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Station and Cooperative  
Extension Service,  
Iowa State University,  
and Division of Soil  
Conservation, Iowa  
Department of  
Agriculture and Land  
Stewardship

# Soil Survey of Dickinson County, Iowa

## Part II





# How To Use This Soil Survey

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This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of soils called associations. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the soil associations on the color-coded map legend, and then refer to the section **General Soil Map Units** in Part I for a general description of the soils in your area.

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets** in Part III. Note the number of the map sheet, and turn to that sheet. Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. The **Contents** in Part I lists the map units and shows the page where each map unit is described.

The **Contents** in Part II shows which table has information on a specific land use or soil property for each detailed soil map unit. Also, see the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

## National Cooperative Soil Survey

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Dickinson County Soil and Water Conservation District.

Major fieldwork for this soil survey was completed in 2009. Soil names and descriptions were approved in 2010. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2010. The tables reflect the data in effect as of March 2011. The most current official data are available on the Internet (<http://soils.usda.gov>).

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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## Cover Photo Caption

A soybean field in northwestern Dickinson County in an area of the Clarion-Nicollet-Webster association. This association is dominated by low-relief, gently rolling swell-and-swale topography.

*Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.*

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Issued 2011

# Soil Survey of Dickinson County, Iowa

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## Introduction to Part II

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

This part of the soil survey includes interpretations for various uses of the soils and data on soil properties. This information can be used to plan the use and management of soils for crops and pasture or as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of gravel, sand, reclamation material, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The table "Classification of the Soils" is at the end of this section. Information about the system of soil taxonomy used by the Natural Resources Conservation Service is available in Part I of this publication. The extent of the map units in this survey area is shown in the table "Acreage and Proportionate Extent of the Soils."

## Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

## Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited*, *somewhat limited*, and *very limited*. The suitability ratings are expressed as *well suited*, *moderately suited*, *poorly suited*, and *unsuited* or as *good*, *fair*, and *poor*.

## Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

### Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text in Part I for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Augusta Lake-----	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
*Augusta Lake-----	Coarse-loamy, mixed, superactive, mesic Typic Eutrudepts
Belview-----	Fine-loamy, mixed, superactive, mesic Typic Calcudolls
*Belview-----	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Biscay-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Endoaquolls
Blue Earth-----	Fine-silty, mixed, superactive, calcareous, mesic Mollic Fluvaquents
*Bolan-----	Coarse-loamy, mixed, superactive, mesic Typic Eutrudepts
Calco-----	Fine-silty, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Canisteo-----	Fine-loamy, mixed, superactive, calcareous, mesic Typic Endoaquolls
Clarion-----	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Clarion-----	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Coland-----	Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls
Crippin-----	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Cylinder-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Aquic Hapludolls
*Cylinder-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Aquic Hapludolls
Delft-----	Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls
Dickinson-----	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
*Dickinson-----	Coarse-loamy, mixed, superactive, mesic Typic Eutrudepts
Dickman-----	Sandy, mixed, mesic Typic Hapludolls
Estherville-----	Sandy, mixed, mesic Typic Hapludolls
*Estherville-----	Sandy, mixed, mesic Typic Eutrudepts
Everly-----	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Everly-----	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Fostoria-----	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Gillett Grove-----	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
Harps-----	Fine-loamy, mixed, superactive, mesic Typic Calcuaquolls
Havelock-----	Fine-loamy, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Hawick-----	Sandy, mixed, mesic Entic Hapludolls
Histosols-----	Loamy, mixed, euic, mesic Terric Medisaprists
Letri-----	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
Madelia-----	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
McCreath-----	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Nicollet-----	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Ocheyedan-----	Fine-loamy, mixed, superactive, mesic Typic Hapludolls

## Soil Survey of Dickinson County, Iowa—Part II

### Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Okabena-----	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Okobojo-----	Fine, smectitic, mesic Cumulic Vertic Endoaquolls
Omsrud-----	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Omsrud-----	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
*Pilot Grove-----	Sandy, mixed, mesic Typic Eutrudepts
Ransom-----	Fine-silty, mixed, mesic Aquic Hapludolls
Ridgeton-----	Fine-loamy, mixed, superactive, mesic Pachic Hapludolls
Roine-----	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
Rolfe-----	Fine, smectitic, mesic Typic Argialbolls
Sac-----	Fine-silty, mixed, superactive, mesic Oxyaquic Hapludolls
Spicer-----	Fine-silty, mixed, superactive, calcareous, mesic Typic Endoaquolls
Spillville-----	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Storden-----	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Talcot-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Endoaquolls
Terril-----	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Udorthents-----	Udorthents
Wadena-----	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls
Waldorf-----	Fine, smectitic, mesic Vertic Endoaquolls
Webster-----	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
Wilmington-----	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls

### Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
6	Okobojo silty clay loam, 0 to 1 percent slopes-----	6,616	2.6
27B	Terril loam, 2 to 5 percent slopes-----	2,020	0.8
28B	Dickman fine sandy loam, 2 to 5 percent slopes-----	56	*
32	Spicer silty clay loam, MLRA 107, 0 to 2 percent slopes-----	1,044	0.4
34	Estherville sandy loam, 0 to 2 percent slopes-----	734	0.3
34B	Estherville sandy loam, 2 to 5 percent slopes-----	2,095	0.8
34C2	Estherville sandy loam, 5 to 9 percent slopes, moderately eroded-----	792	0.3
55	Nicollet loam, 1 to 3 percent slopes-----	41,322	16.0
77B	Sac silty clay loam, 2 to 5 percent slopes-----	2,886	1.1
95	Harps loam, 0 to 2 percent slopes-----	713	0.3
107	Webster silty clay loam, 0 to 2 percent slopes-----	18,731	7.2
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded-----	2,079	0.8
138B	Clarion loam, 2 to 5 percent slopes-----	39,583	15.3
138C	Clarion loam, 5 to 9 percent slopes-----	5,250	2.0
175B	Dickinson fine sandy loam, 2 to 5 percent slopes-----	296	0.1
175C2	Dickinson fine sandy loam, 5 to 9 percent slopes, moderately eroded-----	81	*
199	Cylinder-Nicollet complex, 0 to 3 percent slopes-----	257	*
200	Cylinder complex, 0 to 2 percent slopes-----	2,067	0.8
259	Biscaya clay loam, 0 to 2 percent slopes-----	788	0.3
274	Rolfe silty clay loam, 0 to 1 percent slopes-----	139	*
282	Ransom silty clay loam, 1 to 3 percent slopes-----	3,798	1.5
283B	Dickman-Clarion complex, 2 to 5 percent slopes-----	105	*
308	Wadena loam, 0 to 2 percent slopes-----	4,395	1.7
308B	Wadena loam, 2 to 5 percent slopes-----	2,227	0.9
308C	Wadena loam, 5 to 9 percent slopes-----	111	*
327	Wadena-Augusta Lake-Clarion complex, 0 to 2 percent slopes-----	58	*
327B	Wadena-Augusta Lake-Clarion complex, 2 to 5 percent slopes-----	542	0.2
331	Madelia silty clay loam, 0 to 2 percent slopes-----	443	0.2
341C2	Estherville-Pilot Grove complex, 5 to 9 percent slopes, moderately eroded	728	0.3
346B	Augusta Lake-Estherville complex, 2 to 5 percent slopes-----	912	0.4
347B	Augusta Lake loam, 1 to 5 percent slopes-----	192	*

See footnote at end of table.

## Soil Survey of Dickinson County, Iowa—Part II

### Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
347C	Augusta Lake loam, 5 to 9 percent slopes-----	135	*
374B	Okabena silty clay loam, 1 to 5 percent slopes-----	5,769	2.2
374C	Okabena silty clay loam, 5 to 9 percent slopes-----	417	0.2
390	Waldorf silty clay loam, 0 to 2 percent slopes-----	4,199	1.6
397	Letri silty clay loam, 0 to 1 percent slopes-----	1,505	0.6
456	Wilmington silty clay loam, 1 to 3 percent slopes-----	4,546	1.8
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded-----	584	0.2
507	Canisteo silty clay loam, 0 to 2 percent slopes-----	12,351	4.8
511	Blue Earth mucky silt loam, 0 to 1 percent slopes-----	2,348	0.9
557	Talcot-Biscay complex, 0 to 2 percent slopes-----	130	*
559	Talcot silty clay loam, 0 to 2 percent slopes-----	1,070	0.4
574C2	Bolan-Augusta Lake complex, 5 to 9 percent slopes, moderately eroded-----	116	*
577B	Everly clay loam, 2 to 5 percent slopes-----	4,235	1.6
577C2	Everly clay loam, 5 to 9 percent slopes, moderately eroded-----	376	0.1
586B	Coland-Spillville complex, 1 to 5 percent slopes, occasionally flooded---	556	0.2
634E2	Belview-Omsrud complex, 14 to 18 percent slopes, moderately eroded-----	1,276	0.5
634G	Belview-Omsrud complex, 18 to 40 percent slopes-----	1,220	0.5
635C2	Belview-Storden complex, 5 to 9 percent slopes, moderately eroded-----	873	0.3
638C2	Clarion-Storden complex, 5 to 9 percent slopes, moderately eroded-----	17,335	6.7
655	Crippin loam, 1 to 3 percent slopes-----	6,050	2.3
733	Calco silty clay loam, 0 to 2 percent slopes, occasionally flooded-----	1,671	0.6
735	Havelock loam, 0 to 2 percent slopes, occasionally flooded-----	406	0.2
740D	Hawick gravelly sandy loam, 9 to 14 percent slopes-----	344	0.1
740F	Hawick gravelly sandy loam, 14 to 24 percent slopes-----	201	*
740G	Hawick gravelly sandy loam, 24 to 40 percent slopes-----	372	0.1
835D2	Omsrud-Storden complex, 9 to 14 percent slopes, moderately eroded-----	6,984	2.7
854D	Histosols, fens, 5 to 14 percent slopes-----	2	*
875B	Roine fine sandy loam, 2 to 5 percent slopes-----	530	0.2
878	Ocheyedan loam, 0 to 2 percent slopes-----	628	0.2
878B	Ocheyedan loam, 2 to 5 percent slopes-----	1,683	0.7
879	Fostoria loam, 1 to 3 percent slopes-----	2,056	0.8
1032	Spicer silty clay loam, 0 to 2 percent slopes-----	873	0.3
1091	McCreath silty clay loam, 0 to 2 percent slopes-----	2,609	1.0
1091B	McCreath silty clay loam, 2 to 5 percent slopes-----	1,121	0.4
1092	Gillett Grove silty clay loam, 0 to 2 percent slopes-----	2,430	0.9
1511	Blue Earth muck, ponded, 0 to 1 percent slopes-----	2,187	0.8
1707B	Delft-Terril complex, 1 to 5 percent slopes-----	8,856	3.4
2700C	Ridgeton loam, 5 to 9 percent slopes-----	889	0.3
4946B	Udorthents-Highway complex, 0 to 5 percent slopes-----	137	*
5010	Pits, sand and gravel-----	770	0.3
5040	Udorthents, loamy-----	1,155	0.4
AW	Animal waste lagoon-----	8	*
SL	Sewage lagoon-----	29	*
W	Water-----	16,508	6.4
	Total-----	258,600	100.0

\* Less than 0.1 percent.

# Agronomy

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This section provides some general information about managing the soils for crops and for hay and pasture. The Iowa corn suitability rating system and the system of land capability classification used by the Natural Resources Conservation Service are explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil. Prime farmland and other categories of important farmland are described, and interpretations for windbreaks and environmental plantings and for agricultural waste management are provided.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

## Cropland Management Considerations

The main concerns in managing nonirrigated cropland in the survey area are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control wind erosion and water erosion. Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining soil fertility include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer. Many soils are more productive than they were in their natural state because applications of commercial fertilizer and lime have overcome deficiencies in plant nutrients.

## Crop Yield Estimates

The tables "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops" and "Land Capability and Yields per Acre of Pasture" are described in this section. Crops other than those shown in the tables are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

## Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forestland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

*Capability classes*, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, or wildlife habitat.

*Capability units* are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

[Reference: United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. USDA Handbook 210.]

## **Corn Suitability Rating**

The corn suitability rating (CSR) system was developed in Iowa to rate the productivity of each different kind of soil for row crops. CSRs provide a relative ranking of all soils mapped in the State of Iowa. They can be used to compare the potential yield production of one soil with that of other soils. Ratings range from 5 to 100. A rating of 5 indicates severe limitations for row crop production. Soil properties and weather conditions are the dominant factors that affect productivity.

## **Crop Yields**

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the table. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

## **Pasture Yields**

Some pasture yields are expressed in the table in terms of animal unit months. An animal unit month (AUM) is the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

The local office of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about forage yields other than those shown in the table.

## Soil Survey of Dickinson County, Iowa—Part II

### Land Capability, Corn Suitability Rating, and Yields per Acre of Crops

(The crop yield estimates are based on a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. See text for additional information)

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
6----- Okoboji	80	3w	43	143	46	100
27B----- Terril	80	2e	71	181	58	127
28B----- Dickman	85	3e	14	104	33	73
32----- Spicer	85	2w	77	188	66	141
34----- Estherville	85	3s	15	105	34	74
34B----- Estherville	65	3s	15	105	34	74
34C2----- Estherville, moderately eroded	65	4e	15	105	34	74
55----- Nicollet	85	1	73	183	59	128
77B----- Sac	90	2e	76	188	66	141
95----- Harps	85	2w	57	162	52	113
107----- Webster	70	2w	70	179	57	125
135----- Coland, occasionally flooded	85	2w	58	163	52	114
138B----- Clarion	85	2e	73	183	59	128
138C----- Clarion	70	3e	67	175	56	123
175B----- Dickinson	80	3e	31	127	41	89
175C2----- Dickinson, moderately eroded	80	3e	28	122	39	86
199----- Cylinder	30	2s	57	162	52	113
Nicollet-----	20	1				
200----- Cylinder	60	2s	45	146	47	102
Cylinder, calcareous----	25	2s				

Soil Survey of Dickinson County, Iowa—Part II

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
259----- Biscay	85	2w	41	140	45	98
274----- Rolfe	85	3w	39	138	44	96
282----- Ransom	85	1	78	190	66	142
283B----- Dickman----- Clarion-----	35 25	3e 2e	44	144	46	101
308----- Wadena	85	2s	43	143	46	100
308B----- Wadena	75	2e	36	134	43	94
308C----- Wadena	70	3e	32	128	41	90
327----- Wadena----- Augusta Lake----- Clarion-----	35 30 25	2s 3e 2e	60	166	53	116
327B----- Wadena----- Augusta Lake----- Clarion-----	35 30 20	2e 3e 2e	55	159	51	111
331----- Madelia	70	2w	74	185	59	129
341C2----- Estherville, moderately eroded----- Pilot Grove, moderately eroded-----	40 30	4e 4s	19	111	36	78
346B----- Augusta Lake----- Estherville-----	40 30	3e 3s	40	139	45	98
347B----- Augusta Lake	70	3e	59	165	53	115
347C----- Augusta Lake	65	3e	48	150	48	105
374B----- Okabena	70	1	73	184	59	128
374C----- Okabena	65	3e	69	178	57	125
390----- Waldorf	50	2w	59	164	52	115
397----- Letri	90	2w	72	182	64	137

Soil Survey of Dickinson County, Iowa—Part II

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
456----- Wilmington	95	1	73	183	64	138
485----- Spillville, occasionally flooded	80	2w	68	177	57	124
507----- Canisteo	60	2w	71	180	58	126
511----- Blue Earth	80	3w	49	151	48	106
557----- Talcot----- Biscay-----	45 20	2w 2w	50	153	49	107
559----- Talcot	95	2w	40	139	44	97
574C2----- Bolan, moderately eroded Augusta Lake, moderately eroded-----	50 35	3e 3e	45	145	47	102
577B----- Everly	100	2e	73	183	64	138
577C2----- Everly, moderately eroded	80	3e	67	176	62	132
586B----- Coland, occasionally flooded----- Spillville, occasionally flooded---	65 20	2w 2w	55	160	51	112
634E2----- Belview, moderately eroded----- Omsrud, moderately eroded-----	35 20	6e 4e	18	109	35	76
634G----- Belview----- Omsrud-----	55 30	6e 6e	6	93	30	65
635C2----- Belview, moderately eroded----- Storden, moderately eroded-----	70 25	3e 3e	18	109	35	76
638C2----- Clarion, moderately eroded----- Storden, moderately eroded-----	50 20	3e 3e	52	156	50	109
655----- Crippin	65	1	71	181	58	127

Soil Survey of Dickinson County, Iowa—Part II

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
733----- Calco, occasionally flooded	85	2w	64	172	55	120
735----- Havelock, occasionally flooded	73	2w	57	161	52	113
740D----- Hawick	80	4s	11	100	32	70
740F----- Hawick	90	6s	7	94	30	66
740G----- Hawick	85	6s	5	92	29	64
835D2----- Omsrud, moderately eroded-----	50	3e	35	132	42	92
Storden, moderately eroded-----			25	3e		
854D----- Histosols, fens	100	52	5	---	---	---
875B----- Roine	88	3e	63	171	60	128
878----- Ocheyedan	95	1	78	190	67	143
878B----- Ocheyedan	85	2e	74	185	65	138
879----- Fostoria	85	1	73	184	64	138
1032----- Spicer	95	2w	74	185	59	130
1091----- McCreath	90	1	82	195	68	146
1091B----- McCreath	95	1	77	189	66	142
1092----- Gillett Grove	85	2w	79	191	67	143
1511----- Blue Earth, ponded	90	8w	5	---	---	---
1707B----- Delft-----	55	2w	59	165	53	115
Terril-----		20	2e			
2700C----- Ridgeton	75	4e	66	174	56	122
4946B. Udorthents-Highway						

## Soil Survey of Dickinson County, Iowa—Part II

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn  Bu	Soybeans  Bu	Oats  Bu
5010. Pits, sand and gravel						
5040. Udorthents, loamy						
AW. Animal waste lagoon						
SL. Sewage lagoon						
W. Water						

## Soil Survey of Dickinson County, Iowa—Part II

### Land Capability and Yields per Acre of Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Bromegrass-	Bromegrass-	Kentucky	Smooth
		alfalfa	alfalfa hay	bluegrass	bromegrass
		AUM*	Tons	AUM*	AUM*
6----- Okoboji	3w	5.1	4.3	2.7	4.1
27B----- Terril	2e	6.5	5.4	3.4	5.2
28B----- Dickman	3e	3.7	3.1	1.9	3.0
32----- Spicer	2w	6.7	5.7	3.5	5.4
34----- Estherville	3s	3.8	3.2	2.0	3.0
34B----- Estherville	3s	3.8	3.2	2.0	3.0
34C2----- Estherville, moderately eroded	4e	3.8	3.2	2.0	3.0
55----- Nicollet	1	6.6	5.5	3.4	5.2
77B----- Sac	2e	6.7	5.6	3.5	5.4
95----- Harps	2w	5.8	4.9	3.0	4.6
107----- Webster	2w	6.4	5.4	3.4	5.1
135----- Coland, occasionally flooded	2w	5.8	4.9	3.0	4.6
138B----- Clarion	2e	6.6	5.5	3.4	5.2
138C----- Clarion	3e	6.3	5.3	3.3	5.0
175B----- Dickinson	3e	4.6	3.8	2.4	3.6
175C2----- Dickinson, moderately eroded	3e	4.4	3.7	2.3	3.5
199----- Cylinder	2s	5.8	4.9	3.0	4.6
Nicollet-----	1				

See footnote at end of table.

## Soil Survey of Dickinson County, Iowa—Part II

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-	Bromegrass-	Kentucky	Smooth
		alfalfa	alfalfa hay	bluegrass	bromegrass
		AUM*	Tons	AUM*	AUM*
200----- Cylinder----- Cylinder, calcareous----	2s 2s	5.2	4.4	2.7	4.2
259----- Biscay	2w	5.0	4.2	2.6	4.0
274----- Rolfe	3w	4.9	4.1	2.6	3.9
282----- Ransom	1	6.8	5.7	3.6	5.4
283B----- Dickman----- Clarion-----	3e 2e	5.1	4.3	2.7	4.1
308----- Wadena	2s	5.1	4.3	2.7	4.1
308B----- Wadena	2e	4.8	4.0	2.5	3.8
308C----- Wadena	3e	4.6	3.8	2.4	3.7
327----- Wadena----- Augusta Lake----- Clarion-----	2s 3e 2e	5.9	5.0	3.1	4.7
327B----- Wadena----- Augusta Lake----- Clarion-----	2e 3e 2e	5.7	4.8	3.0	4.5
331----- Madelia	2w	6.6	5.5	3.5	5.3
341C2----- Estherville, moderately eroded----- Pilot Grove, moderately eroded-----	4e 4s	4.0	3.3	2.1	3.2
346B----- Augusta Lake----- Estherville-----	3e 3s	5.0	4.2	2.6	4.0
347B----- Augusta Lake	3e	5.9	4.9	3.1	4.7
347C----- Augusta Lake	3e	5.4	4.5	2.8	4.3
374B----- Okabena	1	6.6	5.5	3.4	5.2
374C----- Okabena	3e	6.4	5.4	3.3	5.1

See footnote at end of table.

Soil Survey of Dickinson County, Iowa—Part II

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass-	Bromegrass-	Kentucky	Smooth
		alfalfa AUM*	alfalfa hay Tons	bluegrass AUM*	bromegrass AUM*
390----- Waldorf	2w	5.9	4.9	3.1	4.7
397----- Letri	2w	6.5	5.5	3.4	5.2
456----- Wilmington	1	6.6	5.5	3.4	5.2
485----- Spillville, occasionally flooded	2w	6.3	5.3	3.3	5.0
507----- Canisteo	2w	6.5	5.4	3.4	5.1
511----- Blue Earth	3w	5.4	4.5	2.8	4.3
557----- Talcot----- Biscay-----	2w 2w	5.5	4.6	2.9	4.3
559----- Talcot	2w	5.0	4.2	2.6	4.0
574C2----- Bolan, moderately eroded Augusta Lake, moderately eroded-----	3e 3e	5.2	4.4	2.7	4.1
577B----- Everly	2e	6.6	5.5	3.4	5.2
577C2----- Everly, moderately eroded	3e	6.3	5.3	3.3	5.0
586B----- Coland, occasionally flooded----- Spillville, occasionally flooded---	2w 2w	5.7	4.8	3.0	4.6
634E2----- Belview, moderately eroded----- Omsrud, moderately eroded-----	6e 4e	3.9	3.3	2.0	3.1
634G----- Belview----- Omsrud-----	6e 6e	3.3	2.8	1.7	2.6
635C2----- Belview, moderately eroded----- Storden, moderately eroded-----	3e 3e	3.9	3.3	2.0	3.1

See footnote at end of table.

## Soil Survey of Dickinson County, Iowa—Part II

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Land capability	Brome-grass- alfalfa	Brome-grass- alfalfa hay	Kentucky bluegrass	Smooth brome-grass
		AUM*	Tons	AUM*	AUM*
638C2----- Clarion, moderately eroded----- Storden, moderately eroded-----	3e  3e	5.6	4.7	2.9	4.4
655----- Crippin	1	6.5	5.4	3.4	5.2
733----- Calco, occasionally flooded	2w	6.2	5.2	3.2	4.9
735----- Havelock, occasionally flooded	2w	5.8	4.8	3.0	4.6
740D----- Hawick	4s	3.6	3.0	1.9	2.8
740F----- Hawick	6s	3.4	2.8	1.8	2.7
740G----- Hawick	6s	3.3	2.8	1.7	2.6
835D2----- Omsrud, moderately eroded----- Storden, moderately eroded-----	3e  3e	4.7	4.0	2.5	3.8
854D----- Histosols, fens	5w	---	---	---	---
875B----- Roine	3e	6.1	5.1	3.2	4.9
878----- Ocheyedan	1	6.8	5.7	3.6	5.4
878B----- Ocheyedan	2e	6.6	5.5	3.5	5.3
879----- Fostoria	1	6.6	5.5	3.4	5.2
1032----- Spicer	2w	6.6	5.6	3.5	5.3
1091----- McCreath	1	7.0	5.9	3.7	5.6
1091B----- McCreath	1	6.8	5.7	3.5	5.4
1092----- Gillett Grove	2w	6.8	5.7	3.6	5.4

See footnote at end of table.

## Soil Survey of Dickinson County, Iowa—Part II

### Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass- alfalfa AUM*	Bromegrass- alfalfa hay Tons	Kentucky bluegrass AUM*	Smooth bromegrass AUM*
1511----- Blue Earth, ponded	8w	---	---	---	---
1707B----- Delft----- Terril-----	2w 2e	5.9	4.9	3.1	4.7
2700C----- Ridgeton	4e	6.2	5.2	3.3	5.0
4946B. Udorthents-Highway					
5010. Pits, sand and gravel					
5040. Udorthents, loamy					
AW. Animal waste lagoon					
SL. Sewage lagoon					
W. Water					

\* Animal unit month: The amount of forage required to feed one mature cow, of approximately 1,000 pounds weight, with or without a calf, for 30 days.

## Prime Farmland and Other Important Farmland

The table “Prime Farmland and Other Important Farmland” lists the map units in the survey area that are considered prime farmland and farmland of statewide importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation’s food supply.

*Prime farmland* is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

For some soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

In some areas, land that does not meet the criteria for prime farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

## Soil Survey of Dickinson County, Iowa—Part II

### Prime Farmland and Other Important Farmland

(Only the soils considered prime or important farmland are listed. Urban or built-up areas of the soils listed are not considered prime or important farmland. If a soil is prime or important farmland only under certain conditions, such as "where drained," these conditions are specified)

Map symbol	Map unit name	Farmland classification
27B	Terril loam, 2 to 5 percent slopes	Prime farmland
28B	Dickman fine sandy loam, 2 to 5 percent slopes	Farmland of statewide importance
32	Spicer silty clay loam, MLRA 107, 0 to 2 percent slopes	Prime farmland where drained
34	Estherville sandy loam, 0 to 2 percent slopes	Farmland of statewide importance
34B	Estherville sandy loam, 2 to 5 percent slopes	Farmland of statewide importance
34C2	Estherville sandy loam, 5 to 9 percent slopes, moderately   eroded	Farmland of statewide importance
55	Nicollet loam, 1 to 3 percent slopes	Prime farmland
77B	Sac silty clay loam, 2 to 5 percent slopes	Prime farmland
95	Harps loam, 0 to 2 percent slopes	Prime farmland where drained
107	Webster silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
135	Coland clay loam, 0 to 2 percent slopes, occasionally   flooded	Prime farmland where drained
138B	Clarion loam, 2 to 5 percent slopes	Prime farmland
138C	Clarion loam, 5 to 9 percent slopes	Farmland of statewide importance
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	Prime farmland
175C2	Dickinson fine sandy loam, 5 to 9 percent slopes,   moderately eroded	Farmland of statewide importance
199	Cylinder-Nicollet complex, 0 to 3 percent slopes	Prime farmland
200	Cylinder complex, 0 to 2 percent slopes	Prime farmland
259	Biscay clay loam, 0 to 2 percent slopes	Farmland of statewide importance
282	Ransom silty clay loam, 1 to 3 percent slopes	Prime farmland
308	Wadena loam, 0 to 2 percent slopes	Prime farmland
308B	Wadena loam, 2 to 5 percent slopes	Prime farmland
308C	Wadena loam, 5 to 9 percent slopes	Farmland of statewide importance
327	Wadena-Augusta Lake-Clarion complex, 0 to 2 percent slopes	Prime farmland
327B	Wadena-Augusta Lake-Clarion complex, 2 to 5 percent slopes	Farmland of statewide importance
331	Madelia silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
341C2	Estherville-Pilot Grove complex, 5 to 9 percent slopes,   moderately eroded	Farmland of statewide importance
346B	Augusta Lake-Estherville complex, 2 to 5 percent slopes	Farmland of statewide importance
347B	Augusta Lake loam, 1 to 5 percent slopes	Prime farmland
347C	Augusta Lake loam, 5 to 9 percent slopes	Farmland of statewide importance
374B	Okabena silty clay loam, 1 to 5 percent slopes	Prime farmland
374C	Okabena silty clay loam, 5 to 9 percent slopes	Farmland of statewide importance
390	Waldorf silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
397	Letri silty clay loam, 0 to 1 percent slopes	Prime farmland where drained
456	Wilmonton silty clay loam, 1 to 3 percent slopes	Prime farmland
485	Spillville loam, 0 to 2 percent slopes, occasionally   flooded	Prime farmland
507	Canisteo silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
557	Talcot-Biscay complex, 0 to 2 percent slopes	Prime farmland where drained
559	Talcot silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
574C2	Bolan-Augusta Lake complex, 5 to 9 percent slopes,   moderately eroded	Farmland of statewide importance
577B	Everly clay loam, 2 to 5 percent slopes	Prime farmland
577C2	Everly clay loam, 5 to 9 percent slopes, moderately eroded	Farmland of statewide importance
586B	Coland-Spillville complex, 1 to 5 percent slopes,   occasionally flooded	Prime farmland where drained
635C2	Belview-Storden complex, 5 to 9 percent slopes, moderately   eroded	Farmland of statewide importance
638C2	Clarion-Storden complex, 5 to 9 percent slopes, moderately   eroded	Farmland of statewide importance
655	Crippin loam, 1 to 3 percent slopes	Prime farmland
733	Calco silty clay loam, 0 to 2 percent slopes, occasionally   flooded	Prime farmland where drained
735	Havelock loam, 0 to 2 percent slopes, occasionally flooded	Prime farmland where drained
740D	Hawick gravelly sandy loam, 9 to 14 percent slopes	Farmland of statewide importance
740F	Hawick gravelly sandy loam, 14 to 24 percent slopes	Farmland of statewide importance

## Soil Survey of Dickinson County, Iowa—Part II

### Prime Farmland and Other Important Farmland--Continued

Map symbol	Map unit name	Farmland classification
835D2	Omsrud-Storden complex, 9 to 14 percent slopes, moderately eroded	Farmland of statewide importance
875B	Roine fine sandy loam, 2 to 5 percent slopes	Prime farmland
878	Ocheyedan loam, 0 to 2 percent slopes	Prime farmland
878B	Ocheyedan loam, 2 to 5 percent slopes	Prime farmland
879	Fostoria loam, 1 to 3 percent slopes	Prime farmland
1032	Spicer silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
1091	McCreath silty clay loam, 0 to 2 percent slopes	Prime farmland
1091B	McCreath silty clay loam, 2 to 5 percent slopes	Prime farmland
1092	Gillett Grove silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
1707B	Delft-Terril complex, 1 to 5 percent slopes	Prime farmland
2700C	Ridgeton loam, 5 to 9 percent slopes	Farmland of statewide importance

## **Windbreaks and Environmental Plantings**

Windbreaks protect livestock, buildings, yards, fruit trees, gardens, and cropland from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

The table “Windbreaks and Environmental Plantings” shows the height that locally grown trees and shrubs are expected to reach in 20 years on soils in the survey area. The estimates in the table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

## Soil Survey of Dickinson County, Iowa—Part II

### Windbreaks and Environmental Plantings

(Absence of an entry indicates that trees generally do not grow to the given height)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
6: Okoboji-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
27B: Terril-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
28B: Dickman-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
32: Spicer-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
34: Estherville-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
34B: Estherville-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
34C2: Estherville, moderately eroded-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
55: Nicollet-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
77B: Sac-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
95: Harps-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
107: Webster-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
135: Coland, occasionally flooded-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
138B: Clarion-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
138C: Clarion-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
175B: Dickinson-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
175C2: Dickinson, moderately eroded-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
199: Cylinder-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
199: Nicollet-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
200: Cylinder-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
Cylinder, calcareous----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
259: Biscay-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
274: Rolfe-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
282: Ransom-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
283B: Dickman-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
283B: Clarion-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
308: Wadena-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
308B: Wadena-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
308C: Wadena-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
327: Wadena-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
Augusta Lake-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
327: Clarion-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
327B: Wadena-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
Augusta Lake-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
Clarion-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
331: Madelia-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
341C2: Estherville, moderately eroded-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
Pilot Grove, moderately eroded-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
346B: Augusta Lake-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
Estherville-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
347B: Augusta Lake-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
347C: Augusta Lake-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
374B: Okabena-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
374C: Okabena-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
390: Waldorf-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
397: Letri-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
456: Wilmington-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
485: Spillville, occasionally flooded---	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
507: Canisteo-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
511: Blue Earth-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
557: Talcot-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
Biscay-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
559: Talcot-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
574C2: Bolán, moderately eroded	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
Augusta Lake, moderately eroded-----	Arrowwood; buttonbush; gray dogwood; ninebark	American plum; chokecherry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redcedar; fir; jack pine; white oak; white spruce	Black oak; chinkapin oak; hackberry; hawthorn; hickory; northern red oak; Norway spruce; pawpaw; red pine; walnut
577B: Everly-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
577C2: Everly, moderately eroded-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
586B: Coland, occasionally flooded-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
Spillville, occasionally flooded---	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
634E2: Belview, moderately eroded-----	Gray dogwood; ninebark	American plum; Nanking cherry; nannyberry	Blackhaw; eastern redcedar; jack pine; white oak	Chinkapin oak; hackberry; northern red oak; shagbark hickory
Omsrud, moderately eroded-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
634G:				
Belview-----	Gray dogwood; ninebark	American plum; Nanking cherry; nannyberry	Blackhaw; eastern redcedar; jack pine; white oak	Chinkapin oak; hackberry; northern red oak; shagbark hickory
Omsrud-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
635C2:				
Belview, moderately eroded-----	Gray dogwood; ninebark	American plum; Nanking cherry; nannyberry	Blackhaw; eastern redcedar; jack pine; white oak	Chinkapin oak; hackberry; northern red oak; shagbark hickory
Storden, moderately eroded-----	Gray dogwood; ninebark	American plum; Nanking cherry; nannyberry	Blackhaw; eastern redcedar; jack pine; white oak	Chinkapin oak; hackberry; northern red oak; shagbark hickory
638C2:				
Clarion, moderately eroded-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
Storden, moderately eroded-----	Gray dogwood; ninebark	American plum; Nanking cherry; nannyberry	Blackhaw; eastern redcedar; jack pine; white oak	Chinkapin oak; hackberry; northern red oak; shagbark hickory

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
655: Crippin-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
733: Calco, occasionally flooded-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
735: Havelock, occasionally flooded-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
740D: Hawick-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
740F: Hawick-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak
740G: Hawick-----	Arrowwood; gray dogwood	American plum; chokecherry; hazelnut; Nanking cherry; ninebark	Black Hills spruce; blackhaw; butternut; eastern redcedar; hawthorn; jack pine; Midwest crabapple; white fir	Black oak; hackberry; hickory; northern red oak; red pine; white oak

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
835D2: Omsrud, moderately eroded-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
Storden, moderately eroded-----	Gray dogwood; ninebark	American plum; Nanking cherry; nannyberry	Blackhaw; eastern redcedar; jack pine; white oak	Chinkapin oak; hackberry; northern red oak; shagbark hickory
854D. Histosols, fens				
875B: Roine-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
878: Ocheyedan-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
878B: Ocheyedan-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
879: Fostoria-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
1032: Spicer-----	Gray dogwood-----	American plum; Nanking cherry; nannyberry; ninebark	Eastern redcedar; jack pine	Hackberry; river birch
1091: McCreath-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
1091B: McCreath-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood; winterberry	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; sandbar willow; serviceberry	Eastern redbud; eastern redcedar; Midwest crabapple	Hackberry; hawthorn; Kentucky coffeetree; pawpaw; river birch; silver maple; walnut
1092: Gillett Grove-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
1511. Blue Earth, ponded				

Soil Survey of Dickinson County, Iowa—Part II

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
1707B:				
Delft-----	Buttonbush; silky dogwood; winterberry	Elderberry; redosier dogwood	---	Hackberry; silver maple
Terril-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
2700C:				
Ridgeton-----	Arrowwood; buttonbush; gray dogwood; ninebark; silky dogwood	American plum; chokecherry; elderberry; hazelnut; highbush cranberry; Nanking cherry; nannyberry; redosier dogwood; serviceberry	Black cherry; Black Hills spruce; blackhaw; butternut; eastern redbud; eastern redcedar; jack pine; Midwest crabapple; white fir; white oak; white spruce	Basswood; black maple; black oak; chinkapin oak; hackberry; hawthorn; Kentucky coffeetree; northern red oak; northern white cedar; Norway spruce; pawpaw; red pine; shagbark hickory; silver maple; sugar maple; walnut
4946B.				
Udorthents-Highway				
5010.				
Pits, sand and gravel				
5040.				
Udorthents, loamy				
AW.				
Animal waste lagoon				
SL.				
Sewage lagoon				
W.				
Water				

## Agricultural Waste Management

The table “Agricultural Waste Management” is described in this section.

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

This table shows the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of this table, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the table are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Application of manure and food-processing waste* not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by

which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

*Application of sewage sludge* not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

*Disposal of wastewater by irrigation* not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

A soil feature considered in the ratings for application of manure, sewage sludge, and wastewater is depth to the top of a water table (saturated zone). During August, September, and October, this depth is generally more than 60 cm in normal years. For soils that are limited by wetness, “Nov-Jul” indicates the most problematic months of the year for application of manure, sewage sludge, and wastewater. These soils may be slow to drain and can become waterlogged and boggy during periods of heavy precipitation.

## Soil Survey of Dickinson County, Iowa—Part II

### Agricultural Waste Management

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste		Application of sewage sludge		Disposal of wastewater by irrigation	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:							
Okoboji-----	80	Very limited		Very limited		Very limited	
		Slow water	1.00	Slow water	1.00	Slow water	1.00
		movement		movement		movement	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		(Nov-Jul)		(Nov-Jul)		(Nov-Jul)	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Leaching	0.50				
27B:							
Terril-----	80	Not limited		Not limited		Not limited	
28B:							
Dickman-----	85	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	
		Leaching	0.45	Too acid	0.14	Too acid	0.14
		Too acid	0.03				
32:							
Spicer-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		(Nov-Jul)		(Nov-Jul)		(Nov-Jul)	
		Leaching	0.50	Slow water	0.22	Slow water	0.22
		Slow water	0.30	movement		movement	
		movement					
34:							
Estherville-----	85	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	
		Leaching	0.45	Droughty	0.30	Droughty	0.30
		Droughty	0.30				
34B:							
Estherville-----	65	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	
		Leaching	0.45	Droughty	0.30	Droughty	0.30
		Droughty	0.30				

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
34C2: Estherville, moderately eroded--	65	Very limited Filtering capacity Leaching Droughty	1.00 0.45 0.33	Very limited Filtering capacity Droughty	1.00 0.33	Very limited Filtering capacity Too steep for surface application Droughty Too steep for sprinkler application	1.00 0.92 0.33 10.02
55: Nicollet-----	85	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	1.00 0.50 0.30	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22
77B: Sac-----	90	Very limited Slow water movement Too acid	1.00 0.11	Very limited Slow water movement Too acid	1.00 0.42	Very limited Slow water movement Too acid	1.00 0.42
95: Harps-----	85	Very limited Depth to saturated zone (Nov-Jul) Leaching	1.00 0.70	Very limited Depth to saturated zone (Nov-Jul)	1.00	Very limited Depth to saturated zone (Nov-Jul)	1.00
107: Webster-----	70	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	1.00 0.50 0.30	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22
135: Coland, occasionally flooded-----	85	Very limited Depth to saturated zone (Nov-Jul) Flooding Leaching Slow water movement	1.00 0.60 0.50 0.30	Very limited Depth to saturated zone (Nov-Jul) Flooding Slow water movement	1.00 1.00 0.22	Very limited Depth to saturated zone (Nov-Jul) Flooding Slow water movement	1.00 0.60 0.22
138B: Clarion-----	85	Not limited		Not limited		Not limited	

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
138C: Clarion-----	70	Not limited	Not limited	Somewhat limited			
				Too steep for surface application			0.92
				Too steep for sprinkler application			0.02
175B: Dickinson-----	80	Very limited	Very limited	Very limited			
		Filtering capacity	Filtering capacity	Filtering capacity	1.00	1.00	1.00
		Leaching	Droughty	Droughty	0.45	0.05	0.05
		Droughty			0.05		
175C2: Dickinson, moderately eroded--	80	Very limited	Very limited	Very limited			
		Filtering capacity	Filtering capacity	Filtering capacity	1.00	1.00	1.00
		Leaching		Too steep for surface application	0.45		0.92
				Too steep for sprinkler application			0.02
199: Cylinder-----	30	Very limited	Very limited	Very limited			
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement	0.50	0.22	0.22
		Slow water movement			0.30		
Nicollet-----	20	Very limited	Very limited	Very limited			
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement	0.50	0.22	0.22
		Slow water movement			0.30		
200: Cylinder-----	60	Very limited	Very limited	Very limited			
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement	0.50	0.22	0.22
		Slow water movement			0.30		

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of	Value	Application	Value	Disposal of	Value
		manure and food- processing waste		of sewage sludge		wastewater by irrigation	
		Rating class and limiting features		Rating class and limiting features		Rating class and limiting features	
200:							
Cylinder, calcareous	25	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		(Nov-Jul)		(Nov-Jul)		(Nov-Jul)	
		Leaching	0.50	Slow water	0.22	Slow water	0.22
		Slow water	0.30	movement		movement	
		movement					
259:							
Biscay-----	85	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		(Nov-Jul)		(Nov-Jul)		(Nov-Jul)	
		Leaching	0.70				
274:							
Rolfe-----	85	Very limited		Very limited		Very limited	
		Slow water	1.00	Slow water	1.00	Slow water	1.00
		movement		movement		movement	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		(Nov-Jul)		(Nov-Jul)		(Nov-Jul)	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Too acid	0.02	Too acid	0.07	Too acid	0.07
282:							
Ransom-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		(Nov-Jul)		(Nov-Jul)		(Nov-Jul)	
		Leaching	0.50	Slow water	0.22	Slow water	0.22
		Slow water	0.30	movement		movement	
		movement					
283B:							
Dickman-----	35	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	
		Leaching	0.45	Too acid	0.14	Too acid	0.14
		Too acid	0.03				
Clarion-----	25	Not limited		Not limited		Not limited	
308:							
Wadena-----	85	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	
308B:							
Wadena-----	75	Very limited		Very limited		Very limited	
		Filtering	1.00	Filtering	1.00	Filtering	1.00
		capacity		capacity		capacity	

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
308C:							
Wadena-----	70	Very limited Filtering capacity	1.00	Very limited Filtering capacity	1.00	Very limited Filtering capacity Too steep for surface application Too steep for sprinkler application	1.00   0.92  10.02
327:							
Wadena-----	35	Very limited Filtering capacity	1.00	Very limited Filtering capacity	1.00	Very limited Filtering capacity	1.00
Augusta Lake-----	30	Somewhat limited Leaching	0.45	Somewhat limited Too acid	0.01	Somewhat limited Too acid	0.01
Clarion-----	25	Not limited		Not limited		Not limited	
327B:							
Wadena-----	35	Very limited Filtering capacity	1.00	Very limited Filtering capacity	1.00	Very limited Filtering capacity	1.00
Augusta Lake-----	30	Somewhat limited Leaching	0.45	Somewhat limited Too acid	0.01	Somewhat limited Too acid	0.01
Clarion-----	20	Not limited		Not limited		Not limited	
331:							
Madelia-----	70	Very limited Depth to saturated zone (Nov-Jul) Leaching	1.00  0.70	Very limited Depth to saturated zone (Nov-Jul)	1.00	Very limited Depth to saturated zone (Nov-Jul)	1.00
341C2:							
Estherville, moderately eroded--	40	Very limited Filtering capacity Leaching Droughty	1.00  0.45 0.33	Very limited Filtering capacity Droughty	1.00  0.33	Very limited Filtering capacity Too steep for surface application Droughty Too steep for sprinkler application	1.00  0.92  0.33  10.02
Pilot Grove, moderately eroded--	30	Somewhat limited Leaching	0.45	Not limited		Somewhat limited Too steep for surface application Too steep for sprinkler application	0.92  10.02

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
346B:							
Augusta Lake-----	40	Somewhat limited Leaching	0.45	Somewhat limited Too acid	0.01	Somewhat limited Too acid	0.01
Estherville-----	30	Very limited Filtering capacity Leaching Droughty	1.00 0.45 0.30	Very limited Filtering capacity Droughty	1.00 0.30	Very limited Filtering capacity Droughty	1.00 0.30
347B:							
Augusta Lake-----	70	Somewhat limited Leaching	0.45	Somewhat limited Too acid	0.01	Somewhat limited Too acid	0.01
347C:							
Augusta Lake-----	65	Somewhat limited Leaching	0.45	Somewhat limited Too acid	0.01	Somewhat limited Too steep for surface application Too steep for sprinkler application Too acid	0.92 0.02 0.01
374B:							
Okabena-----	70	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	1.00 0.50 0.30	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22
374C:							
Okabena-----	65	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	1.00 0.50 0.30	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	1.00 0.22	Very limited Depth to saturated zone (Nov-Jul) Too steep for surface application Slow water movement Too steep for sprinkler application	1.00 0.92 0.02 0.02
390:							
Waldorf-----	50	Very limited Slow water movement Depth to saturated zone (Nov-Jul) Runoff	1.00 1.00 0.40	Very limited Slow water movement Depth to saturated zone (Nov-Jul)	1.00 1.00	Very limited Slow water movement Depth to saturated zone (Nov-Jul)	1.00 1.00

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of	Application	Disposal of
		manure and food- processing waste	of sewage sludge	wastewater by irrigation
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
		Value	Value	Value
397: Letri-----	90	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Slow water movement
		1.00	1.00	1.00
		0.50	0.22	0.22
		0.30		
456: Wilmington-----	95	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Slow water movement
		1.00	1.00	1.00
		0.50	0.22	0.22
		0.30		
485: Spillville, occasionally flooded-----	80	Very limited Depth to saturated zone (Nov-Jul) Leaching Flooding	Very limited Depth to saturated zone (Nov-Jul) Flooding	Very limited Depth to saturated zone (Nov-Jul) Flooding
		1.00	1.00	1.00
		0.70	1.00	0.60
		0.60		
507: Canisteeo-----	60	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Slow water movement
		1.00	1.00	1.00
		0.50	0.22	0.22
		0.30		
511: Blue Earth-----	80	Very limited Depth to saturated zone (Nov-Jul) Ponding Leaching Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Ponding Slow water movement	Very limited Depth to saturated zone (Nov-Jul) Ponding Slow water movement
		1.00	1.00	1.00
		0.50	0.22	0.22
		0.30		
557: Talcot-----	45	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Leaching Slow water movement	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Slow water movement	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Slow water movement
		1.00	1.00	1.00
		1.00	1.00	1.00
		0.50	0.22	0.22
		0.30		

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
557: Biscay-----	20	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Leaching	1.00 1.00 0.70	Very limited Filtering capacity Depth to saturated zone (Nov-Jul)	1.00 1.00	Very limited Filtering capacity Depth to saturated zone (Nov-Jul)	1.00 1.00
559: Talcot-----	95	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Leaching Slow water movement	1.00 1.00 0.50 0.30	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Slow water movement	1.00 1.00 0.22	Very limited Filtering capacity Depth to saturated zone (Nov-Jul) Slow water movement	1.00 1.00 0.22
574C2: Bolan, moderately eroded-----	50	Not limited		Not limited		Somewhat limited Too steep for surface application Too steep for sprinkler application	0.92 0.02
Augusta Lake, moderately eroded--	35	Somewhat limited Leaching	0.45	Somewhat limited Too acid	0.01	Somewhat limited Too steep for surface application Too steep for sprinkler application Too acid	0.92 0.02 0.01
577B: Everly-----	100	Somewhat limited Slow water movement	0.30	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement Too steep for surface application	0.22 0.08
577C2: Everly, moderately eroded-----	80	Somewhat limited Slow water movement	0.30	Somewhat limited Slow water movement	0.22	Somewhat limited Too steep for surface application Slow water movement Too steep for sprinkler application	0.92 0.22 0.02

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
586B: Coland, occasionally flooded-----	65	Very limited Depth to saturated zone (Nov-Jul) Flooding Leaching Slow water movement	1.00 1.00 0.60 0.50 0.30	Very limited Depth to saturated zone (Nov-Jul) Flooding Slow water movement	1.00 1.00 1.00 0.22	Very limited Depth to saturated zone (Nov-Jul) Flooding Slow water movement	1.00 1.00 0.60 0.22
Spillville, occasionally flooded-----	20	Very limited Depth to saturated zone (Nov-Jul) Leaching Flooding	1.00 1.00 0.70 0.60	Very limited Depth to saturated zone (Nov-Jul) Flooding	1.00 1.00	Very limited Depth to saturated zone (Nov-Jul) Flooding	1.00 0.60
634E2: Belview, moderately eroded-----	35	Very limited Too steep	1.00	Very limited Too steep	1.00	Very limited Too steep for surface application Too steep for sprinkler application	1.00 1.00
Omsrud, moderately eroded-----	20	Very limited Too steep Slow water movement	1.00 1.00 0.30	Very limited Too steep Slow water movement	1.00 1.00 0.22	Very limited Too steep for surface application Too steep for sprinkler application Slow water movement	1.00 1.00 1.00 0.22
634G: Belview-----	55	Very limited Too steep	1.00	Very limited Too steep	1.00	Very limited Too steep for surface application Too steep for sprinkler application	1.00 1.00

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
634G: Omsrud-----	30	Very limited Too steep Slow water movement	1.00 0.30	Very limited Too steep Slow water movement	1.00 0.22	Very limited Too steep for surface application Too steep for sprinkler application Slow water movement	1.00 1.00 0.22
635C2: Belview, moderately eroded-----	70	Not limited		Not limited		Somewhat limited Too steep for surface application Too steep for sprinkler application	0.92 0.02
Storden, moderately eroded-----	25	Not limited		Not limited		Somewhat limited Too steep for surface application Too steep for sprinkler application	0.92 0.02
638C2: Clarion, moderately eroded-----	50	Not limited		Not limited		Somewhat limited Too steep for surface application Too steep for sprinkler application	0.92 0.02
Storden, moderately eroded-----	20	Not limited		Not limited		Somewhat limited Too steep for surface application Too steep for sprinkler application	0.92 0.02
655: Crippin-----	65	Very limited Depth to saturated zone (Nov-Jul) Leaching	1.00 0.70	Very limited Depth to saturated zone (Nov-Jul)	1.00	Very limited Depth to saturated zone (Nov-Jul)	1.00

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of	Application	Disposal of
		manure and food- processing waste	of sewage sludge	wastewater by irrigation
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
		Value	Value	Value
733: Calco, occasionally flooded-----	85	Very limited	Very limited	Very limited
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Flooding	Flooding	Flooding
		0.60	1.00	0.60
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		
735: Havelock, occasionally flooded-----	73	Very limited	Very limited	Very limited
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Flooding	Flooding	Flooding
		0.60	1.00	0.60
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		
740D: Hawick-----	80	Very limited	Very limited	Very limited
		Filtering capacity	Filtering capacity	Filtering capacity
		1.00	1.00	1.00
		Droughty	Droughty	Too steep for surface
		0.91	0.63	1.00
		Too steep	Too steep	Too steep for sprinkler application
		0.63	0.63	0.91
		Leaching		Too steep for sprinkler application
		0.45		0.78
740F: Hawick-----	90	Very limited	Very limited	Very limited
		Filtering capacity	Filtering capacity	Filtering capacity
		1.00	1.00	1.00
		Too steep	Too steep	Too steep for surface
		1.00	1.00	1.00
		Droughty	Droughty	Too steep for sprinkler application
		0.91	0.91	1.00
		Leaching		Too steep for sprinkler application
		0.45		0.91
740G: Hawick-----	85	Very limited	Very limited	Very limited
		Too steep	Filtering capacity	Filtering capacity
		1.00	1.00	1.00
		Filtering capacity	Too steep	Too steep for surface
		1.00	1.00	1.00
		Droughty	Droughty	Too steep for sprinkler application
		0.91	0.91	1.00
		Leaching		Too steep for sprinkler application
		0.45		0.91

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
835D2: Omsrud, moderately eroded-----	50	Somewhat limited Too steep Slow water movement	0.63 0.30	Somewhat limited Too steep Slow water movement	0.63 0.22	Very limited Too steep for surface application Too steep for sprinkler application Slow water movement	1.00 0.78 0.22
Storden, moderately eroded-----	25	Somewhat limited Too steep	0.63	Somewhat limited Too steep	0.63	Very limited Too steep for surface application Too steep for sprinkler application	1.00 0.78
854D: Histosols, fens----	100	Very limited Depth to saturated zone (Nov-Jul) Leaching Slow water movement Too steep	1.00 0.50 0.30 0.16	Very limited Depth to saturated zone (Nov-Jul) Slow water movement Too steep	1.00 0.22 0.16	Very limited Depth to saturated zone (Nov-Jul) Too steep for surface application Too steep for sprinkler application Slow water movement	1.00 1.00 1.00 0.40 0.22
875B: Roine-----	88	Somewhat limited Leaching Slow water movement	0.45 0.30	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement Too steep for surface application	0.22 0.08
878: Ocheyedan-----	95	Somewhat limited Slow water movement	0.30	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement	0.22
878B: Ocheyedan-----	85	Somewhat limited Slow water movement	0.30	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement	0.22

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of	Application	Disposal of
		manure and food- processing waste	of sewage sludge	wastewater by irrigation
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
		Value	Value	Value
879: Fostoria-----	85	Very limited	Very limited	Very limited
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		
1032: Spicer-----	95	Very limited	Very limited	Very limited
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		
1091: McCreath-----	90	Very limited	Very limited	Very limited
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		
1091B: McCreath-----	95	Very limited	Very limited	Very limited
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		
1092: Gillett Grove-----	85	Very limited	Very limited	Very limited
		Slow water movement	Slow water movement	Slow water movement
		1.00	1.00	1.00
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Leaching		
		0.50		
1511: Blue Earth, ponded--	90	Very limited	Very limited	Very limited
		Ponding	Ponding	Ponding
		1.00	1.00	1.00
		Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)	Depth to saturated zone (Nov-Jul)
		1.00	1.00	1.00
		Leaching	Slow water movement	Slow water movement
		0.50	0.22	0.22
		0.30		

Soil Survey of Dickinson County, Iowa—Part II

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1707B:							
Delft-----	55	Very limited	Very limited	Very limited			
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.50	Slow water movement	0.22	Slow water movement	0.22
		Slow water movement	0.30				
Terril-----	20	Not limited	Not limited	Not limited			
2700C:							
Ridgeton-----	75	Not limited	Not limited	Somewhat limited			
				Too steep for surface application			10.92
				Too steep for sprinkler application			10.02
4946B:							
Udorthents, loamy---	65	Not rated	Not rated	Not rated			
Highway-----	30	Not rated	Not rated	Not rated			
5010:							
Pits, sand and gravel-----	100	Not rated	Not rated	Not rated			
5040:							
Udorthents, loamy---	100	Not rated	Not rated	Not rated			
AW:							
Animal waste lagoon	100	Not rated	Not rated	Not rated			
SL:							
Sewage lagoon-----	100	Not rated	Not rated	Not rated			
W:							
Water-----	100	Not rated	Not rated	Not rated			

# Recreational Development

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The titles of the tables described in this section are:

- “Camp Areas, Picnic Areas, and Playgrounds”
- “Paths, Trails, and Golf Fairways”

In the tables described in this section, the soils of the survey area are rated according to limitations that affect their suitability for recreational development. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in these tables can be supplemented by other information in this survey, for example, interpretations for dwellings without basements, for local roads and streets, and for septic tank absorption fields.

*Camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and

not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

*Playgrounds* require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

*Paths and trails* for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

*Off-road motorcycle trails* require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

*Golf fairways* are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

## Soil Survey of Dickinson County, Iowa—Part II

### Camp Areas, Picnic Areas, and Playgrounds

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6: Okoboji-----	80	Very limited Depth to saturated zone Ponding Slow water movement	1.00	Very limited Depth to saturated zone Ponding Slow water movement	1.00	Very limited Depth to saturated zone Ponding Slow water movement	1.00
27B: Terril-----	80	Not limited		Not limited		Somewhat limited Slope	0.12
28B: Dickman-----	85	Not limited		Not limited		Somewhat limited Slope	0.12
32: Spicer-----	85	Very limited Depth to saturated zone Slow water movement	1.00	Very limited Depth to saturated zone Slow water movement	0.15	Very limited Depth to saturated zone Slow water movement	0.15
34: Estherville-----	85	Not limited		Not limited		Not limited	
34B: Estherville-----	65	Not limited		Not limited		Somewhat limited Slope	0.12
34C2: Estherville, moderately eroded--	65	Not limited		Not limited		Very limited Slope	1.00
55: Nicollet-----	85	Very limited Depth to saturated zone Slow water movement	1.00	Very limited Depth to saturated zone Slow water movement	0.15	Very limited Depth to saturated zone Slow water movement	0.15
77B: Sac-----	90	Somewhat limited Slow water movement	0.99	Somewhat limited Slow water movement	0.99	Somewhat limited Slow water movement Slope	0.12
95: Harps-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
107: Webster-----	70	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
135: Coland, occasionally flooded-----	85	Very limited Depth to saturated zone Flooding Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Flooding Slow water movement	1.00 0.60 0.15
138B: Clarion-----	85	Not limited		Not limited		Somewhat limited Slope	0.12
138C: Clarion-----	70	Not limited		Not limited		Very limited Slope	1.00
175B: Dickinson-----	80	Not limited		Not limited		Somewhat limited Slope	0.12
175C2: Dickinson, moderately eroded--	80	Not limited		Not limited		Very limited Slope	1.00
199: Cylinder-----	30	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
Nicollet-----	20	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
200: Cylinder-----	60	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
Cylinder, calcareous	25	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15

Soil Survey of Dickinson County, Iowa—Part II

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
259: Biscay-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
274: Rolfe-----	85	Very limited Depth to saturated zone Slow water movement Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Slow water movement Ponding	1.00 1.00 1.00	Very limited Slow water movement Depth to saturated zone Ponding	1.00 1.00 1.00
282: Ransom-----	85	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
283B: Dickman-----	35	Not limited		Not limited		Somewhat limited Slope	0.12
Clarion-----	25	Not limited		Not limited		Somewhat limited Slope	0.12
308: Wadena-----	85	Not limited		Not limited		Not limited	
308B: Wadena-----	75	Not limited		Not limited		Somewhat limited Slope	0.12
308C: Wadena-----	70	Not limited		Not limited		Very limited Slope	1.00
327: Wadena-----	35	Not limited		Not limited		Not limited	
Augusta Lake-----	30	Not limited		Not limited		Not limited	
Clarion-----	25	Not limited		Not limited		Not limited	
327B: Wadena-----	35	Not limited		Not limited		Somewhat limited Slope	0.12
Augusta Lake-----	30	Not limited		Not limited		Somewhat limited Slope	0.12
Clarion-----	20	Not limited		Not limited		Somewhat limited Slope	0.12
331: Madelia-----	70	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

# Soil Survey of Dickinson County, Iowa—Part II

## Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Value	Picnic areas	Value	Playgrounds	Value
		Rating class and limiting features		Rating class and limiting features		Rating class and limiting features	
341C2: Estherville, moderately eroded--	40	Not limited		Not limited		Very limited Slope	1.00
Pilot Grove, moderately eroded--	30	Not limited		Not limited		Very limited Slope	1.00
346B: Augusta Lake-----	40	Not limited		Not limited		Somewhat limited Slope	0.12
Estherville-----	30	Not limited		Not limited		Somewhat limited Slope	0.12
347B: Augusta Lake-----	70	Not limited		Not limited		Somewhat limited Slope	0.12
347C: Augusta Lake-----	65	Not limited		Not limited		Very limited Slope	1.00
374B: Okabena-----	70	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slope Slow water movement	1.00 0.15 0.12
374C: Okabena-----	65	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slope Slow water movement	1.00 0.15 0.15
390: Waldorf-----	50	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Slow water movement Depth to saturated zone	1.00 1.00
397: Letri-----	90	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
456: Wilmington-----	95	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15

Soil Survey of Dickinson County, Iowa—Part II

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
485: Spillville, occasionally flooded-----	80	Very limited Depth to saturated zone Flooding	1.00 1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60
507: Canisteeo-----	60	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
511: Blue Earth-----	80	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Ponding Content of gravel Slow water movement	1.00 1.00 0.56 0.15
557: Talcot-----	45	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
Biscay-----	20	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
559: Talcot-----	95	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
574C2: Bolan, moderately eroded-----	50	Not limited		Not limited		Very limited Slope	1.00
Augusta Lake, moderately eroded--	35	Not limited		Not limited		Very limited Slope	1.00
577B: Everly-----	100	Somewhat limited Slow water movement	0.15	Somewhat limited Slow water movement	0.15	Somewhat limited Slope Slow water movement	0.50 0.15

# Soil Survey of Dickinson County, Iowa—Part II

## Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
577C2: Everly, moderately eroded-----	80	Somewhat limited Slow water movement	0.15	Somewhat limited Slow water movement	0.15	Very limited Slope Slow water movement	1.00 0.15
586B: Coland, occasionally flooded-----	65	Very limited Depth to saturated zone Flooding Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Flooding Slow water movement	1.00 0.60 0.15
Spillville, occasionally flooded-----	20	Very limited Depth to saturated zone Flooding	1.00 1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding Slope	1.00 0.60 0.12
634E2: Belview, moderately eroded-----	35	Very limited Slope	1.00	Very limited Slope	1.00	Very limited Slope	1.00
Omsrud, moderately eroded-----	20	Very limited Slope Slow water movement	1.00 0.15	Very limited Slope Slow water movement	1.00 0.15	Very limited Slope Slow water movement	1.00 0.15
634G: Belview-----	55	Very limited Slope	1.00	Very limited Slope	1.00	Very limited Slope	1.00
Omsrud-----	30	Very limited Slope Slow water movement	1.00 0.15	Very limited Slope Slow water movement	1.00 0.15	Very limited Slope Slow water movement	1.00 0.15
635C2: Belview, moderately eroded-----	70	Not limited		Not limited		Very limited Slope	1.00
Storden, moderately eroded-----	25	Not limited		Not limited		Very limited Slope	1.00
638C2: Clarion, moderately eroded-----	50	Not limited		Not limited		Very limited Slope	1.00

Soil Survey of Dickinson County, Iowa—Part II

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
638C2: Storden, moderately eroded-----	20	Not limited		Not limited		Very limited Slope	1.00
655: Crippin-----	65	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
733: Calco, occasionally flooded-----	85	Very limited Depth to saturated zone Flooding Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Flooding Slow water movement	1.00 1.00 0.60 0.15
735: Havelock, occasionally flooded-----	73	Very limited Depth to saturated zone Flooding Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 1.00 0.15	Very limited Depth to saturated zone Flooding Slow water movement	1.00 1.00 0.60 0.15
740D: Hawick-----	80	Somewhat limited Slope Too sandy	0.63 0.12	Somewhat limited Slope Too sandy	0.63 0.12	Very limited Slope Content of gravel Too sandy	1.00 0.90 0.12
740F: Hawick-----	90	Very limited Slope Too sandy	1.00 0.12	Very limited Slope Too sandy	1.00 0.12	Very limited Slope Content of gravel Too sandy	1.00 0.90 0.12
740G: Hawick-----	85	Very limited Slope Too sandy	1.00 0.12	Very limited Slope Too sandy	1.00 0.12	Very limited Slope Content of gravel Too sandy	1.00 0.90 0.12
835D2: Omsrud, moderately eroded-----	50	Somewhat limited Slope Slow water movement	0.63 0.15	Somewhat limited Slope Slow water movement	0.63 0.15	Very limited Slope Slow water movement	1.00 0.15
Storden, moderately eroded-----	25	Somewhat limited Slope	0.63	Somewhat limited Slope	0.63	Very limited Slope	1.00

Soil Survey of Dickinson County, Iowa—Part II

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
854D: Histosols, fens-----	100	Very limited Depth to saturated zone Organic matter content Slope Slow water movement	1.00 1.00 0.16 0.15	Very limited Depth to saturated zone Organic matter content Slope Slow water movement	1.00 1.00 0.16 0.15	Very limited Depth to saturated zone Organic matter content Slope Slow water movement	1.00 1.00 1.00 1.00
875B: Roine-----	88	Not limited		Not limited		Somewhat limited Slope	0.50
878: Ocheyedan-----	95	Not limited		Not limited		Not limited	
878B: Ocheyedan-----	85	Not limited		Not limited		Somewhat limited Slope	0.12
879: Fostoria-----	85	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
1032: Spicer-----	95	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
1091: McCreath-----	90	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15
1091B: McCreath-----	95	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement	1.00 0.15	Very limited Depth to saturated zone Slow water movement Slope	1.00 0.15 0.12
1092: Gillett Grove-----	85	Very limited Depth to saturated zone Slow water movement	1.00 0.99	Very limited Depth to saturated zone Slow water movement	1.00 0.99	Very limited Depth to saturated zone Slow water movement	1.00 0.99

Soil Survey of Dickinson County, Iowa—Part II

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1511: Blue Earth, ponded--	90	Very limited Depth to saturated zone	1.00	Very limited Ponding Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Ponding	1.00	slow water movement	0.15	Ponding	1.00
		Slow water movement	0.15	Slow water movement	0.15	Slow water movement	0.15
1707B: Delft-----	55	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Slow water movement	0.15	Slow water movement	0.15	Slow water movement	0.15
						Slope	0.12
Terril-----	20	Not limited		Not limited		Somewhat limited Slope	0.12
2700C: Ridgeton-----	75	Not limited		Not limited		Very limited Slope	1.00
4946B: Udorthents, loamy---	65	Not rated		Not rated		Not rated	
Highway-----	30	Not rated		Not rated		Not rated	
5010: Pits, sand and gravel-----	100	Not rated		Not rated		Not rated	
5040: Udorthents, loamy---	100	Not rated		Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated		Not rated	
W: Water-----	100	Not rated		Not rated		Not rated	

## Soil Survey of Dickinson County, Iowa—Part II

### Paths, Trails, and Golf Fairways

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Paths and trails	Off-road motorcycle trails	Golf fairways			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6: Okoboji-----	80	Very limited Depth to saturated zone Ponding	1.00	Very limited Depth to saturated zone Ponding	1.00	Very limited Depth to saturated zone Ponding	1.00
27B: Terril-----	80	Not limited		Not limited		Not limited	
28B: Dickman-----	85	Not limited		Not limited		Not limited	
32: Spicer-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
34: Estherville-----	85	Not limited		Not limited		Somewhat limited Droughty	0.10
34B: Estherville-----	65	Not limited		Not limited		Somewhat limited Droughty	0.10
34C2: Estherville, moderately eroded--	65	Not limited		Not limited		Somewhat limited Droughty	0.12
55: Nicollet-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
77B: Sac-----	90	Not limited		Not limited		Not limited	
95: Harps-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
107: Webster-----	70	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails	Off-road motorcycle trails	Golf fairways			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
135: Coland, occasionally flooded-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60
138B: Clarion-----	85	Not limited		Not limited		Not limited	
138C: Clarion-----	70	Not limited		Not limited		Not limited	
175B: Dickinson-----	80	Not limited		Not limited		Not limited	
175C2: Dickinson, moderately eroded--	80	Not limited		Not limited		Not limited	
199: Cylinder-----	30	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Nicollet-----	20	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
200: Cylinder-----	60	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Cylinder, calcareous	25	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
259: Biscay-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
274: Rolfe-----	85	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
282: Ransom-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
283B: Dickman-----	35	Not limited		Not limited		Not limited	
Clarion-----	25	Not limited		Not limited		Not limited	

Soil Survey of Dickinson County, Iowa—Part II

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails	Value	Off-road motorcycle trails	Value	Golf fairways	Value
		Rating class and limiting features		Rating class and limiting features		Rating class and limiting features	
308: Wadena-----	85	Not limited		Not limited		Not limited	
308B: Wadena-----	75	Not limited		Not limited		Not limited	
308C: Wadena-----	70	Not limited		Not limited		Not limited	
327: Wadena-----	35	Not limited		Not limited		Not limited	
Augusta Lake-----	30	Not limited		Not limited		Not limited	
Clarion-----	25	Not limited		Not limited		Not limited	
327B: Wadena-----	35	Not limited		Not limited		Not limited	
Augusta Lake-----	30	Not limited		Not limited		Not limited	
Clarion-----	20	Not limited		Not limited		Not limited	
331: Madelia-----	70	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
341C2: Estherville, moderately eroded--	40	Not limited		Not limited		Somewhat limited Droughty	0.12
Pilot Grove, moderately eroded--	30	Not limited		Not limited		Somewhat limited Droughty	0.10
346B: Augusta Lake-----	40	Not limited		Not limited		Not limited	
Estherville-----	30	Not limited		Not limited		Somewhat limited Droughty	0.10
347B: Augusta Lake-----	70	Not limited		Not limited		Not limited	
347C: Augusta Lake-----	65	Not limited		Not limited		Not limited	
374B: Okabena-----	70	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
374C: Okabena-----	65	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails	Off-road motorcycle trails	Golf fairways			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
390: Waldorf-----	50	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
397: Letri-----	90	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
456: Wilmington-----	95	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
485: Spillville, occasionally flooded-----	80	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60
507: Canisteo-----	60	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
511: Blue Earth-----	80	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
557: Talcot-----	45	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Biscay-----	20	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
559: Talcot-----	95	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
574C2: Bolan, moderately eroded-----	50	Not limited		Not limited		Not limited	
Augusta Lake, moderately eroded--	35	Not limited		Not limited		Not limited	
577B: Everly-----	100	Not limited		Not limited		Not limited	

Soil Survey of Dickinson County, Iowa—Part II

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails	Off-road motorcycle trails	Golf fairways			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
577C2: Everly, moderately eroded-----	80	Not limited		Not limited		Not limited	
586B: Coland, occasionally flooded-----	65	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60
Spillville, occasionally flooded-----	20	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60
634E2: Belview, moderately eroded-----	35	Somewhat limited Slope	0.02	Not limited		Very limited Slope	1.00
Omsrud, moderately eroded-----	20	Somewhat limited Slope	0.02	Not limited		Very limited Slope	1.00
634G: Belview-----	55	Very limited Slope	1.00	Somewhat limited Slope	0.14	Very limited Slope	1.00
Omsrud-----	30	Very limited Slope	1.00	Somewhat limited Slope	0.56	Very limited Slope	1.00
635C2: Belview, moderately eroded-----	70	Not limited		Not limited		Not limited	
Storden, moderately eroded-----	25	Not limited		Not limited		Not limited	
638C2: Clarion, moderately eroded-----	50	Not limited		Not limited		Not limited	
Storden, moderately eroded-----	20	Not limited		Not limited		Not limited	
655: Crippin-----	65	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
733: Calco, occasionally flooded-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60

Soil Survey of Dickinson County, Iowa—Part II

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails	Off-road motorcycle trails	Golf fairways			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
735: Havelock, occasionally flooded-----	73	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Flooding	1.00 0.60
740D: Hawick-----	80	Somewhat limited Too sandy	0.12	Somewhat limited Too sandy	0.12	Very limited Droughty Slope	1.00 0.63
740F: Hawick-----	90	Somewhat limited Slope Too sandy	0.18 0.12	Somewhat limited Too sandy	0.12	Very limited Slope Droughty	1.00 1.00
740G: Hawick-----	85	Very limited Slope Too sandy	1.00 0.12	Somewhat limited Slope Too sandy	0.44 0.12	Very limited Slope Droughty	1.00 1.00
835D2: Omsrud, moderately eroded-----	50	Not limited		Not limited		Somewhat limited Slope	0.63
Storden, moderately eroded-----	25	Not limited		Not limited		Somewhat limited Slope	0.63
854D: Histosols, fens----	100	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Organic matter content Depth to saturated zone Slope	1.00 1.00 0.16
875B: Roine-----	88	Not limited		Not limited		Not limited	
878: Ocheyedan-----	95	Not limited		Not limited		Not limited	
878B: Ocheyedan-----	85	Not limited		Not limited		Not limited	
879: Fostoria-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
1032: Spicer-----	95	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails	Off-road motorcycle trails	Golf fairways			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1091: McCreath-----	90	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
1091B: McCreath-----	95	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
1092: Gillett Grove-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
1511: Blue Earth, ponded--	90	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
1707B: Delft-----	55	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Terril-----	20	Not limited		Not limited		Not limited	
2700C: Ridgeton-----	75	Not limited		Not limited		Not limited	
4946B: Udorthents, loamy---	65	Not rated		Not rated		Not rated	
Highway-----	30	Not rated		Not rated		Not rated	
5010: Pits, sand and gravel-----	100	Not rated		Not rated		Not rated	
5040: Udorthents, loamy---	100	Not rated		Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated		Not rated	
W: Water-----	100	Not rated		Not rated		Not rated	

# Wildlife Habitat

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Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In the table described in this section, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated *good*, *fair*, *poor*, or *very poor*. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

*Hardwood trees* and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, and blackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn olive and crabapple.

*Coniferous plants* furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

*Wetland plants* are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

*Shallow water areas* have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

*Habitat for woodland wildlife* consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

*Habitat for wetland wildlife* consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Soil Survey of Dickinson County, Iowa—Part II

Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Pct. of map unit	Potential for habitat elements						Potential as habitat for--				
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	
6: Okoboji-----	80	Fair	Fair	Fair	Fair	Very poor	Good	Good	Fair	Fair	Good	
27B: Terril-----	80	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
28B: Dickman-----	85	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
32: Spicer-----	85	Good	Good	Fair	Fair	Poor	Good	Good	Good	Fair	Good	
34: Estherville-----	85	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
34B: Estherville-----	65	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
34C2: Estherville, moderately eroded	65	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
55: Nicollet-----	85	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
77B: Sac-----	90	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
95: Harps-----	85	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	
107: Webster-----	70	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good	
135: Coland, occasionally flooded-----	85	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good	
138B: Clarion-----	85	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
138C: Clarion-----	70	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
175B: Dickinson-----	80	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	

Soil Survey of Dickinson County, Iowa—Part II

Wildlife Habitat--Continued

Map symbol and soil name	Pct. of map unit	Potential for habitat elements						Potential as habitat for--				
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	
175C2: Dickinson, moderately eroded	80	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
199: Cylinder-----	30	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
Nicollet-----	20	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
200: Cylinder-----	60	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
Cylinder, calcareous-----	25	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
259: Biscay-----	85	Good	Good	Good	Good	Fair	Good	Good	Good	Fair	Good	
274: Rolfe-----	85	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	
282: Ransom-----	85	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor	
283B: Dickman-----	35	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
Clarion-----	25	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
308: Wadena-----	85	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
308B: Wadena-----	75	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
308C: Wadena-----	70	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
327: Wadena-----	35	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
Augusta Lake-----	30	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
Clarion-----	25	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
327B: Wadena-----	35	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
Augusta Lake-----	30	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	

Soil Survey of Dickinson County, Iowa—Part II

Wildlife Habitat--Continued

Map symbol and soil name	Pct. of map unit	Potential for habitat elements						Potential as habitat for--				
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	
327B: Clarion-----	20	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
331: Madelia-----	70	Good	Good	Good	Good	Fair	Good	Good	Good	Fair	Good	
341C2: Estherville, moderately eroded	40	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
Pilot Grove, moderately eroded	30	Poor	Good	Good	Poor	Poor	Very poor	Very poor	Good	Poor	Very poor	
346B: Augusta Lake-----	40	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
Estherville-----	30	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	
347B: Augusta Lake-----	70	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
347C: Augusta Lake-----	65	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
374B: Okabena-----	70	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
374C: Okabena-----	65	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
390: Waldorf-----	50	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good	
397: Letri-----	90	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	
456: Wilmington-----	95	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
485: Spillville, occasionally flooded-----	80	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
507: Canisteo-----	60	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good	
511: Blue Earth-----	80	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Poor	Good	
557: Talcot-----	45	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good	
Biscay-----	20	Good	Good	Good	Good	Fair	Good	Good	Good	Fair	Good	

Soil Survey of Dickinson County, Iowa—Part II

Wildlife Habitat--Continued

Map symbol and soil name	Pct. of map unit	Potential for habitat elements						Potential as habitat for--				
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	
559: Talcot-----	95	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good	
574C2: Bolan, moderately eroded-----	50	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	
Augusta Lake, moderately eroded	35	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
577B: Everly-----	100	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	
577C2: Everly, moderately eroded-----	80	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
586B: Coland, occasionally flooded-----	65	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good	
Spillville, occasionally flooded-----	20	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
634E2: Belview, moderately eroded-----	35	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor	
Omsrud, moderately eroded-----	20	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
634G: Belview-----	55	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor	
Omsrud-----	30	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
635C2: Belview, moderately eroded-----	70	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor	
Storden, moderately eroded-----	25	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor	
638C2: Clarion, moderately eroded-----	50	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	

Soil Survey of Dickinson County, Iowa—Part II

Wildlife Habitat--Continued

Map symbol and soil name	Pct. of map unit	Potential for habitat elements						Potential as habitat for--				
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	
638C2: Storden, moderately eroded-----	20	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor	
655: Crippin-----	65	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor	
733: Calco, occasionally flooded-----	85	Good	Fair	Good	Poor	Very poor	Good	Good	Fair	Poor	Fair	
735: Havelock, occasionally flooded-----	73	Good	Good	Good	Poor	Poor	Good	Good	Good	Poor	Good	
740D: Hawick-----	80	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	
740F: Hawick-----	90	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	
740G: Hawick-----	85	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	
835D2: Omsrud, moderately eroded-----	50	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
Storden, moderately eroded-----	25	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor	
854D: Histosols, fens----	100	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	
875B: Roine-----	88	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor	
878: Ocheyedan-----	95	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
878B: Ocheyedan-----	85	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
879: Fostoria-----	85	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
1032: Spicer-----	95	Good	Good	Fair	Fair	Poor	Good	Good	Good	Fair	Good	
1091: McCreath-----	90	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	

Soil Survey of Dickinson County, Iowa—Part II

Wildlife Habitat--Continued

Map symbol and soil name	Pct. of map unit	Potential for habitat elements						Potential as habitat for--				
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	
1091B: McCreath-----	95	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	
1092: Gillett Grove-----	85	Good	Good	Good	Fair	Poor	Good	Fair	Good	Fair	Fair	
1511: Blue Earth, ponded	90	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	
1707B: Delft-----	55	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good	
Terril-----	20	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	
2700C: Ridgeton-----	75	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	
4946B. Udorthents-Highway												
5010. Pits, sand and gravel												
5040. Udorthents, loamy												
AW. Animal waste lagoon												
SL. Sewage lagoon												
W. Water												

# Engineering

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This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

*Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.*

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, reclamation material, roadfill, and topsoil; plan structures for water management; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary, which is in Part I of this publication.

## Building Site Development

The titles of the tables described in this section are:

- “Dwellings and Small Commercial Buildings”
- “Roads and Streets, Shallow Excavations, and Lawns and Landscaping”

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. The tables described in this section show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Dwellings* are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

*Small commercial buildings* are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of

flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

## Soil Survey of Dickinson County, Iowa—Part II

### Dwellings and Small Commercial Buildings

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:							
Okoboji-----	80	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
		Ponding	1.00	Ponding	1.00	Ponding	1.00
27B:							
Terril-----	80	Not limited		Somewhat limited		Not limited	
				Depth to	0.61		
				saturated zone			
28B:							
Dickman-----	85	Not limited		Not limited		Not limited	
32:							
Spicer-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.14	Shrink-swell	0.14	Shrink-swell	0.14
34:							
Estherville-----	85	Not limited		Not limited		Not limited	
34B:							
Estherville-----	65	Not limited		Not limited		Not limited	
34C2:							
Estherville, moderately eroded--	65	Not limited		Not limited		Somewhat limited	
						Slope	0.88
55:							
Nicollet-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
77B:							
Sac-----	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.50	Depth to	0.61	Shrink-swell	0.50
				saturated zone			
95:							
Harps-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
107:							
Webster-----	70	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.32			Shrink-swell	0.32

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
135: Coland, occasionally flooded-----	85	Very limited Flooding Depth to saturated zone Shrink-swell	Very limited Flooding Depth to saturated zone Shrink-swell	Very limited Flooding Depth to saturated zone Shrink-swell
138B: Clarion-----	85	Not limited	Somewhat limited Depth to saturated zone	Not limited
138C: Clarion-----	70	Not limited	Somewhat limited Depth to saturated zone	Somewhat limited Slope
175B: Dickinson-----	80	Not limited	Not limited	Not limited
175C2: Dickinson, moderately eroded--	80	Not limited	Not limited	Somewhat limited Slope
199: Cylinder-----	30	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
Nicollet-----	20	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
200: Cylinder-----	60	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
Cylinder, calcareous	25	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
259: Biscay-----	85	Very limited Depth to saturated zone Shrink-swell	Very limited Depth to saturated zone	Very limited Depth to saturated zone Shrink-swell
274: Rolfe-----	85	Very limited Depth to saturated zone Shrink-swell Ponding	Very limited Depth to saturated zone Shrink-swell Ponding	Very limited Depth to saturated zone Shrink-swell Ponding

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without	Dwellings with basements	Small commercial			
		basements		buildings			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
282:							
Ransom-----	85	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 0.50
283B:							
Dickman-----	35	Not limited		Not limited		Not limited	
Clarion-----	25	Not limited		Somewhat limited Depth to saturated zone	0.61	Not limited	
308:							
Wadena-----	85	Not limited		Not limited		Not limited	
308B:							
Wadena-----	75	Not limited		Not limited		Not limited	
308C:							
Wadena-----	70	Not limited		Not limited		Somewhat limited Slope	0.88
327:							
Wadena-----	35	Not limited		Not limited		Not limited	
Augusta Lake-----	30	Not limited		Not limited		Not limited	
Clarion-----	25	Not limited		Somewhat limited Depth to saturated zone	0.61	Not limited	
327B:							
Wadena-----	35	Not limited		Not limited		Not limited	
Augusta Lake-----	30	Not limited		Not limited		Not limited	
Clarion-----	20	Not limited		Somewhat limited Depth to saturated zone	0.61	Not limited	
331:							
Madelia-----	70	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Very limited Depth to saturated zone Shrink-swell	1.00 0.01
341C2:							
Estherville, moderately eroded--	40	Not limited		Not limited		Somewhat limited Slope	0.88
Pilot Grove, moderately eroded--	30	Not limited		Not limited		Somewhat limited Slope	0.88
346B:							
Augusta Lake-----	40	Not limited		Not limited		Not limited	
Estherville-----	30	Not limited		Not limited		Not limited	

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features	
347B: Augusta Lake-----	70	Not limited	Not limited	Not limited	
347C: Augusta Lake-----	65	Not limited	Not limited	Somewhat limited Slope	
374B: Okabena-----	70	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 1.00 0.50
374C: Okabena-----	65	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Slope Shrink-swell	1.00 1.00 0.88 0.50
390: Waldorf-----	50	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00 0.50 1.00
397: Letri-----	90	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 1.00 0.50 1.00
456: Wilmington-----	95	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 1.00 0.50 0.50
485: Spillville, occasionally flooded-----	80	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00 1.00 1.00
507: Canisteo-----	60	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Very limited Depth to saturated zone Shrink-swell	1.00 1.00 0.01 1.00
511: Blue Earth-----	80	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00 1.00 1.00 1.00

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without	Dwellings with basements	Small commercial			
		basements		buildings			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
557:							
Talcot-----	45	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.50			Shrink-swell	0.50
Biscay-----	20	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.50			Shrink-swell	0.50
559:							
Talcot-----	95	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.50			Shrink-swell	0.50
574C2:							
Bolan, moderately eroded-----	50	Not limited		Not limited		Somewhat limited	
						Slope	0.88
Augusta Lake, moderately eroded--	35	Not limited		Not limited		Somewhat limited	
						Slope	0.88
577B:							
Everly-----	100	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
				Depth to	0.61		
				saturated zone			
577C2:							
Everly, moderately eroded-----	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.50	Shrink-swell	0.50	Slope	0.88
				Depth to	0.61	Shrink-swell	0.50
				saturated zone			
586B:							
Coland, occasionally flooded-----	65	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Spillville, occasionally flooded-----	20	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
634E2:							
Belview, moderately eroded-----	35	Very limited Slope	1.00	Very limited Slope	1.00	Very limited Slope	1.00
Omsrud, moderately eroded-----	20	Very limited Slope	1.00	Very limited Slope	1.00	Very limited Slope	1.00
634G:							
Belview-----	55	Very limited Slope	1.00	Very limited Slope	1.00	Very limited Slope	1.00
Omsrud-----	30	Very limited Slope	1.00	Very limited Slope	1.00	Very limited Slope	1.00
635C2:							
Belview, moderately eroded-----	70	Not limited		Not limited		Somewhat limited Slope	0.88
Storden, moderately eroded-----	25	Not limited		Not limited		Somewhat limited Slope	0.88
638C2:							
Clarion, moderately eroded-----	50	Not limited		Somewhat limited Depth to saturated zone	0.61	Somewhat limited Slope	0.88
Storden, moderately eroded-----	20	Not limited		Not limited		Somewhat limited Slope	0.88
655:							
Crippin-----	65	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
733:							
Calco, occasionally flooded-----	85	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 0.50	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 0.50	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 0.50
735:							
Havelock, occasionally flooded-----	73	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00
740D:							
Hawick-----	80	Somewhat limited Slope	0.63	Somewhat limited Slope	0.63	Very limited Slope	1.00

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
740F: Hawick-----	90	Very limited Slope	Very limited Slope	Very limited Slope
		1.00	1.00	1.00
740G: Hawick-----	85	Very limited Slope	Very limited Slope	Very limited Slope
		1.00	1.00	1.00
835D2: Omsrud, moderately eroded-----	50	Somewhat limited Slope	Somewhat limited Slope	Very limited Slope
		0.63	0.63	1.00
Storden, moderately eroded-----	25	Somewhat limited Slope	Somewhat limited Slope	Very limited Slope
		0.63	0.63	1.00
854D: Histosols, fens----	100	Very limited Subsidence Depth to saturated zone Organic matter content Slope	Very limited Subsidence Depth to saturated zone Slope	Very limited Subsidence Depth to saturated zone Organic matter content Slope
		1.00 1.00 1.00 0.16	1.00 1.00 0.16	1.00 1.00 1.00 1.00
875B: Roine-----	88	Not limited	Somewhat limited Depth to saturated zone	Not limited
			0.61	
878: Ocheyedan-----	95	Not limited	Somewhat limited Depth to saturated zone	Not limited
			0.61	
878B: Ocheyedan-----	85	Not limited	Somewhat limited Depth to saturated zone	Not limited
			0.61	
879: Fostoria-----	85	Very limited Depth to saturated zone Shrink-swell	Very limited Depth to saturated zone Shrink-swell	Very limited Depth to saturated zone Shrink-swell
		1.00 0.50	1.00 0.50	1.00 0.50
1032: Spicer-----	95	Very limited Depth to saturated zone Shrink-swell	Very limited Depth to saturated zone Shrink-swell	Very limited Depth to saturated zone Shrink-swell
		1.00 0.14	1.00 0.14	1.00 0.14
1091: McCreath-----	90	Very limited Depth to saturated zone Shrink-swell	Very limited Depth to saturated zone	Very limited Depth to saturated zone Shrink-swell
		1.00 1.00	1.00	1.00 1.00

Soil Survey of Dickinson County, Iowa—Part II

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings			
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features			
1091B: McCreath-----	95	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
1092: Gillett Grove-----	85	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
1511: Blue Earth, ponded--	90	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
1707B: Delft-----	55	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 0.50	Very limited Depth to saturated zone Shrink-swell	1.00 0.50
Terril-----	20	Not limited		Somewhat limited Depth to saturated zone	0.61	Not limited	
2700C: Ridgeton-----	75	Not limited		Not limited		Somewhat limited Slope	0.88
4946B: Udorthents, loamy---	65	Not rated		Not rated		Not rated	
Highway-----	30	Not rated		Not rated		Not rated	
5010: Pits, sand and gravel-----	100	Not rated		Not rated		Not rated	
5040: Udorthents, loamy---	100	Not rated		Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated		Not rated	
W: Water-----	100	Not rated		Not rated		Not rated	

## Soil Survey of Dickinson County, Iowa—Part II

### Roads and Streets, Shallow Excavations, and Lawns and Landscaping

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations		Lawns and landscaping		
			Rating class and limiting features	Value	Rating class and limiting features	Value	
6:							
Okoboji-----	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	1.00	Ponding	1.00	Ponding	1.00
		Frost action	1.00	Unstable excavation walls	0.10		
		Low strength	1.00				
		Ponding	1.00				
27B:							
Terril-----	80	Somewhat limited		Somewhat limited		Not limited	
		Low strength	0.22	Depth to saturated zone	0.61		
		Frost action	0.50	Unstable excavation walls	0.10		
28B:							
Dickman-----	85	Not limited		Very limited		Not limited	
				Unstable excavation walls	1.00		
32:							
Spicer-----	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Unstable excavation walls	0.10		
		Low strength	1.00				
		Shrink-swell	0.14				
34:							
Estherville-----	85	Not limited		Very limited		Somewhat limited	
				Unstable excavation walls	1.00	Droughty	0.10
34B:							
Estherville-----	65	Not limited		Very limited		Somewhat limited	
				Unstable excavation walls	1.00	Droughty	0.10
34C2:							
Estherville, moderately eroded--	65	Not limited		Very limited		Somewhat limited	
				Unstable excavation walls	1.00	Droughty	0.12
55:							
Nicollet-----	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Unstable excavation walls	0.10		
		Low strength	1.00				

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
77B: Sac-----	90	Very limited Frost action Low strength Shrink-swell	1.00 1.00 0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
95: Harps-----	85	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00
107: Webster-----	70	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 1.00 0.32	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00
135: Coland, occasionally flooded-----	85	Very limited Depth to saturated zone Frost action Flooding Low strength Shrink-swell	1.00 1.00 1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.10	Very limited Depth to saturated zone Flooding	1.00 0.60
138B: Clarion-----	85	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
138C: Clarion-----	70	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
175B: Dickinson-----	80	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
175C2: Dickinson, moderately eroded--	80	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	

# Soil Survey of Dickinson County, Iowa—Part II

## Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
199:				
Cylinder-----	30	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Frost action	Unstable excavation walls	
Nicollet-----	20	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Frost action	Unstable excavation walls	
		Low strength		
200:				
Cylinder-----	60	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Frost action	Unstable excavation walls	
Cylinder, calcareous	25	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Frost action	Unstable excavation walls	
		Low strength		
259:				
Biscay-----	85	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Frost action	Unstable excavation walls	
		Low strength		
		Shrink-swell		
274:				
Rolfe-----	85	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Shrink-swell	Ponding	Ponding
		Frost action	Too clayey	
		Low strength	Unstable excavation walls	
		Ponding		
282:				
Ransom-----	85	Very limited	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone	Depth to saturated zone
		Frost action	Unstable excavation walls	
		Low strength		
		Shrink-swell		
283B:				
Dickman-----	35	Not limited	Very limited	Not limited
			Unstable excavation walls	

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
283B: Clarion-----	25	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 1.00	Not limited	
308: Wadena-----	85	Somewhat limited Low strength	0.22	Very limited Unstable excavation walls	1.00	Not limited	
308B: Wadena-----	75	Somewhat limited Low strength	0.22	Very limited Unstable excavation walls	1.00	Not limited	
308C: Wadena-----	70	Somewhat limited Low strength	0.22	Very limited Unstable excavation walls	1.00	Not limited	
327: Wadena-----	35	Somewhat limited Low strength	0.22	Very limited Unstable excavation walls	1.00	Not limited	
Augusta Lake-----	30	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
Clarion-----	25	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 1.00	Not limited	
327B: Wadena-----	35	Somewhat limited Frost action Low strength	0.50 0.22	Very limited Unstable excavation walls	1.00	Not limited	
Augusta Lake-----	30	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
Clarion-----	20	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 1.00	Not limited	
331: Madelia-----	70	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.01	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
341C2: Estherville, moderately eroded--	40	Not limited	Very limited Unstable excavation walls	1.00	Somewhat limited Droughty	0.12	
Pilot Grove, moderately eroded--	30	Not limited	Very limited Unstable excavation walls	1.00	Somewhat limited Droughty	0.10	
346B: Augusta Lake-----	40	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
Estherville-----	30	Not limited	Very limited Unstable excavation walls	1.00	Somewhat limited Droughty	0.10	
347B: Augusta Lake-----	70	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
347C: Augusta Lake-----	65	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
374B: Okabena-----	70	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
374C: Okabena-----	65	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
390: Waldorf-----	50	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 1.00 0.28 0.10	Very limited Depth to saturated zone	1.00

## Soil Survey of Dickinson County, Iowa—Part II

### Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
397: Letri-----	90	Very limited Depth to saturated zone Frost action Shrink-swell Low strength	1.00 1.00 0.50 0.22	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
456: Wilmington-----	95	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
485: Spillville, occasionally flooded-----	80	Very limited Depth to saturated zone Flooding Low strength Frost action	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.10	Very limited Depth to saturated zone Flooding	1.00 0.60
507: Canisteo-----	60	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.01	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
511: Blue Earth-----	80	Very limited Depth to saturated zone Frost action Low strength Ponding	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding Unstable excavation walls	1.00 1.00 1.00 0.10	Very limited Depth to saturated zone Ponding	1.00 1.00
557: Talcot-----	45	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00	Very limited Depth to saturated zone	1.00
Biscay-----	20	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
559: Talcot-----	95	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 1.00	Very limited Depth to saturated zone	1.00
574C2: Bolan, moderately eroded-----	50	Somewhat limited Frost action	0.50	Very limited Unstable excavation walls	1.00	Not limited	
Augusta Lake, moderately eroded--	35	Somewhat limited Frost action	0.50	Somewhat limited Unstable excavation walls	0.10	Not limited	
577B: Everly-----	100	Very limited Low strength Shrink-swell Frost action	1.00 0.50 0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
577C2: Everly, moderately eroded-----	80	Very limited Low strength Shrink-swell Frost action	1.00 0.50 0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
586B: Coland, occasionally flooded-----	65	Very limited Depth to saturated zone Frost action Flooding Low strength Shrink-swell	1.00 1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.10	Very limited Depth to saturated zone Flooding	1.00 0.60
Spillville, occasionally flooded-----	20	Very limited Depth to saturated zone Flooding Low strength Frost action	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.10	Very limited Depth to saturated zone Flooding	1.00 0.60
634E2: Belview, moderately eroded-----	35	Very limited Slope Low strength Frost action	1.00 0.22 0.50	Very limited Slope Unstable excavation walls	1.00 0.10	Very limited Slope	1.00

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
634E2: Omsrud, moderately eroded-----	20	Very limited Slope Low strength Frost action	1.00 1.00 0.50	Very limited Slope Unstable excavation walls	1.00 1.00 0.10	Very limited Slope	1.00
634G: Belview-----	55	Very limited Slope Frost action Low strength	1.00 0.50 0.22	Very limited Slope Unstable excavation walls	1.00 1.00 0.10	Very limited Slope	1.00
Omsrud-----	30	Very limited Slope Frost action Low strength	1.00 0.50 0.22	Very limited Slope Unstable excavation walls	1.00 1.00 0.10	Very limited Slope	1.00
635C2: Belview, moderately eroded-----	70	Somewhat limited Frost action Low strength	0.50 0.22	Somewhat limited Unstable excavation walls	0.10	Not limited	
Storden, moderately eroded-----	25	Somewhat limited Frost action	0.50	Somewhat limited Unstable excavation walls	0.10	Not limited	
638C2: Clarion, moderately eroded-----	50	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
Storden, moderately eroded-----	20	Somewhat limited Frost action	0.50	Somewhat limited Unstable excavation walls	0.10	Not limited	
655: Crippin-----	65	Very limited Depth to saturated zone Frost action Low strength	1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
733: Calco, occasionally flooded-----	85	Very limited Depth to saturated zone Frost action Flooding Low strength Shrink-swell	1.00 1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 1.00 0.60 0.10	Very limited Depth to saturated zone Flooding	1.00 0.60

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
735: Havelock, occasionally flooded-----	73	Very limited Depth to saturated zone Shrink-swell Frost action Flooding Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 1.00 0.60 0.10	Very limited Depth to saturated zone Flooding	1.00 1.00 0.60
740D: Hawick-----	80	Somewhat limited Slope	0.63	Very limited Unstable excavation walls Slope	1.00 0.63	Very limited Droughty Slope	1.00 0.63
740F: Hawick-----	90	Very limited Slope	1.00	Very limited Unstable excavation walls Slope	1.00 1.00 1.00	Very limited Slope Droughty	1.00 1.00
740G: Hawick-----	85	Very limited Slope	1.00	Very limited Slope Unstable excavation walls	1.00 1.00 1.00	Very limited Slope Droughty	1.00 1.00
835D2: Omsrud, moderately eroded-----	50	Very limited Low strength Slope Frost action	1.00 0.63 0.50	Somewhat limited Slope Unstable excavation walls	0.63 0.10	Somewhat limited Slope	0.63
Storden, moderately eroded-----	25	Somewhat limited Slope Frost action	0.63 0.50	Somewhat limited Slope Unstable excavation walls	0.63 0.10	Somewhat limited Slope	0.63
854D: Histosols, fens----	100	Very limited Depth to saturated zone Subsidence Frost action Slope	1.00 1.00 1.00 1.00 0.16	Very limited Depth to saturated zone Slope Unstable excavation walls	1.00 0.16 0.10	Very limited Organic matter content Depth to saturated zone Slope	1.00 1.00 0.16
875B: Roine-----	88	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
878: Ocheyedan-----	95	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
878B: Ocheyedan-----	85	Somewhat limited Frost action	0.50	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
879: Fostoria-----	85	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00
1032: Spicer-----	95	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.14	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00
1091: McCreath-----	90	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00
1091B: McCreath-----	95	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00
1092: Gillett Grove-----	85	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.10	Very limited Depth to saturated zone	1.00

Soil Survey of Dickinson County, Iowa—Part II

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets	Shallow excavations	Lawns and landscaping			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1511: Blue Earth, ponded--	90	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 1.00 0.10	Very limited Ponding Depth to saturated zone	1.00 1.00
1707B: Delft-----	55	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.50	Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00 0.10	Very limited Depth to saturated zone	1.00
Terril-----	20	Somewhat limited Frost action Low strength	0.50 0.22	Somewhat limited Depth to saturated zone Unstable excavation walls	0.61 0.10	Not limited	
2700C: Ridgeton-----	75	Somewhat limited Low strength Frost action	0.78 0.50	Somewhat limited Unstable excavation walls	0.10	Not limited	
4946B: Udorthents, loamy---	65	Not rated		Not rated		Not rated	
Highway-----	30	Not rated		Not rated		Not rated	
5010: Pits, sand and gravel-----	100	Not rated		Not rated		Not rated	
5040: Udorthents, loamy---	100	Not rated		Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated		Not rated	
W: Water-----	100	Not rated		Not rated		Not rated	

## Sanitary Facilities

The titles of the tables described in this section are:

- “Sewage Disposal”
- “Landfills”

These tables show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

## Soil Survey of Dickinson County, Iowa—Part II

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

## Soil Survey of Dickinson County, Iowa—Part II

### Sewage Disposal

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
6:					
Okoboji-----	80	Very limited		Very limited	
		Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone	
		Slow water	1.00	Ponding	1.00
		movement		Seepage	0.50
		Ponding	1.00		
27B:					
Terril-----	80	Very limited		Somewhat limited	
		Depth to	1.00	Depth to	0.71
		saturated zone		saturated zone	
		Slow water	0.50	Seepage	0.50
		movement		Slope	0.08
28B:					
Dickman-----	85	Very limited		Very limited	
		Seepage, bottom	1.00	Seepage	1.00
		layer		Slope	0.08
		Filtering	1.00		
		capacity			
32:					
Spicer-----	85	Very limited		Very limited	
		Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone	
		Slow water	0.50	Seepage	0.50
		movement			
34:					
Estherville-----	85	Very limited		Very limited	
		Filtering	1.00	Seepage	1.00
		capacity			
		Seepage, bottom	1.00		
		layer			
34B:					
Estherville-----	65	Very limited		Very limited	
		Filtering	1.00	Seepage	1.00
		capacity		Slope	0.08
		Seepage, bottom	1.00		
		layer			
34C2:					
Estherville, moderately eroded--	65	Very limited		Very limited	
		Filtering	1.00	Seepage	1.00
		capacity		Slope	1.00
		Seepage, bottom	1.00		
		layer			

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
55: Nicollet-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	0.50
77B: Sac-----	90	Very limited Depth to saturated zone	1.00	Somewhat limited Depth to saturated zone	0.71
		Slow water movement	0.46	Seepage Slope	0.53 0.08
95: Harps-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Slow water movement	0.50	Seepage	0.50
107: Webster-----	70	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	0.50
135: Coland, occasionally flooded-----	85	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00
		Slow water movement	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		
138B: Clarion-----	85	Very limited Depth to saturated zone	1.00	Somewhat limited Depth to saturated zone	0.71
		Slow water movement	0.50	Seepage Slope	0.50 0.08
138C: Clarion-----	70	Very limited Depth to saturated zone	1.00	Very limited Slope Depth to saturated zone	1.00 0.71
		Slow water movement	0.50	Seepage	0.50
175B: Dickinson-----	80	Very limited Seepage, bottom layer	1.00	Very limited Seepage Slope	1.00 0.08

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
175C2: Dickinson, moderately eroded--	80	Very limited Seepage, bottom layer	1.00	Very limited Seepage Slope	1.00 1.00
199: Cylinder-----	30	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 1.00
Nicollet-----	20	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.50
200: Cylinder-----	60	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 1.00
Cylinder, calcareous	25	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 1.00
259: Biscay-----	85	Very limited Depth to saturated zone Seepage, bottom layer Slow water movement	1.00 1.00 1.00 0.50	Very limited Seepage Depth to saturated zone	1.00 1.00
274: Rolfe-----	85	Very limited Depth to saturated zone Slow water movement Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Ponding Seepage	1.00 1.00 0.50

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank	Sewage lagoons		
		absorption fields	Rating class and limiting features	Rating class and limiting features	
282: Ransom-----	85	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.50
283B: Dickman-----	35	Very limited Seepage, bottom layer Filtering capacity	1.00 1.00	Very limited Seepage Slope	1.00 0.08
Clarion-----	25	Very limited Depth to saturated zone Slow water movement	1.00 0.50	Somewhat limited Depth to saturated zone Seepage Slope	0.71 0.50 0.08
308: Wadena-----	85	Very limited Seepage, bottom layer Slow water movement	1.00 0.50	Very limited Seepage	1.00
308B: Wadena-----	75	Very limited Seepage, bottom layer Slow water movement	1.00 0.50	Very limited Seepage Slope	1.00 0.08
308C: Wadena-----	70	Very limited Seepage, bottom layer Slow water movement	1.00 0.50	Very limited Seepage Slope	1.00 1.00
327: Wadena-----	35	Very limited Seepage, bottom layer Slow water movement	1.00 0.50	Very limited Seepage	1.00
Augusta Lake-----	30	Somewhat limited Slow water movement	0.50	Very limited Seepage	1.00
Clarion-----	25	Very limited Depth to saturated zone Slow water movement	1.00 0.50	Somewhat limited Depth to saturated zone Seepage	0.71 0.50

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank	Sewage lagoons		
		absorption fields	Rating class and limiting features	Rating class and limiting features	Value
327B:					
Wadena-----	35	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage Slope	1.00 0.08
		Slow water movement	0.50		
Augusta Lake-----	30	Somewhat limited		Very limited	
		Slow water movement	0.50	Seepage Slope	1.00 0.08
Clarion-----	20	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.71
		Slow water movement	0.50	Seepage Slope	0.50 0.08
331:					
Madelia-----	70	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.50	Seepage	0.50
341C2:					
Estherville, moderately eroded--	40	Very limited		Very limited	
		Filtering capacity	1.00	Seepage Slope	1.00 1.00
		Seepage, bottom layer	1.00		
Pilot Grove, moderately eroded--	30	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope Seepage	1.00 1.00
346B:					
Augusta Lake-----	40	Somewhat limited		Very limited	
		Slow water movement	0.50	Seepage Slope	1.00 0.08
Estherville-----	30	Very limited		Very limited	
		Filtering capacity	1.00	Seepage Slope	1.00 0.08
		Seepage, bottom layer	1.00		
347B:					
Augusta Lake-----	70	Somewhat limited		Very limited	
		Slow water movement	0.50	Seepage Slope	1.00 0.08
347C:					
Augusta Lake-----	65	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope Seepage	1.00 1.00

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank	Sewage lagoons
		absorption fields	
		Rating class and limiting features	Rating class and limiting features
374B: Okabena-----	70	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	Seepage Slope
374C: Okabena-----	65	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	Slope Seepage
390: Waldorf-----	50	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	
397: Letri-----	90	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	Seepage
456: Wilmington-----	95	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	
485: Spillville, occasionally flooded-----	80	Very limited	Very limited
		Flooding	Flooding
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	Seepage
507: Canisteo-----	60	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	Seepage
511: Blue Earth-----	80	Very limited	Very limited
		Depth to saturated zone	Depth to saturated zone
		Slow water movement	Ponding
		Ponding	

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
557: Talcot-----	45	Very limited Depth to saturated zone	1.00	Very limited Seepage	1.00
		Seepage, bottom layer	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00		
Biscay-----	20	Very limited Depth to saturated zone	1.00	Very limited Seepage	1.00
		Seepage, bottom layer	1.00	Depth to saturated zone	1.00
		Slow water movement	0.50		
559: Talcot-----	95	Very limited Depth to saturated zone	1.00	Very limited Seepage	1.00
		Seepage, bottom layer	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00		
574C2: Bolan, moderately eroded-----	50	Very limited Seepage, bottom layer	1.00	Very limited Slope	1.00
				Seepage	1.00
Augusta Lake, moderately eroded--	35	Somewhat limited Slow water movement	0.50	Very limited Slope	1.00
				Seepage	1.00
577B: Everly-----	100	Very limited Depth to saturated zone	1.00	Somewhat limited Depth to saturated zone	0.71
		Slow water movement	1.00	Seepage	0.50
				Slope	0.32
577C2: Everly, moderately eroded-----	80	Very limited Depth to saturated zone	1.00	Very limited Slope	1.00
		Slow water movement	1.00	Depth to saturated zone	0.71
				Seepage	0.50

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
586B: Coland, occasionally flooded-----	65	Very limited Flooding Depth to saturated zone Slow water movement Seepage, bottom layer	1.00 1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Seepage	1.00 1.00 1.00
Spillville, occasionally flooded-----	20	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 0.50	Very limited Flooding Depth to saturated zone Seepage Slope	1.00 1.00 0.50 0.08
634E2: Belview, moderately eroded-----	35	Very limited Slope Slow water movement	1.00 0.50	Very limited Slope Seepage	1.00 0.50
Omsrud, moderately eroded-----	20	Very limited Slope Slow water movement	1.00 0.50	Very limited Slope Seepage	1.00 0.50
634G: Belview-----	55	Very limited Slope Slow water movement	1.00 0.50	Very limited Slope Seepage	1.00 0.50
Omsrud-----	30	Very limited Slope Slow water movement	1.00 0.50	Very limited Slope Seepage	1.00 0.50
635C2: Belview, moderately eroded-----	70	Somewhat limited Slow water movement	0.50	Very limited Slope Seepage	1.00 0.50
Storden, moderately eroded-----	25	Somewhat limited Slow water movement	0.50	Very limited Slope Seepage	1.00 0.50

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
638C2: Clarion, moderately eroded-----	50	Very limited Depth to saturated zone Slow water movement	1.00 0.50	Very limited Slope Depth to saturated zone Seepage	1.00 0.71 0.50
Storden, moderately eroded-----	20	Somewhat limited Slow water movement	0.50	Very limited Slope Seepage	1.00 0.50
655: Crippin-----	65	Very limited Depth to saturated zone Slow water movement	1.00 0.50	Very limited Depth to saturated zone Seepage	1.00 0.50
733: Calco, occasionally flooded-----	85	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00
735: Havelock, occasionally flooded-----	73	Very limited Flooding Depth to saturated zone Slow water movement Seepage, bottom layer	1.00 1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Seepage	1.00 1.00 1.00
740D: Hawick-----	80	Very limited Filtering capacity Seepage, bottom layer Slope	1.00 1.00 0.63	Very limited Slope Seepage	1.00 1.00
740F: Hawick-----	90	Very limited Filtering capacity Seepage, bottom layer Slope	1.00 1.00 1.00	Very limited Slope Seepage	1.00 1.00

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
740G:					
Hawick-----	85	Very limited		Very limited	
		Filtering	1.00	Slope	1.00
		capacity		Seepage	1.00
		Slope	1.00		
		Seepage, bottom	1.00		
		layer			
835D2:					
Omsrud, moderately eroded-----	50	Somewhat limited		Very limited	
		Slow water	0.50	Slope	1.00
		movement		Seepage	0.50
		Slope	0.63		
Storden, moderately eroded-----	25	Somewhat limited		Very limited	
		Slow water	0.50	Slope	1.00
		movement		Seepage	0.50
		Slope	0.63		
854D:					
Histosols, fens-----	100	Very limited		Very limited	
		Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone	
		Subsidence	1.00	Slope	1.00
		Slow water	1.00	Seepage	1.00
		movement			
		Slope	0.16		
875B:					
Roine-----	88	Very limited		Very limited	
		Depth to	1.00	Seepage	1.00
		saturated zone		Depth to	0.71
		Slow water	1.00	saturated zone	
		movement		Slope	0.32
878:					
Ocheyedan-----	95	Very limited		Very limited	
		Depth to	1.00	Seepage	1.00
		saturated zone		Depth to	0.71
		Slow water	1.00	saturated zone	
		movement			
878B:					
Ocheyedan-----	85	Very limited		Very limited	
		Depth to	1.00	Seepage	1.00
		saturated zone		Depth to	0.71
		Slow water	1.00	saturated zone	
		movement		Slope	0.08
879:					
Fostoria-----	85	Very limited		Very limited	
		Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone	
		Slow water	1.00		
		movement			

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
1032: Spicer-----	95	Very limited Depth to saturated zone Slow water movement	1.00 0.50	Very limited Depth to saturated zone Seepage	1.00 0.50
1091: McCreath-----	90	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.50
1091B: McCreath-----	95	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage Slope	1.00 0.50 0.08
1092: Gillett Grove-----	85	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.50
1511: Blue Earth, ponded--	90	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
1707B: Delft-----	55	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage Slope	1.00 0.50 0.08
Terril-----	20	Very limited Depth to saturated zone Slow water movement	1.00 0.50	Somewhat limited Depth to saturated zone Seepage Slope	0.71 0.50 0.08
2700C: Ridgeton-----	75	Somewhat limited Slow water movement	0.50	Very limited Slope Seepage	1.00 0.50
4946B: Udorthents, loamy---	65	Not rated		Not rated	
Highway-----	30	Not rated		Not rated	

Soil Survey of Dickinson County, Iowa—Part II

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank	Value	Sewage lagoons	Value
		absorption fields		Rating class and limiting features	Rating class and limiting features
5010: Pits, sand and gravel-----	100	Not rated		Not rated	
5040: Udorthents, loamy---	100	Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated	
W: Water-----	100	Not rated		Not rated	

## Soil Survey of Dickinson County, Iowa—Part II

### Landfills

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:							
Okoboji-----	80	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
		Ponding	1.00	Ponding	1.00	Hard to compact	1.00
		Too clayey	0.50			Ponding	1.00
						Too clayey	0.50
27B:							
Terril-----	80	Very limited		Very limited		Not limited	
		Depth to	1.00	Depth to	1.00		
		saturated zone		saturated zone			
28B:							
Dickman-----	85	Very limited		Very limited		Very limited	
		Seepage, bottom	1.00	Seepage	1.00	Seepage	1.00
		layer				Too sandy	1.00
		Too sandy	1.00				
32:							
Spicer-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
34:							
Estherville-----	85	Very limited		Very limited		Very limited	
		Seepage, bottom	1.00	Seepage	1.00	Seepage	1.00
		layer				Too sandy	1.00
		Too sandy	1.00			Content of gravel	0.13
34B:							
Estherville-----	65	Very limited		Very limited		Very limited	
		Seepage, bottom	1.00	Seepage	1.00	Seepage	1.00
		layer				Too sandy	1.00
		Too sandy	1.00			Content of gravel	0.13
34C2:							
Estherville, moderately eroded--	65	Very limited		Very limited		Very limited	
		Seepage, bottom	1.00	Seepage	1.00	Seepage	1.00
		layer				Too sandy	1.00
		Too sandy	1.00				
55:							
Nicollet-----	85	Very limited		Very limited		Very limited	
		Depth to	1.00	Depth to	1.00	Depth to	1.00
		saturated zone		saturated zone		saturated zone	
77B:							
Sac-----	90	Very limited		Very limited		Somewhat limited	
		Depth to	1.00	Depth to	1.00	Too clayey	0.50
		saturated zone		saturated zone			
		Too clayey	0.50				

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
95: Harps-----	85	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
107: Webster-----	70	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
135: Coland, occasionally flooded-----	85	Very limited Flooding Depth to saturated zone Seepage, bottom layer Too clayey	Very limited Flooding Depth to saturated zone	Very limited Depth to saturated zone Seepage Too clayey
138B: Clarion-----	85	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Not limited
138C: Clarion-----	70	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Not limited
175B: Dickinson-----	80	Very limited Seepage, bottom layer Too sandy	Very limited Seepage	Very limited Seepage Too sandy
175C2: Dickinson, moderately eroded--	80	Very limited Seepage, bottom layer Too sandy	Very limited Seepage	Very limited Seepage Too sandy
199: Cylinder-----	30	Very limited Depth to saturated zone Seepage, bottom layer Too sandy	Very limited Depth to saturated zone Seepage	Very limited Depth to saturated zone Seepage Too sandy
Nicollet-----	20	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
200:				
Cylinder-----	60	Very limited Depth to saturated zone Seepage, bottom layer Too sandy	Very limited Depth to saturated zone Seepage	Very limited Depth to saturated zone Seepage Too sandy
		1.00 1.00 0.50	1.00 1.00	1.00 1.00 0.50
Cylinder, calcareous	25	Very limited Too sandy Depth to saturated zone Seepage, bottom layer	Very limited Depth to saturated zone Seepage	Very limited Depth to saturated zone Too sandy Seepage
		1.00 1.00 1.00	1.00 1.00	1.00 1.00 1.00
259:				
Biscay-----	85	Very limited Seepage, bottom layer Too sandy Depth to saturated zone	Very limited Seepage Depth to saturated zone	Very limited Depth to saturated zone Seepage Too sandy Content of gravel
		1.00 1.00 1.00	1.00 1.00	1.00 1.00 1.00 0.06
274:				
Rolfe-----	85	Very limited Too clayey Depth to saturated zone Ponding	Very limited Depth to saturated zone Ponding	Very limited Depth to saturated zone Too clayey Hard to compact Ponding
		1.00 1.00 1.00	1.00 1.00	1.00 1.00 1.00 1.00
282:				
Ransom-----	85	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
		1.00	1.00	1.00
283B:				
Dickman-----	35	Very limited Seepage, bottom layer Too sandy	Very limited Seepage	Very limited Seepage Too sandy
		1.00 1.00	1.00	1.00 1.00
Clarion-----	25	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Not limited
		1.00	1.00	
308:				
Wadena-----	85	Very limited Seepage, bottom layer Too sandy	Very limited Seepage	Very limited Seepage Too sandy Content of gravel
		1.00 1.00	1.00	1.00 1.00 0.15
308B:				
Wadena-----	75	Very limited Seepage, bottom layer Too sandy	Very limited Seepage	Very limited Seepage Too sandy Content of gravel
		1.00 1.00	1.00	1.00 1.00 0.15

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Value	Area sanitary landfill	Value	Daily cover for landfill	Value
		Rating class and limiting features		Rating class and limiting features		Rating class and limiting features	
308C:							
Wadena-----	70	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Too sandy	1.00			Too sandy	1.00
						Content of gravel	0.15
327:							
Wadena-----	35	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Too sandy	1.00			Too sandy	1.00
						Content of gravel	0.15
Augusta Lake-----	30	Not limited		Very limited		Not limited	
				Seepage	1.00		
Clarion-----	25	Very limited		Very limited		Not limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
327B:							
Wadena-----	35	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Too sandy	1.00			Too sandy	1.00
						Content of gravel	0.15
Augusta Lake-----	30	Not limited		Very limited		Not limited	
				Seepage	1.00		
Clarion-----	20	Very limited		Very limited		Not limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
331:							
Madelia-----	70	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
341C2:							
Estherville, moderately eroded--	40	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Too sandy	1.00			Too sandy	1.00
Pilot Grove, moderately eroded--	30	Not limited		Very limited		Not limited	
				Seepage	1.00		
346B:							
Augusta Lake-----	40	Not limited		Very limited		Not limited	
				Seepage	1.00		
Estherville-----	30	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Too sandy	1.00			Too sandy	1.00
						Content of gravel	0.13
347B:							
Augusta Lake-----	70	Not limited		Very limited		Not limited	
				Seepage	1.00		

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
347C: Augusta Lake-----	65	Not limited	Very limited Seepage	Not limited
			1.00	
374B: Okabena-----	70	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
		1.00	1.00	1.00
374C: Okabena-----	65	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
		1.00	1.00	1.00
390: Waldorf-----	50	Very limited Too clayey Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone Too clayey Hard to compact
		1.00 1.00	1.00	1.00 1.00 1.00
397: Letri-----	90	Very limited Depth to saturated zone Too clayey	Very limited Depth to saturated zone Seepage	Very limited Depth to saturated zone Too clayey
		1.00 0.50	1.00 1.00	1.00 0.50
456: Wilmington-----	95	Very limited Depth to saturated zone Too clayey	Very limited Depth to saturated zone	Very limited Depth to saturated zone Too clayey
		1.00 0.50	1.00	1.00 0.50
485: Spillville, occasionally flooded-----	80	Very limited Flooding Depth to saturated zone	Very limited Flooding Depth to saturated zone	Very limited Depth to saturated zone
		1.00 1.00	1.00 1.00	1.00
507: Canistee-----	60	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
		1.00	1.00	1.00
511: Blue Earth-----	80	Very limited Organic matter content Depth to saturated zone Ponding Too clayey	Very limited Depth to saturated zone Ponding	Very limited Depth to saturated zone Hard to compact Ponding Too clayey Content of gravel
		1.00 1.00 1.00 0.50	1.00 1.00	1.00 1.00 1.00 0.50 0.06

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Value	Area sanitary landfill	Value	Daily cover for landfill	Value
		Rating class and limiting features		Rating class and limiting features		Rating class and limiting features	
557: Talcot-----	45	Very limited Seepage, bottom layer Too sandy Depth to saturated zone	1.00 1.00 1.00	Very limited Seepage Depth to saturated zone	1.00 1.00	Very limited Depth to saturated zone Seepage Too sandy	1.00 1.00 1.00 1.00
Biscay-----	20	Very limited Seepage, bottom layer Too sandy Depth to saturated zone	1.00 1.00 1.00	Very limited Seepage Depth to saturated zone	1.00 1.00	Very limited Depth to saturated zone Seepage Too sandy Content of gravel	1.00 1.00 1.00 1.00 0.06
559: Talcot-----	95	Very limited Seepage, bottom layer Too sandy Depth to saturated zone	1.00 1.00 1.00	Very limited Seepage Depth to saturated zone	1.00 1.00	Very limited Depth to saturated zone Seepage Too sandy	1.00 1.00 1.00 1.00
574C2: Bolan, moderately eroded-----	50	Very limited Too sandy Seepage, bottom layer	1.00 1.00	Very limited Seepage	1.00	Very limited Too sandy Seepage	1.00 1.00
Augusta Lake, moderately eroded--	35	Not limited		Very limited Seepage	1.00	Not limited	
577B: Everly-----	100	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Not limited	
577C2: Everly, moderately eroded-----	80	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Not limited	
586B: Coland, occasionally flooded-----	65	Very limited Flooding Depth to saturated zone Seepage, bottom layer Too clayey	1.00 1.00 1.00 0.50	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Depth to saturated zone Too clayey	1.00 0.50

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
586B: Spillville, occasionally flooded-----	20	Very limited Flooding Depth to saturated zone	Very limited Flooding Depth to saturated zone	Very limited Depth to saturated zone
634E2: Belview, moderately eroded-----	35	Very limited Slope	Very limited Slope	Very limited Slope
Omsrud, moderately eroded-----	20	Very limited Slope	Very limited Slope	Very limited Slope
634G: Belview-----	55	Very limited Slope	Very limited Slope	Very limited Slope
Omsrud-----	30	Very limited Slope	Very limited Slope	Very limited Slope
635C2: Belview, moderately eroded-----	70	Not limited	Not limited	Not limited
Storden, moderately eroded-----	25	Not limited	Not limited	Not limited
638C2: Clarion, moderately eroded-----	50	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Not limited
Storden, moderately eroded-----	20	Not limited	Not limited	Not limited
655: Crippin-----	65	Very limited Depth to saturated zone	Very limited Depth to saturated zone	Very limited Depth to saturated zone
733: Calco, occasionally flooded-----	85	Very limited Flooding Depth to saturated zone Too clayey	Very limited Flooding Depth to saturated zone	Very limited Depth to saturated zone Too clayey

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
735: Havelock, occasionally flooded-----	73	Very limited Flooding Depth to saturated zone Seepage, bottom layer Too clayey	1.00 1.00 1.00 0.50	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Depth to saturated zone Too clayey	1.00 0.50
740D: Hawick-----	80	Very limited Seepage, bottom layer Too sandy Slope	1.00 1.00 0.63	Very limited Seepage Slope	1.00 0.63	Very limited Seepage Too sandy Slope	1.00 1.00 0.63
740F: Hawick-----	90	Very limited Seepage, bottom layer Too sandy Slope	1.00 1.00 1.00	Very limited Seepage Slope	1.00 1.00	Very limited Seepage Too sandy Slope	1.00 1.00 1.00
740G: Hawick-----	85	Very limited Slope Seepage, bottom layer Too sandy	1.00 1.00 1.00	Very limited Slope Seepage	1.00 1.00	Very limited Slope Seepage Too sandy	1.00 1.00 1.00
835D2: Omsrud, moderately eroded-----	50	Somewhat limited Slope	0.63	Somewhat limited Slope	0.63	Somewhat limited Slope	0.63
Storden, moderately eroded-----	25	Somewhat limited Slope	0.63	Somewhat limited Slope	0.63	Somewhat limited Slope	0.63
854D: Histosols, fens----	100	Very limited Depth to saturated zone Too clayey Slope	1.00 0.50 0.16	Very limited Depth to saturated zone Seepage Slope	1.00 1.00 1.00 0.16	Very limited Depth to saturated zone Slope	1.00 0.16
875B: Roine-----	88	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Somewhat limited Seepage	0.50
878: Ocheyedan-----	95	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Not limited	

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
878B: Ocheyedan-----	85	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Not limited	
879: Fostoria-----	85	Very limited Depth to saturated zone Too clayey	1.00 0.50	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Too clayey	1.00 0.50
1032: Spicer-----	95	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
1091: McCreath-----	90	Very limited Depth to saturated zone Too clayey	1.00 0.50	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Too clayey	1.00 0.50
1091B: McCreath-----	95	Very limited Depth to saturated zone Too clayey	1.00 0.50	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Too clayey	1.00 0.50
1092: Gillett Grove-----	85	Very limited Depth to saturated zone Too clayey	1.00 0.50	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Too clayey	1.00 0.50
1511: Blue Earth, ponded--	90	Very limited Ponding Depth to saturated zone Too clayey	1.00 1.00 0.50	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone Too clayey	1.00 1.00 0.50
1707B: Delft-----	55	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Terril-----	20	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00	Not limited	
2700C: Ridgeton-----	75	Not limited		Not limited		Not limited	
4946B: Udorthents, loamy---	65	Not rated		Not rated		Not rated	
Highway-----	30	Not rated		Not rated		Not rated	

Soil Survey of Dickinson County, Iowa—Part II

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary	Area sanitary	Daily cover
		landfill	landfill	for landfill
		Rating class and limiting features	Rating class and limiting features	Rating class and limiting features
		Value	Value	Value
5010: Pits, sand and gravel-----	100	Not rated	Not rated	Not rated
5040: Udorthents, loamy---	100	Not rated	Not rated	Not rated
AW: Animal waste lagoon	100	Not rated	Not rated	Not rated
SL: Sewage lagoon-----	100	Not rated	Not rated	Not rated
W: Water-----	100	Not rated	Not rated	Not rated

## Construction Materials

The titles of the tables described in this section are:

- “Source of Gravel and Sand”
- “Source of Reclamation Material, Roadfill, and Topsoil”

These tables give information about the soils as potential sources of gravel, sand, reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

*Gravel* and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table “Source of Gravel and Sand,” only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated as *improbable*, *possible*, *probable*, or *very likely* sources of gravel. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of gravel. The number 0.00 indicates an improbable source; 0.01 to 0.39, a possible source; 0.40 to 0.99, a probable source; and 1.00, a very likely source.

The soils are rated *good*, *fair*, or *poor* as potential sources of sand. A rating of good or fair means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. The larger the number, the greater the likelihood that the layer is a source of sand.

In the table “Source of Reclamation Material, Roadfill, and Topsoil,” the rating class terms are *good*, *fair*, and *poor*. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of reclamation material, roadfill, and topsoil. The lower the number, the greater the limitation.

*Reclamation material* is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the

soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

# Soil Survey of Dickinson County, Iowa—Part II

## Source of Gravel and Sand

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
6: Okoboji-----	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
27B: Terril-----	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
28B: Dickman-----	85	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.11
		Thickest layer	0.00	Bottom layer	0.82
32: Spicer-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
34: Estherville-----	85	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.03
		Bottom layer	0.00	Bottom layer	0.69
34B: Estherville-----	65	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.03
		Bottom layer	0.00	Bottom layer	0.69
34C2: Estherville, moderately eroded--	65	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.10
		Bottom layer	0.04	Bottom layer	0.69
55: Nicollet-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
77B: Sac-----	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
95: Harps-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
107: Webster-----	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
135: Coland, occasionally flooded-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
138B: Clarion-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
138C: Clarion-----	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
175B: Dickinson-----	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.36
175C2: Dickinson, moderately eroded--	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.12
199: Cylinder-----	30	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.04	Bottom layer	0.10
Nicollet-----	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
200: Cylinder-----	60	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.04	Bottom layer	0.10
Cylinder, calcareous	25	Fair		Fair	
		Bottom layer	0.04	Thickest layer	0.38
		Thickest layer	0.04	Bottom layer	0.52
259: Biscay-----	85	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.47
274: Rolfe-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
282:					
Ransom-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
283B:					
Dickman-----	35	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.11
		Thickest layer	0.00	Bottom layer	0.82
Clarion-----	25	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
308:					
Wadena-----	85	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.63
308B:					
Wadena-----	75	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.63
308C:					
Wadena-----	70	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.63
327:					
Wadena-----	35	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.63
Augusta Lake-----	30	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.04
Clarion-----	25	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
327B:					
Wadena-----	35	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.63
Augusta Lake-----	30	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.04
Clarion-----	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
331:					
Madelia-----	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
341C2: Estherville, moderately eroded--	40	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.10
		Bottom layer	0.04	Bottom layer	0.69
Pilot Grove, moderately eroded--	30	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.59
346B: Augusta Lake-----	40	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.04
Estherville-----	30	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.03
		Bottom layer	0.00	Bottom layer	0.69
347B: Augusta Lake-----	70	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.04
347C: Augusta Lake-----	65	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.04
374B: Okabena-----	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
374C: Okabena-----	65	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
390: Waldorf-----	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
397: Letri-----	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
456: Wilmington-----	95	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
485: Spillville, occasionally flooded-----	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
507: Canisteo-----	60	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
511: Blue Earth-----	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
557: Talcot-----	45	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.38
Biscay-----	20	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.47
559: Talcot-----	95	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.38
574C2: Bolan, moderately eroded-----	50	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.14
Augusta Lake, moderately eroded--	35	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.07
577B: Everly-----	100	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
577C2: Everly, moderately eroded-----	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
586B: Coland, occasionally flooded-----	65	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Spillville, occasionally flooded-----	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
634E2:					
Belview, moderately eroded-----	35	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Omsrud, moderately eroded-----	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
634G:					
Belview-----	55	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Omsrud-----	30	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
635C2:					
Belview, moderately eroded-----	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Storden, moderately eroded-----	25	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
638C2:					
Clarion, moderately eroded-----	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Storden, moderately eroded-----	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
655:					
Crippin-----	65	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
733:					
Calco, occasionally flooded-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
735:					
Havelock, occasionally flooded-----	73	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.03

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
740D:					
Hawick-----	80	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.07
		Bottom layer	0.04	Bottom layer	0.78
740F:					
Hawick-----	90	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.07
		Bottom layer	0.04	Bottom layer	0.78
740G:					
Hawick-----	85	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.07
		Bottom layer	0.04	Bottom layer	0.78
835D2:					
Omsrud, moderately eroded-----	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Storden, moderately eroded-----	25	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
854D:					
Histosols, fens-----	100	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
875B:					
Roine-----	88	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.01
878:					
Ocheyedan-----	95	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
878B:					
Ocheyedan-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
879:					
Fostoria-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
1032:					
Spicer-----	95	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
1091:					
McCreath-----	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Soil Survey of Dickinson County, Iowa—Part II

Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
1091B: McCreath-----	95	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
1092: Gillett Grove-----	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
1511: Blue Earth, ponded--	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
1707B: Delft-----	55	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Terril-----	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
2700C: Ridgeton-----	75	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
4946B: Udorthents, loamy---	65	Not rated		Not rated	
Highway-----	30	Not rated		Not rated	
5010: Pits, sand and gravel-----	100	Not rated		Not rated	
5040: Udorthents, loamy---	100	Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated	
W: Water-----	100	Not rated		Not rated	

## Soil Survey of Dickinson County, Iowa—Part II

### Source of Reclamation Material, Roadfill, and Topsoil

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Potential as source of roadfill	Potential as source of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6: Okoboji-----	80	Fair	Poor	Poor			
		Carbonate content	0.97	Wetness	0.00	Wetness	0.00
		Water erosion	0.99	Low strength	0.00	Too clayey	0.05
		Too clayey	0.05	Shrink-swell	0.16		
27B: Terril-----	80	Fair	Fair	Good			
		Carbonate content	0.97	Low strength	0.78		
28B: Dickman-----	85	Fair	Good	Fair			
		Low content of organic matter	0.12			Too sandy	0.32
		Too sandy	0.32				
		Too acid	0.95				
32: Spicer-----	85	Fair	Poor	Poor			
		Water erosion	0.90	Wetness	0.00	Wetness	0.00
		Carbonate content	0.97	Low strength	0.00	Carbonate content	0.97
				Shrink-swell	0.98		
34: Estherville-----	85	Poor	Good	Poor			
		Too sandy	0.00			Too sandy	0.00
		Low content of organic matter	0.12			Rock fragments	0.00
		Droughty	0.70			Gravel content	0.00
						Hard to reclaim (rock fragments)	0.32
						Gravel content (rock fragments)	0.32
34B: Estherville-----	65	Poor	Good	Poor			
		Too sandy	0.00			Too sandy	0.00
		Low content of organic matter	0.12			Rock fragments	0.00
		Droughty	0.70			Gravel content	0.00
						Hard to reclaim (rock fragments)	0.32
34C2: Estherville, moderately eroded--	65	Fair	Good	Fair			
		Low content of organic matter	0.12			Too sandy	0.22
		Too sandy	0.22			Hard to reclaim (rock fragments)	0.82
		Droughty	0.67			Gravel content	0.82
						Rock fragments	0.97

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Potential as source of roadfill	Potential as source of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
55: Nicollet-----	85	Fair	Poor	Poor			
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Water erosion	0.90				
		Carbonate content	0.97				
77B: Sac-----	90	Fair	Poor	Fair			
		Low content of organic matter	0.50	Low strength	0.00	Too clayey	0.77
		Water erosion	0.68				
		Too acid	0.84				
		Too clayey	0.88				
95: Harps-----	85	Fair	Poor	Poor			
		Carbonate content	0.92	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Carbonate content	0.92
				Shrink-swell	0.87		
107: Webster-----	70	Fair	Poor	Poor			
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Water erosion	0.90				
		Carbonate content	0.97				
135: Coland, occasionally flooded-----	85	Fair	Poor	Poor			
		Too clayey	0.98	Wetness	0.00	Wetness	0.00
						Too clayey	0.98
138B: Clarion-----	85	Fair	Good	Good			
		Low content of organic matter	0.12				
		Water erosion	0.90				
		Carbonate content	0.97				
138C: Clarion-----	70	Fair	Good	Good			
		Low content of organic matter	0.12				
		Water erosion	0.90				
		Carbonate content	0.97				
175B: Dickinson-----	80	Fair	Good	Good			
		Low content of organic matter	0.12				
		Too acid	0.84				
		Droughty	0.95				

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Potential as source of roadfill	Potential as source of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
175C2: Dickinson, moderately eroded--	80	Fair Low content of organic matter Too acid	0.50 0.84	Good		Good	
199: Cylinder-----	30	Fair Too sandy Low content of organic matter	0.01 0.12	Poor Wetness	0.00	Poor Wetness	0.00 0.01 0.04 0.04 0.99 (rock fragments)
Nicollet-----	20	Fair Low content of organic matter Water erosion Carbonate content	0.12 0.90 0.97	Poor Wetness	0.00	Poor Wetness	0.00
200: Cylinder-----	60	Fair Too sandy Low content of organic matter	0.01 0.12	Poor Wetness	0.00	Poor Wetness	0.00 0.01 0.04 0.04 0.99 (rock fragments)
Cylinder, calcareous	25	Fair Low content of organic matter	0.12	Poor Wetness	0.00	Poor Wetness	0.00 0.99 (rock fragments) 0.99
259: Biscay-----	85	Fair Low content of organic matter Carbonate content	0.12 0.97	Poor Wetness	0.00	Poor Wetness	0.00 0.03 (rock fragments) 0.03
274: Rolfe-----	85	Poor Too clayey Water erosion Low content of organic matter Too acid	0.00 0.68 0.88 0.97	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.53	Poor Wetness Too clayey	0.00 0.00 0.00
282: Ransom-----	85	Fair Low content of organic matter Water erosion Too clayey	0.12 0.90 0.98	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.87	Poor Wetness Too clayey	0.00 0.70

## Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Value	Potential as source of roadfill	Value	Potential as source of topsoil	Value
		Rating class and limiting features		Rating class and limiting features		Rating class and limiting features	
283B:							
Dickman-----	35	Fair		Good		Fair	
		Low content of organic matter	0.12			Too sandy	0.32
		Too sandy	0.32				
		Too acid	0.95				
Clarion-----	25	Fair		Good		Good	
		Low content of organic matter	0.12				
		Water erosion	0.90				
		Carbonate content	0.97				
308:							
Wadena-----	85	Fair		Good		Fair	
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.01
						Gravel content	0.01
						Rock fragments	0.92
308B:							
Wadena-----	75	Fair		Good		Fair	
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.01
						Gravel content	0.01
						Rock fragments	0.92
308C:							
Wadena-----	70	Fair		Good		Fair	
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.01
						Gravel content	0.01
						Rock fragments	0.92
327:							
Wadena-----	35	Fair		Good		Fair	
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.01
						Gravel content	0.01
						Rock fragments	0.92
Augusta Lake-----	30	Fair		Fair	0.78	Good	
		Low content of organic matter	0.12	Low strength			
		Too acid	0.84				
Clarion-----	25	Fair		Good		Good	
		Low content of organic matter	0.12				
		Water erosion	0.90				
		Carbonate content	0.97				
327B:							
Wadena-----	35	Fair		Good		Fair	
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.01
						Gravel content	0.01
						Rock fragments	0.92

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of	Potential as source	Potential as source			
		reclamation material	of roadfill	of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
327B:							
Augusta Lake-----	30	Fair		Fair		Good	
		Low content of organic matter	0.12	Low strength	0.78		
		Too acid	0.84				
Clarion-----	20	Fair		Good		Good	
		Low content of organic matter	0.12				
		Water erosion	0.90				
		Carbonate content	0.97				
331:							
Madelia-----	70	Fair		Poor		Poor	
		Water erosion	0.90	Wetness	0.00	Wetness	10.00
				Low strength	0.00		
				Shrink-swell	0.99		
341C2:							
Estherville, moderately eroded--	40	Fair		Good		Fair	
		Low content of organic matter	0.12			Too sandy	0.22
		Too sandy	0.22			Hard to reclaim (rock fragments)	0.82
		Droughty	0.67			Gravel content	0.82
						Rock fragments	0.97
Pilot Grove, moderately eroded--	30	Fair		Poor		Fair	
		Low content of organic matter	0.12	Low strength	0.00	Rock fragments	0.97
						Gravel content	0.97
346B:							
Augusta Lake-----	40	Fair		Fair		Good	
		Low content of organic matter	0.12	Low strength	0.78		
		Too acid	0.84				
Estherville-----	30	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Low content of organic matter	0.12			Rock fragments	0.00
		Droughty	0.70			Gravel content	0.00
						Hard to reclaim (rock fragments)	0.32
347B:							
Augusta Lake-----	70	Fair		Fair		Good	
		Low content of organic matter	0.12	Low strength	0.78		
		Too acid	0.84				
347C:							
Augusta Lake-----	65	Fair		Fair		Good	
		Low content of organic matter	0.12	Low strength	0.78		
		Too acid	0.84				

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of	Potential as source	Potential as source			
		reclamation material	of roadfill	of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
374B: Okabena-----	70	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Water erosion	0.90	Low strength	0.00		
		Carbonate content	0.97				
374C: Okabena-----	65	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Water erosion	0.90	Low strength	0.00		
		Carbonate content	0.97				
390: Waldorf-----	50	Poor		Poor		Poor	
		Too clayey	0.00	Wetness	0.00	Too clayey	0.00
		Low content of organic matter	0.12	Low strength	0.00	Wetness	0.00
				Shrink-swell	0.30		
397: Letri-----	90	Fair		Poor		Poor	
		Low content of organic matter	0.88	Wetness	0.00	Wetness	0.00
				Low strength	0.00		
				Shrink-swell	0.87		
456: Wilmington-----	95	Fair		Poor		Poor	
		Low content of organic matter	0.88	Wetness	0.00	Wetness	0.00
		Water erosion	0.99	Low strength	0.00		
		Carbonate content	0.99	Shrink-swell	0.87		
485: Spillville, occasionally flooded-----	80	Good		Poor		Poor	
				Wetness	0.00	Wetness	0.00
				Low strength	0.00		
507: Canisteo-----	60	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Water erosion	0.90				
		Carbonate content	0.97				
511: Blue Earth-----	80	Fair		Poor		Poor	
		Carbonate content	0.92	Wetness	0.00	Wetness	0.00
		Water erosion	0.99	Low strength	0.00	Rock fragments	0.00
						Gravel content	0.00
						Hard to reclaim (rock fragments)	0.84
						Low content of organic matter	0.94
						Carbonate content	0.97

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Potential as source of roadfill	Potential as source of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
557:							
Talcot-----	45	Fair	Poor	Poor			
		Too clayey	0.88	Wetness	0.00	Wetness	0.00
		Low content of organic matter	0.88			Hard to reclaim (rock fragments)	0.61
		Carbonate content	0.97			Gravel content	0.61
						Too clayey	0.88
						Carbonate content	0.97
Biscay-----	20	Fair	Poor	Poor			
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Carbonate content	0.97			Hard to reclaim (rock fragments)	0.03
						Gravel content	0.03
559:							
Talcot-----	95	Fair	Poor	Poor			
		Too clayey	0.88	Wetness	0.00	Wetness	0.00
		Low content of organic matter	0.88			Hard to reclaim (rock fragments)	0.61
		Carbonate content	0.97			Gravel content	0.61
						Too clayey	0.88
						Carbonate content	0.97
574C2:							
Bolan, moderately eroded-----	50	Fair	Good	Good			
		Low content of organic matter	0.12				
		Too acid	0.95				
Augusta Lake, moderately eroded--	35	Fair	Fair	Good			
		Low content of organic matter	0.12	Low strength	0.78		
		Too acid	0.84				
577B:							
Everly-----	100	Fair	Poor	Good			
		Low content of organic matter	0.12	Low strength	0.00		
		Carbonate content	0.97	Shrink-swell	0.87		
577C2:							
Everly, moderately eroded-----	80	Fair	Poor	Good			
		Low content of organic matter	0.12	Low strength	0.00		
		Carbonate content	0.97	Shrink-swell	0.87		
586B:							
Coland, occasionally flooded-----	65	Fair	Poor	Poor			
		Too clayey	0.98	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Too clayey	0.98

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material		Potential as source of roadfill		Potential as source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
586B: Spillville, occasionally flooded-----	20	Good		Poor		Poor	
				Wetness	0.00	Wetness	0.00
				Low strength	0.00		
634E2: Belview, moderately eroded-----	35	Fair		Fair		Poor	
		Low content of organic matter	0.12	Slope	0.98	Slope	0.00
		Water erosion	0.90			Carbonate content	0.97
		Carbonate content	0.97				
Omsrud, moderately eroded-----	20	Fair		Fair		Poor	
		Low content of organic matter	0.12	Slope	0.98	Slope	0.00
		Water erosion	0.90			Rock fragments	0.92
		Carbonate content	0.97			Gravel content	0.92
634G: Belview-----	55	Fair		Poor		Poor	
		Low content of organic matter	0.12	Slope	0.00	Slope	0.00
		Carbonate content	0.97	Low strength	0.78	Carbonate content	0.97
Omsrud-----	30	Fair		Poor		Poor	
		Low content of organic matter	0.12	Slope	0.00	Slope	0.00
		Water erosion	0.90				
		Carbonate content	0.97				
635C2: Belview, moderately eroded-----	70	Fair		Good		Fair	
		Low content of organic matter	0.12			Carbonate content	0.97
		Water erosion	0.90				
		Carbonate content	0.97				
Storden, moderately eroded-----	25	Fair		Good		Fair	
		Low content of organic matter	0.88			Carbonate content	0.97
		Carbonate content	0.97				
638C2: Clarion, moderately eroded-----	50	Fair		Good		Good	
		Low content of organic matter	0.12				
		Water erosion	0.90				
		Carbonate content	0.97				

# Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Potential as source of roadfill	Potential as source of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
638C2: Storden, moderately eroded-----	20	Fair Low content of organic matter Carbonate content	0.88 0.97	Good		Fair Carbonate content	0.97
655: Crippin-----	65	Fair Low content of organic matter Water erosion Carbonate content	0.12 0.90 0.97	Poor Wetness	0.00	Poor Wetness	0.00
733: Calco, occasionally flooded-----	85	Fair Water erosion Carbonate content	0.90 0.97	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.87	Poor Wetness Carbonate content	0.00 0.97
735: Havelock, occasionally flooded-----	73	Fair Carbonate content Too clayey	0.97 0.98	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.73	Poor Wetness Too clayey Carbonate content	0.00 0.93 0.97
740D: Hawick-----	80	Poor Too sandy Droughty Low content of organic matter	0.00 0.09 0.12	Good		Poor Too sandy Rock fragments Gravel content Slope Hard to reclaim (rock fragments)	0.00 0.03 0.03 0.37 0.98
740F: Hawick-----	90	Poor Too sandy Droughty Low content of organic matter	0.00 0.09 0.12	Fair Slope	0.82	Poor Too sandy Slope Rock fragments Gravel content Hard to reclaim (rock fragments)	0.00 0.00 0.03 0.03 0.98
740G: Hawick-----	85	Poor Too sandy Droughty Low content of organic matter	0.00 0.09 0.12	Poor Slope	0.00	Poor Slope Too sandy Rock fragments Gravel content Hard to reclaim (rock fragments)	0.00 0.00 0.03 0.03 0.98

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of	Potential as source	Potential as source
		reclamation material	of roadfill	of topsoil
		Rating class and	Rating class and	Rating class and
		limiting features	limiting features	limiting features
		Value	Value	Value
835D2: Omsrud, moderately eroded-----	50	Fair	Good	Fair
		Low content of organic matter	0.12	Slope
		Water erosion	0.90	Rock fragments
		Carbonate content	0.97	Gravel content
				0.37
				0.92
				0.92
Storden, moderately eroded-----	25	Fair	Good	Fair
		Low content of organic matter	0.88	Slope
		Carbonate content	0.97	Carbonate content
				0.37
				0.97
854D: Histosols, fens----	100	Poor	Poor	Poor
		Wind erosion	0.00	Wetness
				0.00
				Wetness
				0.00
				Low strength
				0.00
				High content of organic matter
				Slope
				0.84
875B: Roine-----	88	Good	Good	Good
878: Ocheyedan-----	95	Fair	Good	Good
		Low content of organic matter	0.12	
		Water erosion	0.68	
878B: Ocheyedan-----	85	Fair	Good	Good
		Low content of organic matter	0.12	
		Water erosion	0.68	
879: Fostoria-----	85	Fair	Poor	Poor
		Low content of organic matter	0.12	Wetness
		Carbonate content	0.97	Low strength
				0.00
				0.00
				Shrink-swell
				0.87
1032: Spicer-----	95	Fair	Poor	Poor
		Water erosion	0.90	Wetness
		Carbonate content	0.97	Low strength
				0.00
				0.00
				Shrink-swell
				0.98
1091: McCreath-----	90	Fair	Poor	Poor
		Low content of organic matter	0.12	Wetness
		Water erosion	0.68	Shrink-swell
		Too clayey	0.88	0.75
		Carbonate content	0.92	Too clayey
				0.00
				0.68

Soil Survey of Dickinson County, Iowa—Part II

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material	Potential as source of roadfill	Potential as source of topsoil			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1091B: McCreath-----	95	Fair	Poor	Poor			
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Water erosion	0.68	Shrink-swell	0.75	Too clayey	0.68
		Too clayey	0.88				
		Carbonate content	0.92				
1092: Gillett Grove-----	85	Fair	Poor	Poor			
		Too clayey	0.88	Wetness	0.00	Wetness	0.00
		Carbonate content	0.92	Low strength	0.00	Too clayey	0.83
		Water erosion	0.99	Shrink-swell	0.32		
1511: Blue Earth, ponded--	90	Poor	Poor	Poor			
		Wind erosion	0.00	Wetness	0.00	Wetness	0.00
		Carbonate content	0.92	Low strength	0.00	Carbonate content	0.92
		Water erosion	0.99			Low content of organic matter	0.94
1707B: Delft-----	55	Fair	Poor	Poor			
		Water erosion	0.99	Wetness	0.00	Wetness	0.00
				Low strength	0.00		
Terril-----	20	Fair	Fair	Good			
		Carbonate content	0.97	Low strength	0.78		
2700C: Ridgeton-----	75	Fair	Poor	Good			
		Low content of organic matter	0.12	Low strength	0.00		
4946B: Udorthents, loamy---	65	Not rated	Not rated	Not rated			
Highway-----	30	Not rated	Not rated	Not rated			
5010: Pits, sand and gravel-----	100	Not rated	Not rated	Not rated			
5040: Udorthents, loamy---	100	Not rated	Not rated	Not rated			
AW: Animal waste lagoon	100	Not rated	Not rated	Not rated			
SL: Sewage lagoon-----	100	Not rated	Not rated	Not rated			
W: Water-----	100	Not rated	Not rated	Not rated			

## Water Management

The table “Ponds and Embankments” gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Aquifer-fed excavated ponds* are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

## Soil Survey of Dickinson County, Iowa—Part II

### Ponds and Embankments

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6: Okoboji-----	80	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Ponding Hard to pack	1.00 1.00 0.15	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
27B: Terril-----	80	Somewhat limited Seepage	0.70	Somewhat limited Piping	0.49	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
28B: Dickman-----	85	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
32: Spicer-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.06	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
34: Estherville-----	85	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
34B: Estherville-----	65	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
34C2: Estherville, moderately eroded--	65	Very limited Seepage Slope	1.00 0.92	Very limited Seepage	1.00	Very limited Depth to water	1.00
55: Nicollet-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.44	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
77B: Sac-----	90	Somewhat limited Seepage	0.72	Not limited		Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.28

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
95: Harps-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone	1.00	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
107: Webster-----	70	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.21	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
135: Coland, occasionally flooded-----	85	Very limited Seepage	1.00	Very limited Depth to saturated zone Piping	1.00 0.34	Somewhat limited Unstable excavation walls	0.10
138B: Clarion-----	85	Somewhat limited Seepage	0.70	Very limited Piping	1.00	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
138C: Clarion-----	70	Somewhat limited Slope Seepage	0.92 0.70	Very limited Piping	1.00	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
175B: Dickinson-----	80	Very limited Seepage	1.00	Somewhat limited Seepage	0.55	Very limited Depth to water	1.00
175C2: Dickinson, moderately eroded--	80	Very limited Seepage Slope	1.00 0.92	Somewhat limited Seepage	0.43	Very limited Depth to water	1.00
199: Cylinder-----	30	Very limited Seepage	1.00	Very limited Depth to saturated zone Seepage	1.00 0.32	Very limited Unstable excavation walls	1.00
Nicollet-----	20	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.44	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
200:							
Cylinder-----	60	Very limited Seepage	1.00	Very limited Depth to saturated zone Seepage	1.00 0.32	Very limited Unstable excavation walls	1.00
Cylinder, calcareous	25	Very limited Seepage	1.00	Very limited Depth to saturated zone	1.00	Very limited Unstable excavation walls	1.00
259:							
Biscay-----	85	Very limited Seepage	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Very limited Unstable excavation walls	1.00
274:							
Rolfe-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Ponding	1.00 1.00	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
282:							
Ransom-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone	1.00	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
283B:							
Dickman-----	35	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
Clarion-----	25	Somewhat limited Seepage	0.70	Very limited Piping	1.00	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
308:							
Wadena-----	85	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
308B:							
Wadena-----	75	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
308C:							
Wadena-----	70	Very limited Seepage Slope	1.00 0.92	Very limited Seepage	1.00	Very limited Depth to water	1.00
327:							
Wadena-----	35	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
Augusta Lake-----	30	Very limited Seepage	1.00	Not limited		Very limited Depth to water	1.00

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
327: Clarion-----	25	Somewhat limited Seepage	0.70	Very limited Piping	1.00	Somewhat limited Depth to saturated zone	0.81
						Slow refill	0.30
						Unstable excavation walls	0.10
327B: Wadena-----	35	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
Augusta Lake-----	30	Very limited Seepage	1.00	Not limited		Very limited Depth to water	1.00
Clarion-----	20	Somewhat limited Seepage	0.70	Very limited Piping	1.00	Somewhat limited Depth to saturated zone	0.81
						Slow refill	0.30
						Unstable excavation walls	0.10
331: Madelia-----	70	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.11	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
341C2: Estherville, moderately eroded--	40	Very limited Seepage Slope	1.00 0.92	Very limited Seepage	1.00	Very limited Depth to water	1.00
Pilot Grove, moderately eroded--	30	Very limited Seepage Slope	1.00 0.92	Not limited		Very limited Depth to water	1.00
346B: Augusta Lake-----	40	Very limited Seepage	1.00	Not limited		Very limited Depth to water	1.00
Estherville-----	30	Very limited Seepage	1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
347B: Augusta Lake-----	70	Very limited Seepage	1.00	Not limited		Very limited Depth to water	1.00
347C: Augusta Lake-----	65	Very limited Seepage Slope	1.00 0.92	Not limited		Very limited Depth to water	1.00
374B: Okabena-----	70	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.05	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
374C: Okabena-----	65	Somewhat limited Slope Seepage	0.92 0.70	Very limited Depth to saturated zone Piping	1.00 0.05	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
390: Waldorf-----	50	Not limited		Very limited Depth to saturated zone Hard to pack	1.00 0.10	Very limited Slow refill Unstable excavation walls	1.00 0.10
397: Letri-----	90	Very limited Seepage	1.00	Very limited Depth to saturated zone Piping	1.00 0.04	Somewhat limited Unstable excavation walls	0.10
456: Wilmington-----	95	Somewhat limited Seepage	0.05	Very limited Depth to saturated zone	1.00	Somewhat limited Slow refill Unstable excavation walls	0.95 0.10
485: Spillville, occasionally flooded-----	80	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.77	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
507: Canisteo-----	60	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.54	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
511: Blue Earth-----	80	Somewhat limited Seepage	0.05	Very limited Organic matter content Depth to saturated zone Ponding	1.00 1.00	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
557: Talcot-----	45	Very limited Seepage	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Very limited Unstable excavation walls	1.00
Biscay-----	20	Very limited Seepage	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Very limited Unstable excavation walls	1.00

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
559: Talcot-----	95	Very limited Seepage	1.00	Very limited Depth to saturated zone Seepage	1.00 1.00	Very limited Unstable excavation walls	1.00
574C2: Bolan, moderately eroded-----	50	Very limited Seepage Slope	1.00 0.92	Somewhat limited Seepage	0.10	Very limited Depth to water	1.00
Augusta Lake, moderately eroded--	35	Very limited Seepage Slope	1.00 0.92	Not limited		Very limited Depth to water	1.00
577B: Everly-----	100	Somewhat limited Seepage Slope	0.70 0.08	Not limited		Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
577C2: Everly, moderately eroded-----	80	Somewhat limited Slope Seepage	0.92 0.70	Somewhat limited Piping	0.29	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
586B: Coland, occasionally flooded-----	65	Very limited Seepage	1.00	Very limited Depth to saturated zone Piping	1.00 0.10	Somewhat limited Unstable excavation walls	0.10
Spillville, occasionally flooded-----	20	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.77	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
634E2: Belview, moderately eroded-----	35	Very limited Slope Seepage	1.00 0.70	Somewhat limited Piping	0.90	Very limited Depth to water	1.00
Omsrud, moderately eroded-----	20	Very limited Slope Seepage	1.00 0.70	Somewhat limited Piping	0.81	Very limited Depth to water	1.00

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
634G:							
Belview-----	55	Very limited Slope Seepage	1.00 0.70	Somewhat limited Piping	0.73	Very limited Depth to water	1.00
Omsrud-----	30	Very limited Slope Seepage	1.00 0.70	Somewhat limited Piping	0.81	Very limited Depth to water	1.00
635C2:							
Belview, moderately eroded-----	70	Somewhat limited Slope Seepage	0.92 0.70	Somewhat limited Piping	0.90	Very limited Depth to water	1.00
Storden, moderately eroded-----	25	Somewhat limited Slope Seepage	0.92 0.70	Very limited Piping	1.00	Very limited Depth to water	1.00
638C2:							
Clarion, moderately eroded-----	50	Somewhat limited Slope Seepage	0.92 0.70	Somewhat limited Piping	0.99	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
Storden, moderately eroded-----	20	Somewhat limited Slope Seepage	0.92 0.70	Very limited Piping	1.00	Very limited Depth to water	1.00
655:							
Crippin-----	65	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.78	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
733:							
Calco, occasionally flooded-----	85	Somewhat limited Seepage	0.05	Very limited Depth to saturated zone Piping	1.00 0.04	Somewhat limited Slow refill Unstable excavation walls	0.95 0.10
735:							
Havelock, occasionally flooded-----	73	Very limited Seepage	1.00	Very limited Depth to saturated zone Piping	1.00 0.03	Somewhat limited Unstable excavation walls	0.10
740D:							
Hawick-----	80	Very limited Seepage Slope	1.00 1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
740F: Hawick-----	90	Very limited Seepage Slope	1.00 1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
740G: Hawick-----	85	Very limited Seepage Slope	1.00 1.00	Very limited Seepage	1.00	Very limited Depth to water	1.00
835D2: Omsrud, moderately eroded-----	50	Very limited Slope Seepage	1.00 0.70	Somewhat limited Piping	0.81	Very limited Depth to water	1.00
Storden, moderately eroded-----	25	Very limited Slope Seepage	1.00 0.70	Very limited Piping	1.00	Very limited Depth to water	1.00
854D: Histosols, fens----	100	Very limited Slope Seepage	1.00 1.00	Very limited Depth to saturated zone Seepage Hard to pack	1.00 1.00 1.00	Somewhat limited Unstable excavation walls	0.50
875B: Roine-----	88	Very limited Seepage Slope	1.00 0.08	Very limited Piping	1.00	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
878: Ocheyedan-----	95	Very limited Seepage	1.00	Very limited Piping	1.00	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
878B: Ocheyedan-----	85	Very limited Seepage	1.00	Very limited Piping	1.00	Somewhat limited Depth to saturated zone Slow refill Unstable excavation walls	0.81 0.30 0.10
879: Fostoria-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 0.42	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10

Soil Survey of Dickinson County, Iowa—Part II

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees		Aquifer-fed excavated ponds		
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1032: Spicer-----	95	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 1.00 0.06	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
1091: McCreath-----	90	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 1.00 0.14	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
1091B: McCreath-----	95	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 1.00 0.14	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
1092: Gillett Grove-----	85	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone	1.00	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
1511: Blue Earth, ponded--	90	Somewhat limited Seepage	0.05	Very limited Ponding Depth to saturated zone Piping	1.00 1.00 1.00	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
1707B: Delft-----	55	Somewhat limited Seepage	0.70	Very limited Depth to saturated zone Piping	1.00 1.00 0.77	Somewhat limited Slow refill Unstable excavation walls	0.30 0.10
Terril-----	20	Somewhat limited Seepage	0.70	Somewhat limited Piping	0.49	Somewhat limited Slow refill Depth to saturated zone Unstable excavation walls	0.30 0.81 0.10
2700C: Ridgeton-----	75	Somewhat limited Slope Seepage	0.92 0.70	Somewhat limited Piping	0.29	Very limited Depth to water	1.00
4946B: Udorthents, loamy---	65	Not rated		Not rated		Not rated	
Highway-----	30	Not rated		Not rated		Not rated	
5010: Pits, sand and gravel-----	100	Not rated		Not rated		Not rated	

# Soil Survey of Dickinson County, Iowa—Part II

## Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds			
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
5040: Udorthents, loamy---	100	Not rated		Not rated		Not rated	
AW: Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL: Sewage lagoon-----	100	Not rated		Not rated		Not rated	
W: Water-----	100	Not rated		Not rated		Not rated	



# Soil Properties

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Data relating to soil properties are collected during the course of the soil survey.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

## Engineering Properties

The table described in this section gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

*Depth* to the upper and lower boundaries of each layer is indicated.

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary in Part I.

*Classification* of the soils is determined according to the Unified soil classification system (ASTM) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

## Soil Survey of Dickinson County, Iowa—Part II

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

*Rock fragments* larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit and plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

### *References:*

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487–00.

Engineering Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
6:	In											
Okoboji-----	0-6	Silty clay loam	OH	A-7-6	0	0	100	100	95-100	91-96	64-76	24-28
	6-32	Silty clay loam	MH	A-7-5	0	0	100	100	95-100	91-96	51-69	25-28
	32-56	Silty clay loam, silty clay	CH	A-7-6	0	0	100	100	95-100	90-97	46-59	25-30
	56-79	Silty clay loam, loam	CL	A-6	0	0-4	95-100	84-100	79-100	70-93	35-46	17-25
27B:												
Terril-----	0-9	Loam	CL	A-6	0	0-5	94-100	89-100	75-97	55-74	33-47	11-21
	9-36	Loam, clay loam	CL	A-6	0	0-5	94-100	89-100	75-99	55-76	29-47	12-22
	36-50	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	84-100	74-94	56-73	35-42	16-21
	50-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
28B:												
Dickman-----	0-10	Fine sandy loam	SC-SM, SC, SM	A-4, A-2	0	0	94-100	89-100	77-99	31-47	20-34	3-12
	10-12	Fine sandy loam	SC-SM, SC, SM	A-4, A-2	0	0	94-100	89-100	77-99	31-47	19-33	3-12
	12-19	Sandy loam	SC, SC-SM, SM	A-2, A-4	0	0	94-100	89-100	63-82	28-44	18-31	3-12
	19-33	Loamy sand	SC, SC-SM, SM	A-2, A-4	0	0	95-100	81-100	61-84	13-36	18-28	3-9
	33-80	Sand, coarse sand	SP-SM	A-2, A-3	0	0	88-100	76-100	57-79	5-11	0-19	NP-2
32:												
Spicer-----	0-12	Silty clay loam	MH	A-7-5, A-7	0	0	100	100	95-100	90-100	50-58	20-24
	12-16	Silty clay loam, silt loam	ML	A-7-6, A-7	0	0	100	100	95-100	85-100	35-55	12-24
	16-40	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	85-100	30-49	12-25
	40-60	Silt loam, loam	CL	A-6, A-7	0-5	0-10	90-100	85-97	75-95	50-75	28-45	12-22
34:												
Estherville----	0-7	Sandy loam	SC, SC-SM, SM	A-4, A-2	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	7-18	Sandy loam, loam, coarse sandy loam	SC, SC-SM, SM	A-2, A-4, A-1	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-80	Gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-7	66-92	35-92	16-48	3-13	0-21	NP-4

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
34B: Estherville-----	In											
	0-7	Sandy loam	SC, SC-SM, SM	A-4, A-2	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	7-18	Sandy loam, loam, coarse sandy loam	SC, SC-SM, SM	A-2, A-4, A-1	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-80	Gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-7	66-92	35-92	16-48	3-13	0-21	NP-4
34C2: Estherville, moderately eroded-----	0-6	Sandy loam	SC, SC-SM, SM	A-4, A-2	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	6-18	Loamy sand, sandy loam, coarse sandy loam	SC, SC-SM, SM	A-2, A-4, A-1	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-24	Sand, gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-10	55-90	50-85	10-40	2-25	0-21	NP
	24-29	Gravelly sand, Gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-10	55-90	50-85	10-40	2-25	0-21	NP
	29-80	Gravelly sand, Gravelly coarse sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-10	55-90	50-85	10-40	2-25	0-21	NP
55: Nicollet-----	0-10	Loam, clay loam	ML	A-7-6	0	0-5	94-100	82-100	68-93	50-70	39-49	11-18
	10-17	Clay loam, loam	CL	A-7-6	0	0-5	94-100	82-100	68-93	52-73	36-50	13-21
	17-36	Clay loam, loam	CL	A-6	0	0-5	94-100	83-100	66-93	50-73	27-44	11-21
	36-60	Loam, sandy loam	CL, SC, SC-SM, CL-ML	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
77B: Sac-----	0-6	Silty clay loam	ML, MH, CL, CH	A-7	0	0	100	100	95-100	90-100	46-58	21-27
	6-16	Silty clay loam	ML, MH, CL, CH	A-7	0	0	100	100	95-100	90-100	46-58	22-28
	16-32	Silty clay loam, clay loam	CL	A-7	0	0	100	100	95-100	90-100	41-49	21-25
	32-38	Silt loam	CL, CL-ML,	A-6	0	2-5	95-100	90-100	75-90	65-80	25-40	5-20
	38-55	Clay loam	CL, CL-ML,	A-6	0	2-5	95-100	90-100	75-90	65-80	25-40	5-20
	55-80	Clay loam	CL, CL-ML,	A-6	0	2-5	95-100	90-100	75-90	65-80	25-40	5-20

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index	
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200			
			In				Pct	Pct					Pct
95:													
Harps-----	0-8	Loam	ML	A-7, A-6	0	0-5	95-100	95-100	80-90	65-80	30-45	10-25	
	8-16	Loam	ML	A-7, A-6	0	0-5	95-100	95-100	80-90	65-80	30-45	10-25	
	16-63	Loam	CL	A-7, A-6	0	0-5	95-100	95-100	80-90	65-80	30-60	15-35	
	63-79	Loam	CL	A-6	0	0-5	95-100	90-100	70-80	50-75	25-40	10-25	
107:													
Webster-----	0-8	Silty clay loam	MH, CL, CH	A-7, A-6	0	0-5	94-100	89-100	85-100	76-94	35-60	15-30	
	8-16	Silty clay loam	MH, CL, CH	A-7-6, A-6, A-7	0	0-5	94-100	89-100	85-100	76-94	35-60	15-30	
	16-32	Clay loam, loam	CL	A-7-6, A-6, A-7	0	0-5	95-100	89-100	77-96	60-77	39-51	17-25	
	32-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15	
135:													
Coland, occasionally flooded-----	0-8	Clay loam, silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	95-100	84-92	47-59	18-24	
	8-32	Silty clay loam, clay loam	CL	A-7-6, A-6, A-7	0	0	100	100	95-100	84-92	35-50	15-25	
	32-40	Clay loam	MH, ML	A-7-5, A-7	0	0	100	100	91-94	76-79	45-53	18-21	
	40-44	Loam	SC, SC-SM	A-4, A-2-6, A-2-4	0	0	95-100	87-100	65-85	35-50	23-36	7-15	
	44-52	Loam	CL	A-6	0	0	100	95-100	79-97	59-75	25-41	9-19	
	52-79	Sandy loam, loam	SC, SC-SM	A-4, A-2-6, A-2-4	0	0	95-100	87-100	65-85	35-50	23-36	7-15	
138B:													
Clarion-----	0-7	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15	
	7-18	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15	
	18-36	Loam, clay loam	CL, CL-ML,	A-6, A-4	0	0-4	91-100	78-100	69-94	52-73	25-40	5-15	
	36-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15	
138C:													
Clarion-----	0-7	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15	
	7-18	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15	
	18-36	Loam, clay loam	CL, CL-ML,	A-6, A-4	0	0-4	91-100	78-100	69-94	52-73	25-40	5-15	
	36-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15	

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
175B: Dickinson-----	In											
	0-9	Fine sandy loam	SC, SC-SM, SM	A-4, A-2	0	0	100	100	85-95	30-50	15-30	NP-10
	9-18	Fine sandy loam, sandy loam	SC, SC-SM, SM	A-4	0	0	100	100	85-95	35-50	15-30	NP-10
	18-30	Fine sandy loam, sandy loam	SC, SC-SM, SM	A-4	0	0	100	100	85-95	35-50	15-30	NP-10
	30-36	Loamy sand, loamy fine sand, fine sand	SM, SC-SM	A-2, A-3	0	0	100	100	80-95	5-20	10-20	NP-5
	36-60	Sand, loamy fine sand	SM	A-2, A-3	0	0	100	100	70-90	5-20	0-14	NP
175C2: Dickinson, moderately eroded-----												
	0-6	Fine sandy loam	SC, SC-SM, SM	A-4, A-2	0	0	100	100	89-97	30-50	15-30	NP-10
	6-32	Fine sandy loam, sandy loam	SC, SC-SM, SM	A-4	0	0	100	100	90-95	40-45	15-30	NP-10
	32-54	Loamy fine sand, loamy sand, fine sand	SM, SC-SM	A-2, A-3	0	0	100	100	93-99	10-22	15-23	NP-5
	54-80	Fine sand, sand, loamy fine sand	SM	A-2, A-3	0	0	100	100	91-97	10-21	15-23	NP-6
199: Cylinder-----												
	0-8	Loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	8-18	Loam, clay loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	18-28	Clay loam, loam	CL, SC	A-6	0	0	95-100	80-100	80-95	45-70	30-40	10-20
	28-80	Very gravelly loamy sand, coarse sand, loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0-10	65-95	65-95	20-55	5-25	0-14	NP
Nicollet-----												
	0-10	Loam, clay loam	ML	A-7-6	0	0-5	94-100	82-100	68-93	50-70	39-49	11-18
	10-17	Clay loam, loam	CL	A-7-6	0	0-5	94-100	82-100	68-93	52-73	36-50	13-21
	17-36	Clay loam, loam	CL	A-6	0	0-5	94-100	83-100	66-93	50-73	27-44	11-21
	36-60	Loam, sandy loam	CL, SC, SC-SM, CL-ML	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
200: Cylinder-----												
	0-8	Loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	8-18	Loam, clay loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	18-28	Clay loam, loam	CL, SC	A-6	0	0	95-100	80-100	80-95	45-70	30-40	10-20
	28-80	Very gravelly loamy sand, coarse sand, loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0-10	65-95	65-95	20-55	5-25	0-14	NP

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
200: Cylinder, calcareous-----	In											
	0-8	Loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	8-23	Loam, clay loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	23-38	Clay loam, loam	CL, SC	A-6	0	0	95-100	80-100	80-95	45-70	30-40	10-20
	38-68	Sand, coarse sand, very gravelly loamy sand, loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0-10	65-95	65-95	20-55	5-25	0-14	NP
	68-80	Coarse sand, very gravelly loamy sand, loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0-10	65-95	65-95	20-55	5-25	0-14	NP
259: Biscay-----	0-7	Clay loam, loam	MH, ML, CL	A-7, A-6	0	0	94-100	88-100	77-93	60-73	35-50	10-25
	7-20	Loam, clay loam	ML, CL	A-7-6, A-7, A-6	0	0	94-100	88-100	79-94	60-73	37-53	17-21
	20-28	Loam, clay loam, sandy clay loam	CL	A-6, A-7	0	0	94-100	83-100	70-96	51-73	30-43	12-21
	28-36	Gravelly loam, sandy loam, gravelly sandy loam	SC, SC-SM	A-6, A-4	0	0-4	95-100	64-100	51-98	35-73	20-38	6-19
	36-80	Very gravelly coarse sand	SW-SM, SP-SM, SP	A-1-b	0	0-3	63-95	23-95	10-47	2-15	0-20	NP-3
274: Rolfe-----	0-10	Silty clay loam	ML, CL, OL	A-4, A-6	0	0	100	94-100	88-98	75-84	30-40	5-15
	10-21	Silt loam	CL, ML, OL	A-6, A-4	0	0	100	94-100	84-100	71-92	30-40	5-15
	21-55	Silty clay, clay, clay loam	CH	A-7-6	0	0	100	95-100	90-100	86-98	49-57	27-33
	55-80	Clay loam, loam	CL	A-6, A-7	0	0	95-100	86-100	73-97	57-78	34-46	16-25
282: Ransom-----	0-8	Silty clay loam	ML	A-7	0	0	100	100	94-100	91-100	45-60	18-27
	8-16	Silty clay loam	CL	A-7	0	0	100	100	94-100	91-100	41-54	19-27
	16-33	Silty clay loam	CL	A-7	0	0	94-100	83-100	76-100	73-100	35-50	16-27
	33-80	Loam, clay loam	CL	A-6	0	0-5	95-100	81-100	74-100	59-85	27-40	12-21

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In											
283B:												
Dickman-----	0-10	Fine sandy loam	SC-SM, SM, SC	A-4, A-2	0	0	94-100	89-100	77-99	31-47	20-34	3-12
	10-12	Fine sandy loam	SC-SM, SC, SM	A-4, A-2	0	0	94-100	89-100	77-99	31-47	19-33	3-12
	12-19	Sandy loam	SC, SC-SM, SM	A-2, A-4	0	0	94-100	89-100	63-82	28-44	18-31	3-12
	19-33	Loamy sand	SC, SC-SM, SM	A-2, A-4	0	0	95-100	81-100	61-84	13-36	18-28	3-9
	33-80	Sand, coarse sand	SP-SM	A-2, A-3	0	0	88-100	76-100	57-79	5-11	0-19	NP-2
Clarion-----	0-7	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	7-18	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	18-36	Loam, clay loam	CL, CL-ML,	A-6, A-4	0	0-4	91-100	78-100	69-94	52-73	25-40	5-15
	36-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
308:												
Wadena-----	0-8	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	33-45	11-18
	8-13	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	31-43	11-18
	13-30	Loam	CL, SC	A-6	0	0	95-100	77-100	64-93	47-70	29-41	12-19
	30-80	Stratified very gravelly coarse sand to sand	SP-SM, SP	A-1-b	0-2	0-3	63-100	19-100	15-80	2-14	0-19	NP-2
308B:												
Wadena-----	0-8	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	33-45	11-18
	8-13	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	31-43	11-18
	13-30	Loam	CL, SC	A-6	0	0	95-100	77-100	64-93	47-70	29-41	12-19
	30-80	Stratified very gravelly coarse sand to sand	SP-SM, SP	A-1-b	0-2	0-3	63-100	19-100	15-80	2-14	0-19	NP-2
308C:												
Wadena-----	0-8	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	33-45	11-18
	8-13	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	31-43	11-18
	13-30	Loam	CL, SC	A-6	0	0	95-100	77-100	64-93	47-70	29-41	12-19
	30-80	Stratified very gravelly coarse sand to sand	SP-SM, SP	A-1-b	0-2	0-3	63-100	19-100	15-80	2-14	0-19	NP-2

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
327:												
Wadena-----	0-8	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	33-45	11-18
	8-13	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	31-43	11-18
	13-30	Loam	CL, SC	A-6	0	0	95-100	77-100	64-93	47-70	29-41	12-19
	30-80	Stratified very gravelly coarse sand to sand	SP-SM, SP	A-1-b	0-2	0-3	63-100	19-100	15-80	2-14	0-19	NP-2
Augusta Lake----	0-10	Loam, sandy loam, fine sandy loam	SC-SM, SC	A-4, A-2	0	0	100	100	85-95	30-50	21-32	6-12
	10-15	Fine sandy loam, sandy loam			0	0	100	100	90-95	40-45	22-27	6-9
	15-28	Fine sandy loam, sandy loam	SC-SM, SC	A-4	0	0	100	100	90-95	40-45	20-27	6-10
	28-46	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	92-98	31-37	15-23	1-6
	46-80	Loam, silt loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
Clarion-----	0-7	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	7-18	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	18-36	Loam, clay loam	CL, CL-ML,	A-6, A-4	0	0-4	91-100	78-100	69-94	52-73	25-40	5-15
	36-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
327B:												
Wadena-----	0-8	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	33-45	11-18
	8-13	Loam	CL	A-6	0	0	95-100	84-100	72-94	53-71	31-43	11-18
	13-30	Loam	CL, SC	A-6	0	0	95-100	77-100	64-93	47-70	29-41	12-19
	30-80	Stratified very gravelly coarse sand to sand	SP-SM, SP	A-1-b	0-2	0-3	63-100	19-100	15-80	2-14	0-19	NP-2
Augusta Lake----	0-10	Loam, sandy loam, fine sandy loam	SC-SM, SC	A-4, A-2	0	0	100	100	85-95	30-50	21-32	6-12
	10-15	Fine sandy loam, sandy loam			0	0	100	100	90-95	40-45	22-27	6-9
	15-28	Fine sandy loam, sandy loam	SC-SM, SC	A-4	0	0	100	100	90-95	40-45	20-27	6-10
	28-46	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	92-98	31-37	15-23	1-6
	46-80	Loam, silt loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
327B:	In											
Clarion-----	0-7	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	7-18	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	18-36	Loam, clay loam	CL, CL-ML,	A-6, A-4	0	0-4	91-100	78-100	69-94	52-73	25-40	5-15
	36-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
331:												
Madelia-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	91-99	40-59	18-24
	9-19	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	91-99	40-59	18-24
	19-37	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	100	90-100	30-50	10-25
	37-60	Silt loam, silty clay loam	CL, ML	A-6, A-7, A-4	0	0	100	100	100	90-100	30-50	5-25
341C2:												
Estherville, moderately eroded-----	0-6	Sandy loam	SC, SC-SM, SM	A-4, A-2	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	6-18	Loamy sand, sandy loam, loam, coarse sandy loam	SC, SC-SM, SM	A-2, A-4, A-1	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-24	Sand, gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-10	55-90	50-85	10-40	2-25	0-21	NP
	24-29	Gravelly sand, gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-10	55-90	50-85	10-40	2-25	0-21	NP
	29-80	Gravelly sand, gravelly coarse sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-10	55-90	50-85	10-40	2-25	0-21	NP

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
341C2: Pilot Grove, moderately eroded-----	In											
	0-6	Sandy loam	SC-SM, SC, SM	A-4, A-2	0	0-5	90-100	80-100	50-75	25-50	18-31	2-10
	6-18	Sandy loam, loam, coarse sandy loam	SC-SM, SC	A-4, A-2, A-1	0	0-5	85-100	80-95	40-75	15-45	20-30	6-12
	18-28	Sand, loamy sand, coarse sand, loamy coarse sand	SM, SP, SP-SM	A-1	0-5	0-15	55-90	50-90	10-40	2-25	0-21	NP-4
	28-34	Sand, coarse sand, gravelly coarse sand, loamy coarse sand	SP, SM, SP-SM, GP	A-1	0-5	0-15	55-90	50-90	10-40	2-25	0-21	NP-4
	34-52	Sand, coarse sand, gravelly coarse sand, loamy coarse sand	SP, SM, SP-SM, GP	A-1	0-5	0-15	55-90	50-90	10-40	2-25	0-21	NP-4
	52-80	Loam, silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	100	90-100	16-41	2-21
346B: Augusta Lake----	0-10	Loam, sandy loam, fine sandy loam	SC-SM, SC	A-4, A-2	0	0	100	100	85-95	30-50	21-32	6-12
	10-15	Fine sandy loam, sandy loam			0	0	100	100	90-95	40-45	22-27	6-9
	15-28	Fine sandy loam, sandy loam	SC-SM, SC	A-4	0	0	100	100	90-95	40-45	20-27	6-10
	28-46	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	92-98	31-37	15-23	1-6
	46-80	Loam, silt loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
Estherville-----	0-7	Sandy loam	SC, SC-SM, SM	A-4, A-2	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	7-18	Sandy loam, loam, coarse sandy loam	SC, SC-SM, SM	A-2, A-4, A-1	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-80	Gravelly coarse sand, very gravelly sand, loamy coarse sand	SP-SM, GP, SM, SP	A-1	0	0-7	66-92	35-92	16-48	3-13	0-21	NP-4

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
347B: Augusta Lake----	In											
	0-10	Loam, sandy loam, fine sandy loam	SC-SM, SC	A-4, A-2	0	0	100	100	85-95	30-50	21-32	6-12
	10-15	Fine sandy loam, sandy loam			0	0	100	100	90-95	40-45	22-27	6-9
	15-28	Fine sandy loam, sandy loam	SC-SM, SC	A-4	0	0	100	100	90-95	40-45	20-27	6-10
	28-46	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	92-98	31-37	15-23	1-6
	46-80	Loam, silt loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
347C: Augusta Lake----	0-10	Loam, sandy loam, fine sandy loam	SC-SM, SC	A-4, A-2	0	0	100	100	85-95	30-50	21-32	6-12
	10-15	Fine sandy loam, sandy loam			0	0	100	100	90-95	40-45	22-27	6-9
	15-28	Fine sandy loam, sandy loam	SC-SM, SC	A-4	0	0	100	100	90-95	40-45	20-27	6-10
	28-46	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	92-98	31-37	15-23	1-6
	46-80	Loam, silt loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
374B: Okabena-----	0-10	Silty clay loam	ML, MH	A-7	0	0	100	100	96-100	92-97	43-57	18-22
	10-15	Silty clay loam	ML, MH	A-7	0	0	100	100	96-100	92-97	42-56	18-22
	15-22	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	89-100	84-98	29-47	12-22
	22-43	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	91-100	86-100	31-49	12-25
	43-48	Silt loam, silty clay loam	CL	A-6	0	0	100	100	93-100	88-100	27-42	12-22
	48-80	Loam, clay loam	CL	A-6	0	0-4	90-100	75-100	71-100	59-89	30-42	15-22
374C: Okabena-----	0-10	Silty clay loam	ML, MH	A-7	0	0	100	100	96-100	92-97	43-57	18-22
	10-15	Silty clay loam	ML, MH	A-7	0	0	100	100	96-100	92-97	42-56	18-22
	15-22	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	89-100	84-98	29-47	12-22
	22-43	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	91-100	86-100	31-49	12-25
	43-48	Silt loam, silty clay loam	CL	A-6	0	0	100	100	93-100	88-100	27-42	12-22
	48-80	Loam, clay loam	CL	A-6	0	0-4	90-100	75-100	71-100	59-89	30-42	15-22

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
390:	In											
Waldorf-----	0-9	Silty clay loam	CH	A-7	0	0	100	100	95-100	90-100	45-65	20-35
	9-20	Silty clay loam	CH	A-7	0	0	100	100	95-100	90-100	45-65	20-35
	20-45	Silty clay	CH	A-7	0	0	100	100	95-100	95-100	50-70	25-40
	45-80	Silty clay	CH, MH	A-7, A-6	0	0	100	100	95-100	90-100	35-65	11-30
397:												
Letri-----	0-9	Silty clay loam, clay loam	CL	A-7	0	0	94-100	88-100	84-100	74-92	45-62	18-24
	9-20	Clay loam	CL	A-7	0	0	94-100	88-100	77-95	59-75	41-53	19-25
	20-41	Clay loam	CL	A-7	0	0	94-100	83-100	75-100	58-87	31-49	12-25
	41-80	Clay loam, silty clay loam	ML, CL	A-6	0	0-4	95-100	81-100	68-95	52-75	30-50	7-25
456:												
Wilmington-----	0-8	Silty clay loam	CL	A-6	0	0	100	88-100	84-100	74-92	40-60	18-24
	8-17	Silty clay loam	CL	A-6	0	0	100	88-100	84-100	74-92	40-55	18-25
	17-25	Clay loam	CL	A-6	0	0-5	95-100	79-100	69-95	54-75	36-49	17-23
	25-55	Clay loam	CL	A-6	0	0-4	95-100	81-100	70-96	53-76	33-45	15-23
	55-80	Clay loam	CL	A-6	0	0-4	95-100	81-100	70-96	53-76	33-45	15-23
485:												
Spillville, occasionally flooded-----	0-8	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	8-54	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	54-79	Loam, sandy clay loam, sandy loam	CL, CL-ML, SC-SM, SC	A-6, A-4	0	0	100	95-100	80-90	35-75	20-40	5-15
507:												
Canistee-----	0-10	Silty clay loam, clay loam	MH, OL, ML	A-7-5	0	0	94-100	88-100	77-95	59-75	47-59	18-24
	10-18	Clay loam	CL, OL, ML	A-7	0	0	94-100	88-100	77-95	59-75	40-50	15-20
	18-39	Loam, clay loam, silty clay loam	CL	A-7-6, A-6	0	0	98-100	88-100	75-100	57-80	35-53	13-25
	39-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
511:												
Blue Earth-----	0-10	Mucky silt loam	OH	A-7-5	0	0	87-100	75-100	69-100	66-100	50-95	11-21
	10-68	Mucky silty clay loam, Mucky silt loam	OH	A-7-5	0	0	90-100	54-100	48-100	45-99	49-93	11-20
	68-80	Mucky silty clay loam, Mucky silt loam	CL	A-6, A-7	0	0	95-100	85-100	75-100	71-98	29-44	12-23

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
557:	In											
Talcot-----	0-10	Silty clay loam, clay loam	MH	A-7-5, A-7	0	0	100	100	97-100	87-94	48-60	19-24
	10-26	Silty clay loam, clay loam	CL	A-7-6, A-7	0	0	100	100	96-100	85-90	43-53	21-25
	26-30	Clay loam, silty clay loam	CL	A-7-6, A-7	0	0	95-100	78-100	65-94	50-74	37-49	17-25
	30-60	Gravelly sand, loamy coarse sand	SP-SM	A-1-b	0	0	74-90	44-90	33-72	3-10	0-21	NP-3
Biscay-----	0-7	Clay loam, loam	MH, ML, CL	A-7, A-6	0	0	94-100	88-100	77-93	60-73	35-50	10-25
	7-20	Loam, clay loam	ML, CL	A-7-6, A-7, A-6	0	0	94-100	88-100	79-94	60-73	37-53	17-21
	20-28	Loam, clay loam, sandy clay loam	CL	A-6, A-7	0	0	94-100	83-100	70-96	51-73	30-43	12-21
	28-36	Gravelly loam, sandy loam, gravelly sandy loam	SC, SC-SM	A-6, A-4	0	0-4	95-100	64-100	51-98	35-73	20-38	6-19
	36-80	Very gravelly coarse sand	SW-SM, SP-SM, SP	A-1-b	0	0-3	63-95	23-95	10-47	2-15	0-20	NP-3
559:												
Talcot-----	0-10	Silty clay loam, clay loam	MH	A-7-5, A-7	0	0	100	100	97-100	87-94	48-60	19-24
	10-26	Silty clay loam, clay loam	CL	A-7-6, A-7	0	0	100	100	96-100	85-90	43-53	21-25
	26-30	Clay loam, silty clay loam	CL	A-7-6, A-7	0	0	95-100	78-100	65-94	50-74	37-49	17-25
	30-60	Gravelly sand, loamy coarse sand	SP-SM	A-1-b	0	0	74-90	44-90	33-72	3-10	0-21	NP-3
574C2:												
Bolan, moderately eroded-----	0-7	Loam	ML, CL	A-4, A-6	0	0	100	100	85-95	50-70	30-40	5-15
	7-20	Fine sandy loam, loam	SC, CL-ML, CL, SC-SM	A-4, A-6	0	0	100	100	80-90	40-55	25-35	5-15
	20-35	Fine sandy loam	SC, SM, SC-SM	A-4	0	0	100	100	80-90	35-50	15-25	2-8
	35-80	Fine sand, loamy fine sand	SM, SP-SM	A-2	0	0	100	100	70-85	10-30	0-14	NP

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In											
574C2: Augusta Lake, moderately eroded-----	0-6	Loam, sandy loam, fine sandy loam	SC-SM, SC	A-4, A-2	0	0	100	100	85-95	30-50	21-32	6-12
	6-25	Sandy loam, fine sandy loam	SC-SM, SC	A-4	0	0	100	100	85-95	35-50	20-27	6-10
	25-48	Sandy loam, loamy fine sand, loamy sand	SM	A-2	0	0	100	100	70-90	5-20	15-23	1-6
	48-80	Loam, silt loam	CL	A-6	0-1	0-2	95-100	90-98	75-90	50-75	29-39	12-18
577B: Everly-----	0-8	Clay loam	CL	A-6	0	0	100	95-100	85-93	66-73	40-49	18-21
	8-12	Clay loam	CL	A-6	0	0	100	95-100	85-93	66-73	40-49	19-21
	12-26	Clay loam, loam	CL	A-7	0	0	95-100	90-100	78-96	60-77	37-49	17-25
	26-50	Loam, clay loam	CL	A-6	0	0-4	91-100	77-100	65-94	48-73	32-44	15-23
	50-80	Clay loam, loam	CL	A-6	0	0-4	91-100	77-100	65-94	48-73	32-44	15-23
577C2: Everly, moderately eroded-----	0-7	Clay loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	7-26	Clay loam	CL	A-7	0	0	95-100	95-100	85-95	70-90	35-50	15-25
	26-80	Loam, clay loam	CL	A-6	0	0-5	90-100	85-95	75-85	60-80	30-40	10-20
586B: Coland, occasionally flooded-----	0-8	Clay loam, silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	95-100	84-92	47-59	18-24
	8-32	Silty clay loam, clay loam	CL	A-7-6, A-6, A-7	0	0	100	100	95-100	84-92	35-50	15-25
	32-40	Clay loam	MH, ML	A-7-5, A-7	0	0	100	100	91-94	76-79	45-53	18-21
	40-44	Loam	SC, SC-SM	A-4, A-2-6, A-2-4	0	0	95-100	87-100	65-85	35-50	23-36	7-15
	44-52	Loam	CL	A-6	0	0	100	95-100	79-97	59-75	25-41	9-19
	52-60	Sandy loam, loam	SC, SC-SM	A-4, A-2-6, A-2-4	0	0	95-100	87-100	65-85	35-50	23-36	7-15
Spillville, occasionally flooded-----	0-8	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	8-54	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	54-79	Loam, sandy clay loam, sandy loam	CL, CL-ML, SC-SM, SC	A-6, A-4	0	0	100	95-100	80-90	35-75	20-40	5-15

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
634E2: Belview, moderately eroded-----	In											
	0-6	Loam	CL, ML	A-6	0	0-5	94-100	89-100	76-94	56-71	31-44	11-18
	6-32	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
	32-79	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
Omsrud, moderately eroded-----												
	0-6	Loam	CL	A-6	0	0-5	95-100	84-100	73-93	54-70	33-42	13-18
	6-20	Clay loam, loam	CL	A-6	0	0-4	90-100	75-100	63-93	48-72	32-43	15-21
	20-30	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
	30-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
634G: Belview-----												
	0-9	Loam	CL, ML	A-6	0	0-5	94-100	89-100	76-94	56-71	33-47	11-18
	9-50	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
	50-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
Omsrud-----												
	0-9	Loam	CL	A-6	0	0-5	95-100	84-100	73-93	54-70	33-44	13-18
	9-18	Clay loam, loam	CL	A-6	0	0-4	90-100	75-100	63-93	48-72	32-43	15-21
	18-36	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
	36-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
635C2: Belview, moderately eroded-----												
	0-6	Loam	CL, ML	A-6	0	0-5	94-100	89-100	76-94	56-71	31-44	11-18
	6-32	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
	32-79	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
Storden, moderately eroded-----												
	0-6	Loam	CL, ML	A-6, A-4	0	0-5	94-100	89-100	76-94	56-71	30-40	5-15
	6-44	Loam, clay loam	CL, CL-ML,	A-6, A-4	0-1	0-4	95-100	81-100	68-96	50-73	20-40	5-15
	44-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				Pct	Pct				
638C2: Clarion, moderately eroded-----	0-6	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	6-16	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	16-28	Loam	CL, CL-ML,	A-6, A-4	0	0-5	95-100	89-100	77-92	55-68	25-40	5-15
	28-80	Loam, sandy loam	CL, SC-SM, SC, CL-ML	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
Storden, moderately eroded-----	0-6	Loam	CL, ML	A-6, A-4	0	0-5	94-100	89-100	76-94	56-71	30-40	5-15
	6-44	Loam, clay loam	CL, CL-ML,	A-6, A-4	0-1	0-4	95-100	81-100	68-96	50-73	20-40	5-15
	44-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
655: Crippin-----	0-7	Loam	CL	A-6, A-7	0	0	95-100	95-100	80-90	60-80	30-45	10-20
	7-20	Loam	CL	A-6, A-7	0	0	95-100	95-100	80-90	60-80	30-45	10-20
	20-35	Loam	CL	A-6	0	0-5	95-100	90-100	80-90	60-80	30-40	10-20
	35-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
733: Calco, occasionally flooded-----	0-8	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	8-28	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	28-38	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	38-80	Silty clay loam, silt loam	CL	A-6	0	0	100	100	90-100	80-100	30-45	10-20
735: Havelock, occasionally flooded-----	0-9	Loam, clay loam	MH	A-7-5	0	0	100	100	87-95	67-75	49-61	19-25
	9-40	Clay loam	CL	A-7-6	0	0	100	100	87-95	67-75	40-55	19-25
	40-60	Sandy loam, loam	SC	A-6	0	0	100	90-100	63-86	29-48	22-38	7-19

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
740D: Hawick-----	In											
	0-7	Gravelly sandy loam, gravelly loamy sand	SM, SP-SM	A-2, A-3, A-1	0-2	0-5	75-95	60-95	35-70	5-35	0-14	NP-4
	7-11	Gravelly coarse sand, gravelly loamy sand, loamy sand	SP-SM	A-2, A-1, A-3	0-2	0-5	75-95	60-95	35-70	5-25	0-14	NP
	11-80	Gravelly coarse sand	SP, SP-SM	A-3, A-1, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
740F: Hawick-----												
	0-7	Gravelly sandy loam, gravelly loamy sand	SM, SP-SM	A-2, A-3, A-1	0-2	0-5	75-95	60-95	35-70	5-35	0-14	NP-4
	7-11	Gravelly coarse sand, gravelly loamy sand, loamy sand	SP-SM	A-2, A-1, A-3	0-2	0-5	75-95	60-95	35-70	5-25	0-14	NP
	11-80	Gravelly coarse sand	SP, SP-SM	A-3, A-1, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
740G: Hawick-----												
	0-7	Gravelly sandy loam, gravelly loamy sand	SM, SP-SM	A-2, A-3, A-1	0-2	0-5	75-95	60-95	35-70	5-35	0-14	NP-4
	7-11	Gravelly coarse sand, gravelly loamy sand, loamy sand	SP-SM	A-2, A-1, A-3	0-2	0-5	75-95	60-95	35-70	5-25	0-14	NP
	11-80	Gravelly coarse sand	SP, SP-SM	A-3, A-1, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
835D2: Omsrud, moderately eroded-----												
	0-6	Loam	CL	A-6	0	0-5	95-100	84-100	73-93	54-70	33-42	13-18
	6-20	Clay loam, loam	CL	A-6	0	0-4	90-100	75-100	63-93	48-72	32-43	15-21
	20-30	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	29-39	12-18
	30-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
Storden, moderately eroded-----												
	0-6	Loam	CL, ML	A-6, A-4	0	0-5	94-100	89-100	76-94	56-71	30-40	5-15
	6-44	Loam, clay loam	CL, CL-ML,	A-6, A-4	0-1	0-4	95-100	81-100	68-96	50-73	20-40	5-15
	44-80	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In											
854D:												
Histosols, fens	0-35	Muck	PT	A-8	0	0	100	100	100	95-100	0-0	NP
	35-80	Clay loam	CL, CL-ML,	A-6, A-4	0	0	100	100	95-100	84-92	19-57	3-29
875B:												
Roine-----	0-8	Fine sandy loam, loam, sandy loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	8-48	Fine sandy loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	48-52	Loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
	52-59	Silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
	59-80	Clay loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
878:												
Ocheyedan-----	0-7	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	7-14	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	14-34	Fine sandy loam, loam, sandy clay loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	34-65	Silt loam, clay loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
	65-80	Clay loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
878B:												
Ocheyedan-----	0-7	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	7-14	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	14-34	Fine sandy loam, loam, sandy clay loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	34-65	Silt loam, clay loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
	65-80	Clay loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
879:												
Fostoria-----	0-7	Loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	7-19	Clay loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	19-34	Clay loam, loam	CL	A-7	0	0	95-100	95-100	85-95	70-90	35-50	15-25
	34-68	Clay loam, loam	CL	A-6	0	0-5	90-100	85-95	75-85	60-80	30-40	10-20
	68-79	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
1032:												
Spicer-----	0-12	Silty clay loam	MH	A-7-5, A-7	0	0	100	100	95-100	90-100	50-58	20-24
	12-16	Silty clay loam, silt loam	ML	A-7-6, A-7	0	0	100	100	95-100	85-100	35-55	12-24
	16-40	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	85-100	30-49	12-25
	40-60	Silt loam, loam	CL	A-6, A-7	0-5	0-10	90-100	85-97	75-95	50-75	28-45	12-22

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
1091:												
McCreath-----	0-6	Silty clay loam	MH, CH	A-7	0	0	100	100	95-100	90-100	50-60	20-30
	6-17	Silty clay loam	MH, CH	A-7	0	0	100	100	95-100	90-100	50-60	20-30
	17-35	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-55	20-30
	35-44	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	90-100	30-40	11-20
	44-80	Clay loam, gravelly loam, loam	CL, CL-ML	A-4, A-6	0	0-5	80-100	75-95	70-95	55-75	25-40	5-15
1091B:												
McCreath-----	0-6	Silty clay loam	MH, CH	A-7	0	0	100	100	95-100	90-100	50-60	20-30
	6-17	Silty clay loam	MH, CH	A-7	0	0	100	100	95-100	90-100	50-60	20-30
	17-35	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-55	20-30
	35-44	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	90-100	30-40	11-20
	44-80	Clay loam, gravelly loam, loam	CL, CL-ML	A-4, A-6	0	0-5	80-100	75-95	70-95	55-75	25-40	5-15
1092:												
Gillett Grove---	0-8	Silty clay loam, silty clay	MH, CH	A-7	0	0	100	100	95-100	90-100	50-65	20-35
	8-17	Silty clay loam, silty clay	MH, CH	A-7	0	0	100	100	95-100	90-100	50-65	20-35
	17-44	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	35-50	20-35
	44-57	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	15-25
	57-62	Loam, clay loam	CL	A-6	0	0-5	90-100	85-100	80-90	50-75	30-40	10-20
1511:												
Blue Earth, ponded-----	0-10	Muck	ML	A-5	0	0	95-100	95-100	85-95	80-95	41-50	2-8
	10-68	Mucky silty clay loam, Mucky silt loam	ML	A-5	0	0	95-100	80-100	80-95	80-95	41-50	2-8
	68-80	Mucky silty clay loam, Mucky silt loam	ML	A-7	0	0	95-100	90-100	80-100	70-95	35-50	11-20
1707B:												
Delft-----	0-12	Clay loam	CL	A-6, A-7	0	0	95-100	90-100	75-90	60-80	30-45	10-20
	12-29	Loam	CL	A-6, A-7	0	0	95-100	90-100	75-90	60-80	30-45	10-20
	29-34	Silt loam, clay loam	CL, ML	A-6, A-4	0	0	95-100	90-100	70-90	50-75	30-45	10-20
	34-46	Clay loam, loam, sandy loam	CL, CL-ML, SC	A-6, A-4	0	0-5	90-100	85-100	75-90	40-70	20-35	8-15
	46-60	Loam	CL	A-6, A-4	0	0	95-100	90-100	70-90	50-75	25-40	7-15

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
1707B:	In											
Terril-----	0-9	Loam	CL	A-6	0	0-5	94-100	89-100	75-97	55-74	33-47	11-21
	9-36	Loam, clay loam	CL	A-6	0	0-5	94-100	89-100	75-99	55-76	29-47	12-22
	36-50	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	84-100	74-94	56-73	35-42	16-21
	50-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-4	91-100	78-100	65-93	46-69	22-32	7-15
2700C:												
Ridgeton-----	0-10	Loam	ML	A-7-6	0	0-5	94-100	89-100	75-93	55-70	31-44	11-18
	10-29	Loam	ML	A-7-6	0	0-5	94-100	89-100	75-93	55-70	31-44	11-18
	29-38	Loam	ML	A-7-6	0	0-5	94-100	89-100	75-93	55-70	31-44	11-18
	38-50	Loam, clay loam	CL	A-6, A-7	0	0-4	95-100	85-100	74-94	55-72	30-41	15-21
	50-80	Loam, clay loam	CL	A-6	0	0-4	95-100	84-100	72-95	53-73	30-41	13-21
4946B.												
Udorthents- Highway												
5010.												
Pits, sand and gravel												
5040.												
Udorthents, loamy												
AW.												
Animal waste lagoon												
SL.												
Sewage lagoon												
W.												
Water												

## Physical Properties

The table described in this section shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

*Sand* as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In the table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

*Silt* as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In the table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

*Moist bulk density* is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at  $1/3$ - or  $1/10$ -bar (33-kPa or 10-kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Saturated hydraulic conductivity* refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (Ksat). The estimates in the table indicate the rate of water movement, in micrometers per second, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an

important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Linear extensibility* refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at  $1/3$ - or  $1/10$ -bar tension (33-kPa or 10-kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

*Erosion factors* are shown in the table as the K factor ( $K_w$  and  $K_f$ ) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor  $K_w$*  indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

*Erosion factor  $K_f$*  indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

*Wind erodibility index* is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Physical Properties of the Soils

(The percentages in the sand and clay columns are shown as low, representative value, and high. The percentages in the silt column are shown as a representative value. Representative values are indicative of conditions that occur most commonly. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
6: Okoboji-----	0-6	0- 7- 15	-54-	35-39- 40	1.30-1.40	0.10-1.00	0.21-0.23	6.0-8.9	9.0-12	.24	.24	5	4	86
	6-32	0- 7- 15	-54-	35-39- 40	1.30-1.40	0.10-1.00	0.21-0.23	6.0-8.9	3.0-9.0	.24	.24			
	32-56	5- 8- 20	-53-	35-39- 42	1.30-1.40	0.10-1.00	0.18-0.20	6.0-8.9	0.5-3.0	.37	.37			
	56-79	5-18- 60	-52-	25-30- 35	1.40-1.50	1.00-10.00	0.18-0.20	2.6-5.8	0.0-0.5	.43	.43			
27B: Terril-----	0-9	15-38- 40	-40-	18-22- 30	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	9-36	15-38- 40	-40-	18-22- 32	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	1.0-3.0	.32	.32			
	36-50	25-37- 60	-37-	24-26- 30	1.40-1.45	1.00-10.00	0.17-0.19	2.3-4.2	0.5-1.0	.32	.32			
	50-60	25-43- 60	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
28B: Dickman-----	0-10	52-68- 80	-20-	6-12- 18	1.30-1.40	10.00-100.00	0.13-0.15	0.0-2.9	1.5-2.5	.20	.20	2	3	86
	10-12	52-68- 80	-20-	6-12- 18	1.30-1.40	10.00-100.00	0.13-0.15	0.0-2.9	1.0-2.0	.24	.24			
	12-19	52-68- 80	-20-	6-12- 18	1.30-1.40	10.00-100.00	0.13-0.15	0.0-2.9	0.5-1.0	.24	.24			
	19-33	70-84- 86	- 4-	6-12- 14	1.35-1.50	10.00-100.00	0.12-0.14	0.0-2.9	0.5-1.0	.02	.02			
	33-80	85-96-100	- 2-	1- 3- 5	1.50-1.70	100-705	0.04-0.07	0.0-2.9	0.0-0.5	.02	.02			
32: Spicer-----	0-12	4- 7- 12	-61-	29-32- 35	1.20-1.30	1.00-10.00	0.18-0.24	2.4-3.0	6.0-7.0	.32	.32	5	4L	86
	12-16	5- 8- 15	-64-	18-28- 35	1.25-1.35	1.00-10.00	0.16-0.22	2.2-5.5	3.0-5.0	.37	.37			
	16-40	5- 9- 15	-64-	18-27- 35	1.25-1.35	1.00-10.00	0.16-0.22	2.2-5.5	1.0-2.0	.43	.43			
	40-60	25-26- 40	-51-	18-23- 32	1.50-1.70	1.00-10.00	0.14-0.19	2.2-3.8	0.0-2.0	.49	.49			
34: Estherville-----	0-7	52-67- 85	-23-	5-10- 15	1.25-1.35	10.00-100.00	0.13-0.18	0.0-2.9	1.5-2.5	.20	.20	2	3	86
	7-18	52-67- 82	-19-	11-14- 18	1.35-1.60	10.00-100.00	0.12-0.19	0.0-2.9	0.5-1.0	.24	.24			
	18-80	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
34B: Estherville-----	0-7	52-67- 85	-23-	5-10- 15	1.25-1.35	10.00-100.00	0.13-0.18	0.0-2.9	1.5-2.5	.20	.20	2	3	86
	7-18	52-67- 82	-19-	11-14- 18	1.35-1.60	10.00-100.00	0.12-0.19	0.0-2.9	0.5-1.0	.24	.24			
	18-80	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility	erodi- bility
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
34C2: Estherville, moderately eroded---	0-6	52-67- 85	-23-	5-10- 15	1.25-1.35	10.00-100.00	0.13-0.18	0.0-2.9	1.0-2.0	.24	.24	2	3	86
	6-18	75-80- 85	-13-	5- 7- 15	1.35-1.60	10.00-100.00	0.12-0.19	0.0-2.9	0.5-1.0	.20	.20			
	18-24	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
	24-29	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
	29-80	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
55: Nicollet-----	0-10	29-39- 49	-37-	18-24- 27	1.15-1.25	1.00-10.00	0.17-0.22	1.3-3.2	5.0-6.0	.24	.24	5	6	48
	10-17	20-34- 35	-38-	21-28- 30	1.15-1.25	1.00-10.00	0.17-0.22	1.3-3.2	3.0-5.0	.28	.28			
	17-36	20-34- 35	-38-	17-28- 30	1.25-1.35	1.00-10.00	0.15-0.19	0.1-4.2	0.5-2.0	.32	.32			
	36-60	40-43- 47	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
77B: Sac-----	0-6	0- 6- 10	-60-	31-35- 38	1.25-1.30	1.00-10.00	0.21-0.23	3.0-5.9	3.0-5.0	.28	.28	5	6	48
	6-16	0- 9- 10	-56-	32-36- 39	1.25-1.30	0.10-1.00	0.21-0.23	3.0-5.9	2.5-4.5	.32	.32			
	16-32	0- 6- 10	-61-	31-33- 35	1.30-1.35	1.00-10.00	0.18-0.20	3.0-5.9	1.0-2.0	.37	.37			
	32-38	20-21- 40	-56-	22-23- 28	1.50-1.65	1.00-10.00	0.16-0.18	0.0-2.9	0.0-1.0	.49	.49			
	38-55	20-29- 40	-44-	22-27- 28	1.50-1.65	1.00-10.00	0.16-0.18	0.0-2.9	0.0-1.0	.43	.43			
	55-80	20-29- 45	-44-	22-27- 28	1.50-1.65	1.00-10.00	0.16-0.18	0.0-2.9	0.0-1.0	.43	.43			
95: Harps-----	0-8	30-38- 45	-36-	25-26- 27	1.35-1.40	1.00-10.00	0.19-0.21	3.0-5.9	4.5-5.5	.20	.20	5	4L	86
	8-16	30-38- 45	-36-	25-26- 27	1.35-1.40	1.00-10.00	0.19-0.21	3.0-5.9	4.5-5.5	.17	.17			
	16-63	30-39- 60	-37-	18-25- 32	1.40-1.50	1.00-10.00	0.17-0.19	3.0-5.9	2.0-3.0	.28	.28			
	63-79	35-39- 65	-37-	21-25- 30	1.50-1.70	1.00-10.00	0.17-0.19	3.0-5.9	0.0-1.0	.32	.32			
107: Webster-----	0-8	15-17- 20	-53-	27-30- 35	1.35-1.40	1.00-10.00	0.19-0.21	3.2-5.8	6.0-7.0	.28	.28	5	6	48
	8-16	15-17- 20	-53-	27-30- 35	1.35-1.40	1.00-10.00	0.19-0.21	3.2-5.8	4.0-5.0	.32	.32			
	16-32	18-34- 45	-37-	25-30- 35	1.40-1.50	1.00-10.00	0.16-0.18	2.6-5.8	2.0-3.0	.28	.28			
	32-60	18-43- 45	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
135: Coland, occasionally flooded-----	0-8	15-22- 40	-47-	27-31- 35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	5.0-7.0	.28	.28	5	6	48
	8-32	15-19- 40	-50-	27-31- 35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	4.0-5.0	.24	.24			
	32-40	15-27- 30	-44-	27-29- 30	1.40-1.50	1.00-10.00	0.15-0.19	3.2-4.2	4.0-6.5	.28	.28			
	40-44	15-30- 30	-48-	12-22- 22	1.45-1.60	10.00-100.00	0.11-0.17	0.0-1.6	0.5-2.0	.37	.37			
	44-52	15-30- 30	-48-	14-22- 27	1.50-1.60	1.00-10.00	0.13-0.19	0.0-3.2	0.5-2.0	.37	.37			
	52-79	30-58- 60	-26-	12-16- 22	1.45-1.60	10.00-100.00	0.11-0.17	0.0-1.6	0.5-2.0	.24	.24			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility	erodi- bility
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct				group	index
138B:														
Clarion-----	0-7	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	3.0-4.0	.24	.24	5	6	48
	7-18	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	2.0-3.0	.32	.32			
	18-36	15-37- 40	-37-	24-26- 30	1.50-1.70	1.00-10.00	0.17-0.19	0.0-2.3	0.5-2.0	.32	.32			
	36-60	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
138C:														
Clarion-----	0-7	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	3.0-4.0	.24	.24	5	6	48
	7-18	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	2.0-3.0	.32	.32			
	18-36	15-37- 40	-37-	24-26- 30	1.50-1.70	1.00-10.00	0.17-0.19	0.0-2.3	0.5-2.0	.32	.32			
	36-60	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
175B:														
Dickinson-----	0-9	40-66- 70	-20-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.5-2.5	.17	.17	3	3	86
	9-18	40-67- 70	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28			
	18-30	60-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28			
	30-36	80-86- 95	- 7-	4- 7- 10	1.55-1.65	10.00-100.00	0.08-0.10	0.0-2.9	0.0-0.5	.15	.15			
	36-60	80-91- 95	- 2-	4- 7- 10	1.60-1.70	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
175C2:														
Dickinson, moderately eroded---	0-6	40-66- 70	-20-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.20	.20	3	3	86
	6-32	60-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.3-0.8	.28	.28			
	32-54	80-90- 95	- 5-	4- 5- 10	1.55-1.65	10.00-100.00	0.08-0.10	0.0-2.9	0.0-0.5	.15	.15			
	54-80	80-91- 95	- 2-	4- 7- 10	1.60-1.70	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.05	.05			
199:														
Cylinder-----	0-8	18-39- 40	-37-	22-25- 27	1.40-1.45	1.00-10.00	0.20-0.22	1.6-3.2	4.0-5.0	.24	.24	3	6	48
	8-18	18-39- 40	-37-	22-25- 27	1.40-1.45	1.00-10.00	0.20-0.22	1.6-3.2	2.0-3.0	.24	.24			
	18-28	30-38- 40	-35-	22-27- 30	1.45-1.60	1.00-10.00	0.17-0.19	1.6-3.2	0.5-2.0	.32	.32			
	28-80	75-84- 95	- 6-	2-10- 12	1.60-1.70	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.02	.02			
Nicollet-----	0-10	29-39- 49	-37-	18-24- 27	1.15-1.25	1.00-10.00	0.17-0.22	1.3-3.2	5.0-6.0	.24	.24	5	6	48
	10-17	20-34- 35	-38-	21-28- 30	1.15-1.25	1.00-10.00	0.17-0.22	1.3-3.2	3.0-5.0	.28	.28			
	17-36	20-34- 35	-38-	17-28- 30	1.25-1.35	1.00-10.00	0.15-0.19	0.1-4.2	0.5-2.0	.32	.32			
	36-60	40-43- 47	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
200:														
Cylinder-----	0-8	18-39- 40	-37-	22-25- 27	1.40-1.45	1.00-10.00	0.20-0.22	1.6-3.2	4.0-5.0	.24	.24	3	6	48
	8-18	18-39- 40	-37-	22-25- 27	1.40-1.45	1.00-10.00	0.20-0.22	1.6-3.2	2.0-3.0	.24	.24			
	18-28	30-38- 40	-35-	22-27- 30	1.45-1.60	1.00-10.00	0.17-0.19	1.6-3.2	0.5-2.0	.32	.32			
	28-80	75-84- 95	- 6-	2-10- 12	1.60-1.70	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.02	.02			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility	erodi- bility
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct				group	index
200:														
Cylinder, calcareous	0-8	18-39- 40	-37-	22-25- 27	1.40-1.45	1.00-10.00	0.20-0.22	1.6-3.2	4.0-5.0	.24	.24	3	6	48
	8-23	18-39- 40	-37-	22-25- 27	1.40-1.45	1.00-10.00	0.20-0.22	1.6-3.2	2.0-3.0	.24	.24			
	23-38	30-38- 40	-35-	22-27- 30	1.45-1.60	1.00-10.00	0.17-0.19	1.6-3.2	0.5-2.0	.32	.32			
	38-68	75-90- 95	- 5-	2- 5- 12	1.60-1.70	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.02	.02			
	68-80	75-90- 95	- 5-	2- 5- 12	1.60-1.70	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.02	.02			
259:														
Biscay-----	0-7	10-34- 55	-37-	25-29- 30	1.20-1.30	1.00-10.00	0.20-0.22	3.0-5.9	5.5-6.5	.20	.20	3	4L	86
	7-20	10-37- 55	-37-	25-26- 30	1.20-1.30	1.00-10.00	0.20-0.22	3.0-5.9	1.0-6.0	.24	.24			
	20-28	15-39- 55	-37-	18-24- 30	1.25-1.35	1.00-10.00	0.17-0.19	3.0-5.9	0.5-1.0	.32	.32			
	28-36	45-47- 70	-34-	11-19- 28	1.35-1.55	10.00-100.00	0.11-0.17	0.0-2.9	0.0-0.5	.20	.32			
	36-80	75-90- 95	- 6-	1- 4- 6	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
274:														
Rolfe-----	0-10	7-17- 20	-50-	31-33- 35	1.35-1.40	1.00-10.00	0.22-0.24	0.0-2.9	4.0-6.0	.28	.28	5	6	48
	10-21	5-16- 18	-60-	18-25- 35	1.35-1.40	1.00-10.00	0.22-0.24	0.0-2.9	1.0-2.0	.49	.49			
	21-55	3- 8- 35	-51-	38-42- 45	1.40-1.50	0.01-0.10	0.11-0.13	6.0-8.9	0.5-1.0	.37	.37			
	55-80	30-34- 45	-37-	24-30- 35	1.50-1.60	1.00-10.00	0.14-0.16	2.3-5.9	0.0-0.5	.32	.32			
282:														
Ransom-----	0-8	1- 6- 10	-61-	27-33- 38	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	4.0-6.0	.28	.28	5	6	48
	8-16	1- 6- 10	-61-	27-33- 38	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	2.0-3.0	.37	.37			
	16-33	1- 7- 10	-62-	24-31- 38	1.25-1.35	1.00-10.00	0.16-0.19	3.0-5.9	0.5-1.0	.43	.43			
	33-80	28-33- 40	-41-	18-26- 30	1.40-1.70	1.00-10.00	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
283B:														
Dickman-----	0-10	52-68- 80	-20-	6-12- 18	1.30-1.40	10.00-100.00	0.13-0.15	0.0-2.9	1.5-2.5	.20	.20	2	3	86
	10-12	52-68- 80	-20-	6-12- 18	1.30-1.40	10.00-100.00	0.13-0.15	0.0-2.9	1.0-2.0	.24	.24			
	12-19	52-68- 80	-20-	6-12- 18	1.30-1.40	10.00-100.00	0.13-0.15	0.0-2.9	0.5-1.0	.24	.24			
	19-33	70-84- 86	- 4-	6-12- 14	1.35-1.50	10.00-100.00	0.12-0.14	0.0-2.9	0.5-1.0	.02	.02			
	33-80	85-96-100	- 2-	1- 3- 5	1.50-1.70	100-705	0.04-0.07	0.0-2.9	0.0-0.5	.02	.02			
Clarion-----	0-7	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	3.0-4.0	.24	.24	5	6	48
	7-18	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	2.0-3.0	.32	.32			
	18-36	15-37- 40	-37-	24-26- 30	1.50-1.70	1.00-10.00	0.17-0.19	0.0-2.3	0.5-2.0	.32	.32			
	36-60	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
308:														
Wadena-----	0-8	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	3	6	48
	8-13	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32			
	13-30	29-39- 40	-37-	18-24- 27	1.35-1.50	1.00-10.00	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	30-80	89-92- 94	- 5-	1- 3- 5	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth In	Sand Pct	Silt Pct	Clay Pct	Moist bulk density g/cc	Saturated hydraulic conductivity um/sec	Available water capacity In/in	Linear extensi- bility Pct	Organic matter Pct	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility group	erodi- bility index
308B: Wadena-----	0-8	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	3	6	48
	8-13	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32			
	13-30	29-39- 40	-37-	18-24- 27	1.35-1.50	1.00-10.00	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	30-80	89-92- 94	- 5-	1- 3- 5	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
308C: Wadena-----	0-8	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	3	6	48
	8-13	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32			
	13-30	29-39- 40	-37-	18-24- 27	1.35-1.50	1.00-10.00	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	30-80	89-92- 94	- 5-	1- 3- 5	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
327: Wadena-----	0-8	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	3	6	48
	8-13	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32			
	13-30	29-39- 40	-37-	18-24- 27	1.35-1.50	1.00-10.00	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	30-80	89-92- 94	- 5-	1- 3- 5	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
Augusta Lake-----	0-10	40-50- 60	-36-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.24	.24	5	5	56
	10-15	55-67- 80	-20-	11-13- 15	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.8-1.3	.20	.20			
	15-28	55-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28			
	28-46	55-78- 80	-15-	4- 7- 10	1.60-1.70	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.32	.32			
	46-80	20-39- 50	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32			
Clarion-----	0-7	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	3.0-4.0	.24	.24	5	6	48
	7-18	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	2.0-3.0	.32	.32			
	18-36	15-37- 40	-37-	24-26- 30	1.50-1.70	1.00-10.00	0.17-0.19	0.0-2.3	0.5-2.0	.32	.32			
	36-60	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
327B: Wadena-----	0-8	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	3	6	48
	8-13	29-40- 40	-38-	18-23- 27	1.30-1.50	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32			
	13-30	29-39- 40	-37-	18-24- 27	1.35-1.50	1.00-10.00	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	30-80	89-92- 94	- 5-	1- 3- 5	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
Augusta Lake-----	0-10	40-50- 60	-36-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.24	.24	5	5	56
	10-15	55-67- 80	-20-	11-13- 15	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.8-1.3	.20	.20			
	15-28	55-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28			
	28-46	55-78- 80	-15-	4- 7- 10	1.60-1.70	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.32	.32			
	46-80	20-39- 50	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32			
Clarion-----	0-7	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	3.0-4.0	.24	.24	5	6	48
	7-18	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	2.0-3.0	.32	.32			
	18-36	15-37- 40	-37-	24-26- 30	1.50-1.70	1.00-10.00	0.17-0.19	0.0-2.3	0.5-2.0	.32	.32			
	36-60	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth In	Sand Pct	Silt Pct	Clay Pct	Moist bulk density g/cc	Saturated hydraulic conductivity um/sec	Available water capacity In/in	Linear extensi- bility Pct	Organic matter Pct	Erosion factors			Wind	Wind	
										Kw	Kf	T	erodi- bility group	erodi- bility index	
331:															
Madelia-----	0-9	1- 7- 15	-62-	27-31- 35	1.20-1.30	1.00-10.00	0.18-0.24	3.2-5.8	5.0-7.0	.32	.32	5	6	48	
	9-19	1- 7- 15	-62-	27-31- 35	1.20-1.30	1.00-10.00	0.18-0.24	3.2-5.8	4.0-7.0	.32	.32				
	19-37	1- 7- 15	-63-	22-30- 35	1.25-1.35	1.00-10.00	0.16-0.22	1.0-5.8	2.0-4.0	.37	.37				
	37-60	1- 9- 15	-65-	18-27- 35	1.30-1.40	1.00-10.00	0.16-0.22	1.0-5.8	1.0-2.0	.43	.43				
341C2:															
Estherville, moderately eroded---	0-6	52-67- 85	-23-	5-10- 15	1.25-1.35	10.00-100.00	0.13-0.18	0.0-2.9	1.0-2.0	.24	.24	2	3	86	
	6-18	52-80- 82	-13-	5- 7- 15	1.35-1.60	10.00-100.00	0.12-0.19	0.0-2.9	0.5-1.0	.20	.20				
	18-24	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
	24-29	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
	29-80	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
Pilot Grove, moderately eroded---	0-6	52-68- 76	-20-	5-12- 15	1.25-1.35	10.00-100.00	0.13-0.18	0.0-2.9	1.0-2.0	.20	.20	5	3	86	
	6-18	52-67- 80	-19-	11-14- 18	1.35-1.60	10.00-100.00	0.13-0.18	0.0-2.9	0.0-0.5	.24	.24				
	18-28	70-87- 90	-10-	1- 3- 8	1.50-1.65	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
	28-34	85-92-100	- 4-	1- 4- 8	1.50-1.65	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
	34-52	85-92-100	- 4-	1- 4- 8	1.50-1.65	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
	52-80	17-40- 52	-37-	5-23- 30	1.30-1.40	1.00-10.00	0.16-0.22	0.0-2.9	0.1-0.8	.37	.37				
346B:															
Augusta Lake-----	0-10	40-50- 60	-36-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.24	.24	5	5	56	
	10-15	55-67- 80	-20-	11-13- 15	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.8-1.3	.20	.20				
	15-28	55-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28				
	28-46	55-78- 80	-15-	4- 7- 10	1.60-1.70	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.32	.32				
	46-80	20-39- 50	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				
Estherville-----	0-7	52-67- 85	-23-	5-10- 15	1.25-1.35	10.00-100.00	0.13-0.18	0.0-2.9	1.5-2.5	.20	.20	2	3	86	
	7-18	52-67- 82	-19-	11-14- 18	1.35-1.60	10.00-100.00	0.12-0.19	0.0-2.9	0.5-1.0	.24	.24				
	18-80	80-92-100	- 4-	1- 4- 8	1.50-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02				
347B:															
Augusta Lake-----	0-10	40-50- 60	-36-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.24	.24	5	5	56	
	10-15	55-67- 80	-20-	11-13- 15	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.8-1.3	.20	.20				
	15-28	55-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28				
	28-46	55-78- 80	-15-	4- 7- 10	1.60-1.70	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.32	.32				
	46-80	20-39- 50	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				
347C:															
Augusta Lake-----	0-10	40-50- 60	-36-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.24	.24	5	5	56	
	10-15	55-67- 80	-20-	11-13- 15	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.8-1.3	.20	.20				
	15-28	55-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28				
	28-46	55-78- 80	-15-	4- 7- 10	1.60-1.70	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.32	.32				
	46-80	20-39- 50	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility	erodi- bility
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
374B: Okabena-----	0-10	0- 7- 20	-64-	27-30- 32	1.20-1.30	1.00-10.00	0.18-0.24	0.0-2.9	4.0-8.0	.37	.37	5	6	48
	10-15	0- 7- 20	-64-	27-30- 32	1.20-1.30	1.00-10.00	0.18-0.24	0.0-2.9	3.5-7.5	.37	.37			
	15-22	0- 7- 20	-65-	18-28- 32	1.25-1.35	1.00-10.00	0.16-0.20	0.0-2.9	1.0-3.0	.43	.43			
	22-43	0- 9- 20	-65-	18-27- 35	1.25-1.35	1.00-10.00	0.16-0.22	3.0-5.9	1.0-2.0	.43	.43			
	43-48	0- 9- 20	-66-	18-25- 32	1.25-1.35	1.00-10.00	0.16-0.20	0.0-2.9	0.1-0.5	.49	.49			
	48-80	23-28- 52	-47-	22-26- 32	1.35-1.55	1.00-10.00	0.15-0.19	0.0-2.9	0.0-0.5	.49	.49			
374C: Okabena-----	0-10	0- 7- 20	-64-	27-30- 32	1.20-1.30	1.00-10.00	0.18-0.24	0.0-2.9	4.0-8.0	.37	.37	5	6	48
	10-15	0- 7- 20	-64-	27-30- 32	1.20-1.30	1.00-10.00	0.18-0.24	0.0-2.9	3.5-7.5	.37	.37			
	15-22	0- 7- 20	-65-	18-28- 32	1.25-1.35	1.00-10.00	0.16-0.20	0.0-2.9	1.0-3.0	.43	.43			
	22-43	0- 9- 20	-65-	18-27- 35	1.25-1.35	1.00-10.00	0.16-0.22	3.0-5.9	1.0-2.0	.43	.43			
	43-48	0- 9- 20	-66-	18-25- 32	1.25-1.35	1.00-10.00	0.16-0.20	0.0-2.9	0.1-0.5	.49	.49			
	48-80	23-28- 52	-47-	22-26- 32	1.35-1.55	1.00-10.00	0.15-0.19	0.0-2.9	0.0-0.5	.49	.49			
390: Waldorf-----	0-9	5- 8- 15	-55-	35-38- 40	1.20-1.30	0.10-1.00	0.18-0.25	6.0-8.9	6.0-8.0	.32	.32	5	4	86
	9-20	5- 8- 15	-55-	35-38- 40	1.20-1.30	0.10-1.00	0.18-0.25	6.0-8.9	5.5-7.5	.32	.32			
	20-45	1- 6- 10	-47-	41-48- 55	1.25-1.35	0.01-0.10	0.13-0.16	6.0-8.9	0.5-1.0	.32	.32			
	45-80	1- 8- 10	-50-	41-42- 55	1.25-1.45	0.01-0.10	0.20-0.22	3.0-5.9	0.0-0.5	.37	.37			
397: Letri-----	0-9	12-19- 30	-50-	27-31- 35	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	4.0-8.0	.28	.28	5	6	48
	9-20	15-35- 40	-34-	27-31- 35	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	2.0-4.0	.28	.28			
	20-41	20-35- 40	-35-	18-30- 35	1.25-1.35	10.00-100.00	0.15-0.19	3.0-5.9	1.0-2.0	.24	.24			
	41-80	20-35- 40	-37-	22-28- 32	1.40-1.70	1.00-10.00	0.17-0.19	3.0-5.9	0.5-1.0	.32	.32			
456: Wilmington-----	0-8	10-18- 20	-51-	27-31- 35	1.25-1.35	1.00-10.00	0.20-0.26	3.0-5.9	4.0-7.0	.28	.28	5	6	48
	8-17	10-18- 20	-51-	27-31- 35	1.25-1.35	1.00-10.00	0.20-0.26	3.0-5.9	3.0-5.0	.32	.32			
	17-25	25-34- 40	-37-	25-29- 32	1.30-1.45	1.00-10.00	0.15-0.19	3.0-5.9	0.5-3.0	.32	.32			
	25-55	25-35- 40	-38-	22-27- 32	1.45-1.70	1.00-10.00	0.14-0.19	3.0-5.9	0.5-1.0	.37	.37			
	55-80	25-35- 40	-38-	22-27- 32	1.45-1.70	1.00-10.00	0.14-0.19	3.0-5.9	0.5-1.0	.37	.37			
485: Spillville, occasionally flooded	0-8	30-41- 45	-37-	18-22- 26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	4.0-5.0	.24	.24	5	6	48
	8-54	30-41- 45	-37-	18-22- 26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	1.0-4.0	.32	.32			
	54-79	35-43- 60	-38-	14-19- 24	1.55-1.70	1.00-10.00	0.15-0.18	0.0-2.3	1.0-2.0	.37	.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility	erodi- bility
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct				group	index
507: Canisteo-----	0-10	18-18- 45	-51-	27-31- 35	1.25-1.35	1.00-10.00	0.18-0.22	3.2-5.8	5.0-7.0	.28	.28	5	4L	86
	10-18	18-35- 45	-34-	27-31- 35	1.25-1.35	1.00-10.00	0.18-0.22	3.2-5.8	3.0-5.0	.24	.24			
	18-39	18-35- 55	-39-	21-26- 35	1.35-1.50	1.00-10.00	0.15-0.19	3.0-5.8	2.0-4.0	.28	.28			
	39-80	18-43- 55	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.1-0.5	.43	.43			
511: Blue Earth-----	0-10	5- 7- 15	-68-	18-25- 32	0.20-0.80	1.00-10.00	0.18-0.24	3.0-5.9	10-25	.37	.37	5	4L	86
	10-68	5- 7- 15	-65-	18-28- 32	0.20-0.80	1.00-10.00	0.18-0.24	0.0-2.9	10-25	.37	.37			
	68-80	5- 7- 15	-65-	18-28- 32	1.30-1.60	1.00-10.00	0.14-0.16	3.0-5.9	0.0-0.5	.49	.49			
557: Talcot-----	0-10	5-15- 25	-55-	28-30- 35	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	5.0-7.0	.32	.32	3	4L	86
	10-26	10-20- 55	-48-	31-33- 35	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	2.0-4.0	.32	.32			
	26-30	15-35- 55	-33-	25-33- 35	1.25-1.35	1.00-10.00	0.17-0.20	3.0-5.9	1.0-2.0	.28	.28			
	30-60	75-90- 95	- 7-	1- 4- 6	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.5-1.0	.02	.02			
Biscay-----	0-7	10-34- 55	-37-	25-29- 30	1.20-1.30	1.00-10.00	0.20-0.22	3.0-5.9	5.5-6.5	.20	.20	3	4L	86
	7-20	10-37- 55	-37-	25-26- 30	1.20-1.30	1.00-10.00	0.20-0.22	3.0-5.9	1.0-6.0	.24	.24			
	20-28	15-39- 55	-37-	18-24- 30	1.25-1.35	1.00-10.00	0.17-0.19	3.0-5.9	0.5-1.0	.32	.32			
	28-36	45-47- 70	-34-	11-19- 28	1.35-1.55	10.00-100.00	0.11-0.17	0.0-2.9	0.0-0.5	.20	.32			
	36-80	75-90- 95	- 6-	1- 4- 6	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.0-0.5	.02	.02			
559: Talcot-----	0-10	-15-	-55-	28-30- 35	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	5.0-7.0	.32	.32	3	4L	86
	10-26	10-20- 55	-48-	31-33- 35	1.20-1.30	1.00-10.00	0.18-0.22	3.0-5.9	2.0-4.0	.32	.32			
	26-30	15-35- 55	-33-	25-33- 35	1.25-1.35	1.00-10.00	0.17-0.20	3.0-5.9	1.0-2.0	.28	.28			
	30-60	75-90- 95	- 7-	1- 4- 6	1.55-1.65	100-705	0.02-0.04	0.0-2.9	0.5-1.0	.02	.02			
574C2: Bolan, moderately eroded-----	0-7	25-40- 75	-38-	21-23- 26	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.9	2.2-3.2	.28	.28	3	6	48
	7-20	40-55- 85	-29-	12-16- 20	1.45-1.50	1.00-10.00	0.17-0.19	0.0-2.9	0.0-1.0	.32	.32			
	20-35	60-67- 90	-20-	11-13- 16	1.50-1.60	10.00-100.00	0.11-0.13	0.0-2.9	0.0-0.5	.28	.28			
	35-80	75-90- 95	- 5-	2- 5- 8	1.60-1.70	10.00-100.00	0.08-0.10	0.0-2.9	0.0-0.5	.05	.05			
Augusta Lake, moderately eroded---	0-6	40-50- 60	-36-	11-14- 18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.5-1.5	.28	.28	5	5	56
	6-25	55-67- 80	-20-	11-13- 15	1.45-1.55	10.00-100.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28			
	25-48	55-75- 80	-18-	4- 7- 10	1.60-1.70	10.00-100.00	0.02-0.04	0.0-2.9	0.0-0.5	.24	.24			
	48-80	20-39- 50	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind	
										Kw	Kf	T	erodi- bility group	erodi- bility index	
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct						
577B:															
Everly-----	0-8	15-34- 35	-37-	27-29- 30	1.40-1.45	1.00-10.00	0.17-0.19	3.0-5.9	3.0-4.0	.24	.24	5	6	48	
	8-12	15-34- 35	-37-	27-29- 30	1.40-1.45	1.00-10.00	0.17-0.19	3.0-5.9	2.0-4.0	.24	.24				
	12-26	15-34- 35	-37-	25-30- 35	1.45-1.55	1.00-10.00	0.15-0.17	3.0-5.9	1.0-2.0	.32	.32				
	26-50	20-37- 40	-37-	22-26- 32	1.55-1.65	1.00-10.00	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32				
	50-80	20-37- 40	-35-	22-28- 32	1.55-1.65	1.00-10.00	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32				
577C2:															
Everly, moderately eroded-----	0-7	15-34- 35	-37-	27-29- 30	1.40-1.45	1.00-10.00	0.17-0.19	3.0-5.9	2.2-3.2	.28	.28	5	6	48	
	7-26	15-34- 35	-37-	25-30- 35	1.45-1.55	1.00-10.00	0.15-0.17	3.0-5.9	1.0-1.5	.32	.32				
	26-80	20-37- 40	-37-	22-26- 32	1.55-1.65	1.00-10.00	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32				
586B:															
Coland, occasionally flooded-----	0-8	15-22- 40	-47-	27-31- 35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	5.0-7.0	.28	.28	5	6	48	
	8-32	15-19- 30	-50-	27-31- 35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	4.0-5.0	.24	.24				
	32-40	15-27- 30	-44-	27-29- 30	1.40-1.50	1.00-10.00	0.15-0.19	3.2-4.2	4.0-6.5	.28	.28				
	40-44	15-30- 30	-48-	12-22- 22	1.45-1.60	10.00-100.00	0.11-0.17	0.0-1.6	0.5-2.0	.37	.37				
	44-52	15-30- 30	-48-	14-22- 27	1.50-1.60	1.00-10.00	0.13-0.19	0.0-3.2	0.5-2.0	.37	.37				
	52-60	30-58- 60	-26-	12-16- 22	1.45-1.60	10.00-100.00	0.11-0.17	0.0-1.6	0.5-2.0	.24	.24				
Spillville, occasionally flooded	0-8	30-41- 45	-37-	18-22- 26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	4.0-5.0	.24	.24	5	6	48	
	8-54	30-41- 45	-37-	18-22- 26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	1.0-4.0	.32	.32				
	54-79	35-43- 60	-38-	14-19- 24	1.55-1.70	1.00-10.00	0.15-0.18	0.0-2.3	1.0-2.0	.37	.37				
634E2:															
Belview, moderately eroded-----	0-6	25-40- 52	-38-	18-23- 27	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	1.7-3.7	.28	.28	5	4L	86	
	6-32	25-39- 52	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				
	32-79	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43				
Omsrud, moderately eroded-----	0-6	30-40- 52	-38-	21-23- 26	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32	5	6	48	
	6-20	20-36- 45	-37-	22-28- 30	1.35-1.50	1.00-10.00	0.17-0.19	0.0-2.9	0.5-2.0	.32	.32				
	20-30	30-39- 52	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				
	30-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43				
634G:															
Belview-----	0-9	25-40- 52	-38-	18-23- 27	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	3.0-5.0	.24	.24	5	4L	86	
	9-50	25-39- 52	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				
	50-60	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43				

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
634G:														
Omsrud-----	0-9	20-40- 45	-38-	21-23- 26	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	2.0-4.0	.32	.32	5	6	48
	9-18	20-36- 45	-37-	22-28- 30	1.35-1.50	1.00-10.00	0.17-0.19	0.0-2.9	0.5-2.0	.32	.32			
	18-36	15-39- 40	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32			
	36-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
635C2:														
Belview, moderately eroded-----	0-6	25-40- 52	-38-	18-23- 27	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	1.7-3.7	.28	.28	5	4L	86
	6-32	25-39- 52	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32			
	32-79	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
Storden, moderately eroded-----	0-6	27-40- 46	-38-	18-23- 27	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	1.7-2.7	.32	.32	5	4L	86
	6-44	24-39- 55	-37-	18-24- 30	1.35-1.65	1.00-10.00	0.17-0.19	0.0-2.9	0.5-1.0	.32	.32			
	44-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
638C2:														
Clarion, moderately eroded-----	0-6	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	2.2-3.2	.32	.32	5	6	48
	6-16	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	1.0-2.0	.32	.32			
	16-28	20-42- 45	-37-	18-21- 24	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.3	0.5-1.0	.37	.37			
	28-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.1-0.5	.43	.43			
Storden, moderately eroded-----	0-6	27-40- 46	-38-	18-23- 27	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	1.7-2.7	.32	.32	5	4L	86
	6-44	24-39- 55	-37-	18-24- 30	1.35-1.65	1.00-10.00	0.17-0.19	0.0-2.9	0.5-1.0	.32	.32			
	44-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
655:														
Crippin-----	0-7	20-39- 40	-37-	22-25- 27	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	5.0-6.0	.20	.20	5	4L	86
	7-20	20-39- 40	-37-	22-25- 27	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	5.0-6.0	.24	.24			
	20-35	20-38- 40	-36-	24-26- 30	1.40-1.55	1.00-10.00	0.17-0.19	0.0-2.9	3.0-4.0	.24	.24			
	35-60	40-43- 47	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
733:														
Calco, occasionally flooded-----	0-8	1- 7- 15	-63-	28-31- 33	1.25-1.30	1.00-10.00	0.21-0.23	3.0-5.9	5.0-7.0	.32	.32	5	4L	86
	8-28	1- 7- 15	-63-	28-31- 33	1.25-1.30	1.00-10.00	0.21-0.23	3.0-5.9	4.0-5.0	.32	.32			
	28-38	1- 6- 15	-61-	31-33- 35	1.25-1.30	1.00-10.00	0.21-0.23	3.0-5.9	2.0-4.0	.37	.37			
	38-80	1- 7- 35	-66-	22-27- 32	1.30-1.45	1.00-10.00	0.18-0.20	3.0-5.9	1.0-2.0	.43	.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind	
										Kw	Kf	T	erodi- bility group	erodi- bility index	
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct						
735: Havelock, occasionally flooded	0-9	15-35- 65	-40-	21-25- 35	1.40-1.50	1.00-10.00	0.20-0.22	6.0-8.9	5.0-7.0	.28	.28	5	4L	86	
	9-40	15-35- 65	-34-	27-31- 35	1.40-1.50	1.00-10.00	0.20-0.22	6.0-8.9	1.0-4.0	.28	.28				
	40-60	20-66- 70	-15-	12-19- 28	1.50-1.65	10.00-100.00	0.13-0.17	0.0-2.9	0.0-0.5	.17	.17				
740D: Hawick-----	0-7	60-75- 90	-17-	7- 8- 10	1.50-1.65	10.00-100.00	0.03-0.13	0.0-2.9	0.5-1.5	.10	.17	5	5	56	
	7-11	75-91- 95	- 4-	1- 6- 10	1.50-1.65	100-705	0.03-0.10	0.0-2.9	0.0-0.5	.05	.05				
	11-80	75-94- 95	- 3-	1- 3- 5	1.55-1.65	100-705	0.02-0.06	0.0-2.9	0.0-0.5	.02	.02				
740F: Hawick-----	0-7	60-75- 90	-17-	7- 8- 10	1.50-1.65	10.00-100.00	0.03-0.13	0.0-2.9	0.5-1.5	.10	.17	5	5	56	
	7-11	75-91- 95	- 4-	1- 6- 10	1.50-1.65	100-705	0.03-0.10	0.0-2.9	0.0-0.5	.05	.05				
	11-80	75-94- 95	- 3-	1- 3- 5	1.55-1.65	100-705	0.02-0.06	0.0-2.9	0.0-0.5	.02	.02				
740G: Hawick-----	0-7	60-75- 90	-17-	7- 8- 10	1.50-1.65	10.00-100.00	0.03-0.13	0.0-2.9	0.5-1.5	.10	.17	5	5	56	
	7-11	75-91- 95	- 4-	1- 6- 10	1.50-1.65	100-705	0.03-0.10	0.0-2.9	0.0-0.5	.05	.05				
	11-80	75-94- 95	- 3-	1- 3- 5	1.55-1.65	100-705	0.02-0.06	0.0-2.9	0.0-0.5	.02	.02				
835D2: Omsrud, moderately eroded-----	0-6	30-40- 52	-38-	21-23- 26	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.32	.32	5	6	48	
	6-20	20-36- 45	-37-	22-28- 30	1.35-1.50	1.00-10.00	0.17-0.19	0.0-2.9	0.5-2.0	.32	.32				
	20-30	30-39- 52	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32				
	30-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43				
Storden, moderately eroded-----	0-6	27-40- 46	-38-	18-23- 27	1.35-1.45	1.00-10.00	0.20-0.22	0.0-2.9	1.7-2.7	.32	.32	5	4L	86	
	6-44	24-39- 55	-37-	18-24- 30	1.35-1.65	1.00-10.00	0.17-0.19	0.0-2.9	0.5-1.0	.32	.32				
	44-80	30-43- 63	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43				
854D: Histosols, fens-----	0-35	0- 5- 10	-90-	1- 5- 15	0.15-0.35	4.23-42.34	0.35-0.45	0.0-0.0	20-85	.02	.02	1	2	134	
	35-80	10-27- 30	-44-	27-29- 30	1.50-1.80	1.00-10.00	0.14-0.22	0.0-2.9	0.5-4.0	.32	.32				
875B: Roine-----	0-8	40-69- 70	-16-	11-15- 25	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	2.0-3.0	.15	.15	5	3	86	
	8-48	55-69- 80	-16-	11-15- 25	1.50-1.55	10.00-100.00	0.12-0.15	0.0-2.9	1.0-2.0	.24	.24				
	48-52	20-44- 45	-40-	11-16- 27	1.55-1.75	1.00-10.00	0.17-0.19	0.0-2.9	0.0-0.5	.43	.43				
	52-59	20-30- 40	-54-	11-16- 27	1.35-1.45	1.00-10.00	0.20-0.22	3.0-5.9	0.0-0.5	.55	.55				
	59-80	25-34- 35	-37-	25-29- 33	1.55-1.75	1.00-10.00	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37				

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility group	erodi- bility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
878: Ocheyedan-----	0-7	30-38- 50	-36-	24-26- 27	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	7-14	30-38- 50	-36-	24-26- 27	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	14-34	35-53- 60	-28-	14-19- 24	1.45-1.60	10.00-100.00	0.16-0.18	0.0-2.9	0.5-1.0	.28	.28			
	34-65	30-32- 65	-50-	12-18- 28	1.45-1.70	1.00-10.00	0.19-0.21	0.0-2.9	0.0-0.5	.49	.49			
	65-80	30-32- 50	-40-	25-28- 35	1.45-1.70	1.00-10.00	0.19-0.21	0.0-2.9	0.0-0.5	.37	.37			
878B: Ocheyedan-----	0-7	30-38- 50	-36-	24-26- 27	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	7-14	30-38- 50	-36-	24-26- 27	1.40-1.45	1.00-10.00	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	14-34	35-53- 60	-28-	14-19- 24	1.45-1.60	10.00-100.00	0.16-0.18	0.0-2.9	0.5-1.0	.28	.28			
	34-65	30-32- 65	-50-	12-18- 28	1.45-1.70	1.00-10.00	0.19-0.21	0.0-2.9	0.0-0.5	.49	.49			
	65-80	30-32- 50	-40-	25-28- 35	1.45-1.70	1.00-10.00	0.19-0.21	0.0-2.9	0.0-0.5	.37	.37			
879: Fostoria-----	0-7	25-34- 45	-39-	24-27- 28	1.40-1.45	1.00-10.00	0.17-0.19	3.0-5.9	3.0-4.0	.28	.28	5	6	48
	7-19	25-34- 45	-37-	27-29- 30	1.40-1.45	1.00-10.00	0.17-0.19	3.0-5.9	2.0-4.0	.24	.24			
	19-34	25-34- 45	-37-	25-30- 35	1.45-1.55	1.00-10.00	0.15-0.17	3.0-5.9	1.0-2.0	.32	.32			
	34-68	8-37- 55	-35-	22-28- 32	1.55-1.65	1.00-10.00	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32			
	68-79	20-43- 45	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
1032: Spicer-----	0-12	4- 7- 12	-61-	29-32- 35	1.20-1.30	1.00-10.00	0.18-0.24	2.4-3.0	6.0-7.0	.32	.32	5	4L	86
	12-16	5- 8- 15	-64-	18-28- 35	1.25-1.35	1.00-10.00	0.16-0.22	2.2-5.5	3.0-5.0	.37	.37			
	16-40	5- 9- 15	-64-	18-27- 35	1.25-1.35	1.00-10.00	0.16-0.22	2.2-5.5	1.0-2.0	.43	.43			
	40-60	25-26- 40	-51-	18-23- 32	1.50-1.70	1.00-10.00	0.14-0.19	2.2-3.8	0.0-2.0	.49	.49			
1091: McCreath-----	0-6	1- 7- 10	-62-	28-31- 35	1.25-1.30	1.00-10.00	0.21-0.23	6.0-8.9	5.0-6.0	.32	.32	5	6	48
	6-17	1- 7- 10	-62-	28-31- 35	1.25-1.30	1.00-10.00	0.21-0.23	6.0-8.9	4.0-5.0	.28	.28			
	17-35	1- 6- 10	-61-	31-33- 35	1.30-1.35	1.00-10.00	0.18-0.20	6.0-8.9	0.5-2.0	.43	.43			
	35-44	1- 7- 10	-67-	25-26- 30	1.35-1.40	1.00-10.00	0.20-0.22	3.0-5.9	0.0-1.0	.49	.49			
	44-80	25-28- 45	-44-	22-28- 30	1.60-1.80	1.00-10.00	0.14-0.19	0.0-2.9	0.0-0.5	.43	.43			
1091B: McCreath-----	0-6	1- 7- 10	-62-	28-31- 35	1.25-1.30	1.00-10.00	0.21-0.23	6.0-8.9	5.0-6.0	.32	.32	5	6	48
	6-17	1- 7- 10	-62-	28-31- 35	1.25-1.30	1.00-10.00	0.21-0.23	6.0-8.9	4.0-5.0	.28	.28			
	17-35	1- 6- 10	-61-	31-33- 35	1.30-1.35	1.00-10.00	0.18-0.20	6.0-8.9	0.5-2.0	.43	.43			
	35-44	1- 7- 10	-67-	25-26- 30	1.35-1.40	1.00-10.00	0.20-0.22	3.0-5.9	0.0-1.0	.49	.49			
	44-80	25-28- 45	-44-	22-28- 30	1.60-1.80	1.00-10.00	0.14-0.19	0.0-2.9	0.0-0.5	.43	.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility	erodi- bility
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct				group	index
1092:														
Gillett Grove-----	0-8	1- 8- 10	-53-	36-39- 42	1.30-1.35	0.10-1.00	0.21-0.23	6.0-8.9	6.0-8.0	.28	.28	5	4L	86
	8-17	1- 8- 10	-53-	36-39- 42	1.30-1.35	0.10-1.00	0.21-0.23	6.0-8.9	4.0-6.0	.32	.32			
	17-44	1- 6- 10	-61-	31-33- 35	1.35-1.40	1.00-10.00	0.18-0.20	6.0-8.9	1.0-3.0	.37	.37			
	44-57	1- 7- 10	-67-	24-26- 35	1.35-1.45	1.00-10.00	0.20-0.22	3.0-5.9	0.0-1.0	.49	.49			
	57-62	25-31- 45	-43-	24-26- 32	1.60-1.75	1.00-10.00	0.17-0.19	3.0-5.9	0.0-0.5	.49	.49			
1511:														
Blue Earth, ponded---	0-10	5- 7- 15	-68-	18-25- 32	0.20-0.80	1.00-10.00	0.18-0.24	3.0-5.9	10-25	---	---	5	2	134
	10-68	5- 7- 15	-65-	18-28- 32	0.20-0.80	1.00-10.00	0.18-0.24	0.0-2.9	10-25	.37	.37			
	68-80	5- 7- 15	-65-	18-28- 32	1.30-1.60	1.00-10.00	0.14-0.16	3.0-5.9	0.0-0.5	.49	.49			
1707B:														
Delft-----	0-12	20-34- 45	-37-	25-30- 35	1.40-1.65	1.00-10.00	0.18-0.20	3.0-5.9	6.0-8.0	.24	.24	5	6	48
	12-29	25-38- 52	-36-	18-27- 35	1.40-1.55	1.00-10.00	0.19-0.22	3.0-5.9	2.0-6.0	.24	.24			
	29-34	5-19- 40	-55-	18-27- 35	1.40-1.55	1.00-10.00	0.19-0.22	0.0-2.9	1.0-4.0	.37	.37			
	34-46	20-43- 45	-29-	12-28- 32	1.55-1.75	1.00-10.00	0.15-0.19	0.0-1.6	0.0-0.5	.32	.32			
	46-60	25-39- 52	-37-	18-25- 32	1.30-1.40	1.00-10.00	0.19-0.22	0.0-2.9	1.0-4.0	.28	.28			
Terril-----	0-9	15-38- 40	-40-	18-22- 30	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	9-36	15-38- 40	-40-	18-22- 32	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	1.0-3.0	.32	.32			
	36-50	25-37- 60	-37-	24-26- 30	1.40-1.45	1.00-10.00	0.17-0.19	2.3-4.2	0.5-1.0	.32	.32			
	50-60	25-43- 60	-40-	12-17- 22	1.50-1.70	1.00-10.00	0.17-0.19	0.0-1.6	0.0-0.5	.43	.43			
2700C:														
Ridgeton-----	0-10	30-41- 45	-37-	18-22- 26	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	2.0-4.0	.28	.28	5	6	48
	10-29	30-41- 45	-37-	18-22- 26	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	1.8-3.8	.28	.28			
	29-38	30-41- 45	-37-	18-22- 26	1.35-1.40	1.00-10.00	0.20-0.22	0.0-2.9	2.0-4.0	.28	.28			
	38-50	25-38- 60	-36-	22-26- 30	1.45-1.70	1.00-10.00	0.16-0.18	0.0-2.9	0.0-1.0	.32	.32			
	50-80	25-39- 60	-37-	21-25- 30	1.35-1.55	1.00-10.00	0.15-0.19	1.0-4.2	0.1-0.5	.32	.32			
4946B.														
Udorthents-Highway														
5010.														
Pits, sand and gravel														
5040.														
Udorthents, loamy														

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility group	erodi- bility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
AW. Animal waste lagoon														
SL. Sewage lagoon														
W. Water														

## Chemical Properties

The table described in this section shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated.

*Cation-exchange capacity* is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

*Soil reaction* is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Calcium carbonate* equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

*Gypsum* is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

# Soil Survey of Dickinson County, Iowa—Part II

## Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
6:					
Okoboji-----	0-6	29-33	6.6-7.8	0-10	0
	6-32	28-32	6.6-7.8	0-10	0
	32-56	26-33	6.6-7.8	0-10	0
	56-79	18-26	7.4-8.4	5-20	0
27B:					
Terril-----	0-9	16-25	6.1-7.3	0	0
	9-36	15-27	6.1-7.3	0	0
	36-50	19-24	6.1-7.3	0	0
	50-60	8.9-18	7.6-8.4	5-20	0
28B:					
Dickman-----	0-10	6.5-16	5.6-6.5	0	0
	10-12	6.2-16	5.6-6.5	0	0
	12-19	5.7-15	5.6-6.5	0	0
	19-33	5.7-12	5.6-7.3	0	0
	33-80	0.8-3.8	6.1-7.8	0-10	0
32:					
Spicer-----	0-12	25-30	7.4-8.4	5-20	0
	12-16	16-29	7.4-8.4	5-20	0
	16-40	15-28	7.4-8.4	5-20	0
	40-60	13-26	7.4-8.4	5-20	0
34:					
Estherville-----	0-7	5.6-14	5.6-7.3	0	0
	7-18	8.5-15	5.6-7.3	0	0
	18-80	0.8-5.8	6.6-8.4	0-20	0
34B:					
Estherville-----	0-7	5.6-14	5.6-7.3	0	0
	7-18	8.5-15	5.6-7.3	0	0
	18-80	0.8-5.8	6.6-8.4	0-20	0
34C2:					
Estherville, moderately eroded---	0-6	4.2-11	5.6-7.3	0	0
	6-18	3.9-10	5.6-7.3	0	0
	18-24	0.7-5.6	6.6-8.4	0-20	0
	24-29	0.7-5.6	6.6-8.4	0-20	0
	29-80	0.7-5.6	6.6-8.4	0-20	0
55:					
Nicollet-----	0-10	16-23	6.1-7.3	0	0
	10-17	17-26	6.1-7.3	0	0
	17-36	14-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0
77B:					
Sac-----	0-6	26-32	5.1-6.5	0	0
	6-16	26-32	5.6-6.5	0	0
	16-32	24-28	6.1-7.3	0	0
	32-38	15-23	6.1-7.8	0-10	0
	38-55	15-23	7.4-8.4	5-20	0
	55-80	15-23	7.4-8.4	5-20	0

Soil Survey of Dickinson County, Iowa—Part II

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-	Soil	Calcium	Gypsum
	In	exchange capacity	reaction	carbon- ate	Pct
	In	meq/100 g	pH	Pct	Pct
95:					
Harps-----	0-8	22-23	7.9-9.0	15-30	0
	8-16	22-23	7.9-9.0	15-30	0
	16-63	16-27	7.9-9.0	15-30	0
	63-79	15-24	7.9-9.0	15-30	0
107:					
Webster-----	0-8	23-30	6.6-7.3	0	0
	8-16	23-29	6.6-7.3	0	0
	16-32	21-29	7.6-7.8	5-10	0
	32-60	8.9-18	7.6-8.4	5-20	0
135:					
Coland, occasionally flooded-----	0-8	23-30	6.1-7.3	0	0
	8-32	23-29	6.1-7.3	0	0
	32-40	23-26	6.1-7.3	0	0
	40-44	10-19	6.1-7.3	0	0
	44-52	12-22	6.1-7.3	0	0
	52-79	10-19	6.1-7.3	0	0
138B:					
Clarion-----	0-7	16-21	5.6-7.3	0	0
	7-18	16-20	5.6-7.3	0	0
	18-36	19-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0
138C:					
Clarion-----	0-7	16-21	5.6-7.3	0	0
	7-18	16-20	5.6-7.3	0	0
	18-36	19-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0
175B:					
Dickinson-----	0-9	9.0-16	5.6-7.3	0	0
	9-18	8.6-13	5.1-6.5	0	0
	18-30	8.6-13	5.1-6.5	0	0
	30-36	3.3-8.6	5.1-6.5	0	0
	36-60	3.3-8.6	5.6-7.3	0	0
175C2:					
Dickinson, moderately eroded---	0-6	8.9-16	5.6-7.3	0	0
	6-32	8.4-13	5.1-6.5	0	0
	32-54	3.3-8.6	5.6-7.3	0	0
	54-80	3.3-8.6	5.6-7.3	0	0
199:					
Cylinder-----	0-8	19-23	5.6-7.3	0	0
	8-18	19-23	5.6-7.3	0	0
	18-28	18-25	6.1-7.3	0	0
	28-80	1.8-10	6.6-8.4	0-20	0
Nicollet-----	0-10	16-23	6.1-7.3	0	0
	10-17	17-26	6.1-7.3	0	0
	17-36	14-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0

Soil Survey of Dickinson County, Iowa—Part II

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
200:					
Cylinder-----	0-8	19-23	5.6-7.3	0	0
	8-18	19-23	5.6-7.3	0	0
	18-28	18-25	6.1-7.3	0	0
	28-80	1.8-10	6.6-8.4	0-20	0
Cylinder, calcareous	0-8	19-23	7.4-8.4	5-20	0
	8-23	19-23	7.4-8.4	5-20	0
	23-38	18-25	7.4-8.4	5-20	0
	38-68	1.8-10	7.4-8.4	5-20	0
	68-80	1.8-10	7.4-8.4	5-20	0
259:					
Biscay-----	0-7	22-26	6.1-7.8	0-10	0
	7-20	20-26	6.1-7.8	0-10	0
	20-28	15-24	6.6-7.8	0-10	0
	28-36	7.6-22	6.6-7.8	0-10	0
	36-80	1.0-5.5	7.4-8.4	5-20	0
274:					
Rolfe-----	0-10	25-29	5.1-7.3	0	0
	10-21	15-27	5.1-7.3	0	0
	21-55	28-33	6.1-7.3	0	0
	55-80	17-26	6.1-8.4	0-20	0
282:					
Ransom-----	0-8	24-32	6.6-7.3	0	0
	8-16	22-30	6.6-7.3	0	0
	16-33	17-26	6.6-7.8	0-10	0
	33-80	12-20	7.4-8.4	5-20	0
283B:					
Dickman-----	0-10	6.5-16	5.6-6.5	0	0
	10-12	6.2-16	5.6-6.5	0	0
	12-19	5.7-15	5.6-6.5	0	0
	19-33	5.7-12	5.6-7.3	0	0
	33-80	0.8-3.8	6.1-7.8	0-10	0
Clarion-----	0-7	16-21	5.6-7.3	0	0
	7-18	16-20	5.6-7.3	0	0
	18-36	19-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0
308:					
Wadena-----	0-8	16-23	6.1-7.3	0	0
	8-13	16-23	6.1-7.3	0	0
	13-30	15-22	5.6-7.3	0	0
	30-80	1.0-4.6	6.6-8.4	0-20	0
308B:					
Wadena-----	0-8	16-23	6.1-7.3	0	0
	8-13	16-23	6.1-7.3	0	0
	13-30	15-22	5.6-7.3	0	0
	30-80	1.0-4.6	6.6-8.4	0-20	0
308C:					
Wadena-----	0-8	16-23	6.1-7.3	0	0
	8-13	16-23	6.1-7.3	0	0
	13-30	15-22	5.6-7.3	0	0
	30-80	1.0-4.6	6.6-8.4	0-20	0

## Soil Survey of Dickinson County, Iowa—Part II

### Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
<b>327:</b>					
Wadena-----	0-8	16-23	6.1-7.3	0	0
	8-13	16-23	6.1-7.3	0	0
	13-30	15-22	5.6-7.3	0	0
	30-80	1.0-4.6	6.6-8.4	0-20	0
Augusta Lake-----	0-10	8.9-16	5.6-7.3	0	0
	10-15	8.8-13	5.6-7.3	0	0
	15-28	7.6-13	5.1-6.5	0	0
	28-46	3.3-8.6	5.6-7.8	0-10	0
	46-80	15-23	7.4-8.4	5-20	0
Clarion-----	0-7	16-21	5.6-7.3	0	0
	7-18	16-20	5.6-7.3	0	0
	18-36	19-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0
<b>327B:</b>					
Wadena-----	0-8	16-23	6.1-7.3	0	0
	8-13	16-23	6.1-7.3	0	0
	13-30	15-22	5.6-7.3	0	0
	30-80	1.0-4.6	6.6-8.4	0-20	0
Augusta Lake-----	0-10	8.9-16	5.6-7.3	0	0
	10-15	8.8-13	5.6-7.3	0	0
	15-28	7.6-13	5.1-6.5	0	0
	28-46	3.3-8.6	5.6-7.8	0-10	0
	46-80	15-23	7.4-8.4	5-20	0
Clarion-----	0-7	16-21	5.6-7.3	0	0
	7-18	16-20	5.6-7.3	0	0
	18-36	19-25	5.6-7.8	0-10	0
	36-60	8.9-18	7.6-8.4	5-20	0
<b>331:</b>					
Madelia-----	0-9	23-30	6.1-7.3	0	0
	9-19	23-30	6.1-7.3	0	0
	19-37	19-29	6.6-7.8	0-10	0
	37-60	15-28	7.4-8.4	5-20	0
<b>341C2:</b>					
Estherville, moderately eroded---	0-6	4.2-11	5.6-7.3	0	0
	6-18	3.9-10	5.6-7.3	0	0
	18-24	0.7-5.6	6.6-8.4	0-20	0
	24-29	0.7-5.6	6.6-8.4	0-20	0
	29-80	0.7-5.6	6.6-8.4	0-20	0
Pilot Grove, moderately eroded---	0-6	4.2-11	5.6-7.3	0	0
	6-18	4.3-11	5.6-7.3	0	0
	18-28	0.7-5.6	5.6-7.3	0	0
	28-34	0.7-5.6	6.6-8.4	0-20	0
	34-52	0.7-5.6	6.6-8.4	0-20	0
	52-80	3.1-17	7.4-8.4	5-20	0

Soil Survey of Dickinson County, Iowa—Part II

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth In	Cation- exchange capacity meq/100 g	Soil reaction pH	Calcium carbon- ate Pct	Gypsum Pct
<b>346B:</b>					
Augusta Lake-----	0-10	8.9-16	5.6-7.3	0	0
	10-15	8.8-13	5.6-7.3	0	0
	15-28	7.6-13	5.1-6.5	0	0
	28-46	3.3-8.6	5.6-7.8	0-10	0
	46-80	15-23	7.4-8.4	5-20	0
<b>Estherville-----</b>					
	0-7	5.6-14	5.6-7.3	0	0
	7-18	8.5-15	5.6-7.3	0	0
	18-80	0.8-5.8	6.6-8.4	0-20	0
<b>347B:</b>					
Augusta Lake-----	0-10	8.9-16	5.6-7.3	0	0
	10-15	8.8-13	5.6-7.3	0	0
	15-28	7.6-13	5.1-6.5	0	0
	28-46	3.3-8.6	5.6-7.8	0-10	0
	46-80	15-23	7.4-8.4	5-20	0
<b>347C:</b>					
Augusta Lake-----	0-10	8.9-16	5.6-7.3	0	0
	10-15	8.8-13	5.6-7.3	0	0
	15-28	8.3-13	5.6-7.3	0	0
	28-46	3.3-8.6	5.6-7.3	0	0
	46-80	15-23	7.4-8.4	5-20	0
<b>374B:</b>					
Okabena-----	0-10	23-28	5.6-7.3	0	0
	10-15	23-27	5.6-7.3	0	0
	15-22	15-27	5.6-7.3	0	0
	22-43	15-28	7.4-8.4	5-20	0
	43-48	14-25	7.4-8.4	5-20	0
	48-80	15-25	7.4-8.4	5-20	0
<b>374C:</b>					
Okabena-----	0-10	23-28	5.6-7.3	0	0
	10-15	23-27	5.6-7.3	0	0
	15-22	15-27	5.6-7.3	0	0
	22-43	15-28	7.4-8.4	5-20	0
	43-48	14-25	7.4-8.4	5-20	0
	48-80	15-25	7.4-8.4	5-20	0
<b>390:</b>					
Waldorf-----	0-9	29-32	6.1-7.3	0	0
	9-20	28-32	6.1-7.3	0	0
	20-45	29-40	6.6-7.8	0-10	0
	45-80	26-39	7.4-8.4	5-20	0
<b>397:</b>					
Letri-----	0-9	23-30	6.1-7.8	0-10	0
	9-20	22-29	6.1-7.8	0-10	0
	20-41	15-28	6.1-7.8	0-10	0
	41-80	18-25	6.6-8.4	0-20	0
<b>456:</b>					
Wilmonton-----	0-8	23-30	6.1-7.3	0	0
	8-17	23-29	6.1-7.3	0	0
	17-25	20-27	6.1-7.8	0-10	0
	25-55	18-25	7.6-8.4	5-20	0
	55-80	18-25	7.6-8.4	5-20	0

Soil Survey of Dickinson County, Iowa—Part II

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth In	Cation- exchange capacity meq/100 g	Soil reaction pH	Calcium carbon- ate Pct	Gypsum Pct
485: Spillville, occasionally flooded	0-8	16-22	5.6-7.3	0	0
	8-54	15-22	5.6-7.3	0	0
	54-79	12-20	5.6-7.3	0	0
507: Canisteo-----	0-10	23-30	7.6-8.4	5-20	0
	10-18	23-29	7.6-8.4	5-20	0
	18-39	17-29	7.6-8.4	5-20	0
	39-80	9.6-18	7.6-8.4	5-20	0
511: Blue Earth-----	0-10	8.8-54	7.6-8.4	5-20	0
	10-68	8.8-54	7.6-8.4	5-20	0
	68-80	13-25	7.6-8.4	5-20	0
557: Talcot-----	0-10	24-30	7.6-8.4	5-20	0
	10-26	25-29	7.6-8.4	5-20	0
	26-30	20-28	7.6-8.4	5-20	0
	30-60	1.1-5.6	7.6-8.4	5-20	0
Biscay-----	0-7	22-26	6.1-7.8	0-10	0
	7-20	20-26	6.1-7.8	0-10	0
	20-28	15-24	6.6-7.8	0-10	0
	28-36	7.6-22	6.6-7.8	0-10	0
	36-80	1.0-5.5	7.4-8.4	5-20	0
559: Talcot-----	0-10	24-30	7.6-8.4	5-20	0
	10-26	25-29	7.6-8.4	5-20	0
	26-30	20-28	7.6-8.4	5-20	0
	30-60	1.1-5.6	7.6-8.4	5-20	0
574C2: Bolan, moderately eroded-----	0-7	17-22	5.6-7.3	0	0
	7-20	8.9-17	5.6-7.3	0	0
	20-35	7.6-13	5.6-7.3	0	0
	35-80	1.8-7.1	5.6-7.3	0	0
Augusta Lake, moderately eroded---	0-6	9.4-15	5.6-7.3	0	0
	6-25	8.3-13	5.6-7.3	0	0
	25-48	3.3-8.6	5.6-7.3	0	0
	48-80	16-23	7.4-8.4	5-20	0
577B: Everly-----	0-8	23-25	5.6-7.3	0	0
	8-12	22-25	5.6-7.3	0	0
	12-26	20-28	6.1-7.3	0	0
	26-50	15-25	7.4-8.4	5-20	0
	50-80	15-25	7.4-8.4	5-20	0
577C2: Everly, moderately eroded-----	0-7	22-25	5.6-7.3	0	0
	7-26	20-28	6.1-7.3	0	0
	26-80	15-25	7.6-8.4	5-20	0

Soil Survey of Dickinson County, Iowa—Part II

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth In	Cation- exchange capacity meq/100 g	Soil reaction pH	Calcium carbon- ate Pct	Gypsum Pct
<b>586B:</b>					
Coland, occasionally flooded-----	0-8	23-30	6.1-7.3	0	0
	8-32	23-29	6.1-7.3	0	0
	32-40	23-26	6.1-7.3	0	0
	40-44	10-19	6.1-7.3	0	0
	44-52	12-22	6.1-7.3	0	0
	52-60	10-19	6.1-7.3	0	0
<b>Spillville, occasionally flooded</b>					
	0-8	16-22	5.6-7.3	0	0
	8-54	15-22	5.6-7.3	0	0
	54-79	12-20	5.6-7.3	0	0
<b>634E2:</b>					
Belview, moderately eroded-----	0-6	15-23	7.4-8.4	5-20	0
	6-32	15-23	7.4-8.4	5-20	0-1
	32-79	8.9-18	7.6-8.4	5-20	0-1
<b>Omsrud, moderately eroded-----</b>					
	0-6	17-22	5.6-7.3	0	0
	6-20	18-25	5.6-7.3	0	0
	20-30	15-23	7.4-8.4	5-20	0-1
	30-80	8.9-18	7.6-8.4	5-20	0
<b>634G:</b>					
Belview-----	0-9	16-23	7.4-8.4	5-20	0
	9-50	15-23	7.4-8.4	5-20	0-1
	50-60	8.9-18	7.6-8.4	5-20	0
<b>Omsrud-----</b>					
	0-9	17-22	5.6-7.3	0	0
	9-18	18-25	5.6-7.3	0	0
	18-36	15-23	7.4-8.4	5-20	0-1
	36-80	8.9-18	7.6-8.4	5-20	0
<b>635C2:</b>					
Belview, moderately eroded-----	0-6	15-23	7.4-8.4	5-20	0
	6-32	13-23	7.4-8.4	5-20	0-1
	32-79	8.9-18	7.6-8.4	5-20	0-1
<b>Storden, moderately eroded-----</b>					
	0-6	15-23	7.6-8.4	5-20	0
	6-44	15-24	7.6-8.4	5-20	0
	44-80	8.9-18	7.6-8.4	5-20	0
<b>638C2:</b>					
Clarion, moderately eroded-----	0-6	16-21	5.6-7.3	0	0
	6-16	15-20	5.6-7.3	0	0
	16-28	15-20	5.6-7.8	0-10	0
	28-80	9.6-18	7.6-8.4	5-20	0
<b>Storden, moderately eroded-----</b>					
	0-6	15-23	7.6-8.4	5-20	0
	6-44	15-24	7.6-8.4	5-20	0
	44-80	8.9-18	7.6-8.4	5-20	0

# Soil Survey of Dickinson County, Iowa—Part II

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
655:					
Crippin-----	0-7	19-23	6.6-8.4	0-20	0
	7-20	19-23	6.6-8.4	0-20	0
	20-35	20-25	7.4-8.4	5-20	0
	35-60	8.9-18	7.6-8.4	5-20	0
733:					
Calco, occasionally flooded-----	0-8	24-28	7.6-8.4	5-20	0
	8-28	24-28	7.6-8.4	5-20	0
	28-38	25-29	7.6-8.4	5-20	0
	38-80	18-26	7.6-8.4	5-20	0
735:					
Havelock, occasionally flooded	0-9	18-30	7.6-8.4	5-20	0
	9-40	22-29	7.6-8.4	5-20	0
	40-60	8.9-22	7.6-8.4	5-20	0
740D:					
Hawick-----	0-7	6.5-9.7	6.1-7.8	0-10	0
	7-11	0.8-7.2	6.1-7.8	0-10	0
	11-80	0.8-3.8	7.4-8.4	5-20	0
740F:					
Hawick-----	0-7	6.5-9.7	6.1-7.8	0-10	0
	7-11	0.8-7.2	6.1-7.8	0-10	0
	11-80	0.8-3.8	7.4-8.4	5-20	0
740G:					
Hawick-----	0-7	6.5-9.7	6.1-7.8	0-10	0
	7-11	0.8-7.2	6.1-7.8	0-10	0
	11-80	0.8-3.8	7.4-8.4	5-20	0
835D2:					
Omsrud, moderately eroded-----	0-6	17-22	5.6-7.3	0	0
	6-20	18-25	5.6-7.3	0	0
	20-30	15-23	7.4-8.4	5-20	0-1
	30-80	8.9-18	7.6-8.4	5-20	0
Storden, moderately eroded-----	0-6	15-23	7.6-8.4	5-20	0
	6-44	15-24	7.6-8.4	5-20	0
	44-80	8.9-18	7.6-8.4	5-20	0
854D:					
Histosols, fens-----	0-35	24-187	7.4-7.8	5-10	0
	35-80	10-21	7.6-8.4	5-20	0
875B:					
Roine-----	0-8	9.9-21	5.6-7.3	0	0
	8-48	9.7-21	5.6-7.3	0	0
	48-52	8.3-21	7.4-8.4	5-20	0
	52-59	8.3-21	7.4-8.4	5-20	0
	59-80	17-25	7.4-8.4	5-20	0
878:					
Ocheyedan-----	0-7	20-23	5.6-7.3	0	0
	7-14	20-23	5.6-7.3	0	0
	14-34	12-20	6.1-7.8	0-10	0
	34-65	8.9-22	6.6-8.4	0-20	0
	65-80	17-27	6.6-8.4	0-20	0

Soil Survey of Dickinson County, Iowa—Part II

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-	Soil	Calcium	Gypsum
	In	exchange capacity	reaction pH	carbon- ate	Pct
878B:					
Ocheyedan-----	0-7	20-23	5.6-7.3	0	0
	7-14	20-23	5.6-7.3	0	0
	14-34	12-20	6.1-7.8	0-10	0
	34-65	8.9-22	6.6-8.4	0-20	0
	65-80	17-27	6.6-8.4	0-20	0
879:					
Fostoria-----	0-7	20-24	5.6-7.3	0	0
	7-19	22-25	5.6-7.3	0	0
	19-34	20-28	6.1-7.3	0	0
	34-68	15-25	7.6-8.4	5-20	0
	68-79	8.9-18	7.6-8.4	5-20	0
1032:					
Spicer-----	0-12	25-30	7.4-8.4	5-20	0
	12-16	16-29	7.4-8.4	5-20	0
	16-40	15-28	7.4-8.4	5-20	0
	40-60	13-26	7.4-8.4	5-20	0
1091:					
McCreath-----	0-6	24-30	5.6-7.3	0	0
	6-17	24-29	5.6-7.3	0	0
	17-35	23-28	6.1-8.4	0-20	0
	35-44	17-24	7.9-8.4	15-20	0
	44-80	15-23	7.9-8.4	15-20	0
1091B:					
McCreath-----	0-6	24-30	5.6-7.3	0	0
	6-17	24-29	5.6-7.3	0	0
	17-35	23-28	6.1-8.4	0-20	0
	35-44	17-24	7.9-8.4	15-20	0
	44-80	15-23	7.9-8.4	15-20	0
1092:					
Gillett Grove-----	0-8	30-35	6.1-7.8	0-10	0
	8-17	30-35	6.1-7.8	0-10	0
	17-44	24-29	6.1-8.4	0-20	0
	44-57	17-28	7.9-8.4	15-20	0
	57-62	17-25	7.9-8.4	15-20	0
1511:					
Blue Earth, ponded---	0-10	8.8-54	7.6-8.4	5-20	0
	10-68	8.8-54	7.6-8.4	5-20	0
	68-80	13-25	7.6-8.4	5-20	0
1707B:					
Delft-----	0-12	22-30	5.6-7.8	0-10	0
	12-29	16-30	5.6-7.8	0-10	0
	29-34	15-29	6.6-7.8	0-10	0
	34-46	8.9-25	7.4-8.4	5-20	0
	46-60	15-27	7.4-8.4	5-20	0
Terril-----	0-9	16-25	6.1-7.3	0	0
	9-36	15-27	6.1-7.3	0	0
	36-50	19-24	6.1-7.3	0	0
	50-60	8.9-18	7.6-8.4	5-20	0

## Soil Survey of Dickinson County, Iowa—Part II

### Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
2700C:					
Ridgeton-----	0-10	16-22	6.1-7.3	0	0
	10-29	15-22	6.1-7.3	0	0
	29-38	16-22	6.1-7.3	0	0
	38-50	15-24	6.1-7.3	0	0
	50-80	15-23	7.4-8.4	5-20	0
4946B.					
Udorthents-Highway					
5010.					
Pits, sand and gravel					
5040.					
Udorthents, loamy					
AW.					
Animal waste lagoon					
SL.					
Sewage lagoon					
W.					
Water					

## Water Features

The table described in this section gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

*Water table* refers to a saturated zone in the soil. The table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

*Ponding* is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

*Flooding* is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

*Duration* and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual

weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

## Soil Survey of Dickinson County, Iowa—Part II

### Water Features

(See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
6: Okoboji-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.5-2.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		June	1.0-2.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		July	2.0-3.5	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
27B: Terril-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
28B: Dickman-----	A	Jan-Dec	---	---	---	---	None	---	None
32: Spicer-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
34: Estherville-----	A	Jan-Dec	---	---	---	---	None	---	None
34B: Estherville-----	A	Jan-Dec	---	---	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
34C2: Estherville, moderately eroded-----	A	Jan-Dec	---	---	---	---	None	---	None
55: Nicollet-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
77B: Sac-----	C	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
95: Harps-----	B/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
107: Webster-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
135: Coland, occasionally flooded-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		March	0.5-2.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.5-1.5	>6.0	---	---	None	Brief	Occasional
		June	1.0-2.0	>6.0	---	---	None	Brief	Occasional
		July	2.0-3.0	>6.0	---	---	None	Brief	Occasional
		August	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		September	3.0-4.0	>6.0	---	---	None	Brief	Occasional
		October	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		November	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		December	2.0-3.5	>6.0	---	---	None	---	None
138B: Clarion-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
138C: Clarion-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
175B: Dickinson-----	A	Jan-Dec	---	---	---	---	None	---	None
175C2: Dickinson, moderately eroded-----	A	Jan-Dec	---	---	---	---	None	---	None
199: Cylinder-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
Nicollet-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
200: Cylinder-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
200: Cylinder, calcareous-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
259: Biscay-----	B/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
274: Rolfe-----	D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.5-2.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		June	1.0-2.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		July	2.0-3.5	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
282: Ransom-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
283B: Dickman-----	A	Jan-Dec	---	---	---	---	None	---	None
Clarion-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
308: Wadena-----	B	Jan-Dec	---	---	---	---	None	---	None
308B: Wadena-----	B	Jan-Dec	---	---	---	---	None	---	None
308C: Wadena-----	B	Jan-Dec	---	---	---	---	None	---	None
327: Wadena-----	B	Jan-Dec	---	---	---	---	None	---	None
Augusta Lake-----	A	Jan-Dec	---	---	---	---	None	---	None
Clarion-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
327B: Wadena-----	B	Jan-Dec	---	---	---	---	None	---	None
Augusta Lake-----	A	Jan-Dec	---	---	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
327B: Clarion-----	B								
		January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
331: Madelia-----	B/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
341C2: Estherville, moderately eroded-----	A	Jan-Dec	---	---	---	---	None	---	None
Pilot Grove, moderately eroded-----	A	Jan-Dec	---	---	---	---	None	---	None
346B: Augusta Lake-----	A	Jan-Dec	---	---	---	---	None	---	None
Estherville-----	A	Jan-Dec	---	---	---	---	None	---	None
347B: Augusta Lake-----	A	Jan-Dec	---	---	---	---	None	---	None
347C: Augusta Lake-----	A	Jan-Dec	---	---	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
374B: Okabena-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
374C: Okabena-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
390: Waldorf-----	D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
397: Letri-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
456: Wilmington-----	C/D								
		January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
485: Spillville, occasionally flooded-----	B/D								
		January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	Brief	Occasional
		March	1.5-4.0	>6.0	---	---	None	Brief	Occasional
		April	1.0-3.5	>6.0	---	---	None	Brief	Occasional
		May	1.5-4.0	>6.0	---	---	None	Brief	Occasional
		June	2.0-4.5	>6.0	---	---	None	Brief	Occasional
		July	3.0-5.5	>6.0	---	---	None	Brief	Occasional
		August	3.5-6.0	>6.0	---	---	None	Brief	Occasional
		September	4.0-6.5	>6.0	---	---	None	Brief	Occasional
		October	3.5-6.0	>6.0	---	---	None	Brief	Occasional
		November	2.5-5.0	>6.0	---	---	None	Brief	Occasional
		December	3.0-5.5	>6.0	---	---	None	---	None
507: Canisteeo-----	C/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
511: Blue Earth-----	C/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.5-2.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		June	1.0-2.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		July	2.0-3.5	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
557: Talcot-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
Biscay-----	B/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
559: Talcot-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
574C2: Bolan, moderately eroded--	B	Jan-Dec	---	---	---	---	None	---	None
Augusta Lake, moderately eroded-----	A	Jan-Dec	---	---	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
577B: Everly-----	C	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
577C2: Everly, moderately eroded	C	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
586B: Coland, occasionally flooded-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		March	0.5-2.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.5-1.5	>6.0	---	---	None	Brief	Occasional
		June	1.0-2.0	>6.0	---	---	None	Brief	Occasional
		July	2.0-3.0	>6.0	---	---	None	Brief	Occasional
		August	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		September	3.0-4.0	>6.0	---	---	None	Brief	Occasional
		October	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		November	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		December	2.0-3.5	>6.0	---	---	None	---	None
Spillville, occasionally flooded-----	B/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	Brief	Occasional
		March	1.5-4.0	>6.0	---	---	None	Brief	Occasional
		April	1.0-3.5	>6.0	---	---	None	Brief	Occasional
		May	1.5-4.0	>6.0	---	---	None	Brief	Occasional
		June	2.0-4.5	>6.0	---	---	None	Brief	Occasional
		July	3.0-5.5	>6.0	---	---	None	Brief	Occasional
		August	3.5-6.0	>6.0	---	---	None	Brief	Occasional
		September	4.0-6.5	>6.0	---	---	None	Brief	Occasional
		October	3.5-6.0	>6.0	---	---	None	Brief	Occasional
		November	2.5-5.0	>6.0	---	---	None	Brief	Occasional
		December	3.0-5.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
634E2: Belview, moderately eroded	B	Jan-Dec	---	---	---	---	None	---	None
Omsrud, moderately eroded	C	Jan-Dec	---	---	---	---	None	---	None
634G: Belview-----	B	Jan-Dec	---	---	---	---	None	---	None
Omsrud-----	C	Jan-Dec	---	---	---	---	None	---	None
635C2: Belview, moderately eroded	B	Jan-Dec	---	---	---	---	None	---	None
Storden, moderately eroded	B	Jan-Dec	---	---	---	---	None	---	None
638C2: Clarion, moderately eroded	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
Storden, moderately eroded	B	Jan-Dec	---	---	---	---	None	---	None
655: Crippin-----	B/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
733: Calco, occasionally flooded-----	C/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		March	0.5-2.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.5-1.5	>6.0	---	---	None	Brief	Occasional
		June	1.0-2.0	>6.0	---	---	None	Brief	Occasional
		July	2.0-3.0	>6.0	---	---	None	Brief	Occasional
		August	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		September	3.0-4.0	>6.0	---	---	None	Brief	Occasional
		October	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		November	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		December	2.0-3.5	>6.0	---	---	None	---	None
735: Havelock, occasionally flooded-----	C/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		March	0.5-2.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.5-1.5	>6.0	---	---	None	Brief	Occasional
		June	1.0-2.0	>6.0	---	---	None	Brief	Occasional
		July	2.0-3.0	>6.0	---	---	None	Brief	Occasional
		August	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		September	3.0-4.0	>6.0	---	---	None	Brief	Occasional
		October	2.5-3.5	>6.0	---	---	None	Brief	Occasional
		November	1.5-3.0	>6.0	---	---	None	Brief	Occasional
		December	2.0-3.5	>6.0	---	---	None	---	None
740D: Hawick-----	A								
		Jan-Dec	---	---	---	---	None	---	None
740F: Hawick-----	A								
		Jan-Dec	---	---	---	---	None	---	None
740G: Hawick-----	A								
		Jan-Dec	---	---	---	---	None	---	None
835D2: Omsrud, moderately eroded	C								
		Jan-Dec	---	---	---	---	None	---	None
Storden, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding		Flooding		
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
854D: Histosols, fens-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
875B: Roine-----	A	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
878: Ocheyedan-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
878B: Ocheyedan-----	B	January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit Ft	Lower limit Ft	Surface water depth Ft	Duration	Frequency	Duration	Frequency
879: Fostoria-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
1032: Spicer-----	C/D	January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
1091: McCreath-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None
1091B: McCreath-----	C/D	January	3.0-5.5	>6.0	---	---	None	---	None
		February	2.5-5.0	>6.0	---	---	None	---	None
		March	1.5-4.0	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.5-4.0	>6.0	---	---	None	---	None
		June	2.0-4.5	>6.0	---	---	None	---	None
		July	3.0-5.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	4.0-6.5	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	2.5-5.0	>6.0	---	---	None	---	None
		December	3.0-5.5	>6.0	---	---	None	---	None

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
1092: Gillett Grove-----	C/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
1511: Blue Earth, ponded-----	C/D								
		Jan-Dec	0.0	>6.0	0.0-1.0	Very long	Frequent	---	None
1707B: Delft-----	C/D								
		January	2.0-3.5	>6.0	---	---	None	---	None
		February	1.5-3.0	>6.0	---	---	None	---	None
		March	0.5-2.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.5-1.5	>6.0	---	---	None	---	None
		June	1.0-2.0	>6.0	---	---	None	---	None
		July	2.0-3.0	>6.0	---	---	None	---	None
		August	2.5-3.5	>6.0	---	---	None	---	None
		September	3.0-4.0	>6.0	---	---	None	---	None
		October	2.5-3.5	>6.0	---	---	None	---	None
		November	1.5-3.0	>6.0	---	---	None	---	None
		December	2.0-3.5	>6.0	---	---	None	---	None
Terril-----	B								
		January	6.0-6.7	>6.0	---	---	None	---	None
		February	5.5-6.7	>6.0	---	---	None	---	None
		March	4.5-6.5	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.5-6.5	>6.0	---	---	None	---	None
		June	5.0-6.7	>6.0	---	---	None	---	None
		July	6.0-6.7	>6.0	---	---	None	---	None
		August	6.5-6.7	>6.0	---	---	None	---	None
		September	6.5-6.7	>6.0	---	---	None	---	None
		October	6.5-6.7	>6.0	---	---	None	---	None
		November	5.5-6.7	>6.0	---	---	None	---	None
		December	6.0-6.7	>6.0	---	---	None	---	None
2700C: Ridgeton-----	B								
		Jan-Dec	---	---	---	---	None	---	None
4946B. Udorthents-Highway									
5010. Pits, sand and gravel									

Soil Survey of Dickinson County, Iowa—Part II

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table			Ponding		Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
5040. Udorthents, loamy									
AW. Animal waste lagoon									
SL. Sewage lagoon									
W. Water									

## Soil Features

The table described in this section gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

*Subsidence* is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

*Potential for frost action* is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

# Soil Survey of Dickinson County, Iowa—Part II

## Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
6: Okoboji-----	---	---	High	High	Low
27B: Terril-----	---	---	Moderate	Moderate	Low
28B: Dickman-----	---	---	Low	Low	Moderate
32: Spicer-----	---	---	High	High	Low
34: Estherville-----	---	---	Low	Low	Moderate
34B: Estherville-----	---	---	Low	Low	Moderate
34C2: Estherville, moderately eroded-----	---	---	Low	Low	Moderate
55: Nicollet-----	---	---	High	High	Low
77B: Sac-----	---	---	High	High	Moderate
95: Harps-----	---	---	High	High	Low
107: Webster-----	---	---	High	High	Low
135: Coland, occasionally flooded-----	---	---	High	High	Low
138B: Clarion-----	---	---	Moderate	Moderate	Low
138C: Clarion-----	---	---	Moderate	Moderate	Low
175B: Dickinson-----	---	---	Moderate	Low	Moderate
175C2: Dickinson, moderately eroded-----	---	---	Moderate	Low	Moderate
199: Cylinder-----	---	---	High	High	Low
Nicollet-----	---	---	High	High	Low
200: Cylinder-----	---	---	High	High	Low
Cylinder, calcareous-----	---	---	High	High	Moderate

Soil Survey of Dickinson County, Iowa—Part II

Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
259: Biscay-----	---	---	High	High	Low
274: Rolfe-----	---	---	High	High	Low
282: Ransom-----	---	---	High	High	Low
283B: Dickman-----	---	---	Low	Low	Moderate
Clarion-----	---	---	Moderate	Moderate	Low
308: Wadena-----	---	---	Low	High	Moderate
308B: Wadena-----	---	---	Low	High	Moderate
308C: Wadena-----	---	---	Low	High	Moderate
327: Wadena-----	---	---	Low	High	Moderate
Augusta Lake-----	---	---	Moderate	Low	Moderate
Clarion-----	---	---	Moderate	Moderate	Low
327B: Wadena-----	---	---	Moderate	High	Moderate
Augusta Lake-----	---	---	Moderate	Low	Moderate
Clarion-----	---	---	Moderate	Moderate	Low
331: Madelia-----	---	---	High	High	Low
341C2: Estherville, moderately eroded-----	---	---	Low	Low	Moderate
Pilot Grove, moderately eroded-----	---	---	Low	Low	Moderate
346B: Augusta Lake-----	---	---	Moderate	Low	Moderate
Estherville-----	---	---	Low	Low	Moderate
347B: Augusta Lake-----	---	---	Moderate	Low	Moderate
347C: Augusta Lake-----	---	---	Moderate	Low	Moderate
374B: Okabena-----	---	---	High	High	Low
374C: Okabena-----	---	---	High	High	Low

Soil Survey of Dickinson County, Iowa—Part II

Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
390: Waldorf-----	---	---	High	High	Low
397: Letri-----	---	---	High	High	Low
456: Wilmington-----	---	---	High	High	Low
485: Spillville, occasionally flooded-----	---	---	Moderate	High	Low
507: Canisteo-----	---	---	High	High	Low
511: Blue Earth-----	---	---	High	High	Low
557: Talcot-----	---	---	High	High	Low
Biscay-----	---	---	High	High	Low
559: Talcot-----	---	---	High	High	Low
574C2: Bolan, moderately eroded-----	---	---	Moderate	Low	Moderate
Augusta Lake, moderately eroded-----	---	---	Moderate	Low	Moderate
577B: Everly-----	---	---	Moderate	High	Low
577C2: Everly, moderately eroded-----	---	---	Moderate	High	Low
586B: Coland, occasionally flooded-----	---	---	High	High	Low
Spillville, occasionally flooded-----	---	---	Moderate	High	Low
634E2: Belview, moderately eroded-----	---	---	Moderate	Low	Low
Omsrud, moderately eroded-----	---	---	Moderate	Moderate	Low
634G: Belview-----	---	---	Moderate	Low	Low
Omsrud-----	---	---	Moderate	Low	Low
635C2: Belview, moderately eroded-----	---	---	Moderate	Low	Low
Storden, moderately eroded-----	---	---	Moderate	Low	Low
638C2: Clarion, moderately eroded-----	---	---	Moderate	Moderate	Low
Storden, moderately eroded-----	---	---	Moderate	Low	Low

Soil Survey of Dickinson County, Iowa—Part II

Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
655: Crippin-----	---	---	High	High	Low
733: Calco, occasionally flooded-----	---	---	High	High	Low
735: Havelock, occasionally flooded-----	---	---	High	High	Low
740D: Hawick-----	---	---	Low	Low	Low
740F: Hawick-----	---	---	Low	Low	Low
740G: Hawick-----	---	---	Low	Low	Low
835D2: Omsrud, moderately eroded-----	---	---	Moderate	Moderate	Low
Storden, moderately eroded-----	---	---	Moderate	Low	Low
854D: Histosols, fens-----	2-4	25-32	High	High	Moderate
875B: Roine-----	---	---	Moderate	Moderate	Low
878: Ocheyedan-----	---	---	Moderate	Moderate	Low
878B: Ocheyedan-----	---	---	Moderate	Moderate	Low
879: Fostoria-----	---	---	High	High	Low
1032: Spicer-----	---	---	High	High	Low
1091: McCreath-----	---	---	High	High	Low
1091B: McCreath-----	---	---	High	High	Low
1092: Gillett Grove-----	---	---	High	High	Low
1511: Blue Earth, ponded-----	---	---	High	Moderate	Low
1707B: Delft-----	---	---	High	High	Low
Terril-----	---	---	Moderate	Moderate	Low
2700C: Ridgeton-----	---	---	Moderate	Low	Low

# Soil Survey of Dickinson County, Iowa—Part II

## Soil Features--Continued

Map symbol and soil name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
4946B. Udorthents-Highway					
5010. Pits, sand and gravel					
5040. Udorthents, loamy					
AW. Animal waste lagoon					
SL. Sewage lagoon					
W. Water					

# **NRCS Accessibility Statement**

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