamburg, Iowa, as the "chain of hills."[28] George Catlin, the landscape painter, called one of his Loess Hills paintings "Grassy Bluffs on the Upper Missouri," further advancing the notion that the hills were noteworthy more for their grassy landcover than their geology.

The naturalists Edward Harris and John James Audubon, traveling along the western flank of the hills in 1843, use local vernacular labels such as "Black-Snake Hills" for parts of the landscape.[29] Harris noted the "Bluffs which are crowned by the great Prairie," and the "Prairie Bluffs," which he capitalized in his journal but seemed to use as a descriptor of a landform rather than as a place name.[30] He also detected that the bluffs were geologically special, observing first that no exposed rock existed in the hills and then making the contradictory observation that they were formed from a soft yellow sandstone. Harris bemoaned his lack of time to inspect the hills more closely, sensing that his explanation of their geology was incomplete and that closer inspection might reveal a more interesting story.

In the middle of the nineteenth century, a book intended to promote Iowa to emigrants offered effusive descriptions of the Hills, using language such as "swells," "ridges," "points," and "peaks." One of the few illustrations of a landscape feature in the entire book is the "Hills of Silicious Marl, Council Bluffs," a perfect engraving of loess

[28] William J. Orr and Joseph C. Porter. "A Journey Through the Nebraska Region in 1833 and 1834: From the Diaries of Prince Maximilian of Wied," *Nebraska History* 64, no. 3 (1983): 330.

[29] M. B. Durant and M. Harwood, *On the Road with John James Audubon* (New York: Dodd, Mead & Co., 1980).

[30] J. F. McDermott, *Up the Missouri with Audubon, the Journal of Edward Harris* (Norman: University of Oklahoma Press, 1951), 61 & 64.

mounds.[31] This name for the Hills is remarkably accurate, though it never won popular acceptance. The loess is silicious, that is, composed of quartz, and also a marl, in the sense of being a loosely consolidated sediment bound by calcium carbonate.

A more refined recognition of the Loess Hills as a distinct landform occurred in the late 1800s, when the prevailing belief that they were products of fluvial deposition and uplift was replaced with the understanding that they were a rare example of wind-borne deposition.[32] In 1870, the Council Bluffs *Times* reported that the most "remarkable feature of this portion of the county is the bluff system. They rise to a height of about two to three hundred feet, and on their river or westward face are devoid of timber except for a tree here and there."[33] By 1892, promoters from Sioux City, Iowa, made a connection between the local Loess Hills (though they did not use those words) and the similarly well-drained soils of "the famous Yang-Ste-Kiang, China."[34]

The language with which the landform was described in this period moved toward the modern "Loess Hills" usage, but never quite put those words together. Instead, both popular and scientific articles used descriptors such as "Bluff Deposit,"[35] "bluff range,"[36] "light mulatto-colored bluff deposit,"[37] "loess or bluff formation,"[38] and "loess mounds."[39] Finally, in 1902, an article in the New York *Times*, quoting the geologist

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[31] N. Howe Parker, *Iowa as it Is in 1856; a Gazetteer for Citizens and a Hand-book for Emigrants.* (Chicago: Keen and Lee, 1856), 30 and 186.
[32] Bonhomil Shimek, "A Theory of Loess" *Proceedings of the Iowa Academy of Science* 3 (1895): 82-89.
[33] M. A. Bonney, "A New People Come to the Hills" in *Land of the Fragile Giants,* ed. C. Mutel and M. Swander (Iowa City: University of Iowa Press, 1994), 42.
[34] Bonney, "A New People Come to the Hills," p. 42.
[35] C. A. White, *Report of the Geological Survey of the State of Iowa* 1 (Des Moines: Mills and Co., 1870): 106 (White's capitalization).
[36] no author, *History of Fremont County, Iowa* (Des Moines: Iowa Historical Co., 1881), 9.
[37] no author, *History of Western Iowa* (Sioux City, Iowa: Western Publishing Co., 1882), 244.
[38] no author, *History of the Counties of Woodbury and Plymouth, Iowa* (Chicago: A.Warner and Co., 1890), 29.
[39] B. F. Bush, "Notes on the Mound Flora of Atchison County, Missouri, *Missouri Botanical Gardern Report* 1 (1895), 121.

Warren Upham in a long technical report, refers to the hills outside Council Bluffs as "the loess hills."[40]

The arrival of the words "Loess Hills" in the popular press was delayed another thirty years. The 1930s WPA guides used the Loess Hills label but, curiously, the words were applied to the Hills of Missouri, not Iowa or Nebraska. The area defined by this new term extended from immediately north of Kansas City to the Iowa line.[41] The WPA guide to Iowa speaks only of "wind blown loess" and "brown, crumbling bluffs"[42] while the Nebraska guide refers to the landform in that state as "loess bluffs along the Missouri."[43] The WPA guide to Kansas identifies the northeastern extreme of the state, with the greatest presence of loess hills, as "Glacial Uplands."[44]

Shortly after the appearance of the words "Loess Hills" in popular books in the 1930s, they also began to appear on maps. An A. J. Nystrom map of Iowa[45] and a Denoyer-Geppert map of Nebraska,[46] both published in 1941, identify and label the Loess Hills as a distinct physical region. The Iowa version shows the Hills following the east bank of the Missouri River and extending into both South Dakota and Missouri. The Nebraska map shows them running the entire north-south extent of the state, forming a band about ten miles wide in the south and a hundred miles wide in the north. Both maps were designed for elementary or high-school classrooms, so might have contributed to a

[40] The Lansing Skull Discovery. New York *Times*, Sept. 28, 1902, p. 31.
[41] Federal Writers' Project of the Works Project Administration, *Missouri: A Guide to the Show-Me State* (New York: Hastings House, 1941), 24.
[42] Federal Writers' Project of the Works Project Administration, *Iowa* (New York: Viking Press, 1938).
[43] Sheldon Addison, *Nebraska: The Land and Its People* (Chicago: Lewis Publishing Co., 1931): 121.
[44] Federal Writers' Project of the Works Project Administration, *The WPA Guide to 1930s Kansas* (Lawrence: University Press of Kansas, 1984), 307.
[45] *Iowa Physical-Political Soil Map,* Map PS114, 1:560,000 scale. (Chicago: A.J. Nystrom Co., 1941).
[46] *Physical and Political Nebraska,* Map J 126rp, 1:700,000 scale. (Chicago: Denoyer-Geppert Co., 1941)

growing awareness of the Hills as a distinct region among the generation attending school immediately after World War II.

The generation of writers, both popular and scholarly, who had been exposed to those 1940s classroom maps, finally pushed the words Loess Hills into broad usage in the last half of the twentieth century. Harold Hopkins[47] and J. E. Weaver,[48] writing for an audience of scientists, used the words Loess Hills to describe most of eastern Nebraska and northeast Kansas as far south as the Kansas River. Jean Prior, writing for a broader audience in 1976, labeled the hills of Iowa as the "Western Loess Hills."[49] (A revision of the book, issued in 1991, finally simplified the name to Loess Hills.[50]) A year later, the Loess Hills Prairie Seminar began. Together, the Prior book and the seminar mark the beginning of a concerted effort to push the words Loess Hills into popular usage and to associate them specifically with Iowa. That effort gained additional momentum with the publication of Cornelia Mutel's *Fragile Giants* in 1989. In 1992, John Madson, an influential nature writer, published an article on the Loess Hills in *Audubon* magazine, probably the most respected of the mass-market nature magazines, giving even more attention and credibility to the label.[51]

Not only have Iowa writers and institutions been instrumental in cultivating an awareness of the Loess Hills as a distinct place, but they have contributed to a notion that the hills are a specifically Iowa feature. Although Cornelia Mutel's 1989 *Fragile Giants*

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[47] Harold Hopkins, "Native Vegetation of the Loess Hills-Sandhills Ecotone in Central Nebraska," *Transactions of the Kansas Academy of Science* 55 no. 3 (1952): 267-277.
[48] J. E. Weaver, "Comparison of vegetation of Kansas-Nebraska Drift-Loess Hills and Loess Plains," *Ecology* 41 no. 1 (1960): 73-88.
[49] Jean Prior, *A Regional Guide to Iowa Landforms* (Des Moines: State of Iowa, 1976), 32.
[50] Jean Prior, *Landforms of Iowa* (Iowa City: University of Iowa Press, 1991), 48.
[51] John Madson, "Loess Hills, Iowa," *Audubon* 94 no. 1 (1992): 38-39.

acknowledged that the hills exist in Missouri as well as Iowa,[52] many of the writers in the later *Land of the Fragile Giants* treat them as a specifically Iowa locale.[53] Similarly, other authors from the last quarter of the twentieth century speak unhesitatingly about the Loess Hills as being an Iowa landform.[54] Dean Roosa uses a map that shows the hills coming to an end in southern Fremont County, where the Nishnabotna River cuts through the landform. Roosa's map does not show the hills resuming south of the river or across the state line in Missouri.[55] A map displayed at Iowa's Waubonsie State Park, in Fremont County, uses the same image, showing the hills tapering to an end in southern Iowa.

Representation in visual images

Popular representation of the Loess Hills, or any other place, is not limited to written words.[56] Visual artists have actively interpreted the Hills and communicated their existence and characteristics to a broad audience.

In the early 1800s, the Missouri River valley had been settled and used by Native Americans for millennia. Their management of the land, particularly by burning the prairies, had changed the landscape by pushing the boundary between grassland and woodland east of the river. At the same time, the Missouri Valley resisted travel.

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[52] Cornelia Mutel, *Fragile Giants,* (Iowa City: University of Iowa Press, 1989).
[53] Cornelia Mutel and M. Swander, eds., *Land of the Fragile Giants* (Iowa City: University of Iowa Press, 1994).
[54] E. A. Bettis, J. C. Prior, G. R. Hallberg, and R. C. Handy, "Geology of the Loess Hills Region," *Proceedings of the Iowa Academy of Science* 93, no. 3 (1986): 78-85; M. A. Bonney, "A New People Come to the Hills" In *Land of the Fragile Giants,* ed. C. Mutel and M. Swander (Iowa City: University of Iowa Press, 1994); John Madson, "Loess Hills, Iowa," pp. 38-39.
[55] Dean M. Roosa, D. R. Farrar, and M. Ackelson, "Preserving Natural Diversity in Iowa's Loess Hills: Challenges and Opportunities," *Proceedings of the Iowa Academy of Science* 93, no. 3 (1986): 163-165.
[56] Ronald Rees, "John Constable and the Art of Geography," *Geographical Review* 66, no. 1 (1976): 59-72; Bret Wallach, "Painting, Art History, and Geography," *Geographical Review* 87, no. 1 (1997): 92-99.

Neither railroads nor wagon roads reached it. Steamboat travel was perilous, and generally under the control of either the Army or fur-trading companies.

At this time of difficult access, people who wanted to know what this new part of the United States looked like turned to landscape paintings. Lewis and Clark, unfortunately, did not bring an artist with them, but many of the exploring parties that followed them up the Missouri did so. Three of the most accomplished were Titian Peale, a member of Major Stephen Long's surveying party in 1819, George Catlin, who traveled up the Missouri on the American Fur Company's new steamboat, the *Yellowstone*, in 1832, and Karl Bodmer, who ascended the Missouri with Prince Maximilian of Wied's expedition on the same boat in 1833.[57]

The three men had different amounts of training, but all could be classified as expeditionary artists, in contrast to academy or fine artists.[58] This distinction, although handy, should not be applied too strictly. As we will see, even expeditionary artists responded emotionally to their subjects and used creative visual techniques to communicate feelings as well as factual representations of the landscape.

Peale was a naturalist in an era when field scientists routinely brought back paintings and drawings of the things they had observed. He didn't consider himself an artist, and was employed by Major Long for his skill at identifying and preserving specimens. Long's expedition was an attempt to use the novel technology of the day, the steamboat, to survey the American West. Their boat, the *Western Engineer*, was not quite up to the challenge of the Missouri River's current, so they stopped for the winter just above Manuel Lisa's fur-trading post near modern Omaha.

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[57] Mildred Ladner, *William de la Montaigne Cary* (Norman: University of Oklahoma Press, 1984), 12-13.
[58] Roger Balm, "Expeditionary Art: An Appraisal," *Geographical Review* 90, no. 4 (2000): 585-602.

At this forced camp, Peale made a painting of the steamboat nestled in a cove and surrounded by the distinctive rounded bluffs of the Missouri Valley (figure 13). The painting has an off-balance composition, with the boat itself in the lower left corner and its bow facing the edge of the frame. Behind it a small stand of trees lines the riverbank and towering prairie bluffs rise above it. Were it not for the colors, the image almost looks like a palm-fringed cove of an island in the South Pacific. The colors, however, run a narrow range from gray to blue. They capture the dank chill of a river valley in winter, in which everything is either wet or icy. The viewer can imagine the unpleasant experience of waking up in a bunk of damp blankets, touching the ice-glazed wooden planks of the boat, eating soggy hardtack, and doing little more than waiting for months until the trip could resume.

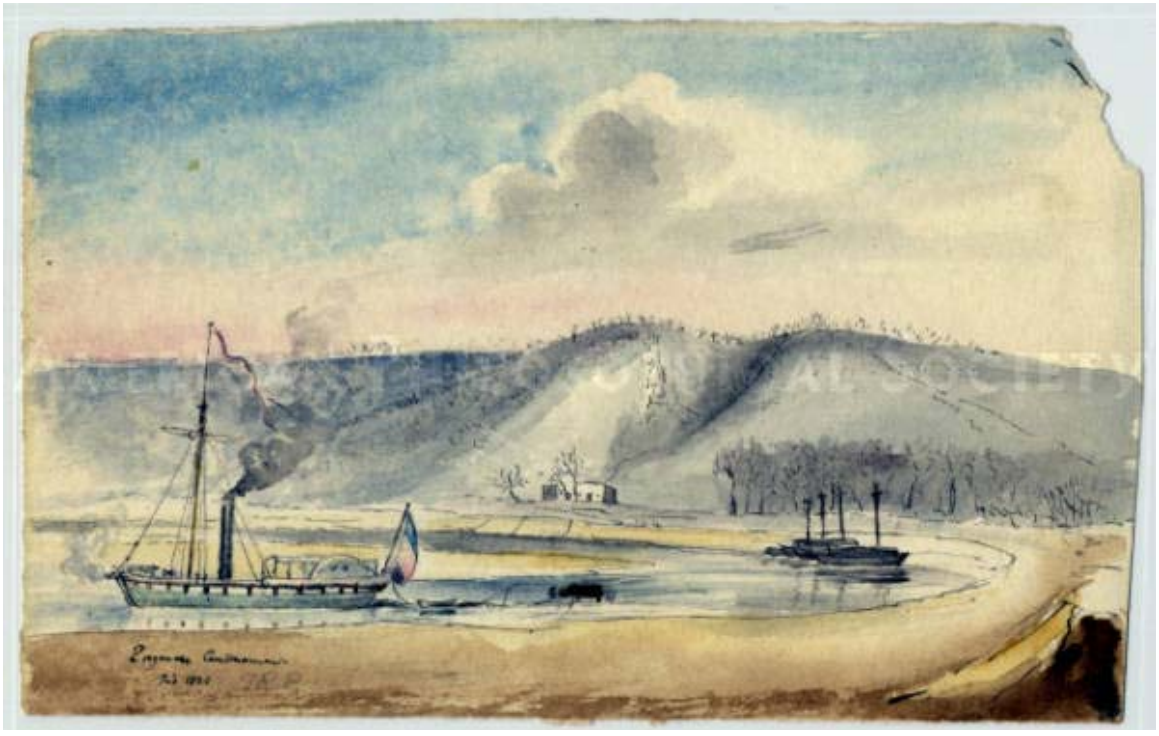

Figure 14. Titian Peale. Engineer Cantonment. (Photo © American Philosophical Society, used with permission)

In contrast to Peale, Karl Bodmer was a highly trained artist with no particular credentials as a scientist. Yet he left some of the most useful scientific illustrations of the Missouri River valley. Bodmer, a Swiss who began the study of painting and engraving in his early teenage years, made a living as an illustrator before signing on as the painter for Maximilian's expedition up the Missouri. The party traveled on an American Fur Company supply boat, so had little time to stop and explore as they ascended the river.

Bodmer's training served him well; he was able to execute quick pencil and watercolor sketches when the boat was stopped to take on fuel or stuck on sandbars. Many of his illustrations are drawn crisply in pencil and have just a few washes of color, suggesting that the steamboat started to move while he was in the midst of painting.

Despite constant interruptions to his work, Bodmer was productive. Most days of his trip yielded at least one painting. When he had time to finish, the paintings are precise and emotional. *Blacksnake Hills, Roubidioux's House* (figure 14), made near what is now St. Joseph, Missouri, is an exacting work of natural history illustration. A cartographer could easily draw contour lines to define the slope of the riverbank bluffs from Bodmer's carefully shaded paint. The distinctive vegetation of the loess bluffs, with trees in the valleys and on the north slopes but prairie grasses on the crests and south slopes, is unmistakable.

Bodmer's painting also captures the isolation of the fur trader's life. Most of the bottom half of the painting is given to a featureless expanse of Missouri River water; most of the top half is hazy sky. All topography, from river sandbars to the top of the bluffs, is contained in a band less than two inches high. Within that band, the trader's

formal, two-story, white house stands out in bleak isolation from any other sign of a human presence.

The quality of Bodmer's work demonstrates that visualization, a buzzword in modern geography for techniques that transform relatively abstract maps into concrete representations of the landscape, is nothing new. Modern visualization implies representations created with powerful drawing or animation software. Bodmer and his colleagues were doing the exact same thing with pencils and watercolor. If Bodmer

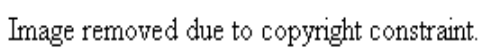

Figure 15. Karl Bodmer, Blacksnake Hills, Roubidioux's House

used ArcScene or Macromedia Flash instead of watercolors, he would be welcome in any cartographic or geographic information systems laboratory.

George Catlin practiced law as a young man before becoming fascinated by the West and Native American culture. He moved to St. Louis and made that city his base of operations for trips throughout the West. As a painter, he is most famous for Indian portraits, dignified formal representations of what he took to be members of vanishing cultures. He was also fascinated by the loess bluffs along the Missouri River and made a series of paintings to illustrate this landform.

Catlin's bluffs paintings are curiously primitive, particularly when compared with his subtle portraits. They show the prairie grasses in a preposterous shade of green, and reduce shoreline brush to blocks that could have been cut from green Styrofoam (figure 15). He typically distorts the hills vertically, making them appear taller than they are, and shows them from an aerial perspective as though he were in a hot-air balloon a hundred feet above the land. As a final romantic flourish, he often placed an Indian figure atop a foreground bluff, surveying the hills rolling away to the horizon.

Artists of lesser stature also took their turns representing the Hills (table 11). Their representations range from restrained scientific illustrations and romanticized distortions of the physical landscape.

Orestes St. John, an illustrator for the report of the Iowa Geological Survey, made line drawings of the Loess Hills.[59] His illustrations, while precise, still reveal an emotional response to the Hills. He included these drawings prominently in a report that covered a wide range of features that could have been illustrated, though the choice of topics may reflect the interests of the author of the study more than those of the artist.

[59] C. A. White, *Report of the Geological Survey.*.

Figure 15. George Catlin. Mouth of the Platte River, 900 Miles above St. Louis. 1832. (Collection of the Smithsonian American Art Museum, used with permission.)

Although St. John's style is restrained, he and the engraver who translated his sketches into printed illustrations apply the technique of chiaroscuro to call attention to (and perhaps even overemphasize) the shape of the Hills. [60]

Other artists, too obscure to have their names attached to their work, produced oblique views and cross-section illustrations of the Hills. Almost universally, they dramatized the landform's size and shape, responding to it as a noteworthy and exotic feature to add meaning to their compositions.

[60] J. C. Prion and C. F. Milligan, "The Iowa landscapes of Orestes St. John," in *Geologists and Ideas*, Ellen Drake, editor (Boulder, Colorado: Geological Society of America, 1985): 189-202.

Conclusion

The emotional response of Euroamerican visual artists to the Hills dates back their first trips to area. Along with a similar response from writers, it shows that people have recognized that the Hills are a distinctive landscape and have struggled to give them a name and description for a very long time. Although concerted efforts to attach the words Loess Hills to a subset of the total landform within Iowa are only three decades old, the Hills that exist in imagination, scholarship and creative expression are both much older and much broader.

Table 11. Visual representation of the hills in the nineteenth and early twentieth centuries.

Artist	Product	Description
Benjamin O'Fallon	Hand-drawn copy of William Clark's 1806 map. Collection of the Joslyn Museum of Art, Omaha, NE	Shows the hills in southern Iowa as a line of chevrons, annotated "bluffs of soft yellow sandstone, about 60 feet"
Karl Bodmer	Paintings (1832-1834) in the collection of the Joslyn Museum of Art, Omaha NE	Carefully drafted, from river or riverboat level. Bodmer made lots of paintings, as many as one a day. From St. Joseph north, they emphasize the bluffs, show a mixture of prairie and forest, vertical cliffs of loess adjacent to the river.
George Catlin	Paintings (1832) in the collection of the Joslyn Museum of Art, Omaha, NE	Romanticized and distorted images of the hills. Dramatic mounds viewed obliquely from above. Indians on hills. Distorted height and steepness. Sense of prairie baldness
Titian Ramsey Peale	Illustrations (1819-1820) for Long's expedition, in the collection of the American Philosophical Society Library	Feb 1820, "Engineer Cantonment" a half mile above Ft Lisa on the same (west) side. Titian R. Peale**,** Engineer Cantonment, February 1820 (Steamboat *Western Engineer);* watercolor, American Philosophical Society Library.
John James Audubon	Paintings from trip of 1843	Ascended Missouri on the Omega, 1843. Most paintings are animal and Indian subjects, not much of a landscape painter.
Herman J. Meyer	St. Joseph, 1850	Rolling loess hills as a backdrop to a view of St. Joseph as a small town. Printed in Charles Phillips, *Missouri: Mother of the American West* (Northridge, Calif: Windsor Press, 1998) pg: 41.
Karl Wilmar	Paintings from river, 1853	Wilmar also made photographs
William de la Montaigne Cary	Paintings from trips up the Missouri in 1861 and 1874	Most paintings focused on the upper river Indian communities, not on landscape.
A. Ruger; Merchants Lithographing	*Birds-Eye View of the City of St. Joseph, Missouri,* 1868 (Chicago: Merchants Lithographing Co., 1868)	Shows St Joe nestled between rounded, prairie-topped mounds on the upstream and downstream sides of the city.
A. Ruger; Merchants Lithographing	*Birds Eye View of the City of Council Bluffs, Pottawatamie Co, Iowa* 1868 (Chicago: Merchants Lithographing Co. 1868)	Shows Council Bluffs wedged between tall, prairie-topped mounds shaded almost white.
A. J. Nystrom Map Co.	Iowa Physical-Political Soil Map. Map PS114. 1941. A. J. Nystrom: Chicago. KU Map library catalog 4150 9 560 1941.	Color map with towns, counties, highways, railroads, rivers and physiographic regions including "Loess Hills", shown extending into Missouri and South Dakota. 1:560,000 scale. Looks like a map published for elementary or high school classroom use. Credits soil data to Iowa State College Department of Agronomy.
Denoyer-Geppert Co.	Physical and Political Nebraska. Map J 126 rp. 1941. Denoyer-Geppert Co.: Chicago.	School-style map of 5 panels (natural regions, population, land use and economy, elevation, rainfall) Natural regions panel has "Loess Hills" from S to N border, 10 miles wide in South, 100 miles wide (3 counties) in North.
Unnamed artist	*View of Fremont County, Iowa*. In Scheffler, p. 34.	1870s primitive drawing of a house and barn, dwarfed by a single great bald mound
Unnamed artist	*Indian Mission at Mouth of Platte River*. In Sheldon	Mission buildings, steamboat, small party of Indians all dwarfed by billowy, rounded hills, mostly unforested.
Francis Robert White	"*Iowa Fair*," 1938 Tempera Mural in post office at Missouri Valley, Iowa	Showing horse and cattle, with dramatically curving Loess Hills as background. Whole painting has something of a Thomas Hart Benton style of exaggerated curves of figures and landscape.
Orestes St. John	Line drawings (1870) to illustrate C.A. White, *Report of the Geological Survey of the State of Iowa*	Precise, well-shaded drawings of the Hills, using both cross-section and oblique views. Hills are featured prominently, may even be over-emphasized by aggressive shading, not unlike an overly contrasted hillshade produced by GIS software.

Chapter 6. How Americans Think About Public Lands

During the slightly more than two centuries that Euroamericans have been aware of the Loess Hills, they have consistently been fascinated by the place. Some have responded to its beauty, some to its mystery, and some to its productive potential. Such responses have prompted many opportunities for government protection. The Hills could have been set aside as a special reserve when the Treaty of Prairie du Chien transferred the region from Native American to Euroamerican hands. They could have been separated from the public domain before allowing land claims by potential farmers in the 1850s. More recently, the Hills could have been acquired and incorporated into a patchwork national forest during the agricultural depression of the 1930s, in much the same way that Mark Twain National Forest was assembled in the Ozarks. Or the Hills could have been declared a unit of the national park system when legislation required the Park Service to consider this possibility in the 1990s. None of these things happened.

The absence of comprehensive protection for the Loess Hills raises the question of how they differ from all the places the federal government has chosen to protect as parks, forests, and refuges. To attack that question, we need to consider how Americans think about public lands and about the kind of places that are appropriate to include within that framework.

Opinions about public lands are a moving target. They have evolved as the nation has evolved and developed in several different realms. For example, if we choose lands for public ownership from among the places we consider beautiful, we will need to focus on aesthetics, and consider how that realm has changed over two centuries. Just as standards of beauty in fashion and architecture fluctuate, we should expect standards of

beauty in natural landscapes to do the same. Similarly, we will have to consider issues of economics in the broadest sense of that word. How we use public lands depends on what the nation expects from those lands. That, in turn, will vary as both the things we value and the technology with which we transform raw material into things of value evolve. Finally, tastes in recreation change dramatically over time, and lead to new demands from government for recreational opportunities. In turn, these opportunities make different demands on public lands.

The discussion that follows explores these various realms more-or-less simultaneously through three distinct eras of public-land thinking. The first time period, throughout the nineteenth century, featured ad hoc policy formation during which much aesthetic groundwork was laid. Then, spanning the administrations of the two Roosevelts, aggressive public policy efforts defined a national approach to public lands that, while occasionally contradictory, was at least rational. Finally, following the World War II, another period of ad hoc and experimental approaches has flourished.

It is important to recognize at the outset that a debate about the use and management of the Loess Hills will never be a debate about wilderness. Although one can argue that no wilderness remains on earth--that all landscapes show the shadow of human behavior--the Loess Hills are noteworthy for having been home to human occupation and manipulation since shortly after the sediments were deposited.[61] The Hills may be pretty, and may be worthy of protection, but they are far from wilderness.

We must also recognize that most scholarship on public-land management assumes that the very idea of public lands makes sense. That assumption is possible only

[61] James Scheffler, *Waubonsie State Park Ecological Management Plan* (Des Moines: Iowa DNR, 2007), 17.

if one believes that the previous tenants of the land--in this case, the Indians who occupied the continent for more than ten centuries prior to European arrival--either never held legitimate ownership or that this claim was legitimately extinguished. Both assertions are open to debate. Careful work by David Wishart, for example, has documented the extent to which the United States government failed to fulfill the terms of purchase agreements made with Indians from the Loess Hills area.[62] The use of the United States military to displace the Indians west of the Hills further undermines any argument that the trans-Mississippi West became part of the public lands of the United States through a legitimate process. Still, by means legal or illegal, this vast territory came under the control of the federal government, and set in motion a two-century debate over how those lands should be managed.

American attitudes toward public lands have been described as the product of a tension between the visions of John Muir and Gifford Pinchot.[63] Muir, the child of a minister, viewed such places as the handiwork of the Creator. His described forests as metaphorical cathedrals and saw public land as places where people could commune with spiritual values. Pinchot, the child of successful real estate speculators, viewed the public domain as a repository of wealth for the benefit of the entire nation. He was steeped in the Progressive political tradition, and wanted to manage such land for sustained economic yield while protecting it from monopolists. This dichotomy, while useful, ignores advocates for views that are intermediate between the two extremes, including

[62] David Wishart, *An Unspeakable Sadness: The Dispossession of the Nebraska Indians* (Lincoln: University of Nebraska Press, 1995).
[63] John M. Meyer, "Gifford Pinchot, John Muir, and the Boundaries of Politics in American Thought," *Polity* 30, no. 2 (1997): 267-284; Char Miller, *Gifford Pinchot and the Making of Modern Environmentalism* (Washington, DC: Island Press, 2001); John Muir, *A Thousand-Mile Walk to the Gulf* (Boston: Houghton-Mifflin, 1916).

the work of public agencies that have bridged the differences between romantic and utilitarian perspectives.

Romantic views: nature and nature's God

At one level, American attitudes toward public lands can be viewed as a coming to terms with the experience of early European colonists. These people tended to see the new world as untamed and godless. As they cleared the forest to make room for agriculture, in their minds the land was transformed into a tamed and blessed place. By the nineteenth century, this romantic view of the wild was firmly in place.[64] Some observers went so far as to posit that North America occupied a "golden mean,"[65] established by a gracious God, a place neither too hot nor too cold for settlement by Europeans. Others suggested that the weakness of Indian tribes, recently devastated by European diseases, further proved that North America had been foreordained for European settlers.[66]

However, as more of the East was cleared for agriculture and Native Americans driven well west of the Appalachians, the romantic view of nature shifted slightly. A tamed wilderness was no longer the most sacred of places. Instead, the true Eden came to be seen as that part of the New World that had not yet been converted to agriculture.[67] This evolving romantic view was given early voice by Henry David Thoreau and Ralph Waldo Emerson, and is well-captured by Thoreau's famous dictum "In wildness is the

[64] Michael Lewis, "American Wilderness," in *American Wilderness*, ed. Michael. Lewis (New York: Oxford University Press, 2007), 7-8.
[65] Lewis "American Wilderness," p. 22.
[66] Lewis, "American Wilderness," p. 23.
[67] Daniel Phillipon, *Conserving Words; How American Nature Writers Shaped the Environmental Movement* (Athens: University of Georgia Press, 2004), 121.

preservation of the world."[68] Later, John Muir made the same point in more theistic language: "In God's wilderness lies the hope of the world."[69]

George Catlin, a lawyer-turned-painter and not a member of the literary world, was one of the first people to see a specific public-policy consequence of this romantic view of wilderness. In 1832 he argued for creation of a national park that would incorporate large segments of both the plains and the Rocky Mountains. This park would preserve both the landscape and the Native American ways of life that Catlin saw as essential tonics to an increasingly developed United States.[70]

John Muir fused the explicitly Christian traditions and language he learned from his Calvinist father with a more theistic vision of a God who inhabited the entire natural world. Muir's formal education had been interrupted when his family emigrated from Scotland to a farm near Portage, Wisconsin, when he was eleven years old. From then until he enrolled at the University of Wisconsin as a young man, his education was largely focused on reading the Bible under the strict direction of his father. At the university, he was exposed to the work of Thoreau and Emerson. His later theology can be seen as a blend of his father's attention to holy writ and the humanistic optimism of Emerson's "Self-Reliance."[71]

On one of his most famous trips, a ramble from Indiana to Florida documented in *A Thousand-Mile Walk to the Gulf*, Muir made room in his backpack for a copy of the New Testament. He also quoted scripture in casual conversation with people he met

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[68] Henry David Thoreau, *The Writings of Henry David Thoreau* (Boston: Houghton Mifflin and Co., 1893), 275.
[69] John Muir, *The Wilderness World of John Muir*, ed. Edwin Way Teale (Boston: Houghton Mifflin Harcourt, 2001), 315.
[70] Phillipon, *Conserving Words*, p. 122.
[71] Philippon, *Conserving Words*, pp. 115-116

along the way.[72] But while Muir was comfortable with scripture, his personal theology focused more on a pervasive divine love. For example, he specifically included the alligator among God's creatures, challenging the notion of his time that this was a creature of the devil.[73] In another revealing incident, Muir came upon the body of a dead bear when hiking in the Sierras. He stopped to mourn this bear as though it were a fellow human, or at least an equal member of Creation.[74] In this way, Muir extended the moral boundaries of his schoolboy fundamentalist faith to include a greater part of creation that, as a child of God, he was obliged to respond to morally rather than just practically.

In tying together nature and God, Muir was invoking the language and thinking of much of nineteenth-century America's educated elite. The religious revival of that period often stressed outdoor experience. Their language suggested that knowledge of God was to be found in the forests, that the forests were temples to God, and that the metaphorical book of nature was equal to scripture as a guide to understanding the mind of the Creator.[75]

Muir was arguably a mystic who followed Emerson's admonition that men should be "acquaint[ed] at first hand with Deity."[76] But he was also a pragmatist and political actor. In a piece of advocacy journalism calling for protection of the forests of California, for example, he endorsed a European practice by which "the economics of forestry have been carefully studied under the auspices of government, with the most

[72] John Muir, *A Thousand-Mile Walk to the Gulf* .
[73] Phillipon, *Conserving Words*, p. 120.
[74] Donald Worster, *A Passion for Nature* (New York: Oxford University Press, 2008).
[75] Mark Stoll, "Religion 'Irradiates' the Wilderness," in *American Wilderness*, ed. Michael Lewis (New York: Oxford University Press, 2007), 35-53.
[76] Emerson quoted in Fred D. White's introductory essay to *Essential Muir*, ed. Frank D. White (Santa Clara, Ca.: Santa Clara University Press, 2006), x.

beneficial results."[77] Thus Muir, who is often cast as the polar opposite to Gifford Pinchot, actually advocated the scientific forestry that Pinchot later introduced to the United States.

Thoreau's vision of nature as a repository of saving virtues did not rely as heavily on the supreme being as did Muir's, but is still shaped by a belief in a benign and protecting God. On his deathbed, when asked if he had made his peace with God, he is famous for replying that he "did not know that we had quarreled."[78] Thoreau's vision for public lands was also more pragmatic than Muir's. He envisioned a practical and aesthetic forest succession in which weeds replaced farm fields, and these, in turn, were succeeded by brush and trees. He suggested that every town should maintain a "primitive forest" free from timber cutting, in which citizens could study nature. [79] These plots would provide specks of wilderness that citizens could visit for education and spiritual enlightenment.

Conservationist views

A competing vision for man's relationship to the natural world can be traced to Vermonter George Perkins Marsh in the early nineteenth century. Marsh sketched out what is now generally known as the conservationist position in an argument for forest preservation. His rationale was neither moral nor romantic, but rather the economic

[77] John Muir, "The Wild Parks and Forest Reservations of the West," *Atlantic Monthly* (August 1897), reprinted in John Muir, *Our National Parks* (San Francisco: Sierra Club Books, 1991), 1-10.
[78] Kathleen Miller, *Last Laughs: Funny Tombstone Quotes and Famous Last Words* (New York: Sterling Publishing Company, 2006), 148.
[79] Donald Worster *Nature's Economy* (Cambridge: Cambridge University Press, 1994), 75.

thesis that standing timber was a valuable resource and, until it was needed, should be left standing, where it would appreciate in value and reduce the erosion of valuable soil. [80]

Marsh was a visionary. His book *Man and Nature, or Physical Geography as Modified by Human Action*[81] makes many of the same arguments about the overuse of natural resources leading to economic peril that brought Jared Diamond fame for his book *Collapse,*[82] published more than a century later. He argued against what today we would call environmental determinism, claiming that the relationship between humanity and nature is not unidirectional but rather one characterized by the "reciprocal action they exert upon one another."[83] He also made a case for what today would be called environmental remediation or mitigation, suggesting that man should "become a co-worker with nature in the reconstruction of the damaged fabric which the negligence or wantonness of former lodgers has rendered untenable."[84] Marsh envisioned the human role in nature to reclaim and repair damaged ecosystems for the material benefits of all mankind.

Late in the nineteenth century, another set of conservationist voices grew out of the community of hunters. Many of these authors, including a future president, Theodore Roosevelt, spoke out in *Forest and Stream* magazine. *Forest and Stream* had been founded in 1873 by Charles Hallock to promote the sport of hunting and what today would be called nature tourism. It was very much a product of its time, serving a primarily male audience, reflecting the attitude that outdoor experience, either for work

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[80] Steven Stoll, "Farm Against Forest" in *American Wilderness*, ed. Michael Lewis (New York: Oxford University Press, 2007), 64-66.
[81] George Perkins Marsh, *Man and Nature, or Physical Geography as Modified by Human Action*, ed. David Lowenthal (Seattle: University of Washington Press, 2003, originally 1864).
[82] Jared Diamond, *Collapse* (New York: Viking Press, 2005).
[83] Marsh, *Man and Nature*, p. 53.
[84] Marsh, *Man and Nature*, p. 35.

or recreation, was still a gendered activity. Hallock later hired George Bird Grinnell, a Yale-trained paleontologist, who became editor in 1879.[85]

Grinnell was steeped in the romantic ideals of nature as a place where the majestic handiwork of God could be seen.[86] He would have been comfortable in conversation with Muir or Thoreau. Grinnell turned *Forest and Stream* into a broader magazine, publishing material far removed from the subjects suggested by its title. Grinnell was also influential in establishing other organizations that spoke for nonconsumptive use of public lands. He cofounded the American Ornithologists' Union in 1883, a group that served not only scientists but the community of amateur birdwatchers and naturalists.[87] Grinnell also founded an Audubon Society in 1886. Although this organization went through a series of institutional forms, and was even formally disbanded later in the nineteenth century, the mission of the modern National Audubon Society to blend nature study by avid amateurs with advocacy for conservation of bird habitat, can be traced back to Grinnell.

Three years after initiating an Audubon society, in 1889, Grinnell helped to found the Boone and Crockett Club. This elite advocacy organization grew out of a conversation at Theodore Roosevelt's New York home, and deliberately limited its membership to one hundred men.[88] Despite of their different organizational structures and apparently contradictory interests, Audubon societies and the Boone and Crockett Club had similar agendas. Both were devoted to protecting the public domain from commercialization and preserving it for what their membership considered a higher use:

[85] Phillipon, *Conserving Words*, pp. 54-55.
[86] Michael Punke, *Last Stand* (New York: HarperCollins, 2007), 25.
[87] Phillipon, *Conserving Words*, p. 54.
[88] Phillipon, *Conserving Words*, p. 166.

recreation. They thus owe debts both to the romantic notion of wilderness as a place to restore the human spirit and the conservationist ethic of using wild country more directly via guides, camps and other elements of nature tourism. Nature was now not a place to be fenced off and preserved for its own sake; instead it should be used and enjoyed, though in ways that left it intact for future generations.

The new perspective provided common ground between what today is called nonconsumptive use, such as bird watching and photography, and consumptive use, such as fishing or hunting. Curiously, many of the affluent and influential hunters and fishermen of the period lobbied through organizations such as the Boone and Crockett Club for a prohibition of hunting on some public lands. This work came to fruition with a hunting ban for Yellowstone National Park, which established a precedent for national parks being places given entirely to travel, tourism, camping, and nature study.[89]

Later, in the early twentieth century, Gifford Pinchot advocated a more aggressively utilitarian variation on Marsh's conservation ethic. Pinchot, the son of wealthy land speculators, chose a career in forestry, a field for which no American university yet offered a curriculum. He therefore trained in Europe, mostly via visits to various scholars of scientific forestry who worked there. Upon his return to the United States, he was able to present himself as an expert, though perhaps only because the threshold in this field was so low.

Along with a commitment to positivist science, Pinchot brought a fiercely utilitarian perspective to resource management. For him, conservation was "the development and use of the earth and all its resources for the enduring good of man."[90]

[89] Punke, *Last Stand*, p. 216.
[90] Worster, *Nature's Economy*, p. 266.

The 1897 National Forest Convention, with Pinchot as a member, argued against the withdrawal of any public land from use. Some should be held for timber production and the rest opened for settlement. Pinchot also compared forests to farms, suggesting that a well-run forest is one that yields sustained production.

Although individuals within the conservationist movement may have been people of religious faith, who occasionally invoked the language and concepts of Christianity, the movement itself was emphatically secular. Its core argument was utilitarian rather than idealistic--that conserving resources from overuse or monopoly exploitation today will yield greater enjoyment for a greater number of users in the future.

Policy consequences

While Muir was sermonizing to the nation in his books and in the pages the *Atlantic Monthly* and similar magazines, and Grinnell and his followers were making their arguments in *Forest and Stream*, political action was creating the core group of public lands that would ultimately define the meaning of a national park. In 1832, the Arkansas Hot Springs had been given protection by the federal government. They were not a majestic sight and were preserved mostly for the practical value of medicinal hot springs, but their status as a national reservation provided legal precedent for federal custodianship of other landscapes of national value. Decades later, the concept of a national park was advanced when an 1864 act transferred ownership of the Yosemite valley to the State of California for preservation as a park.[91]

When travel to the Yosemite valley became easier in the 1870s, the benefits and perils of tourism became increasingly apparent. Uncontrolled and vulgar development,

[91] Phillipon, *Conserving Words*, pp. 125-126.

including proposals to illuminate parts of the valley with colored lights, led to demands for protection at a scale that the State of California was unprepared to provide. The federal government took action in 1890. Officials created an enclosing zone of reserved forest lands on which timber harvesting and grazing were forbidden, with enforcement by the Army.[92] At the same time, the Sierra Club, of which Muir had been made founding president in 1892, devoted itself to the seemingly paradoxical goals of protecting the Sierra and making it accessible. Muir argued that increased tourism would create public support for efforts to transfer more land from the national forest reserves (parts of the public domain set aside from private development by Presidential order, and the administrative predecessors to the National Forests of today) to protected parkland. Muir even worked jointly with Edward Harriman, president of the Southern Pacific Railroad, to lobby for transfer of the Yosemite area back to federal control. He hoped that controlled park development would lead to increased tourism demand.[93]

A middle way

The debate between wilderness and the protection of wild lands in the American west focused on policy toward the public domain and attempted to balance protection, recreation, and exploitation for mining and agriculture. In the east, however, no public domain existed in the sense of parcels of federally controlled lands. Woodland there was privately owned and had been subject to timber harvesting for centuries. Rivers likewise had been managed for hydropower and transportation since the early eighteenth century

[92] Philippon, *Conserving Words*, p. 126.
[93] Phillipon, *Conserving Words*, pp. 143-152.

and a dense road and railroad network cut the landscape into relatively small parcels on which it was difficult to feel isolated from commerce and industry.[94]

In this hard-used eastern woodland the most prolific spokesperson for wilderness aesthetics was George Washington Sears, who often wrote under the pen name of Nessmuk. Sears's formative wilderness experiences occurred in the Adirondacks, an area that, like the Loess Hills of today, was largely in private ownership. Under the direction of Verplanck Colvin, a lawyer-turned-cartographer, the State of New York had created a state forest preserve in the Adirondacks in 1885 and a park in 1892. More than sixty percent of the area was in private ownership, however, so public control was limited. Effective public management did not occur until the 1960s, when Governor Nelson Rockefeller created the Adirondack Park Agency, essentially a regional zoning board, to constrain private development.

Sears had read Colvin's reports on the Adirondacks and, in turn, became the best-known spokesperson for travel in that area.[95] He promoted a new vision of wilderness, one that was compatible with easy rail access, and in which resort hotels, hydropower dams, and timber harvesting were already old news. His brand of back-country travel was open to people of modest means, not just those wealthy enough to travel to the west and hire horses and guides.

The Adirondacks were still densely forested in the 1880s, but also home to resort hotels, steamboats, and the beginning of the Grand Camps, luxurious rural retreats built by extraordinarily wealthy urbanites. Recreational travelers typically employed guides who transported guests in long, narrow rowboats, cooked, prepared camp, and led the

[94] Theodore Steinberg, *Nature Incorporated: Industrialization and the Waters of New England* (Amherst: University of Massachusetts Press, 1994).
[95] Christine Jerome, *An Adirondack Passage* (New York: Harper Collins, 1994), 161.

tourists to opportunities to fish and hunt. The cost of a two-week trip would run about a hundred and fifty dollars, a sum beyond the means of middle-class tradesmen such as Sears. [96]

As an alternative, Sears advanced the relatively novel notion that an individual could travel alone through the Adirondacks or any other wild area. With a small, lightweight canoe, a person could experience the wilderness at little cost beyond that of travel by rail to the Adirondacks. Sears's vision appealed to the nation's blossoming middle class and anticipated the backpacking boom of the late twentieth century. This style of travel also expanded the range of landscapes that could be considered worthy of protection. If one were traveling slowly, at the speed of a solo canoe or a hiker carrying camping equipment, a relatively small area could provide a wilderness experience.

Sears pioneered the modern conception of low-impact wilderness travel. Whereas a horseback party in the late nineteenth-century West was a large and noisy operation, requiring a horse for every member of the party plus others as spares and to carry the heavy camping equipment, Sears' small parties were be relatively invisible, even to others nearby. His style of travel anticipated rules later used by the federal government in places like the Boundary Waters Canoe Area Wilderness that limit the size of the parties traveling together He also anticipated the aesthetic considerations that today argue that wilderness travelers should avoid making campfires and should use natural-colored clothing and equipment to minimize visual impact.

Sears also spoke for a brand of wilderness experience that did not involve hunting or fishing. Prior to Sears, these actions had been focal points. Guides were paid largely

[96] George Washington Sears, *The Adirondack Letters of George Washington Sears whose Pen Name was "Nessmuk"* ed. Dan Brenan (Blue Mountain Lake, New York: Adirondack Museum, 1962), 66-69.

for their ability to find game or fish, give instruction in techniques, and assist in tracking wounded animals and landing fish. If a wilderness trip were not intended to provide hunting or fishing, the need for a guide would be seriously reduced.

Sears's primary outlet for his vision of a new wilderness experience was Grinnell's *Forest and Stream* magazine, for which he wrote more than ninety articles. Many were short, but his best known are a set of long letters reporting his Adirondack travels. In the 1880s, when Sears was at the height of his popularity, few places existed to publish stories of low-impact wilderness experience. *Audubon* magazine had shut down in 1888. Its successor, *Bird Lore*, was not launched until 1899, and only later did it become the modern *Audubon* magazine, with broad focus on environmental and nature tourism topics.[97] By default Grinnell's *Forest and Stream* became the forum in which advocacy for wild country in both the East and West could be presented, and in which consumptive and nonconsumptive users could find equal voice.

Forty years after Sears's arguments for wild areas accessible to the average citizen, the national debate over an official wilderness system began in earnest. Aldo Leopold was the movement's pivotal thinker and advocate from the 1920s to the 1940s, and he used some of the same antielitist arguments made by Sears decades earlier. When Leopold spoke, however, it was as a policy insider, not as a romantic voice in the wild.

A prerequisite step for the modern wilderness movement was a system of federal forest reserves. This had been authorized by an 1891 law that empowered the president to transfer acreage from the public domain to a forest reserve.[98] This provided a mechanism to keep land potentially valuable for timber resources or recreation from

[97] Philippon, *Conserving Words*, pp. 95-96.
[98] Philippon, *Conserving Words* p. 166.

falling in to private ownership. The United States Forest Service was created to administer these forest reserves in 1905 and the National Park Service added in 1916.

These two federal agencies, created with very different missions, institutionalized differences in thinking about public lands that were prevalent in the early twentieth century. While the Forest Service focused on conservation of the nation's timber resources for use in later years, the Park Service was interested in developing outdoor recreational areas. Neither agency thought much about preservation of unused lands or what we might today call wilderness.

Leopold, a product of the Yale forestry school and a career employee of the U. S. Forest Service (USFS) before turning to teaching at the University of Wisconsin in midlife, advocated a third kind of land management, different from the goals of either the Park Service or the Forest Service. Together with allies such as Bob Marshall, he called for large tracts of land to be protected from both logging and intensive motorized recreational access. Such "wilderness" areas, he said, could be carved from national forests and national parks and would not require the creation of any new management agency.

Although the proposed wilderness areas would not be developed for recreation--no roads, lodges, or campgrounds would be allowed within their boundaries--Leopold clearly intended their use for recreation. In a famous formulation he called for wilderness areas large enough to require two weeks to traverse by pack train. They would be open for fishing and hunting, just not with the aid of roads.[99]

[99] Aldo Leopold, *A Sand County Almanc and Sketches Here and There* (New York: Oxford University Press, 1949), 176.

In response to charges that he was proposing a recreational opportunity available only to wealthy adventurers, Leopold argued that exactly the opposite was the case. By excluding roads, lodges, and resorts, these wilderness areas would become available to the frugal traveler, whether on foot or traveling by canoe or horse.[100] Leopold never quotes Sears, but employs the same antielitest logic of his predecessor.

Leopold's vision for wilderness areas was expansive, spanning the entire nation. He advocated representation in all major physiographic regions of the United States, including Midwestern prairies and prairie-forest transition areas. [101] Through much of the public debate over the creation of wilderness areas, Leopold served as vice-president of the Wilderness Society, an exclusive group of preservation advocates. Leopold had joined with Bob Marshall, Robert Sterling Yard, Benton MacKaye, and others to establish the Society in 1935. Marshall joined Leopold in advocating a wilderness definition that included areas much smaller than Leopold's famous two-week-pack-trip standard, suggesting that smaller units would be valuable for recreation and ecological study. In his capacity as head of the Forest Service's Division of Recreation and Lands, in 1937, Marshall developed regulations that allowed for protection of areas as small as five thousand acres, though they carried the label "wild areas" rather than "wilderness."

The expanded conception of wilderness advanced by Leopold and Marshall included the possibility of re-creating wilderness in places that had already been heavily used by humans. The ultimate illustration of this idea of healing a worn-out landscape was Leopold's small farm in Wisconsin that he discussed lyrically in *A Sand County Almanac*. This farm on thin and sandy soil could no longer sustain commercial

[100] Philippon, *Conserving Words*, p. 184.
[101] Philippon, *Conserving Words*, p. 212.

agriculture. In this, it was hardly alone. Throughout the Midwest, high commodity prices during and after World War I brought marginal farmland into production and thereby increased the amount of land vulnerable to erosion during the dustbowl years that followed. So, when Leopold bought his worn-out farm in 1935, he was acquiring just one small corner of an agricultural system that was failing at a regional scale.

Leopold set about restoring his farm by allowing fields to fill with brush and thereby create wildlife habitat. He made an important semantic distinction between reclaimed places such as his farm and the relatively pristine places within some national parks and forests. The big pristine places were wilderness; the small reclaimed places were simply wild, or possessed the quality of wildness.

In his essay "Marshland Elegy," Leopold offered hope that wilderness could be restored. He described how draining and farming first displaced cranes in the Midwest and then, after farms failed, the Civilian Conservation Corps plugged drainage ditches to create an engineered marsh. Cranes returned but roads created by the CCC broke up the big wetlands. "The ultimate value in these marshes is wildness, and the crane is wildness incarnate. But all conservation of wildness is self-defeating, for to cherish we must see and fondle, and when enough have seen and fondled, there is no wilderness left to cherish."[102]

Leopold is, in this passage, anticipating a wilderness movement that deals with the issue of saving little pockets of wildness in heavily used land as much as it needs to advocates protection for enormous tracts of wilderness in the public domain. But in the same breath, Leopold also admits the paradox of conservation advocacy. Public support exists for protection of remote wilderness few of us will ever see, but supporters also

[102] Leopold, *A Sand County Almanac*, p. 101.

want access to places of wildness. Providing that access inevitably diminishes the wildness that advocates set out to protect.

Ron Bell, manager of Squaw Creek National Wildlife Refuge, which extends from the top of the Loess Hills to a bottomland marsh, echoed Leopold's dilemma in conversation with me. The refuge exists to provide habitat to migratory birds and endangered species, and as such it is enormously successful. During the decades before bald eagle populations recovered, it was one of the few places where one could reliably find the wintering birds. The eagles attracted birders by the thousands, many of whom insisted on exploring parts of the refuge that are off limits to humans. Ultimately, in Ron Bell's words, they are "loving the place to death."[103]

In the essay "Thinking Like a Mountain," Leopold explored the need for wildness more deeply.[104] Beyond the beauty of a flock of cranes lies a more frightening vision of the world. Wildness, he argued, requires predators. Predators limit the population of grazing animals such as deer and antelope and add an element of danger to the human experience. Danger, in turn, carries the potential to expand this human experience. A place in which humans are not the only hunters goes beyond beauty to the sublime. Leopold did not use the word "sublime," but his thinking seems to echo the Burkeian distinction between tame, orderly beauty and awesome, fear-inspiring sublime.[105] He concludes his essay with a reference to Thoreau: "Perhaps this is behind Thoreau's dictum: in wildness is the salvation of the world. Perhaps this is the hidden meaning of

[103] Dave McDermott, "Missouri's Squaw Creek NWR," *Bird Watchers' Digest*, March/April 1991.
[104] Leopold, *A Sand County Almanac*, pp. 129-133.
[105] Edmund Burke, *Philosophical Enquiry Into the Origins of our Ideas of the Sublime and the Beautiful* (New York: Harper Bros., 1844).

the howl of the wolf, long known among mountains but seldom perceived among men."[106]

Because Leopold lived and worked in the painfully modern era between two world wars, his view of land is considerably less romantic than that of Muir and considerably less utilitarian than that of Pinchot. He recognized that wilderness, in any practical sense, was gone. The surviving challenge for managers of public lands was to maintain wildness whenever they could. Leopold also anticipated the end of big government by fifty years with his argument that at least some of the protection of wildness would have to play out on private land. His essay "Wilderness" admits that the tallgrass prairie, as a landscape, is gone forever. "We shall do well to find a forty here and there on which prairie plants can be kept alive as a species."[107]

In his most admired essay, "The Land Ethic," Leopold cited the story of Odysseus, who, upon his return from the Trojan War, killed some of his slaves for perceived misconduct. Leopold uses that story to illustrate how, over time, humanity has expanded the boundaries of that part of creation to which they are obliged to respond morally, rather than just instrumentally. In the same way that we now find the holding of slaves and their casual execution to be morally unacceptable, he argues for a future in which we will find the casual destruction of wild places similarly abhorrent. He posits that the time has come for a moral compulsion to protect and serves the health of the land and its wild populations.

Leopold's ethic forms a bridge from Muir. In the same way that Muir tried to extend the moral world to include bears and alligators, creatures that had no apparent role

[106] Leopold, *A Sand County Almanac*, p. 133.
[107] Leopold, *A Sand County Almanac*, p. 189.

in support of humans, Leopold wanted to expand the definition further to include all non-human populations and the environments in which they live. In this, Leopold showed himself to be as much a preservationist as a conservationist. He also anticipates the creation-care movement within Christian churches that support preservationist policies by arguing that obedient servants of God have a responsibility to recognize the good of all of creation.

Leopold's writings brought a multiple-use perspective (to use the expression later made popular in USFS regulation) to wilderness. Such places were not only refuges for endangered species, particularly predators, but also nurseries that could keep alive traditional back-country travel by canoe, pack animals, and on foot, arts that, he observes, were lost in Europe as its wilderness was largely converted to heavily managed forests.[108] Beyond these things, of course, wilderness also had high value to environmental science for the study of ecosystems in something approaching a natural condition.

The U. S. Forest Service provided a useful semantic distinction when writing policy statements at this time. Their choice of the label "primitive" instead of "wilderness" recognized that virtually no true wilderness was left in the United States of the 1920s and 1930s if, by wilderness, we mean places untouched by human action. The word "primitive," instead merely suggested land that reflected conditions from some earlier period, before Anglo-American farming, ranching, mining, and logging had spread across the continent.[109] This subtle choice of language also anticipates objections to the wilderness concept raised decades later. William Cronon's famous essay, "Back to the Wrong Nature," argued in 1995 that the wilderness movement begins from the false

[108] Leopold, *A Sand County Almanac*, p. 193.
[109] Phillipon, *Conserving Words*, p. 187.

premise that wilderness exists and can be preserved.[110] Leopold and his colleagues knew that untouched land was gone forever from the United States, and presented instead a vision for preserving its nearest approximation wherever this could be found or restored.

Leopold can be thought of as a middle generation of conservation. His thinking was evolutionary. He challenged Pinchot's vision by specifically arguing that some wilderness should be set aside for noneconomic use. He also epitomized the secularization of the preservationist movement. Although he may have been steeped in the thinking and language of Muir and Thoreau, and certainly was committed to building a moral argument for conservation, he makes his case with almost no reference to God or use of the language of religious faith. His capstone essay in this regard, "The Land Ethic," makes passing reference to Moses, Ezekiel, and Isaiah, but builds its argument purely in secular terms.[111] Colleagues like Robert Sterling Yard and Robert Marshall similarly avoided the language of religious faith.

One of the great triumphs of the Wilderness Society and its allies was drawing the federal government into the business of wilderness preservation. Description of the movement's goals and methods in totally secular terms was essential to this goal. Another example of the secularization of the time can be seen in preservationists' flagship journals. *Audubon*, *Sierra*, and *Nature*, from, respectively, the Audubon Society, the Sierra Club, and the Nature Conservancy, were outlets where the religiously inspired arguments of Muir or Thoreau would be dramatically out of place.

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[110] William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in William Cronon, ed., *Uncommon Ground: Rethinking the Human Place in Nature*, (New York: W. W. Norton & Co., 1995), 69-90.
[111] Leopold, *A Sand Country Almanac*, p. 203.

The expanded conception of wild places promoted by Leopold is important to this Loess Hills study because it opens a way to think about the region that has been lost from much of the current debate over both parks and wilderness areas. The Hills will never be wilderness; they have been used much too intensively by humans for thousands of years. Even the basic landcover--the balance between prairies and woodland--is in part a product of human action. But whereas the hills will never be wilderness, they can be wild, as marginal farms are taken out of production and woodland invades pastures and fields. Within the metropolitan area of Kansas City it is now possible to hunt in these Hills, to get temporarily lost, and to stumble on farm buildings from the early twentieth century completely surrounded by mature oak-hickory forest.

Wilderness and the visual arts

Muir, Pinchot, and Leopold were not the only people shaping attitudes toward wilderness and public lands in the nineteenth and early twentieth centuries. Visual artists were important, too. In fact, so powerful were their images in shaping public policy that at least one scholar has argued that Thomas Moran's painting "The Grand Canyon of the Yellowstone" "partly inspired the creation of the first national park."[112] Even today, as televised and Internet nature stories rise while visits to parks decline, most awareness of wilderness and public lands is mediated by visual artists.

In the middle of the nineteenth century, as much of the land west of the Mississippi was being opened to settlement, American painting was going through an aesthetic revolution. A focus on portraits, stylized scenes from history and the tidy,

[112] Kevin Avery, "A Historiography of the Hudson River School," in *American Paradise*, ed. John P. O'Neill (New York: Metropolitan Museum of Art, 1987), 7.

domesticated landscape was being displaced by an aesthetic that focused on raw and intimidating nature.

The conflict between these two styles can summarized as a tension between the beautiful and the sublime. This juxtaposition dates to Edmund Burke's 1757 *Philosophical Enquiry Into the Origins of our Ideas of the Sublime and the Beautiful*.[113] Beauty, according to Burke, is characterized by scenes of gentleness and order. A well-tended garden, the geometric precision of a Grecian temple (even in ruins), or the soft curves of a classical nude all characterize the beautiful. The sublime, in contrast, contains elements of chaos, something to invoke terror. Such terror can be inspiring and convey the power of a loving or vengeful deity. Practitioners, for example, have sometimes suggested that their work was inspired by specific texts from the Old and New Testaments.[114] At the same time, this terror can derive from the absence of God, forcing the small human viewer to confront the enormity of an uncaring and unregulated nature.

Visually, the rise of the sublime in American landscape painting can be seen in an evolution from Asher Durand's "Kindred Spirits" to Albert Bierstadt's "Cathedral Rocks, Yosemite Valley, California." Both painters show a wilderness scene with only minimal human presence, but the representations of the natural world vary dramatically. In Durand's painting, two well-dressed gentlemen, the painter Thomas Cole and the writer William Cullen Bryant, survey a scene from a rock shelf at the middle of the frame. The image is one of nature that can be accessed and understood. A viewer can imagine the

[113] Edmund Burke, *Philosophical Enquiry Into the Origins of our Ideas of the Sublime and the Beautiful* (New York: Harper Bros., 1844).
[114] Cole cited Elijah and John in describing the places he chose to paint. See Andres Wilton, "The Sublime in the Old World and the New," in Andrew Wilton and Tim Barringer, *American Sublime* (Princeton, NJ: Princeton University Press, 2002), 14.

two gentlemen continuing their conversation as they walk along a well-worn footpath into the background hills.

Figure 17. Asher B. Durand's "Kindred Spirits,." 1849, Oil on canvas, 44 x 36 in. (Courtesy Crystal Bridges Museum of American Art, Bentonville, Arkansas. Photography by The Metropolitan Museum of Art.)

Bierstadt's painting shares many of the same elements and the same basic composition of level foreground and steep background with Durand, but the feeling is totally different. A human presence is limited to the lowest edge of the painting: some cattle and stumps of felled trees in a meadow. Looming over this modest activity is a wall of rocky and snow-glazed mountains. These mountains are a complete obstacle to any human endeavor. They do not permit agriculture, pasturage, or even a footpath for

human travel. It is a scene meant to suggest a sense of the smallness of humans in the face of nature.

Figure 18. Albert Bierstadt's "Cathedral Rocks." (Image © Science, Inc., used with permission.)

Paintings intended to produce feelings of awe and terror were in vogue throughout the nineteenth century. Practitioners beyond Bierstadt included Sanford Gifford, Frederick Church, John Frederick Kensett, and Martin Heade. These artists produced landscapes representative of the East as well as the West. They brought drama to scenes of the Hudson River Valley and the gently rolling Catskill Mountains of southern New York State. They also included wilder eastern scenes such as coastal Maine, the White Mountains of New Hampshire, and Niagara Falls.

Bierstadt and his colleagues were emphatically part of the mainstream American media culture, not starving artists slaving away in garrets. Their works, purchased by governments and railroads as well as individuals, enabled lavish homes in the Hudson River valley, from which the artists had easy access to the scenery of the Catskill Mountains and the galleries and salons of New York City.[115]

The aesthetic of the sublime, some have argued, was particularly suited to North America. European painters had an orderly landscape on which to draw: well-managed

[115] Angela Miller, "The Fate of Wilderness in American Landscape Art," in *American Wilderness*, ed. Michael Lewis (New York: Oxford University Press, 2007), 91-112.

forests, manicured gardens, elegant cities, and the remains of classical Grecian- and Roman-built environments. Such handiwork provided subjects laced with human meaning that could convey moral messages. In the eyes of a patron of art in the early nineteenth century, these paintings with clear narratives of human courage or faith, constituted "the highest branch of the art of painting--history painting."[116]

Artists in the New World, lacking the backdrop of manicured gardens and ancient monumental sites (Cahokia and other Native American sites were generally ignored in the visual arts) needed to other inspiration to draw on if they were going to achieve paintings that rose above mere description.[117] One way to transform ordinary landscapes into a higher form of creative expression is to infuse the land with elements that inspire awe and that guide the viewer to ponder his relationship to nature or to God. This was the moral quest of the sublime.[118]

Making room for the Hills

Where, then, do the Loess Hills fit into this tradition of thinking about public and wild lands? At the most obvious level, they fit poorly, in the sense that they are neither public nor wild. Most of their acreage is in private ownership (a topic that will be presented quantitatively in chapter eight) where it has been heavily influenced by current or relatively recent farming.

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[116] Oswaldo Roque, "The Exaltation of American Landscape Painting," in *American Paradise*, ed. John P. O'Neill (New York: Metropolitan Museum of Art, 1987), 26.

[117] Geographers may appreciate the irony that, a century later, our profession debated the role of description, sometimes labeled "mere description" and the importance of putting description into a compelling narrative or theoretical structure. See Lester Klimm, "Mere Description," *Economic Geography* 35, no. 1(1959): facing page 1 and Pierce Lewis, "Beyond Description," *Annals of the Association of American Geographers* 75, no. 4 (1985): 465-478.

[118] Tim Barringer, "The Courses of Empires: Landscape and Identity in American and Britain, 1820-1880," in Andrew Wilton and Tim Barringer, eds., *American Sublime* (Princeton, NJ: Princeton University Press, 2002), 38-65.

Still, the Hills do have a place in the aesthetic traditions of both the beautiful and the sublime. A 1920s farmhouse, with walls almost as tall as they are wide and a pyramidal roof, and set at the base of a loess dome, has a kind of orderly beauty. So does a creek flowing through valley walls of soft loess, draining a region of gently rolling hills. These are vistas of fertile and benign nature that a Barbizon painter such as Corot or Millet might have wanted to capture.

At the same time, the Hills can inspire awe. The wide-open prairies of Broken Kettle Grasslands, outside Sioux City, struck by a fall wind howling out of South Dakota and offering not even a tiny grove of trees for shelter, is a frightening place to be. The dense woods of Bluffwoods State Forest, in which the understory forest is so thick that I once walked within two dozen yards of a full-sized barn before I saw it, impresses upon a human visitor that his role in the universe is modest and fleeting. The Hills overall, rolling away to the north or south from any high point of observation, have a majesty that certainly fits the aesthetic tradition of the sublime.

Even though the Hills can fit comfortably within the aesthetic traditions of landscapes worthy of protection, they remain, by and large, unprotected. The reason is that, because they are largely in private hands, they do not fit the models of how Americans protect land. Conditions may be changing. A small portion of the Hills is now owned by public agencies or private conservation organizations, and this fraction is growing. Even so, such public land is held by a wide range of government entities, making consolidation of ownership or management difficult. Some wealthy organizations are working to acquire large tracts of land that could be transferred to a park agency, but no such grand transfer has yet occurred. Such a patchwork of public

and private ownership suggests that, if the Hills are ever to become part of a significant scheme of public ownership or control, it will likely be in a management context similar to that of the Adirondacks, where zoning authority is combinated with limited public ownership to bring the region under some brand of public protection. Various different models of such public protection, and their histories, together with their histories, will be the subject of the next chapter.

Chapter 7. How Not To Make a National Park

Part of the Loess Hills once came close to being a national park. In 1999, Iowa Senators Tom Harken and Charles Grassley, a Democrat and Republican respectively, sponsored Public Law 106-113, instructing the National Park Service (NPS) to study the feasibility of creating a park within that region. The NPS completed the required study and found that, although the Loess Hills were suitable for inclusion in the park system, creation of a unit there was not feasible. The process by which the Park Service reached these conclusions reveals much about both the Loess Hills and the criteria used when evaluating potential units. Those criteria, in turn, grow from the history of the national park movement in the United States.

Any consideration of Park Service protection for an area must begin with acknowledgment of the tremendous variety of places the Park Service protects and the variety of administrative structures it uses. Most readers, when thinking about a national park, might envision of one of the classic units, perhaps Yellowstone in the West or Great Smoky Mountains in the east. Although these are iconic examples, they represent only one of many types of park units.

In addition to its classic parks, the Park Service also administers National Rivers, National Seashores, National Preserves, National Historic Sites, National Cemeteries, National Monuments and various other units. These several types are the product of varying purposes and different legislative authorities, but all are considered by the Park Service to have "equal legal standing."[1]

[1] National Park Service, "Designation of National Park Units" online at http://www.nps.gov/legacy/nomenclature.html, (accessed April 1, 2009).

When the Park Service considered adding the Iowa Loess Hills to its system, it employed a two-step evaluation process.[2] The first was to determine whether the Hills were noteworthy enough to merit inclusion. Unequivocally, the NPS found the Hills to be "suitable" (to use the formal wording of their evaluation process) for addition. This suitability resulted from the Hills being a "resource type that is not currently represented in the National Park System."[3] The evaluators saw the Hills as a region of "exceptional value," one with potential for "visitor use opportunities" that are not being exploited.[4]

When the Park Service considers adding a unit, it looks to avoid duplicating resource types already within the system. Their intention, presumably, is to make sure all major resource types are included before indulging in duplicates. At the same time, the Service is clearly in the business of providing recreation. So, in addition to being geographically noteworthy, a park candidate must have potential for tourism and recreation. Finally, this site must be judged of "exceptional value." This criterion, although vague, is steeped in the history of the Park Service, and is tied to the problem of having mediocre units forced on them by influential legislators.

Having found that the Loess Hills were suitable for inclusion in the park system, the Park Service then considered whether adding such a unit was, in the language of their evaluation process, "feasible."[5] Here the Hills failed for four different and revealing reasons.

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[2] The discussion that follows is based on the *Loess Hills Special Resource Study*, the report the National Park Service produced to fulfill the mandate of PL 106-113. The report has not been published, government depository libraries do not have copies, and NPS staff I contacted were unable to provide a printed copy. It is available online, in a relatively obscure corner of the NPS web site, with few or no links leading to it, at http://www.nps.gov/mwro/loesshills. (accessed February 7, 2005).
[3] *Loess Hills Special Resource Study*, p. 41.
[4] *Loess Hills Special Resource Study*, p. 44.
[5] *Loess Hills Special Resource Study*, p. 45.

First, a park in the Hills would be expensive to create. Much of the land is in agricultural production and, because of federal subsidies for corn and soybeans, such property sells for several thousand dollars per acre. So purchasing enough land to create a park unit would cost a lot of money.

Second, the Hills are owned by a great number of individuals and organizations, each of whom holds a relatively small amount of land. Even public landowners in the area control relatively little and these public holdings are divided among the U. S. Fish and Wildlife Service, the U. S. Air Force, state departments of natural resources, county park boards, and many other agencies. Additional acreage is controlled by private conservation organizations such as the Nature Conservancy with its Broken Kettle Grasslands just north of Sioux City, but the majority of the Hills are owned by individual farmers, homeowners, and investors. The NPS considered this atomistic ownership a major obstacle to creating a park unit. Even if the means existed to buy enough land to create a meaningful park, finding enough willing sellers who own neighboring parcels would likely be an insurmountable challenge. The Park Service study did not consider the use of eminent domain to force landowners to sell.

Third, the length and thinness of the Hills would make administration and interpretation difficult. A linear landform requires many access points, many visitor centers, and a large and mobile presence for law enforcement. The manager of a similarly elongated national wildlife refuge echoed this concern in an interview, explaining to me that his agency could exercise no meaningful law enforcement over the

refuge and admitting that they were dependent on education and a well-behaved public for obedience to the use regulations of the area.[6]

Finally, when the NPS conducted public meetings to discuss possible plans for a Loess Hills park, they found significant aversion to an increased federal presence in the area. Although the Park Service does not document the geographic variation in this opposition, a state park manager reported that the national proposal found support in the relatively urban counties surrounding Sioux City and Council Bluffs, but very little in the more rural counties.[7]

The criteria that the Park Service used to decide that the Loess Hills were suitable but not feasible for inclusion in the park system are, themselves, the product of the history of the national park system. This system is not the product of a unified design, but rather of almost two centuries of ad hoc action.

The origins can be dated to 1832, when a small parcel in the town of Hot Springs, Arkansas was established as the Hot Springs Reservation. The first large park units were, however, Yosemite and Yellowstone. They came into being through completely different methods. Either could have been the model for subsequent parks but, in practice, the Yellowstone model became the benchmark against which other potential parks were measured.

The Yosemite valley in California had become a popular tourist destination by the 1850s. One local entrepreneur, George Gale, even arranged to have a sequoia tree cut down and shipped to the east coast as a commercial novelty. This exploitation of the valley triggered outrage among conservationists and preservationists in the East, outrage

[6] Interview with J. C Bryant, refuge manager at Big Muddy National Wildlife Refuge October 1996.
[7] Interview with Kevin Pape, park manager at Stone State Park, October 2008.

that led Congress to cede eight square miles of the Yosemite Valley to the State of California, removing it from the federal public domain and, ideally, giving it protection under state law.[8]

Had this early attempt at a park been successful, it likely would have led to a system of parks totally different from those we have today. Federal land, typically from the public domain but potentially purchased on the open market, would be given to state governments to run. The idea seems farfetched now, but modern objections to Park Service regulation, particularly in the wake of the so-called sagebrush revolution of western states against federal authority, inadvertently invoke the Yosemite model when they call for greater local control over what can be done in national parks.

Fortunately or unfortunately, depending on ones perspective, the Yosemite model failed. The State of California lacked the resources or political will to protect the valley from commercial exploitation. As this failure of management became apparent, the valley was ceded back to the federal government in 1906.

While the Yosemite experiment was playing out in California, a different model was tested in what was to become Wyoming and Montana. In 1872, President Grant signed legislation creating Yellowstone National Park as a purely federal institution. Grant, of course, did not have the option of using the Yosemite model since no State of Wyoming existed at the time to which he could have given the land and responsibility. Initially, the federal model was a disaster. With no National Park Service in existence for administration, poaching proliferated in Yellowstone. Desperation led to the U. S. Army being put in charge. This was largely successful. With the help of local scouts, the Army

[8] Mark Neuzil and William Kovarik, *Mass Media and Environmental Conflict: America's Green Crusades* (London: Sage, 1996).

gained effective control, although some local people objected to what they considered overly zealous law enforcement by soldiers.

Without a civilian administration at Yellowstone, no infrastructure existed to decide how the park should be used. The well-established process we use today, in which scoping meetings lead to preliminary environmental impact statements and then to formal comment periods before a final environmental impact statement is drafted, did not exist. Instead, it was something of a political free-for-all involving many different public and private interests. The Northern Pacific Railroad, for example, lobbied for a railroad through the park to deliver visitors to the most dramatic sights. George Bird Grinnell and the New York *Times* both advocated protection of the park not as wilderness, but as "the people's Pleasuring Ground."[9] Local business interests effectively defined routes for tourist roads through the park, established precedents for building commercial hotels within park boundaries, and demanded federal law enforcement. Other local interests tried and failed to have the park definition amended to allow places with mineral deposits to be withdrawn from the park and opened to settlement and mining.

Whereas the creation of Yosemite had a distinctly preservationist flavor about it, focused on the need to protect sequoia groves, Yellowstone development placed much greater emphasis on recreation. This basic conflict was obvious in the used by the Park Service when evaluating the Loess Hills. To be suitable, the potential park had to be a unique and exceptional resource (like Yosemite) and a potential recreation site (like Yellowstone).

[9] Langdon Smith and William Wyckoff, "Creating Yellowstone: Montanans in the Early Park Years," *Historical Geography* 29 (2001): 93-115.

John Schelhas has suggested that, in the first decades after the experiments with Yosemite and Yellowstone, the creators of America's national parks tried to select sites that rivaled the grandest landscapes of Europe. In this, the park system was part of a distinctly nationalist aesthetic movement. Then, particularly in the late nineteenth and early twentieth centuries, the selection process came to be influenced by Progressive politics and an ideology that insisted that parks be more than just playgrounds for the wealthy. This movement became more deeply embedded in Park Service thinking after World War II, when the Service set about to develop more lodging and camping opportunities that would be within the means of working-class citizens.[10]

The effort to make national parks accessible to more citizens, particularly those of the urban East, contained the peril that places that were not exemplary examples of particular resources might be added just to provide more recreation opportunities. This trend can be dated to the early 1900s, when relatively modest parks such as Wind Cave (South Dakota), Sully's Hill (North Dakota), and Platt (Oklahoma) were created. This movement gained energy in the 1930s as President Franklin Roosevelt added sixty-four new monuments, battlefields, cemeteries, and memorial sites to the park system.[11] Finally, the National Parks and Recreation Act of 1978 opened the system to pork-barrel demands from local Congressional delegations for parks in their back yards. Senator Alan Cranston of California was a particularly outspoken advocate for the recreation needs of urban populations and racial and ethnic minorities.[12] Critics called the 1978 law

[10] John Schelhas, "The USA National Parks in International Perspective: Have We Learned the Wrong Lesson?" *Environmental Conservation* 28, no. 4 (2001): 300-304.
[11] Alfred Runte, *National Parks: The American Experience* (Lincoln: University of Nebraska Press, 1987).
[12] Runte, *National Parks*, p. 233.

the "parks barrel bill,"[13] though it did win support for its ability to acquire or set aside park land near cites that would otherwise have been vulnerable to urban sprawl.

Demand for urban parks also created interest in broader forms of ownership and management for the NPS system. At the same time, the Park Service was given responsibility for the growing network of federally designated National Rivers and Wild and Scenic Rivers, which demanded administrative forms that could accommodate corridors that were in private ownership and to which a wide variety of parties had prior legal claims on the water for irrigation, drinking, and navigation.

The most dramatically different new form of park management was the National Reserve. In this category, the federal government owns virtually no land, perhaps only enough to accommodate a visitors' center, administrative buildings, and some small parcels of historic or natural importance. It then controls the remainder of the area via leases or zoning authority. This type of park has been proposed for the Loess Hills, so is worth considering in some detail.

The classic model of this type of park is the Pinelands National Reserve in southern New Jersey. The Pine Barrens cover much of the southern half of that state. Small sections were protected as state parks, but the area has been under considerable development pressure since at least 1950. The eastern edge of the Philadelphia-Trenton-Camden metropolitan area has crept eastward while coastal communities expanded to the west. A pivotal point came in the 1960s as airports in New York and Philadelphia became crowded and proposals were advanced to build a regional jetport on the relatively flat pinelands.

[13] Runte, *National Parks*, p. 234.

A movement for comprehensive protection of the Pine Barrens began in response to the airport threat, led in part by the influential Princeton journalist John McPhee.[14] A regional management plan was proposed in 1981, but had almost no enforcement mechanism.[15] Then in 1987, Congress advanced the idea of a Pinelands National Reserve, in which the Park Service would own no land, and in which legal authority for management would be held by state and local officials.[16] Such a plan required the state to create a regional planning commission. The state legislature was reluctant, however, seeing such a body as an attempt to usurp the traditional planning and zoning authority of local governments. Governor Kean then issued a broad executive order essentially freezing development of the entire Pine Barrens, almost twenty percent of the land surface of the state. The legislature, confronted with this dramatic assertion of executive power, decided that a commission would be more open to development than the governor and so voted to create the Pinelands Commission. With this action, the national preserve proposal could proceed.[17]

The Pinelands Commission is an independent agency of state government, with seven members appointed by the governor, seven by municipalities within the reserve, and one by the U. S. Secretary of the Interior. It is charged with creating a comprehensive management plan for the Reserve, and so has been the venue for intense debate over land use. Local governments who depend on economic development for tax revenues are on one side; the demands of the Secretary of the Interior are on the other, a

[14] John McPhee, *The Pine Barrens* (New York: Farrar, Straus and Giroux, 1967).
[15] Iver Peterson, "Environmentalists Fear Favors to Builders in Trenton's Pinelands Plan" New York *Times*, February 24, 1992, Section B, p. 5.
[16] Jeremy Pearce, "A New Barron for the Pine Barrens," New York *Times*, September 29, 2002, Section NJ, p. 6.
[17] Joseph Sullivan, "Kean Plans to Curb Growth, With or Without Legislature, New York *Times*, November 6, 1988, Section E, p. 6.

person who, at least theoretically, could withdraw national reserve status for the area if he or she felt that the standards of the Park Service were not being met. Even relatively minor disputes, such as allowing a small town to build a new school,[18] a restaurant to expand its parking lot,[19] or the construction of radio towers[20] became issues that threatened the fragile commission and, with it, the National Reserve. Because of these weaknesses in design, management, and permanence, public-land advocates continued to lobby for the Park Service to supplement the Reserve by purchasing land in and near the Pine Barrens, on which it could exercise effective management authority.[21]

Another example of the national-reserve model can be found much closer to the Loess Hills, in an area that is similarly poorly understood and substantially in private ownership. The Flint Hills of Kansas have long been recognized as a remarkable natural feature with distinct geology and prairie landcover. They faced some of the same political challenges to creating a national park that exist in both the Pine Barrens and the Loess Hills. No political consensus existed within Kansas for creating such a park. Moreover, local landowners feared development for more immediate reasons: a concern that any action taking grazing land out of production would drive up the cost of leasing all adjoining pastures.[22]

The mechanism for creating the Tallgrass National Preserve in the Flint Hills was different than the Pinelands model. A private organization, the National Park Trust,

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[18] Laura Masnerus, "Director of New Jersey Forest Preserve Steps Down Under Pressure," New York *Times*, September 11, 1999, Section B, p. 1.
[19] Iver Peterson, "An Environmental Plan Threatens and Old Industry," New York *Times*, April 11, 1983, Section A, p. 26.
[20] Eileen Moon, untitled article, New York *Times*, January 22, 1989, Section NJ, page 2.
[21] Albert Parisi, "Additions to U.S. Parkland Urged," New York *Times*, February 23, 1992, Section NJ, p. 6.
[22] "Old Debate Rages at New Prairie Preserve," unattributed article in New York *Times*, January 26, 1977, Section 1, p. 12.

bought a single parcel of land, the Z-Bar Ranch, and then leased the grazing rights on almost the entire ranch to a cattleman, using the rent to pay the mortgage. The Trust then gave a small parcel to the National Park Service on which they could operate a visitors' center and restore some historic ranch buildings. In this model, most of the Preserve remains in private ownership, but no need exists for a regional planning authority since the Preserve does not attempt to control development outside the eleven thousand acres of the former ranch.[23] This model of national preserve also differs from that of the Pinelands in scale. The Pinelands cover hundreds of square miles (as would any comprehensive preserve in the Loess Hills) while the entire Tallgrass National Preserve, including the land the Park Service does not own, is well under twenty square miles. The subtle difference in the names for the two units is deliberate; a national reserve is a park that is operated in conjunction with some local authority, while a national preserve is a park that allows hunting, grazing, mining, or other activities that would not be tolerated in a national park.

After rejecting any action for a national park in the Loess Hills, the National Park Service concluded their assessment by leaving open the possibility for a national reserve, on the model of either the Pinelands *R*eserve or the Tallgrass *Pr*eserve should public attitudes toward a federal presence change in the future.

The Park Service presented several options for potential preservation of the Loess Hills, ranging from no action at all to the creation of a full-fledged national park. Intermediate possibilities included a variety of entities under some kind of National Park Service jurisdiction, including a national heritage area, a national monument, a national parkway, a national scenic trail, and a national reserve. Then, following the methods of

[23] Michael Schumann, "Big House on the Prairie," New York *Post*, June 15, 1999, p. 32.

environmental impact statements, the Park Service selected two preferred alternatives. One, termed the environmentally preferred alternative, was the recommendation they would have made had political and economic factors been removed from consideration and the decision based only on finding appropriate parkland and using the best available management techniques. The other, the preferred alternative, was the agency's formal recommendation, recognizing the constraints of funding, administration, and public support.

The environmentally preferred alternative would have created a national reserve modeled on the Pinelands. It designated a 640,000-acre region of the Hills, located only in Iowa. The State would then create a commission with planning authority for the entire area, and charge that commission with creating a management plan that conformed to the demands of the National Park Service. As in the Pinelands, the federal government would not acquire any parkland in the area.[24]

The national reserve proposal is politically subtle. Although the Park Service would have no direct authority over land use in the region, it would be able to exert considerable leverage through its virtual veto power over actions of the commission. Yet the commission would be seen as the controlling power and might be blamed for usurping municipal and county authority. The Park Service would promote the Loess Hills National Reserve as though it were part of the park system and the Park Service logo would appear on signs and tour guides. In essence, the Park Service would gain a park without the political cost of taking away local authority or the economic cost of purchase and administration. Local proponents of a park would gain the cachet of the National Park Service for the area while maintaining at least a facsimile of legal control.

[24] *Loess Hills Special Resource Study*, pp. 55-56.

Despite its relative modesty, the reserve proposal for federal involvement was too intrusive for many Iowa people. As the Park Service acknowledged, "The majority of comments opposed to this alternative anticipated operational difficulties in administering the entire area, expressed concerns that individual landowners' and farmers' private property rights would not be adequately protected, and were generally not in favor of this level of federal involvement."[25]

Several of the alternatives rejected by the Park Service provide additional insights into both the Hills themselves and the characteristics the Service looks for when evaluating alternatives to national parks. The Hills were rejected as a national heritage area because such an area must tell a unique story of how people have interacted with the local environment. The human-environment interaction in the Hills was judged to be essentially the same as in other Midwestern farming communities. The Hills also were rejected for a national parkway. Authorities argued that no good road corridor existed around which such a parkway could be designed, a conclusion the sponsors of the Loess Hills Scenic Byway likely would dispute. Similarly, the area was rejected for a national scenic trail because no corridor of public land exists along which such a trail could be built. Finally, the area was rejected for a national monument because the Antiquities Act of 1906 allows monuments to be declared only on land already owned by the federal government.[26]

Finally, after rejecting all these options, the Park Service announced its preferred alternative, a recommendation that the government withdraw from the planning process for the Loess Hills and sit on the sidelines until public opinion about federal involvement

[25] *Loess Hills Special Resource Study*, p. 57.
[26] *Loess Hills Special Resource Study*, p. 61.

changed. In the meantime, the NPS suggested that the State of Iowa and local governments might proceed, at their own pace, to build a political structure that could support a national reserve in the future. State and local government could establish a joint powers board, for example, a regional planning commission in which the federal government has only an advisory role. This board could take whatever protective action they felt had immediate popular support but probably would not provide the same level of protection as would a national reserve's planning commission. Still it would begin the planning process and, perhaps, convince local landowners that a reserve might not intrude excessively on their property rights.[27] The Park Service put its hopes for such a process in restrained and politic language: "it provides increased opportunity for consensus building, which in the long term could prove beneficial to both the resources and communities of the Loess Hills."[28] The design of a joint powers board certainly leaves open the possibility of creating a national reserve in the future. If the hoped-for consensus-building occurs, legislation to create a national reserve could be introduced. Then, if passed, the joint powers board would need only modest adjustment to become the planning commission for a Loess Hills National Reserve.

[27] *Loess Hills Special Resource Study*, pp. 99-102.
[28] *Loess Hills Special Resource Study*, p. 103.

Chapter 8. The State of Protection of the Loess Hills

Although the Loess Hills did not receive National Park Service protection in the 1990s, a patchwork of governmental and private ownership in the area still provides land for recreation and protects natural features. These parcels, however, were acquired for differing purposes and in response to changing public expectations from parks and preserves throughout the twentieth century. Coordination among them would be difficult.

Of the 1,512,596 acres in the Loess Hills region, 122,419 acres (about eight percent) are protected by government agencies or major private conservation groups (map 34 in appendix). I identified these parcels from Gap Analysis Program (GAP) stewardship data, a national effort at land-cover and ownership classification sponsored by the U. S. Geological Survey,[1] supplemented by new information published by the states of Missouri and Iowa in 2009.[2] About half of this public land is on Indian reservations, primarily those of the Winnebago and Omaha that, together, comprise most of Thurston County, Nebraska (table 12). Counting Indian land among the protected areas is open to debate. Although these areas are nominally owned by the U. S. Department of Interior and held in trust for the tribes, they are not managed as parks or preserves; instead they are used for many of the same agricultural, industrial and

[1] U. S. Geological Survey, "Gap Analysis," online at http://gapanalysis.nbii.gov/portal/server.pt/gateway/PTARGS_0_2_1021_200_458_43/http%3B/gapcontent1%3B7087/publishedcontent/publish/public_sections/gap_home_sections/official_description__full_version_/official_description.html, (accessed July 27, 2007 and May 5, 2009).

[2] Missouri Department of Natural Resources, "Public Lands," online at ´http://www.msdis.missouri.edu/datasearch/metadata/utm/st_modnr_lands.xml, (accessed May 22, 2009); Iowa Department of Natural Resources, "Administrative and Political Boundaries," Iowa DNR, ftp://ftp.igsb.uiowa.edu/gis_library/ia_state/admin_political_boundary/public_lands/cons_rec_lands_public.zip, (accessed May 22, 2009).

residential purposes as are privately held tracts. Still, they are undeniably under government jurisdiction and therefore not subject to the same kind of

Table 12. Protected areas in the Loess Hills

	Area protected	
Jurisdiction	**Acres**	**Percent of protected areas**
Federal	3,885	3.2
State	32,774	26.8
County	4,226	3.5
Municipal	519	0.4
Indian Reservation	71,114	58.1
Private	4,258	3.5
Unknown	5,639	4.6
Total	122,415	
Source: USGS GAP Program, tabulations by the author		

development risks as lands owned by individuals or for-profit corporations, which can be plowed, quarried, or built on without meaningful outside scrutiny. For this reason, I keep reservations in the tally of protected areas, but recognize that they are not as protected as this label might suggest.

My data on protected areas may also understate the amount of land that is managed with environmental conservation in mind. They do not take into account acreage whose development potential has been constrained by legal arrangements in which a landowner formally donates some or all development rights to a private land conservancy, a local government, or other organization. They also do not count private land owned by individuals who have made a personal commitment to conservation.

More than five thousand acres in the Hills are considered protected by the USGS, yet their ownership is not reported in the GAP data. An inspection of these areas suggests they are typically adjacent to existing parks or preserves and may be areas

whose ownership has recently changed, generally from a private owner to a conservation organization or government agency. Real estate transactions for park land can be agonizingly slow, and may involve long periods in which a conservation organization holds a purchase option on a parcel of land but not the title. Similarly, assembling parkland can involve a series of transactions as parcels are sold and traded among governments and private landlords. Given the complexity of such transactions, it is not surprising that ownership could not be determined for almost five percent of the protected land in the Hills.

Leaving aside the problematic issue of Indian Reservation lands, the remainder of the protected areas in the Loess Hills are owned primarily by state governments. This is consistent with the history of federal-lands ownership discussed in chapter six. The Loess Hills do not fit within any of the mechanisms by which significant pieces of land have fallen under federal jurisdiction. No reason existed to withhold these lands from settlement in the nineteenth century, so they left the public domain. Similarly, no political interest has existed until very recently for acquiring parts of the Loess Hills as federally protected areas, so the federal government remains a marginal player.

Much of the federal land within the Hills was acquired merely because it was adjacent to other federal lands. A superb parcel of the Hills, for example, is part of Squaw Creek National Wildlife Refuge. The refuge, however, exists to provide resting and feeding ground for migratory waterfowl, for whom the Loess Hills are of no value. The uplands included in the refuge were acquired primarily to protect water quality on the refuge by removing a hog farm from the watershed and to provide a site for the refuge headquarters and maintenance buildings. Parts of the Hills are also included in the Fort

Leavenworth Military Reservation in Kansas and Offutt Air Force Base in Nebraska, where they are just an accidental part of institutions created for purposes far removed from environmental protection.

State governments thus became the leaders in protecting the Hills, and now control over half of the non-Indian protected lands. Iowa heads the states' efforts, holding more than 16,000 acres of parks and reserves (table 13). This includes one of its original state parks, Waubonsie in the southern Hills, and two newer parks, Stone in the north and Preparation Canyon in the central Hills. It also includes a series of parcels of Loess Hills State Forest clustered around the town of Pisgah.

Missouri also has significant landholdings in the Loess Hills, though almost all are conservation areas rather than parks. Bluffwoods, Riverbreaks, Honey Creek, and Brickyard Hill are the largest units. Each includes between 1,500 and 2,300 acres, larger than the only Missouri state park in the Hills, Weston Bend. The conservation areas are relatively undeveloped, with only modest parking areas and rough trails, while Weston Bend squeezes all the typical park facilities--campgrounds with electricity, accessible trails, picnic shelters, and interpretive signs--into less than a thousand acres.

Nebraska has two substantial state parks in the Loess Hills. Ponca State Park, at the northwestern edge of the region, contains almost nine hundred acres and Indian Cave, in the southern Hills, almost three thousand acres of forested hill country. Nebraska has also established a few small conservation areas in the Hills. Unlike both Missouri and Iowa, Nebraska does not make extensive use of nonpark conservation areas.

In Iowa alone, county governments are significant Loess Hills landholders, with more than four thousand protected acres held by such entities. These areas include two

Table 13. Protection of Loess Hills by state and protecting jurisdiction

State / Ownership	**Acres**
Iowa	
Federal	39
State	16,297
County	4,226
Municipal	0
Indian Reservation	0
Private	2,793
Unknown	4,844
Total	28,199
Kansas	
Federal	1,118
State	0
County	0
Municipal	0
Indian Reservation	0
Private	0
Unknown	0
Total	1,118
Missouri	
Federal	565
State	10,678
County	0
Municipal	0
Indian Reservation	0
Private	124
Unknown	795
Total	12,162
Nebraska	
Federal	2,161
State	5,798
County	0
Municipal	519
Indian Reservation	70,990
Private	1,340
Unknown	0
Total	80,808
Source: USGS GAP Program, tabulations by the author	

particularly attractive parks: Hitchcock Nature Area and the Dorothy Pecaut Nature Center. Both are highly developed, with sophisticated interpretive displays and comfortable viewing areas for visitors. The unique role of county governments in Iowa will be discussed in more detail later in this chapter.

Private conservation organizations are particularly important Loess Hills landholders in Iowa and, to a lesser extent, in Nebraska. The best known and most important such area in the Hills is the Nature Conservancy's Broken Kettle Grassland just outside Sioux City, Iowa. It is one of the best parcels of grassland remaining in the Hills, and is large enough to support the reintroduction of bison. It is relatively undeveloped, and has almost no facilities for visitors. This reflects one of the advantages that private conservation groups enjoy: they do not have to answer to taxpayers who clamor for recreation in all public parks and conservation areas. Private groups, so long as their benefactors support them, have the luxury of managing land for ecosystem protection alone.

Landcover in protected areas

More than a third of the protected area in the Loess Hills is forested (table 14) and a quarter is grassland or prairie. This imbalance persists in spite of a recent revival of interest in prairie preservation, and reflects both the difficulty of restoring prairie that has been lost to forest incursion and a historical bias in favor of woodland that has roots in the early decades of the state park movement.

Table 14. Landcover on protected areas in the Loess Hills

Landcover	**Acres**	**Percent of protected area**
Open water	797	1
Developed open space	5,899	5
Developed, low intensity	1,897	2
Developed, medium intensity	560	0
Developed, high intensity	389	0
Barren land, rock, sand, clay	3	0
Deciduous forest	46,407	38
Evergreen forest	263	0
Mixed forest	82	0
Shrub, scrub	45	0
Grassland, herbaceous	30,673	25
Pasture, hay	1,898	2
Cultivated crops	31,715	26
Woody wetlands	1,331	1
Emergent herbaceous wetlands	327	0
Total	122,267*	

*This value differs from the total of all protected areas by less than 2/10ths of one percent due to variations in the edges of cells by which the areas are defined.

Source: USGS GAP Program, tabulations by the author

The majority of protected grassland parcels are small (table 15). Most are less than an acre in size, and only one exceeds a thousand acres. This fragmentation is a challenge for resource managers. Small islands of a particular habitat, like a prairie surrounded by forest, generally have modest numbers of individuals of any given species and smaller number of total species than do larger parcels. As a result, it is relatively easy for any given species to be eliminated entirely from the parcel.[3] In addition, small parcels cannot sustain large animals such as bison or pronghorn that many people would like to see restored to the Hills. Nor can they provide the experience of expansive prairie landscape that is important to many recreational users of the Hills.

[3] Edward O. Wilson, *The Diversity of Life* (New York: W. W. Norton, 1992), 220-223.

Table 15. Distribution of protected parcels of grassland in the Loess Hills

Size	**Number of parcels**
More than 1000 acres	1
100-999 acres	9
10-99 acres	159
1-9 acres	538
Less than 1 acre	963
Source: USGS GAP Program, tabulations by the author	

More than a quarter of the protected lands are used for row crops. These areas are a combination of crop fields on Indian reservations, fields planted specifically to provide food for game animals, and fields within parks or preserves that are leased for farming to provide revenue until management plans and resources are available to convert them to uses more in harmony with the park's mission. These last two categories reflect political forces acting on park and forest managers. Much funding for public land still comes from hunting and fishing revenues, and so public agencies are obliged to provide game animals to shoot, even at the cost of planting nonnative crops as food. In addition, because opportunities to acquire new parkland do not always come at convenient times, park administrators sometimes find themselves blessed by new park sites for which they have no money for roads, signs, picnic areas or other developments. In such cases, they temporarily lease the land for row crops.

Very little of the Loess Hills public land--less than three percent--is covered with wetland or standing water. This is a testament both to aggressive draining of wetlands (particularly in the 1930s) and to the naturally well-drained qualities of soils derived from loess. Water shortages also may have impeded park development. For much of the twentieth century, a lake for swimming and boating was seen as a near essential aspect of

outdoor recreation and a landform that could not provide lakes was not very desirable for parks.[4]

A history of state and local protection

Although the public lands scattered throughout the Hills were not acquired in accordance with any single management strategy, they share many characteristics that reflect the history of the state and local parks movements, particularly in the early decades of the twentieth century. This was a pivotal time in attitudes toward parks nationally and one during which many of the places now at the center of protection of the Loess Hill first came into public ownership.

Iowa, Missouri, and Nebraska, each in their own way, have been leaders in public land policy. Iowa came early to a place of prominence. Its State Board of Conservation was so widely respected at the beginning of the park movement that Des Moines was selected by the U. S. Department of the Interior to host a conference on state parks in 1921. This meeting marked the National Park Services's first efforts to support development of state parks.[5] The Arbor Day movement, a fusion of forest conservation and beautification interests, came out of Nebraska in the 1870s. It stands as an early example of public private partnership to improve deteriorating landscapes.[6] It was also an early effort at forest conservation, an initiative in which the roots of the state parks

[4] Langdon Smith, *The Democratization of Nature: State Park Development During the New Deal*, (Ph. D. diss., The University of Kansas, 2002), online at http://www2.lib.ku.edu:2048/login?url=http://proquest.umi.com.www2.lib.ku.edu:2048/pqdweb?did=765046741&sid=2&Fmt=2&clientId=42567&RQT=309&VName=PQD (accessed July 13, 2009).
[5] Smith, *Democratization of Nature*, p. 18.
[6] National Register of Historic Places, "Multiple Property Documentation Form: the Conservation Movement in Iowa, 1857-1942," (Washington, D.C.: United States Department of the Interior, National Park Service, 1991), Online http://www.nr.nps.gov/multiples/64500151.pdf pp. e-51, e-85 (accessed July 29, 2009).

movement can be found. Missouri's opportunity for national leadership came with two constitutional amendments, the first in 1936 to create a nonpartisan commission to oversee conservation policy. Later, the Design for Conservation, a 1977 constitutional amendment, provided reliable funding for public-land acquisition through a dedicated one-eighth of one percent sales tax that would be immune from the politics of the appropriations process.[7]

Nationally, as well as in the Loess Hills states, efforts to create state parks lagged behind the national park movement. A tentative, almost accidental quality also marked efforts at state park creation in the early 1900s, as states struggled to figure out the role they wanted parks to fill and how those parks would fit with other recreational and environmental protection responsibilities of state government.

Iowa

Iowa came close to having a national park in the early years of the twentieth century. The intended site, however, was not the Loess Hills but northeastern Iowa, a region known for the absence of glacial drift that buried much of the relief of the rest of the state. This driftless area has striking, deeply carved valleys extending about fifty miles west from the Mississippi River. It is cut by the Upper Iowa and Yellow rivers and their tributaries. It is also home to large Native American burial and ceremonial mounds scattered along the Mississippi bluffs.

Beginning in 1916, senators and representative from Iowa introduced legislation to protect the driftless region as a national park. This area, they argued, was

[7] The Genesis of Conservation in Missouri, *Missouri Conservationist* (January, 2005), online at http://mdc.mo.gov/conmag/2005/01/30.htm. Accessed May 15, 2009.

environmentally exceptional and offered recreation opportunities to residents of Midwestern cities. They promoted it as Iowa's Little Switzerland. Ultimately, however, the National Park Service rejected the area, concluding it was too expensive to buy, too developed, and not sufficiently stunning.[8] Decades later, much of the area finally won federal protection. Today, the Indian mounds are preserved as Effigy Mounds National Monument, run by the NPS, and much of the upper Mississippi River valley is administered as a national wildlife refuge. The remainder of the driftless area is in private ownership.

While the national park for the driftless area was being debated, a state park movement was taking shape in Iowa. Three separate interest groups, each pursuing different goals, came together in the early 1900s. Hunters and anglers wanted more regulation and preservion for the fish and game upon which their sport depended. Foresters were concerned about the environmental damage of deforestation and a need for local timber to supply the railroad (for crossties) and construction industries. Finally, women's clubs were beginning to speak out on the need for aesthetic management of public spaces.[9]

None of these constituencies thought acquiring park lands was a particularly important goal. Timber culture, game and fish restoration, and beautification all could be conducted on private land. The tree-planting initiative was a curious project in a prairie state. Proponents spoke glowingly of the opportunity to endow the desolate prairie with majestic forests, encouraging the exact aesthetic that modern proponents of prairie

[8] Louis H. Pammel, "State Parks in Iowa," *Scientific Monthly* 10, no. 5 (1920): 516-521.
[9] National Register, "Multiple Property Documentation," pp. 20-35.

restoration work so hard to overcome.[10] Of course, as discussed in chapter two, the natural landcover of the Hills (in the absence of all human activity) balances precariously between grass and woodland.

Only slowly did a consensus grow around the idea that significant tracts of publicly owned land would be necessary to advance the interests of sportsmen, foresters and aesthetes. A vision for programs of public lands was codified in two efforts. In 1917 the Iowa legislature first voted funds for state park development. The initial plan called for purchases to provide points of public access along the state's largest lakes and rivers such as the Maquoqueta and Des Moines. The legislature called for parks to be created in places "of historic, natural, or recreational interest."[11] By this act, the legislature began the process of separating the missions of state parks from those of conservation areas. The authorization does not mention hunting, fishing, or timber. Instead the focus is on places of interest for nature study, recognition of Iowa heritage, and outdoor play.

Iowa's "Twenty-Five Year Conservation Plan," issued by the Board of Conservation in 1933, called for acquiring land throughout the state, building lakes, and repairing degraded habitat. Still reflecting a bias toward hunting and fishing, it gave lesser attention to the needs of hikers, campers, canoeists, and naturalists.[12] However, the plan did recognize the need for three distinct brands of park land: large parks intended primarily for recreation, smaller preserves to protect isolated natural or historic features, and sanctuaries intended to preserve natural features or populations of plants or animals.

[10] National Register, "Multiple Property Documentation," p. 51.
[11] "The Iowa Policy Concerning State Parks," *Science* 50, no. 1296 (1920): 406-407.
[12] Jacob L. Crane, *Report on the Iowa Twenty-Five Year Conservation Plan, Prepared for the Iowa Board of Conservation and the Iowa Fish and Game Commission* (Des Moines: Wallace-Homestead Co., 1933).

Iowa park development, particularly in its early years, exhibited a curious bias for flatland. A map of state parks in 1926 shows holdings concentrated on the central part of the state where the Des Moines lobe of glacial ice deposited a blanket of glacial drift, and the rolling country of the east, between Iowa City and the Quad Cities. Two big blank spots on this map, places with relatively few parks, are the Loess Hills and the stunningly beautiful hill county of northeast Iowa where the national park had been proposed earlier.[13]

In the early years of the Iowa parks movement, tension existed between advocates of parks as nature preserves (or "conservation parks") and parks as playgrounds. Thomas MacBride, a botanist and academician, was the leading advocate for parks as places where nature would be preserved and adventuresome people could hike, paddle, or climb to see it. He was opposed by residents of communities that adjoined parks who instead wanted picnic grounds, golf courses, cottage sites, and other amenities that would draw visitors to their communities.[14]

Louis Pammel, an academic botanist like MacBride, advocated a broader strategy for Iowa's state parks. He recognized that conservation parks, as described by MacBride, had a limited constituency. If parks were to enjoy sustained public support, they must offer roads, picnic shelters, campgrounds, and other features to accommodate that new creation of the 1920s, the tourist with an automobile.[15] In Pammel's strategy we can see a clear break from the design of the early national parks as well. In those parks, a visitor arrived by train and was conveyed by wagon or coach to a lodge from which he made forays throughout the park. The state parks of Iowa, just a few decades removed from

[13] Rebecca Conard, *Places of Quiet Beauty* (Iowa City: University of Iowa Press, 1997), 58.
[14] Conard, *Quiet Beauty*, p. 37.
[15] Conard, *Quiet Beauty*, pp. 52-53.

these original national parks, had already shifted their design to accommodate visitors with cars.

Pammel's vision was also more consistent than MacBride's with the agenda of federal agencies, particularly the Civilian Conservation Corps (CCC), Works Project Administration (WPA), and Civil Works Administration (CWA). These federal organizations were eager to build dams, shelters, lodges, and other recreational facilities in state parks, both as a means to create jobs during the Great Depression and in fulfillment of their vision for the function and appearance of state parks (figure 19). The federal influence on state parks was significant. Among other services, the Park Service offered off-the-shelf plans for individual park components (buildings, roads, dams, etc., all with a deliberately rustic, rough-hewn look) and overall park master plans. These plans were built around the assumption that swimming was an essential component of a park experience and that parks should only be developed where natural swimming areas existed or where artificial lakes could be built. They inevitably included a developed beach and bathhouse. Curiously, the desire to build lakes for swimming and fishing did not extend to support for boating. Although the influence of the recreational boating industry has shaped recent lake development and is frequently cited as a reason for federally funded impoundments, the industry had no such influence on lake design in the 1930s. This follows from the relative scarcity of recreational boats in the early twentieth century and a philosophy of park design that deliberately targeted recreational needs of people of modest means. Swimming, which required no equipment at all, was the ideally democratic activity.[16]

[16] Smith, *Democratization of Nature*, pp 40-44.

Figure 19. Toadstool shelter at Waubonsie State Park, an example of park rustic design, built by the CCC. (photo by the author).

As early as the second decade of the twentieth century, the Loess Hills were specifically recognized as a natural feature worthy of protection as a state park, even though they had little water. Pammel wrote glowingly of the area as "a series of bluffs which are unique in the topography of the country."[17] He remarked on the special combination of sediment and terrain, which, he recognized, extended into both Missouri and Nebraska. He even described the material of the Hills throughout the region as "Missouri Loess,"[18] and acknowledged it was noteworthy for its windblown deposition,

[17] Louis H. Pammel, "Notes on Buckingham Lake Area," in State Board of Conservation, *Iowa Parks : Conservation of Iowa Historic, Scenic and Scientific Areas, Report of the State Board of Conservation* (Des Moines : State of Iowa, 1919), 53.
[18] Pammel, "Notes on Buckingham Lake," p. 53.

the presence of plants otherwise found only west of the hundredth meridian,[19] and the distinctive orchard agriculture it supported. In short, he made almost the same argument for protection of the Hills that the National Park Service advocated at the end of the twentieth century.

Pammel used a combination of names for the Loess Hills. The Hills themselves he called "the mounds,"[20] "the loess mounds,"[21] and "the Loess Bluffs"[22] (capitals Pammel's). As for the material of which this landform is created, this was "Missouri Loess"[23] or "tenacious clay."[24]

Waubonsie State Park was the first park created specifically to protect and interpret the Hills. The purchase the 200-acre Ed Mincer farm in March 1926 was a cooperative effort between state government and a citizens' committee from the nearby town of Hamburg, which provided $2,500 of the $10,000 needed. The land was valued for its rough hills and undisturbed prairie and tree cover. Newspaper reports stressed that the park design was for conservation, not recreation:

> The park will not be an amusement resort, and will be left as near as possible in a natural state. Roadways, walkways, and other like improvements will be made from time to time, as funds are available from the state, and it will be open to the public, but it will never be a resort or amusement place.[25]

The management plan harkened back to MacBride's vision of parks as places whose first priority was to preserve natural systems. Waubonsie was also one of the few

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[19] Pammel, "Notes on Buckingham Lake," p. 57.
[20] Louis H. Pammel, "The Loess of Western Iowa," in State Board of Conservation, *Iowa Parks : Conservation of Iowa Historic, Scenic and Scientific Areas, Report of the State Board of Conservation* (Des Moines : State of Iowa, 1919) p. 58.
[21] Pammel, "The Loess of Western Iowa," p. 58.
[22] Pammel, "The Loess of Western Iowa," p. 58.
[23] Pammel, "Notes on Buckingham Lake," p. 52.
[24] Pammel, "The Loess of Western Iowa," p. 58.
[25] State Park Assured for Hamburg. The Hamburg (Iowa) *Reporter*, March 18, 1926, p. 1.

Iowa Parks with a paid naturalist on staff in the 1930s. In spite of the focus on conservation, local business interests in Hamburg suggested that the park would attract tourists to their corner of the state and that the communities of Hamburg, Sidney, and Riverton would profit. They also noted that local funding came exclusively from leading citizens of Hamburg, not from the municipal government or from other nearby towns. They hinted that they expected eventual development into "one of the most attractive parks in the state."[26]

The Loess Hills were of sufficient interest in the 1930s that the Iowa Conservation Commission proposed four more state parks in the region: Boyer, Westwind, Stone, and Preparation Canyon. Two of these, Stone and Preparation Canyon, were funded and built.[27]

Stone State Park has a history different in almost every way from that of Waubonsie, and illustrates the tension between public recreation and resource protection that was playing out across the state. It began as a private preserve owned by a wealthy and eccentric real-estate speculator from Sioux City, Daniel Hector Talbot, and was later acquired by Thomas Jefferson Stone.[28] After his death, his widow, Lucia Stone, donated her share of the preserve to the city to use as a park. Beginning in 1912, Sioux City attempted to develop the area as a recreation destination, with no regard for preservation of the natural landscape. They constructed a zoo in 1913. They built a wood-framed toboggan run on the steep slope of the loess, and provided specially designed small

[26] State Park Deal Closed on Monday of this Week. The Hamburg (Iowa) *Reporter*, April 22, 1926, p. 1.
[27] James Scheffler, *Waubonsie State Park Ecological Management Plan* (Des Moines: Iowa Natural Heritage Foundation, 2007), p. 28.
[28] Interview with Kevin Halliday, park manager, Stone State Park, October 16, 2008, and from displays at the Dorothy Pecaut Nature Center.

toboggans for park users. They also proposed a golf course, tennis courts, ski slope and skating rink, but the ski and skating facilities were never built.

During the Great Depression, local funding for park development was depleted but federal aid was plentiful. Roadways and other structures would be available via Civilian Conservation Corps camps if ownership were transferred from the municipality to the state. Therefore, Sioux City sold Stone Park to the State of Iowa for one dollar in July, 1935. A CCC camp soon began to build their typical rustic-style shelters, bridges, and administrative buildings. Recreation facilities were removed, and park management emphasized preservation of the landscape and facilities such as trails, camps, and picnic areas that supported enjoyment of the park's natural attractions.

Missing from the planning and promotion of most Loess Hills parks is an appreciation for them as prairie environments. Instead, like other parks of the 1920s and 1930s, they were developed primarily as woodland destinations. An appreciation of prairies and a corresponding action to protect them had to wait until the 1940s and the acquisition of Kalsow Prairie. The failure of a prairie state to appreciate prairie parks has been attributed to political caution on the part of park planners who did not want to acquire land for parks that had agricultural potential.[29] This view resonates with Alfred Runte's argument that, for all the lofty rhetoric about American national parks being showcases for the most dramatic and sublime landscapes of the continent, they were really only the best sites from among what was seen as the most worthless land, places with no economic potential for agriculture or mining.[30] Neglect of grassland continued well into the last half of the twentieth century. As the manager at Stone State Park, in

[29] Conard, *Wild Beauty*, p. 185.
[30] Alfred Runte, *National Parks: The American Experience* (Lincoln: University of Nebraska Press, 1987), 76-78.

which forest has reclaimed all but a few small fragments of hilltop grassland, complained to me: "I've been doing twenty years of burning, but have had only slow success; (we) need to get aggressive."[31]

Local government efforts

County government plays an important role in protecting and interpreting the Loess Hills in Iowa, a role that is not duplicated in Missouri or Nebraska. Two of the most stunning and welcoming parks in the Loess Hills, Hitchcock Nature Center in Pottawatomie County just outside Council Bluffs and Dorothy Pecaut Nature Center just outside Sioux City, are run by county conservation boards. Dorothy Pecaut was created on a ten-acre parcel transferred from Stone State Park to the Woodbury County Conservation Board as the Loess Hills Nature Center in 1993. Hitchcock was developed on a parcel of land that had been a scout camp but was in danger of being rezoned for use as a landfill. Because these centers were developed by local organizations and were tied to state park policy only through the loose oversight of the State Conservation Commission,[32] they were free from any need to conform to statewide expectations for state parks. Both facilities, for example, have stunning visitors' centers and interpretive displays, far beyond the norm for a state park. Both also include dramatic wildlife viewing areas: a comfortable living room at Dorothy Pecaut, an enormous tower at Hitchcock.

The role of county government in parks was explicitly defined by the Iowa legislature. The law that established Iowa state parks in 1919 also called for local

[31] Interview with Kevin Halliday, park manager, Stone State Park, October 16, 2008.
[32] Conard, *Quiet Beauty*, p. 232.

agencies to "establish like parks . . . without the support of the Public State Parks fund."[33] This commitment continued, in various forms, through the 1990s, by which time county conservation agencies operated more than 82,000 acres of parkland. These agencies were supported, in part, by a commitment from the Iowa State Conservation Commission to pass along to the counties half of its federal aid from the Land and Water Conservation Fund Act (LWCA) of 1964.[34]

As federal funds under the LWCA declined during the Reagan Administration, Iowa implemented its own Resource Enhancement and Protection (REAP) program in 1989 to provide money to local and county agencies for recreational and conservation programs. Initially, it was a mechanism to distribute proceeds from the state lottery to local governments, and was intended to expire in 2001. The program was reauthorized, however, and, in recent years has been funded by direct appropriation from the legislature. As a result, the funding has not been as steady and predictable as some advocates would like, but it has provided important support to the Hitchcock Nature Center and similar facilities.[35] REAP has been sufficiently successful to become part of the Iowa vernacular. Small-town newspapers now casually report on REAP funding for local walking trails and parks, with no need to define or explain it. Similarly, park staff casually speak of REAP funding in conversation with visitors.

As the example of the Dorothy Pecaut and Hitchcock nature areas illustrates, a small county park with a clear and focused mission can create a destination with a national audience. This commitment to local projects has allowed counties with

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[33] "Chapter 236, Acts of the 37th General Assembly" in State Board of Conservation, *Iowa parks : Conservation of Iowa Historic, Scenic and Scientific Areas, Report of the State Board of Conservation* (Des Moines: State of Iowa, 1919), 7.
[34]Conard, *Quiet Beauty*, p. 233.
[35] Interview with naturalist Chad Greave, Hitchcock Natural Area, September 12, 2006.

aggressive conservation boards to develop quality nature tourism. Because many of these county parcels are small, however, they contribute to the problem of fragmentation of protected areas. This, in turn, limits opportunities for wildlife restoration (only a large parcel such as Broken Kettle Grasslands can sustain a bison herd) and for protection of sweeping vistas of the Loess Hills landscape.

The role of local government is especially important in the Loess Hills because of the particular quality of the land and sediments there. Throughout much of the twentieth century, lakes were an essential part of any park design. At the same time, the federal government was furiously developing large lakes as part of navigation and flood control plans. Typically, the economic rationale for these lakes included increased recreational opportunities, particularly power boating and lakeside camping.[36] The Loess Hills, however, with their small drainage basins, porous sediments, and lack of bedrock on which to set dams, are a terrible place to try to build lakes. As a result, they were left behind as state agencies poured their energies into parks that aimed at boaters and swimmers. A county government, particularly in a county that was almost entirely composed of loess hill terrain and therefore had no potential for large lake development, was much more likely to turn its park and recreation efforts toward the one dramatic resource it had on hand: the Hills.

[36] Walter M. Kollmorgen, "And Deliver Us from Big Dams," *Land Economics* 30, no. 4 (1954): 333-346.

Missouri

Missouri, in contrast to Iowa, implements its park and public land development generally through the state-level Department of Natural Resources with support from a state sales tax dedicated to public lands and parks.[37]

Missouri's public land system grows out of a unique history. In the first two decades of the twentieth century, resource conservation in Missouri focused on hunting and fishing, and money for those efforts came from license fees. Kansas City and St. Louis, however, made early commitments to parks. Henry Shaw donated land for St. Louis's Tower Grove Park, and later endowed Shaw's Garden, the kernel from which the Missouri Botanical Garden grew. Kansas City, meanwhile, began construction of a system of tree-lined boulevards and large, well-designed parks created by landscape architect George Kessler. Perhaps inspired by these municipal efforts, the state legislature recognized public demand for recreational land for purposes other than hunting and fishing, and diverted five percent of license income from these activities to acquire and operate state parks. In 1923, the diversion was increased to twenty-five percent of license revenues. This funding supported purchase of the relatively small Arrow Rock and Mark Twain historic sites and the acquisition of larger parcels in the Ozarks, where years of logging had left much of the country badly eroded and inexpensive.[38] In the 1930s, Missouri also took advantage of federal assistance. The Civilian Conservation Corps established camps in several parks and the National Park Service bought and developed parks at Lake of the Ozarks, Knob Noster, and Cuivre

[37] Conard, *Quiet Beauty* p. 288.
[38] Charles Callison, *Man and Wildlife in Missouri* (Harrisburg, Pa: Stackpole & Co., 1953), 12.

River as demonstration projects. These were then sold to the state.[39] None of these efforts provided for a park in the Loess Hills, however; that would have to wait until the 1980s.

Later in the 1930s, Missourians made an even more dramatic gesture toward conservation. Recognizing that political pressure on administration of state fish and game laws led to arbitrary--and overly generous--bag and creel limits, citizens voted to amend the state constitution to create a conservation commission, wholly outside the state executive offices and not dependent on an appropriation from the legislature.[40]

Creation of an independent Missouri Conservation Commission highlighted the inherent conflict between parks and game conservation interests. So long as parkland was to be funded by revenues from fishing and hunting license, managers would be predisposed to prioritize service to anglers and hunters, and to give short shrift to the needs of campers, hikers, picnickers, and others. By separating the conservation department from parks administration, and providing the parks agency with its own budget, parks were liberated from the need to serve anglers and hunters exclusively. At the same time, however, when parks are funded by legislative appropriation rather than license sales, they become more subject to the whims of legislators. The tension between conservation and parks administration lingers today in places such as Bennett Spring State Park, where a visitor buys a permit to camp from the Department of Natural Resources but a special permit to fish for trout from the Conservation Department.

Funding for public land in Missouri took three additional noteworthy turns. The federal Land and Water Conservation Fund, initiated in 1964, was used in Missouri

[39] Susan Flader, "Evolution of the System" in Susan Flader, ed. *Exploring Missouri's Legacy* (Columbia: University of Missouri Press, 1992), 1-24.
[40] Callison, *Man and Wildlife*, pp. 24-25.

primarily for acquisition of state park land, in contrast to Iowa where most of those funds were allocated to county-level park purchases.[41] Then, in 1976, Missourians passed the Design for Conservation, a one-eighth of one percent sales tax dedicated to purchase of conservation land, not parks. Among other places, this funding allowed purchase of the Brickyard Hills, Riverbreaks, Honey Creek, and Bluffwoods areas in the Loess Hills, all of which are managed for hunting and fishing. Finally, in 1985, Missourians passed a similar but weaker act that established a one-tenth of one percent sales tax, the proceeds of which are split evenly between state parks and efforts at soil and water conservation.

Not until the 1980s did Missouri begin to establish a state park in the Loess Hills, and even then the Hills location was almost accidental. Weston Bend State Park was acquired in pieces throughout the 1980s and opened in 1990. It was intended to interpret the history of the southern Hills, including the distinctive tobacco agriculture imported to the area by settlers from Kentucky.[42] It was also selected for its proximity to Kansas City, to provide a recreation destination for city-dwellers. Park administrators acknowledge protection and interpretation of the Loess Hills as a mission only when prompted with specific questions about the Hills.[43]

Nebraska

Nebraskans have established two state parks in the Loess Hills, neither of which was particularly intended to protect or provide access to the Hills. As mentioned earlier,

[41] Flader, *Exploring Missouri*, pp. 13-15.
[42] Gladys Emerson, 1978, "Tobacco Culture in a "Little Dixie" Outlier of Northwestern Missouri" (Ph. D. diss., University of Kansas, 1978).
[43] Interviews with Carla Strain, naturalist at Weston Bend State Park and Lana, former superintendent March 14, 2008.

Nebraska does not make use of nonpark conservation land to the extent that is done in Missouri and Iowa.

Ponca State Park followed a path similar to that of Iowa's Waubonsie park. Its initial 200-acre core was a gift from a local American Legion post, and so required money from the state only for development and maintenance. Ponca was developed largely as a conservation park, with only modest facilities for tourism. However, this mission has changed in recent years, as federal grants and appropriations supported construction of an opulent visitor's center dedicated primarily the natural and cultural history of the Missouri River.[44]

Indian Cave State Park, in the southern Nebraska Hills, was acquired as a woodland retreat close to Omaha. Parkland acquisition began in 1963, but was slowed by disputes over the state's use of eminent domain.[45] The process took almost a decade, and development of the park began in 1973 with the clearing of debris that had been dumped at the mouth of the namesake cave.[46] Facilities now include more than one hundred campsites, a network of hiking trails, and access ramps to the Missouri River. According to the park manager, this site was selected because of its "scenery, topography, and terrain." Yet neither the park literature nor my conversation with the managers suggested that this associated specifically with the presence of the Loess Hills.[47]

[44] Interview with Kevin Halliday, park manager, Stone State Park, October 16, 2008.
[45] Dead town is possible park land. Omaha *World- Herald*, May 25, 1968.
[46] Untitled article in Supplement to Peru (Nebraska) *Challenge*, August 1, 1973, p.1
[47] Interview with Kevin Halliday, park manager, Stone State Park, October 16, 2008.

Patchwork protection

Protection of public lands within the Loess Hills is divided across four states, multiple agencies of state government within each state, and many jurisdictions of local government. Coordination among these units of government is conspicuously scarce. Some quasipublic organizations (Golden Hills Resource Conservation and Development, Inc., The Loess Hills Alliance, the Nebraska Loess Hills Resource Conservation Association) attempt to foster communication and collaboration among the many jurisdictions and have enjoyed some success. The Loess Hills Scenic Byway, sponsored by the Loess Hills Scenic Byway Council, presents visitors with direction to federal, state, local, and private lands within the Hills. It comes closer than any other effort to creating an experience similar to that a visitor to a national park or reserve would have. Their published guide even looks a bit like a National Park Service tour booklet.

Yet even the Byway Council's very successful effort is limited to the Hills in Iowa, and totally ignores the opportunities to enjoy similar terrain across a state line. Although state and local park managers regularly speak about cooperative efforts with other park units and other agencies, these, too, generally occur within their home state. In addition, land managers occasionally will speak somewhat disparagingly of parallel efforts in other states, suggesting misdirected conservation energies. The absence of a powerful multistate advocacy organization for the Hills may have contributed to the failure of the proposal to create Loess Hills National Reserve. Officials with the National Park Service saw support for a Loess Hills park only from the congressional delegation of Iowa. If that proposal had included all the Loess Hills states, a political bloc of eight senators rather than just two, the NPS may have been more eager to support immediate

creation of a park. In fact, the Park Service's carefully worded suggestion that it might reconsider creation of a Loess Hills reserve if increased public support becomes apparent can easily be interpreted as a suggestion that inclusion of lands from Missouri, Nebraska, and Kansas would influence their ultimate decision.

Chapter 9. Looking Back and Looking Forward

The Loess Hills are more famous now than they were a century ago, even though they are perceptually smaller, as if compressing their extent from parts of four states down to a thin band in western Iowa has somehow concentrated the essence of the place. Although this shrinking has given rise to commendable and successful efforts to publicize their charms, it has ultimately done the Hills and their residents a disservice. A bigger conception of the Hills, one that extends to Nebraska, Kansas, and Missouri, is truer to the physical geography of the landform and more respectful to the people who make their lives on it.

The Loess Hills are a noteworthy place whose natural and cultural history deserve to be recognized. They are formed from a relatively common sediment, but formed a remarkably rare band of large loess ridges. They are home to a distinctive land cover, a mosaic of forest and grassland that has survived as surrounding land was planted to corn, wheat, and soybeans. The area is not all natural, of course. Intensive fruit and tobacco farming exists, for example, as does grazing. The rolling hills also have attracted vacation homes and upscale exurban sprawl. Finally, the Hills have provoked an extended exercise in land naming. Their curious shape has always demanded special terms by which people could make clear to each other that this place was different from its neighbors. Over the last two hundred years, English speakers have tried many descriptors. Some came from science, others from popular usage. These phrases tried to describe the shape of the Hills, the material from which they were made, or the plants that grew on them. Only in the last few decades have the words “Loess Hills” settled out of the mix as something approaching a consensus name. Regrettably, however, the same

promotional and public relations efforts that encouraged agreement on these particular words also encouraged limiting their application to the Hills of Iowa.

The process by which the Hills came to be named has also shaped policy over how they are used. Different levels of government, from the U. S. Department of the Interior to tiny town councils, have been involved, together with private organizations and individual landowners. All have played substantial roles in conserving the Hills, but their efforts have lacked coordination. In fact, policy has been shaped relatively independently across four states.

New conservation initiatives arise occasionally. Recently, Iowa's Department of Transportation has begun a transformation of interstate rest areas into opulent tourist centers with dramatic buildings and sophisticated interpretive displays. One such conversion has been done in the Hills. It catches the attention of road-weary drivers arriving from the west and encourages them to think of the Hills as a destination rather than a patch of scenery that flashes past the window. Increasing interest in Native American history and archeology has led to efforts at cataloging sites used by indigenous residents of the Hills and weaving these sites together as a larger historic district. The parallel of this involvement with the history of northeast Iowa is impossible to miss: Passed over for a national park because the Mississippi bluffs there were deemed insufficiently beautiful, that same locale eventually secured status as a National Historic Site to protect its Indian mounds. Perhaps a similar process will some day take place in the Loess Hills, with protection coming for its Indian heritage rather than its scenic vistas.

Travelling through the Hills today, one has a feeling that the wave of energy for creating a big park has crested and moved on. The National Park Service is clearly staying on the sidelines, waiting for a shift in public opinion before it makes another effort. The Loess Hills Scenic Byway, a promising concept that called attention to the Hills in the 1990s, has lost momentum as the scenic byway idea has been applied to many other locales and, as a result, carries a diluted cachet.

Despite the absence of coordinated environmental protection on the part of government agencies, the Loess Hills manage to endure without widespread degradation. Prairie aficionados decry the intrusion of forest, but claims that grassland is the true and enduring correct landcover for the Hills are open to dispute. Residential development is a problem only locally. Pockets of low-density construction are creeping north from Kansas City into the Hills of Platte County and a cluster of showy homes perch on the ridge across the Missouri River from Omaha. Smaller subdivisions also have grown elsewhere, but the Hills have acquired no appeal as a real estate destination. Phrases such as “Loess Hills retreat” are remarkable by their absence from regional home ads.

The cities of the Hills are interesting and attractive, but not among the urban destinations seen as trendy in the new century. Most have experienced only modest growth in recent years. The population of Kansas City and Omaha each grew nine percent between the 2000 and 2008, while Sunbelt cities such as Las Vegas, Phoenix, and Raleigh/Cary (center of the so-called research triangle of North Carolina) expanded thirty percent or more. Sioux City was one of the few metropolitan areas in the nation to actually lose population over this span of time.

Many "best-city" awards are offered by organizations intent upon calling attention to themselves or their own interests. In this modern milieu, where it is almost difficult for a city to avoid making someone's top-10 list, it is significant that the cities of the Hills are still largely neglected. *Money* magazine rated Overland Park, the largest suburb of Kansas City, its sixth best city for 2006. By 2009, it had dropped off this top-10 list.[1] Kansas City was listed among *Kiplinger's* top twenty-five cities in 2007, a ranking heavily influenced by Richard Florida's[2] ideas on the importance of workers who manipulated ideas and information rather than material objects.[3] Both Omaha and Sioux City were honored by *Site Selection* magazine in 2007 for their success in attracting new industrial facilities. Sioux City won top honors among cities under 50,000 people while Omaha placed second among cities with populations of 200,000 to one million. Oddly, these cities won while Omaha's long-term population growth was very low and while Sioux City was actually losing population.[4]

Agriculture in the Hills has been similarly stable. The amount of land actively farmed has remained more-or-less constant. Because much of the Hills are so steep that row cropping would quickly destroy the agricultural value of the land with erosion, woodland remains in place. Dramatic increases in corn prices have prompted some shifts away from of grazing or other crops. Corn has largely replaced tobacco in the southern Hills, partly because of federal buyouts of tobacco allotments.

---

[1] *Money* magazine, "Best Places Rated" database, money.cnn.com/magazines/moneymag/bplive/2009/index.html (accessed August 17, 2009).
[2] Richard Florida, *Cities and the Creative Class* (New York: Routledge, 2005).
[3] *Kiplinger's Personal Finance* magazine "Kiplinger's Top-25 cities" database, www.kiplinger.com/features/archives/2007/04/bestcities_table.html (accessed August 17, 2009).
[4] U. S. Bureau of the Census, "American Fact Finder" database, factfinder.census.gov/home/saff/main.html?_lang=en.

What is the future of the Hills? With the local metropolitan areas remaining in the middle of the pack on measures of urban prosperity, it is unlikely that exurban sprawl will threaten their serenity any time soon. For all their charm, the Hills will never become a dynamic tourist destination. Not only do they lack snow-capped peaks, roaring surf, or endless summer, they have not attracted the recreational amenities--artificial lakes with marinas, enormous theme parks, or mega malls--that are associated with industrial-scale tourist destinations. Turning this argument on its head, however, the stability of agriculture and the modest residential and commercial development pressures on the Hills provide an opportunity for a new conservation consensus to emerge.

With the National Park Service withdrawn from the local scene, leadership for protection of the Hills passes to the state and local park agencies, with the support of private conservation groups such as the Nature Conservancy. Private conservation groups, in fact, have been the source of money and enthusiasm to drive the expansion of many state parks recently, at a time when support for public lands was under effective attack from the political right. Local government conservation agencies have also provided a creative energy to the parks movement, perhaps enjoying a measure of immunity from antigovernment sentiments directed at federal and state initiatives. Such agencies have built exquisite interpretive centers to explain the Hills to visitors and exerted an influence out of proportion to the number of acres they own. Because of their small size, such planners are liberated from the demands put on state parks to offer a full set of outdoor recreation experiences. They can afford to be Loess Hills specialists.

Even in the absence of a major federal park, I predict that protection of the Loess Hills will proceed at a rate that keeps pace with, and perhaps gains ground on, forces that

would spoil the region. Protection may be fragmented and inefficient, but it functions. A century from now the distinctive landscape of the Hills should endure.

Appendices

Appendix 1. USDA SSURGO Soil types identified along the edge of the Loess Hills

70	7230	8008	8150	10141	170D
220	7231	8009	8151	10142	170E
378	7234	8010	8155	10146	17B
670	7235	8011	8157	10147	18B
701	7266	8011	9706	10149	1C
717	7271	8019	9711	10150	1C3
10E2	7418	8020	9712	10156	1D
1E3	7422	8032	9714	10158	1D3
3553	7446	8034	9716	10160	1E
3643	7511	8035	9717	10168	1F
3921	7515	8067	9718	10172	1F3
4000	7541	8068	9719	10174	1G
5040	7596	8070	9720	12506	1G3
6300	7612	8071	9931	12508	212+
6301	7618	8073	9932	13508	22D2
6600	7644	8073	10E3	13509	2G
6601	7701	8075	10014	13510	33F3
6602	7716	8076	10017	13539	3D
6673	7750	8078	10033	13555	3E
6675	7770	8079	10034	13560	3F
6680	7771	8092	10037	13562	4001C
6681	7773	8093	10041	13563	4001D
6686	7851	8094	10050	13564	4001E
6687	7867	8096	10051	30065	4001F
6721	7870	8097	10054	36021	4010B
6749	7871	8100	10055	36031	4010C
6750	7874	8101	10056	66029	4010D
6751	7912	8104	10058	99001	4010E
6755	7925	8105	10059	99017	4012B
6765	7930	8106	10061	10B	4012C
6767	7951	8108	10062	10B2	4170C
6768	7952	8114	10063	10C	4170D
6769	7954	8116	10065	10C2	47B
6770	7959	8118	10068	10C3	510B
6787	7963	8123	10098	10D	510C2
6813	7966	8125	10099	10D2	717C
7050	7970	8125	101E2	10D3	717D
7051	7971	8131	10100	10E	983D
7052	7981	8132	10101	10F	9B
7153	7982	8135	10102	10F2	
7170	8000	8136	10109	10G	
7205	8005	8140	10110	12B	
7206	8006	8142	10111	12C	
7219	8007	8143	10115	12D	

Broad soil types associated with the Loess Hills

Around Weston	54f2	Knox 20-30% slope	
	10f	Sneed limestone outcrop	
	55d3	Knox 5-14% slope	
	55e3	Knox 14-20% slope	
Monona county Iowa	2g	Hamburg silt loam 45-75% slope	
	1g	Ida silt loam 30-40% slope	
	1f	Ida silt loam 20-30% slope	
Nemaha county, NE	MpG	Monona-Kipson complex, 30-70% slope	
	MnG	Monona-Ida silt loam, 30-60% slope	
	MnF2	Monona-Ida silt loam, 17-30% slope, eroded	
	MnE2	Monona-Ida silt loam, 11-17% slope, eroded	
	MnD2	Monona-Ida silt loam, 5-11% slope, eroded	
	MmD2	Monona silt loam, 5-11% slope, eroded	
Burt County, Nebraska	BtG	Boone rock outcrop complex, 20-60% slope	
	JuC	Judson silty clay loam, 2-6% slope	
	IdG	Ida silt loam, 30-60% slope	
	IdE	Ida silt loam, 11-17% slope, eroded	
	MnD	Monona silt loam, 6-11% slope	
	MnE2	Monona silt loam, 11-17% slope, eroded	
Nemaha county, Nebraska	MpG	Monona-Kipson complex, 30-70% slope	
	MnG	Monona-Ida silt loam, 30-60% slope	
	MnF2	Monona-Ida silt loam, 17-30 % slope, eroded	
	MnE2	Monona-Ida silt loam, 11-17% slope eroded	
	MnD2	Monona silt loam, 5-11% slope, eroded	

Appendix 2. HTML and Javascript source code for participatory mapping tool

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd"><html
xmlns="http://www.w3.org/1999/xhtml" xmlns:v="urn:schemas-microsoft-
com:vml">

<!-- Application to display a basic map and invite user input to
specify the bounds of a vernacular region -->


<!--

References:

Google Maps API.  2007.
http://www.google.com/apis/maps/documentation/index.html

Gibson, Rich and Schuyler Erle.  2006. Google Maps Hacks. New York:
O'Reilly
Erle, Schulyer and Rich Gibson.  2005. Mapping Hacks: Tips and Tools
for Electronic Cartography.  New York: O'Reilly

See also the work of

Dean, Alex.  2005.  The Regions Project : Examining Vernacular Regions
In the United States.  Unpublished report to accompany MA thesis,
University of Denver.  See also Dean's application at
www.regionsproject.org.



-->


<!--

Design:
Provide a generic tool that can be used for participatory mapping with
the following functions:
    Able to run on almost any computer
    Able to run with dial-up network connections, for use by households
not served by broadband
    Implement for testing with the Loess Hills, but design should be
generic enough to be adapted by non-technical users to other locations

-->

<html xmlns="http://www.w3.org/1999/xhtml">
  <head>

  </head>
<body>

<!-- Provide instructions to the user below.  For quick adaptation,
just change "Loess Hills" to your area of interest -->
```

```
<h1>Please click on the map below to draw the boundaries of the area
<em>you</em> consider to be the Loess Hills.</h1>   <h2>Remember, there
is no right answer; we are interested in where YOU
 think the hills begin and end.  When you are done drawing, just click
the export button to save your region as a set of coordinates, then
copy the coordinates and send them to me.
My email address is at the bottom of the page.</h2>
<h3>You will see your line on the map below once you have entered your
second point.  Add as many or as few points as you wish.  Don't worry
about drawing a perfect closed polygon; just make a sketch that covers
the area you know as the Loess Hills.</h3>
 

<!--  Call google map and give it your key.  Every server location on
which this application is used must have its own key.  Just get a free
key from Google
at www.google.com/apis/maps and paste it in place of my key code -->

<script
src="http://maps.google.com/maps?file=api&amp;v=2&amp;key=ABQIAAAAlbCWB
TYmRbBy8CBfqNZCyRR23mZkmX363PVRZHY09kr9oxK3hxRgZjI7ZWyOnMI5Uj9I5dgpK_ZD
DQ"
            type="text/javascript"></script>


<!-- begin an html form to provide user controls -->

<form>


<!-- Provide buttons to start recording boundaries and to save the
coordinates when finished -->

    <input type="button" value="Start drawing boundaries"
onClick="recording_flag = 1-recording_flag; ">
    <input type="button" value="If you make a mistake, click here and
start over.  Your earlier entries will be deleted."
onClick="clearAll(); ">
        <br>
            Latitude and longitude of your starting point:
        <input size=45 type="text" value="Click the 'Start Drawing
Boundaries' button"
               id="lat_long"  onclick="this.blur()"
        > 

        <br><br>
    <input type="button" value="When complete, click here to export
coordinates" onClick="exportPoints('csv'); ">


<!-- the "values" noted below set the center of the map the user will
see.  These values are for the center of the loess hills.  Just replace
them with values that correspond with your study area.  -->

    <input size=8 type="hidden" value="42.0"  id="click_lat"
onclick="this.blur()"> 
```

```
    <input size=8 type="hidden" value="-96.0" id="click_long"
onclick="this.blur()"> 
<p>


    Segment drawing :    <input size=8 type="text" value="0"
        id="segment_distance" onclick="this.blur()"> 

    Total  segments :    <input size=8 type="text" value="0"
        id="total_distance" onclick="this.blur()"> 




</form>


<!-- display a map of 640 by 480 pixels.  Adjust these values if you
want a larger or smaller map -->

    <div id="map" style="width: 640px; height: 480px"></div>
    <script type="text/javascript">
    //<![CDATA[

    var map = new GMap(document.getElementById("map"));
    var recording_flag = 0;
    var x_array = new Array(0);
    var y_array = new Array(0);
    var segment_distance_array = new Array(0);
    var total_distance_array = new Array(0);


<!-- This provides the map with a zoom control, but does not give the
user the ability to turn aerial imagery on and off, because I don't
want users to draw boundaries based just upon topography.  If you want
your user to be able to see aerial imagery, just remove the comment
symbols from the add.Control command below -->
    map.addControl(new GSmallMapControl());
    /* disable the map type control; do not allow image, just roads */
    /* map.addControl(new GMapTypeControl());  */

<!-- drawa map centered on the latitude and longitude set below.  Set
the zoom level to 10. If you want a smaller scale map, decrease this
number.  Getting the right zoom takes a bit of experimenting -->

    map.setCenter(new GLatLng(41.76, -96.66), 10);

<!-- clear the array that will hold boundary points -->
    function clearAll() {
        x_array = new Array(0);
        y_array = new Array(0);
        segment_distance_array = new Array(0);
        total_distance_array = new Array(0);
    }

    // center and zoom to the lat/long in the form
```

```
    map.centerAndZoom(new GPoint(
                document.getElementById('click_long').value,
                document.getElementById('click_lat').value), 10);


<!-- listen for the user to click the mouse over the map-->
<!--         At the click-->
<!--           call the function to overlay point data on the map-->
<!--                   if the user had already clicked the start
recording button-->
<!--                            capture the coordinates for the point
clicked-->
<!--                                    then call the function called
drawroute to turn the points into a line       -->
        GEvent.addListener(map, 'click',
                function(overlay, point) {
                    if (point) {
                        if (recording_flag > 0) {
                            x_array.push(point.x);
                            y_array.push(point.y);
                            drawRoute();

                            document.getElementById('click_lat').value =
point.y;
                            document.getElementById('click_long').value =
point.x;
                            document.getElementById('lat_long').value =
point.y + ', ' + point.x;
                        }
                    }
                }
            );   // end of GEvent.addListener
<!-- The code published by Gibson and Erle (2006) includes a
copyrighted distance calculation routine provided by another author.
That function is not needed by this project, so is disabled below.  -->

        /* note disabled distance calculation; just return a dummy value
*/
        function calcDist(lon1,lat1,lon2,lat2) {
                return 1;
        }

        function drawRoute() {
            map.clearOverlays();
            var points = [];
            for (i = 0; i < x_array.length; i++) {
                if (i>0) {
                    segment_distance_array[i] = calcDist(x_array[i-1],
y_array[i-1], x_array[i], y_array[1]);
                    total_distance_array[i] = total_distance_array[i-1]
+ segment_distance_array[i];
                    document.getElementById('segment_distance').value =
segment_distance_array[i];
                    document.getElementById('total_distance').value =
total_distance_array[i];
                } else {
                    // initialize the first element distances to 0
```

```
                    document.getElementById('segment_distance').value =
0;
                    document.getElementById('total_distance').value = 0;
                    total_distance_array[0] = 0;
                    segment_distance_array[0] = 0;
                }
                var point = new GPoint(x_array[i], y_array[i]);
                points.push(point);
                var marker = new GMarker(point);

                // define the text that appears in the marker
                var html = "location <b>" + y_array[i] + ', ' +
x_array[i] + "</b>";
                GEvent.addListener(marker, "click", function() {
                    marker.openInfoWindowHtml(html);
                });
<!-- It's kind of a user interface tossup whether it is better to show
a marker for each point selected or just show the lines that the user
draws.  To turn individual point markers off, comment-out or remove the
line of code that follows.  -->
                //map.addOverlay(marker);
            }
            map.addOverlay(new GPolyline(points));
        }


        function exportPoints(format) {
            var export_string = '';
            if (format=='route') {
                export_string = export_string + "<?xml
version=\"1.0\"?>\n<gpx>\n";
                export_string = export_string + "<rte>\n";
            }
            if (format=='track') {
                export_string = export_string + "<?xml
version=\"1.0\"?>\n<gpx>";
            }
            if (format=='csv') {
                //csv header
                export_string = export_string + "latitude, longitude\n";
            }

            for (i = 0; i < x_array.length; i++) {
                var lon = x_array[i];
                var lat = y_array[i];
                if (format=='route') {
                        export_string = export_string + "<rtept lat=" +
lat + " lon=" + lon + "> <name>pt_" + i + "</name></rtept>\n";
                }
                if (format=='track') {
                        export_string = export_string + "<trkpt lat=" +
lat + " lon=" + lon + "></trkpt>\n";
                }
                if (format=='csv') {
                        export_string = export_string +  lat + ", " + lon
+ "\n";
                }
```

```
            }

            // footers
            if (format=='route') {
                export_string = export_string + "</rte></gpx>";
            }
            if (format=='track') {
                export_string = export_string +
"</trkseg>\n</trk>\n</gpx>";
            }

            // write into document
            document.getElementById("output").value=export_string;
        }


    //]]>
    </script>

<form>
        <textarea id="output" rows = "15" cols="75"></textarea>
</form>
  </td>

 </tr>

</table>

<a href="mailto:dmcdermo@ku.edu?subject=Loess Hills Boundaries">
<h2>When you have marked the boundaries, please send them to me.  Just
copy the coordinates that appear in the box and paste them into an
email message to me.  Please tell me about your experience of the Loess
Hills -- do you live there or travel there?
If this link does not bring up your email client (and there are plenty
of good reasons why it might not) just send your email to
dmcdermo@ku.edu.</h2>
</body>

</html>
```

Appendix 3. Participatory Mapping Respondents

Northwest Missouri State University
Mark Lorson
Spring 2008

Illinois State University
John Kostelnick
Spring 2008

University of Nebraska at Omaha
Michael Peterson
Spring 2008

University of South Dakota
Mark Sweeney
Spring 2008

Briarcliff University
Brian T. Hazlett
Director, Environmental Science
Fall 2008

Wayne State University
Mark Hammer
Fall 2008

University of Nebraska, Kearney
John Bauer
Spring 2009

Non-response:
Northcentral Community College
Hank Miller

Little Priest Tribal College
Al Martyn

Buena Vista College

Morningside College
Marty Knepper

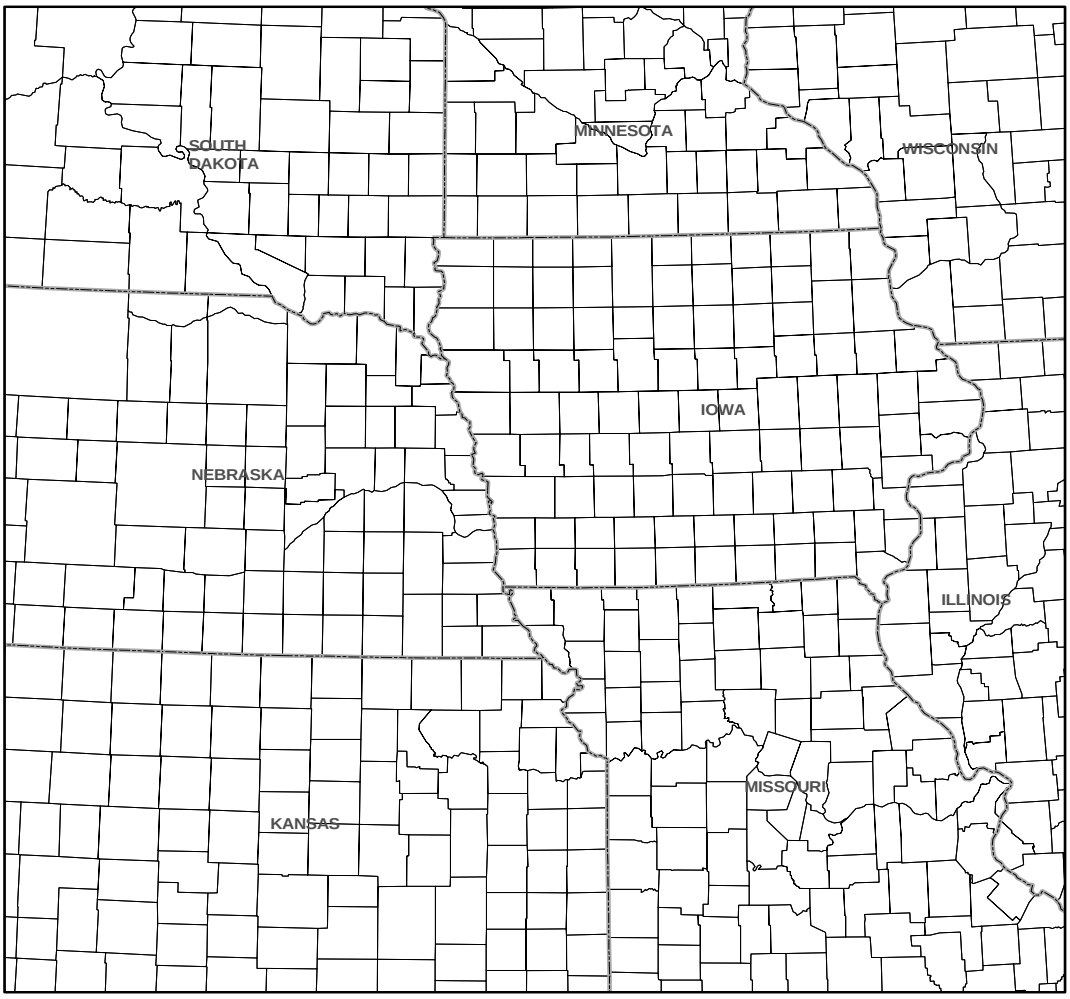
Peru State College
Daryl Long

Appendix 4. Survey instrument

Do you know of a place in North America called the Loess Hills? Yes No

If you answered Yes, please sketch the boundaries of the Loess Hills on the map below.

If you know of other names for the region you sketched, please write them here:


SOUTH
DAKOTA
MINNESOTA
WISCONSIN
IOWA
NEBRASKA
ILLINOIS
MISSOURI
KANSAS

Approved by the Human Subjects Committee Lawrence Campus, University of Kansas. Approval expires one year from 2/29/2008.

Please help us understand awareness of geographic regions by completing this one-page survey. On the reverse, you will find two questions and a blank map. Please complete the questions and follow the instructions to draw a sketch map.

This is a study of how people perceive regions. Therefore, there are no right or wrong answers. Your opinion is as valid as any other.

Information for participants in survey research

The Department of Geography at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You should be aware that even if you agree to participate, you are free to withdraw at any time without penalty.

We are conducting this study to better understand awareness of regions in the Midwest. This will entail your completion of a questionnaire. The questionnaire is expected to take approximately 5 minutes to complete.

The content of the questionnaires should cause no more discomfort than you would experience in your everyday life. Although participation may not benefit you directly, we believe that the information obtained from this study will help us gain a better understanding of how people understand geographic regions. Your participation is solicited, although strictly voluntary. Your name will not be associated in any way with the research findings. If you would like additional information concerning this study before or after it is completed, please feel free to contact us by phone or mail.

Completion of the survey indicates your willingness to participate in this project and that you are over the age of eighteen. If you have any additional questions about your rights as a research participant, you may call (785) 864-7429 or (785) 864-7385 or write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, email dhann@ku.edu or mdenning@ku.edu.

Sincerely,

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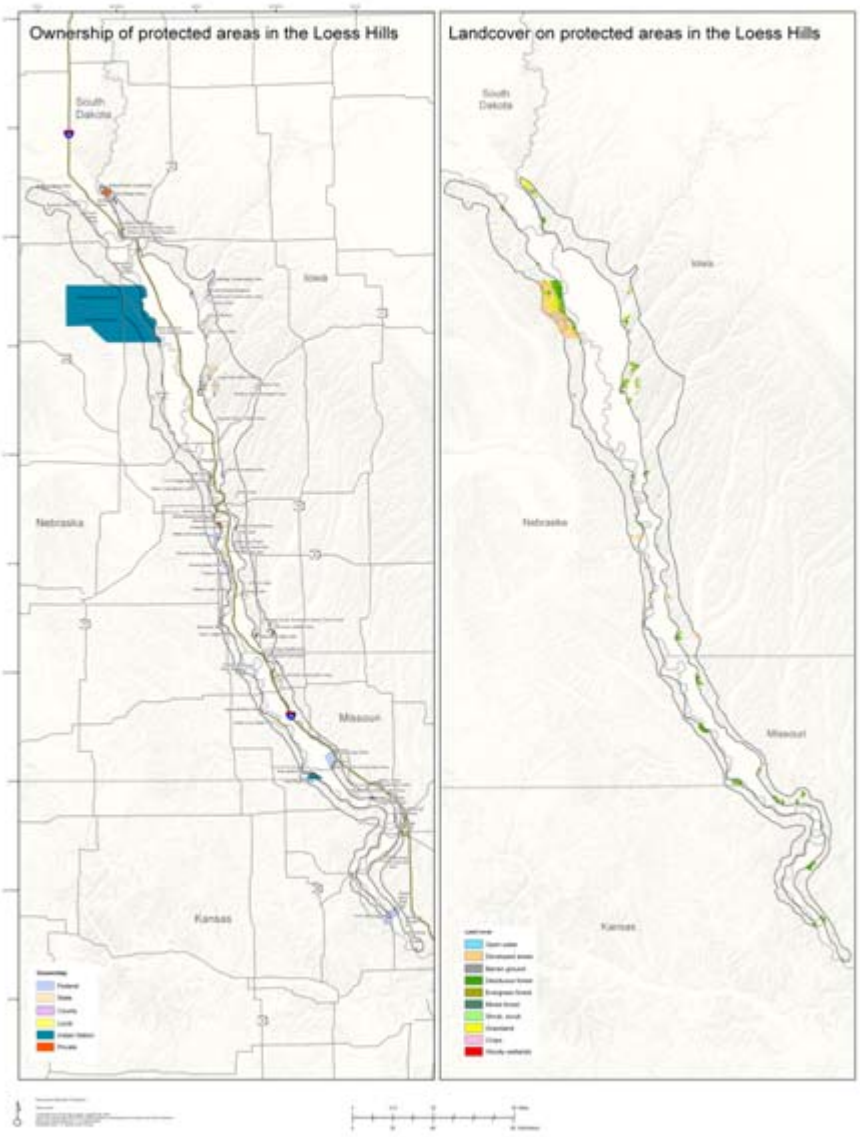
Appendix 5. References to the Hills in print

Date	Type	Author	Source	Description
1804	Scientific	William Clark	Meriwether Lewis and William Clark, *The Journals of the Lewis and Clark Expedition*, ed. Gary Moulton (Lincoln: University of Nebraska Press, 1987): 384.	"ball-pated prairie" and "ball hills" "as far upstream as I can see." from their camp near Star School Prairie
1804	Scientific	Charles Floyd	Quoted in Dayton Duncan, *Scenes of Visionary Enchantment* (Lincoln: University of Nebraska Press, 2004).	"one of the Butifuls Praries I ever saw, open and butyfulley Divided with Hills and Vallies all presenting themselves" (Floyd's spelling and capitalization), p. 37
1814	Popular	Lewis	Samuel Lewis, *A Map of Lewis and Clark's Track* (Philadelphia: Bradford and Inskeep, 1814).	A copy of the Lewis and Clark map, showing the loess hills as chevrons on both the east and west sides of the Missouri, in modern Missouri, Iowa, and Nebraska. Names "Hot Bluffs" and "Miner Bluffs" across and upstream of Floyd's grave at modern Sioux City
1833	Scientific	Maximillian of Wied	Maximilian of Wied, Davis Thomas, Karin Ronnefeldt, Karl Bodmer, *People of the First Man: Life Among the Plains Indians in Their Final Days of Glory : the Firsthand Account of Prince Maximilian's Expedition Up the Missouri River, 1833-34* New York: Dutton, 1976): 23.	"chain of hills"
1843	Scientific	Edward Harris	Harris's Journal	"Bluffs which are crowned by the great Prairie" "Prairie bluffs" Noted no exposed rock in the hills, then "soft yellow sandstone" Harris bemoaned the fact that he didn't have time to get out and study the hills more closely
1856	Popular	N. Howe Parker	N. Howe Parker, *Iowa as it is in 1856; a Gazetteer for Citizens and a Hand-book for Emigrants*. (Chicago: Keen and Lee, 1856).	Effusive description of the western hills as "hills", "swells", "ridges", "points", "peaks" (p. 186). One of the few illustrations of a landscape feature in the book is the "Hills of Silicious Marl, Council Bluffs" (p. 30), a perfect engraving of loess mounds. He describes, at Council Bluffs, the "high points of the adjacent bluffs…" (p. 192). The books is written to describe the state to potential emigrants, primarily (judging by the number of comparisons to Ohio), from Ohio.
1870	Popular	Council Bluff *Times*	M. A. Bonney, "A New People Come to the Hills," in *Land of the Fragile Giants*, ed. C. Mutel and M. Swander (Iowa City: University of Iowa Press, 1994), 42.	"remarkable feature of this portion of the county is the bluff system. They rise to a height of about two to three hundred feet, an on their river or westward face are devoid of timber except for a tree here and there."
1875	Popular	Andreas Atlas	A. T. Andreas, *Illustrated Historical Atlas of the State of Iowa* (Chicago: Andreas Atlas Co., 1875)	A landform made of sandy soil and bluffs
1879	Scientific	C. A. White	C.A. White, *Report of the Geological Survey of the State of Iowa* (Des Moines: Mills and Co., 1879).	"Bluffs…so peculiar in character and appearance" (p. 104). "the bluff-range" (p. 104). Reports it is called "bluff" in Missouri (his quotes) (p. 105). "Bluff Deposit" (his capitals) pp.106 and 109) reports it extends to Missouri, Nebraska, and Kansas (p. 105)
1881	Popular	*History of Fremont County, Iowa*	No author. *History of Fremont County, Iowa*. (Des Moines: Iowa Historical Company, 1881).	"bluff range" quoted in Scheffler, p. 9
1882	Popular	Western Publishing	No author. *History of Western Iowa* (Sioux City: Western Publishing Co., 1882).	Speaks of "the light mulatto-colored bluff deposit" (p. 244) not capitalized.

1886	Popular	No author, St Louis *Globe Democrat*	"Horticultural." St Louis *Globe Democrat*, December 9, 1886, Issue 200, p. 7, column C.	Reporting on news about apple trees from the Annual Fair of the Horticultural Society, the article uses the term "Loess Hills" reporting on the high quality of apples from that region of Missouri.
1888	Popular	Joseph Smith	*History of Harrison County, Iowa* (Des Moines: Iowa Printing Company, 1888).	"bluff deposit", "the bluff deposit", "the bluff formation"
1890	Popular	No author	*History of the Counties of Woodbury and Plymouth, Iowa* (Chicago: A Warner and Co., 1890).	"deep and rugged gullies in the loess" p. 15, "the loess or bluff formation" p. 29. "the bluff formation" p. 33
1892	Popular	Sioux City promotional literature		Made a connection between the landforms of western Iowa and the similarly well-drained soils of "the famous Yang-Ste-Kiang, China"
1895	Scientific	B. F. Bush	Bush, B. F. 1895. "Notes on the Mound Flora of Atchison County, Missouri" *Missouri Botanical Garden Report* 1 (1895): 121-134.	"remarkable line of loess mounds, down to a few miles south of St. Joseph" (p. 121). "denuded appearance; as if entirely devoid of vegetation" (p. 130)
1902	Popular	No author cited	New York *Times* article, "The Lansing Skull Discovery," Sept. 28, 1902.	Quotes geologist Warren Upham speaking of "the loess hills" applied to the hills outside Council Bluffs, site of archeological research.
1914	Popular	Selden Whitcomb	Selden Whitcomb, *Autumn Notes in Iowa*. (Cedar Rapids: Torch Press, 1914)	"scarred bluffs and deep ravines" along Big Sioux and Missouri Rivers (pg 34)
1915	Popular	Charles W. Hunt	Charles W. Hunt, *History of Harrison County Iowa* (Indianapolis: B.F Bowen & Co., 1915)	"bluff formation" p. 40
1919	Popular	Louis Pammel	Pammel, quoted in James Scheffler, "Waubonsie State Park Ecological Management Plan," (Des Moines, Iowa DNR, 2007) unpaginated typescript.	"Loess Bluffs are unique…"
1925	Scientific	John L Tilton	John L. Tilton, "The Definition of Loess," *Science* 65, no. 1595 (1925): 83-83.	Argues, in a discussion of the Palouse, that "loess" should be reserved for wind-deposited sediments, and should exclude wind-deposited silts that landed in lakes and consolidated there.
1930s	Popular	*The WPA Guide to 1930s Kansas*	No author, *The WPA Guide to 1930s Kansas*, New Introduction by James R. Shortridge. (Lawrence: University Press of Kansas, 1984).	"Glacial Uplands" (capitalized as a proper noun, pg 307.
1931	Popular	Addison Sheldon	Addison Sheldon, *Nebraska: The Land and its People*. (Chicago: Lewis Publishing Co., 1931).	"loess bluffs along the Missouri" on the Nebraska side.
1933	Scientific	No author	Photograph, no photographer cited, reproduced from the "1933 Iowa 25 year Conservation Plan" in James Scheffler, "Waubonsie State Park Ecological Management Plan," (Des Moines, Iowa DNR, 2007) unpaginated typescript.	Photograph titled "Wind Hills along the Missouri River" indicates awareness of Aeolian origin.
1938	Popular	*Federal Writers Project Guide to Iowa*	Federal Writers' Project of the Works Project Administration, *Federal Writers Project Guide to Iowa* (New York: Viking Press, 1938).	"wind blown loess" or "brown, crumbling bluffs"
1941	Popular	Classroom map of Iowa	Iowa Physical-Political Soil Map. Map PS114. 1941 (Chicago: A. J. Nystrom).	"Loess Hills" as a map unit

1941	Popular	*The WPA Guide to 1930s Missouri*	*The WPA Guide to 1930s Missouri.* (Lawrence: University Press of Kansas, 1986). Originally *Missouri: A Guide to the Show-Me State (*Jefferson City: Missouri Highway Department, 1941).	Uses "loess hills" to describe the hills along the river north of Kansas City to the Iowa line. Describes county road H, outside New Market (near Weston) as " a highway deep cut in the almost regular folds of the loess hills." Provides no explanation of what the loess hills are, as though that was obvious to the reader. Remarkably little mention of the terrain in northwest Missouri, just and occasional mention of bluffs.
1942	Popular	Iowa Writers Project	Iowa Writers' Project, *Woodbury County History* (Sioux City: Woodbury County Superindendent of Schools, 1942): 1-74.	"soft, porous rock, buff or pale yellow in color" p. 2 "moundlike bluff formations" p. 2 "loess walls" p. 2 quotes Omaha Chief Blackbird "When my spirit is gone, take me to the Big Muddy where the yellow hills rise." Quoted on page 8. (prior to his death and burial at Blackbird mound in 1796. "801 acre area of loess bluffs" p. 162.
1949	Scientific	John Fyre, et al.	John Frye, Norman Plummer, Russel Runnels and William Hladik. "Ceramic Utilization of Northern Kansas Pliestocene Loesses and Fossil Soils," *State Geological Survey of Kansas, Bulletin* 82, part 3 (Oct. 31, 1949): 49-124.	Reports loess over whole north half of the state of Kansas, "Maxima of 195 feet in Doniphan County near the Missouri Valley" (p. 51). Calls loess "calcareous" but that "quartz grains predominate" (p. 52). "60-80% SiO2; 1 – 6% CaCO3" (p. 84). Haydite is made from firing loess, then used as concrete aggregate (p. 80).
1952	Scholarly	Harold Hopkins	Harold Hopkins, "Native Vegetation of the Loess Hills-Sandhills Ecotone in Central Nebraska" *Transactions of the Kansas Academy of Science* 55 no. 3 (1952): 267-277.	Applies "loess hills" to most of the eastern third of Nebraska
1960	Scientific	J. E. Weaver,	J. E. Weaver, "Comparison of Vegetation of Kansas-Nebraska Drift-Loess Hills and Loess Plains," *Ecology* 41, no. 1 (1960): 73-88.	Defines loess hills as "a strip 6 to 15 miles wide along the Missouri River with a thick covering of loess." (p. 75). Maps the loess hills in Kansas and Nebraska all the way south to the Kansas river and 3 – 15 miles wide on the WEST side of the Missouri alone (p. 74).
1976	Popular	Jean Prior	Jean Prior, *A Regional Guide to Iowa Landforms.* (Des Moines: State of Iowa, 1976). Jean Prior, *Landforms of Iowa*. (Iowa City: University of Iowa Press, 1991).	In 1976, her chapter title was "Western Loess Hills" (p. 32). In the 1991 book, which follows the same general structure, the chapter title is simply "Loess Hills) (p. 48)
1977	Popular	Loess Hills Prairie Seminar		
1984	Popular	Dean Roosa	"Preserving the Hills," in *Iowa Conservationist* 43, no. 4 (Apr 1984)	An early argument for government protection, including NPS National Natural Landmark, State Parks, County Conservation Boards, TNC, State Conservation Commission.
1991	Popular	Cornelia Mutel		
1992	Popular	John Madson in Audubon	John Madson, "Loess Hills, Iowa" *Audubon* 94 no. 1 (1992): 38-39.	

Appendix 6. Ownership and landcover of protected areas in the Loess Hills



Bibliography

Access Geneology. "Iowa Indian Tribes." Access Genealogy. http://www.accessgeneology.com/native/iowa/index.htm (accessed Jan. 31, 2007).

Addison, Sheldon. *Nebraska: The Land and Its People*. Chicago: Lewis Publishing Co., 1931.

Avery, Kevin. "A Historiography of the Hudson River School." In *American Paradise*, edited by John P. O'Neill. New York: Metropolitan Museum of Art, 1987: 3-20.

Balm, Roger. "Expeditionary Art: An Appraisal." *Geographical Review* 90, no. 4 (2000): 585-602.

Barringer, Tim. "The Courses of Empires: Landscape and Identity in American and Britain, 1820-1880." In *American Sublime*, edited by Andrew Wilton and Tim Barringer. Princeton, NJ: Princeton University Press, 2002.

Bettis, E. A., J. C. Prior, G. R. Hallberg, and R. C. Handy. "Geology of the Loess Hills Region." *Proceedings of the Iowa Academy of Science* 93, no. 3 (1986): 78-85.

Blankenship, Diane. "Making Friends with Giants." In *Land of the Fragile Giants*, edited by Corneila Mutel and Mary Swander Iowa City: University of Iowa Press, 1994.

Bonney, Margaret. A. "A New People Come to the Hills." In *Land of the Fragile Giants*, edited by Cornelia Mutel and Mary Swander. Iowa City: University of Iowa Press, 1994.

Burke, Edmund. *Philosophical Enquiry Into the Origins of our Ideas of the Sublime and the Beautiful*. New York: Harper Bros., 1844.

Bush, B. F., "Notes on the Mound Flora of Atchison County, Missouri." *Missouri Botanical Garden Report* 1 (1895): 121-134.

Callison, Charles. *Man and Wildlife in Missouri.* Harrisburg, Pa: Stackpole & Co., 1953.

Clark, James, Eric Grimm, Jason Lynch, and Pietra Miller. "Effects of Holocene Climate Change on the C4 Grassland/Woodland Boundary in the Northern Plains, USA." *Ecology* 82, no. 3 (2001): 620-636.

Clark, William. *Journal*. http://lewisandclarkjournals.unl.edu/hilight.php?id=239&keyword=mrr&keyword2=&keyword3= (accessed Aug. 12, 2008).

Conard, Rebecca. *Places of Quiet Beauty.* Iowa City: University of Iowa Press, 1997.

Coucelis, Helen. "The Certainty of Uncertainty; GIS and the Limits of Geographical Knowledge." *Transactions in GIS* 7, no 2 (2004): 165-175.

Crane, Jacob L. *Report on the Iowa Twenty-Five Year Conservation Plan, Prepared for the Iowa Board of Conservation and the Iowa Fish and Game Commission.* Des Moines: Wallace-Homestead Co., 1933.

Cronon, William. *Changes in the Land.* New York: Harper Collins, 1983.

_____. "Modes of Prophecy and Production: Placing Nature in History." *The Journal of American History* 76, no. 4 (1990): 1122-1131.

_____. "The Trouble with Wilderness; or, Getting Back to the Wrong Nature" In *Uncommon Ground: Rethinking the Human Place in Nature*, edited by William Cronon. New York: W. W. Norton & Co., 1995.

Dean, Alan. "The Regions Project." http://regionsproject.org/index.php (accessed Jan. 21, 2009).

Demeritt, David. “What is the ‘Social Construction of Nature’? A Typology and Sympathetic Critique.” *Progress in Human Geography* 26, no. 6 (2002): 767-690.

Denevan, William. “The Pristine Myth: The Landscape of the Americas in 1492.” In *American Environmental History*, edited by Louis Warren. Oxford: Blackwell, 2003.

Diamond, Jared. *Collapse.* New York: Viking Press, 2005.

Dort, Wakefield. *Pleistocene Geology of Doniphan County Kansas.* Lawrence: University of Kansas, 1969.

Duffy, Michael and Darnell Smith. *2007 Farmland Value Survey, File C2-70.* Ames: Iowa State University Press, 2008.

Duncan, Dayton. *Scenes of Visionary Enchantment.* Lincoln: University of Nebraska Press, 2004.

Durant, Mary B. and Michael Harwood. *On the Road with John James Audubon.* New York: Dodd, Mead & Co., 1980.

Edie, Clark. “The Most Controversial Woman in Maine.” *Yankee*, Mar./Apr. 2008, 121-129.

Emerson, Gladys. “Tobacco Culture in a "Little Dixie" Outlier of Northwestern Missouri.” Ph. D. diss., University of Kansas, 1978.

Flader, Susan. “Evolution of the System” in *Exploring Missouri’s Legacy,* edited by Susan Flader. Columbia: University of Missouri Press, 1992.

Florida, Richard. *Cities and the Creative Class.* New York: Routledge, 2005.

Frye, John, Norman Plummer, Russell Runnels, and William Hladik. "Ceramic Utilization of Northern Kansas Pleistocene Loesses and Fossil Soils." *Bulletin of the State Geological Survey of Kansas* 82, no. 3 (Oct. 1949): 49-124.

"The Genesis of Conservation in Missouri," *Missouri Conservationist* (January, 2005), online at http://mdc.mo.gov/conmag/2005/01/30.htm (accessed May 15, 2009).

The Hamburg (Iowa) *Reporter.* "State Park Assured for Hamburg." March 18, 1926, p. 1.

The Hamburg (Iowa) *Reporter.* "State Park Deal Closed on Monday of this Week." April 22, 1926, p. 1.

Herlihy, Peter. "Participatory Research Mapping of Indigenous Lands in Darien, Panama." *Human Organization* 62 (Winter 2003): 315-331.

Hoelscher, Steven. "The Photographic Construction of Tourist Space in Victorian America." *Geographical Review* 88, no. 4 (1998): 548-570.

Hopkins, Harold. "Native Vegetation of the Loess Hills-Sandhills Ecotone in Central Nebraska." *Transactions of the Kansas Academy of Science* 55 no. 3 (1952): 267-277.

Interagency Floodplain Management Review Committee. *Sharing the Challenge: Floodplain Management Into the 21st Century.* Washington, D. C.: IFMRC, 1994.

Iowa Department of Natural Resources. "Administrative and Political Boundaries," Iowa DNR, ftp://ftp.igsb.uiowa.edu/gis_library/ia_state/admin_political_boundary/public_lands/cons_rec_lands_public.zip (accessed May 22, 2009).

Iowa Department of Economic Development. *Iowa: Life Changing – 2006 Travel Guide.* Des Moines: Iowa Department of Economic Development, 2006.

Iowa Department of Transportation. "1995 Transportation Map." Ames: Iowa Department of Transportation, 1995.

_____. "2006 Transportation Map." Ames: Iowa Department of Transportation, 2006.

"The Iowa Policy Concerning State Parks." *Science* 50, no. 1296 (1920): 406-407.

Iowa Physical-Political Soil Map, Map PS114, 1:560,000 scale. Chicago: A.J. Nystrom Co., 1941.

Iowa Writers' Project. *Woodbury County History.* Sioux City: Woodbury County Superindendent of Schools, 1942.

Jerome, Christine. *An Adirondack Passage.* New York: Harper Collins, 1994.

Johnsgard, Paul A.. *The Nature of Nebraska: Ecology and Biodiversity.* Lincoln: University of Nebraska Press, 2005.

Jordan, Terry. "Perceptual Regions in Texas." *Geographical Review* 68, no. 3 (1978): 293-307.

Kiplinger's Personal Finance magazine. "Kiplinger's Top-25 cities" database, www.kiplinger.com/features/archives/2007/04/bestcities_table.html (accessed Aug. 17, 2009).

Klimm, Lester. "Mere Description." *Economic Geography* 35, no. 1(1959): facing page 1.

Koch, George David. “The Loess Hills Region of Northeastern Nebraska; A Geographic Study of the Land Utilization and Attending Conservation Programs.” Ph.D. diss., University of Nebraska, 1938.

Kollmorgen, Walter M. “And Deliver Us from Big Dams.” *Land Economics* 30, no. 4 (1954): 333-346.

Kollmorgen, Walter M., and David Simonett. “Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas.” *Annals of the Association of American Geographers* 55, no. 2 (June, 1965): 260-290.

Ladner, Mildred. *William de la Montaigne Cary.* Norman: University of Oklahoma Press, 1984.

Leopold, Aldo. *A Sand County Almanc and Sketches Here and There.* New York: Oxford University Press, 1949.

Lewis, Pierce. “Beyond Description.” *Annals of the Association of American Geographers* 75, no. 4 (1985): 465-478.

Lewis, Meriwether and William Clark. *The Journals of the Lewis and Clark Expedition.* Edited by Gary Moulton. Lincoln: University of Nebraska Press, 1987.

Lewis, Michael. “American Wilderness.” In *American Wilderness*, edited by Michael. Lewis. New York: Oxford University Press, 2007.

Lewis, Samuel. *A Map of Lewis and Clark’s Track.* Philadelphia: Bradford and Inskeep, 1814.

Madson, John. “Loess Hills, Iowa.” *Audubon* 94, no. 1 (1992).

Mann, Charles C. “1491.” *Atlantic Monthly* 289, no. 3 (March 2002): 1-15.

Marsh, George Perkins. *Man and Nature, or Physical Geography as Modified by Human Action.* Edited by David Lowenthal. Seattle: University of Washington Press, 2003, originally 1864.

Martin, Glenn. "Keepers of the Oaks." *Discover* (August 1996), http://discovermagazine.com/1996/aug/keepersoftheoaks840 (accessed Oct. 14, 2009).

Masnerus, Laura. "Director of New Jersey Forest Preserve Steps Down Under Pressure." New York *Times,* September 11, 1999, Section B, p. 1.

McCall, Michael. "Seeking Good Governance in Participatory-GIS: A Review of Processes and Governance Dimensions in Applying GIS to Participatory Spatial Planning." *Habitat International* 27, no. 4 (2003): 549-573.

McDermott, Dave. "Missouri's Squaw Creek NWR." *Bird Watchers' Digest,* March/April 1991.

McDermott, J. F. *Up the Missouri with Audubon, the Journal of Edward Harris.* Norman: University of Oklahoma Press, 1951.

McPhee, John. *The Pine Barrens.* New York: Farrar, Straus and Giroux, 1967.

Merry, Carl. "The Historic Period," Online publication of the Office of the State Archaeologist, University of Iowa, http://www.uiowa.edu/~osa/learn/historic.hisper.htm, (accessed Oct. 28, 2008).

Meyer, John M. "Gifford Pinchot, John Muir, and the Boundaries of Politics in American Thought." *Polity* 30, no. 2 (1997): 267-284.

Mid-resolution Land Characteristics Consortium. "National Land Cover Datbase," http://www.mrlc.gov (accessed June 23, 2008).

Miller, Angela. “The Fate of Wilderness in American Landscape Art.” In *American Wilderness*, edited by Michael Lewis. New York: Oxford University Press, 2007.

Miller, Char. *Gifford Pinchot and the Making of Modern Environmentalism*. Washington, D.C.: Island Press, 2001.

Miller, Kathleen. *Last Laughs: Funny Tombstone Quotes and Famous Last Words.* New York: Sterling Publishing Company, 2006.

Missouri Department of Conservation. “GLO data,” http://www.msdis.missouri.edu/datasearch/ThemeList.jsp (accessed May 2007)

Missouri Department of Natural Resources. “Public Lands,” http://www.msdis.missouri.edu/datasearch/metadata/utm/st_modnr_lands.xml (accessed May 22, 2009).

Missouri Department of Transportation. “Official Highway Map 2001-2002.” Jefferson City: Missouri Department of Transportation, 2001.

_____. “Official Highway Map 2005-2006.” Jefferson City: Missouri Department of Transportation, 2005.

Money magazine. “Best Places Rated” database, money.cnn.com/magazines/moneymag/bplive/2009/index.html (accessed Aug. 17, 2009).

Moon, Eileen. untitled article. New York *Times*, January 22, 1989, Section NJ, p. 2.

Muir, John. *A Thousand-Mile Walk to the Gulf* . Boston: Houghton-Mifflin, 1916.

Muir, John. “The Wild Parks and Forest Reservations of the West.” *Atlantic Monthly* (Aug. 1897), reprinted in Muir, John. *Our National Parks.* San Francisco: Sierra Club Books, 1991.

Muir, John. *The Wilderness World of John Muir*. Edited by Edwin Way Teale. Boston: Houghton Mifflin Harcourt, 2001.

Mutel, Cornelia and M. Swander, editors. *Land of the Fragile Giants.* Iowa City: University of Iowa Press, 1994.

Mutel, Cornelia. *Fragile Giants.* Iowa City: University of Iowa Press, 1989.

National Park Service. "Loess Hills Special Resource Study," http://www.nps.gov/mwro/loesshills (accessed February 7, 2005).

_____. "Designation of National Park Units" http://www.nps.gov/legacy/nomenclature.html (accessed April 1, 2009).

National Register of Historic Places. "Multiple Property Documentation Form: The Conservation Movement in Iowa, 1857-1942" http://www.nr.nps.gov/multiples/64500151.pdf (accessed July 29, 2009).

National Research Council. *The Missouri River Ecosystem*. Washington, D.C.: National Academy Press, 2002.

National Scenic Byways. "Loess Hills Roadmap, (2006)," http://www.byways.org/library/display/18339/LoessHills_Roadmap_web.gif (accessed April 23, 2006).

Nebraska Loess Hills Resource Conservation and Development Council. http://www.nercd.com/region/c/11/ (accessed Oct. 1, 2008).

Neuzil, Mark and William Kovarik. *Mass Media and Environmental Conflict: America's Green Crusades.* London: Sage, 1996.

New York *Times.* "Old Debate Rages at New Prairie Preserve." January 26, 1977, Section 1, p. 12.

New York *Times.* "The Lansing Skull Discovery." Sept. 28, 1902, p. 31.

Nichols, Roger and Patrick Halley. *Stephen Long and American Frontier Exploration.* Newark: University of Delaware Press, 1980.

Nuzzo, Victorio. "Extent and Status of Midwest Oak Savannas." *Natural Area Journal* 6 (1985): 6-36. Reprinted in *Proceedings of the North America Conference on Savannas and Barren*, http://www.epa.gov/ecopage/upland/oak/oak94/proceedings/nuaao.html (accessed May 30, 2008).

O'Fallon, Benjamin. "Copy of William Clark's Map." Manuscript copy, collection of the Joslyn Museum of Art, Omaha, Nebraska, nd.

Olmstead, Clarence W. "American Orchard and Vineyard Regions." *Economic Geography* 32, no. 3 (July 1956): 189-236.

Omaha *World- Herald.* "Dead town is possible park land." May 25, 1968.

Orr, William J. and Joseph C. Porter. "A Journey Through the Nebraska Region in 1833 and 1834: From the Diaries of Prince Maximilian of Wied." *Nebraska History* 64, no. 3 (1983): 325-340.

Pammel, Louis H. "Notes on Buckingham Lake Area." In State Board of Conservation. *Iowa Parks : Conservation of Iowa Historic, Scenic and Scientific Areas, Report of the State Board of Conservation.* Des Moines: State of Iowa, 1919.

_____. "The Loess of Western Iowa." in State Board of Conservation. *Iowa Parks : Conservation of Iowa Historic, Scenic and Scientific Areas, Report of the State Board of Conservation.* Des Moines: State of Iowa, 1919.

_____. "State Parks in Iowa." *Scientific Monthly* 10, no. 5 (1920): 516-521.

Pang, Alex. “Visualizing Uncertainty is Geo-spatial data.” unpublished paper prepared for the Computer Science and Telecommunications Board (2000).

Parisi, Albert. “Additions to U. S. Parkland Urged.” New York *Times*, February 23, 1992, Section NJ, p. 6.

Parker, N. Howe. *Iowa as it is in 1856; a Gazetteer for Citizens and a Hand-book for Emigrants*. Chicago: Keen and Lee, 1856.

Pearce, Jeremy. “A New Baron for the Pine Barrens.” New York *Times*, September 29, 2002, Section NJ, p. 6.

Peru (Nebraska) *Challenge.* untitled article. Supplement to issue of August 1, 1973, p.1

Peterson, Iver. “An Environmental Plan Threatens and Old Industry.” New York *Times*, April 11, 1983, Section A, p. 26.

_____. “Environmentalists Fear Favors to Builders in Trenton’s Pinelands Plan.” New York *Times*, February 24, 1992, Section B, p. 5.

Petrzelka, Peggy. “The New Landform’s Here! The New Landform’s Here! We’re Somebody Now!! The Role of Discursive Practices on Place Identity.” *Rural Sociology* 69, no. 3 (2004): 386-404.

Phillipon, Daniel. *Conserving Words; How American Nature Writers Shaped the Environmental Movement.* Athens: University of Georgia Press, 2004.

Plewe, Brandon. “Representing Datum-level Uncertainty in Historical GIS.” *Cartography and Geographic Information Science* 30, no. 4 (2003): 319-344.

Prior, Jean. *A Regional Guide to Iowa Landforms*. Des Moines: State of Iowa, 1976.

_____. *Landforms of Iowa*. Iowa City: University of Iowa Press, 1991.

Prior, Jean, George Hallberg, and Arthur Bettis. “Loess Hills Geology.” *Iowa Conservationist*, (April 1984): 3-4.

Prior, Jean. and Carolyn. F. Milligan. “The Iowa landscapes of Orestes St. John,” in *Geologists and Ideas*, edited by Ellen Drake. Boulder, Colorado: Geological Society of America, 1985.

Punke, Michael. *Last Stand.* New York: HarperCollins, 2007.

Pye, Kenneth. *Aeolian Dust and Dust Deposits.* London: Academic Press, 1987.

Raitz, Karl and Richard Ulack. “Cognitive Maps of Appalachia.” *Geographical Review* 71, no. 2 (1981): 201-213.

Reed, John Shelton. “In the Heart of Dixie: An Essay in Folk Geography.” *Social Forces* 54, no. 4 (1976): 925-939.

Rees, Ronald. “John Constable and the Art of Geography.” *Geographical Review* 66, no. 1 (1976): 59-72.

Reese, Don. “The Reese Homestead,” in *Land of the Fragile Giants*, edited by C. Mutel and M. Swander. Iowa City: University of Iowa Press, 1994.

Reich, Peter, David Peterson, David Wedin, and Keith Wrage. “Fire and Vegetation Effects on Productivity and Nitrogen Cycling Across a Forest-Grassland Continuum.” *Ecology* 86, no. 6 (2001): 1703-1719.

Rhodes, R. Sanders and Holmes Semken. “Fossil Mammals of the Loess Hills.” *Iowa Conservationist* (April 1984): 9.

Robertson, Kenneth R., Mark W. Schwartz, Jeffrey W. Olson, Brian K. Dunphy, and H. David Clarke. “50 Years of Change in Illinois Hill Prairies.” *Erigenia: Journal of the Illinois Native Plant Society* no. 14 (November 1995): 41-52.

Roosa, Dean M., D. R. Farrar, and M. Ackelson. "Preserving Natural Diversity in Iowa's Loess Hills: Challenges and Opportunities." *Proceedings of the Iowa Academy of Science* 93, no. 3 (1986): 163-165.

Roosa, Dean A. "A World Treasure: the Loess Hills of Iowa." *Iowa Conservationist*, April 1984.

Roque, Oswaldo. "The Exaltation of American Landscape Painting," in *American Paradise*, edited by John P. O'Neill. New York: Metropolitan Museum of Art, 1987.

Rossum, Sonja and Steven Lavin. "Where Are the Great Plains: A Cartographic Analysis." *Professional Geographer* 52, no. 3 (2000): 543-552.

Runte, Alfred. *National Parks: The American Experience.* Lincoln: University of Nebraska Press, 1987.

Sack, Robert. "The Geographic Problematic: Empirical Issues." *Norwegian Journal of Geography* 55, no. 1 (2001): 107-116.

Sauer, Carl O. "Grassland, Climax, Fire and Man." *Journal of Range Management* 3 (1950): 16-22.

Scheffler, James. *Waubonsie State Park Ecological Management Plan*. Des Moines: Iowa Department of Natural Resources, 2007.

Schelhas, John. "The USA National Parks in International Perspective: Have We Learned the Wrong Lesson?" *Environmental Conservation* 28, no. 4 (2001): 300-304.

Schermer, Shirley, William Green, and James Collins. "A Brief Cultural History of Iowa." Online publication of the Office of the State Archaeologist, University of

Iowa, http://www.uiowa.edu/~osa/learn/prehistoric/overview.htm (1995) (accessed Oct. 28, 2008);

Schnell, Steven. “Creating Narratives of Place and Identity in ‘Little Sweden, USA’.” *Geographical Review* 93, no. 1 (2003): 1-29.

Schroeder, Walter. *Presettlement Prairie of Missouri*. Jefferson City, Missouri: Missouri Department of Conservation, 1982.

Schumann, Michael. “Big House on the Prairie.” New York *Post*, June 15, 1999, p. 32.

Sears, George Washington. *The Adirondack Letters of George Washington Sears whose Pen Name was "Nessmuk,*" edited by Dan Brenan. Blue Mountain Lake, New York: Adirondack Museum, 1962.

Shimek, Bonhomil. “A Theory of Loess.” *Proceedings of the Iowa Academy of Science* 3 (1895): 82-89.

Shoemaker, Owen. “Variance Estimates for Price Changes in the Consumer Price Index.” http://www.bls.gov/cpi/cpivar2005.pdf (accessed Sept. 2, 2008).

James Shortridge. “Vernacular Regions in Kansas.” *American Studies* 21 no. 1 (1980): 73-94.

_____. "The Vernacular Middle West." *Annals of the Association of American Geographers* 75 no. 1 (1985): 48-57.

_____. “Changing Usage of Four American Regional Labels.” *Annals of the Association of American Geographers* 77, no. 3 (1987): 325-336.

Slocum, Terry, Daniel Cliburn, Johannes Feddema, and James Miller. “Evaluating the Useability of a Tool for Visualizing the Uncertainty of Future Global Water

Balance." *Cartography and Geographic Information Science* 30, no. 4 (2003): 299-317.

Smith, Langdon and William Wyckoff. "Creating Yellowstone: Montanans in the Early Park Years." *Historical Geography* 29 (2001): 93-115.

Smith, Langdon. "The Democratization of Nature: State Park Development During the New Deal." Ph. D. diss., The University of Kansas, 2002, online at http://www2.lib.ku.edu:2048/login?url=http://proquest.umi.com.www2.lib.ku.edu:2048/pqdweb?did=765046741&sid=2&Fmt=2&clientId=42567&RQT=309&VName=PQD (accessed July 13, 2009).

Stambaugh, Michael, Richard Guyette, and Erin Murray. "Fire History at the Eastern Great Plains Margin, Missouri River Loess Hills." *Great Plains Research* 16 (Fall 2006): 149-160.

State of Iowa. "Iowa GLO data." ftp://ftp.igsb.uiowa.edu/gis_library/IA_state/biologic_ecologic/GLO_vegetation.zip (accessed May 2007).

State of Nebraska, Department of Economic Development. *Nebraska 2009 Official Travel Guide.* Lincoln: Nebraska Department of Economic Development, 2009.

State of Nebraska, Department of Roads. "2007 Highway Map," http://www.dor.state.ne.us/maps/state-map/current/pdf/front.pdf (accessed Jan. 13, 2009).

Steinberg, Theodore. *Nature Incorporated: Industrialization and the Waters of New England.* Amherst: University of Massachusetts Press, 1994.

Stoll, Mark. “Religion ‘Irradiates’ the Wilderness,” in *American Wilderness*, edited by Michael Lewis. New York: Oxford University Press, 2007.

Stoll, Steven. “Farm Against Forest,” in *American Wilderness*, edited by Michael Lewis. New York: Oxford University Press, 2007.

Sullivan, Joseph. “Kean Plans to Curb Growth, With or Without Legislature.” New York *Times*, November 6, 1988, Section E, p. 6.

Thompson, Dean, Arthur Bettis, and David Benn. “Archaeology of the Loess Hills.” *Iowa Conservationis*t (April 1984): 6-7.

Thoreau, Henry David. *The Writings of Henry David Thoreau*. Boston: Houghton Mifflin and Co., 1893.

Tuan, Yi-Fu. *Space and Place: The Perspective of Experience*. Minneapolis: University of Minnesota Press, 1977.

U. S. Bureau of the Census, “American Fact Finder” database, factfinder.census.gov/home/saff/main.html?_lang=en (accessed July 22, 2008).

U. S. Department of Agriculture, “Plants profile,” http://plants.usda.gov/java/profile?symbol=YUGL (accessed July 22, 2008).

U. S. Department of Agriculture, “Soil Survey Geographic Database,” http://soils.usda.gov/survey/geography/ssurgo/ (accessed July 22, 2008).

U. S. Geological Survey. http://gapanalysis.nbii.gov/portal/server.pt/gateway/PTARGS_0_2_1021_200_458_43/http%3B/gapcontent1%3B7087/publishedcontent/publish/public_sections/gap_home_sections/official_description__full_version_/official_description.html (accessed July 27, 2007 and May 5, 2009).

Yellow Pages web site. http://411.yellowpages.com/nationwide/name_search/loess (accessed Oct. 15, 2008).

Wallach, Bret. "Painting, Art History, and Geography." *Geographical Review* 87, no. 1 (1997): 92-99.

Weaver, John. E. "Comparison of vegetation of Kansas-Nebraska Drift-Loess Hills and Loess Plains." *Ecology* 41 no. 1 (1960): 73-88.

Wells, Philipp. V., and J. D. Stewart. "Cordilleran-Boreal Taiga and Fauna on the Central Great Plains of North America, 14,000 to 18,000 years ago." *American Midland Naturalist* 118, no. 1 (1987): 94-106;

White, Charles. A. "The Bluff Deposit," in *Report of the Geological Survey of the State of Iowa* 1. Des Moines: Mills and Co., 1870.

White, Fred D. "Introduction," in *Essential Muir*, edited by Frank D. White. Santa Clara, Ca.: Santa Clara University Press, 2006.

Willman, Harold. B., Elwood Atherton, J. C. Buschbach, Charles Collison, John Frye, M. E. Hopkins, Jerry A. Lineback, and Jack A. Simon. *Handbook of Illinois Stratigraphy*. Urbana: Illinois State Geological Survey, 1975.

Wilson, Edward O. *The Diversity of Life*. New York: W. W. Norton, 1992.

Wilton, Andres. "The Sublime in the Old World and the New," in Andrew Wilton and Tim Barringer, *American Sublime*. Princeton, NJ: Princeton University Press, 2002.

Wishart, David. *An Unspeakable Sadness: The Dispossession of the Nebraska Indians*. Lincoln: University of Nebraska Press, 1995.

Wolf, Jay. “A 200-year Fire History in a Remnant Oak Savanna in Southeastern Wisconsin.” *American Midland Naturalist* 152, no. 2 (2004): 201-213.

Wood, Denis. “What Makes a Map a Map.” *Cartographica*, 30 nos. 2 and 4 (1993): 81-86.

Wood, Justin. “'How Green is My Valley?' Desktop Geographic Information Systems as a Community-Based Participatory Mapping Tool.” *Area* 37, no. 2 (2005): 159-170.

Worster, Donald. “Transformations of the Earth: Toward an Agroecological Perspective in History.” *The Journal of American History* 76, no. 4 (March 1990): 1087-1106.

_____. *Under Western Skies.* New York: Oxford University Press, 1992.

_____. *Nature’s Economy*. Cambridge: Cambridge University Press, 1994.

_____. *A Passion for Nature.* New York: Oxford University Press, 2008.

Wright, John K. “Terrae Incognitae: The Place of Imagination in Geography.” *Annals of the Association of American Geographers* 37 no. 1 (1947): 1-15;

_____. *Human Nature in Geography.* Cambridge: Harvard University Press: 1966.

Zelinsky, Wilbur. "North America's Vernacular Regions." *Annals of the Association of American Geographers* 70, no. 1(1980): 1-16.