

# The Loess Hills of Western Iowa

*Common Vision and  
Comprehensive Plan 2011*

The Loess Hills Alliance





# Preface

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## Acknowledgements

The Loess Hills Alliance Executive Committee directed this project and report and assisted with data collection, writing, and review:

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Vice-Chairman:	Joe Blankenship, Mills County
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Loess Hills Special Resource Study  
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Cover image:  
Mike Whye



# Executive Summary

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The Loess Hills region includes some of Iowa's most precious cultural, historic and natural resources. The Loess Hills landform is located in Western Iowa on the eastern edge of the Missouri River floodplain. Spanning seven counties, the landform is roughly 1080 square miles in size. Two nationally-significant intrinsic qualities, natural areas and Prehistoric cultural resources, have been verified in the region. The Loess Hills also contains 50-75% of Iowa's remaining native prairies. The Loess Hills National Scenic Byway, designated a national scenic byway in 2000, provides a great way for visitors and residents to explore the richness of resources. The purpose of this plan was to review and report on change in the Loess Hills region over the past twenty years and to establish goals and action items for the future. The scope of the review included development, landcover, farmland values, population and county land use regulation changes.

The Common vision for the future of the region developed through this plan builds on the existing local, state and national recognition. It balances the fragility and significance of the resources present with conservation, enjoyment and active use of the land. Delineated significant areas and prairie habitat are permanently conserved while low impact design, construction and agriculture practices are employed in remaining areas to protect the integrity of the landform and supporting resources. National scenic byway and ridge top views remain undeveloped.

The changes measured by this study demonstrate that progress toward this future vision is occurring but that progress is tempered by large scale landscape change and economics, often resulting in permanent alteration of the natural landscape. Significant changes measured included:

- Comprehensive Plans in all seven counties now identify the Loess Hills landform as worthy of protection. Four of seven counties have adopted a technical Loess Hills boundary on their county zoning map and three of these counties today have adopted portions of model ordinances developed specifically for the region. These counties require stricter development standards in the Loess Hills region compared with other parts of their counties. The availability of qualified technical county staff is a key limitation to more widespread adoption of land use regulations.
- The amount of land in permanent conservation has increased to approximately 32,500 acres.
- Stewardship initiatives in the region have made impressive gains in removing woody plant encroachment threatening oak savannas and prairies. Prescribed burning and mechanical clearing removed 10,000 acres in the past ten years. Eastern Red Cedar trees encroached into additional 5,181 acres during this same time.
- The net amount of cropland in the Loess Hills landform increased by more than 50,000 acres between 1992 and 2006, primarily through conversion of prairies. During this same time, the size of rooftops, pavement and mown lawn increased by 30,000 acres.

The Loess Hills Alliance is the only organization in the region integrating county-elected leadership and staff from all 7 counties, as well as state agencies, non-profit organizations and residents. With additional administration support, they will be well positioned to expand their communication and organization in the region to support the common vision. Suggested action items for the Loess Hills Alliance to address include continuing to work with farmers and landowners to permanently conserve land, supporting technical positions to work with farmers to adopt conservation practices, supporting fire departments and landowners interested in prescribed burning and promoting education and awareness about the region. Beyond the scope of the Alliance are needs dealing with the continued evolution of county and municipal land use regulations and cultural and historic resource protection.



# Table of Contents

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	<b>Introduction</b>
9	<b>Goals of the Comprehensive Plan</b>
11	<b>Action Plan</b>
13	<b>Role of the Loess Hills Alliance</b>
13	legislative responsibilities
15	membership +organization
17	<b>A Common Vision for the Loess Hills Region</b>
19	<b>Loess Hills Perspective</b>
21	biological crossroads
22	vast and rich human history
24	where the west began
27	<b>Loess Hills Region Today</b>
31	change in region
42	protection / use ordinances in place
43	highly erosive soils & scenic vistas
44	model ordinance adoption
46	inherent social values
47	summary of issues and concerns
48	<b>Conclusion</b>
49	<b>Bibliography</b>
53	<b>Appendix</b>



# Goals + Actions

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The following Goals and Action Plan for the Loess Hills Alliance were developed during the comprehensive planning effort through stake holder input, an internal visioning process, and analysis of existing conditions in the region.

## Goals of the Loess Hills Alliance

Long term, the Loess Hills Alliance sees the Loess Hills as a region where economic and ecological resilience are balanced and people have diverse opportunities to experience and learn about the unique resources present. Many types of coordination and action on the land are necessary to achieve and sustain this balance. In particular, the Loess Hills Alliance sees its role to work to permanently protect significant areas and work with landowners interested in the natural value of their land. As an organization, the Loess Hills Alliance has the following goals:

- 1. Promote a collaborative working relationship among the various organizations, municipalities, counties and agencies working in the region**
  - a. Network with other organization and agencies with similar goals
  - b. Assist with matching technical resources to landowner conservation needs
  
- 2. Work to permanently protect significant areas, including the viewshed of the scenic byway and the 12 Special Landscape Areas (SLAs) within the Loess Hills landform**
  - a. The Alliance will continue to support the use of conservation easements through education on easements and through financial support to acquire easements from willing owners. Conservation easements are voluntary deed restrictions that landowners can use in collaboration with a qualified agency or organization to ensure protection for their land, but also enable them to continue to use the land for compatible activities such as livestock grazing, sustainable timber harvesting, and limited development.

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- b. Assist with land acquisitions. Working with county and state agencies and/or non-profit organizations, the Alliance has provided financial and technical support for partner agencies/organizations to purchase land from willing sellers. A focus has been on land within the 12 SLA's, along the national scenic byway and those lands adjacent to existing protected lands.
  - c. Minimize impact from new development and resource extraction.
    - i. Assist counties interested in land protection ordinances and protection

**3. Ensure technical resources and assistance is available to landowners interested in protecting and restoring the ecological condition of their property**

- a. Vegetation management and invasive species control. The Loess Hills Alliance can continue to provide technical assistance and support for prescribed fire, brush management and invasive species management for exotic plants such as leafy spurge, crown vetch and garlic mustard. Lack of fire is a critical problem for maintaining open grasslands and healthy productive woodland habitats, thus special emphasis has been placed on increasing prescribed fire in the region. An estimated 10-15,000 acres are burned each year, but analysis indicates 100,000 acres should be treated to restore and maintain the regions natural and semi-natural habitats.
- b. Livestock grazing management
- c. Erosion prevention practices
- d. Research new methods in resource stewardship and restoration methods
- e. Assist with appropriate siting of developments to avoid sensitive areas

**4. Increase public awareness of the Loess Hills region and resources**

- a. Support public and landowner educational activities
- b. Promote regional opportunities and attractions
- c. Increase tourism to the region

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## Action Plan

Overlaps between the concerns and needs in the region and the strengths and abilities of the Loess Hills Alliance are clear. As the only regional organization with both elected county representation and non-profit organizations, they have the ability to focus ongoing research and management of native plant communities while advocating for protection of all types of resources at the municipal, county and regional level.

### Collaboration Action

- Organize and promote technical assistance to landowners specifically focusing on vegetation management options to restore native communities, and the sliding scale of landowner options to permanently protect their land
- Promote technical planning and development assistance to counties and municipalities, including development alternatives that minimize flooding, soil erosion, and resource damage impacts

### Landform and Resource Action

- Support updated GIS (geographic information system) mapping of landform boundaries and tracts in permanent protection to allow consistent, accurate tracking of acquisitions and easement status
- Sponsor updated research on Special Landscape Area (SLA) designations based on integration of newly available data (LiDAR and University of Iowa Archaeological research) to investigate possibility of adding new or expanding current designated areas
- Sponsor updated landcover research focusing on the presence of croplands following the 2011 growing season, particularly focused on the slope and previous cover of new cropland since 2006
- Promote development of viewshed mapping for the scenic byway
- Continue focus on purchasing conservation easements from willing landowners within SLAs and scenic byway viewshed for conservation and public access

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### **Awareness Action**

- Adopt educational outcome requirements and documentation for all Loess Hills Alliance funded activities
- Support updates and strengthening of existing zoning and planning documents
  - Landform boundary adopted by counties as consistent with the Iowa Department of Natural Resources definition
  - Restrictions on ridgetop development and development on slopes >14%
  - Fee for development in landform region with resulting revenue used to purchase conservation easements

### **Tourism and Quality of Life Action**

- Support development of regional trails systems, such as Iowa's Lewis and Clark Multi-Use Trail, to draw new users and create demand for small community-supported businesses
- Support Loess Hills tourism marketing efforts sponsored by Loess Hills National Scenic Byway Council and Western Iowa Tourism Region
- Continued support for and development of educational sessions for landowners concerning natural resources management practices such as prescribed burning, integration of natural resources management with livestock grazing, invasive species management (leafy spurge, crown vetch, tree of heaven). Expanded communication on permanent protection options to landowners.
- Coordinate among organizations and the Loess Hills Alliance on permanent conservation efforts
- Develop web-based education focused on Loess Hills

# Role of the Loess Hills Alliance

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## **Loess Hills Alliance Committee Duties**

### Protection Committee

- Works with partners to permanently protect priority areas with conservation easements and acquisitions through grant funding assistance
- Assists in educational material development, such as the book, Landowner Options, produced by the Iowa Natural Heritage Foundation

### Stewardship Committee

- Prioritizes ecological restoration areas for cost-share funding
- Providing education, training, and resources to local fire departments and private landowners for the implementation of prescribed burning to maintain and manage native grasslands and oak savannas.

### Economic Development Committee

- Promotes regional recreation opportunities
- Expands advertising of Loess Hills region recreation and tourism opportunities

## **Purpose of this Plan & Role of the Loess Hills Alliance**

Change on the ground in Western Iowa always begins with local action. Regional resource plans, such as this one, bring the opportunity to focus these actions and gather new energy to reach goals. The purpose of this plan was to review and report on change in the Loess Hills landform region of western Iowa from the year 2000 to date. Development, vegetation type, farmland values, population and land use regulations were included in the review. Planning also included development of a common vision for the Loess Hills region. The long term vision and planning objectives included in this study were developed using a social assessment of Loess Hills Alliance members. This plan also fulfills a requirement mandated by the Iowa legislature.

## **Legislative Responsibilities**

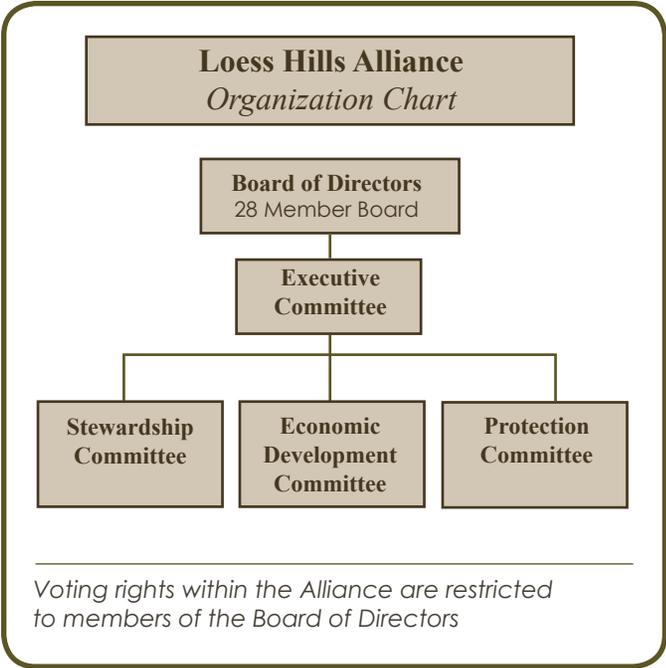
Iowa code 161D established the Loess Hills Alliance on March 15, 1999 as a part of the Loess Hills Development and Conservation Authority. The Hungry Canyons Alliance was also authorized under this authority. Funds are directed to both non-profit organizations through the Iowa legislature. State funds are used to match and fund projects under the discretion of each organization. Statutory responsibilities include:

- To prepare and adopt a comprehensive plan for the development and conservation of the Loess Hills area subject to the approval of the authority. The plan shall provide for the designation of significant scenic areas, the protection of native vegetation, the education of the public on the need for and methods of preserving the natural resources of the loess hills area, and the promotion of tourism and related business and industry in the loess hills area.
- To apply for, accept, and expend public and private funds for planning and implementing projects, programs, and other components of the mission of the Loess Hills Alliance subject to approval of the authority.

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- To study different options for the protection and preservation of significant historic, scenic, geologic, and recreational areas of the Loess Hills including but not limited to a federal or state park, preserve, or monument designation, fee title acquisition, or restrictive easement.
  - To make recommendations to and coordinate the planning and projects of the Loess Hills Alliance with the authority.
  - To develop and implement pilot projects for the protection of Loess Hills areas with the use of restrictive easements from willing sellers and fee title ownership from willing sellers subject to approval of the authority.
  - To report annually not later than January 15 to the general assembly the activities of the Loess Hills Alliance during the preceding fiscal year including, but not limited to, its projects, funding, and expenditures.

***Loess Hills Alliance Mission***

*Protect special natural and cultural resources of Iowa's Loess Hills while ensuring economic viability and promoting awareness.*



## Membership and Organization

General membership is extended to any person interested in participating and advancing the mission of the Loess Hills Alliance. Voting rights are limited to the Board of Directors. Membership of the Board is comprised of individuals living and working in the Loess Hills region. The 28-member Board is comprised of 21 members appointed by the County Board of Supervisors (three representatives from each county in the Loess Hills region). One of the three county representatives must be a County Supervisor. The Development and Conservation Authority appoints the seven remaining seats on the Board. An executive committee includes the elected officers and three at-large members.

One of the most important tasks of the Loess Hills Alliance is to coordinate and communicate with other organizations and agencies operating in the region. Partnerships with state agencies include Iowa Department of Natural Resources, Iowa Division of Agriculture and Land Stewardship and Iowa Department of Economic Development. Federal agency coordination includes USDA Natural Resources Conservation Service and U.S. Department of the Interior National Park Service and Fish and Wildlife Service. Local county conservation boards and staff in all seven counties are important partners as well as the non-profit organizations including the Iowa Natural Heritage Foundation, The Nature Conservancy and Golden Hills RC&D Inc. Other smaller organizations in the hills include the Sierra Club, Loess Hills Audubon, Loess Hills Preservation Society and the Loess Hills Hospitality Association, all of which coordinate a small, but dedicated core of volunteers to build support for the hills.



# A Common Vision for the Loess Hills Region

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A vision is communication about the future. It speaks to goals and intended outcomes and, indirectly, of action. A vision speaks beyond the aims and abilities of a single entity and organization. This common vision for the Loess Hills represents a milestone for the Loess Hills Alliance and the region. It is the first reframing and refocusing the 7-county Alliance has undertaken since authorized in 1999. This vision for the Loess Hills represents the voices of non-profit organizations, officials, technical staff and residents in the region. It is decidedly "local," balancing energy with reality.

The mission of the Loess Hills Alliance, as well as the goals and action items developed through this planning process, speak to many aspects of this vision. Most importantly, it can use its collective energy and focus to understand the status of the landform region, the interests of various organizations working toward the same goals, and set the direction of future action.

## A region where...

The unique land formation, culture and history of the hills are conserved for future generations;

Areas of special interest are protected from development, soil mining, soil erosion and other visually disruptive activities;

Awareness and educational opportunities are promoted about the unique nature of the region;

Vegetation is managed to encourage native plant and wildlife communities, such as prairie, savanna and oak woodlands;

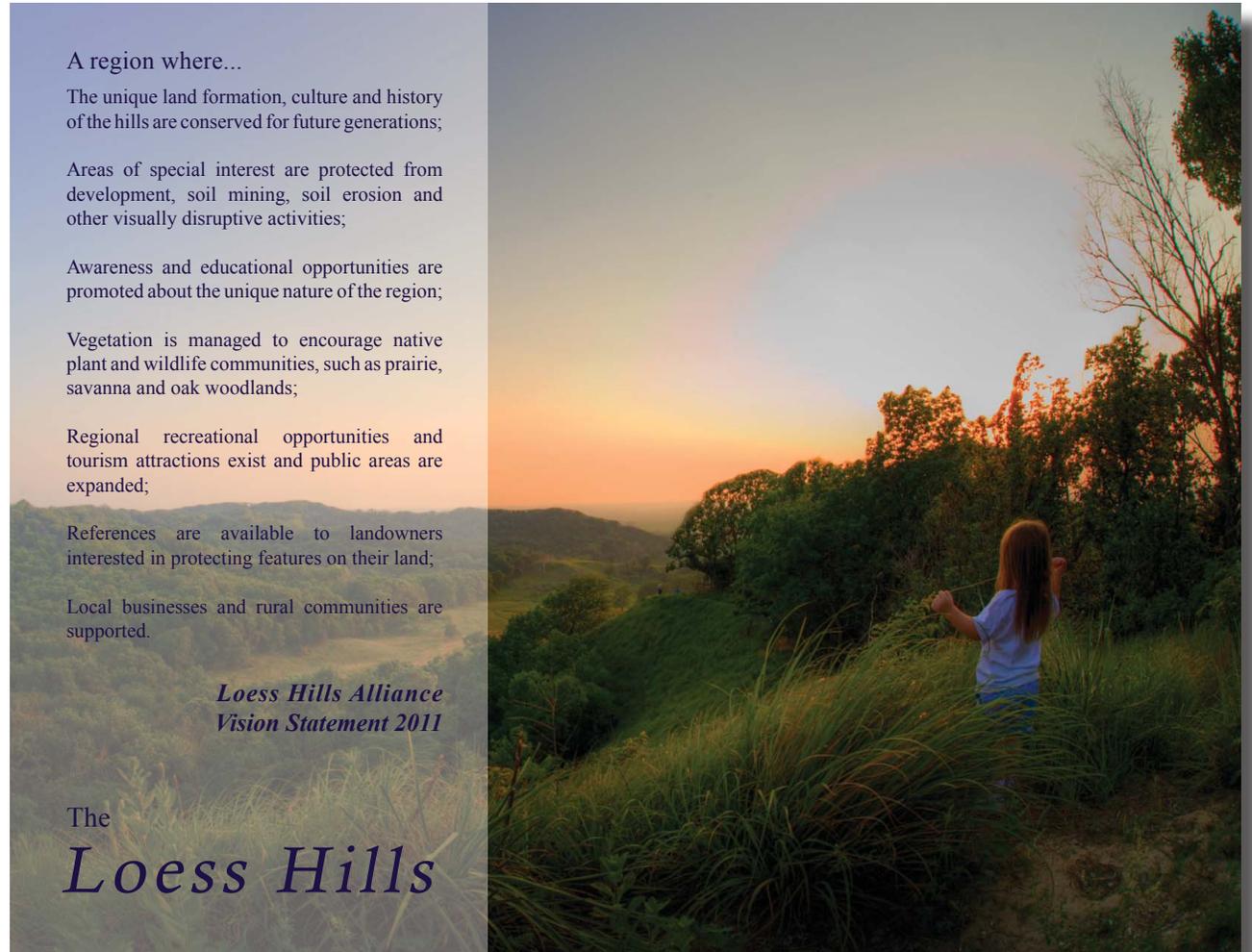
Regional recreational opportunities and tourism attractions exist and public areas are expanded;

References are available to landowners interested in protecting features on their land;

Local businesses and rural communities are supported.

*Loess Hills Alliance  
Vision Statement 2011*

The  
*Loess Hills*





# Loess Hills Perspective

The Loess Hills region (Figure 1) includes some of Iowa's most precious cultural, historic and natural resources. Since the 1980's, two nationally significant intrinsic qualities have been verified in the region—natural areas and Prehistoric cultural resources (Table 1). The unique geological and topographic features of the hills, the extensive natural and semi-natural grasslands and forests and the many archaeological sites found in this one geologic landform create a treasure for the region. Nearly 32,500 acres of land are either in public ownership or public protection. The Loess Hills National Scenic Byway, designated a national scenic byway in 2000, provides a great way for visitors and residents to explore the richness of resources (Figure 2).

Table 1. Categories of Significance and Identified Resources in or near the Loess Hills, 2011

Status	Authorizing Agency	Quantity Listed or Recognized
National Natural Landmark <sup>1</sup>	National Parks Service (U.S. Department of the Interior)	10,420 acres
National Scenic Byway <sup>2</sup>	Federal Highway Administration	220 miles
National Historic Landmarks <sup>3</sup>	National Parks Service (U.S. Department of the Interior)	4
National Register of Historic Places <sup>4</sup>		Over 60
National Historic Trails <sup>5</sup>		3
Sites of Historic or Cultural Interest <sup>6</sup>	local	139

1. Source: National Park Service <http://www.nature.nps.gov/nhl/nation.cfm>  
 2. Source: Iowa Department of Transportation [http://www.iowadot.gov/iowasbyways/scenic\\_byways.pdf](http://www.iowadot.gov/iowasbyways/scenic_byways.pdf)  
 3. Source: National Park Service <http://tps.cr.nps.gov/nhl/default.cfm>  
 4. Source: National Park Service <http://www.nps.gov/nr/research/>  
 5. Source: National Park Service [http://www.nps.gov/nts/nts\\_trails.html](http://www.nps.gov/nts/nts_trails.html)  
 6. Source: The Immense Journey, Loess Hills Cultural Resource Study

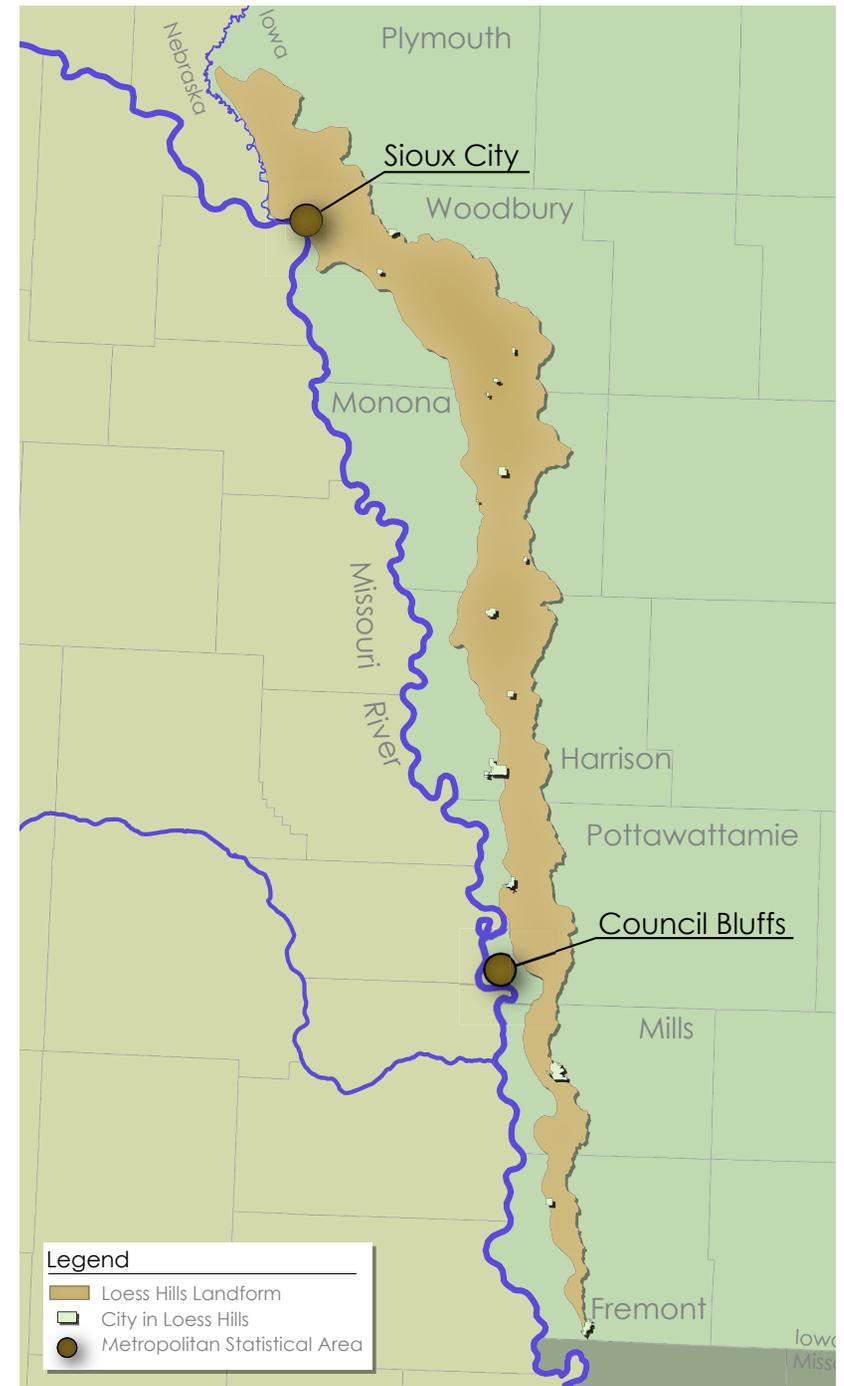


Figure 1. Loess Hills Context Map

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The “hills” aspect of the region’s name refers to what appear today to be large drifts of soil along the eastern edge of the Missouri River floodplain. Wind-deposited loess soil makes up these drifts, reaching up to 300 feet deep in some locations. The oldest and deepest layers of loess are 140,000 to 160,000 years old while the most recent deposit ended approximately 12,000 years ago. All this soil originated from melt water during the last glacial period. Alternating cycles of wind deposition and erosion during the last 12,000 years created the dissected nature of ridges and valley slopes seen today. In fact, erosion continues to remodel the topography, but today often as a result of human action and intense rain events. The depth and scale of this type of soil deposit sets the region apart from other formations in the country and around the world.

The landscape of the Loess Hills dries rapidly after rain with little water infiltrating into the soil. Unlike other types of soil, loess is most stable when cut into a shear, vertical face rather than at a slope. Often the vertical cuts of dry, tan loess soil, the result of road construction or mining operations, is one of the first and more interesting features to visitors driving through the region. When wetted, loess soil loses structural strength and is highly erodible. Entire bluffs are known to collapse and slump down slope. Deep gullies are also common in areas where earthwork has occurred for new construction and in cropland. Due to the unique soil properties and the underlying gravel deposits, mining for fill dirt and gravel has occurred on the western edge of the landform near the major metropolitan areas. These mining areas are visible from Interstate 29.

Sharp elevation changes and the soil’s lack of infiltration ability are also the reason so many plants and wildlife species, uncommon in other parts of the region, exist here. The Loess Hills region is best known for its prairie plant communities among enthusiasts. Both the Lewis and Clark expedition journals and land surveyors in the mid-1800’s noted vast expanses of prairie grasslands in the region. Eastern deciduous forest and savanna are also valuable resources in the Loess Hills.

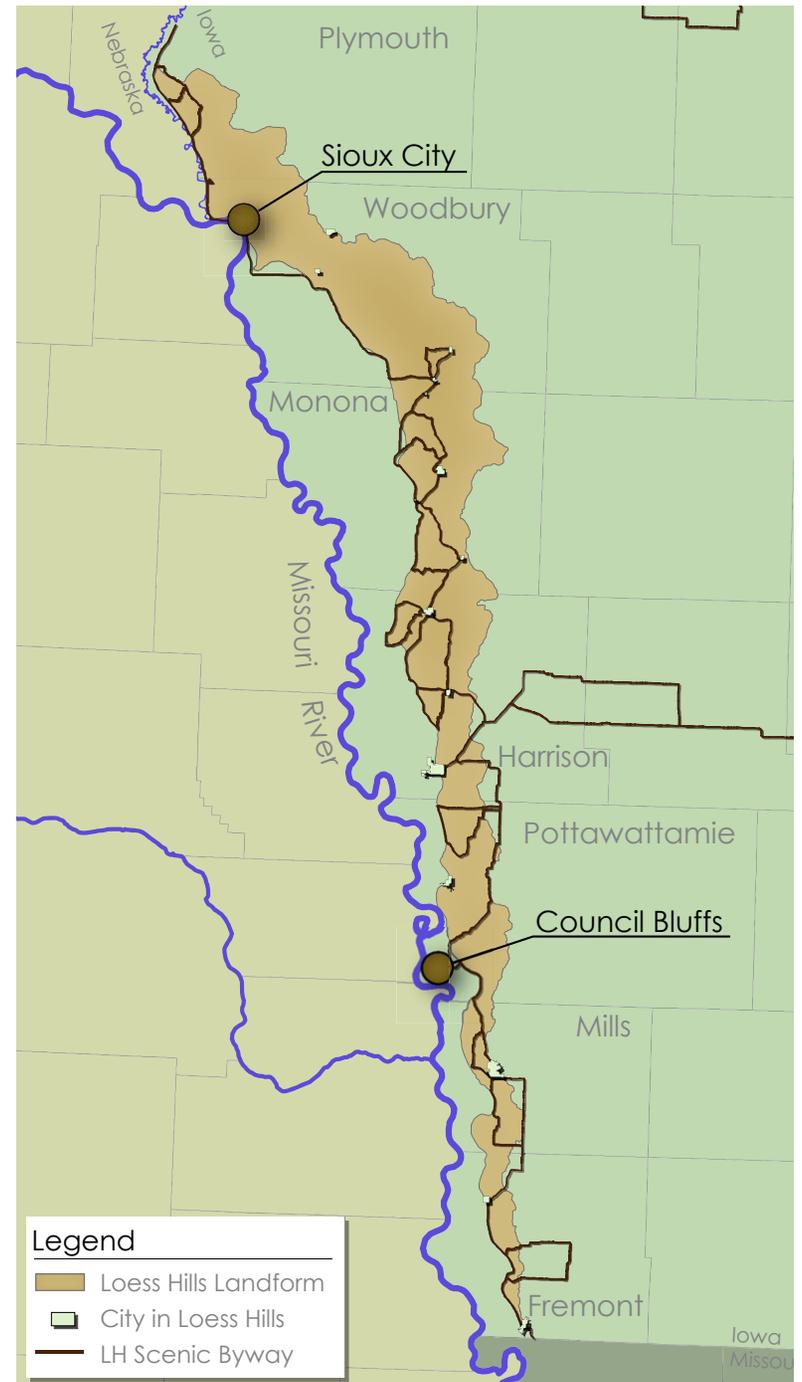


Figure 2. Loess Hills National Scenic Byway Route Map



*Saddles, ridges, and steep side slopes are common features in the Loess Hills landform. Photo: Mike Whye.*

## Biological Crossroads

More than 10,000 acres were declared a National Natural Landmark in 1986, identifying them as one of the best examples of loess topography in the U.S. This was the first nationally significant designation of intrinsic qualities for the landform region. Approximately seven hundred species of non-woody plants – over a third of Iowa's flora – have been identified in the Loess Hills. In total 96 Loess Hills species are of interest because of range distribution limitations or listed by the State of Iowa as threatened, endangered, or of special concern. The 39 state-listed species in the Loess Hills is the largest concentration of rare species in the state. Many of these species are associated with the relatively extensive prairie habitat, in comparison to other areas in the region. Approximately 35,000 acres of warm season prairie grassland remain or have been restored in the Loess Hills region as of 2006, representing 50-75% of Iowa's remaining prairie heritage.

The savanna plant community, the transition between prairie and forest, is another well-known icon of the Loess Hills. Savannas are open, grass and forb-dominated areas with sparsely occurring large trees such as Bur Oak. Like prairies, savannas are fire-dependent ecosystems. Savannas are valued biological resources because they maintain a richness of flora and fauna species. When woodland species are allowed to overtake grasslands and savannas, species diversity drops dramatically.

Prairie and savanna plant communities are suited to areas in the region where the land is steep with hotter, dryer south or west-facing slopes. However, the east and north-facing slopes are more moist and cool and are suited for eastern forest plant communities. This dichotomy is easily identified on ridgelines running north to south.

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The dominant land cover type influences the wildlife present in the Loess Hills. Rare western species, dependent on dry-grassland communities, include the Great Plains skink, prairie rattlesnake, and plains pocket mouse. The rarer grass and western species are primarily found in the northern areas of the Loess Hills where more remnant prairie and open grasslands are present. In woodland areas common animals such as white-tailed deer, fox squirrels, woodchucks, and eastern cottontail rabbits mix with rarer species such as the hickory hairstreak butterfly and speckled kingsnake.

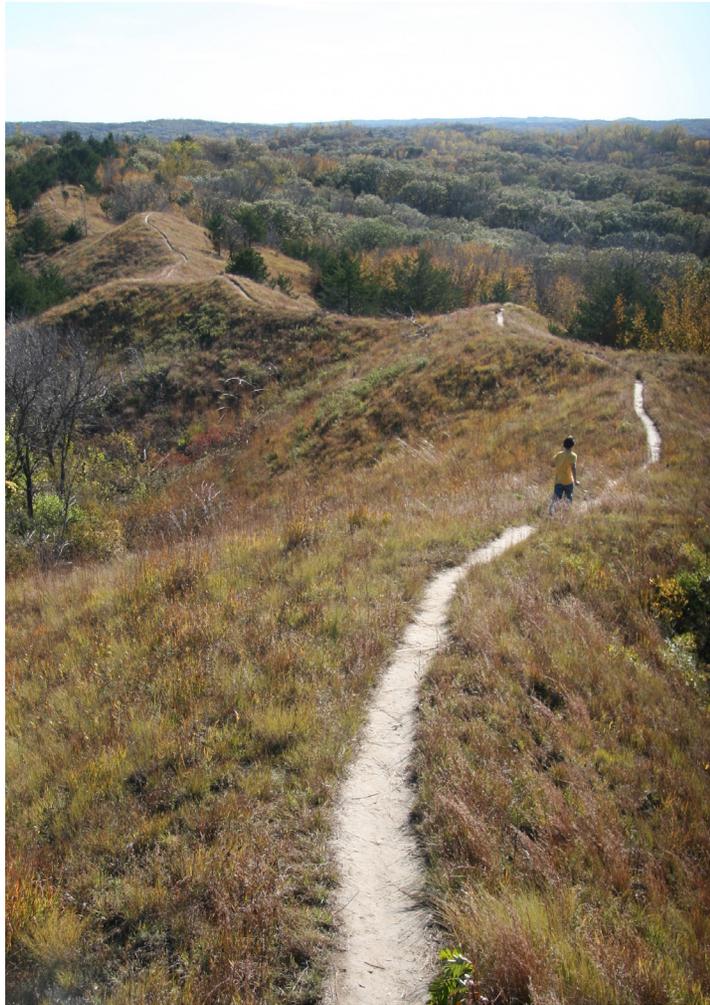
Development patterns typical in the US Midwest are also evident in this region. Large scale agricultural operations, communities, and rural, dispersed housing are common. These changes impact vegetation on remaining natural areas. The elimination of fire associated with agricultural land management has had enormous impact. Some native woody plants, including Eastern Red Cedar and dogwood, encroach on native grassland and savanna communities and out-compete them. Practices such as prescribed burning and mechanical clearing of brush and encroaching trees are used and encouraged to maintain and restore desired plant communities.

## Vast and Rich Human History

The Loess Hills region is known as one of this country's archaeological gems. The University of Iowa's Office of the State Archaeologist partnered with communities, landowners, and the public in the region in 2008-2009 to make important new discoveries. The research team verified the national significance of many Loess Hills sites, demonstrating that the region includes a second nationally significant intrinsic quality. This research was funded on behalf of the National Scenic Byway Council and led by Golden Hills RC&D.



*Artifacts discovered in Mill Creek archeological sites show what pre-historic life was like in the Loess Hills. Photo: The Immense Journey.*



*A trail following the ridge tops and saddles of the Loess Hills landform. Photo: Mike Whye.*

Humans have been crossing through or living in the region for at least the past 12,000 years. Significant examples of human exploration and occupation of the Loess Hills include Paleoindian hunters from approximately 10,000 B.C., a 5,000-year old cemetery in Turin, and late Prehistoric settlements of ancestral Plains Indians occupied between A.D. 1000 and 1400.

Nationally significant today, are the late prehistoric settlements of Mill Creek and Glenwood. These villages, one compact and fortified and the other dispersed and not fortified, were located within the Loess Hills landform and juxtaposed with major river confluences. The area including one of these settlements, the Glenwood locality, was dedicated in 2009 as Iowa's largest archaeological preserve—the highest level of state protection for Iowa natural and cultural heritage. Research archaeologists estimate the Glenwood locality included as many as 1,000 earth lodge dwellings in its hills and valleys, all within a 10-mile radius of the Platte and Missouri Rivers. The 407 acre preserve includes 109 archeological sites, 27 of which are Prehistoric earth lodges. Golden Hills RC&D is leading the research on the preserve through Transportation Enhancement funding, including the submittal of two National Historic Landmark applications.

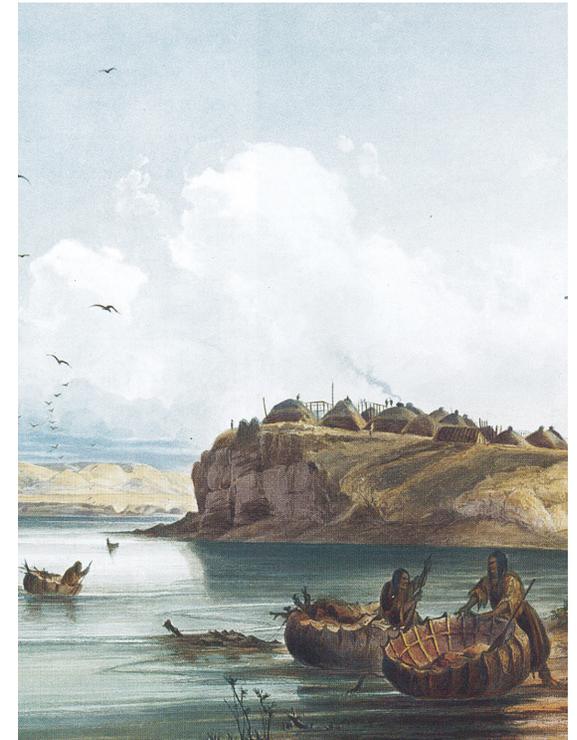
Earth lodges were partially subterranean dwellings occupied by residents of the first known sedentary farming communities. The lodges are estimated to have been occupied for approximately 200 years before their people either left or were absorbed by other societies around A.D. 1400. The Archeological Conservancy, a national organization dedicated to acquiring and preserving the best of our country's remaining archaeological sites, announced plans in 2010 to acquire and protect the Woodfield Earth Lodges site.

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## Where the West Began

Many Indian tribes lived in Iowa, each as an independent nation. Tension and wars between nations were nearly continual in the 1700s and 1800s in Iowa, as expansion of American settlers pushed westward. By the mid and late 1700s French fur-traders were already actively trading in what is now Iowa. Following the Louisiana Purchase in 1803, the Corps of Discovery led by Lewis and Clark were dispatched by President Thomas Jefferson in 1804 to explore the newly acquired western United States. Their journey included some of the first scientific documentation of the Loess Hills region and the Missouri River from present day Council Bluffs to Sioux City. Lewis and Clark were the front line for the American settlers that would flood through and settle the western regions of the United States.

Euro-American settlement of the Great Plains, including Iowa, expanded in the 1830s and 1840s. Multiple mass migrations to the west passed through the Loess Hills via Council Bluffs and included early pioneers traveling the California and Oregon Trails, miners seeking fortune in the 1849 California gold rush, and Mormon followers making the pilgrimage to Salt Lake City in 1853. The last of the Sioux were officially forced to abandon land in the state in 1853. More than thirty treaties ceding land had been signed with Iowa tribes by this time.



Above: Beginning approximately 800 years ago, Central Plains Indians settled areas of the Loess Hills. Photo: *The Immense Journey*

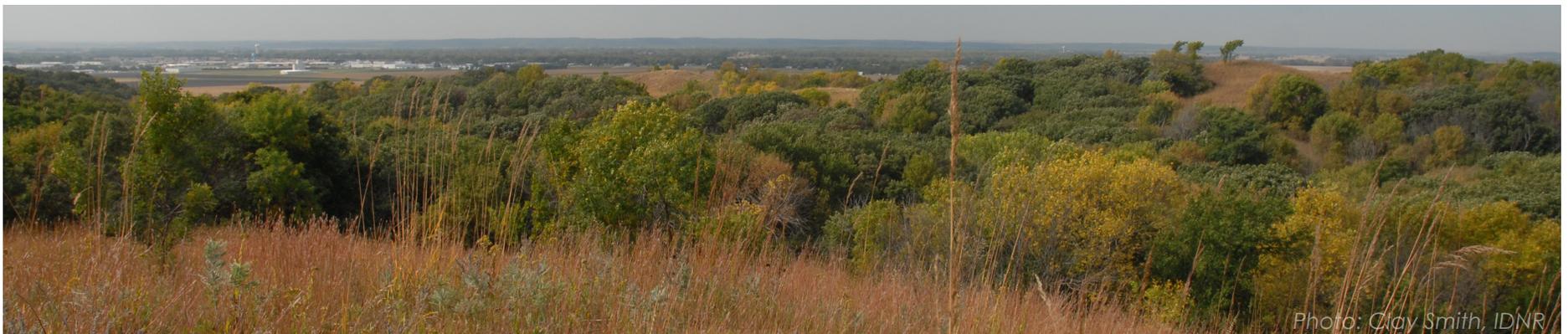
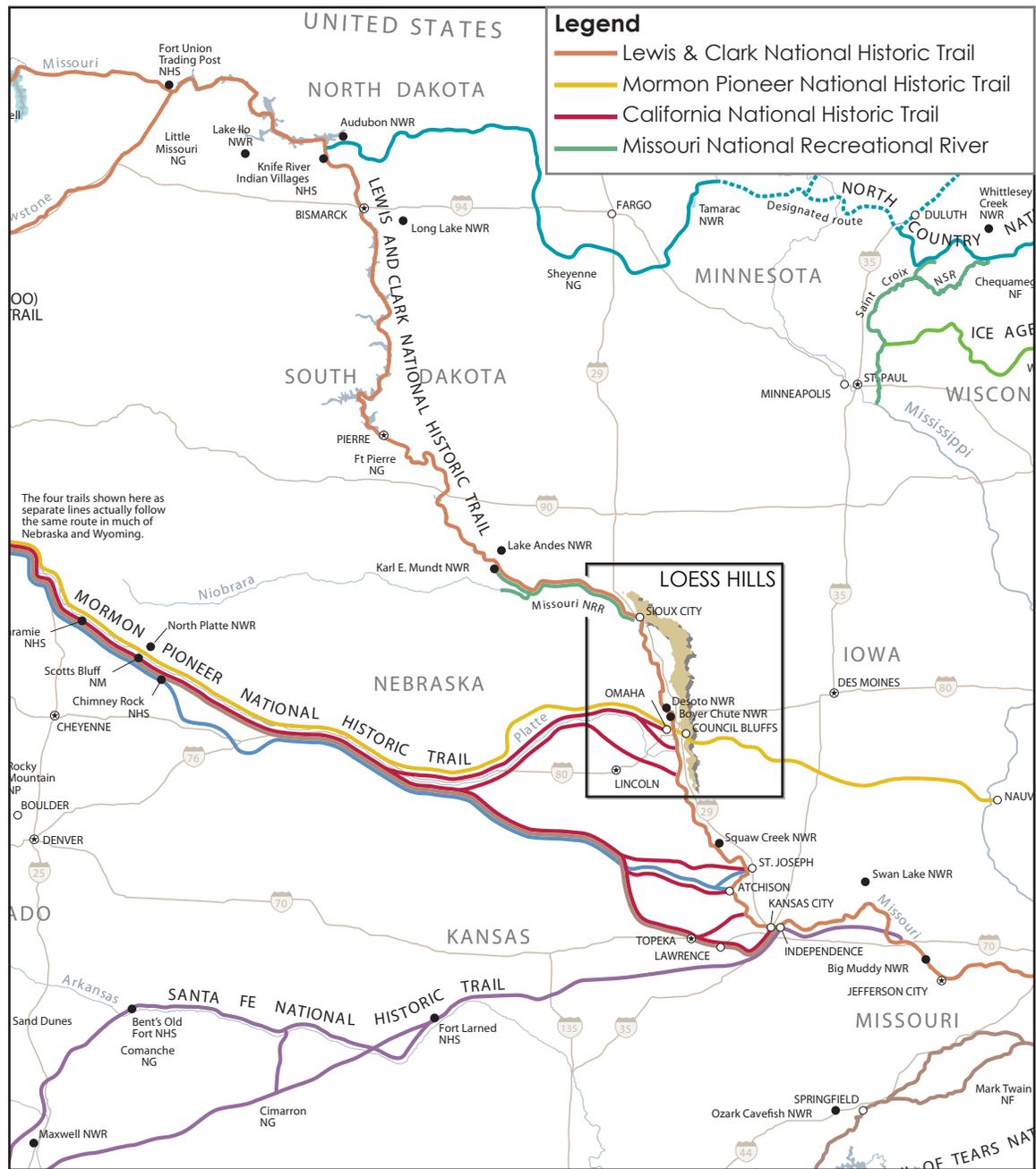


Photo: Clay Smith, IDNR



During the dark days of the American Civil War, individuals in the southern Iowa, including the Loess Hills region, were a source of light for many slaves seeking to escape southern slavery. The Underground Railroad, a loose network of sympathizers who helped smuggle slaves to freedom in the North, included many stops in the Loess Hills and across Iowa. The Iowa Freedom Trail Project documents the history of the period and includes sites such as the Todd House in Tabor.

The first Transcontinental Railroad, completed in 1869, passed through Council Bluffs expanding trading capabilities of the nation. The Lincoln Highway, a recreational automobile route, passed through the Loess Hills in 1913 and was a source of inspiration for the Dwight D. Eisenhower System of Interstate and Defense Highways.

Primary source records, including personal letters, diaries, and memoirs of early settlers, missionaries, and migrant groups paint a diverse and detailed portrait of the Loess Hills throughout the early nineteenth century and into the twentieth century. Nearly 140 sites from the mid-1800's and early 1900's with historical or architectural interest were identified in a limited inventory associated with the Loess Hills National Scenic Byway. These include pioneer churches, homesteads and other residences.

The Loess Hills were a waypoint for many waves of westward exploration and migration beginning with Lewis and Clarke and including the Mormons and '49-ers seeking gold in California as shown in this National Historic Trails Map by the National Parks Service.



# Loess Hills Region Today

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The 690,428-acre landform region identified by Iowa Department of Natural Resources includes twelve Special Landscape Areas (SLAs) (Figure 3). National Park Service planners and scientists, in coordination with advocacy organizations and state staff, identified these tracts in 2002. However, dating back as far as the 1930's these areas were known by the Iowa DNR and other conservationists for their important biological and geological features. Geologic, soils and vegetation data from 1981 – 2000 was used to develop SLA boundaries. The most-western facing slopes were also given a strong preference in this model. The combined area of the SLAs is 92,981 acres, approximately 13% of the landform region.

These 12 areas represent clusters of exemplary biological and geological features and capture approximately 80% of the remnant prairie in the hills as well as excellent examples of oak savanna and woodland habitat. Protection of these SLA tracts and land within the viewshed of the Loess Hills National Scenic Byway have been a priority for conservation boards, organizations and agencies, including the Loess Hills Alliance. Today, slightly more than 30% of SLA acres are in some form of permanent protection, an increase of almost 50% since 2003, when 17% of the SLA's were protected. Protected areas include 11,500 acres of Loess Hills State Forest and 6,000 acres of private lands protected with conservation easements. Overall, 5% of the landform region is either public land or privately-owned and under permanent protection (Figure 4, page 25).

## Loess Hills National Scenic Byway

- Explores the entire length and width of the Loess Hills Landform
- Seven-county byway route developed in 1992
- 221 miles including 16 excursion loops totaling 405.4 miles
- Roadways include federal, state and county-maintained segments
- The Loess Hills Byway one of the largest tourism draws of the region.

## Population and Housing

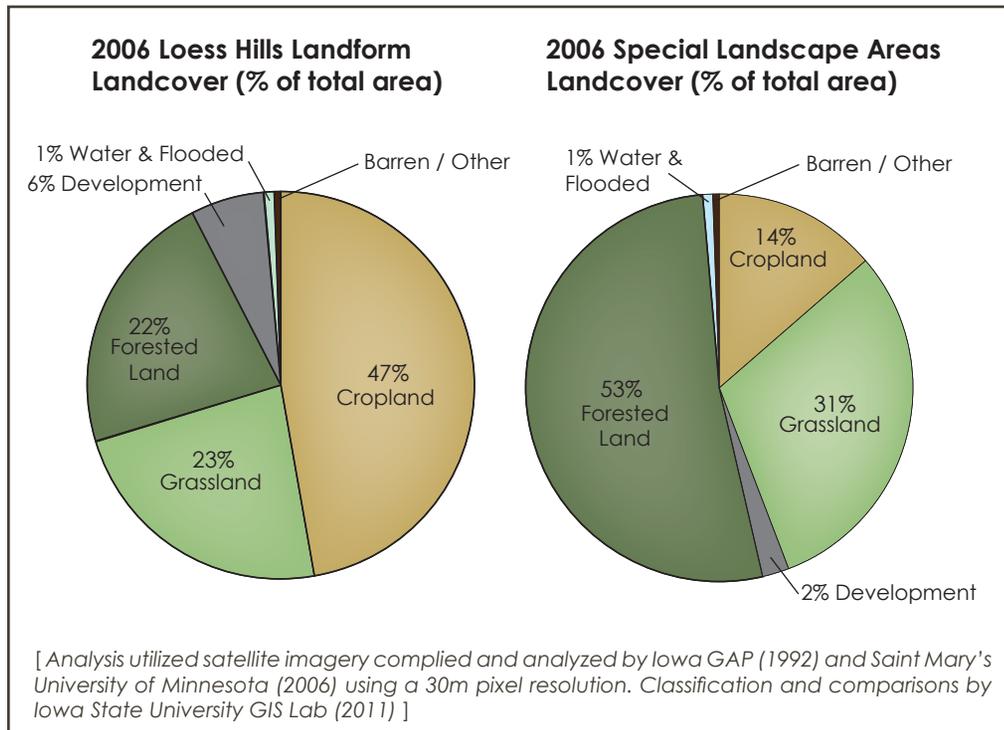
- Incorporated land in the region includes the 2 large, expanding metropolitan areas of Sioux City and Council Bluffs. Twenty-two smaller communities are also included in the region.
- Urban population in the landform region includes 167,322 (2010)
- Total population in Loess Hills counties includes 266,987 (2010)
- Residential Housing Units in Loess Hills Landform Region by County

Plymouth:	957
Woodbury:	not available
Monona:	837
Harrison:	2,148
Pottawattamie:	12,042
Mills:	1,956
Fremont:	262

## Tourism

A University of Northern Iowa study of Scenic Byway travellers, completed in 2003 found the following:

- Visitors from outside the Loess Hills region utilize services such as accommodations, restaurants, and service stations.
- About 50% of visitors to the Loess Hills were classified as non-local, meaning from outside the counties in or adjacent to the Scenic Byway.
- Among travellers, there was a greater preference for less developed amenities in natural settings such as scenic overlooks, walking and hiking trails, picnic areas, and interpretive signage.
- The average age of visitors was 53.3 years, over 58.6% of the visitors were full-time employees, and 28% were retired.



Currently, local forms of government are responsible for land use regulation in the landform region. No consistent regulatory regional authority exists. The Loess Hills landform boundary only has legal standing where counties or cities have adopted it as an overlay district. Cities and counties act independently to protect and manage land within their jurisdiction. There are also multiple instances of state-owned land in the region. USDA Natural Resources Conservation Service, US Fish and Wildlife Service and US Department of Transportation are involved with stewardship activities.

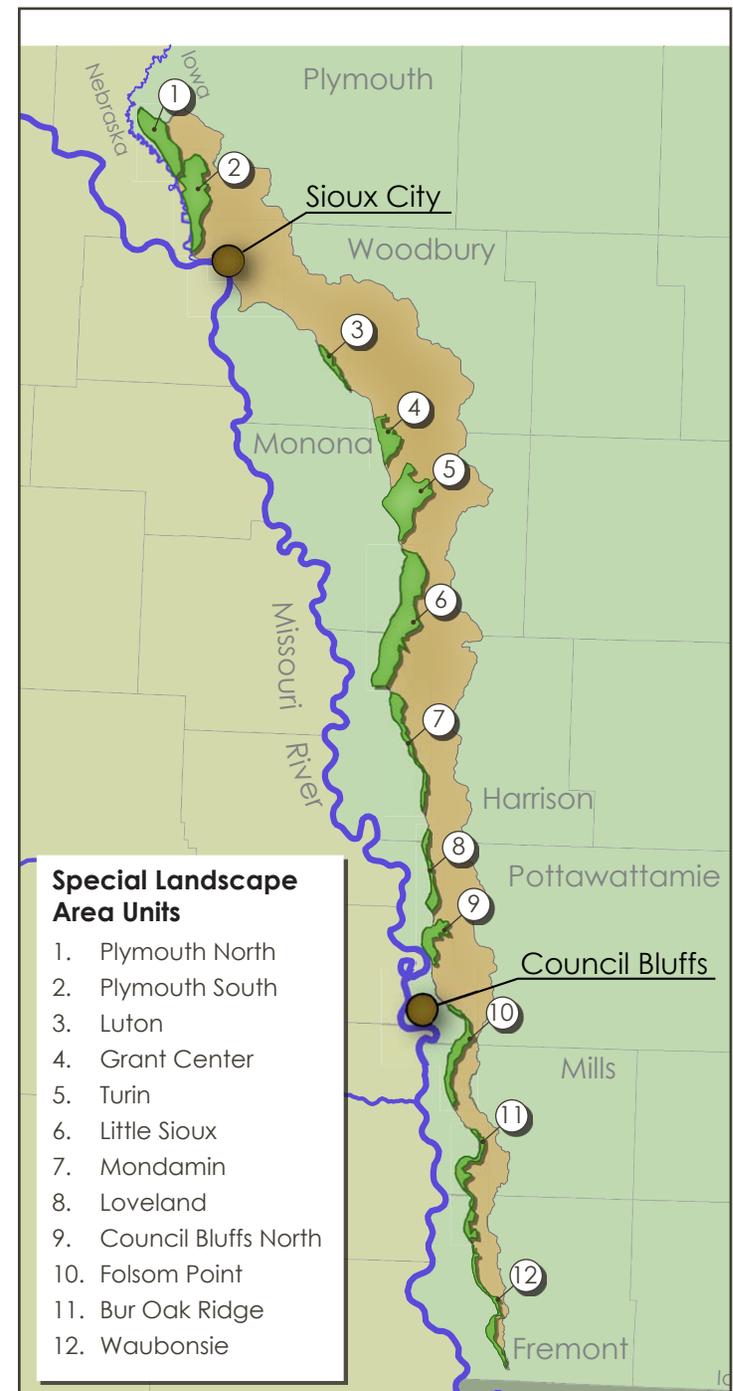


Figure 3. Special Landscape Areas

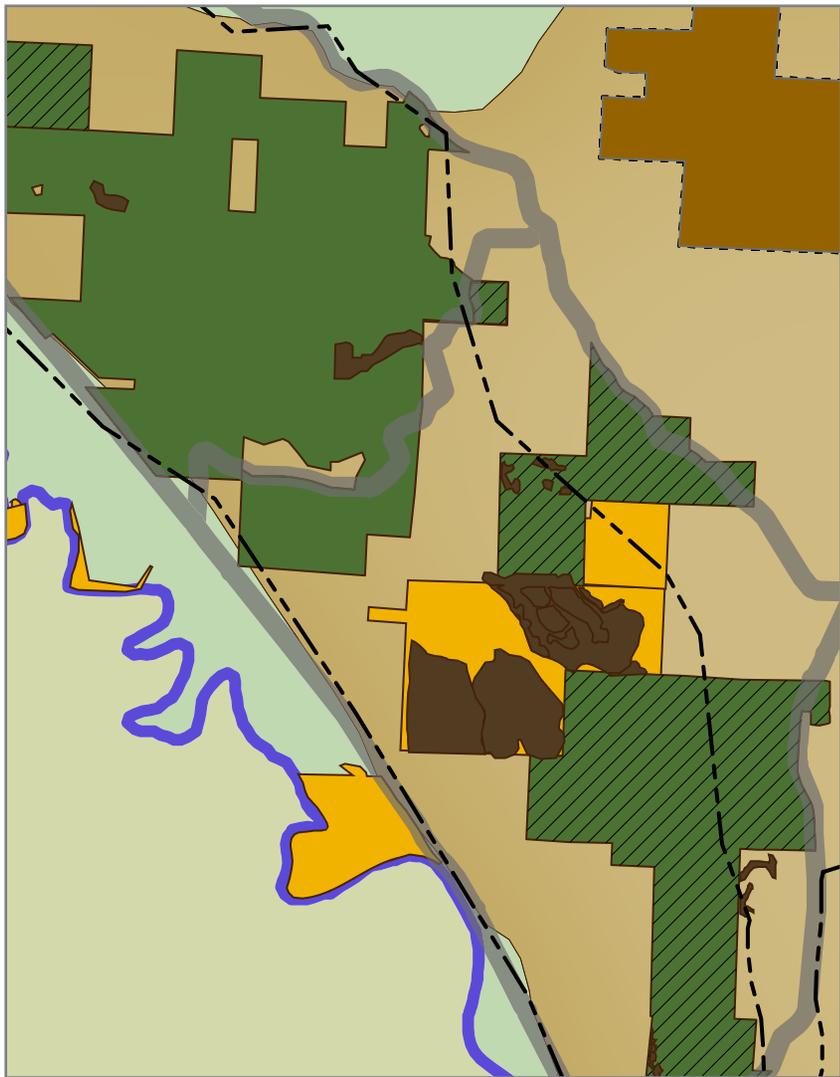
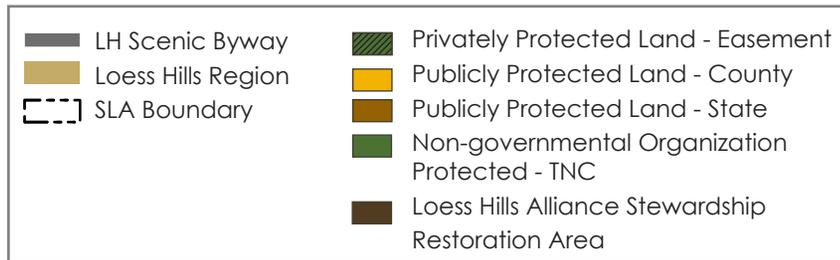


Figure 4 . Permanently protected land ownership example in the Loess Hills region.

The Loess Hills Alliance has sought to coordinate and enhance the efforts of these units of government through implementing more targeted education and stewardship activities, providing and securing matching grants, and supporting partners in their land protection opportunities in high priority areas. Golden Hills RC&D, the Loess Hills National Scenic Byway Council, The Nature Conservancy and the Iowa Natural Heritage Foundation are some of the more prominent non-profit organizations working in the region on permanent protection and stewardship.

Permanent protection includes agreement about the way land will be managed long-term between landowners and a conservation group. Conservation groups are public agencies and private, nonprofit organizations providing technical assistance to landowners. Willing landowners determine the method of protection that best fits their needs. Options include property sale, conservation easement, donation and bequest. Some methods provide tax advantages to landowners.

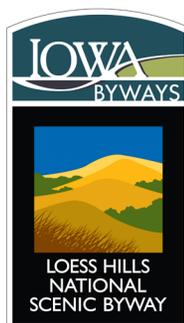
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The Loess Hills Alliance and other non-profit organizations are working in the region to balance development and permanent protection. Together, these organizations partner to restore native vegetation, protect cultural and natural resources, educate landowners and the public and minimize human impact to significant areas. They promote the unique history and characteristics of the landscape. Working together, the Loess Hills Alliance has directed nearly 2.8 million dollars in appropriated state funds and raised additional funds from grants and partner counties. These funds have been used to restore native habitat, conserve natural resources from more intensive development and education and tourism opportunities.

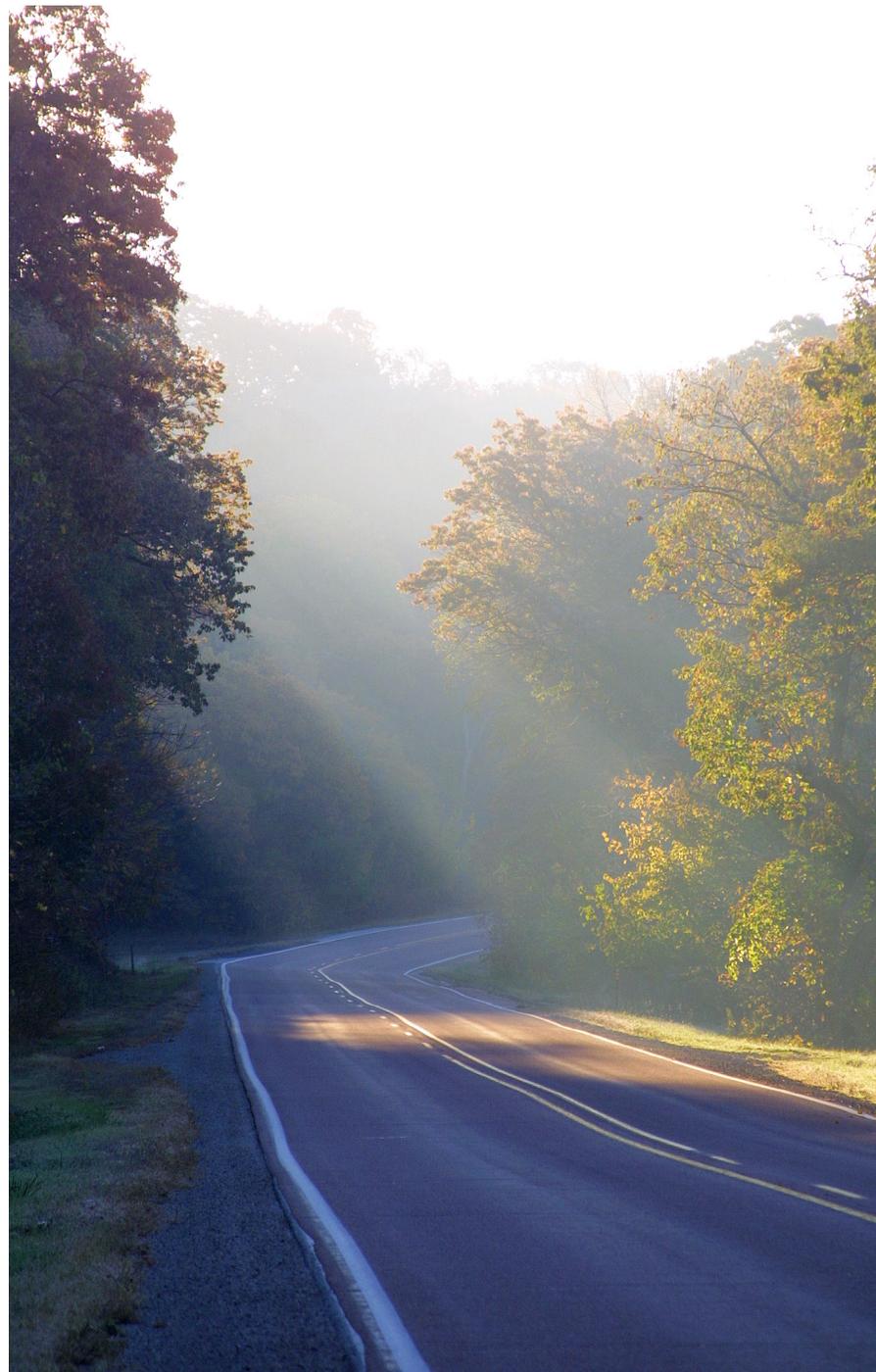
*Loess Hills National Scenic Byway  
Signage Standards,  
Iowa Department of Transportation*



(Individual Byway Logo)



(Wayshowing Signage)



Loess Hills National Scenic Byway. Photo: Clay Smith, IDNR



Photo: Clay Smith, IDNR

# Change in the Region

Substantial change has occurred in the region, even from the time of the scenic byway creation in 1992. In some cases trends in the landform region differ from those in other parts of the state, including population. Loess Hill counties, for example, experienced a range of conditions since 1980. Population growth in two counties, Pottawattamie and Mills, exceeded the state's total population growth rate (Table 2). Fremont and Monona counties, located farthest away from the major population centers of Sioux City and Council Bluffs, each recorded losses of 21%.

*Table 2. Change in county population 1980—2010*

County	2010 Population	% Change 1980-2010
Plymouth	24,986	+1%
Woodbury	102,172	+1%
Monona	9,243	-21%
Harrison	14,928	-9%
Pottawattamie	93,158	+8%
Mills	15,059	+12%
Fremont	7,441	-21%
7-Counties	266,987	+2%
State of Iowa	3,046,355	+4.1%

1. Source: U.S. Census Bureau <http://data.iowadatacenter.org/browse/state.html#Population-Decennial>

# Agriculture

Loess Hills Alliance helped to fund 3 full-time Private Lands Conservationist positions to work with agricultural producers and landowners developing conservation plans and implementing conservation practices.

Agriculture, both cropland and grazing, occupies the largest number of acres of any land use. Agriculture is also one of the land uses affecting water quality in streams in the Loess Hills region. Drainage from upstream agricultural watersheds resulted in impaired waters on several streams in the Loess Hills landform. Segments of the Floyd, Little Sioux, Maple, Soldier, Boyer and East Nishnabotna Rivers are included on Iowa's EPA 303(d) list for bacteria impairment in 2008 and/or 2010.



Photo: Clay Smith, IDNR



Cropland prices are increasing across the state and in the Loess Hills pressuring landowners to converting perennial cover, such as grassland, to agricultural fields. Photo: Clay Smith, IDNR

Farmland values in Loess Hills counties exceeded the state average increase of 245% since 1980 (Table 3). Importantly however, the amount of land used for annual crops also expanded (Figure 5). The net amount of cropland in the Loess Hills landform increased by more than 50,000 acres between 1992 and 2006 (Table 4 and 5). The majority (81%) of new cropland was converted from grassland (full table in Appendix A). Special Landscape Areas measured proportionally less conversion to cropland and less loss of warm-season grassland. A greater proportion, however, of new forested land occurred in SLAs.

Table 3 . Farmland Values in the Loess Hills Counties: 1980-2010

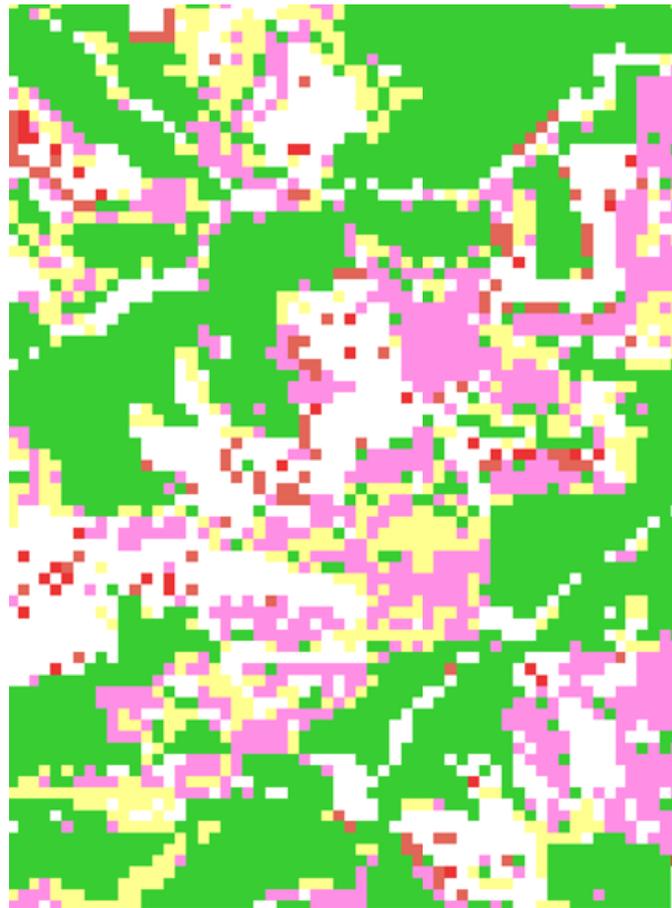
County	1980 Land Value	1990 Land Value	2000 Land Value	2010 Land Value	Value Increase: 1980-2010
Plymouth	\$2,254	\$1,362	\$2,146	\$6,462	287%
Woodbury	\$1,759	\$1,119	\$1,665	\$4,754	270%
Monona	\$1,560	\$1,019	\$1,561	\$4,676	300%
Harrison	\$1,657	\$1,026	\$1,700	\$5,151	311%
Pottawattamie	\$1,884	\$1,057	\$1,809	\$5,553	295%
Mills	\$1,884	\$997	\$1,698	\$5,121	272%
Fremont	\$1,835	\$983	\$1,554	\$4,586	250%
Seven County Average	\$1,833	\$1,080	\$1,733	\$5,186	283%
State of Iowa Average	\$2,066	\$1,214	\$1,857	\$5,064	245%

Source: 2010 Farmland Value Survey Iowa State University:  
<http://www.extension.iastate.edu/agdm/wholefarm/html/c2-70.html>

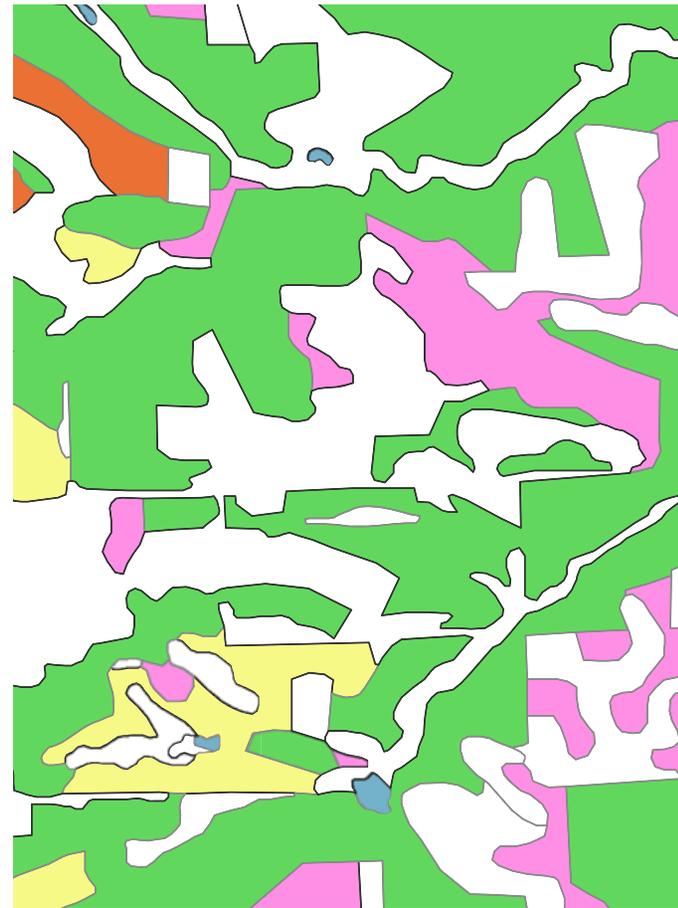
Figure 5 . Landcover change 1992-2006



Vicinity Map



Landcover 1992 - raster data



Landcover 2006 -vector data

**Legend**

-  Cedar
-  Woodland
-  Warm-season Grass
-  Cool-season Grass
-  Cropland
-  Water



Table 4. Landcover Difference Summary Between 1992<sup>1</sup> and 2006<sup>2</sup>. Landcover refers to the vegetation or surface type on the land and is characterized using satellite imagery and GIS software. Complete comparison details found in Appendix A.

Landcover Type	Loess Hills Region		Special Landscape Areas	
	% change between the two years	Net acre increase or decrease measured	% change between the two years	Net acre increase or decrease measured
Cropland	+8%	+52,482	-2%	-2,086
Warm Season Grassland	-9%	-59,091	-3%	-2,557
Other Grassland	-9%	-63,262	-11%	-10,459
Development (buildings, pavement)	+5%	+31,219	+1%	+1,301
Forested Land	+7%	+46,078	+16%	14,510
Water and Flooded Lands	<1%	-1,551	<1%	-146
Barren and Other	-1%	-5,527	-1%	-559

1. Source: Iowa(1992) Gap Analysis Program. The map is derived from 1992 satellite imagery and depicts existing natural vegetation to the level of dominant or co-dominant plant species. The resolution of the source imagery is 30 meters.
2. Source: Saint Mary's University of Minnesota (2006). The resolution of the source imagery is 30 meters.

Efforts are underway in the Loess Hills to protect native grass lands from invasive species and other encroachments. Photo: Kathy Kosovich 34 and Iowa Natural Heritage Foundation (bottom)

Table 5. Detail on Selected Landcover Gains and Losses Between 1992 and 2006

Net change identified between 1992 and 2006	1992 total acres identified	Actual new identified in 2006 (acres)	Actual loss or removal from 1992 (acres)	2006 total acres
51,782 acres in cropland previously in perennial cover	275,757	104,931	52,449	328,239
59,129 acres of warm-season grassland removed	94,088	21,644	80,736	34,997
63,707 acres of other (cool season and other grass mix) grassland removed	187,560	54,626	117,888	123,852
31,255 acres of new developed area	10,412	33,626 added	2,406 removed	41,631
46,487 acres of new forested land (not woody cover in 1992)	97,479	70,153	21,983	145,648
2086 acres Eastern Red Cedar removed	10,045	5,181	8,227	7,959



The same hillside north of Hamburg, IA photographed in the 1900s (top) and in 2006 (bottom) showing the spread of cedars and woodlands in the Loess Hills. Photos: Stan Buman.

Table 6. Employment Trends in the Seven County Loess Hills Region, 1990-2000

Occupation of Employment in Loess Hills Counties	Year 2000	% Change 1990-2000	Year 1990
Land-Use Derived <sup>1</sup>	1,328	-29.6%	1,886
Construction	6,640	41.9%	4,680
Manufacturing	18,319	19.9%	15,279
Wholesale Trade	4,027	-20.3%	5,054
Retail	13,176	-25.6%	17,717
Transportation <sup>2</sup>	6,288	11.8%	5,622
Information and Communication <sup>3</sup>	2,871	-0.1%	2,875
Financial <sup>4</sup>	6,945	11.5%	6,227
All Service Industries <sup>5</sup>	40,579	-11.6%	45,900
Public Administration	3,400	17.1%	2,904
Total Workers 16 Years of Age and Over	103,573	-4.2%	108,144

Source: U.S. Census Bureau 2010: <http://www.census.gov/>

<sup>1</sup> Land-Use Derived: includes agriculture, forestry, fishing, hunting, and mining

<sup>2</sup> Transportation: includes warehousing and utilities

<sup>3</sup> Information and Communication.: includes information, communications, and public utilities

<sup>4</sup> Financial: includes insurance and real estate

<sup>5</sup> All Service Industries: includes professional services, recreation, arts, entertainment, accommodation, education, and healthcare

## Urban Areas and Other Development

Other important industries in the region over the past twenty years include construction, manufacturing, wholesale trade, retail, transportation services, information and communications, financial, service industries, and public administration. The number of employed workers in each occupational sector 16 years of age and over between 1990 and 2000 is shown in Table 6. Estimates for occupational sector data was not part of the 2010 Census at the town-level used generate the data in Table 6, so no direct comparison can be made for employment trends over the past ten years.

Population changes in urban areas associated with the Loess Hills region was generally accompanied by an increase in incorporated limits of cities (Table 7). Nearly half of communities associated with the Loess Hills region reported an increase in population (Figure 6, page 34). Most of these increasing population cities also reported annexations between 1990 and 2010. Annexation in some cases included land within the Loess Hills landform region including Sioux City and Council Bluffs.

Table 7. Population and Incorporated Area Changes. Cities included are those within the landform region boundaries or on the national scenic byway route.

City	1990 Population <sup>1</sup>	1990 Incorporated Area (ac) <sup>2</sup>	Pop. 2010 <sup>1</sup>	Incorporated Area (ac) current <sup>3</sup>	% Change Population 1990-2010	% Change Incorporated Area 1990-2010
Plymouth County Communities						
Akron	1,450	741	1,486	789	+2%	+6%
Westfield	160	79	132	82	-17%	+4%
Woodbury County Communities						
Bronson	209	177	322	221	+54%	+25%
Lawton	482	340	908	461	+88%	+36%
Oto	118	165	108	245	-8%	+48%
Sergeant Bluff	2,772	1282	4,227	1368	+52%	+7%
Sioux City	80,505	35493	82,678	38004	+3%	+7%
Smithland	252	188	224	195	-11%	+4%
Monona County Communities						
Castana	159	562	147	593	-8%	+6%
Moorhead	259	154	226	199	-13%	+29%
Rodney	71	96	60	104	-15%	+8%
Turin	95	58	68	55	-28%	-5%
Harrison County Communities						
Logan	1,401	682	1,534	635	+9%	-7%
Magnolia	204	319	183	390	-10%	+22%
Missouri Valley	2,888	1450	2,838	2093	-2%	+44%
Pisgah	268	645	251	593	-6%	-8%
Pottawattamie County Communities						
Council Bluffs	54,315	24859	62,230	28254	+15%	+14%
Crescent	469	529	617	617	+32%	+17%
Mills County Communities						
Glenwood	4,960	1267	5,269	1639	+6%	+29%
Fremont County Communities						
Hamburg	1,248	669	1,187	699	-5%	+4%
Riverton	333	390	304	378	-9%	-3%
Sidney	1,253	809	1,138	809	-9%	0
Tabor	994	782	956	806	-4%	+3%
Thurman	239	351	229	357	-4%	+2%

<sup>1</sup>Source: U.S. Census Bureau <http://data.iowadatecenter.org/browse/state.html#Population-Decennial>  
<sup>2</sup>Source: U.S. Census Bureau <http://data.iowadatecenter.org/datatables/PlacesAll/sclandarea19902000.pdf>  
<sup>3</sup>Source: Provided by County Auditor offices or County GIS staff

Severe erosion resulting in gully formations and siltation of low-lying areas is common in the Loess Hills due to a combination of poorly sited residences, improper stormwater management techniques, and the unique nature of loess soils.

Model ordinances have been created to guide development in the Loess Hills. Model ordinance adoption is making progress throughout the Loess Hills. Photos: Rich Maaske, IDALS.

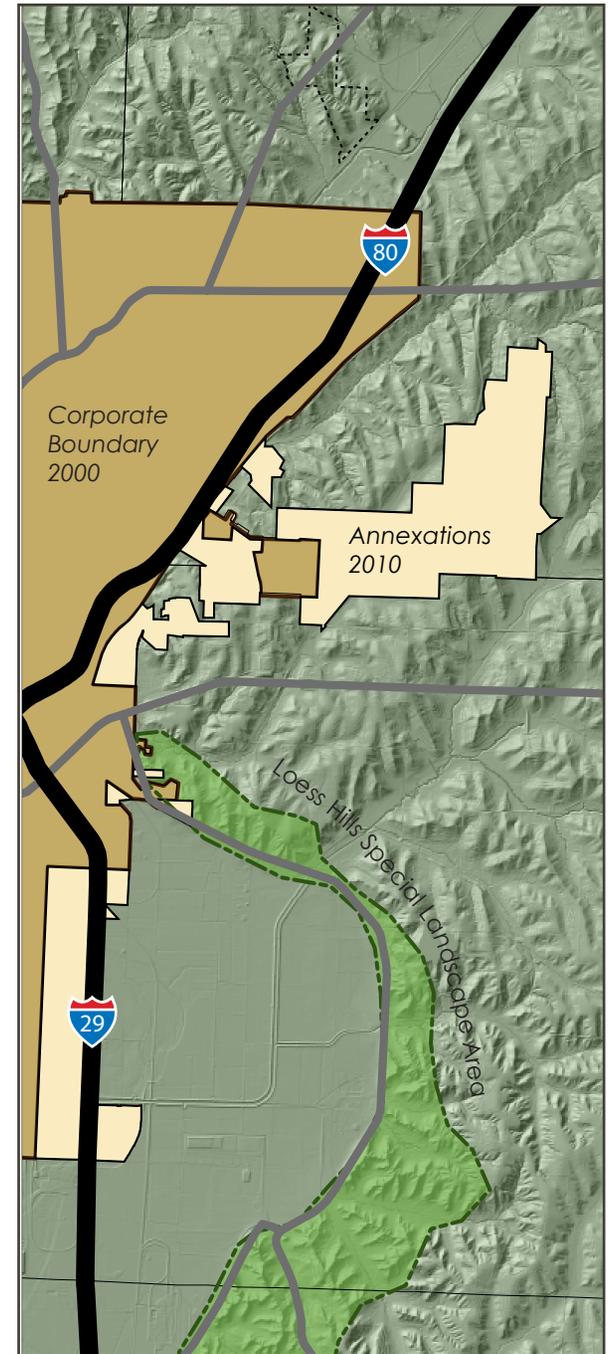


Figure 6 . Example of City of Council Bluffs annexations since 2000.

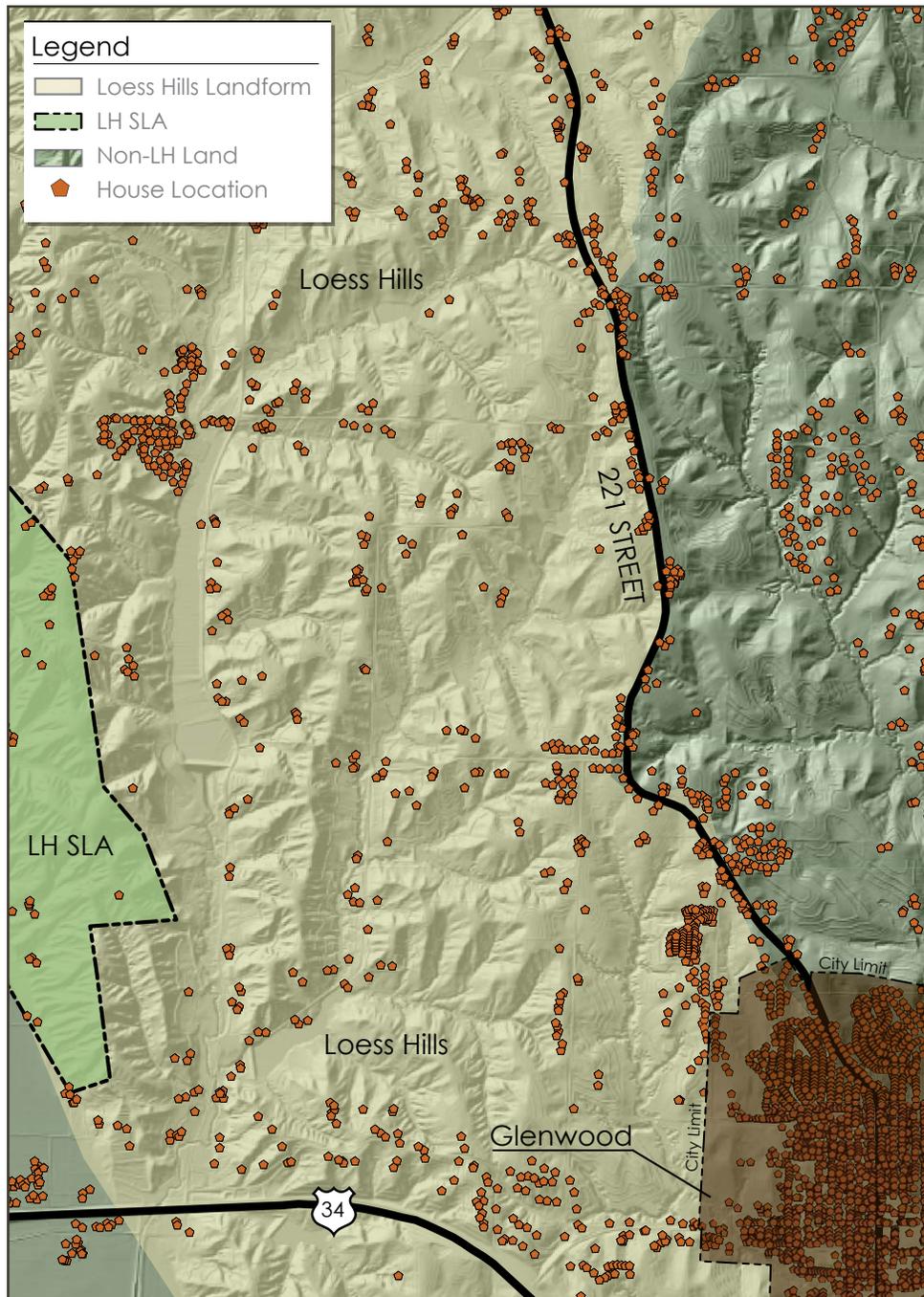


Figure 7 . Example of rural housing locations in Mills County.

Population and incorporated limits of urban areas tell only part of the story though. Rural subdivisions and dispersed housing in unincorporated areas is regulated by counties. County development ordinances are typically less stringent compared to municipal ordinances and property taxes are also often lower in rural areas, incentivizing this type of construction. These reasons plus the availability of undeveloped land and an increase in commuting distances and telecommunicating have made rural housing very common (Figure 7). Change in the number of houses in unincorporated areas is also more difficult to study because of limited data sources. Current housing locations are available but analysis in terms of when each was built is not available.

Landcover identifying developed areas, as a whole, increased significantly between 1992 and 2006 (Table 4 and 5). Rooftops, pavement and mown lawn landcover increased by 30,000 acres between 1992 and 2006 in the Loess Hills landform region. Analysis showed that developed areas tend to stay developed, unlike areas of perennial and annual vegetation which may switch periodically reflecting crop rotation (Table 5).



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## Natural Areas Change

The Loess Hills Alliance was awarded and implemented a \$36,500 grant for oak savanna and prairie restoration in 2006.

A great deal of change also occurred in “natural areas” in the region. Areas with perennial vegetation (various types of grassland and forest) were considered natural areas in this study and included grazing land. The amount and type of forest cover is one example of significant change.

Eastern Red Cedar, a native woody species that can be problematic in Iowa, quickly encroaches abandoned grasslands and bluffs. Once established, cedars are difficult to permanently eradicate. Stewardship initiatives in the region have made impressive gains in removing cedar. The net effect of removal efforts measured was positive: there were more than 2,000 fewer acres of cedar compared to 1992. However, while 8227 acres were removed by prescribed burning and clearing, the tree spread into an additional 5,181 acres.

Warm-season grasslands including prairie remnants are a recognizable icon for this landform region. Adapted to dry soils, this plant community is challenged by the increases in precipitation during the past forty years and the absence of fire brought by permanent settlement of the region and changes in agricultural management. Both these changes encourage expansion of woody species over grasslands. More than 45,000 new acres of deciduous or evergreen trees were identified in 2006 that were not present in 1992 (Table 4, above).

Cedar clearing efforts continue to make an impact in the Loess Hills, exposing the iconic rugged topography of the region. Photos: Iowa Natural Heritage Foundation

## Recreation and Educational Opportunities

The Loess Hills Alliance developed curriculum for K-12 education about Loess Hills resources as well as provides annual financial support for county-level recreation and education opportunities.

Together, the Loess Hills landform region and the national scenic byway routes include more than 42,000 acres of public land for recreational use (Table 8).

*Table 8 . Acres of existing public recreation areas by County in LH landform or adjacent to National Scenic Byway routes*

<b>County</b>	<b>Public Recreation Acres</b>
Plymouth	5,828
Woodbury	5,001
Monona	13,127
Harrison	8,716
Pottawattamie	3,626
Mills	664
Fremont	5,078

Source: Loess Hills Recreation Plan Study, Golden Hills RC&D

Many of these sites include educational interpretive information. Multi-purpose trails, hiking and low-impact recreation, wildlife observation, fishing, camping, hunting, horseback riding trails, golf and winter sports are included. Facilities are owned and managed by cities, counties, non-profit organizations or the state of Iowa. Recent recreational planning commissioned by Golden Hills RC&D identified future planned recreational facilities in the Loess Hills landform in Monona County. These sites, known as the Reese and Hansen Acquisitions, total 355 acres. The Reese site is particularly exciting as it was sold to the County with the understanding that it will include a Loess Hills visitor center and house the county conservation board headquarters. Both sites also were purchased from landowners who had previously placed their land in permanent conservation easements, lowering the cost to Monona County for eventual purchase. The future, planned Lewis and Clark Multi-Use Trail will also be a great draw for visitors and residents.

Significant recreation sites in the landform region include Broken Kettle Grasslands, Stone State Park, the Turin Loess Hills State Preserve, the Loess Hills State Forest, Hitchcock Nature Area, and Waubonsie State Park.

Many county conservation boards offer naturalist-led programs to school groups and local citizens, providing significant opportunities for local residents and others to learn about the unique ecology of the region.

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## Protection / Use Ordinances in Place

The Loess Hills Alliance provided funding and technical assistance to counties and communities for development of comprehensive plans and zoning updates to protect resources.

Zoning and other forms of land use regulation is one tool available at the county scale to guide land use and action. None of the seven counties had adopted land use regulation distinguishing the Loess Hills region or providing different protection from disturbance at the time of the scenic byway establishment. National designation of the byway created the funding opportunity to provide technical assistance to counties to update their planning tools and ordinances to reflect their values. Most counties today have ordinances tailored to their concerns and priorities for the Loess Hills region of their county.

Counties maintain land use ordinances based on direction provided by their county comprehensive plan. These plans reflect local priorities but are not legally binding. Zoning ordinances are then generally revised to follow the spirit of the comprehensive plan. Like all county business, zoning is overseen by an appointed zoning commission and is formally adopted and enforced by the elected county supervisors. Zoning maps and ordinances are legal documents in Iowa. County zoning maps identify the limits of land area assigned to each zoning classification. Each classification describes the types and provisions of use allowed either unconditionally or by special use permit. County zoning is a politically-based system intended to guide development of private property outside of municipal jurisdictions. Decisions about changes in zoning ordinances and how they are enforced are made by local elected officials.

As of 2011, 1,386 residential housing units were located in the Loess Hills Special Landscape Areas. By SLA unit, these include:

- Plymouth North 18
- Plymouth South 127
- Luton (not available)
- Grant Center 27  
(only Monona County)
- Turin 67
- Little Sioux 94
- Mondamin 193
- Loveland 124
- Council Bluffs North 297
- Folsom Point 283
- Bur Oak Ridge 99
- Waubonsie 57

Source: Iowa Geospatial Infrastructure, Geological Survey Bureau of Iowa

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## Highly Erosive Soils and Scenic Vistas

The erosive nature of the soils, the importance of habitat and other resources present, and views of the Loess Hills from the scenic byway routes were all compelling reasons for counties to establish ordinances that separated the landform region from the remainder of the county. Recent housing development construction in the landform region had caused erosion, sedimentation and stormwater management issues for home buyers and the counties. Several instances of construction activity in the landform region were found in violation of their National Pollutant Discharge Elimination System (NPDES) permits. These permits regulate construction site erosion for activities disturbing one or more acres in size.

Funding and technical assistance was provided to counties to revisit their comprehensive plans and ordinances in order to protect physical and scenic resources. Model ordinances were also developed particularly for the landform region and included in the Loess Hills National Scenic Byway Corridor Management Plan. These ordinances have been updated to reflect current technology and development trends, most recently in 2008.

### Model Ordinances Developed for the Loess Hills Landform Region

- **Overlay District Ordinance** establishing a formal Loess Hills district as separate from the remainder of the county
- **Ridge and Hillside Ordinance** defining limitations on construction and alteration of land within a specific steepness class and on top of major ridgelines and bluffs
- **Sign Ordinance** limiting the types and sizes of signs used
- **Subdivision Ordinance** describing how residential and other uses are developed and designed
- **Planned Conservation Development Ordinance** describing planning and design methods to preserve natural features in a subdivision
- **Mining/Mineral Extraction Ordinance** describing how extraction operations are operated
- **Telecommunications Tower and Antennas Ordinance** describing where towers may be installed and the size of equipment allowed
- **Wind Energy Systems Ordinances** describing where one or more wind energy systems may be installed
- **Property Tax Exemptions Program** describing alternative exemptions for special types of vegetation including prairies, wetlands and trees
- **Stormwater Management Ordinance** describing methods for successfully managing stormwater runoff, minimizing soil erosion and non-point source pollution
- **Loess Hills Stormwater Best Management Practices Guidance Manual** including design standards for stormwater management practices suited to deep loess soils

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## **Model Ordinance Adoption**

Counties have responded to technical assistance and model ordinances in a variety of ways (Table 9). Comprehensive Plans in all counties now identify the Loess Hills landform as worthy of protection. Four of the seven counties have already passed zoning ordinances that reflect the special qualities of the Loess Hills. Counties opting not to utilize a special land use district for the Loess Hills region, such as Monona and Woodbury, typically use an agricultural or rural residential zoning class.

Two aspects of the model ordinances are most important in terms of maintaining the open and scenic views used to locate scenic byway routes in the 1990s: ridge protection and slope restrictions on new building sites. While single-house construction and vegetation removal activities for agriculture are not restricted in any county, some counties have added additional permitting requirements for earthwork quantities. The availability of qualified technical county staff is a key criteria to the ability to successfully manage special ordinances.

Two issues of housing development design are particularly useful in areas when natural resources are present and stormwater runoff is a concern. Recent Iowa trends in rural housing development include the use of smaller, clustered lots combined with larger common lot areas. The larger common areas can include the steep, erosive soils and native vegetation. This style of housing design is known as conservation development; Plymouth, Harrison and Mills County recommend but do not require this style of housing in the landform region. Another trend developing in Iowa is the use of low impact development (LID) techniques. These techniques focus on how stormwater in the development is collected and discharged, with the goal of reducing impact including erosion and pollution. Low impact development often costs less to construct and maintain compared to traditional development because it does not rely as heavily on storm sewer pipe and structures. LID practices are included in the model ordinances but have not been adopted by any county or municipality.

Table 9. Adoption of key planning elements included in model ordinances, by county. Note that agriculture and construction of a single house are exempted uses in the model ordinances as well as all county ordinances.

Planning Element	Plymouth	Woodbury	Monona	Harrison	Pottawattamie	Mills	Fremont
Loess Hills landform is distinguished with a boundary	X			X	X	X	
County landform boundary substantially matches DNR boundary	X	X	---	X	X	X	---
Major ridgelines protected from development	partial			X			
Sediment and erosion plan or permit required beyond NPDES standards				X		X	
Slope restriction on building sites	X >20%			X >17%			
Prairies protected				X			
Large trees protected				X		X	
Extraction / mining activities limitations in landform	X allowed only in industrial zones			X not allowed on west face		X no new operations	
Minimum lot size permitted for new single-family dwellings	5 acres	2 acres	1 acre	5 acres	2 acres	3 acres	2 acres
Outdoor advertising prohibited or some protection on scenic byway routes	X	X		X		X	
Wind energy systems limited in some way in landform	X			X		X	
Comprehensive Plan Date Loess Hills Landform recognized	1999	2005	2005	2007	2004	2007	2006
Zoning Ordinance Date	2010	2008	2008	2009	2004	2007	2000

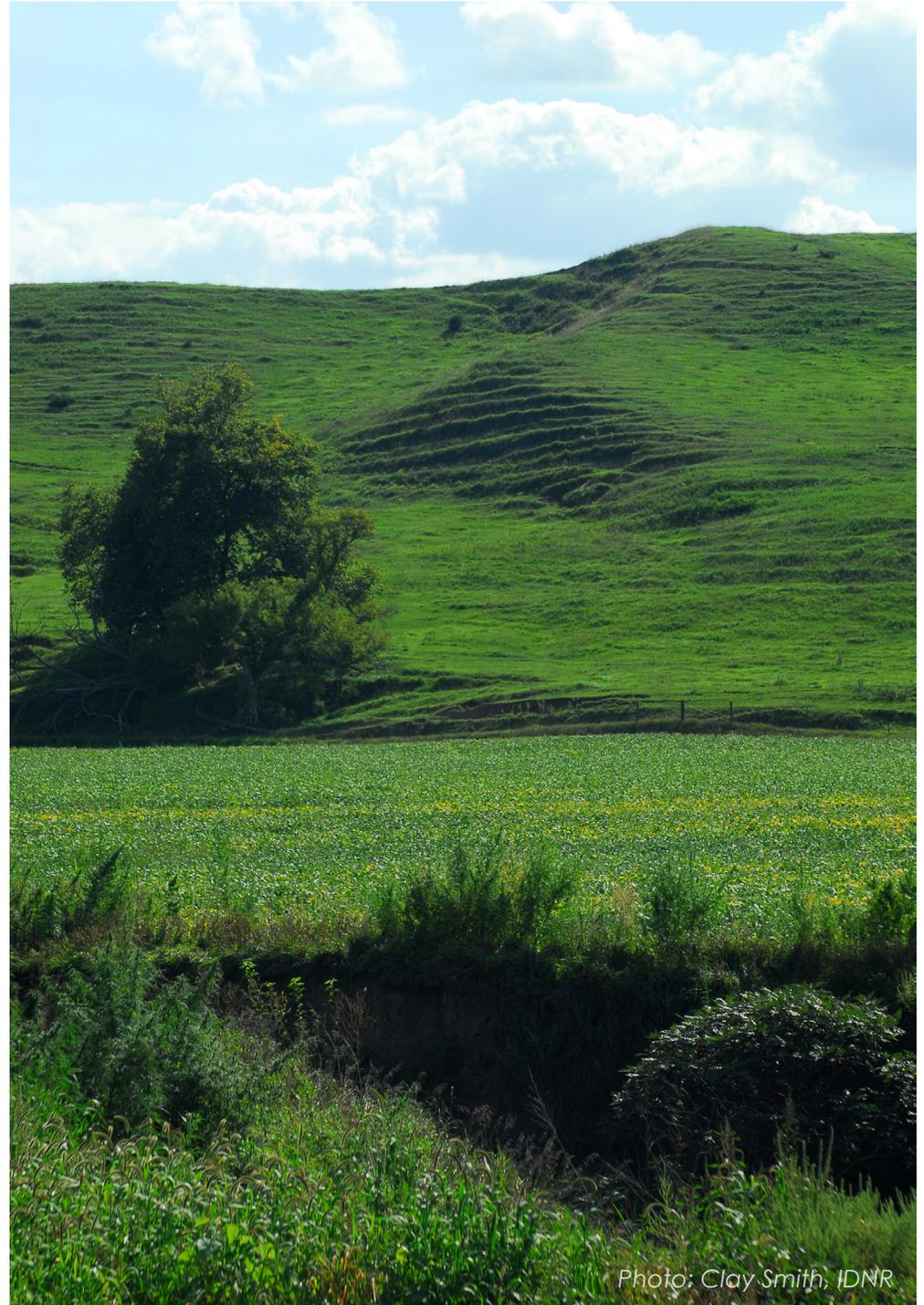
Source: County zoning ordinances, maps and comprehensive plan documents

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## Inherent Social Values

The most recent social assessment at the public scale was completed in 1994 as a part of the Loess Hills Landscape Resource Study, a forerunner of the Scenic Byway Corridor Management Plan. Many issues identified as public priorities in this assessment have been accomplished or had the groundwork laid in the time since 1994. Examples include delineation of the Loess Hills region in county zoning ordinances, exclusion of new quarries, work toward protecting historical and cultural resources, use of conservation practices on agricultural land, and enhancing native prairie areas. Minimizing development on ridgetops and within the viewshed of the scenic byway is less well established.

The social assessment conducted as a part of this comprehensive plan development was limited to Loess Hills Alliance participants. Themes were developed using qualitative and quantitative research with Alliance participants. The common vision and goals were shaped using these results. Working toward permanent protection of significant areas in the Loess Hills was viewed as the most important Alliance funding priority among participants. Other key findings focused on working with landowners, minimizing effects of development, and education about the region. The Alliance role in economic development-focused and promotional activities, such as business development and promotion of the scenic byway, was identified as supporting rather than primary responsibility.



Photo; Clay Smith, IDNR

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## Summary of Issues and Concerns from All Aspects of the Region

Local action led to the discovery of additional, significant cultural resources and the permanent protection of 32,500 acres in the Loess Hills landform. During these past twenty years, other developments have also taken place. Communities in the Loess Hills region physically expanded into the landform, rural housing spread and 105,000 acres of natural areas were replaced with row crop agriculture. Loess Hills counties began considering the value of their natural resources and reflecting that value through policy to manage development. However, the mining of loess soil—its use as inexpensive construction site fill on adjacent the Missouri River floodplain—is especially prevalent near metropolitan areas and largely unregulated.

Technical assistance for native plant community restoration is well supported in the region. However, little technical assistance or design details are available for residential and acreage-scale gullies where the use of heavy equipment is not possible. Fortunately, the Hungry Canyons Alliance addresses design and construction of stabilization structures in this region along roads and bridges. Stormwater regulations hold the potential to limit liability and property damage in the region, especially with builders unaware of soil conditions.

The economic backbone of this region is agriculture. It also has a large influence on habitat, soil quality and water quality. Fortunately, local landowners, volunteer fire departments, and agency and non-profit staff have strongly supported the reintroduction of prescribed burning and clearing of woody invasive species. Both are critical tools in maintaining the grasslands and healthy oak woodlands for which the region is known. These natural systems provide both habitat for native wildlife and agricultural uses such as livestock grazing and timber harvesting. Keeping pace with cedar and other encroaching plant species, including low quality woodlands, will be an ongoing issue for producers and conservationists in the landform. Sharply rising land prices also challenge conservation efforts.

Counties in the landform region acknowledge the importance of the landform and have responded by passing important, initial policies to guide development in ways that protect the integrity of the landscape. Scenic views of the Loess Hills are the most accessible resource available to visitors. Progress in terms of ensuring these views from change by purchasing easements or land will have a lasting impact into the future. Several counties have already limited outdoor advertising on scenic byway routes. Restrictions limiting development on the steepest soils and the region's ridgelines are another tool to ensure protection of soils, habitat and scenic resources. Harrison County has been the role model for other counties in adopting model ordinances for the region including limitations on outdoor advertising and slope restrictions on development.

# Conclusion

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The past twenty years brought about a shift locally in terms of how the Loess Hills landform is perceived. The launching and success of the Loess Hills National Scenic Byway began a transformation for many residents in terms of realizing the significance and value of the land for visitors and their own quality of life. The common vision for the future of the loess hills region builds on this recognition. It places mutual value on conservation and active use of the land. It also recognizes the fragile nature of the soils and vegetation, that when radically altered, almost never regain their ecologic, historic or visual value.

Strong interest exists to maintain tracts of undeveloped land to conserve the integrity of the land formation in and of itself as well as for the culture, history and resources for future generations. Future generations need access, both visually and physically, to the landform in an undeveloped condition. This means permanent protection of significant tracts and low impact use of remaining areas. Along with conservation, interested people need access to educational materials to understand the region and make decisions about land management and conservation.

This plan measured substantial amounts of conversion from perennial vegetation to developed area and cropland since 1992. And while some large areas of grassland were reclaimed from woody encroachment in the past ten years, other grassland areas were encroached during the same time. Substantial amounts of development and removal of perennial plant cover. The amount of land entering into public or private permanent protection has been significant. The significance and number of cultural resource sites has also increased beyond what was previously understood. Local communities have become invested in the special nature of the region and its value to tourism and quality of life. And while initial protection steps have been taken, many parts of the region could be easily changed radically in ways that are permanent.

The Loess Hills Alliance has led significant efforts to enhance protection, awareness and conservation; they have partnered with other organizations leading many additional efforts. Some technical planning work remains such as viewshed mapping and review of SLA boundaries; both are warranted due to availability of new resource data and topographic information. However, reaching the common vision for future generations requires additional funding and willing landowners, cities and counties to take action. The Loess Hills Alliance has the ability and the organization to continue making substantial contributions toward achieving the common vision.

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# Appendix A

## Landcover Change Data

The following tables contain the detailed landcover data uses to produce the graphics in Figure 5. Total study area: 690,986 acres.

<b>Cropland</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	275,757	328,239	52,482	8
<b>loss from previous</b>		<b>52,449</b>		
converted to cedar		590		
converted to forest, woodland		17,660		
converted to warm season grass		4,810		
converted to other grass		20,865		
converted to developed area		7,398		
converted to all other		1,125		
<b>gain from previous</b>		<b>104,931</b>		
converted from cedar		677		
converted from forest, woodland		5,245		
converted from warm season grass		38,039		
converted from other grass		54,211		
converted from developed area		380		
converted from all other		6,380		

<b>Warm Season Grassland</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	94,088	34,997	-59,091	-9
<b>loss from previous</b>		<b>80,736</b>		
converted to cedar		955		
converted to forest, woodland		14,527		
converted to cropland		38,039		
converted to other grass		21,581		
converted to developed area		4,812		
converted to all other		821		
<b>gain from previous</b>		<b>21,644</b>		
converted from cedar		420		
converted from forest, woodland		1,948		
converted from cropland		4,810		
converted from other grass		13,865		
converted from developed area		78		
converted from all other		523		

<b>Cool + Other Grassland</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	187,560	124,298	-63,262	-9
<b>loss from previous</b>	<b>117,888</b>			
converted to cedar	1,981			
converted to forest, woodland	29,838			
converted to cropland	54,211			
converted to warm season grassland	13,865			
converted to developed area	16,136			
converted to all other	1,856			
<b>gain from previous</b>	<b>54,626</b>			
converted from cedar	1,019			
converted from forest, woodland	6,560			
converted from cropland	20,865			
converted from warm season grass	21,581			
converted from developed area	787			
converted from all other	3,814			

<b>Developed Area</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	10,412	41,631	31,219	5
<b>loss from previous</b>	<b>2,406</b>			
converted to cedar	76		31,255	
converted to forest, woodland	840			
converted to cropland	380			
converted to warm season grassland	78			
converted to cool + other grass	787			
converted to all other	246			
<b>gain from previous</b>	<b>33,626</b>			
converted from cedar	701			
converted from forest, woodland	2,896			
converted from cropland	7,398			
converted from warm season grass	4,812			
converted from cool + other grass	16,136			
converted from all other	1,682			

<b>Eastern Red Cedar</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	10,045	7,954	-2,091	-0.3026
<b>loss from previous</b>	<b>8,227</b>		2,091	
converted to developed area	701			
converted to forest, woodland	5,241			
converted to cropland	677			
converted to warm season grassland	420			
converted to cool + other grass	1,018			
converted to all other	170			
<b>gain from previous</b>	<b>6,136</b>			
converted from developed area	76			
converted from forest, woodland	2,489			
converted from cropland	590			
converted from warm season grass	955			
converted from cool + other grass	1,982			
converted from all other	44			

<b>Forest and Woodland</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	97,479	145,648	48,169	7
<b>loss from previous</b>	<b>21,983</b>			
converted to developed area	2,896			
converted to cedar	2,488			
converted to cropland	6,744			
converted to warm season grassland	1,948			
converted to cool + other grass	6,571			
converted to all other	1,336			
<b>gain from previous</b>	<b>70,153</b>			
converted from developed area	840			
converted from cedar	5,240			
converted from cropland	17,382			
converted from warm season grass	14,404			
converted from cool + other grass	29,805			
converted from all other	2,482			

<b>Open Water</b>	<b>1992 acres</b>	<b>2006 acres</b>	<b>net change</b>	<b>% change</b>
total measured in date	3,278	4,829	1,551	0.2