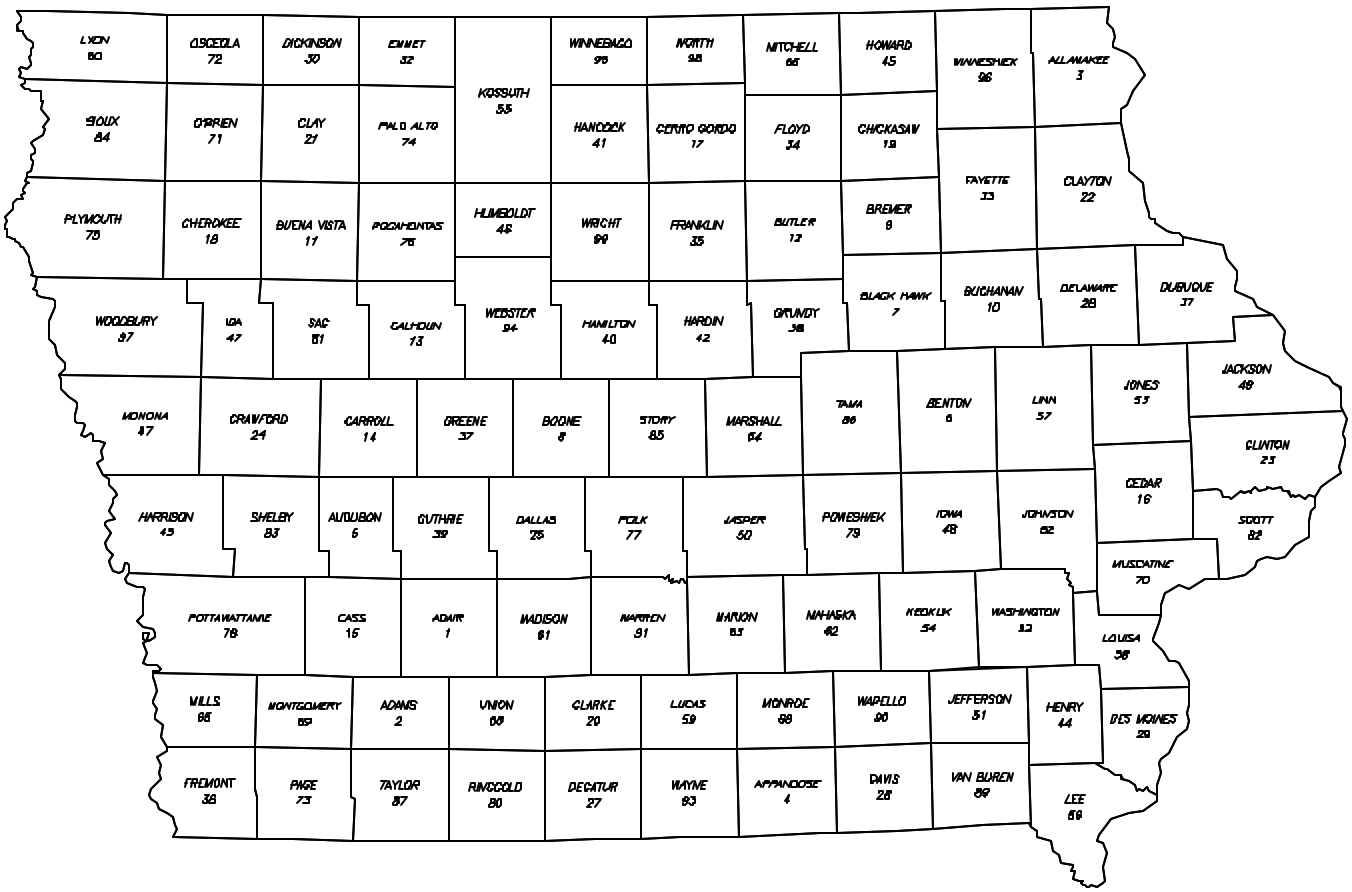
(ISPAID 6.0)

IOWA SOIL PROPERTIES AND INTERPRETATIONS DATABASE

July 1996



IOWA STATE UNIVERSITY
Iowa Agriculture and Home Economics Experiment Station
University Extension Service

in cooperation with the

UNITED STATES DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

and the

IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
Division of Soil Conservation

Item #	Field Name	Field width	Field Character Position	Field description	Unit of measure	Documen-tation status[a]
1	SMS	6	01-06	Soil Map Symbol	--	11-88
2	SMU	6	07-12	Soil Map Unit	--	04-89
3	SCSSOIL5	6	13-18	NRCS-Soils-5 Number	--	05-85
4	SOILNAME	22	19-40	Soil Name	--	02-86
5	LCC	2	41-42	Land Capability Class/Subclass	--	09-85
6	PRIMELND	2	43-44	USDA Prime Farmland	--	05-85
7	LEAGFMLND	2	45-46	LEAG Farmland Units	--	02-86
8	CSR	3	47-49	Corn Suitability Rating[b]	--	02-86
9	CORNYLD	3	50-52	Corn Yield	bu/ac	07-86
10	SOYBNYLD	2	53-54	Soybean Yield	bu/ac	07-86
11	OATYLD	3	55-57	Oat Yield	bu/ac	07-86
12	WHEATYLD	2	58-59	Wheat Yield	bu/ac	07-86
13	ALFBRMYLD	3	60-62	Alfalfa-Bromegrass Yield	T/ac	02-88
14	TIGRSYLD	3	63-65	Tall Introduced Grasses Yield	aum/ac	02-88
15	KYBGYLD	3	66-68	Kentucky Bluegrass Yield	aum/ac	02-88
16	MSA	2	69-70	Major Soil Area	--	05-85
17	MLRA	3	71-73	Major Land Resource Area	--	02-86
18	ADDMLRA	1	74	No. of Additional MLRA's	--	02-86
19	ACREAGE	7	75-81	Acreage	ac	02-86
20	SLOPERNGL	2	82-83	Slope Range Low	%	04-88
21	SLOPERNGH	2	84-85	Slope Range High	%	04-88
22	ORDER	1	86	Taxonomic Classification (order)	--	04-88
23	SUBORDER	2	87-88	Taxonomic Classification (suborder)	--	04-88
24	GREATGROUP	2	89-90	Taxonomic Classification (great group)	--	04-88
25	SUBGROUP	2	91-92	Taxonomic Classification (subgroup)	--	04-88
26	FAMILY	2	93-94	Taxonomic Classification (family)	--	04-88
27	SMUKIND	1	95	Kind of Map Unit	--	05-85
28	COMPKIND	1	96	Kind of Component	--	05-85
29	HYDROGRP	3	97-99	Hydrologic Group	--	07-86
30	HYDSOILCD	1	100	Hydric Soil Code	--	04-89
31	FLOODFRQ	6	101-106	Flooding Frequency	--	04-88
32	FLOODFRQCD	2	107-108	Flooding Frequency Code	--	07-86
33	AVWATCAPL	5	109-113	Available Water Capacity Low	in/5 ft.	05-85
34	AVWATCAPH	5	114-118	Available Water Capacity High	in/5 ft.	05-85
35	SURBDL	4	119-122	Surface Bulk Density Low	g/cm^3	02-86
36	SURBDH	4	123-126	Surface Bulk Density High	g/cm^3	02-86
37	SUBSLBDL	4	127-130	Subsoil Bulk Density Low	g/cm^3	02-86
38	SUBSLBDH	4	131-134	Subsoil Bulk Density High	g/cm^3	02-86
39	SUBSOILP	3	135-137	Subsoil P	--	10-92
40	SUBSOILK	3	138-140	Subsoil K	--	10-92
41	SUBSOILGRP	1	141	Subsoil Group	--	07-86
42	NATIVEVEG	1	142	Native Vegetation	--	05-85
43	PARENTMAT	2	143-144	Parent Material	--	06-89
44	LNDSCPPOS	2	145-146	Landscape Position	--	04-88
45	DEPTHCNTRS	2	147-148	Depth to Strongly Contrasting Particle-Size Class (0-40") Shallow	in.	03-88
46	DEPTHCNTRD	2	149-150	Depth to Strongly Contrasting Particle-Size Class (0-40") Deep	in.	03-88
47	TXCMPD060S	2	151-152	Depth to Textural or Compositional Discontinuity (0-60") Shallow	in.	06-89
48	TXCMPD060D	2	153-154	Depth to Textural or Compositional Discontinuity (0-60") Deep	in.	06-89
49	TXCMP060CD	1	155	Textural or Compositional Discontinuity Code	--	06-89

Item #	Field Name	Field width	Field Character Position	Field description	Unit of measure	Documen-tation status[a]
50	TXCMPD080S	2	156-157	Depth to Textural or Compositional Discontinuity (0-80") Shallow	in.	06-95
51	TXCMPD080D	2	158-159	Depth to Textural or Compositional Discontinuity (0-80") Deep	in.	06-95
52	TXCMP080CD	1	160	Textural or Compositional Discontinuity Code	--	06-95
53	DPTHHIWTRS	3	161-163	Depth to High Water Table Shallow	ft.	11-89
54	DPTHHIWTRD	3	164-166	Depth to High Water Table Deep	ft.	11-89
55	PERM	5	167-171	Permeability	--	04-88
56	PERMCODE	2	172-173	Permeability Code	--	04-88
57	DRNCLASS	5	174-178	Drainage Class (natural)	--	07-86
58	DRNCLSCD	2	179-180	Drainage Class Code (natural)	--	07-86
59	TEXTSURHOR	8	181-188	Texture (surface horizon)	--	05-85
60	EROSIONC	3	189-191	Erosion Class	--	05-85
61	OMM	4	192-195	Organic Matter Midpoint	%	04-88
62	OMR	4	196-199	Organic Matter Range (±)	%	04-88
63	OMRL	4	200-203	Organic Matter Range Low	%	09-88
64	OMRH	4	204-207	Range Low	meq/100g	07-86
65	PHSURL	3	208-210	pH (surface horizon) Low	--	07-86
66	PHSURH	3	211-213	pH (surfsce horizon) High	--	07-86
67	CECL	2	214-215	CEC Range Low	meq/100g	07-86
68	CECH	2	216-217	CEC Range High	meq/100g	07-86
69	KFACTOR	4	218-221	K Factor	--	07-86
70	KFFACTOR	4	222-225	KF Factor	--	09-95
71	TFACTOR	1	226	T Factor	T/ac/yr	07-86
72	WINDERGRP	2	227-228	Wind Erodibility Group	--	07-86
73	CLAYSURL	2	229-230	Clay Content (surface) Low	%	07-86
74	CLAYSURH	2	231-232	Clay Content (surface) High	%	07-86
75	SANDCONTSL	2	233-234	Sand Content (surface) Low	%	07-86
76	SANDCONTSH	2	235-236	Sand Content (surface) High	%	07-86
77	SANDSIZESH	1	237	Sand Size (surface horizon)	--	04-88
78	TOPSOILMP	2	238-239	Topsoil Thickness Midpoint	in.	07-86
79	TOPSOILRNG	2	240-241	Topsoil Thickness Range (±)	in.	07-86
80	SURCOLVL	1	242	Surface Layer Color Value	--	01-90
81	SURCOLCHR	1	243	Surface Layer Color Chroma	--	01-90
82	MOLCOLMD	2	244-245	Thickness of Mollic Colors Midpoint	in.	01-90
83	MOLCOLRNG	2	246-247	Thickness of Mollic Colors Range (±)	in.	01-90
84	DPTFREECAR	1	248	Depth to Free Carbonates	--	07-86
85	TONSRES	3	249-251	Tons of Residue/Acre	T/ac	04-88
86	TILTHRTG	1	252	Tilth Rating	--	04-89
87	PWRINDX	3	253-255	Power Index	--	04-89
88	HEL	1	256	Highly Erodible Land (HEL) Code	--	12-89
89	CONO	2	257-258	County Number	--	01-93
90	MUID	9	259-267	Map Unit ID	--	01-93
91	SSMU	4	268-271	Series Soil Map Unit	--	05-93
92	DSMACRES	7				

[a] Date listed indicates the date the documentation description was finalized (or revised) by the ISPAID committee.
[b] The ISPAID database contains the Corn Suitability Rating that represents the higher of the two numbers where there are CSR's given for improved and unimproved soil map units in the soil survey report.

ISPAID DOCUMENTATION[d]

1 Soil Map Symbol (SMS)

The symbol as used on the soil map sheets.

2 Soil Map Unit [SMU]

The Soil Map Unit (SMU) symbol identifies the soil type, the slope class, and the erosion phase. A statewide legend has been developed to include all SMUs that have been correlated in modern county soil surveys (Fig. 1). Soil maps that are coded with alphabetic symbols for the soil type identification require conversion to the numeric symbols for use of the database. The statewide legend for soil type identification is developed according to the following numbering system. (NOTE: 7000, 8000, and 9000 numbers are not used as a publication symbol. These numbers were assigned to their respective publication symbol, the sms, to help account for yield differences in soils mapped statewide.)

SMU #	
001-2999	Standard SMU number.
3000-3999	Reserved for soils protected from flooding along the Mississippi River. An example is: 961A0--the typical Ambraw soil. 3961A0 is a protected Ambraw soil along the Mississippi River.
4000-4999	Urban SMUs. No yields assigned. On-site investigation required. Contact your local SWCD.
5000-5999	Soil areas that are associated with standing water and other special land uses such as pits, mines, quarries.
6000-6999	None.
7000-7999	Soils mapped statewide that are identified for northwestern Iowa in MSAs 9 and 10. An example is 133A0--the typical Colo soil. 7133A0 is the Colo soil located in MSAs 9 and 10. (See Fig. 2 for geographic extent of MSAs.)
8000-8999	Soils mapped in eastern and western Iowa. The 8000 series identifies those soils mapped west of the division line. (See Fig. 2 for division of the state.) An example is 76B1--Ladoga silt loam. 8076B1 identifies Ladoga silt loam west of the division line.
9000-9999	Unimproved soil areas. An example is 321--Boots mucky peat. 9321 identifies Boots mucky peat as unimproved, no yields assigned.

Slope: The standard slope classes are as listed. A few exceptions occur. For example, for some depressional units the "A" is 0-1%, and for some "B" slopes units are 1-4%.

A = 0-2% = Level and nearly level
B = 2-5% = Gently sloping
C = 5-9% = Moderately sloping
D = 9-14% = Strongly sloping
E = 14-18% = Moderately steep (western Iowa = 14-20%)
F = 18-25% = Steep (western Iowa = 20-30%)
G = 25-40% = Very steep

[d] Interpretations assigned to complexes are either the complete range of all soils identified in the name or are the most limiting value. Please refer to each field definition. Interpretations assigned to complexes which have a nonsoil component (i.e., gullied land, rock outcrop, etc.) are values only of the named soil.

Erosion and deposition:

+ = Overwash
0 = None or slight. More than 7 inches of A or A plus E horizon remaining.
1 = None or slight. More than 7 inches of A or A plus E horizon remaining.
2 = Moderately eroded. Three to 7 inches of A or A plus E horizon remaining. Some of the AB and B horizons are mixed with the surface layer in those soils that have been tilled.
3 = Severely eroded. Less than 3 inches of A or A plus E horizon remaining. Most of the surface layer consists of the AB and/or B horizons in those soils that have been tilled, causing the surface to be much lighter in color.

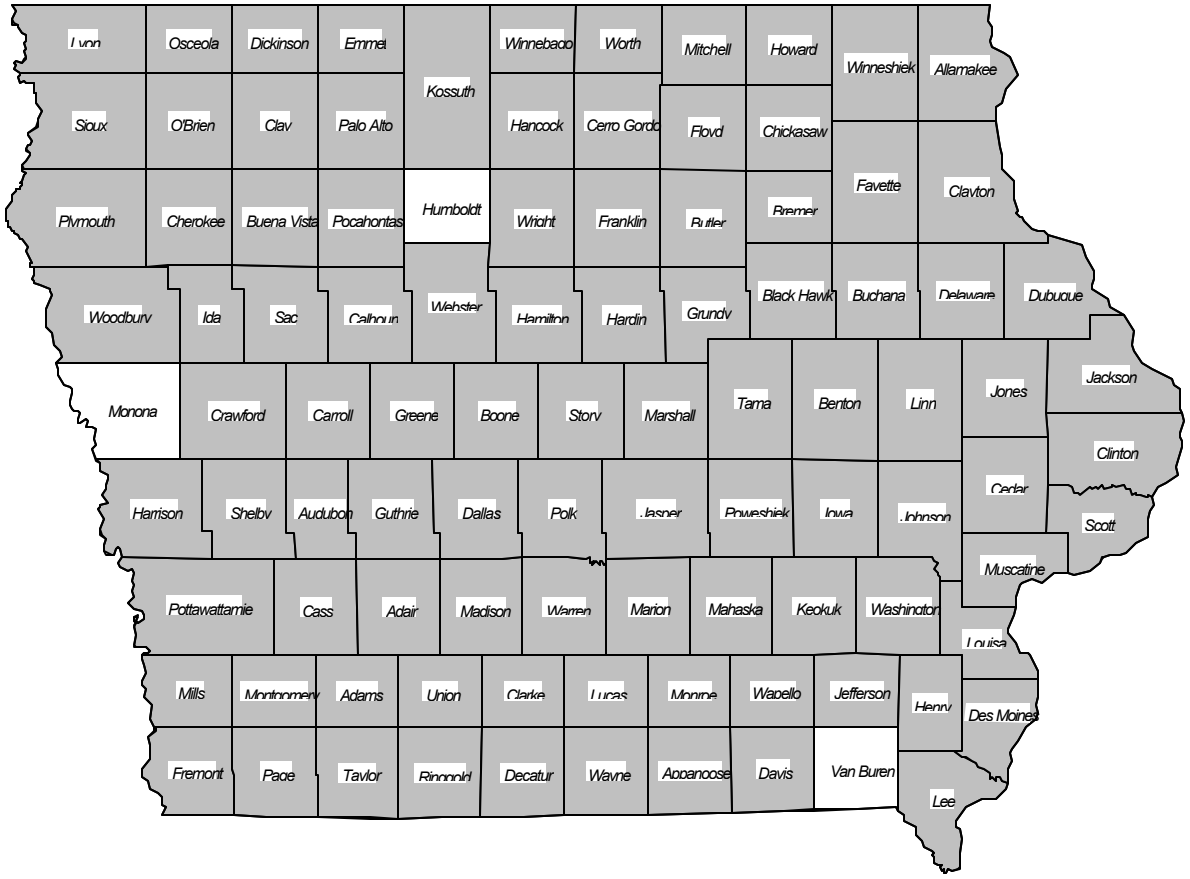


Figure 1. Map showing the 96 Iowa counties that have been mapped and correlated and have associated ISPAID databases. The remaining three counties (in white) have ISPAID updates in progress as of June, 1996.

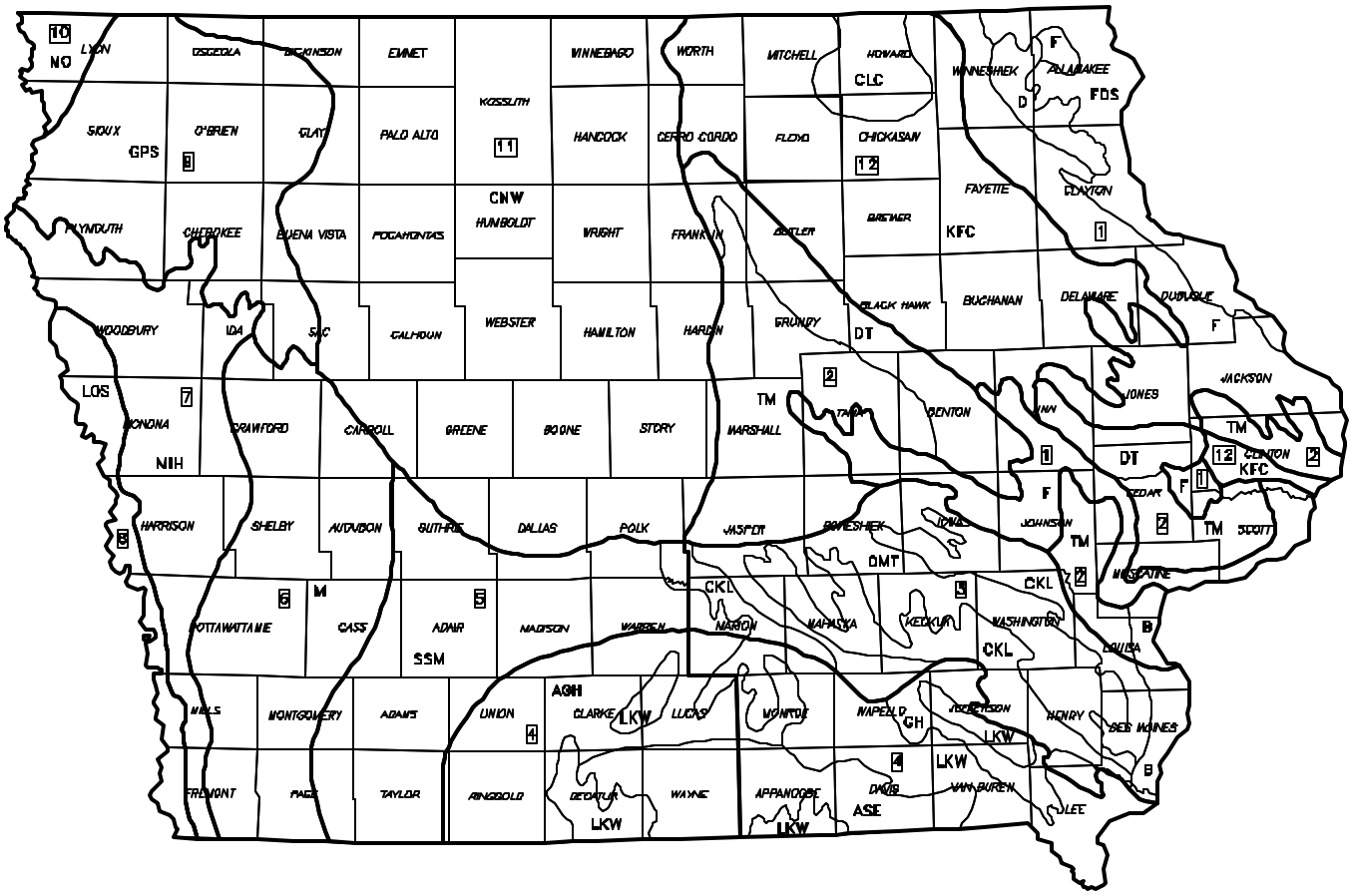


Figure 2. Map of Iowa delineating the 21 principal soil association areas (letters) and the 12 major soil areas (numbers) (from Fenton et al., 1971).

AGH: Adair-Grundy-Haig
ASE: Adair-Seymour-Edina
B: Mississippi Bottomland
CKL: Clinton-Keswick-Lindley
CLC: Cresco-Lourdes-Clyde
CNW: Clarion-Nicollet-Webster
D: Downs
DT: Dinsdale-Tama
F: Fayette
FDS: Fayette-Dubuque-Stonyland
GH: Grundy-Haig
GPS: Galva-Primghar-Sac
KFC: Kenyon-Floyd-Clyde
LKW: Lindley-Keswick-Weller
LOS: Luton-Onawa-Sally
M: Marshall
MIH: Monona-Ida-Hamburg
MO: Moody
OMT: Otley-Mahaska-Taintor
SSM: Shelby-Sharpsburg-Macksburg
TM: Tama-Muscatine

3 Soils-5 Number [SCSSOIL5]

Record number from NRCS-SOI-5 form. First two letters indicate state in which typical pedon is located. (Exceptions: UM=Misc. soils; XS=Complexes; etc.)

4 Soil Name [SOILNAME]

This identifies the soil series name or may also include specific soil phase modifiers, such as texture of the surface horizon, profile depth limits, flooding frequency, overwash characteristics, etc., if applicable.

5 Land Capability Class/Subclass [LCC]

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. 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 woodland and for engineering purposes. The numbers 1 through 7 indicate progressively greater limitations and narrower choices for practical use. The capital letters (E, W, S) indicate the soils' main limitation within one class. There are no subclasses in class 1 because the soils of this class have few limitations.

Class 1 = Soils have few limitations that restrict their use.
Class 2 = Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
Class 3 = Soils have severe limitations that reduce the choice of plants or that require very careful management or both.
Class 4 = Soils have very severe limitations that reduce the choice of plants or that require very careful management or both.
Class 5 = Soils are not likely to erode but have other limitations, impractical to remove, that limit their use.
Class 6 = Soils have severe limitations that make them generally unsuitable for cultivation.
Class 7 = Soils have very severe limitations that make them unavailable for cultivation.

Subclass E = Risk of erosion unless close-growing plant cover is maintained.
Subclass W = Water in or on the soil interferes with plant growth or cultivation (in some soils wetness can be partly corrected by artificial drainage).
Subclass S = Shallow, droughty, or stony.

6 USDA Prime Farmland [PRIMELND]

Prime farmland, as defined by the USDA, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but is not urban and built-up land or water areas. It either is used for food or fiber or is available for these uses. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce economically a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slopes range mainly from 0 to 6 percent.

Some soils have a seasonal high water table and soils that are frequently flooded qualify for prime farmland only in areas where these limitations have been overcome by a drainage system or flood control. The need for these measures is indicated by a number following the letter designation for prime farmland. On-site evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

P = Prime
P2 = Prime, where drained
P3 = Prime, if protected from flooding or does not flood more than once in 2 years during a growing season
P5 = Prime, where drained and protected from flooding
S = Statewide Importance. These are soils that generally also can be highly productive for cropland, but occur on slopes greater than 6% or have limitations in drainage or flood control that are more difficult to overcome. These soils are in capability class 3 or 4. At this time, the soils identified as statewide importance are a potential listing as it has not yet been approved by the State of Iowa.
L = Local Importance. These are soils that generally are poorly suited or unsuited to cropland because of the steepness of slope or flooding and wetness limitations. They may be important in the county, however, for other uses such as pasture, wildlife, or recreation. The soils identified as local importance are a potential listing of soils that may be considered by county officials for this designation.

7 LEAG Farmland Units [LEAGFMLND]

LEAG farmland units are a refinement of the USDA prime farmland units. The LEAG definition of prime farmland is based on land capability classes and native productivity. The LEAG farmland units are:

- P1 = Most SMUs listed in capability classes 1 and 2 but does not include those soils that have profile features that limit rooting depth and water-holding capacity. All are on slopes of 0-5%.
- P2 = Those SMUs with profile features that limit rooting depth or water-holding capacity and have slopes of 0-5%.
- P3 = Highly productive soils on slopes of 5-9% that can be major sediment producers if they are intensively used for row crop production without conservation practices. Includes prairie-derived soils that are in erosion classes slight and moderate and transitional and forest-derived soils that are in erosion class slight.
- P4 = Those SMUs protected from flooding or that do not flood more than once in 2 years during the growing season.
- S1 = SMUs that generally are sloping (5-9%), that are severely eroded prairie soils, or are moderately or severely eroded transition and forested units. Includes some less productive soils on slopes less than 5-9%.
- S2 = SMUs with desirable profile characteristics but occur on slopes 9-14%. Erosion classes 1 and 2 are included. Includes some less productive soils on slopes less than 9-14%.
- S3 = All other units that have more desirable properties than land of local importance.
- O = SMUs of local importance.
- U = Organic soils and some sandy soils that are suited for vegetable crops under high-level management resulting in high yields.

8 Corn Suitability Rating [CSR]

Corn suitability ratings provide a relative ranking of all soils mapped in the state of Iowa based on their potential to be utilized for intensive row crop production. The CSR is an index that can be used to rate one soil's potential yield against another over a period of time. The CSR considers average weather conditions as well as frequency of use of the soil for row crop production. Ratings range from 100 for soils that have no physical limitations, occur on minimal slopes, and can be continuously row cropped to as low as 5 for soils with severe limitations for row crops. The ratings listed in this table assume a) adequate management, b) natural weather conditions (no irrigation), c) artificial drainage where required, d) that soils lower on the landscape are not affected by frequent floods, and e) no land leveling or terracing. The weighed CSR for a given field can be modified by the occurrence of sandy spots, local deposits, rock and gravel outcroppings, field boundaries, noncrossable drainageways, and so forth. Even though predicted average yields will change with time, the CSRs are expected to remain relatively constant in relation to one another over time.

9 Corn Yield (bu/ac) [CORNYLD]

Corn yield in bushels per acre. The benchmark yield is listed and may be adjusted for weather conditions in a specific county. The yield estimate for each SMU is based on kind of parent material, slope class, erosion class, natural drainage class, and nature of the subsoil in terms of rooting environment to include limiting layers, soil depth, and plant available water capacity. In addition, potential for periodic flooding and weather conditions are included. Corn yields are estimated for high-level management and are normalized for a 5-year average. High-level management includes the adoption of best available technology for crop production to include agronomic, engineering, and economic practices. [Yields for complexes are calculated using a percentage of the benchmark yield for each of the soils identified in the soil name. Where two soils are identified, 50% of each benchmark soil was used in the calculation; where three soils are identified, the percentages used were 34-33-33. For individual counties, yields should be calculated based on the actual percentages of each soil in each unit.]

10 **Soybean Yield (bu/ac) [SOYBNYLD]**

Soybean yield in bushels per acre. The benchmark yield is listed and may be adjusted for weather conditions in a specific county. The yield estimate for each SMU is calculated from a percentage of the estimated corn yield. Location in the state and kind of parent material are considered in these calculations. [Yields for complexes are calculated using a percentage of the benchmark yield for each of the soils identified in the soil name. Where two soils are identified, 50% of each benchmark soil was used in the calculation; where three soils are identified, the percentages used were 34-33-33. For individual counties, yields should be calculated based on the actual percentages of each soil in each unit.]

MSA	Factor Used Based on Corn Yield
1,2,3,4,5,6,7,8. Includes silt loam and silty clay loam, loess-derived soils in MSA 12.	0.335
9, 10. Use 0.350 for silt loam and silty clay loam, loess-derived soils occurring in Osceola, Dickinson, Clay, Buena Vista, Ida, Sac, Cherokee, and Plymouth counties.	0.375
11	0.320
12. Includes loam, clay loam, and coarser, till derived soils in MSAs 1 and 2.	0.305

11 **Oat Yield (bu/ac) [OATYLD]**

Oat yield in bushels per acre. The benchmark yield is listed and may be adjusted for weather conditions in a specific county. The yield estimate for each SMU is calculated from a percentage of the estimated corn yield. Estimates are related to average weather condition and location in the state. [Yields for complexes are calculated using a percentage of the benchmark yield for each of the soils identified in the soil name. Where two soils are identified, 50% of each benchmark soil was used in the calculation; where three soils are identified, the percentages used were 34-33-33. For individual counties, yields should be calculated based on the actual percentages of each soil in each unit.]

MSA	Factor Used Based on Corn Yield
4, 5	0.50
3, 6, 7, 8	0.55
1, 2, 12	0.60
11	0.70
9, 10	0.75

12 **Wheat Yield (bu/ac) [WHEATYLD]**

Wheat yield in bushels per acre. The benchmark yield is listed and may be adjusted for weather conditions in a specific county. Wheat yields are listed for soils occurring only in MSAs 3, 4, 5, 6, 7, and 8. The yield estimate for each SMU is calculated from a percentage of the estimated corn yield. [Yields for complexes are calculated using a percentage of the benchmark yield for each of the soils identified in the soil name. Where two soils are identified, 50% of each benchmark soil was used in the calculation; where three soils are identified, the percentages used were 34-33-33. For individual counties, yields should be calculated based on the actual percentages of each soil in each unit.]

13 **Alfalfa-Bromegrass Yield (T/ac/yr) [ALFBRMYLD]**

Alfalfa-bromegrass in tons per acre per year. The benchmark yield is listed and may be adjusted for weather conditions in a specific county. The alfalfa-bromegrass hay yield estimate assumes 80% or more alfalfa in the stand with either orchard grass or bromegrass. The yield estimate for each SMU is calculated by using a percentage of the estimated corn yield. Natural soil drainage class is considered in the yield estimate. To convert to AUM for harvest and haul, multiply Tons x 1.67. [Yields for complexes are calculated using a percentage of the benchmark yield for each of the soils identified in the soil name. Where two soils are identified, 50% of each benchmark soil was used in the calculation; where three soils are identified, the percentages used were 34-33-33. For individual counties, yields should be calculated based on the actual percentages of each soil in each unit.]

Natural Soil Drainage Class (statewide)	Factor Used Based on Corn Yield
Excessively, somewhat excessively, well and moderately well	0.042
Moderately well (only for upland soils of the Cresco-Lourdes soil association and the Grundy-Pershing-Weller soil association) and somewhat poorly	0.040
Poorly and very poorly	0.030

14 **Tall Introduced Grasses Yield (AUM) [TIGRSYLD]**

Tall introduced grasses yield in animal-unit per month (AUM). Tall introduced grasses include smooth brome, orchard grass, reed canary-grass, and tall fescue. The amount of forage or feed required to feed one animal unit--one cow, one horse, one mule, five sheep, or five goats--for 30 days. The yield estimate for each SMU is calculated as a percentage of the estimated corn yield.

15 **Kentucky Bluegrass Yield (AUM) [KYBGYLD]**

Kentucky bluegrass in animal-unit per month (AUM). The amount of forage or feed required to feed one animal unit--one cow, one horse, one mule, five sheep, or five goats--for 30 days. The yield estimate is calculated as a percentage of the estimated Tall Introduced Grasses yield.

16 **Major Soil Area [MSA]**

Major soil area where the SMU typically occurs (see Fig. 2).

17 **Major Land Resource Area [MLRA]**

Location of SMU in Major Land Resource Area (MLRA). (See Fig. 3). MLRAs are defined in USDA Agricultural Handbook No. 296, revised December 1981.

18 **No. of Additional MLRAs [ADDMLRA]**

Number of additional MLRAs in which the SMU has been correlated.

19 **Acreage [ACREAGE]**

Total acres of the respective SMU mapped in the state/county as determined from the Map Unit Use File (MUUF).

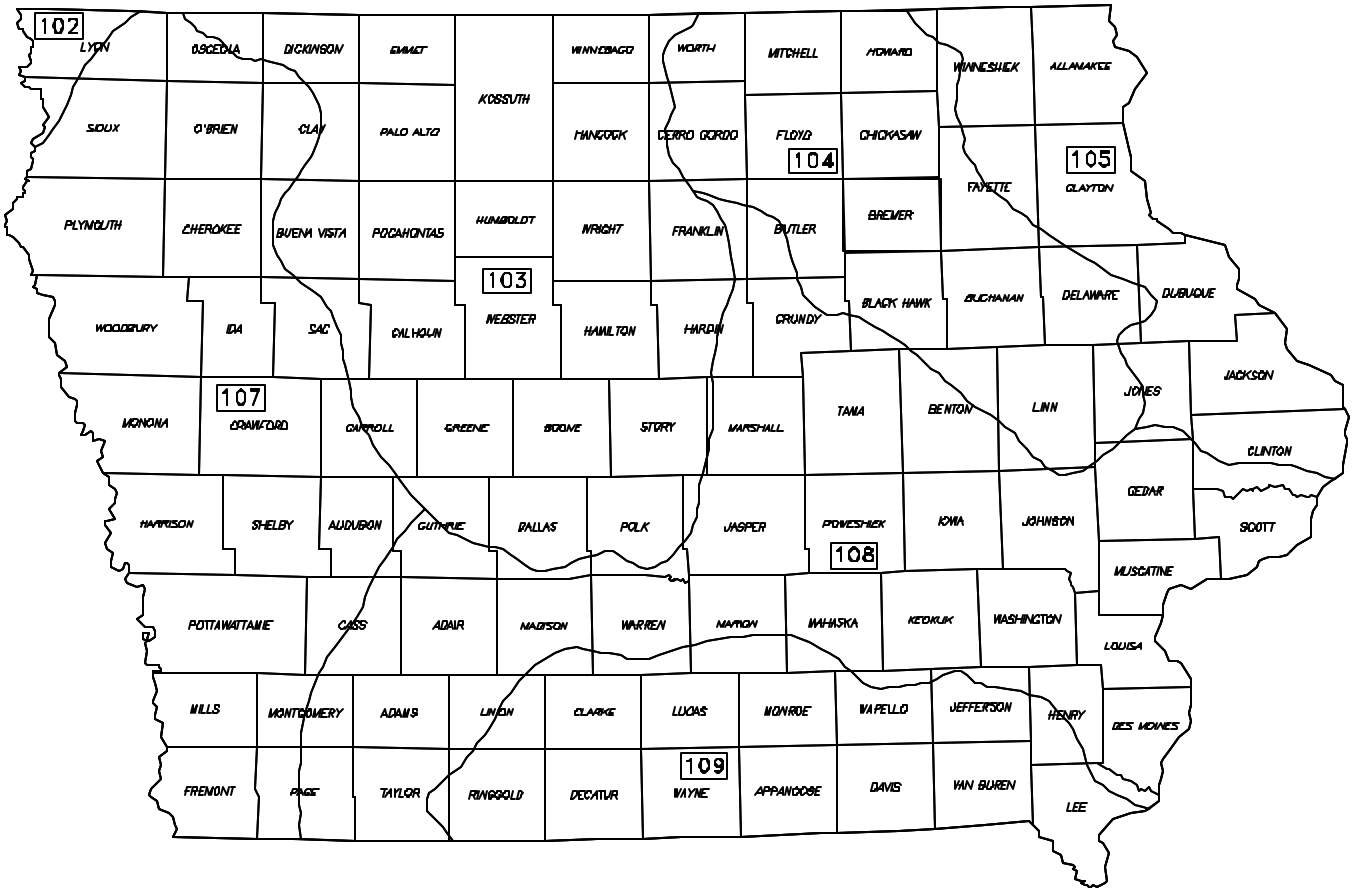


Figure 3. Map of Iowa delineating the major land resource areas.

20 **Slope Range (%) Low [SLOPERNGL]**

The incline of the surface of a soil. It is expressed in percentages of slope which equal the number of feet of fall per 100 feet of horizontal distance.

21 **Slope Range (%) High [SLOPERNGH]**

The incline of the surface of a soil. It is expressed in percentages of slope which equal the number of feet of fall per 100 feet of horizontal distance.

Taxonomic classification of the soils as listed on the NRCS-SOILS-5 forms and defined by **Soil Taxonomy**. The orders listed are the five orders used in the state of Iowa. The suborders and great groups are from Tables 2 and 3, respectively, from **Soil Taxonomy** (not all of these classes are used in Iowa). The subgroup and family classes listed are currently used in Iowa. The list of code numbers follows.

Translate code numbers as follows:

1	03	03	13	24	=	fine, mixed, mesic Mollic Albaqualfs
1						Order (Alfisols)
	03					Suborder (aqu)
		03				Great Group (alb)
			13			Subgroup (mollic)
				24		Family (fine, mixed, mesic)

22 Order [ORDER]

1 = Alfisols
2 = Entisols
3 = Histosols
4 = Inceptisols
5 = Mollisols

23 Suborder [SUBORDER]

01 =	alb	07 =	ferr	13 =	ochr	19 =	torr
02 =	and	08 =	fibr	14 =	orth	20 =	trop
03 =	aqu	09 =	fluv	15 =	plagg	21 =	ud
04 =	ar	10 =	fol	16 =	psamm	22 =	umbr
05 =	arg	11 =	hem	17 =	rend	23 =	ust
06 =	bor	12 =	hum	18 =	sapr	24 =	xer

24 Greatgroup [GREATGROUP]

01 =	acr	13 =	eu, eutr	25 =	med	37 =	sal
02 =	agr	14 =	ferr	26 =	nadur	38 =	sider
03 =	alb	15 =	fluv	27 =	natr	39 =	sphagn
04 =	and	16 =	frag	28 =	ochr	40 =	sulf
05 =	arg	17 =	fragloss	29 =	pale	41 =	torr
06 =	bor	18 =	gibbs	30 =	pell	42 =	ud
07 =	calc	19 =	gloss	31 =	plac	43 =	umbr
08 =	camb	20 =	hal	32 =	plagg	44 =	ust
09 =	chrom	21 =	hapl	33 =	plinth	45 =	verm
10 =	cry	22 =	hum	34 =	psamm	46 =	vitr
11 =	dur	23 =	hydr	35 =	quartz	47 =	xer
12 =	dys, dystr	24 =	luv	36 =	rhod		

25 Subgroup [SUBGROUP]

01 =	Aeric	08 =	Entic	15 =	Psammentic
02 =	Alfic	09 =	Fluvaquentic	16 =	Terric
03 =	Aquic	10 =	Fluventic	17 =	Thapto-Histic
04 =	Aquollic	11 =	Limmic	18 =	Typic
05 =	Argiaquic	12 =	Lithic	19 =	Udic
06 =	Cumulic	13 =	Mollic	20 =	Udollic
07 =	Dystric	14 =	Pachic	21 =	Vertic

26 **Family [FAMILY]**

1 mesic, uncoated
2 euic, mesic
3 mixed, mesic
4 montmorillonitic, mesic
5 clayey, montmorillonitic, mesic
6 clayey over loamy, mixed, mesic
7 clayey over loamy, montmorillonitic, mesic
8 clayey over loamy, montmorillonitic (calc), mesic
9 clayey over sandy or sandy-skeletal, montmorillonitic (calc), mesic
10 clayey-skeletal, mixed, mesic
11 coarse-loamy, carbonatic, mesic
12 coarse-loamy, mixed, mesic
13 coarse-loamy, mixed, (calc), mesic
14 coarse-loamy, mixed (nonacid), mesic
15 coarse-loamy over clayey, mixed (calc), mesic
16 coarse-loamy over sandy or sandy-skeletal, mixed, mesic
17 coarse-silty, mixed, mesic
18 coarse-silty, mixed (calc), mesic
19 coarse-silty, mixed (nonacid), mesic
20 coarse-silty over clayey, mixed (calc), mesic
21 coarse-silty over sandy or sandy-skeletal, mixed (calc), mesic
22 coprogenous, euic, mesic
23 fine, illitic, mesic
24 fine, mixed, mesic
25 fine, montmorillonitic, mesic
26 fine, montmorillonitic, mesic, sloping
27 fine, montmorillonitic (calc), mesic
28 fine, montmorillonitic (nonacid), mesic
29 fine-loamy, -, mesic
30 fine-loamy, mixed, mesic
31 fine-loamy, mixed (calc), mesic
32 fine-loamy over clayey, mixed, mesic
33 fine-loamy over sandy or sandy-skeletal, -, mesic
34 fine-loamy over sandy or sandy-skeletal, mixed, mesic
35 fine-loamy over sandy or sandy-skeletal, mixed (calc), mesic
36 fine-loamy over sandy-skeletal, mixed, mesic
37 fine-silty, -, mesic
38 fine-silty, mixed, mesic
39 fine-silty, mixed (calc), mesic
40 fine-silty, mixed (nonacid), mesic
41 fine-silty over clayey, mixed, mesic
42 fine-silty over sandy or sandy-skeletal, mixed, mesic
43 fine-silty over sandy or sandy-skeletal, mixed (calc), mesic
44 loamy, mixed, euic, mesic
45 loamy, mixed, mesic
46 loamy-skeletal, mixed, mesic
47 sandy, mixed, mesic
48 sandy or sandy-skeletal, mixed, euic, mesic
49 sandy over clayey, mixed (calc), mesic
50 sandy-skeletal, mixed, mesic
51 very-fine, mixed, mesic
52 sandy over loamy, mixed (calc), mesic
53 very-fine, montmorillonitic, mesic
54 sandy over loamy, mixed, mesic

27 **Kind of Map Unit [SMUKIND]**

C = Consociation. Map units in which the named soil makes up at least 50% of the unit.
X = Complex. Map units that consist of 2 or more soils that are in a regular repeating pattern and so intricately associated that it is not practical to map them separately at the scale of approximately 1:20,000.
U = Undifferentiated. Map units on steep slopes or soils showing little profile development and separation of the 2 or 3 soils is not practical.

28 **Kind of Component [COMPKIND]**

F = Family
G = Taxon above family
M = Miscellaneous
S = Series
T = Taxadjunct. Soil properties outside the range of the named series but similar enough to the series that little would be gained by naming a new series.
V = Variant. Soil is clearly outside the range of the named series, but a new series was not named because of small acreage.

29 **Hydrologic Group [HYDROGRP]**

Used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms. [The hydrologic group listed for complexes is the most limiting group of the soils identified in the map unit name (i.e., Ackmore = B and Colo = B/D; Ackmore-Colo complex = B/D).] The four 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 gravely 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 permanent 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.

30 **Hydric Soil Code [HYDSOILCD]**

A hydric soil is a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils developed under conditions sufficiently wet to support the growth and regeneration of hydrophytic vegetation. Hydric soils include phases of soil series that may or may not have been artificially drained. Some series on the hydric list have phases that are not hydric.

1 = Yes, this map unit is hydric.
2 = This map unit is potentially hydric or has hydric inclusions.
3 = No, this soil is not hydric.

31 Flooding Frequency [FLOODFRQ]

32 Flooding Frequency Code [FLOODFRQCD]

The temporary covering of soil with water from overflowing streams and runoff from adjacent slopes. [Flooding frequency listed for complexes is the most limiting frequency of the soils identified in the map unit name (i.e., Ackmore = FREQ and Colo = COMMON; Ackmore-Colo complex = FREQ).] The phrase used to describe frequency of flooding for each SMU and the respective code number follow:

NONE	=	00 =	Flooding is not probable.
RARE	=	10 =	Flooding is unlikely but possible under unusual weather conditions.
OCCAS	=	20 =	Flooding occurs on an average of 50 times or less in 100 years.
COMMON	=	30 =	Flooding is likely under normal conditions.
FREQ	=	40 =	Flooding occurs on an average of more than 50 times in 100 years.
PONDED	=	50 =	Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration. (Ponded is for short duration unless otherwise specified).

33 Available Water Capacity Low (in/5 ft) [AVWATCAPL]

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at the wilting point. It is commonly expressed as inches of water per inch of soil. [Available water capacity for complexes is the complete range of the soils identified in the map unit (i.e., Ackmore = 11.55-12.75 and Colo = 11.22-12.42; Ackmore-Colo complex = 11.22-12.75 inches per 5 ft).] The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed in soil survey reports as:

Very low	=	0-3"
Low	=	3-6"
Moderate	=	6-9"
High	=	9-12"
Very high	=	>12"

34 Available Water Capacity High (in/5 ft) [AVWATCAPH]

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at the wilting point. It is commonly expressed as inches of water per inch of soil. [Available water capacity for complexes is the complete range of the soils identified in the map unit (i.e., Ackmore = 11.55-12.75 and Colo = 11.22-12.42; Ackmore-Colo complex = 11.22-12.75 inches per 5 ft).] The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed in soil survey reports as:

Very low	=	0-3"
Low	=	3-6"
Moderate	=	6-9"
High	=	9-12"
Very high	=	>12"

35 Surface Bulk Density Low (g/cm^3) [SURBDL]

36 Surface Bulk Density High (g/cm^3) [SURBDH]

Bulk density is the weight of soil (oven dry) per unit volume. Volume is measured when the soil is at field capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105C. Expressed in grams per cubic centimeter of soil material that is <2 mm in diameter. Bulk density indicates the pore space available for water and air. A bulk density of more than 1.6 g/cm^3 in medium textured soils can restrict water storage and root penetration. It is influenced by texture, kind of clay, content of organic matter, and soil structure. [Bulk density for complexes is the complete range of the soils identified in the map unit name (i.e., Ackmore = 1.25-1.30 and Colo = 1.28-1.32; Ackmore-Colo complex = 1.25-1.32 g/cm^3).]

37 **Subsoil Bulk Density Low (g/cm^3) [SUBSLBDL]**

38 **Subsoil Bulk Density High (g/cm^3) [SUBSLBDH]**

Bulk density is the weight of soil (oven dry) per unit volume. Volume is measured when the soil is at field capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105C. Expressed in grams per cubic centimeter of soil material that is <2 mm in diameter. Bulk density indicates the pore space available for water and air. A bulk density of more than 1.6 g/cm^3 in medium textured soils can restrict water storage and root penetration. It is influenced by texture, kind of clay, content of organic matter, and soil structure. [Bulk density for complexes is the complete range of the soils identified in the map unit name (i.e., Ackmore = 1.25-1.30 and Colo = 1.28-1.32; Ackmore-Colo complex = 1.25-1.32 g/cm^3).]

39 **Subsoil P [SUBSOILP]**

The amount of plant available phosphorus in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (30-42 inch depth). [The value listed for complexes is the most limiting value of the soils identified in the map unit name (i.e., Colo = M and Ely = L; Colo-Ely complex = L)].

Soil Test Class		Soil Test Value, ppm
Very Low	(VL)	< 7.5
Low	(L)	7.5 - 13.0
Medium	(M)	13.0 - 22.5
High	(H)	> 22.5

40 **Subsoil K [SUBSOILK]**

The amount of plant available potassium in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (12-24 inch depth). [The value listed for complexes is the most limiting value of the soils identified in the map unit name (i.e., Colo = VL+ and Ely = L; Colo-Ely complex = VL+).]

Very Low minus	(VL-)	< 25
Very Low plus	(VL+)	25 - 50
Low	(L)	50 - 79
Medium	(M)	79 - 125
High	(H)	> 125

41 **Subsoil Group (B Horizon only) [SUBSOILGRP]**

[Subsoil group listed for complexes is the most limiting group of the soils identified in the map unit name (i.e., Steinauer = 1 and Shelby = 2; Steinauer-Shelby complex = 2).]

1 = Subsoil texture about the same as surface soil texture, not more than 34% clay, subsoil favorable for crop growth.

2 = Subsoil moderately unfavorable for crop growth: slow permeability [35-40% clay content] or high plasticity.

3 = Subsoil very unfavorable for crop growth: silty clay and clay textures, very slow permeability [>40% clay content], or high plasticity.

42 **Native Vegetation [NATIVEVEG]**

P = Prairie

F = Forest

T = Transition

43 Parent Material [PARENTMAT]

Parent material is the unconsolidated organic and mineral matter in which soil forms. Listed below are abbreviations used for parent materials. (S&g means sand OR sand and gravel.) [Parent material assigned to complexes is the parent material of the dominant soil (the soil listed first).]

A = Alluvium
B = Alluvium (MO River bottom)
C = Calcareous
D = Weathered shale
E = Eolian sand
F = Local alluvium
G = Gray paleosol
H = Sandstone
I = Sediments
J = Residuum
K = Calcareous sand & gravel
L = Loess
M = Lacustrine sediments
N = Gray or gray mottles
O = Organic materials
P = Paleosol--reddish
Q = Sandy sediments
R = Rock--limestone
S = Coarse alluvium/S&g
T = Till (Pre-Wisconsinan)
U = Till or till-derived sediments (Wisc-Cary)
V = Old valley alluvium (OVA)
W = Silty sediments
X = Weathered red shale
Y = Loamy sediments
Z = Aren. or frag. limestone
AC = Alluvium--calcareous
AO = Alluvium/Organic
AR = Alluvium/Rock--limestone
AS = Alluvium/Sand
BC = Missouri bottom--calc
BS = Missouri bottom--sandy
DC = Shale--calcareous
ET = Eolian sand/Till
FC = Local alluvium--calc
FR = Local alluvium/Limestone
FT = Local alluvium/Till
GV = Gray paleosol--OVA
IC = Sediments-- calc
ID = Sediments/Weathered shale
IG = Sediments/Gray paleosol
IP = Sediments/Paleosol--reddish
IR = Sediments/Rock--limestone
IS = Calc loamy sediments/S&g
IT = Loam or clay loam sediments/Till
IZ = Sediments/Aren. limestone
JR = Residuum/Rock==limestone
LC = Loess--calcareous
LD = Loess/Weathered shale
LF = Loess & Local alluvium
LG = Loess/Gray paleosol
LH = Loess/Sandstone
LI = Loess/Sediments
LJ = Loess/Residuum
LN = Loess--gray or gray mottles
LR = Loess/Rock--limestone
LS = Loess/Sand & gravel
LT = Loess/Till (pre-Wisconsinan)
MC = Lacustrine--calcareous
MR = Lacustrine/Rock--limestone
MT = Lacustrine/Till
PL = Paleosol--rdsh--Loveld loess
PV = Paleosol--rdsh--OVA
QT = Sandy sediments/Till
QY = Loamy & sandy sediments
SA = Sandy alluvium
SR = Sand/Rock--limestone
TC = Till--calcareous (pre-Wisc)
TL = Loess/Till (W or p-W)(NW IA)
TR = Till/Rock--limestone
TU = Till--calc (Tazewell or p-W)
UC = Till or till-derived sediments--calc (Wisc-Cary)
US = Till or till-derived sediments/Sand & gravel
WK = Silty sediments/Calc S&g
WS = Silty sediments/S&g
YK = Loamy sediments/Calc S&g
YM = Loamy sedi/Lacust sedi/Sand
YM = Loamy sedi/Lacust
YR = Loamy sedi/Rock-Limestone
YS = Loamy sediments/S&g
YT = Loamy sediments/Till (pre-Wisc)

44 Landscape Position [LNDSCPPOS]

B = High benches-loess covered
C = Concave depressions
D = Upland drainageways
F = Footslopes and/or alluvial fans
G = Glacial lake or till plains
K = Upland swales
O = Outwash plains
R = Summits-upland flats
S = Summits
T = Stream terraces
U = Uplands-narrow summits, sideslopes, backslopes
V = High benches-old valley alluvium
W = Floodplain

45 Depth to Strongly Contrasting Particle-Size Class (0-40 inches) Shallow [DEPTHCNTRS]

Strongly contrasting particle-size classes are defined by Soil Taxonomy (Soil Survey Staff, 1975, pp. 385-386) and apply to a control section in the upper 40 inches of the solum. This field also identifies lithic or paralithic contacts in the upper 40 inches of the solum (because the particle-size control section ends at such a contact). [Depths listed for complexes are the shallowest of the soils identified in the map unit name (i.e., Gosport = 20-40 and Clanton = 40>; Gosport-Clanton complex = 20-40).]

46 Depth to Strongly Contrasting Particle-Size Class (0-40 inches) Deep [DEPTHCNTRD]

Strongly contrasting particle-size classes are defined by Soil Taxonomy (Soil Survey Staff, 1975, pp. 385-386) and apply to a control section in the upper 40 inches of the solum. This field also identifies lithic or paralithic contacts in the upper 40 inches of the solum (because the particle-size control section ends at such a contact). [Depths listed for complexes are the shallowest of the soils identified in the map unit name (i.e., Gosport = 20-40 and Clanton = 40>; Gosport-Clanton complex = 20-40).]

47 Depth to Textural or Compositional Discontinuity Shallow (0-60 inches) [TXCMPD060S]
48 Depth to Textural or Compositional Discontinuity Deep (0-60 inches) [TXCMPD060D]
49 Textural or Compositional Discontinuity Code [TXCMP060CD]

Depth to a discontinuity in texture or composition that is likely to significantly affect rooting volume, penetration of roots, movement of water, or storage of water. This depth may coincide with a change in permeability, parent material, or both. A code number is used to give more information about the textural or compositional discontinuity:

1 = lithic or paralithic contact
2 = underlying material is coarser than that above
3 = underlying material is finer than that above
4 = no discontinuity

50 Depth to Textural or Compositional Discontinuity Shallow (0-80 inches) [TXCMPD080S]
51 Depth to Textural or Compositional Discontinuity Deep (0-80 inches) [TXCMPD080D]
52 Textural or Compositional Discontinuity Code [TXCMP080CD]

Depth to a discontinuity in texture or composition that is likely to significantly affect rooting volume, penetration of roots, movement of water, or storage of water. This depth may coincide with a change in permeability, parent material, or both. A code number is used to give more information about the textural or compositional discontinuity:

1 = lithic or paralithic contact
2 = underlying material is coarser than that above
3 = underlying material is finer than that above
4 = no discontinuity

53 **Depth to High Water Table Shallow (ft) [DPTHHIWTRS]**

The level (in ft.) of a saturated zone in the soil for 30 or more consecutive days in most years. [The depth to high water table listed for complexes is the most limiting range of depths of the soils identified in the map unit name (i.e., Shelby =>6.0 and Adair = 1.0-5.0; Shelby-Adair complex = 1.0-5.0 ft.).]

54 **Depth to High Water Table Deep (ft) [DPTHHIWTRD]**

The level (in ft.) of a saturated zone in the soil for 30 or more consecutive days in most years. [The depth to high water table listed for complexes is the most limiting range of depths of the soils identified in the map unit name (i.e., Shelby =>6.0 and Adair = 1.0-5.0; Shelby-Adair complex = 1.0-5.0 ft.).]

55 **Permeability [PERM]**

56 **Permeability Code [PERMCODE]**

The quality of the soil that enables water to move through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. If the clayey material or the residuum overlying bedrock is 1 to 5 inches thick and continuous, the permeability is slower than the overlying material. A slash indicates that two materials with different permeabilities occur; i.e., MR/S means moderately rapid over slow. [Permeability listed for complexes is the most limiting class of the soils identified in the map unit name (i.e., Marshall = moderate and Dickman = moderately rapid over rapid; Marshall-Dickman complex = moderately rapid over rapid).] Permeability class abbreviations and code numbers assigned are:

VR	=	00	=	Very rapid [>20.0 in/hr]
R/VR	=	05	=	Rapid/Very rapid
R	=	10	=	Rapid [6.0-20.0 in/hr]
MR/VR	=	15	=	Moderately rapid/Very rapid
MR/R	=	20	=	Moderately rapid/Rapid
M/VR	=	25	=	Moderate/Very rapid
MR	=	30	=	Moderately rapid [2.0-6.0 in/hr]
M/R	=	35	=	Moderate/Rapid
R/M	=	40	=	Rapid/Moderate
MR/M	=	45	=	Moderately rapid/Moderate
M	=	50	=	Moderate [0.6-2.0 in/hr]
MS	=	55	=	Moderately slow [0.2-0.6 in/hr]
MS/M	=	56	=	Moderately slow/Moderate
MR/MS	=	57	=	Moderately rapid/Moderately slow
MS/R	=	58	=	Moderately slow/Rapid
R/S	=	60	=	Rapid/Slow
MR/S	=	65	=	Moderately rapid/Slow
M/S	=	70	=	Moderate/Slow
S/R	=	72	=	Slow/Rapid
VS/R	=	75	=	Very slow/Rapid
S	=	80	=	Slow [0.06-0.20 in/hr]
M/VS	=	85	=	Moderate/Very slow
VS	=	90	=	Very slow [<0.06 in/hr]

57 **Drainage Class (Natural) [DRNCLASS]**

58 **Drainage Class (Natural) Code [DRNCLSCD]**

Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. [The drainage class listed for complexes is the most limiting class of the soils identified in the map unit name (i.e., Ackmore = SP-P and Colo = P; Ackmore-Colo complex = P).] Drainage class abbreviations and code numbers assigned follow.

E	=	10	=	Excessive
E-SE	=	15	=	Excessive-Somewhat excessive
SE	=	20	=	Somewhat excessive
SE-W	=	25	=	Somewhat excessive-Well
W	=	30	=	Well
W-MW	=	35	=	Well-Moderately well
MW	=	40	=	Moderately well
MW-SP	=	45	=	Moderately well-Somewhat poor
SP	=	50	=	Somewhat poor
SP-P	=	55	=	Somewhat poor-Poor
P	=	60	=	Poor
P-VP	=	65	=	Poor-Very poor
VP	=	70	=	Very poor

59 **Texture (Surface Horizon) [TEXTSURHOR]**

[Texture assigned to complexes is the texture of the dominant soil (the soil listed first).]

C	=	Clay	MK-SIL	=	Mucky silt loam
CL	=	Clay loam	S	=	Sand
CN-SIL	=	Channery silt loam	SCL	=	Sandy clay loam
COS	=	Coarse sand	SI	=	Silt
FSL	=	Fine sandy loam	SIC	=	Silty clay
GR-SL	=	Gravelly sandy loam	SICL	=	Silty clay loam
L	=	Loam	SIL	=	Silt loam
LFS	=	Loamy fine sand	SL	=	Sandy loam
LS	=	Loamy sand	SP	=	Sapric
MK	=	Muck	S&G	=	Sand & gravel
MK-SICL	=	Mucky silty clay loam			

60 **Erosion Class [EROSIONC]**

OVE	=	Overwash
NON	=	None
SLI	=	Slight
MOD	=	Moderate
SEV	=	Severe
CAT	=	Catsteps. A step-like appearance on the very steep slopes of the Hamburg soils. These catsteps are a result of the repeated slipping and downslope movement of loess.

61 **Organic Matter Midpoint (%) [OMM]**

62 **Organic Matter Range (±) (%) [OMR]**

The plant and animal residue in the soil in various stages of decomposition. The percentage of organic matter is estimated for tilled surface horizons, 0 to 7 inches. Organic matter content values apply to soils in cultivation for more than 20 years. The two fields indicate the midpoint and the range of the percentage of organic matter; e.g., midpoint = 2.0, range (±) = 0.5 indicates that the content of organic matter ranges from 1.5 to 2.5%. [Percent organic matter listed for complexes is the complete range of values of the soils identified in the map unit name (i.e., Ackmore = 2.0 ± 1.0% and Colo = 6.0 ± 1.0%; Ackmore-Colo complex = 4.0 ± 3.0%).]

63 Organic Matter Range Low (%) [OMRL]

64 Organic Matter Range High (%) [OMRH]

The plant and animal residue in the soil in various stages of decomposition. The percentage of organic matter is estimated for tilled surface horizons, 0 to 7 inches. Organic matter content values apply to soils in cultivation for more than 20 years.

[Percent organic matter listed for complexes is the complete range of values of the soils identified in the map unit name (i.e., Ackmore = 1.0-3.0% and Colo = 5.0-7.0%; Ackmore-Colo complex = 1.0-7.0%).]

65 pH (Surface Horizon) Low [PHSURL]

A measure of acidity or alkalinity of a soil, expressed as pH. A soil that tests pH 7.0 is described as neutral in reaction because it is neither acid nor alkaline. The pH of most acid soils can be readily changed to neutral with application of appropriate amounts of liming materials. Soils naturally strongly acidic will have a broad pH range, for example 4.5-7.3; whereas, soils naturally slightly acidic will have a narrow pH range, for example 6.1-7.3. [The pH listed for complexes is the complete range of values of the soils identified in the map unit name (i.e., Steinauer = 7.4-8.4 and Shelby = 5.1-7.3; Steinauer-Shelby complex = 5.1-8.4).] The degrees are expressed as:

< 4.5 = Extremely acid
4.5-5.0 = Very strongly acid
5.1-5.5 = Strongly acid
5.6-6.0 = Medium acid
6.1-6.5 = Slightly acid
6.6-7.3 = Neutral
7.4-7.8 = Mildly alkaline
7.9-8.4 = Moderately alkaline

66 pH (Surface Horizon) High [PHSURH]

A measure of acidity or alkalinity of a soil, expressed as pH. A soil that tests pH 7.0 is described as neutral in reaction because it is neither acid nor alkaline. The pH of most acid soils can be readily changed to neutral with application of appropriate amounts of liming materials. Soils naturally strongly acidic will have a broad pH range, for example 4.5-7.3; whereas, soils naturally slightly acidic will have a narrow pH range, for example 6.1-7.3. [The pH listed for complexes is the complete range of values of the soils identified in the map unit name (i.e., Steinauer = 7.4-8.4 and Shelby = 5.1-7.3; Steinauer-Shelby complex = 5.1-8.4).] The degrees are expressed as:

< 4.5 = Extremely acid
4.5-5.0 = Very strongly acid
5.1-5.5 = Strongly acid
5.6-6.0 = Medium acid
6.1-6.5 = Slightly acid
6.6-7.3 = Neutral
7.4-7.8 = Mildly alkaline
7.9-8.4 = Moderately alkaline

67 Cation-Exchange Capacity Low (meq/100g) [CECL]

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil, when bases were determined at pH 7.0 by NH_4OAc method and acidity by $BaCl_2$-triethanolamine at pH 8.2. [The amount listed for complexes is the complete range of the soils identified in the map unit name (i.e., Ackmore = 25-30 and Colo = 36-41; Ackmore-Colo complex = 25-41 meq/100g).]

68 **Cation-Exchange Capacity High (meq/100g) [CECH]**

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil, when bases were determined at pH 7.0 by NH_4OAc method and acidity by $BaCl_2$-triethanolamine at pH 8.2. [The amount listed for complexes is the complete range of the soils identified in the map unit name (i.e., Ackmore = 25-30 and Colo = 36-41; Ackmore-Colo complex = 25-41 meq/100g).]

69 **K Factor [KFACTOR]**

Indicates the susceptibility of a soil to sheet and rill erosion by water. K factor is one of six factors used in the Universal Soil Loss Equation (USLE) 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 (up to 4%) and on soil structure and permeability. The estimates are modified by rhe presence of rock fragments. Values of K in Iowa range from 0.05 to 0.43. The higher the value, the more susceptible the soil is to sheet and rill erosion. [The K factor listed for complexes is the most limiting value of the soils identified in the map unit name (i.e., Ackmore = .37 and Colo = .28; Ackmore-Colo complex = .37).]

70 **KF Factor [KFFACTOR]**

Indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.[The KF factor listed for complexes is the most limiting value of the soils identified in the map unit name (ie., Ackmore = . and Colo = . ; Ackmore-colo complex = .).]

71 **T Factor (T/ac/yr) [TFACTOR]**

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. [The T factor listed for complexes is the most limiting value of the soils identified in the map unit name (i.e., Marshall = 5 and Dickman = 3; Marshall-Dickman complex = 3).]

72 **Wind Erodibility Group [WINDERGRP]**

Made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing and the amount of soil lost. [The wind erodibility group assigned to complexes is the most limiting group of the soils identified in the map unit name (i.e., Ackmore = 6 and Colo = 7; Ackmore-Colo complex = 6).] Soils are grouped according to the following distinctions.

1 = Sands, coarse sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2 = Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3 = Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L = Calcareous loamy soils that are less than 35% clay and more than 5% finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4 = Clays, silty clays, clay loams, and silty clay loams that are more than 35% clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5 = Loamy soils that are less than 18% clay and less than 5% finely divided calcium carbonate, and sandy clay loams and sandy clays that are less than 5% finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6 = Loamy soils that are 18 to 35% clay and less than 5% finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7 = Silty clay loams that are less than 35% clay and less than 5% finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8 = Stony or gravely soils and other soils not subject to soil blowing.

73 **Clay Content (Surface Horizon) Low (%) [CLAYSURL]**

The content of mineral soil particles <0.002 mm in diameter. Given as a percentage, by weight, of the soil material that is <2 mm in diameter. Clay percentage for the surface layer represents the full range of the map unit; it is not limited to the textural name assigned to the surface layer. [The percent clay listed for complexes is the complete range of the soils identified in the map unit name (i.e., Ackmore = 25-30% and Colo = 30-36%; Ackmore-Colo complex = 25-36%).]

74 **Clay Content (Surface Horizon) High (%) [CLAYSURH]**

The content of mineral soil particles <0.002 mm in diameter. Given as a percentage, by weight, of the soil material that is <2 mm in diameter. Clay percentage for the surface layer represents the full range of the map unit; it is not limited to the textural name assigned to the surface layer. [The percent clay listed for complexes is the complete range of the soils identified in the map unit name (i.e., Ackmore = 25-30% and Colo = 30-36%; Ackmore-Colo complex = 25-36%).]

75 **Sand Content (Surface Horizon) Low (%) [SANDCONTSL]**

Percentage of total sand in the surface horizon. [Total sand percentage listed for complexes is the complete range of the soils identified in the map unit name (i.e., Steinauer = 20-45 and Shelby = 25-45; Steinauer-Shelby complex = 20-45%).]

76 **Sand Content (Surface Horizon) High (%) [SANDCONTSH]**

Percentage of total sand in the surface horizon. [Total sand percentage listed for complexes is the complete range of the soils identified in the map unit name (i.e., Steinauer = 20-45 and Shelby = 25-45; Steinauer-Shelby complex = 20-45%).]

77 **Sand Size (Surface Horizon) [SANDSIZESH]**

[Sand size assigned to complexes is the most limiting size of the soils identified in the map unit name (i.e., Marshall = - and Dickman = 1; Marshall-Dickman complex = 1).]

- \- = <50% total sand
- 1 = >50% total fine sand [<0.25 mm]
- 0 = >50% total medium & coarse sand [0.25-1 mm]

78 **Topsoil Thickness Midpoint (in.) [TOPSOILMP]**

79 **Topsoil Thickness Range (±) (in.) [TOPSOILRNG]**

Topsoil is the upper part of the soil, which is the most favorable material for plant growth. The two fields indicate the midpoint and the range of top soil depth; i.e., midpoint = 40, range = ±5 indicates that the topsoil depth ranges from 35 to 45 inches. [Topsoil depth listed for complexes is the complete range of depths of the soils identified in the map unit name (i.e., Ackmore = 18±16 and Colo = 40±5; Ackmore-Colo complex = 29±16 [i.e., 13-45 in.]).]

80 **Surface Layer Color Value [SURCOLVL]**

81 **Surface Layer Color Chroma [SURCOLCHR]**

Based on Munsell system (moist soil). [The surface layer color value and chroma listed for complexes are the colors of the dominant soil (the soil listed first).]

82 **Thickness of Mollic Colors (Midpoint) (in.) [MOLCOLMD**

83 **Thickness of Mollic Colors Range (±) (in.) [MOLCOLRNG]**

Mollic colors in Iowa have Munsell color value darker than 3.5 when moist and 5.5 when dry and chroma is less than 3.5 when moist. In general, they are 10 inches thick and the horizon is not stratified. [Thickness of mollic colors listed for complexes is the complete range of thicknesses of the soils identified in map unit name (i.e., Ackmore = 18±16 and Colo = 40±5; Ackmore-Colo complex = 29±16 [or 13-45 inches]).]

84 **Depth to Free Carbonates [DPTFREECAR]**

[Depth to free carbonates listed for complexes is the most limiting depth of the soils identified in the soil name (i.e., Shelby = 4 and Adair = 5; Shelby-Adair complex = 4).]

- 0 = 0-7"
- 1 = 7-12"
- 2 = 12-24"
- 3 = 24-40"
- 4 = 40-60"
- 5 = >60"

85 **Tons of Residue/Acre [TONSRES]**

Tons of residue per acre is calculated using the following formula: 56 x Corn Yield (bu/ac)/2000 = Tons of Residue Produced/ac

86 **Tilth Rating [TILTHRTG]**

Based on clay content, organic matter, drainage class, sand size, and sand content (see Fig. 3).

- 1 = Good
- 2 = Fair
- 3 = Poor
- 4 = Very Poor

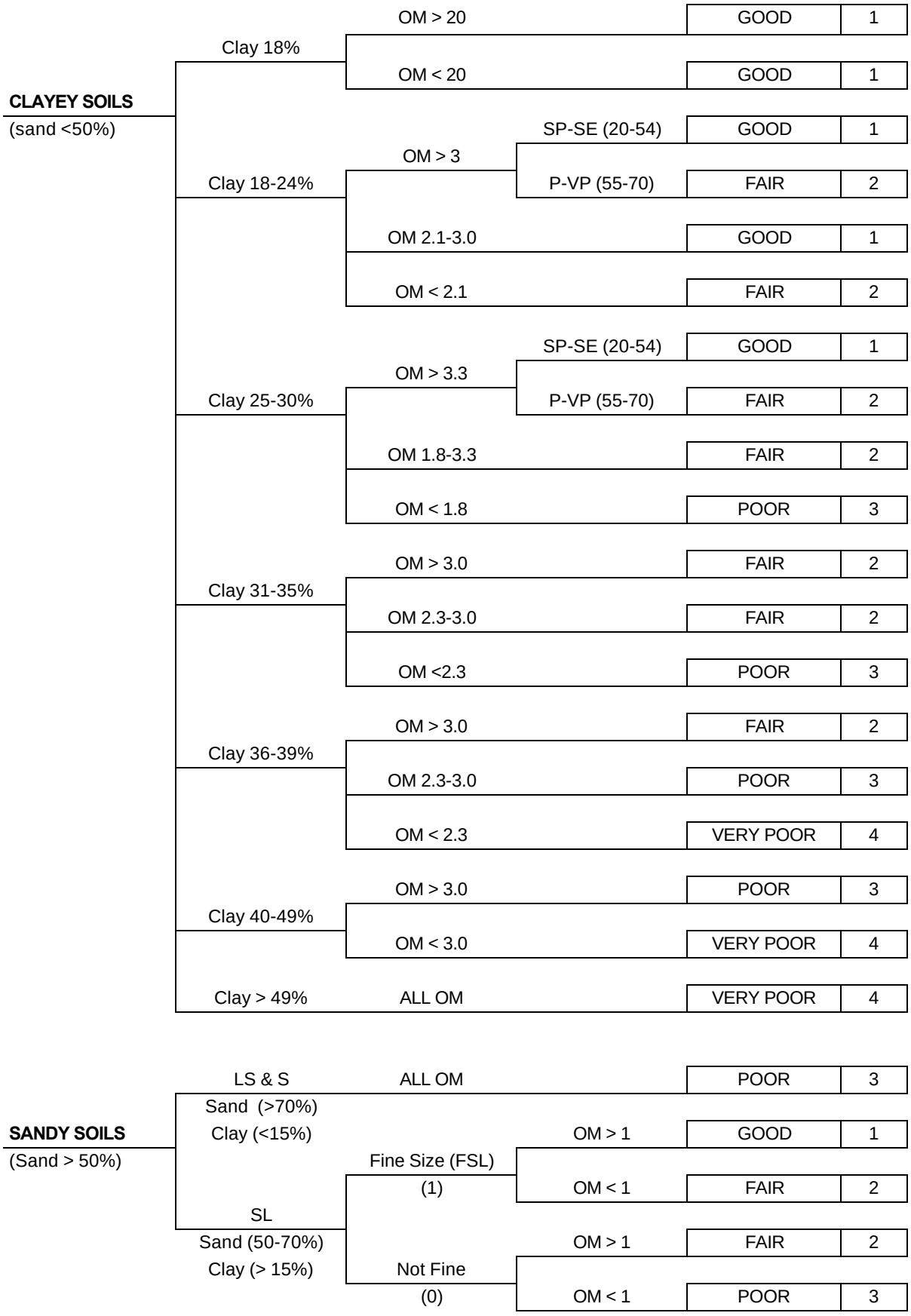


Figure 4. Soil tilth. Percentages listed for clay, sand, and organic matter are the median of the range (Ratings: Good = 1, Fair = 2, Poor = 3, Very Poor = 4).

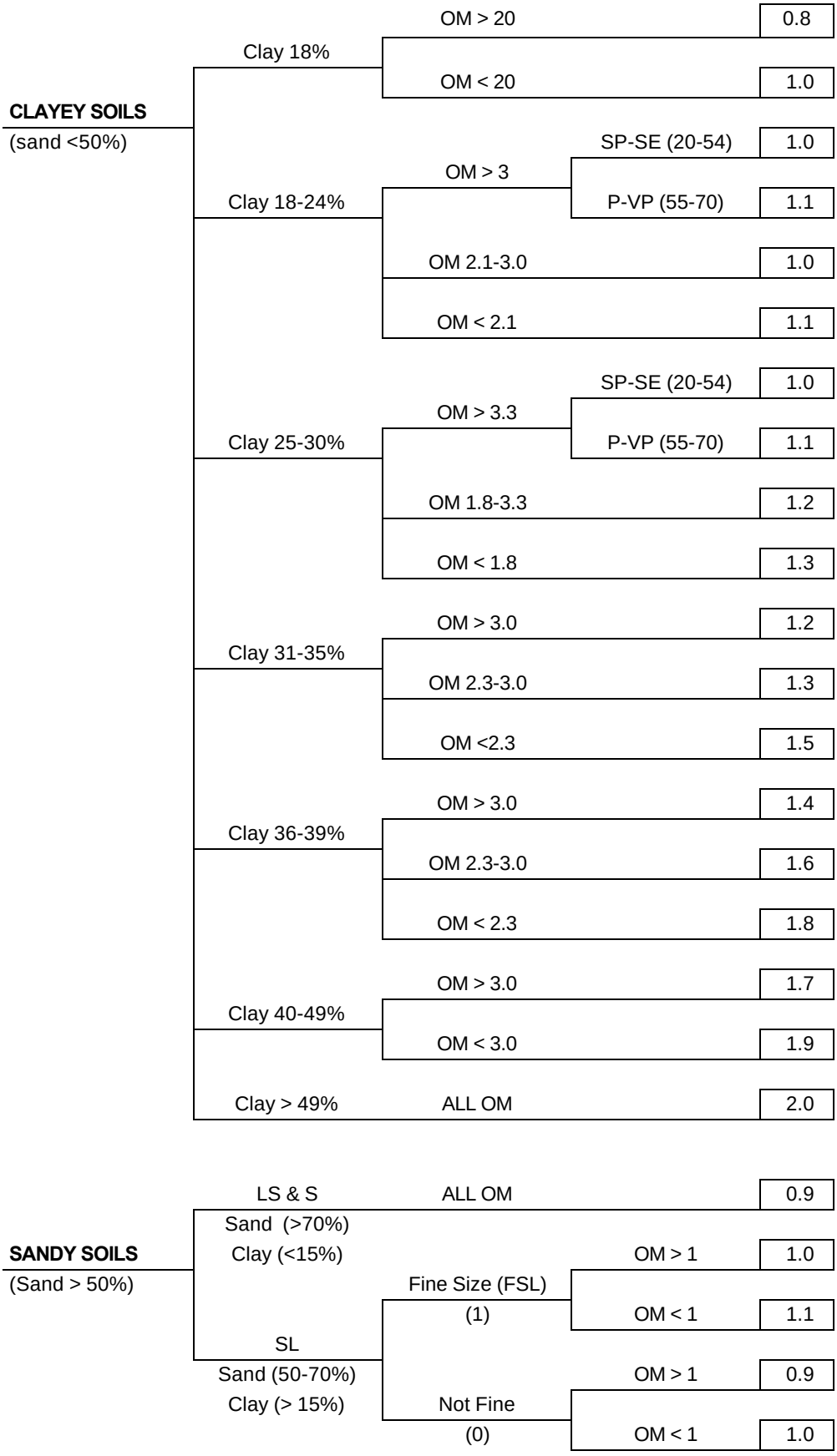


Figure 5. Power index. Percentages listed for clay, sand, and organic matter are the median of the range.

87 **Power Index [PWRINDX]**

The plow layer of each kind of soil has different combinations of clay, sand, silt, and organic matter which determine (along with its moisture content) the power requirements for tillage operations. Power requirements are available for tilling the plow layer of Nicollet clay loam (31% clay) on the Agronomy Farm and Agricultural Engineering Research Center near Ames. Indexes of 0.8 to 2.0 have been assigned to all SMUs in Iowa using the power requirements of Nicollet clay loam (31% clay) as a guide with 1.0 index rating. (See Figure 5.)

88 **Highly Erodible Land (HEL) Code [HEL]**

Land classified by the Soil Conservation Service in Land Capability Class 4, 6, 7, or 8; or land that, if used to produce an agricultural commodity, would have an excessive annual rate of erosion as determined by the Universal Soil Loss Equation and the wind erosion equation.

1 = Yes, this map unit is highly erodible.
2 = This map unit is potentially highly erodible.
3 = No, this map unit is not highly erodible.

89 **County Number [CONO]**

Iowa county number

90 **Map unit ID [MUID]**

NRCS map unit identification number

91 **Series Soil Map Unit [SSMU]**

The soil map unit symbol for the soil series. (refer to item number 2, page 4)