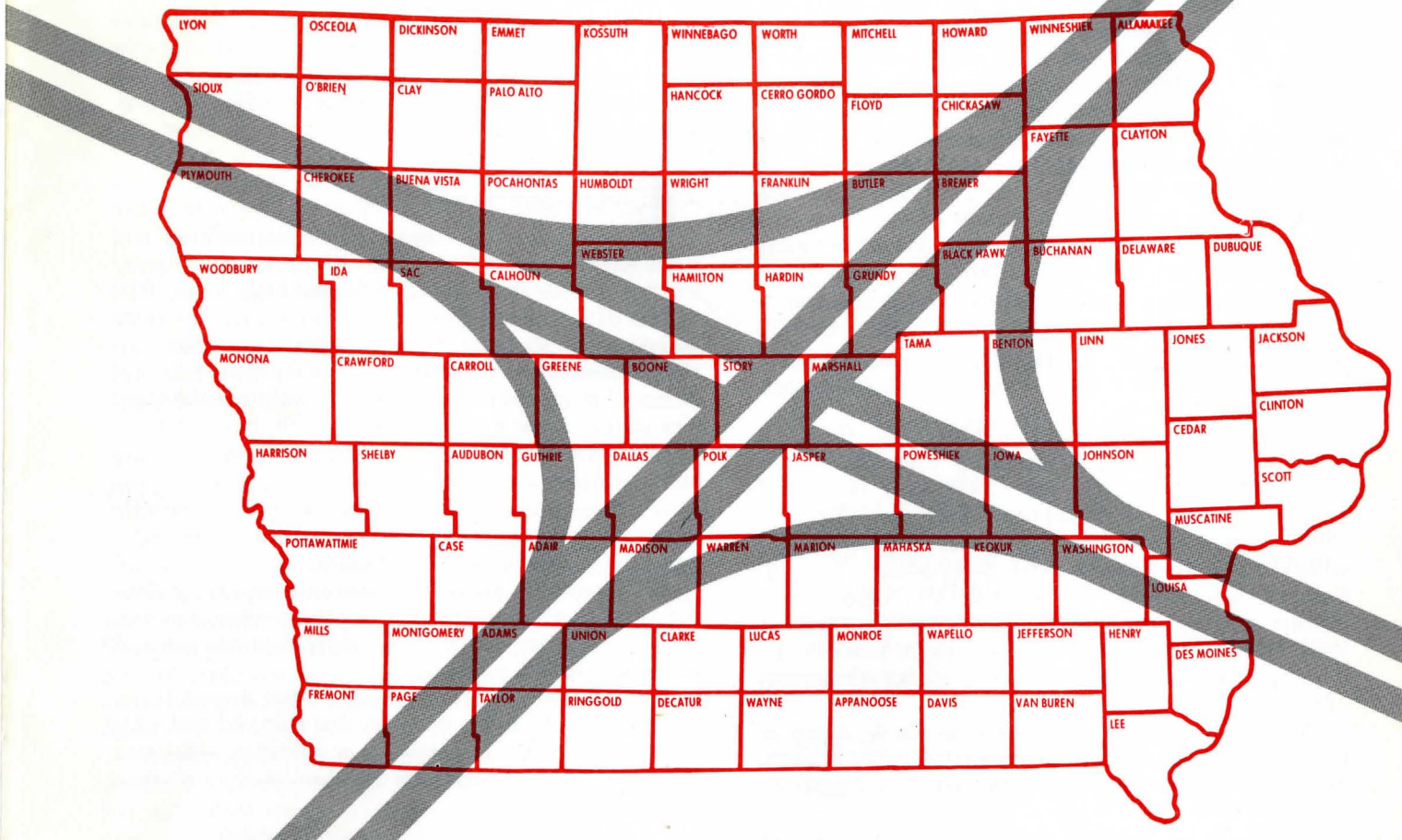
HIGHWAY GUIDE OF IOWA SOIL ASSOCIATIONS



IOWA STATE UNIVERSITY of Science and Technology
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HIGHWAY GUIDE OF IOWA SOIL ASSOCIATIONS

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

The map (center spread) does not attempt to show all 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 concerning soil associations is available in Special Report 42, *Principal Soils of Iowa.*

Even more detailed information is available through the soil survey program. This program is a cooperative effort between the Iowa Agricultural Experiment Station and the USDA Soil Conservation Service. Modern soil survey reports are available for some counties. In addition, soil maps of many individual tracts are available in other counties where modern published surveys are not available.

The soil association areas of Iowa have developed from three major kinds of parent material—loess (wind-blown material), glacial till, and alluvium.

The Missouri River floodplains were a major source for *loess* in Iowa. And the loess is thickest near the Missouri River. It thins and increases in clay content in a southeasterly direction away from the source. The loess passes beneath the CNW area (see map in center for explanation of abbreviations) in the northern half of the state and extends across the surface of the southern portion of the state. Soil associations in which loess is a major parent material are Mo, GPS, MIH, M, SSM, AGH, LKW, ASE, and GH. Another area of loess-derived soils is to the east and south of the KFC area and includes the DT, TM, OMT, CKL, F, D, and FDS soil associations. Soils developed from loess occupy about 40 percent of the area of the state.

A second grouping includes those areas in which the soils have developed primarily from *glacial till.* This grouping includes the CNW area developed from Cary till (late Wisconsin) and the KFC and CLC areas developed on the Iowan erosion surface which cut into Kansan and Nebraskan till. Till-derived soils such as Adair, Keswick, Lindley and Shelby outcrop on slopes below the loess-derived soils in south-central and southeastern Iowa. Soils developed from glacial till occupy about 40 percent of the state area.

A third major grouping includes those areas in which the soils developed primarily from *alluvial materials* and includes the LOS and B soil associations.

Following are more detailed descriptions of the soil association areas:

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AGH: Adair-Grundy-Haig

Grundy and Haig soils have developed from loess. Adair soils have developed from exposed paleosols (old buried soils) of glacial origin. Dominant vegetation was prairie grasses; but some soils in this area were formed under forest vegetation, particularly those on the steeper slopes near streams.

Cash grain and livestock farming predominate in this area. Soils on steeper slopes are used more for hay and pasture while the more level phases are used for corn and soybeans.

Adair soils occur on extended ridgetops below the loess-covered ridges. These soils are seasonally seepy. Major problems are erosion control and fertility maintenance. They have only fair production potential. Shelby soils occur below Adair soils on steeper slopes.

Grundy soils occur on rounded, loess-covered, gently sloping ridgetops and on moderately sloping sideslopes. They are moderately to highly productive with good management. These soils are sometimes wet. Steeper phases need erosion protection.

Haig soils occur on broad, loess-covered upland flats. They are moderately to highly productive with good management. These soils need drainage but tile is not too effective because of fine textured subsoils.

ASE: Adair-Seymour-Edina

Soils in this area are among the finest textured and most slowly permeable in Iowa. They are slightly less productive than the Grundy and Haig soils. Half or less of the area in this association is used for cultivated crops. Much of the remainder is used for pasture. Some is used for timber. The upland flats and gently sloping bottomlands are commonly cultivated. The steeper areas are pastured.

Adair soils, developed from exposed paleosols, are on the steeper side-valley slopes below the loess-derived soils. Predominant native vegetation was prairie grasses. These soils are sometimes wet. Most cultivated areas need erosion protection.

Seymour soils are on the loess-capped, gently sloping ridges and sideslopes. They are fine textured and very slowly permeable. They are sometimes wet and also need erosion protection.

Edina soils occur on the nearly level, broad, loess-covered upland flats. They are fine textured and very slowly permeable. Drainage is a problem, which can be improved somewhat by shallow surface ditches. Tile are not effective.

CKL: Clinton-Keswick-Lindley

General topography is quite hilly with only a few flat upland divides. Narrow, rounded and gently to moderately sloping divides predominate. Oak-hickory forest was the dominant native vegetation. Medium-

sized bottomland areas are common in this association. The soils are acid unless limed, and moderate to high amounts of fertilizer are needed. Principal cultivated areas are on the bottomland and on the gently to moderately sloping ridges, which are mainly Clinton soils. Corn is the major crop.

Clinton soils, formed from loess, are found on the rounded ridgetops.

Keswick and *Lindley* soils, formed from glacial till, are located on the steeper sideslopes. Some areas have shale exposed on the steeper slopes. Keswick soils, developed from exposed paleosols, have a redder and more clayey subsoil than Lindley and may be seasonally seepy. Erosion control and fertility maintenance are the major problems. A high percentage of Keswick and Lindley soils are in timber or pasture.

CLC: Cresco-Lourdes-Clyde

A variety of soils occur in this association, but the dominant soils occur on gently sloping topography. The slopes are long and grade to broad, slightly concave drainageways. Prairie grasses were the main native vegetation with some scattered trees. The dominant soils have good water-holding capacity, require moderate to high amounts of phosphorus and potassium, and are generally acid. Major problems are wetness, fertility maintenance, and erosion control on sloping land. Cash grain and livestock farming predominate. Principal crops are corn, soybeans, oats and hay.

Cresco and *Lourdes* soils developed from two-storied material—a loamy upper story of 1 1/2 to 2 feet over a very firm glacial till. A stone line or pebble band separates the upper story from the underlying clay loam till. These moderately well drained soils occur on convex ridges and are slowly permeable.

Clyde soils occur in the smaller slightly concave drainageways. They are poorly drained and require tile drainage. They developed in a loamy sediment 3 or more feet thick over glacial till.

CNW: Clarion-Nicollet-Webster

These soils have developed from loam-textured glacial till or till-derived sediments. Native vegetation was prairie grass. About 75 percent of the area has level to gently sloping topography and is well suited to intensive production of corn and soybeans. Available phosphorus and potassium are low on most soils of the area. Major crops are corn, soybeans and alfalfa.

Clarion soils are well drained and occur predominantly on convex slopes of 2 to 5 percent gradient, but gradients range from 2 to 20 percent. Erosion control practices are recommended on the more sloping Clarion soils.

Nicollet soils are somewhat poorly drained and occur on slightly convex areas between the well-drained Clarion and the poorly drained Webster soils. Slope gradients are 1 to 3 percent. Depth to carbonates usually ranges between 2 1/2 to 4 1/2 feet in both the Clarion and Nicollet soils. Sand lenses and pockets are often present in the substratum. Tile drainage is needed on some areas of Nicollet soils that border Webster soils.

Webster soils occur on slopes with gradients of 0 to 2 percent, typically at lower elevations than the Clarion and Nicollet soils. Tile drainage is needed on most Webster soils.

D: Downs

The soils in this association occur on gently sloping to moderately steep uplands. These soils developed from moderately thick loess under mixed forest and prairie vegetation.

The well drained *Downs* soils occur on slopes and need erosion protection. Downs soils are dominant in this area but there are a variety of other soils. The darker colored Tama soils occupy the more level divides between drainageways, and the lighter colored Fayette soils occupy the more sloping areas.

These soils have good water-holding capacity and moderate permeability. They require moderate amounts of phosphorus and higher amounts of potassium. They are acid unless limed. These soils are highly productive and are used for dairy and general livestock farming. Major crops are corn, oats and hay.

DT: Dinsdale-Tama

These soils occur on gently sloping to moderately sloping topography. The parent materials consist of glacial till covered with a layer of loess of varying thickness. The dominant native vegetation was prairie grasses, though some areas had mixed prairie-forest vegetation.

Dinsdale soils occur where the loess is from about 20 to 40 inches thick.

Tama soils occur where the loess is 40 or more inches thick.

The dominant soils have good water-holding capacity and are moderately permeable. They require moderate to high amounts of phosphorus and moderate amounts of potassium. Fertilizer needs are commonly higher on Dinsdale than on Tama soils. Most areas are acid unless limed. The major problems are erosion control and fertility maintenance.

These soils are highly productive and are used principally for cash grain and livestock farming. Principal crops are corn, soybeans, oats and hay.

F: Fayette

The soils in this association occur on moderately to steeply sloping topography. The geological history of these scattered areas is complex. Thick loess deposits blanket most of the area.

Fayette soils were formed from thick loess under forest vegetation. Glacial till underlies the loess in the Fayette area in east-central Iowa, but in the northeast, the loess is underlain by limestone bedrock, shale, and in some areas by glacial till.

PRINCIPAL SOIL ASSOCIATION AREAS OF IOWA

Mo
GPS
MIH
LOS
M
SSM
CNW
LKW
AGH
TM
KFC
CLC
DT
CKL
OMT
ASE
GH
FDS
F
D
B

Approximate areas of principal soil associations of Iowa.

Symbol and Name	Soil Association	Area* square miles	Area* Acres	Percent of state area
AGH	Adair-Grundy-Haig	2,410	1,542,400	4.3
ASE	Adair-Seymour-Edina	1,340	857,600	2.4
CKL	Clinton-Keswick-Lindley	2,020	1,292,800	3.5
CLC	Cresco-Lourdes-Clyde	620	396,800	1.1
CNW	Clarion-Nicollet-Webster	11,870	7,596,800	21.2
D	Downs	450	288,000	.8
DT	Dinsdale-Tama	1,510	966,400	2.7
F	Fayette	3,640	2,329,600	6.5
FDS	Fayette-Dubuque-Stonyland	1,570	1,004,800	2.8
GH	Grundy-Haig	560	358,400	1.0
GPS	Galva-Primghar-Sac	3,860	2,470,400	6.9
KFC	Kenyon-Floyd-Clyde	5,820	3,724,800	10.4
LKW	Lindley-Keswick-Weller	1,680	1,075,200	3.0
LOS	Luton-Onawa-Salix	840	537,600	1.5
M	Marshall	4,260	2,726,400	7.6
MIH	Monona-Ida-Hamburg	2,860	1,830,400	5.1
Mo	Moody	500	320,000	.9
OMT	Otley-Mahaska-Taintor	2,410	1,542,400	4.3
SSM	Shelby-Sharpsburg-Macksburg	3,470	2,220,800	6.2
TM	Tama-Muscatine	4,030	2,579,200	7.2
B	Bottomland-Mississippi River	280	179,200	.5
TOTALS		56,000	35,840,000	100.0

* Based on approximate state area of 56,000 square miles, rounded to nearest 10 square miles. Square miles x 640 = acres.

Estimated Percent of Iowa Land in Given Slope Classes

% slope	% of land area
0-2	27.7
2-5	31.9
5-9	15.6
9-14	11.7
14-18	5.3
18-25	2.5
25+	2.0

Gradational Boundary
Tentative Boundary
Abrupt Boundary

Base map: Iowa Highway Commission

Approximate Scale: 1 inch = 23 miles

Dominant soils in this association are well drained, moderately permeable, and have good water-holding capacity. These soils require moderate amounts of phosphorus and higher amounts of potassium. They are acid unless limed.

Major problems are erosion control and fertility maintenance. These soils are highly productive and are used for dairy and general livestock farming. Major crops are corn, oats and hay.

FDS: Fayette-Dubuque-Stonyland

This association is the most rugged, rocky part of Iowa. The hilly topography with wooded, rocky slopes is distinctive in Iowa. Thick loess blankets most of the uplands. Limestone bedrock, sandstone or shales outcrop on the steeper slopes. Native vegetation was forest.

Much of the present land area is covered by trees. Cropping is mainly confined to ridgetops and stream valleys. The major hazards are erosion control and fertility maintenance. Dairy and general livestock farming predominate. Major crops are corn, oats and hay. About 50 percent or more of the area is pasture and timber.

Fayette soils formed from thick loess on the ridgetops.

Dubuque soils formed in shallow loess, 15 to 30 inches over limestone on the upper slopes.

Stonyland is a land type which consists mainly of about 12 inches of loamy material over limestone. Limestone outcrops are common and the topography is very steep.

GH: Grundy-Haig

These soils formed in thick loess dominantly under prairie vegetation. Grundy and Haig soils are moderately to highly productive with good management. Cash grain and livestock farming predominate. Principal crops are corn, soybeans, oats and hay.

Grundy soils occur on rounded ridgetops. The gently sloping Grundy soils are sometimes wet and also need erosion protection. In the more rolling areas the glacial till outcrops and areas of Clarinda, Adair and Shelby soils occur on lower parts of the sideslopes.

Haig soils occur on broad flat upland areas. The level Haig soils need drainage but tile is not too effective.

GPS: Galva-Primghar-Sac

The soils of this association have developed under prairie vegetation. Loess covers the broad upland flats and ridges and extends down the sideslopes. The loess generally is thicker in the western and southwestern parts of the area and is thinnest in the eastern third.

Much of this association area is suited to intensive row cropping. Moisture may be a limiting factor in many years because of the low average annual precipitation. Water conservation and erosion control are needed on the sloping areas, and artificial drainage is needed on the poorly drained soils. Nitrogen and phosphorus are usually required for high corn yields, and limestone applications are profitable on much of the area.

Galva, Primghar and Marcus soils occur where the loess is 40 inches or greater in thickness. Sac soils occur where the loess thickness is between 15 and 40 inches and overlies clay loam textured glacial till.

Galva soils occur primarily on slopes of 2 to 5 percent gradient but gradients may range from 1 to 15 percent. In much of the area, the Galva soils occur on long, gentle, uniform slopes.

Primghar soils occur on slightly concave or convex slopes with dominant gradients of 1 to 3 percent and are moderately well to somewhat poorly drained.

Marcus soils are poorly drained and occur in slightly concave positions (0-2 percent) at heads of upland draws and on broad upland flats.

Sac soils are well drained and have slope gradients predominantly between 2 and 5 percent.

KFC: Kenyon-Floyd-Clyde

These soils developed on a nearly level to gently sloping erosional surface from a two-storied parent material. Original vegetation was dominantly prairie grasses with some scattered trees. Huge boulders, conspicuous throughout the area, are outstanding features of the landscape.

The soils and topography of the area are well suited for livestock farming and very intensive cash grain row crop production. Principal crops are corn, soybeans, oats and hay.

Kenyon soils are moderately well drained and occur on the convex ridges in the upland.

Floyd soils are somewhat poorly drained and occur on gently sloping concave lower slopes and upper ends of drainageways.

Clyde soils are poorly drained and occur mainly in the upper drainageways.

A variety of other soils occur in the area, including soils shallow to sands and gravels and alluvial soils associated with the streams.

The dominant soils in this association have good moisture-holding capacity, require moderate to high amounts of phosphorus and potassium, and are usually acid in the sloping areas unless limed. Major management problems are erosion control, some wetness on Kenyon, and drainage on Clyde and Floyd soils.

LKW: Lindley-Keswick-Weller

A high percentage of this area has steep slopes and is used for timber and pasture. Farm ponds are numerous. Cultivated areas are principally on the bottomland and on gently sloping ridgetops. Major crops are corn, oats, hay and pasture.

The soils in this association have dominantly slowly and very slowly permeable subsoils. The native vegetation of the area was oak-hickory forest. Erosion control and fertility maintenance are the major problems. Moderate to high amounts of fertilizer are needed, and the soils are generally acid.

Lindley, Keswick and *Weller* soils occur on moderately to steeply sloping topography. Weller soils formed from loess on the rounded and gently sloping ridges. Lindley and Keswick soils formed from glacial till on the steeper sideslopes. Some places have shale-derived soils which occur on the steeper sideslopes below the Lindley soils. Medium-size bottomland areas are common.

LOS: Luton-Onawa-Salix

These soils occur on the nearly level floodplains of the Missouri River. Oxbows and depressions are conspicuous landscape features. Native vegetation of the area was grass and trees. The soils vary widely in properties and productivity primarily because of variation in the parent materials, which are alluvial sediments. These soils have drainage problems, and nitrogen and phosphorus fertilizers are needed for high yields. Cash grain farming predominates in the area; the major crops are corn, soybeans and wheat.

Luton, Onawa and Salix are the principal soils. However, there are many other associated soils including McPaul, Kennebec, Colo, Zook and Modale.

Luton soils are the most extensive. They are silty clay in texture and have poor to very poor natural drainage.

Onawa soils are poorly drained and silty clay in texture to a depth of about 24 inches. Below this depth, the texture is coarse silt loam or sandy loam.

The *Salix* silty clay loam soils are moderately well drained and among the most productive in the area.

M: Marshall

The topography of this area is gently to strongly sloping. Slope gradients range from 1 to 30 percent, but gradients of 2 to 14 percent are the most common. Loess covers most of the upland area, but glacial till outcrops on lower parts of steeper slopes.

Marshall soils occupy about 45 percent of the area. These well-drained soils developed from loess under the influence of prairie vegetation. They occur on nearly level to gently sloping upland divides and on gently sloping to steep sideslopes.

A relatively high proportion of the area is used for cultivated crops. Soil and water conservation practices are needed on sloping land. Lime is needed periodically on the slightly acid soils of the area. Nitrogen and phosphorus are needed for high yields of corn, the major crop of the area.

MIH: Monona-Ida-Hamburg

The topography of this area is characterized by narrow, gently sloping ridges and steep sideslopes that gradually change to well-defined alluvial valleys. Soils of this area are developed primarily from deep loess under grass vegetation.

The well-drained *Monona* soils occur on the gently sloping narrow ridges and strongly sloping sideslopes. Carbonates are generally present between 2 1/2 and 8 1/2 feet.

Ida soils occur on narrow divides and steep sideslopes of 6 to 30 percent gradient and have carbonates present in the surface.

Hamburg soils occur on steep catstep slopes adjacent to the Missouri River bottomlands and along drainageways that outlet into the bottomland. They have formed from thick, coarse loess.

A moderately high percentage of this association is used for cultivated crops. Nitrogen and phosphorus are commonly needed along with extensive erosion control practices for maximum production.

Mo: Moody

The topography of this association area is nearly level to gently sloping in the east and gently sloping to sloping in the west. The major parent material of the upland soils is loess, but glacial till-derived soils occur on steeper slopes where loess is not present.

The well-drained *Moody* soils are the most extensive in this area. These soils have developed from loess under prairie vegetation. Slope gradients are commonly 2 to 5 percent but range from 1 to 15 percent. Carbonates, including secondary lime concretions, are usually present between 3 and 5 feet.

Low moisture is a limiting factor in crop yields in this area more frequently than in any other association area of Iowa. This factor increases the importance of water conservation and erosion control practices. The soils of this area are moderately to highly productive for corn, alfalfa and oats. Nitrogen and phosphorus fertilization are required for high yields. Many of the surface layers may be acid in reaction and require liming.

OMT: Otley-Mahaska-Taintor

Mahaska and *Taintor* soils occur on the nearly level, irregular divides that are the highest parts of the landscape. They have moderately permeable subsoils but require tile drainage for highest yields.

Otley soils are found on the valley slopes. Erosion control is the major problem on the Otley and associated till soils.

Otley, Mahaska and Taintor soils formed in thick loess under prairie vegetation and are underlain with glacial till. Clarinda, Adair and Shelby soils occur where the till outcrops on the steeper sideslopes. A variety of other soils also are found in this association.

The dominant soils have good water-holding capacity, are moderately slowly permeable, require moderate to high amounts of phosphorus and moderate amounts of potassium and lime. These soils are highly productive, and cash grain and livestock farming predominate. Principal crops are corn, soybeans, oats and alfalfa.

SSM: Shelby-Sharpsburg-Macksburg

The landscape and topography of this area are quite similar to those of the Adair-Grundy-Haig area. In the SSM area, however, loess thickness is greater

on the upland divides and the loess extends farther downslope.

Shelby soils occur downslope from Adair and Clarinda soils on slopes ranging in gradient from 9 to 30 percent. The moderately well to well drained Shelby soils have formed from glacial till under a native vegetation of prairie grasses.

Sharpsburg soils are on nearly level uplands, sideslopes and loess-covered high stream benches. Slope gradients range from 0 to 18 percent but are predominantly between 2 and 9 percent. These moderately well to well drained soils have formed from loess under the influence of prairie vegetation.

Macksburg soils occur on moderately wide upland divides and coves that slope gently from the upland flats. Common slope gradients are 1 to 3 percent. They usually occupy slightly higher elevations than the Sharpsburg soils. They formed from loess under prairie vegetation and are somewhat poorly drained.

Approximately two-thirds of this association area is used for cultivated crops. Sloping areas require erosion control practices. Artificial drainage is frequently needed on nearly level areas, hillside seeps and waterways. Nitrogen and phosphorus fertilizers are needed for high yields of most crops.

TM: Tama-Muscatine

These soils occur on nearly level and gently to moderately sloping topography. They have developed from moderately thick loess, primarily under prairie vegetation.

The dominant soils in this association have good water-holding capacity, are moderately permeable, require moderate amounts of phosphorus and potassium, and are acid. They are very highly productive for corn, soybeans, oats and hay.

Tama soils occur on the more sloping landscapes and need erosion protection.

Muscatine soils occur on nearly level uplands. They are somewhat poorly drained and may require some tile for highest production.

A wide variety of other soils occur in this association. The topography and loess thickness vary in the different parts of the four Tama-Muscatine associations.

B: Soils of Mississippi River Bottomlands

These soils vary widely in properties and productivity. Alluvial material deposited during flood periods provides parent material for these soils. The area is nearly level with a few areas of undulating topography. The undulating topography is due mainly to oxbows or natural levees, but there are a few hummocky areas where sand has been deposited by wind.

Soils in the area commonly known as Muscatine Island are quite sandy with very low moisture-holding capacity. Vegetable crops are grown successfully when irrigated.

Soils of the floodplains frequently suffer from seasonal wetness because of flooding. Some have poor internal drainage. Some of the major soil series are Wabash, Colo, Zook, Huntsville, Chequest, Sawmill, Lawson and Nodaway.

Major problems include drainage, maintenance of good tilth on the fine-textured soils, control of drifting sand, and low water-holding capacity on the coarse-textured soils. Cash grain farming and vegetable crops predominate. Major crops are corn, soybeans and vegetable crops.

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