

## **Appendix D**

### **Major Land Resource Area Detailed Information**

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### Major Land Resource Areas

Major Land Resource Areas (MLRA), as defined by the Natural Resource Conservation Service (USDA 2006), provide a broad overview of soil characteristics in the study area. MLRAs are geographically associated land areas that share physiography, geology, climate, water, soils, biological resources, and land use characteristics. Land Resource Regions are geographically associated MLRAs which approximate broad agricultural market regions.

Appendix A, Map A-4 provides an overview of the Land Resource Regions and MLRAs crossed by the System Alternatives. The following provides a brief description of the location, extent, landscape, and soil characteristics in each MLRA (USDA 2006).

#### Land Resource Region F – Northern Great Plains Spring Wheat Region

**53B Central Dark Brown Glaciated Plains** – This MLRA covers 19,640 square miles and extends from northwest North Dakota to north central South Dakota. The land surface is nearly level to rolling till plains. Moderately steep and step slopes are adjacent to the major stream valleys. The dominant soil order in this MLRA is Mollisols, deep, rich soils of the prairie. They are generally very deep, well drained to very poorly drained, and clayey to loamy.

**54 Rolling Soft Shale Plain** - This MLRA covers 29,280 square miles and extends from western North Dakota to northwestern South Dakota, with a small area bordering into Montana. The land surface is mostly unglaciated. The area is on an old, moderately dissected, rolling plain with some local badlands, buttes and isolated hills. Terraces are adjacent to broad flood plains and along most of the major drainages. Maximum local relief is about 330 feet. The dominant soil orders in this MLRA are Mollisols and Entisols (soils of more recent origin). They are shallow to very deep, generally somewhat excessively drained and loamy or clayey.

**55A Northern Black Glaciated Plains** - This MLRA covers 12,765 square miles and is located along the US/Canada border in North Dakota. The till plain land surface is mostly nearly level to gently rolling, as well as nearly level lake plains. Some steep slopes are found adjacent to streams. The Turtle mountains rise approximately 500 feet above the adjacent till plain. Mollisols dominate the landscape. They generally are very deep, well drained to poorly drained, and loamy or clayey.

**55B Central Black Glaciated Plains** – This MLRA covers 17,155 square miles extending from east central North Dakota to north central South Dakota. The land surface is characterized by nearly level to gently rolling till plains and many poorly defined drainage channels. Steep slopes are adjacent to the main streams and glacial lake plains. The dominant soil order is Mollisols, which are generally very deep, well drained to poorly drained, and loamy or clayey.

**56 Red River Valley of the North** – This MLRA covers 16,300 square miles and extends along the border of eastern North Dakota and northwestern Minnesota. The land surface is nearly level glacial lake plain

bordered on the east by outwash plains, gravelly beaches and dunes. Mollisols and Vertisols (soils with shrink/swell clays) dominate the soil orders in this MLRA. They are very deep, somewhat poorly drained to very poorly drained, and loamy or clayey. Vertisols have shrink/swell characteristics that may need to be considered for construction.

### **Land Resource Region K – Northern Lake States Forest and Forage Region**

**57 Northern Minnesota Gray Drift** – This MLRA covers 9,875 square miles and is located in north-central Minnesota. The landscape developed through a series of glaciations and includes a complex pattern of moraines, outwash plains, drumlins, lake plains and drainages. Lakes, ponds and marshes are common. Relief is typically 15 to 50 feet within short distances. Alfisols (forest soils), Entisols and Histosols (soils with deep peat) dominate the soil orders. Some Mollisols are present in the westernmost part of the MLRA. Soils tend to be very deep and generally are sandy to loamy.

**88 Northern Minnesota Glacial Lake Basins** – This MLRA covers 11,695 square miles and is dispersed through several areas in northern Minnesota. The landscape is in the glacial lakebeds of Agassiz, Upham and Aitkin. The mostly level or nearly level plains are bordered by some gently sloping strandlines and rolling dune land. Ditches have been constructed in an attempt to drain the many wet areas, but low gradients commonly prevent adequate removal of surface and subsurface water for farming. Alfisols, Entisols and Histosols dominate the soil orders. They are very deep, are sandy to clayey, and are dominantly somewhat poorly drained to very poorly drained. Extensive areas of organic soils (Histosols) occur in the MLRA.

**90A Wisconsin and Minnesota Thin Loess and Till, Northern Part** – This MLRA covers 17,535 square miles and is dispersed through three distinct areas in east-central Minnesota, northern Wisconsin and extending into the Upper Peninsula of Michigan. The landscape is characterized by gently undulating to rolling, loess-mantled till plains, drumlin fields, and end moraines mixed with outwash plains associated with drainage ways, swamps and bogs. Steeper areas occur mostly as valley side slopes along flood plains and as escarpments along the margins of lakes, which are common. Alfisols, Entisols, Histosols and Spodosols (forest soils with a leached horizon) dominate the soil orders. Soils are shallow to deep with silty to sandy textures. Drainage ranges from excessively drained in sandy regions to very poorly drained in swamps and bogs.

**90B Wisconsin and Minnesota Thin Loess and Till, Southern Part** – This MLRA covers 8,935 square miles in east-central Minnesota and north-central Wisconsin. The landscape is gently undulating to rolling; steepest areas are adjacent to river valleys. Natural lakes, bogs, swamps, flood plains and depressions are fairly extensive. Local relief is commonly 10 to 20 feet but can be more than 300 feet along the St. Croix River. The soil orders in this MLRA are dominantly Entisols, Alfisols, Histosols, Spodosols, and Inceptisols (very young soils). Mollisols occur to a much lesser extent. They generally are moderately deep to very deep, well drained to very poorly drained, and sandy to loamy.

**91A Central Minnesota Sandy Outwash** – This MLRA covers 4,600 square miles in central Minnesota. Most of the area is gently undulating to rolling. Some steep areas are on valley sidewalls or on

escarpments along lake margins. Local relief is mostly 10 to 20 feet, but as much as 80 feet in some areas. Mollisols and Histosols dominate the soil orders. On uplands, soils are generally well drained to excessively drained. Very poorly drained Histosols are in basins and depressions.

**91B Wisconsin and Minnesota Sandy Outwash** – This MLRA covers 4,110 square miles and extends from east central Minnesota to northwest Wisconsin. Much of the area is nearly level to gently sloping, but some steeper escarpments occur along streams, rivers and lake borders. Lakes are common. Local relief is typically less than 10 feet. Alfisols, Entisols, Histosols and Spodosols dominate the soil orders. Soils on uplands are very deep, excessively drained to somewhat poorly drained, and sandy. Soils on lowlands are very deep, poorly drained or very poorly drained, and sandy or mucky.

**92 Superior Lake Plain** – This MLRA covers 2,920 square miles along the Lake Superior shoreline in Minnesota, Wisconsin and Upper Michigan. The landscape includes some rocky knobs, hills and low mountains adjacent to nearly level lake plain. Local relief on the lake plain is only 3 to 6 feet, but the adjacent hills and low mountains rise sharply from 85 to more than 300 feet above the plains. Alfisols, Spodosols, Inceptisols and Entisols dominate the soil orders. Soil depths, textures and drainage characteristics cover broad ranges, from shallow to deep, sandy to clayey (and organic), and from very poorly drained to well drained, respectively.

**93A Superior Stony and Rocky Loamy Plains and Hills, Western Part** – This MLRA covers 8,570 square miles in northeastern Minnesota. The landscape is dominated by glacial features, such as drumlin fields, moraines, lake plains and outwash plains. Bedrock is at or near the surface in many areas. Closed depressions, lakes, ponds and bogs are common. Local relief ranges from 10 to more than 100 feet. It can be 600 feet or more in some areas adjacent to Lake Superior. Soil orders are dominated by Entisols, Inceptisols and Histosols. The soils are dominantly shallow or moderately deep in the north part of the MLRA and very deep in the southern part. They are very poorly drained to excessively drained and are level to very steep.

#### **Land Resource Region M - Central Feed Grains and Livestock Region**

**102A Rolling Till Prairie** – This MLRA covers 16,545 square miles in western Minnesota and northeastern South Dakota. The landscape is nearly level to rolling with many depressions and ill-defined drainages. Prairie pothole lakes and ponds are common. Steeper slopes occur on the sides of drainages and on breaks adjacent to some of the larger tributaries. Mollisols dominate the soil order in this area. They generally are very deep, well drained to very poorly drained, and loamy.

**103 Central Iowa and Minnesota Till Prairies** – This MLRA covers 27,640 square miles in south central Minnesota and central Iowa. This part of the Des Moines Lobe is mostly on a young, nearly level to gently rolling glaciated till plain with moraines and glacial lake plains in some areas. The eastern part of the MLRA has some higher hills (moraines). Natural lakes, marshes and potholes occur throughout the area. Relief is usually less than 10 to 20 feet, but some major valleys are 165 feet or more below the adjoining uplands. Mollisols, and to a lesser extent, Alfisols and Inceptisols dominate the soil orders. Soils are generally very deep, well drained to very poorly drained and loamy.

**104 Eastern Iowa and Minnesota Till Prairies** – This MLRA covers 9,660 square miles in east-central Iowa, southeast Minnesota and a small area of west-central Wisconsin. The landscape is nearly level to gently rolling glaciated plain, with long slopes. The natural drainage network is well established, with few lakes and ponds present. Karst topography is common, with sinkholes present. Local relief is 10 to 20 feet. Mollisols and Alfisols dominate the soil orders. Soils generally are very deep, well drained to very poorly drained and loamy.

**105 Northern Mississippi Valley Loess Hills** – This MLRA covers 17,950 square miles in southwest Wisconsin, southeast Minnesota and northeast Iowa. It is known as the “Driftless Area” because it was avoided by the most recent glaciations. The landscape consists of mostly gently sloping to rolling summits with steeper valley walls, adjacent to small to very large flood plains. There are abundant rock outcrops and high cliffs, caves and sinkholes. Local relief is 10 to 20 feet, but as much as 50 to 100 feet on valley walls along major streams, and as much as 250 feet along the Mississippi River bluffs. Alfisols and Entisols are the dominant soil orders, with a lesser extent of Mollisols. Soils generally are moderately deep to very deep, well drained or moderately well drained, and loamy.

**108A Illinois and Iowa Deep Loess and Drift, Eastern Part** – This MLRA covers 11,145 square miles in central Illinois. The landscape is relatively young, moderately dissected, rolling plain with stream terraces adjacent to the broad flood plains along major streams and rivers. Glacial moraines are numerous and tend to form elongated ridges tending northwest to southeast. Slopes are generally less than 5 percent, but steeper along moraines and major streams. Local relief is about 160 feet along major streams and typically 3 to 10 feet on broad, flat uplands. Mollisols and Alfisols dominate the soil orders. Soils generally are moderately deep to very deep, poorly drained to moderately well drained, and silty to clayey.

**108B Illinois and Iowa Deep Loess and Drift, East-Central Part** – This MLRA covers 7,450 square miles in two parts, one in northwest Illinois and one in central Illinois. The entire MLRA was glaciated and has deposits of loess of various thickness. The landscape is relatively young, moderately dissected to strongly dissected, rolling plain where stream terraces are adjacent to broad flood plains along the major rivers. Local relief is about 160 feet along the major streams and dissected drainage ways, and only 3 to 10 feet on the broad, flat uplands. Alfisols, Entisols, Inceptisols and Mollisols are all present in this MLRA, with Alfisols and Mollisols most common. Soils tend to be moderately deep to very deep, somewhat poorly drained to well drained, and silty or clayey.

**108C Illinois and Iowa Deep Loess and Drift, West-Central Part** – This MLRA covers 9,805 square miles in southeast Iowa. The landscape is mostly rolling to hilly, but some broad ridge tops are nearly level to undulating. Areas bordering major stream valleys are steep. A few large rivers have nearly level, broad valley floors. Local relief generally is 10 to 20 feet (or less), but valley floors can be 80 to 200 feet below the adjacent uplands. Mollisols dominate the soil order, with lesser amounts of Alfisols, Entisols and Inceptisols. Soils generally are very deep, well drained to poorly drained, and silty, loamy or clayey.

**110 Northern Illinois and Indiana Heavy Till Plain** – This MLRA covers 7,535 square miles in northeast Illinois, southeast Wisconsin and northwest Indiana. The landscape is nearly level to gently sloping

glaciated plain, with more rolling topography along the major stream valleys and on glacial moraines. Local relief is typically 10 to 25 feet. The dominant soils orders are Alfisols, Histosols, Inceptisols and Mollisols. Soils generally are moderately deep to very deep, poorly drained to moderately well drained, and silty or clayey in the subsoil.

**115C Central Mississippi Valley Wooded Slopes, Northern Part** – This MLRA covers 13,650 square miles in northeast Missouri, southeast Iowa and west/central Illinois. The landscape includes nearly level to very steep uplands that are dissected by large and small tributaries of the Mississippi River. The broad summits are nearly level to gently sloping. Flood plains along the small streams are narrow. Major rivers have well defined valleys with broad flood plains and numerous stream terraces. Local relief generally is 10 to 20 feet, but can be 50 to 100 feet along drainage ways and streams. The bluffs along the Illinois and Mississippi Rivers are as much as 250 feet above the valley floors. Soil orders are dominated by Alfisols, Entisols, Inceptisols and Mollisols. Soils are very shallow to very deep, poorly drained to excessively drained, and loamy, silty or clayey.

## References

United States Department of Agriculture, Natural Resources Conservation Service. 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296.