

# Iowa Soil Associations

**Soil** is Iowa's greatest natural resource. However, there are many different soils in Iowa, each possessing a unique set of properties.

The enclosed map does not attempt to show all of the soils in Iowa. Rather it shows the geographic areas where major soil groups occur. These soil groups are called soil associations, and the map is called a soil association map. A soil association is a group of soils that are closely associated geographically and occur in a characteristic pattern. More information about soil associations is available on the Iowa NRCS web site at [www.ia.nrcs.usda.gov/soils.html](http://www.ia.nrcs.usda.gov/soils.html). More detailed information about soils is available online through the U.S. Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov/app/>.

This brochure is a cooperative effort between the Iowa Department of Agriculture and Land Stewardship, Iowa Department of Transportation, United States Department of Agriculture's Natural Resources Conservation Service and Iowa State University Extension.

## 1 Loess over glacial till – low rainfall Moody - Trent Soils

These soils formed in a mantle of loess and occur in the far northwest corner of the state. This area is considered the driest part of Iowa. Moisture is limited, but is usually present when conditions are suitable for plant growth. The landscape consists of gently undulating to steep soils with long smooth slopes and well defined drainage ways. The hills have broad undulating to rolling ridgetops and hilly to steep valley sides. The valleys generally are narrow, but the major rivers and other large tributaries have broad flood plains and terraces.

Nearly all of this area is farmed. Corn and soybeans are the major crops. Feed grains and hay crops are also widely grown. Native vegetation was mixed tall and short grass prairie

★ *Fun Fact: This area receives the least precipitation at an average of 26 inches. The overall State precipitation average is 34 inches.*

## 2 Northwest Iowa Loess Galva – Primghar Soils

Most of the soils of this region formed in loess. Most slopes are nearly level and gently sloping but some slopes bordering major stream valleys are steep. A few large rivers have nearly level and broad valley floors and stream terraces.

Nearly all of this region is cultivated. Corn and soybeans are the principal crops. Native vegetation varied between tallgrass prairie vegetation on moist soils to short grass vegetation on slopes and uplands. Timber made up less than 1 percent of the area.

★ *Fun Fact: Prehistoric fossils found in this area include crocodiles, large turtles, and sharks.*

## 3 Tazewell Glacial Till Everly - Wilmonton – Letri Soils

This area has soils formed in a thin mantle of loess or erosional sediments and the underlying Tazewell glacial till. The landscape consists of broad, plane and convex ridges, long, convex side slopes, and concave drainageways. Slopes are nearly level to moderately sloping.

Nearly all of this region is cultivated. Corn and soybeans are the principal crops. Native vegetation is mixed tall and short grass prairie.

★ *Fun Fact: Unique wetlands called 'fens' are common in this region. Fens typically are formed on sidehills from groundwater discharge. Fens in Iowa contain about 200 different plant species, of which 20 are rare and endangered.*

## 4 Loamy Wisconsin Glacial Till Clarion – Nicollet – Webster Soils

This area is commonly referred to as the "Des Moines Lobe" of the Wisconsin-age ice sheet that covered the north central United States about 12,000 years ago. Most of this area is a nearly level to gently rolling till plain. The city of Des Moines was built on the high moraine at the farthest south extent of this lobe. Natural lakes dot this region and numerous bogs, swales and circular depressions indicate sites of previously ponded water. Much of the area is tile drained. End moraines have a banded pattern across this area and are typically described as knob and kettle topography. These soils formed in loamy glacial till, glacial outwash, and/or local alluvium.

Nearly all this area is cropland. Corn and soybeans are the major crops. Some cropland is used for hay. Native vegetation was mixed tall and short grass prairie.

★ *Fun Fact: As the glacial ice stagnated, long ridges called moraines were formed. The Iowa State Capital sits atop the far Southern end of the Wisconsin glacial advance.*

## 5 Clayey Lake Deposits Marna – Kossuth – Bode Soils

These soils formed in silty and clayey glacial lacustrine sediments overlying calcareous loamy glacial till within the Loamy Wisconsin Till area. They contain more clay and less sand than the typical soils of the Des Moines Lobe. In contrast to the Wisconsin till plain, this area's relief is low. Knobs of well drained soils are less common and less distinct, and depressions are few, shallow, and indistinct.

Nearly all this area is cropland. Corn and soybeans are the major crops. Native vegetation is tall grass prairie.

★ *Fun Fact: Nearly all of Iowa's naturally formed lakes are found in the north central part of the State.*

## 6 Iowan Erosion Surface Kenyon – Clyde – Floyd Soils

This land surface is level to gently rolling with long slopes, low relief and open views. The soils in this area formed in a mantle of silty or loamy sediments and the underlying glacial till. Recent alluvium consisting of clay, silt, sand, and gravel fill the major river valleys. Drainage is well established, though stream gradients are often low and a few areas of poor drainage or bog conditions occur. A typical feature of this area is scattered large boulders partially buried or lying on the surface. These erratics, composed of rock types not found in the area are clearly of glacial origin. A few scattered *pahas* occur in the southern part of this area. They typically are elongated and are oriented in a distinct north-west-southeast direction.

Nearly all of this area is farmed. Corn and soybeans are the major crops. A small portion is wooded, mainly on wet bottom land and on steep slopes bordering stream valleys. Many of the wet soils require artificial drainage for timely field operations and good crop growth. Native vegetation is mixed tall and short grass prairie.

★ *Fun Fact: Fossils found in this area show that tundra conditions were well established in Iowa 17,000 years ago.*

## 7 Shallow To Bedrock Rockton Soils

This region is located in the northeastern portion of the state. It consists of nearly level to very steep soils underlain by limestone and shale. Limestone is found at a depth of 20 to 40 inches and occur on sides slopes and crests of upland ridges and on stream terraces.

Row crops typically are grown on the nearly level to gently sloping uplands and on the greater part of the stream terraces. The moderately sloping to very steep areas generally are in pasture or woodland.

★ *Fun Fact: Dairies are common in northeast Iowa. Iowa ranks 12th in the nation in annual milk production.*

## 8 Loess with Bedrock Outcrops Downs – Fayette – Nordness Soils

This region is commonly incorrectly referred to as the "Driftless Area" because it suggests that this area was never glaciated. However, soil scientists and geologists have documented evidence of glacial deposits scattered throughout the area. Scenic landscapes with deep valleys, abundant rock outcrops, high bluffs, caves, crevices, sinkholes and an angular stepped skyline occur in this area. Along many of the steepest slopes, bare limestone forms rock outcrops. Often valleys take abrupt, sharp-angled turns indicating the local drainage network is controlled by joint patterns in the underlying bedrock.

Nearly all this area is in farms, but only about one-half is cropland. Feed grains and forage for dairy cattle and other livestock are principal crops. Native vegetation of the upland soils is hardwood forest.

★ *Fun Fact: The types of bedrock found in this region have resulted in the formation of many sinkholes, springs, and caves.*

## 9 Shallow Loess over Glacial Till Dinsdale – Klinger Soils

The characteristic landscape of this region is wide, gently sloping, convex ridgetops and moderately sloping side slopes. The upland soils in this region formed in a thin mantle of loess and the underlying glacial till.

Nearly all of this area is in cropland. Corn and soybeans are the major crops. Many of the wet soils require artificial drainage for timely field operations and good crop growth. Native vegetation is mixed tall and short grass prairie.

★ *Fun Fact: More than 2 billion bushels of corn are produced annually on rich Iowa soils, such as those found in this region.*

## 10 Loess Ridges and Sideslopes Tama – Muscatine - Downs Soils

This region consists of nearly level to steep soils that formed in loess. The side slopes typically have many drainageways.

Tama and Muscatine soils formed under tall prairie grasses, and Downs soils, which typically are located on steeper slopes along the major river systems, formed under a mix of deciduous trees and tall grass prairie. Nearly all of this region is cultivated. Corn and soybeans are the principal crops. Some of the steeper areas are used for hay and pasture or remain in timber.

★ *Fun Fact: The Muscatine Soil is rated as the top crop-producing soil in Iowa.*

## 11 Loess with exposures of Glacial Till Marshall – Shelby Soils

This region is characterized by broad, rounded ridgetops and gently sloping to strongly sloping side slopes with wide river valleys. Most of the soils on the ridgetops and upper portions of the slopes in this region formed in deep loess. On the steeper portions of the slopes, glacial till commonly is exposed. Nearly all of this region is cultivated. Corn and soybeans are the principal crops. Some of the steeper areas are used for hay and pasture. Native vegetation is mixed tall and short grass prairie.

★ *Fun Fact: The native prairie vegetation resulted in soils with topsoil as thick as 20 inches.*

## 12 Very Deep Loess Monona – Ida – Napier Soils

This region has nearly level to moderately sloping ridgetops and moderately sloping to steep side slopes. It is dissected by numerous drainageways in which gullies are common.

Monona and Ida soils formed in deep loess. Monona soils typically occur on the broader ridges and long smooth side slopes. Ida soils typically occur on narrow ridgetops and the steepest portion of the hill slope. Napier soils formed in local alluvium and occur in most of the narrow drainageways and on footslopes. Nearly all of this region is cultivated. Corn and soybeans are the principal crops. Some of the steeper areas are used for hay and pasture. Native vegetation is mixed tall and short grass prairie.

★ *Fun Fact: Man-made terraces cross the landscape in this region to protect these soils from gully erosion.*

## 13 Missouri River Bluffs Ida – Hamburg Soils

This region consists of a narrow band of soils that formed in thick loess under prairie grasses in the bluffs area east of the Missouri River floodplain. It is characterized by narrow, rounded ridgetops; long, steep to very steep side slopes; and very deep, raw gullies.

These steep and very steep soils formed in deep loess. The Hamburg soils typically occur closest to the floodplain and are characterized by the 'catsteps' formed by small earth slips on the very steep slopes. Napier soils formed in local alluvium and occur in most of the narrow drainageways and on footslopes.

Some ridgetops and side slopes and small areas along drainageways are cultivated and used for row crops and pasture. Most of the steeper areas are in permanent pasture or timber.

★ *Fun Fact: Landscapes similar to the loess bluffs only exist in the corresponding latitudes of China along the Yellow River.*

## 14 Missouri River Alluvium Albaton – Luton – Onawa Soils

This region of the Missouri River floodplain is characterized as a nearly level, broad, valley floor. Although once a braided river system with numerous islands and channels, the main channel of the Missouri River was narrowed to about half of its original width, and most of the islands eliminated. The river carries large loads of sediment. Tributary streams also carry large loads of sediment because of the erosive nature of the adjacent loess mantled hills.

The soils in this area formed from alluvium deposited by the Missouri River and its tributaries, and from soil washed from the adjacent loess covered hills.

Nearly all of this region is dominated by agriculture. Corn and soybeans are the principal crops. A few old oxbow river channels still remain as wildlife habitat and recreational areas.

★ *Fun Fact: The Lewis and Clark Exploration traveled this region noting the appearance of deer, bear and elk for 37 days in 1804.*

## 15 Loess Ridges/Glacial Till – SW Iowa Sharpsburg – Shelby – Adair Soils

Slopes in this region are mostly rolling to hilly but some broad ridge tops are nearly level to undulating. The slopes bordering major stream valleys are steep. A few large rivers have nearly level and broad valley floors.

Deep loess soils, such as Sharpsburg, make up a good share of the upland hillslopes. Where slopes are steeper and sharper, glacial tills soils such as Shelby and Adair are more prominent.

Historically, this area was dominated by prairie with the remainder of its landscape covered by forest, savannas, or shrub lands. Today, this region is dominated by agriculture, with only about 5 percent of land covered by native vegetation.

★ *Fun Fact: Thin layers of volcanic ash originating from now extinct volcanoes in Yellowstone can be found here sandwiched between layers of glacial till.*

## 16 Loess, Shale, and Glacial Till Pershing – Gosport – Gara Soils

This region consists of gently sloping to strongly sloping soils that formed in loess and strongly sloping to steep soils that formed in shale and glacial till. Pershing, Gosport, and Gara are the major soil in this region. These soils are gently sloping and moderately sloping. They formed in loess under mixed prairie grasses and trees. Gosport soils formed in residuum from shale under forest vegetation and occupy the steepest parts of the slopes. Gara soils are on strongly sloping to steep convex side slopes. They formed in glacial till under mixed prairie grasses and trees.

The steeper areas of this region are used mostly for hay, pasture, and woodland. The gently sloping soils are used for row crops.

★ *Fun Fact: Fossils dating back 300 million years from extinct marine animals identified as 'conodonts' are common in the shales of this region.*

## 17 Loess Ridges/Glacial Till – SE Iowa Otley – Ladoga Soils

This region consists of soils developed in loess on broad, convex ridgetops and upper side slopes. Soils developed in glacial till soils dominate the steeper side slopes. The side slopes are dissected with many drainage ways and small streams. A few large rivers have nearly level and broad valley floors.

Otley and Ladoga formed in loess and contain 35 to 42 percent clay in the subsoil. Gara soils formed in glacial till and contain 30 to 35 percent clay in the subsoil. Native vegetation of Otley soil is tall grass prairie. Ladoga and Gara soils developed under mixed prairie grasses and deciduous forest.

Most of this region is farmed, with about 70 percent in cropland. Common crops are corn and soybeans, with some hay. Swine and cattle operations are common.

★ *Fun Fact: European settlement occurred in this region as early as the 1830s along the region's many rivers, which provided a source of fresh water.*

## 18 Eolian Sand Sparta – Chelsea – Dickinson Soils

This region consists of well-drained and excessively-drained soils that formed from windblown sandy and loamy parent material. These soils occur on high stream benches and upland side slopes, mainly along the bluffs and breaks of the major rivers.

Most of the soils in this area are droughty and are susceptible to wind and water erosion. Flatter areas are used for cultivated crops but the steeper slopes are used for pasture, woodland, and wildlife habitat.

★ *Fun Fact: As glaciers melted, strong winds blew the exposed soil and formed sand sheets, dunes, and stringers in Iowa.*

## 19 Loess –Timbered Fayette Soils

This region consists of soils on broad to narrow, convex ridgetops, and long convex side slopes. Many of these areas occur on the steeper slopes near major streams. The side slopes are dissected by numerous waterways. The landscape is undulating to very steep. The dominant soil of this area, Fayette, formed in loess under native forest conditions.

Most of the less sloping areas of this region are farmed but some of the steepest areas remain in timber or are used for pasture.

★ *Fun Fact: The native forest conditions result in an abundance of Morel mushrooms in the Spring.*

## 20 Alluvium Colo – Chequest – Titus Soils

Alluvial soils occur on floodplains along rivers and streams throughout Iowa. In the southeastern portion of the state, the poorly drained Colo, Chequest, and Titus soils make up a large portion of floodplain soils. Most of these soils are artificially drained and in cropland, but some oxbow wetlands remain. Corn and soybeans are the major crops.

★ *Fun Fact: The lowest elevation in Iowa at 480 feet above sea level occurs where the Des Moines River joins the Mississippi.*

## 21 Loess Ridges/Glacial Till Sideslopes Grundy – Haig – Arispe – Gara Soils

This region consists of soils developed in loess on broad, convex ridgetops and side slopes and glacial till on strongly sloping to steep side slopes. Grundy, Haig, and Arispe are the major soils on slopes of less than 9 percent. These soils typically contain 42 to 48 percent clay in the subsoil. Many of the side slopes that are steeper than 9 percent developed in glacial till. Gara is the major soils on these positions.

Nearly all of this area is farmed. Corn and soybeans are the major crops. Native vegetation of Grundy, Haig, and Arispe is tall grass prairie. Gara soils formed under a mix of prairie grasses and deciduous trees.

★ *Fun Fact: Natural geologic erosion in this region has left the oldest landscape surfaces at the highest elevations, while younger surfaces are cut into lower landscape positions.*

## 22 Loess Ridges/Clay Paleosol Seymour – Edina - Clarinda Soils

This region consists of nearly level to moderately sloping soils formed in loess on wide upland divides and upper side slopes, and moderately sloping to steep soils formed in glacial till or a paleosol formed in glacial till on side slopes. Seymour, Edina, and Clarinda formed under prairie grasses and are the major soils. Seymour and Edina formed in loess and Clarinda soils formed in a paleosol formed in glacial till. These soils typically contain more than 45 percent clay in the subsoil. Gara soils formed in glacial till under mixed prairie grasses and trees, and typically occur on the steepest slopes.

The majority of the nearly level to moderately sloping soils are farmed. Corn and soybeans are the major crops. Many of the steeper slopes are in pasture.

★ *Fun Fact: This was one of the main coal mining regions in Iowa during the first third of the 20th century.*

Detailed information about individual soil series can be found at:  
<http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi>





# HIGHWAY GUIDE OF IOWA SOIL ASSOCIATIONS

**Loess**—material transported and deposited by wind and consisting of predominately silt-sized particles.

**Moraine**—a mound, ridge, or other topographicly distinct accumulation of glacial till deposits primarily by the direct action of glacial ice.

**Paha**—prominent hills typically oriented from northwest to southeast, that tend to be in the southern part of the Iowan Erosion Surface, and typically have large deposits of loess on them.

**Colluvial/Colluvium**—soil material deposited in footslope positions by the action of gravity, soil creep, or local wash.

**Glacial till**—generally unconsolidated and non-stratified material deposited directly by a glacier without subsequent reworking by melt water, and consisting of clay, silt, sand, gravel, stones, and boulders intermingled in any proportion.

**Knob and kettle topography**—an undulating landscape in which a dispersed assemblage of stream terraces or ridges of glacial till is interspersed with irregular depressions.

**Lacustrine sediments**—material deposited in lake water and later exposed by receding water levels.

**Tazewell glacial till**—the earliest advance of the most recent glaciation period in Iowa, considered to be approximately 26 thousand to 40 thousand years before present.

## Glossary of Terms

### Iowa Soil Regions

**Legend**

Soil Regions

- 1 Loess over glacial till - low rainfall
- 2 Northwest Iowa Loess
- 3 Tazewell Glacial Till
- 4 Loamy Wisconsin Glacial Till
- 5 Clayey Lake Deposits
- 6 Iowan Erosion Surface
- 7 Shallow to Bedrock
- 8 Loess with Bedrock Outcrops
- 9 Shallow Loess over Glacial Till
- 10 Loess Ridges and Sideslopes
- 11 Loess with exposures of Glacial Till
- 12 Very Deep Loess
- 13 Missouri River Bluffs
- 14 Missouri River Alluvium
- 15 Loess Ridges/Glacial Till - SW Iowa
- 16 Loess, Shale, and Glacial Till
- 17 Loess Ridges/Glacial Till - SE Iowa
- 18 Eolian Sand
- 19 Loess - Timbered
- 20 Alluvium
- 21 Loess Ridges/Glacial Till Sideslopes
- 22 Loess Ridges/Clay Paleosol
- 23 Water

USDA NRCS  
United States Department of Agriculture  
Natural Resources Conservation Service

