

Appendix D

Soil Series Descriptions

Soil Series Descriptions

Soil Orders

Mollisols — This order covers a considerable land area of western and southern Minnesota and is the basis for the state's productive agricultural base. The formative syllable, *oll*, is derived from the Latin word *mollis*, or soft. Its most distinguishing feature is a thick, dark-colored surface layer that is high in nutrients. It occurs throughout the former prairie areas of Minnesota. The Latin term for soft in its name is descriptive in that most of these soils usually have a rather loose, low-density surface. Three suborders of mollisols occur in Minnesota: Aquolls, Udolls, and Ustolls.

Alfisols — This order covers a large land area in Minnesota, part of which is now cultivated and part forested. *Alf* is the formative element and is coined from a soil term, pedalfer. Pedalfers were identified in the 1930s as soils of the eastern part of the United States with an accumulation of aluminum and iron. The *alf* refers to the chemical symbols for aluminum (Al) and iron (Fe). Alfisols are primarily fertile soils of the forest, formed in loamy or clayey material. The surface layer of soil, usually light gray or brown, has less clay in it than does the subsoil. These soils are usually moist during the summer, although they may dry during occasional droughts. Two suborders of alfisols occur in Minnesota: Aqualfs and Udalfs.

Histosols — The formative element in the name is *ist* and comes from the Greek word *histos*, which means tissue. This is an appropriate association because these soils are formed from plant remains in wet environments like marshes and bogs. Although they occur throughout most of Minnesota, these soils are found most extensively in the north, in the beds of former glacial lakes. Histosols, or organic soils, have been termed peat and muck; in Soil Taxonomy they are Sapristis, Hemists, and Fibristis.

Condensed Soils Series Descriptions

Source: USDA-NRCS Soil Survey Division

<http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi>

Ramsey County Soils – 264

The **Freeon** series are Alfisols with the following characteristics:

- Very deep, moderately well drained soils
- Soil with a perched seasonal high water table at a depth of 2 to 3.5 feet for 1 month or more at some time during the period of September to June in most years
- Formed in loess or silty lacustrine deposits and in the underlying dense sandy loam till on ground moraines, end moraines, disintegration moraines, drumlins, and ice-walled glacial lake plains of Late Wisconsinan Age
- Permeability is moderate in the silty mantle, slow or moderately slow in the till subsoil, and very slow in the substratum.
- Slopes range from 0 to 20 percent
- Coarse-loamy, mixed, superactive, frigid Oxyaquic Glossudalfs
- Native vegetation is deciduous forest. Common trees are Sugar Maple, Black Cherry, American Basswood, White Ash, Yellow Birch, American Elm, Bigtooth Aspen, Quaking Aspen, Balsam Fir, Northern Red Oak, and Eastern Hophornbeam

Ramsey County Soils – 266

The **Freer** series are Alfisols that consist of:

- Poorly drained soils

- Soils formed in silty sediments of eolian or lacustrine sediments and noncalcareous dense loamy glacial till of Late Wisconsinan Age.
- Soils that are moderately deep or deep to dense till (paralithic contact)
- Soils that have moderate permeability in the silty mantle and very slow permeability in the dense till
- Slopes ranging from 0 to 3 percent
- Fine-loamy, mixed, superactive, frigid Aeric Glossaqualfs
- Native vegetation that was mixed deciduous forest or mixed deciduous-coniferous forest

Ramsey County Soils – 543

The Markey series is a hydric soil with the following characteristics:

- Very deep, very poorly drained organic soils
- Formed in herbaceous organic material 40 to 130 centimeters thick overlying sandy deposits in depressions on outwash plains, lake plains, flood plains, river terraces, valley trains, and moraines. Soils on nearby uplands are predominantly sandy.
- Saturated hydraulic conductivity is moderately slow to moderately rapid in the organic layers and rapid or very rapid in the sandy material.
- Slopes range from 0 to 2 percent
- Sandy or sandy-skeletal, mixed, euic, frigid Terric Haplosaprists
- Generally dominated by sapric material
- Most of this soil is in native vegetation. Most areas are forested with Black Ash, Quaking Aspen, Balsam Fir, Black Spruce, Tamarack, Northern White Cedar, and Paper Birch. Some areas are in cattails, marsh grasses, reeds, and sedges. A small part is used for permanent pasture.

Ramsey County Soils – 862 – Urban Land – Dundas Complex

The Dundas series is an Alfisol with the following characteristics:

- Very deep, poorly drained soils that formed in loamy calcareous till on moraines
- Soils on level, or nearly level, plane to slightly convex slopes on end or ground moraines. They formed mostly in friable calcareous, glacial till of Late Wisconsin Age.
- These soils have moderately slow saturated hydraulic conductivity. Poorly drained
- Slopes range from 0 to 2 percent
- Fine-loamy, mixed, superactive, mesic Mollic Endoaqualfs
- Native vegetation was mixed deciduous forest and prairie grass.

Ramsey County Soils – 132C – Hayden

The Hayden series is an Alfisol with the following characteristics:

- Deep, well drained soils
- Formed in calcareous loamy glacial till on glacial moraines and till plains
- These soils have moderate permeability
- Their slopes range from 2 to 40 percent
- Fine-loamy, mixed, superactive, mesic Glossic Hapludalfs
- On gently undulating through steep glacial moraines of the Des Moines and Grantsburg sublobe of the Late Wisconsinan glaciation. Montmorillonite is the dominant clay mineral in the glacial till.
- Native vegetation was deciduous forest of Maple, Basswood, Oak, and Elm.

Ramsey County Soils – 153B

The Santiago series is an Alfisol with the following characteristics:

- Well drained soils which are deep to a densic contact
- They formed in loess or silty lacustrine deposits and in the underlying dense sandy loam till on ground moraines, disintegration moraines, and end moraines
- Permeability is moderate in the silty mantle, slow or moderately slow in the lower part of the solum, and very slow in the substratum
- Slope ranges from 1 to 45 percent
- Coarse-loamy, mixed, superactive, frigid Haplic Glossudalfs
- Native vegetation is mixed hardwood forest with a few conifers. Common trees are Sugar Maple, American Basswood, Northern Red Oak, White Ash, American Elm, and Quaking Aspen with some White Pine and Red Pine

Ramsey County Soils – 155C

The **Chetek** series is an Alfisol with the following characteristics:

- Very deep, somewhat excessively drained soils which are shallow to sandy outwash
- They formed mostly in loamy alluvium and in the underlying sandy and gravelly outwash. Typically, they are on outwash plains and stream terraces but some are on moraines or kame terraces.
- Permeability is moderate or moderately rapid in the loamy mantle and rapid or very rapid in the sandy outwash.
- Slopes range from 0 to 45 percent
- Coarse-loamy, mixed, superactive, frigid Inceptic Hapludalfs
- The native vegetation is mixed deciduous and coniferous forest.

Ramsey County Soils – 342D

The **Kingsley** series is an Alfisol with the following characteristics:

- Very deep, well drained soils
- Formed in loamy glacial till on glacial moraines
- Soils that formed in nonacid, reddish brown sandy loam till located on convex slopes on complex undulating to steep moraines of Late Wisconsin age
- Soils that have moderate over moderately slow permeability
- Slopes range from 2 to 40 percent
- Coarse-loamy, mixed, superactive, mesic Mollic Hapludalfs
- The native vegetation was mixed deciduous forest. Present day vegetation is mainly oaks.

Ramsey County Soils – 857C – Urban Lands – Waukegan Complex

The **Waukegan** series are Mollisols with the following characteristics:

- Very deep, well drained soils
- Formed in 50 to 100 centimeters of loess or silty glacial alluvium and in the underlying sandy or sandy-skeletal glacial outwash
- These soils are on slightly concave to convex slopes on glacial outwash plains and valley trains.
- Slope ranges from 0 to 12 percent
- Fine-silty over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls
- The native vegetation is Big Bluestem, Indiangrass, Switchgrass, and other grasses of the tall grass prairie.

Hennepin County Soils – D4 – Dorset sandy loam, (B) 2 to 6 percent slopes and (C) 6 to 12 percent slopes

The **Dorset** series is a Mollisol with the following characteristics:

- Very deep, somewhat excessively drained soils
- Soils formed in a thin loamy mantle and in underlying sandy and gravelly outwash sediments. They are on plane or convex slopes on outwash plains, valley trains, stream terraces and moraines.
- Slopes range from 0 to 35 percent
- Coarse-loamy, mixed, superactive, frigid Calcic Argiudolls
- Native vegetation is prairie grasses, later succeeded by mixed deciduous and coniferous forest.

Hennepin County Soils – D7A – Hubbard loamy sand, (A) 0 to 2 percent slopes, (B) 2 to 6 percent slopes and (C) 6 to 12 percent slopes

The **Hubbard** series are Mollisols with the following characteristics:

- Very deep, excessively drained soils
- Soils that formed in sandy glacial outwash on outwash plains, valley trains, and stream terraces. The materials are of the Late Wisconsin glaciation
- Slopes range from 0 to 35 percent
- Sandy, mixed, frigid Entic Hapludolls
- Native vegetation is principally tall grass prairie with scattered Bur Oak and Hazel

Hennepin County Soils – D8E – Sandberg Series

The **Sandberg Series** is a Mollisol with the following characteristics:

- Very deep, excessively drained soils
- Soils that formed in coarse or moderately coarse glacial outwash sediments or glacial beach deposits with or without a thin loamy mantle
- These soils are on outwash plains, glacial lake beaches, stream terraces, valley trains, and glacial moraines .
- Permeability is moderately rapid or rapid in the upper part and very rapid in the lower part.
- Slopes range from 0 to 45 percent
- Sandy, mixed, frigid Calcic Hapludolls
- Native vegetation is mixed prairie grasses with scattered oak hardwoods.

Hennepin County Soils – D8E – Sandberg Series

The **Sandberg Series** is a Mollisol with the following characteristics:

- Very deep, excessively drained soils
- Soils that formed in coarse or moderately coarse glacial outwash sediments or glacial beach deposits with or without a thin loamy mantle
- These soils are on outwash plains, glacial lake beaches, stream terraces valley trains, and glacial moraines.
- Permeability is moderately rapid or rapid in the upper part and very rapid in the lower part.
- Slopes range from 0 to 45 percent
- Sandy, mixed, frigid Calcic Hapludolls
- Native vegetation is mixed prairie grasses with scattered oak hardwoods.

Hennepin County Soils – D17A – Duelm loamy sand, 0 to 2 percent slopes

The **Duelm** series are Mollisols that consist of:

- Very deep, moderately well drained soils
- Soils that are on plane to slightly concave or convex positions on level to undulating outwash plains, stream terraces, and valley trains. Slope gradients are 0 to 3 percent. The soil

formed in Des Moines lobe sandy outwash sediments of Late Wisconsinan Age. These soils have slopes of 0 to 3 percent.

- Sandy, mixed, frigid Oxyaquic Hapludolls
- Native vegetation is mixed tall prairie grasses and deciduous forest.

Hennepin County Soils – D28B – Urban Land – Bygland Complex, 1 to 6 percent slopes

The Bygland series are Mollisols with the following characteristics:

- Very deep, moderately well drained soils
- Soils that formed in lacustrine sediments
- These soils are typically on plane to convex slopes on glacial lake plains and ice walled lakes within moraines. The soils formed in silty lacustrine sediments over 80 inches thick.
- Surface runoff is medium to high. Permeability is moderately slow. An apparent water table occurs in most years from 2.5 to 3.5 feet during the months April to June.
- The permeability is moderately slow.
- Slopes range from 0 to 20 percent.
- Fine, smectitic, frigid Oxyaquic Vertic Argiudolls
- Native vegetation is mixed hardwoods and prairie grasses..

Hennepin County Soils – D29B – Urban Land – Hubbard Complex, bedrock substratum, 0 to 8 percent slopes

The Hubbard series are Mollisols consisting of

- Very deep, excessively drained soils
- Soils that formed in sandy glacial outwash on outwash plains, valley trains and stream terraces. The materials are of the Late Wisconsin glaciation.
- Slopes range from 0 to 35 percent.
- Sandy, mixed, frigid Entic Hapludolls
- Native vegetation is principally tall grass prairie with scattered Bur Oak and Hazel.

Hennepin County Soils – D30A – Seelyville

The Seelyville series are Histosols that consist of:

- Very deep, very poorly drained soils
- Soils formed in organic materials more than 51 inches thick
- These soils are on glacial outwash plains, valley trains, flood plains, glacial lake plains, and glacial moraines.
- They have moderately rapid to moderately slow permeability.
- Slopes are 0 to 15 percent
- Euic, frigid Typic Haplosaprists
- Native vegetation primarily is sedges and grasses. Some areas have scattered Alders, Willow, Tamarack, and Bog Birch.

Hennepin County Soils –D31A—Urban land-Duelm complex, 0 to 2 percent slopes

The Duelm series are Mollisols that consist of:

- Very deep, moderately well drained soils
- Soils that are on plane to slightly concave or convex positions on level to undulating outwash plains, stream terraces, and valley trains. Slope gradients are 0 to 3 percent. The soil formed in Des Moines lobe sandy outwash sediments of Late Wisconsinan Age. These soils have slopes of 0 to 3 percent.
- Sandy, mixed, frigid Oxyaquic Hapludolls
- Native vegetation is mixed tall prairie grasses and deciduous forest.

Hennepin County Soils – D33 – Urban Land – Dorset, (B) 0 to 8 percent slopes and (C) 8 to 18 percent slopes

The **Dorset** series are Mollisols with the following characteristics:

- Very deep, somewhat excessively drained soils
- Soils formed in a thin loamy mantle and in underlying sandy and gravelly outwash sediments. They are on plane or convex slopes on outwash plains, valley trains, stream terraces and moraines.
- Slopes range from 0 to 35 percent.
- Coarse-loamy, mixed, superactive, frigid Calcic Argiudolls
- Native vegetation is prairie grasses, later succeeded by mixed deciduous and coniferous forest.

Hennepin County Soils - D34B - Urban land-Hubbard complex, 0 to 8 percent slopes

The **Hubbard** series are Mollisols with the following characteristics:

- Very deep, excessively drained soils
- Soils that formed in sandy glacial outwash on outwash plains, valley trains and stream terraces. The materials are of the Late Wisconsin glaciation.
- Slopes range from 0 to 35 percent.
- Sandy, mixed, frigid Entic Hapludolls
- Native vegetation is principally tall grass prairie with scattered Bur Oak and Hazel.

Hennepin County Soils – D35A – Elkriver

The **Elkriver** series are Mollisols with the following characteristics:

- Very deep, somewhat poorly and moderately well drained soils
- Soils that formed in postglacial alluvium consisting of a coarse-loamy mantle and underlying sandy sediments on flood plains.
- Soils that have moderate and moderately rapid permeability in the upper part and rapid permeability in the underlying material.
- Slopes range from 0 to 3 percent.
- Coarse-loamy, mixed, superactive, frigid Cumulic Hapludolls
- Native vegetation is mixed prairie grasses and mixed deciduous forest.

Fordum is an inclusion in this Map Unit.

The **Fordum** series are Entisols with the following characteristics:

- Very deep, poorly drained soils
- Soils which are moderately deep to sand
- They formed in recent alluvium on flood plains.
- Permeability is moderate or moderately rapid in the loamy alluvium and rapid or very rapid in the sandy alluvium.
- Slopes range from 0 to 2 percent.
- Coarse-loamy, mixed, superactive, nonacid, frigid Mollic Fluvaquents
- Soils are on the lowest part of the floodplain adjacent to stream or river channels. Numerous abandoned meander, small overflow channels, and scours produce an irregular microrelief.
- Common trees are Silver Maple, Red Maple, Quaking Aspen, Big Tooth Aspen, Paper Birch, American Elm, White Spruce, and Yellow Birch. Tag Alder is common in many places. Some areas are in marsh vegetation of grasses, sedges, and shrubs.

D37F—Dorset, bedrock substratum-Rock outcrop complex, 25 to 65 percent slopes

The Dorset series are Mollisols with the following characteristics:

- Very deep, somewhat excessively drained soils
- Soils formed in a thin loamy mantle and in underlying sandy and gravelly outwash sediments. They are on plane or convex slopes on outwash plains, valley trains, stream terraces and moraines.
- Slopes range from 0 to 35 percent.
- Coarse-loamy, mixed, superactive, frigid Calcic Argiudolls
- Native vegetation is prairie grasses, later succeeded by mixed deciduous and coniferous forest.

Hennepin County Soils – D41C – Urban Land – Waukon Complex, 6 to 18 percent slopes

The Waukon series is an Alfisol with the following characteristics:

- Very deep, well drained soils
- Soils that formed in glacial till on glacial moraines.
- Permeability is moderate.
- Slopes range from 0 to 40 percent.
- Fine-loamy, mixed, superactive, frigid Mollic Hapludalfs
- Native vegetation was prairie grasses which later were succeeded by mixed hardwood forest.

Hennepin County Soils – L3C—Rasset sandy loam, 6 to 12 percent slopes

The Rasset series are Mollisols with the following characteristics:

- Very deep, well drained soils
- Soils that formed in 50 to 100 centimeters of loamy sediments and the underlying sandy and gravelly outwash.
- Soils on nearly level to convex slopes on outwash plains, valley trains, and moraines and on treads and risers of strath terraces.
- Slope ranges from 0 to 40 percent.
- Coarse-loamy, mixed, superactive, mesic Typic Argiudolls
- The native vegetation is mixed deciduous forest and Big Bluestem, Little Bluestem, Switchgrass, and other grasses of the tall grass prairie.

Hennepin County Soils – L52C—Urban land-Lester complex, 2 to 18 percent slopes

The Lester series are Alfisols with the following characteristics:

- Very deep, well drained soils
- Soils that formed in calcareous loamy till on till plains and moraines of the late Wisconsinan Age.
- Soils that have moderate permeability.
- Their slopes range from 5 to 70 percent.
- Fine-loamy, mixed, superactive, mesic Mollic Hapludalfs
- Native vegetation is savanna.

Hennepin County Soils – L53B—Urban land-Moon complex, 2 to 8 percent slopes

The Moon series are Alfisols that consist of:

- Very deep, moderately well drained soils
- Soils that formed in wind- or water-laid sandy material and the underlying till on moraines and till plains.
- Soils whose permeability is rapid in the upper sandy material and moderate or moderately slow in the underlying loamy till.

- Slope ranges from 0 to 5 percent.
- Loamy, mixed, active, mesic Arenic Oxyaquic Hapludalfs
- Native vegetation is deciduous forest.

Hennepin County Soils - L54A—Urban land-Dundas complex, 0 to 3 percent slopes

The **Dundas** series is an Alfisol with the following characteristics:

- Very deep, poorly drained soils that formed in loamy calcareous till on moraines.
- Soils on level, or nearly level, plane to slightly convex slopes on end or ground moraines. They formed mostly in friable calcareous, glacial till of Late Wisconsin Age.
- These soils have moderately slow saturated hydraulic conductivity. Poorly drained
- Slopes range from 0 to 2 percent.
- Fine-loamy, mixed, superactive, mesic Mollic Endoaqualfs
- Native vegetation was mixed deciduous forest and prairie grass.

Hennepin County Soils - L55—Urban land-Malardi complex, (B) 0 to 8 percent slopes and (C) 8 to 18 percent

The **Malardi** series is a Mollisol with the following characteristics:

- Very deep, somewhat excessively drained soils that formed in loamy outwash sediments.
- Soils on nearly level or convex slopes on outwash plains, stream terraces, and collapsed glacial alluvium within ground moraines and end moraines.
- Surface runoff potential is negligible to medium.
- Slopes range from 0 to 35 percent.
- Coarse-loamy, mixed, superactive, mesic Typic Argiudoll.
- Native vegetation was mixed deciduous forest and prairie grass of the tall grass prairie.

Hennepin County Soils -L62—Koronis-Kingsley-Malardi complex, (C2) 6 to 12 percent slopes, eroded and (E) 18 to 35 percent slopes

The **Koronis** series is with the following characteristics:

- Very deep, well drained soils that formed in loamy glacial till on moraines.
- Permeability is moderate or moderately rapid.
- Slopes range from 2 to 40 percent.
- Fine-loamy, mixed, superactive, mesic Mollic Hapludalfs
- Native vegetation was savanna or prairie later succeeded by mixed hardwood forest.

Hennepin County Soils – U1A, U2A, and U5A – Udorthents, Wet Substratum – Soils

These are all soils mapped without reference to a soil series, identified by the NRCS as highly disturbed, cut and fill, or impervious surface. These three units are mapped as disturbed soils with wet substratum due to filling or draining activities.

Hennepin County Soils – U3B, U4A, and U6B – Udorthents, Cut and Fill – Soils

These are all soils mapped without reference to a soil series, identified by the NRCS as highly disturbed, cut and fill, or impervious surface. There is no indication that these soils were hydric soils prior to disturbance.

1929 Hennepin County Soil Survey

The 1929 Hennepin County Soil Survey mapped portions of Minneapolis prior to development, and subsequent soil disturbance that effectively removed native soil characteristics. To a large degree, the

Northeast portion of the project area has not been mapped since the first soils series. Two predominant map units were described during the 1920s survey in Northeast Minneapolis. The dominant soil unit in the northeast corner of the MWMO area was mapped as Hayden Loam, with Webster Silty Clay Loam forming extensive areas in depressions and swales leading downslope to the west.

The Soil Survey described the entire county as “originally covered with hardwood forests,” except for some of the sandy plains along the Minnesota and Mississippi Rivers.

Hayden Loam – This soil was described in the 1929 survey as a light-gray or gray surface soil ranging in texture from fine sandy loam to loam. The upper part when moist is sticky and plastic, and when dry becomes somewhat hard. “The fine texture of the subsoil allows it to retain moisture well. The deeper part of the subsoil consists of friable . . . sandy clay loam or clay loam containing considerable lime. In areas in which the surface is more rolling, the soil has a tendency to wash, the finer material being carried to the lowlands, leaving the brown heavier upper subsoil exposed. Therefore, the lower slopes of many of the steeper hills have a finer-textured soil. In some places erosion has formed small gullies, but sheet erosion has been more damaging.”

“Most of the Hayden loam has a sufficiently coarse-textured surface soil that, after being saturated with water, dried out rather rapidly, thus allowing the land to be worked early in the spring. With the exception of the well-drained sands, this soil is among the first in the county to dry in the spring and accordingly is the first to be worked. It is naturally productive . . . Most of the land devoted to pasture consists of wooded and hilly tracts.”

This is to a large degree, the 1929 soil description

The modern soils series provides a generally similar description. Features of the modern description of the **Hayden Series** are:

- Forest ecosystem Alfisols
- Deep, well drained soils that formed in calcareous loamy glacial till on moraines and till plains.
- Permeability is moderate
- Slopes range from 2 to 40 percent.
- Fine-loamy, mixed, superactive, mesic Glossic Hapludalfs
- Plane or convex slopes on gently undulating to steep moraines of the Des Moines and Grantsburg sublobe.
- Native vegetation was deciduous forest of Maple, Basswood, Oak, and Elm.

Webster Silt Loam - The other common soils mapped in the northeast portion of Minneapolis were Webster and peat. Peat soils are soils of poorly decomposed organic matter. The map units D30A (Hennepin County) and 543 (Ramsey County) are typical modern mapped units of organic peat or muck. The Webster soils are described in the 1929 Soil Survey as dark-colored poorly drained sandy loam to clay loam. The upper part of the subsoil is either dark-gray or light-gray, more or less stained with blotches of orange, yellow, and red. The subsurface material is mostly clay loam, sticky when wet, and somewhat impervious to percolation.

The soil is located in depressions surrounded by steeply sloping uplands. The upper layer is covered with a fine coating of silty material at the outer edge of depressions. The soil is described as typical of potholes smaller than an acre which cannot be shown on the map because of their small size. In Northeast Minneapolis, the multiple small depressions indicated on the map, but not identified as Webster, were likely viewed as this series.

This soil was described as typical of soil borders of peat bogs as a narrow fringe. The soil was described as typical of small basins with no surface outlet, typical of the till mounds of the eastern edge of the MWMO. The survey suggests that much of this map unit was farmed as it was typical of farm fields, though too small to be farmed around.

The modern NRCS description is as follows:

The Webster Series are Mollisols that consist of:

- Very deep, poorly drained, moderately permeable soils
- Soils that formed in glacial till or local alluvium derived from till on uplands.
- Webster soils are on relatively undissected till plains of Wisconsin age.
- Slope ranges from 0 to 3 percent.
- Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
- Native vegetation is predominantly wet-site tall prairie grasses.