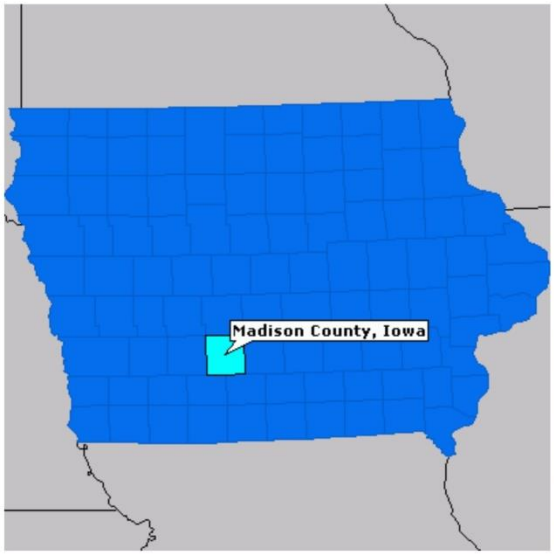
A NATURALIST'S GUIDE TO MADISON COUNTY, IA

What resources can our geology offer?



Madison Beeler

Madison Beeler

Chad Heinzel

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ABSTRACT

This compilation of research will provide a general background on the geologic record of Iowa and the landform regions in Iowa. From this, a more detailed scope of view will focus on the bedrock geology, landforms, natural resources, history, and recreational opportunities of Madison County. This guide will aid and inform tourists, teachers, geology enthusiasts, and natives to the area how the geology has impacted Madison County in each of the noted areas above over time, and what resources this provides for the county. I will also highlight steps that Madison County is taking to maximize resources and recreational opportunities.

INTRODUCTION

Growing up in the heart of south-central Iowa, I was immediately exposed to the rich history and landscape of Madison County. From the covered bridges, to Pammel State Park, Madison County, Iowa has many historical and geological areas of interest that I hope to shed light on within this project.

Geology influences our daily life in many ways. For Madison County, the abundance of limestone became a not only an important economic resource, but the basis for many historical monuments throughout the county. Cliffs of limestone and shale can be viewed along many of the rivers throughout the county, enriching the scenery and providing an abundant fossil record of the Carboniferous Period for those willing to explore the strata further. It is within the Winterset Limestone and Bethany Limestones, particularly, that these fossils can be found, and these limestones, among many other resources, are of great economic importance to the county.

HISTORICAL BACKGROUND

Madison County was founded January 13, 1846, named after James Madison, the fourth president of the United States. James Madison was viewed as a man of dignity and worth, and the ideal of the "old-fashioned American gentleman" (Des Moines Union Historical Company, 1879). The first man to organize the colonization was Hiram Hurst of Missouri. It was believed that he came to Iowa in order to avoid arrest for arson.

Madison County was acquired from the Native Americans by peaceful negotiation. Although the natives requested that upon the settlers' arrival they would be granted a reservation, but the government did not agree to provide them with this land. In a situation that could have easily turned into a quarrel, the settlers compromised by paying the Native Americans a sum of money to leave the area, and they did so without much resistance. Near the end of April 1843, the Treaty of Western Iowa had been finalized, and settlers anxiously waited along the Des Moines River to move into new territory. The land of Madison County, initially named "Hoosier Prairie" was highly sought after, even before knowledge of potential coal mining due to the fertile soil and abundance of streams throughout the county. Settlers were anxious to break ground and begin cultivating crops (Des Moines Union Historical Company, 1879).

Madison County is most popularly known for its world famous covered bridges. Originally, nineteen covered bridges were erected, only 6 remain today. The six bridges are Imes, Roseman, Hogback, Holliwell, Cedar, and the Cutler-Donahoe. Most of the bridges are between 80-100 feet in length. The bridges were originally covered by the Madison County Board of Supervisors to protect the floorboards of the roadway, since these materials would be more expensive to replace that the wood making up the walls

and ceiling of the covered bridges. Most bridges were constructed in the late 1800s and have since been renovated around the 1990s. A celebratory bridge festival tradition was established in 1970, and every year since then during the second weekend in October the covered bridges are honored with a parade and guided tours of the current Bridges of Madison County.

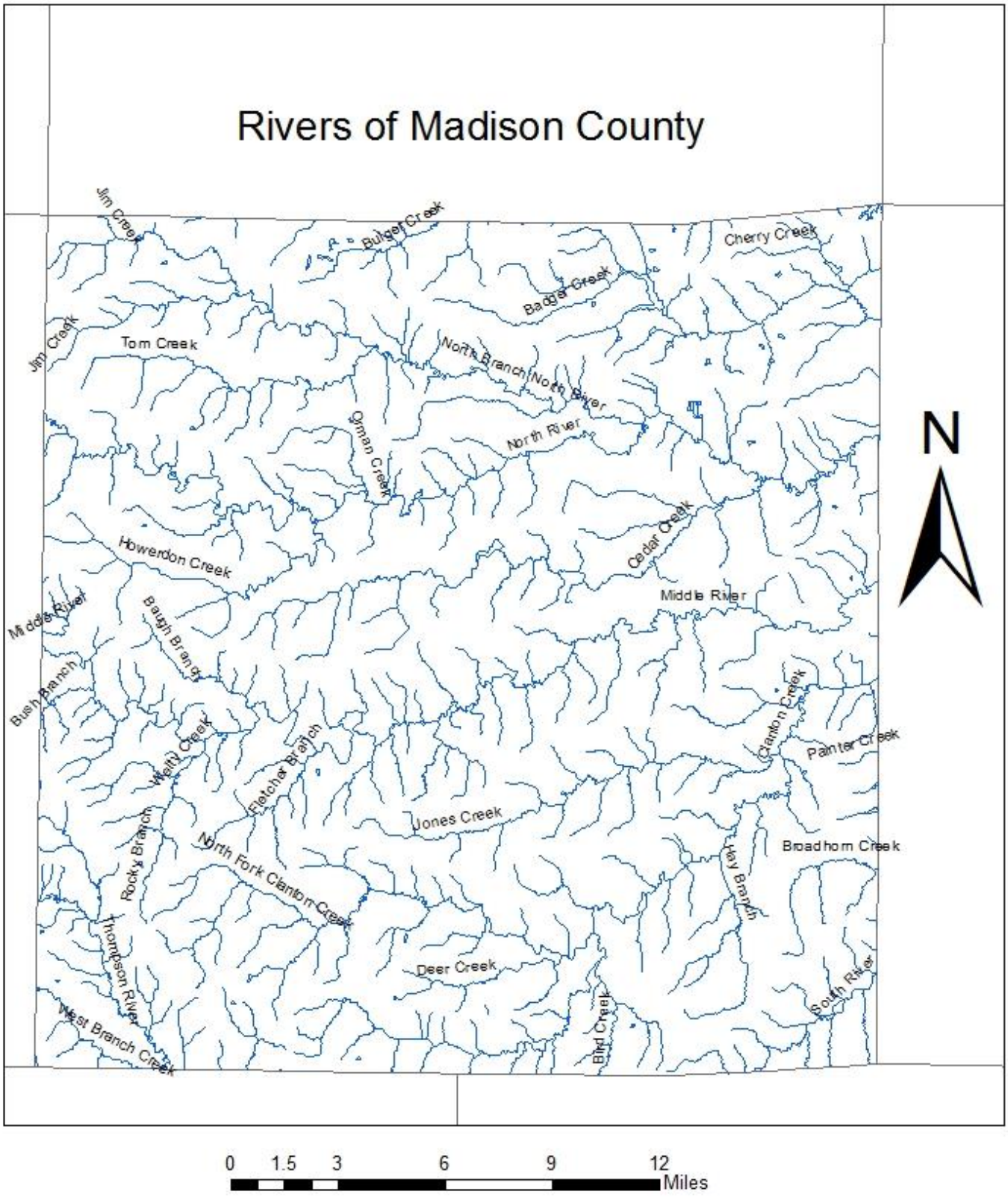
Another historical landmark is Clark Tower. Clark Tower is a tower constructed with Bethany Limestone located in Winterset City Park. The tower was originally erected in 1926 in memory of Caleb Clark, a stonemason who was the first white settler of Madison County. The tower stands 25 feet tall (Madison County Chamber of Commerce).

GEOGRAPHY

Madison County, located in south-central Iowa, is home to more than 15,600 of Iowa's residents (United States Census Bureau). The population density is approximately 28 people per square mile, lower than the average county population density in Iowa. Madison County is made up of 32% urban, and 64% rural areas.

There are four main rivers that make up Madison County, North River, Middle River, South River, and Thompson River. Middle River, North River and their tributaries together drain about 91% of Madison County (Benton, 1921). Each of these streams and major rivers are depicted in the figure below (Figure 1). The drainage from the Middle and North Rivers largely flows into the Des Moines River; These drainage patterns strongly dictate the future development of recreational areas in Madison County. Due to the high amount of surface drainage, water quality of runoff becomes a concern.

Figure 1.



As shown in this figure, Madison County is abundant in rivers and streams. These waterways have long influenced the surrounding landforms, and dictate what areas can be developed.

IOWA'S GEOLOGIC PAST

PRECAMBRIAN (541 Ma to 4.6 Ga)

The Precambrian history in the state of Iowa begins nearly 3 billion years ago with the complex formation of igneous and metamorphic rocks. This is the longest period in Earth's history, but is only represented in the extreme Northwest corner of Iowa. Mountain building events took place to form the Penokean Orogen, the Central Plains Orogenic Belt, and the Eastern Granite Rhyolite Province.

Formed during the Precambrian Period, Sioux Quartzite remains today as Iowa's oldest exposed bedrock at 1.6 billion years in age. The Sioux Quartzite was originally thought to be an uplifted ridge of a sedimentary environment, but due to its quartz composition the Sioux Quartzite has been able to withstand significant weathering and erosion throughout time. Its environment of deposition was most likely fluvial.

Although the Precambrian Period accounts for 88% of Earth's history, only a small fraction of it is exposed in Lyon County, Iowa and cannot be found at the surface in any other part of the state. There have been several investigations conducted in order to explore Precambrian geology. Several drill sites around Iowa have been pursued in hopes of gaining more knowledge on Iowa's Precambrian history, few have had the reached depths far enough below to detect the presence of oil, gas, or other valuable natural resources.

CAMBRIAN (485 Ma to 541 Ma)

During much of the Cambrian time period, Iowa was above water, experiencing significant weathering and erosion. We know this to be true due to the lack of deposition

during the Early Cambrian, leaving an unconformity in rock strata. This missing gap in time amounts to be approximately 370 million years. By the Late Cambrian, the interior of the continent slowly sank, and seas transgressed. Iowa was once again flooded and left with shoreline and offshore shelf deposits. Similar environments tell us that depth of this marine shelf was about 600 feet and can be observed today in the Gulf of Mexico.

There are six major formations present in Cambrian strata: Mt. Simon, Eau Claire, Wonewoc, Lone Rock, St. Lawrence, and Jordan. The Mt. Simon, Wonewoc, and Jordan formations all mark the base and top of each transgressive-regressive sequence and are representative of shoreline or inner-shelf environments. These formations are composed of mature quartz sandstones, with well-rounded, well-sorted grains, and chemically uniform grains. These grains have been significantly weathered and transported by both wind and water from underlying Precambrian rock during the late Precambrian and Early to Middle Cambrian time. The Eau Claire, Lone Rock, and St. Lawrence formations accumulated in deeper, offshore marine settings.

Cambrian bedrock is located in the far Northeast corner of Iowa in Alamakee County. The Cambrian Period is also known as the “Age of the Trilobites” due to increased oxygen levels in the atmosphere increasing the diversity of life. However, since there is little exposed Cambrian bedrock in the state of Iowa, trilobites are not typically found.

ORDOVICIAN (443 Ma to 485 Ma)

During most of the Ordovician, the state of Iowa was underwater. The shallow, shifting inland sea initiated the formation of many of carbonate rocks, sandy carbonate rocks, and quartz sandstones. Many of these rocks are well represented in the Prairie du Chien formation. The marine deposition of this marine sediment remained

uninterrupted until the Early Ordovician. Toward the end of the Early Ordovician, the sea withdrew from the interior of the continent and previously deposited rock was then exposed and weathered.

In Middle Ordovician time, the sea transgressed inward from the continental margins to once again submerge Iowa over its eroded surface. As the seas continued to advance, the environments of deposition changed from a sandy seafloor, to a muddy carbonate shelf. Many of the Middle Ordovician formations such as the Glenwood, Platteville, Decorah, and Dunleith are composed of these marine muds and carbonate sediments.

During the Late Ordovician, these muds and carbonates continued to be deposited and contributed to the formation of the Wise Lake, Dubuque, and Maquoketa formations. It is also during the Late Ordovician that we see a variety of fossils present within the strata. Past life included graptolites, cephalopods, gastropods, brachiopods, bivalves, and trilobites. Near the end of the Ordovician, the sea once again regressed, allowing for more weathering and erosion to occur. There is an unconformity separating the Ordovician and Silurian periods. Today we can observe exposed Ordovician rock in Northeast Iowa.

SILURIAN (419 Ma to 443 Ma)

Iowa's Silurian rock consists almost entirely of marine carbonate sediments. The Silurian Period has eight major formations that are present in Iowa. The Mosalem, Tete des Morts, Blanding, Hopkinton, Scotch Grove, and Gower are composed primarily of dolostone. The two limestone formations of the Silurian are the Waucoma and the La Porte City. The Silurian rock layer is valuable for a variety of ways in the state of Iowa. Silurian rock has provided us with agricultural lime, road aggregate, concrete aggregate,

building stone, and bedrock aquifers. In addition to resources, Silurian rock has also provided Iowa with a number of state parks in Northeast Iowa.

The Hopkinton Formation, in particular, can be found in Backbone State Park and the Maquoketa Caves State Park. The Hopkinton is composed of fine to coarse grained crystalline dolostones with cherty intervals. Within these Hopkinton dolostone exposures, much of Silurian life is represented.

The Silurian fossil record is similar to that of the Ordovician, just not as well preserved. In the Silurian, colonial corals, solitary corals, bryozoans, brachiopods, trilobites, and nautiloid cephalopods comprised a diverse community of organisms. The strata in which these fossils are found are helpful in determining water depths of the Silurian Seas.

DEVONIAN (358 Ma to 419 Ma)

Due to the absence of seas near the beginning of the Devonian, marine sediment was not deposited until the Middle Devonian, starting with the Wapsipinicon group. Within this group were the Bertram, Otis, Spillville, and Pinicon Ridge Formations.

This deposition continued until the Late Devonian with the Cedar Valley Group containing the Little Cedar, Coralville, Lithograph City, and Shell Rock Formations. All formations within the Little Cedar Group are composed of limestone or dolostone. Within these formations, well preserved fossils of brachiopods, bryozoans, corals, conodonts, and stromatoporoids can be found. During the Late Devonian a global mass extinction occurred, which particularly targeted brachiopods, bryozoans, colonial corals, echinoderms, and stromatoporoids. The youngest Devonian deposits are composed primarily of shales due to the muddy marine shelf environment with deoxygenated

waters.

Today, the Devonian serves as a source of pure limestone and an important aquifer for the state of Iowa. It has proven to be economically valuable by being a crucial source of aggregate for concrete and cement.

CARBONIFEROUS (358 Ma to 298 Ma)

The rock record deposited during the Carboniferous can be divided into two periods, the Mississippian and the Pennsylvanian. The Mississippian Period marks the last major sea to submerge Iowa, and within the strata, ten transgression-regression cycles can be observed. Due to these significant changes in environment over time, many different formations can be found within the Mississippian System. Limestones, dolomites, cherts, and evaporites are all present within the strata. Mississippian environments were likely similar to that of the Bahama Banks we see today. Limestones are frequently quarried today in Lee, Des Moines, Hancock, and Cerro Gordo Counties (Anderson, 1998).

A unique characteristic of the Mississippian geologic record in Iowa is the abundance of geodes, Iowa's state rock. Keokuk, Iowa is home to one of the most well-known geode locations in the world. Geodes originate from the Warsaw formation, with quartz being the most common mineral composing them. They are formed by the process of crystallization of minerals from solutions that have seeped into the cavities of a rock.

Common Mississippian life forms were brachiopods, bivalves, gastropods, crinoids, rugose corals, annelid worms, bryozoans, mollusks, conodonts, and trilobites. Crinoids were especially abundant and well preserved. The first amphibians discovered

in Mississippian rock strata occurred in southeast Iowa, and was not only a significant discovery for the state, but for the entire paleontological community.

During the Pennsylvanian period, seas retreated from Iowa. Due to the absence of the sea, there lies an unconformity between the Mississippian and Pennsylvanian Periods. The Pennsylvanian contains alternating layers of marine and nonmarine deposits and serves as a favorable environment for the formation of coal. Nonmarine deposits can be found in the Lower and Middle Pennsylvanian; the Upper Pennsylvanian depositional environments were marine environments.

The Pennsylvanian strata present in Iowa are diverse and varied. The types of rocks found in the Pennsylvanian are often siltstone, sandstone, clay, coal, and limestone. The four main supergroups of the Pennsylvanian are Morrow, Des Moines, Missouri, and Virgil. From these subgroups, the strata are further divided into groups, formations, and series. Pennsylvanian rock out crops can be observed in a few state parks in central Iowa such as Dolliver State Park, Ledges State Park, and Red Rock State Park (Anderson, 1998).

Understanding the formation of coal becomes very important in the Pennsylvanian rock record because transitional wetland environments favor these processes. Iowa's tropical environment and low relief favored the growth of vegetation and changes in sea level. When the growth of plant material exceeds the decomposition of plant material, this matter accumulates over time. These environments lack oxygen and are highly acidic, contributing to the formation of peat, the first step in the formation of coal. Once this peat is buried and pressurized, it takes the form of lignite. After this lignite has been pressurized and heated overtime, it becomes coal.

In the 1800s and early 1900s coal, the excitement of this discovery of coal, fueled

the mining industry in central Iowa. Unfortunately due to its high sulfur content, the burning of this coal was deemed inefficient and unclean. Energy sources in the early 1900s shifted away from coal, and more toward oil and gas energy sources. Today there are no active coal mines in the state of Iowa (Anderson, 1998).

MESOZOIC ERA (232 Ma to 66 Ma)

The Mesozoic Era consists of the Triassic, Jurassic, and Cretaceous Periods. Due to long periods or weathering and erosion, Iowa does not have a significant Mesozoic geologic record. There is no Triassic rock record, a small area of Jurassic strata in Webster County, and very poorly exposed Cretaceous rock in northwest Iowa due to thick glacial till.

The Jurassic record that is present in Iowa can be found in the Fort Dodge Formation. The evaporite, gypsum, is abundant and has a wide range of economic uses. Iowa is among the top producers of gypsum in the United States. Since it is only such a small portion of the state that this gypsum is found, resources are expected to be depleted within the next thirty years (Anderson, 1998). The Fort Dodge Formation is overlain by red and green layers of shale, sandstone, and siltstone. It is unsure the origin of the red shales, but red coloration in rocks is often indicative of oxidation.

The Cretaceous Period's most well-known formation is the Dakota Formation. This formation is found in western Iowa and is composed of a variety of rock types such varying from sandstone, to mudstone, to conglomerates. The Lower Dakota contains the course grained sandstones, pebble sandstones, and conglomerates. The Upper Dakota contains the mudstones, sandstones, and siltstones.

A Peculiar feature of the Cretaceous strata in Iowa is the Manson Impact

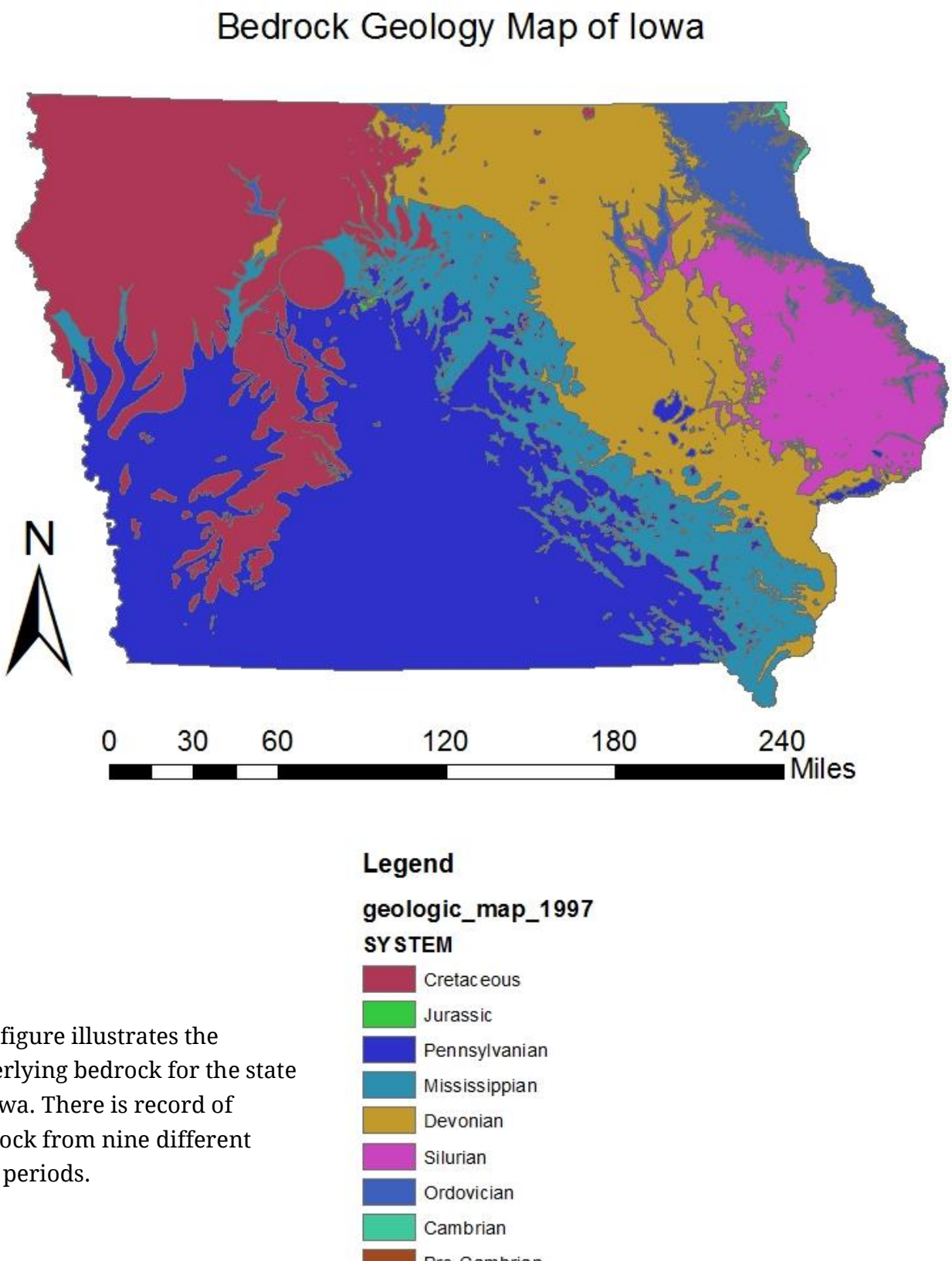
structure. The Manson Impact Structure is 73.8 million years old. It was originally dated at ~65 million years ago, and was thought to have been the cause of the extinction of dinosaurs, scientists determined that the crater was much too small, and actually occurred at an earlier date. Some smaller dinosaurs were killed, but no mass extinction took place. Today, much of the twenty three mile wide crater has been filled in by sediment, but this area remains the only circular region in Iowa where soft water is found (Anderson, 1998).

Life during the time of the Mesozoic included many vertebrate and plant species. Animals such as plesiosaurs, mosasaurs, the crocodilian reptile, the large teleost fish, and giant sea turtles are all common fossils found during the Cretaceous Period in Iowa or surrounding states. Plant remnants include lycopods, bryophytes, ferns, gymnosperms, and angiosperms (Anderson, 1998).

QUATERNARY

Much of Iowa's Quaternary record is due to deposits from the Pleistocene Epoch. During this time there were three main glaciations that impacted Iowa, they are the Pre-Illinoian, the Illionoian and the Wisconsin glaciations. The Pre-Illionoian glacial deposits were laid down between 2,5 million year ago and 500,000 years ago. The Pre-Illionoian glaciation covered nearly the entire state of Iowa. The Illinoian glaciation took place 300,000 years ago to 130,000 years ago, yet only covered the extreme southeast corner of Iowa. The Wisconsin glaciation took place about 40,000 years ago, and remained until about 10,000 years ago. The Wisconsin glaciation only covered north central Iowa, where the Des Moines Lobe landform region resides today. All bedrock exposures prior to the Quaternary can be located in the figure below (Figure 2).

Figure 2.



This figure illustrates the underlying bedrock for the state of Iowa. There is record of bedrock from nine different time periods.

IOWA'S LANDFORM REGIONS

Iowa has seven major landform regions that are present throughout the state (Figure 3). They are the Loess Hills, Des Moines Lobe, Iowan Surface, Southern Iowa Drift Plain, Northwest Iowa Plain, Paleozoic Plateau, and Alluvial Plains. Each of these land regions greatly impact the use of the land and dictate the types of habitats formed within them. There are many factors that contribute to these diverse landform regions, such as the bedrock geology, glacial history, fluvial development, and more recently human activity. All of these factors contribute to Iowa's landform regions in different ways.

The **Loess Hills** are a rare landform that was formed 18,000 years ago after the Last Ice Age. They are approximately 15 miles wide and 200 miles long, extended from Sioux City, Iowa, southward. Loess is wind-driven, homogenous, non-stratified, weakly coherent, porous, calcareous silt. They come from areas of high sedimentation such as glacial outwash or fluvial environments; the sediments must be fine enough to then be carried by the wind. These windblown soils are a unique feature due to their depth of about 200 feet. Bedrock is not often exposed within the Loess Hills, and the underlying Loess soils can easily be eroded away if topsoil is disturbed.

The **Des Moines Lobe** consists of abundant moraines and gentle rolling hills with a few shallow wetland basins and deep natural lakes. This region in North-central Iowa is composed of till that is angular, poorly sorted, and contains clay, causing it to be quite impermeable. Many of the shallow wetland basins have been drained to be used for agricultural purposes. This area is the most recently glaciated portion of the state, and area of land occupied by the Des Moines Lobe has undergone less weathering and erosion than other landform regions, since it has been most recently glaciated by the

Wisconsin glaciation (40,000-10,500 years ago).

The **Iowan Surface** is a gently rolling region with a thin layer of loam over glacial drift that covers much of northeast Iowa. This landform region is located in the northeast corner of Iowa and was glaciated during the Pre-Illinoisan glaciation (2,500,000 to 500,000 years ago) along with the Southern Iowa Drift Plain, but had later been eroded more aggressively by the Wisconsin glaciation. There are many large glacial boulders that can be found northeast Iowa. Since this area has been glaciated multiple times, the Iowa Surface has experienced more weathering and erosion, contributing to its gradual, elongate hills. Due to the glaciers scraping away at the surface, bedrock is not found too far beneath the soil, and is exposed in many places. Although the area has relatively low relief, its drainage system is relatively effective. Karst topography occurs, as underlying limestone has dissolved and collapsed to form sinkholes overtime.

The **Southern Iowa Drift Plain** is the largest landform region, extending through most of the southern half of Iowa (including Madison County as shown in Figure 4). It has a moderate cover of Loess, and is almost entirely covered of glacial drift. The area is interrupted by many streams traveling through providing a landscape of rolling hills. Streams have had much to do with the molding of the Southern Iowa Drift Plain landform. During the time that the Des Moines Lobe was ice covered due to the Wisconsin glaciation, much of the ice that melted flowed down through the Southern Iowa Drift Plain giving it the topography that we see today. The exposed bedrock we see is typically found in deeper valleys that have been carved out by streams and rivers.

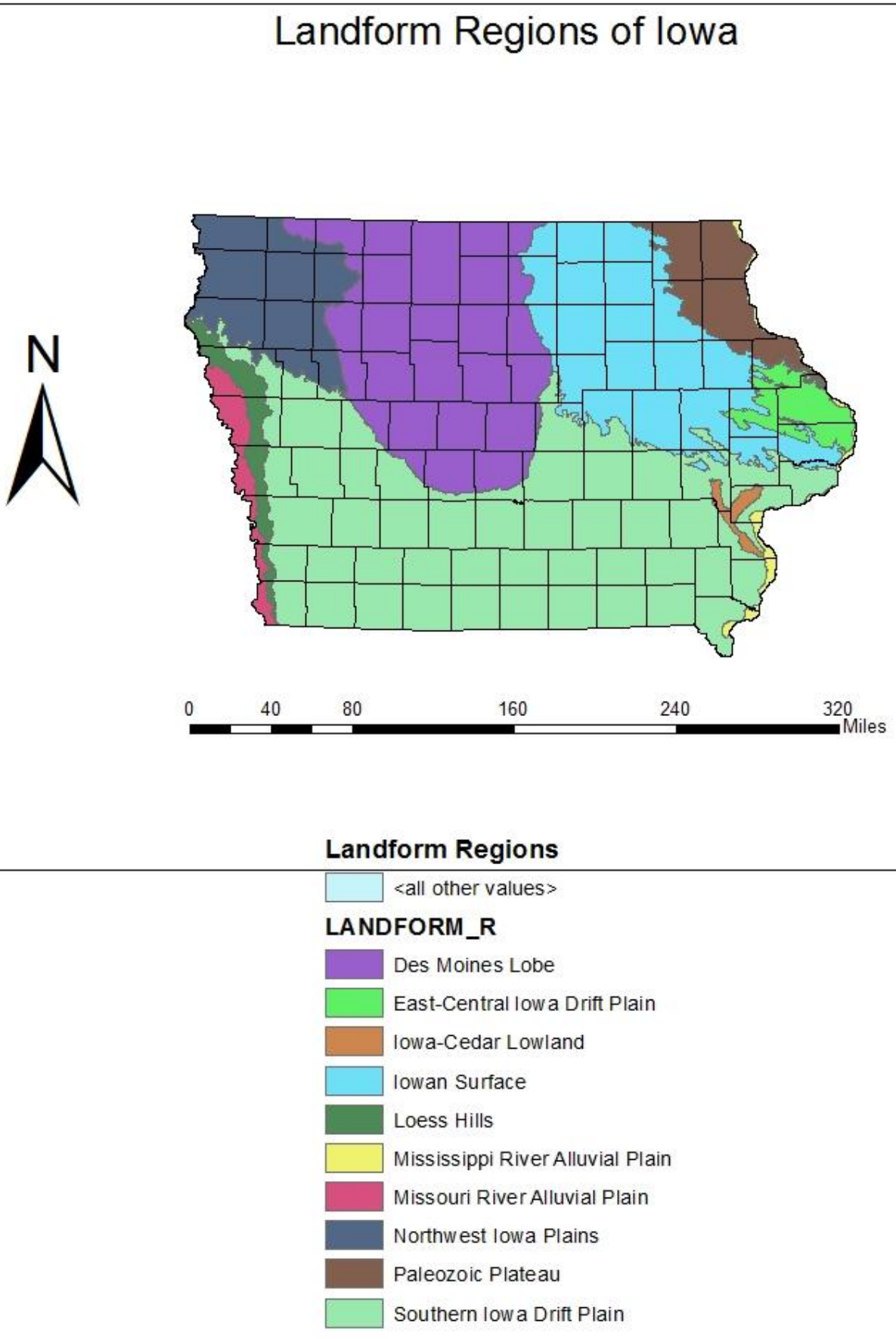
The **Northwest Iowa Plains** includes a small area occupying the northwest corner of Iowa. Similar to the Iowan Surface, this landform region has low relief, with a thin to moderate loess cover over glacial till. The western portion of the Northwest Iowa Plains

had been glaciated by the Pre-Illinoisan glaciation, and the eastern part of this landform region had been glaciated by the Wisconsin glaciation. This area has a well-developed network of streams, and has a higher elevation than any other part of the state. This corner of Iowa also receives less annual rainfall, on average, than other part of the state. Bedrock exposures are rare (with the exception of the Sioux Quartzite) and trees and vegetation are not as abundant.

The **Paleozoic Plateau** landform region can be found in the far northeast corner of the state, and has some of the most distinct land features in the state. Glacial deposits are not present, and karst topography is common. The Paleozoic Plateau is home to Pikes Peak State Park, and has the highest relief topography of the state. Bedrock is exposed frequently throughout the terrain. Ravines and narrow valleys are common in this landform region. Cool water streams give rise to moist, wooded habitats for a wide variety of animals and plants.

The **Alluvial Plains** are caused by the flow of water off of a landscape carrying along sediments such as cobbles, gravels, sands, and silts. This type of landform in Iowa can be found along the Missouri and Mississippi rivers where the flow of sediment is greatest. These plains are constantly being changed and modified due to the continuous flow, terraces and alluvial fans are common features of this landform (Iowa Department of Natural Resources: Landform Regions).

Figure 3.


Landform Regions of Iowa
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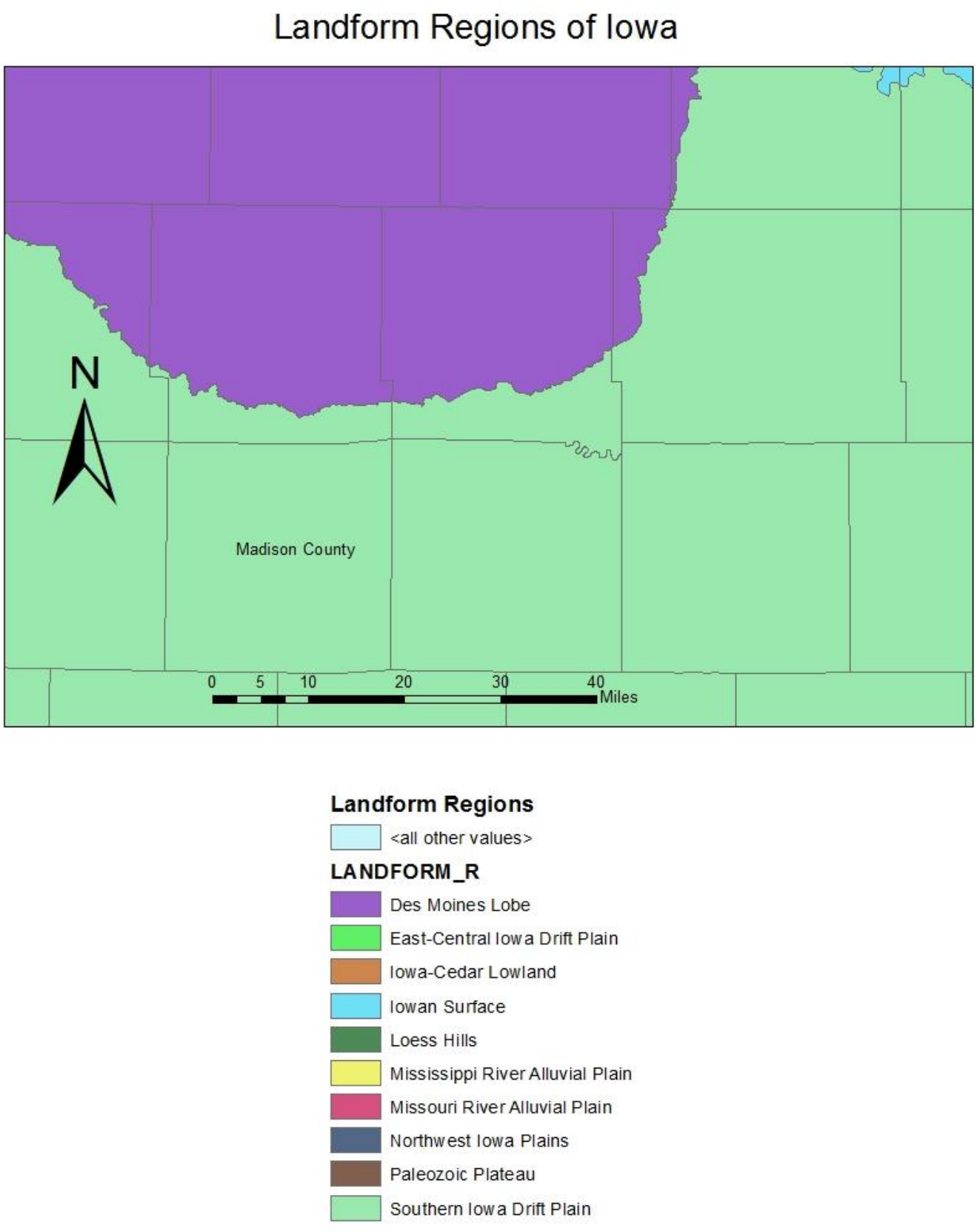
LANDFORM_R
Des Moines Lobe
East-Central Iowa Drift Plain
Iowa-Cedar Lowland
Iowan Surface
Loess Hills
Mississippi River Alluvial Plain
Missouri River Alluvial Plain
Northwest Iowa Plains
Paleozoic Plateau
Southern Iowa Drift Plain

Figure 4.


Landform Regions of Iowa
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Des Moines Lobe
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Iowa-Cedar Lowland
Iowan Surface
Loess Hills
Mississippi River Alluvial Plain
Missouri River Alluvial Plain
Northwest Iowa Plains
Paleozoic Plateau
Southern Iowa Drift Plain

GEOLOGY OF MADISON COUNTY

BEDROCK GEOLOGY

The bedrock immediately underlying Madison County is entirely Carboniferous, responsible for the abundance of limestone and shale (Figure 5). More recent deposits from the Pleistocene overlay the Carboniferous, contributing clay, sand and loess. It was originally thought that some Cretaceous rock was once present in Madison County due to an unconformity in the geologic record, but it has not been proven (Tilton & Bain, 1897).

The Des Moines supergroup is part of the Middle Pennsylvanian, and underlies eastern Madison County (citation). The deposition for this series took place during five transgression-regression cycles. The result of alternating marine and nonmarine deposits are alternating layers of shales, sandstones, limestone, and some coal. In the Des Moines supergroup, especially, there is little continuity within individual rock beds over a long distance, but general characteristics of rock layers can be recognized over a wide area. The best exposures of the Des Moines are located along Clanton Creek in the South township, though occasional outcrops can be found in the eastern part of the county.

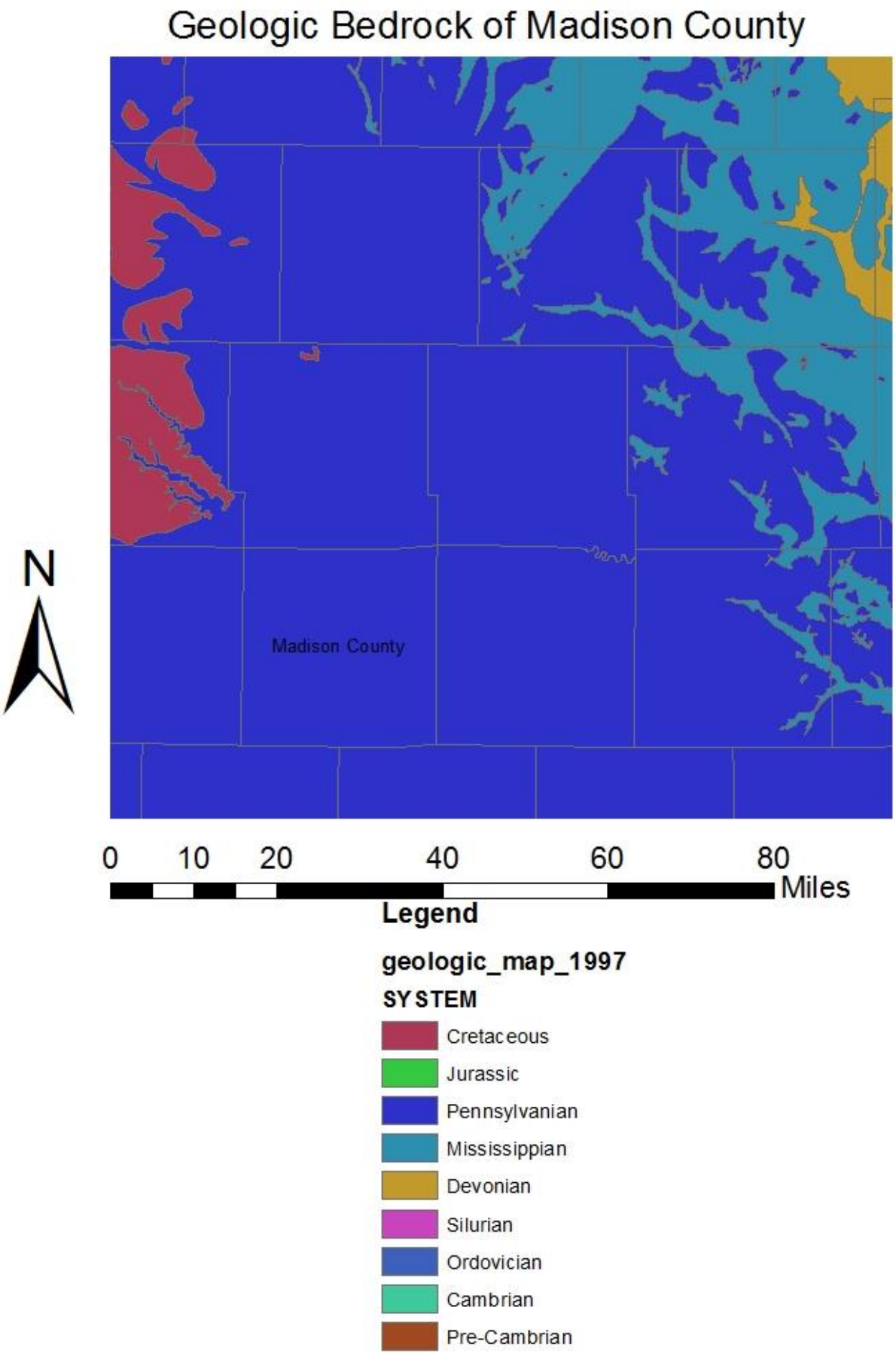
Of the Des Moines supergroup, the Cherokee group remains the most prominent. It is within the Cherokee group specifically that coal can be found, due to its primarily marine and marginal marine environment of deposition (Anderson, 1998). The Cherokee group is not well exposed in Madison County.

The Missourian supergroup contains primarily alternating layers of shale and limestone. The most prominent feature of the Missourian supergroup in Madison County is the Bethany limestone. These strata are well exposed along the Middle River. Other

limestones present in the Missourian are Fragmental, Winterset, and Earlham limestones. Fragmental limestone exposure can be found near Clanton Creek. Winterset limestone exposures are best observed southwest of Winterset along the Middle River (Wilson, 1992). Earlham limestones are commonly exposed near the town of Earlham (Mueller, 1915). Due to the abundance of limestone, there is a large number of fossil species that can be found within the Missourian supergroup.

About the Missourian and the Des Moines strata we see Pleistocene deposits. Most of these deposits are composed of rich clays, sands, and loess. Thinner layers of this glacial drift are found in the northwest part of the county. This thinning is most likely due to glacial movement, and ultimately erosion.

Figure 5.


Geologic Bedrock of Madison County
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SYSTEM
Cretaceous
Jurassic
Pennsylvanian
Mississippian
Devonian
Silurian
Ordovician
Cambrian
Pre-Cambrian

FOSSIL SPECIES FOUND

Des Moines Supergroup

1. *Spirifer cameratus*
2. *Rhynchonella*
3. *Productus cora*
4. *Lepidodendron*

Missourian Supergroup

5. *Spirifer lineatus*
6. *Productus costatus*
7. *Productus longispinus*
8. *Athyris subtilita*
9. *Hustedia mormoni*
10. *Spiriferina kentuckensis*
11. *Lophophyllum proliferum*
12. *Productus punctatus*
13. *Derbya crassa*
14. *Myalina subquadrata*
15. *Aviculopecten occidentalis*

(Tilton & Bain, 1897)

Figure 6.

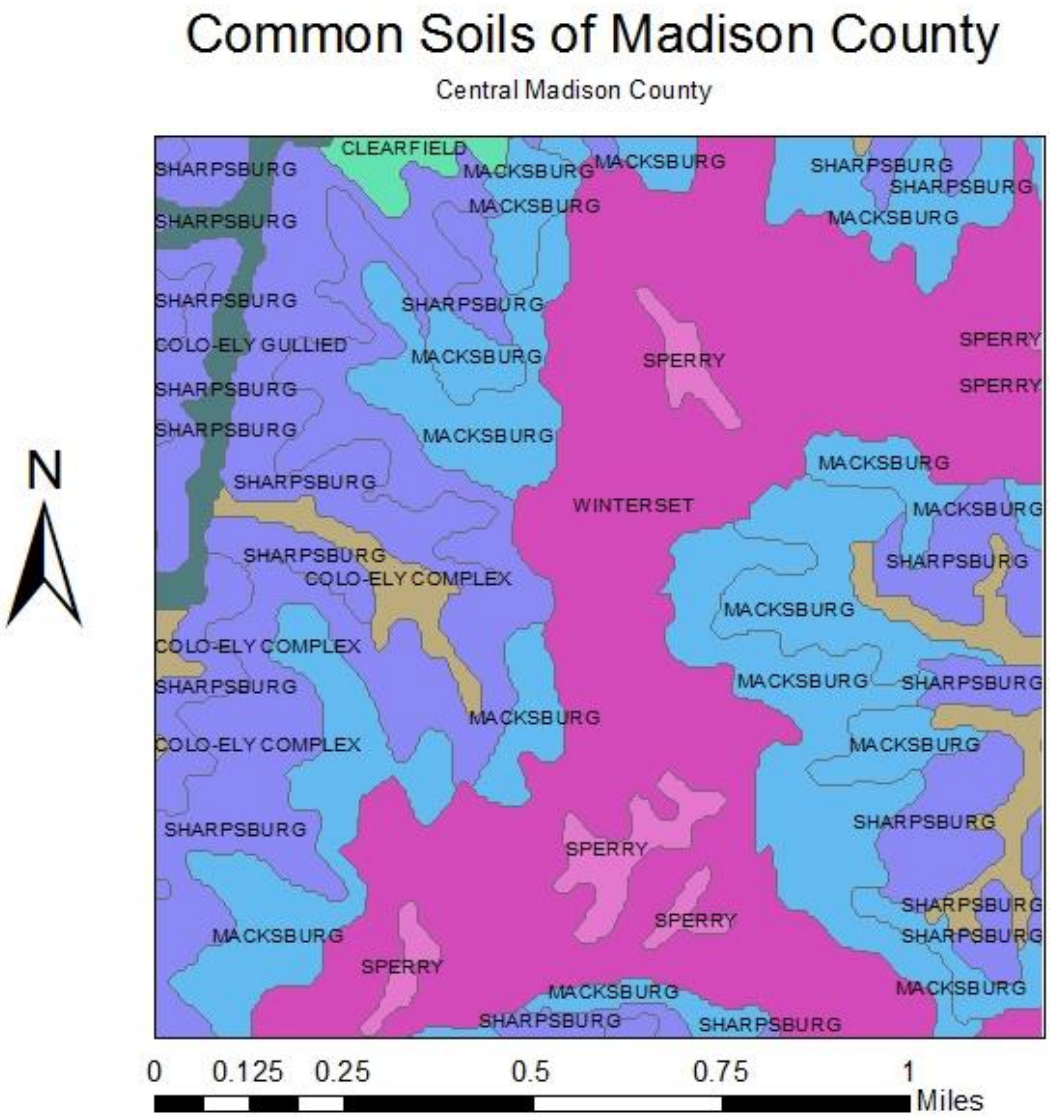
Common Soils of Madison County
Central Madison County
CLEARFIELD
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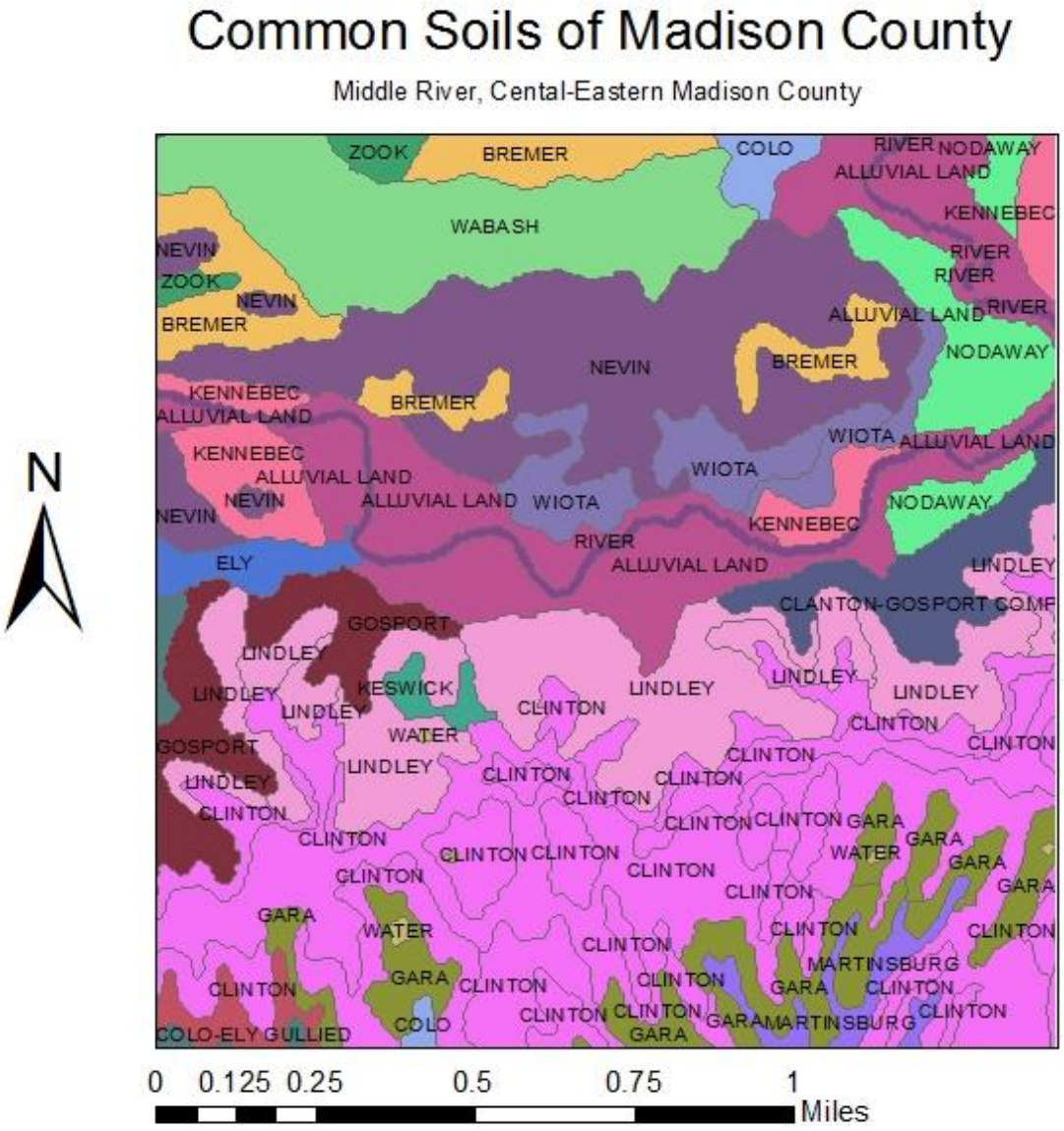
Figure 7.


Common Soils of Madison County
Middle River, Cental-Eastern Madison County
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ZOOK
BREMER
COLO
RIVER
NODAWAY
ALLUVIAL LAND
KENNEBEC
WABASH
NEVIN
ZOOK
NEVIN
BREMER
RIVER
RIVER
ALLUVIAL LAND
RIVER
NODAWAY
NEVIN
BREMER
KENNEBEC
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NATURAL RESOURCES

Madison County initially became a point of interest to geologists due to the presence of coal in the Cherokee group. Once the coal was deemed low quality, and energy sources shifted more toward oil and gas, the desire of coal mining diminished. Madison County offers important resources such as aggregate, water, and soil.

Much of Madison County's economy is centered on the limestone industry. There are numerous quarries located throughout the county in Winterset, Peru, Earlham, and Bevington providing products such as ag lime, gravel, limestone rock, roadstone, and sand.

Madison County has abundant water supply, but most of it is surficial (Madison County, Iowa Resource Enhancement Protection Plan, 2009). Since rivers and creeks run virtually everywhere throughout Madison County, water quality preservation and land use planning becomes very important. Drainage patterns determine much of what can be built where.

Perhaps the greatest resource that Madison County has is its soil. The landform region encompassing the entirety of Madison County is the Southern Iowa Drift Plain. This landform region is the largest in Iowa. Among this landform region emerge rich, productive soils. Madison County soils are suitable to grow most finds of field crops (King et al, 1975). Common soils of Madison County include the Sharpsburg, Macksburg, Winterset, and Clinton (Figures 6 & 7). The Sharpsburg, Macksburg, and Winterset are all variations of silty, clay, loam mixture. The Clinton soils are composed of primarily silt and loam.

RECREATION

The three areas below are some of Madison County's largest public land areas. Iowa ranks 50th in the nation for the number of acres in public ownership (Madison County, Iowa Resource Enhancement and Protection Plan, 2009). Madison County is working to expanding and improving the quality of these public lands and recreational areas (Figure 8).

Clanton Creek Recreation Area contains over 1,000 acres of wildlife area for the county. This recreational area is broken up into 4 units: Deer Creek, Turkey Ridge, Clanton Unit, and the Sawyer Unit. Here the public has access to fishing, hunting, and hiking year round. There are areas of upland hickory forests, savanna prairie, and various smaller wetlands. The area as a whole is one of Madison County's largest remaining landlocked wilderness areas. Clanton Creek Recreation Area is located 3 miles southeast of Peru.

Jensen Marsh is a 190 acre wildlife area located 3 miles south of Bevington. The marsh serves as a year-round viewing area for various species of waterfowl, and aquatic reptiles, mammals, and amphibians. In addition to wetland animal species there are wetland plant habitats, wooded timbers, and tallgrass prairie areas. This is one of the few wetland areas in Madison County. This park allows for public hunting, non-motorized boating, and hiking at all times of the year.

Pammel State Park is the lone state park in Madison County, and was one of the first established state parks in Iowa (My County Parks). The 350 acre park is located 4 miles southwest of Winterset. Flourishing with wildflowers and woodlands, Pammel maintains a diverse habitat. The Middle River meanders through the park revealing the

signature limestone outcroppings (Figure 9). The park includes trails, campgrounds, cabins, a nature center, the Middle River Ford, and canoe access points throughout the park.

Madison County has suggested ideas to improve the recreational opportunities of the county by implementing more bike paths and walkways, coordinating development of school and recreational facilities, preserving architecturally significant areas, However, wind and water erosion present setbacks for the county to act on these suggestions. Water quality and soil erosion have also been addressed for areas of concern. Practices such as implementing pond structures, planting vegetation on marginal areas of a watershed, and applying buffer strips to stream banks are all efforts worth moving forward on.

Figure 8.

High Resolution Landcover of Madison County, 2009

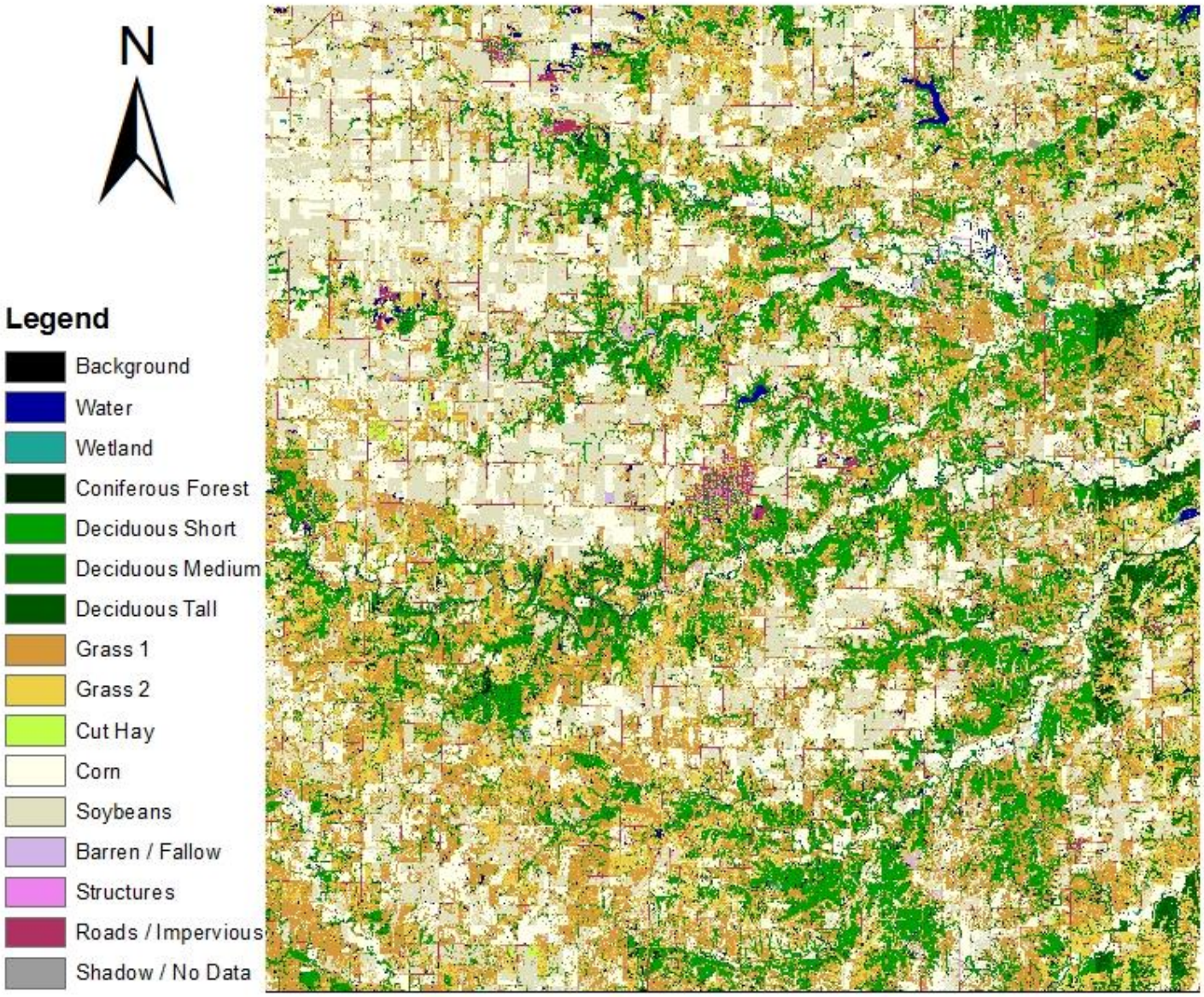
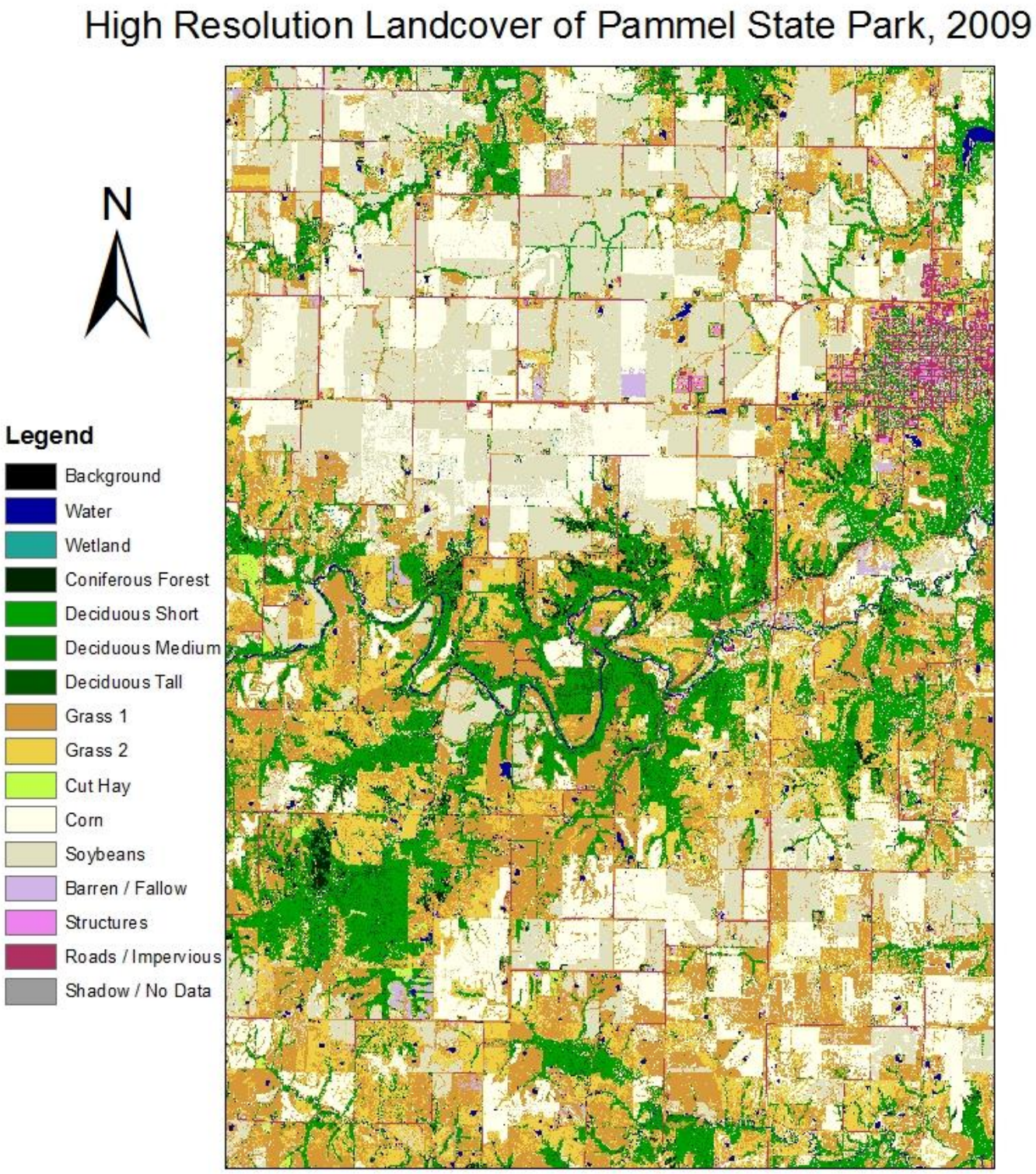


Figure 9.


High Resolution Landcover of Pammel State Park, 2009
N
Legend
Background
Water
Wetland
Coniferous Forest
Deciduous Short
Deciduous Medium
Deciduous Tall
Grass 1
Grass 2
Cut Hay
Corn
Soybeans
Barren / Fallow
Structures
Roads / Impervious
Shadow / No Data

CONCLUSION

The geology of an area can influence many features of that area such as the history, natural resources, the recreational opportunities, and landforms. The natural resources of Madison County are fragile. Careful measures must be taken to maximize the usage of the land without disrupting the qualities of the soil and water, two of the county's most abundant resources. With this guide, it is my hope that those visiting Madison County for the first time, or those that have lived here there whole life will have a better understanding of how the geology of the area ties all of these features together and of the conservation efforts taking place to preserve them.

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