Appendix 1

Official Soil Series Description

The descriptions, maps, and information in the appendices were generated using publically accessible websites developed and supported by the USDA Natural Resources Conservation Service. They are examples of the soil survey products discussed in this manual. These products are developed and delivered to the public with the integrated use of standardized procedures, terminology, technologies, and data systems in a cooperative environment that includes Federal, State, and local units of government and universities (i.e., the National Cooperative Soil Survey).

The appendices provide examples of four main pillars of soil survey information: (1) official soil series descriptions (OSDs), (2) detailed map unit descriptions, (3) the National Cooperative Soil Survey Soil Characterization Database, and (4) Web Soil Survey.

The OSD database is the national collection of more than 20,000 detailed soil series descriptions from across the U.S. and its territories. The OSDs are managed in a text format following specific standards for organization and content. The name of a soil series is the common reference term used in the name of soil map units. Soil series are the most homogenous classes in Soil Taxonomy. The descriptions contain soil properties that define a specific soil series and distinguish it from other soil series and serve as the basis for the taxonomic classification.

As an example, the official description of the Olton series follows.

Olton Series

Location, Olton: TX+NM
Established Series
Rev. TCB-JKA-RM
08/2016

The Olton series consists of very deep, well drained, moderately slowly permeable soils that formed in clayey, calcareous eolian sediments in the Blackwater Draw Formation of Pleistocene age. These soils are

on nearly level to gently sloping plains and upper side slopes of playas and draws. Slope ranges from 0 to 5 percent. Mean annual precipitation is 483 mm (19 in), and mean annual temperature is 15 degrees C (59 degrees F).

TAXONOMIC CLASS: Fine, mixed, superactive, thermic Aridic Paleustolls

TYPICAL PEDON: Olton clay loam, on a northeast-facing, convex, 2 percent slope in cropland at an elevation of about 1,120 m (3,675 ft.). (Colors are for dry soil unless otherwise stated.)

A—0 to 20 cm (0 to 8 in); brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium granular and subangular blocky structure; hard, friable; many fine roots; common fine pores; common earthworm channels; common wormcasts; neutral; gradual smooth boundary. (15 to 36 cm [6 to 14 in] thick)

Bt1—20 to 38 cm (8 to 15 in); brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; common fine roots; few fine pores and root channels; few distinct clay films on faces of peds; slightly alkaline; gradual wavy boundary. (10 to 25 cm [4 to 10 in] thick)

Bt2—38 to 79 cm (15 to 31 in); reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; very hard, firm; few fine roots, mostly between peds; earthworm channels and casts; few distinct clay films on faces of peds; noneffervescent in upper part; few films and threads of calcium carbonate at a depth of about 22 inches, slightly effervescent; moderately alkaline; gradual wavy boundary. (20 to 41 cm [8 to 16 in] thick)

Btk1—79 to 122 cm (31 to 48 in); reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; weak medium angular blocky structure; very hard, firm; common fine root channels and pores; few distinct clay films on faces of peds; about 5 percent fine films and threads of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary. (38 to 66 cm [15 to 26 in] thick)

Btk2—122 to 191 cm (48 to 75 in); pink (5YR 7/3) clay loam, light reddish brown (5YR 6/4) moist; weak medium angular blocky and subangular blocky structure; hard, firm; about 35 percent fine and medium calcium carbonate masses and medium and coarse calcium carbonate concretions and nodules; violently effervescent; moderately alkaline; diffuse wavy boundary. (25 to 91 cm [10 to 26 in] thick)

Btk3—191 to 251 cm (75 to 99 in); red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; weak very coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm; few distinct clay films on faces of peds and clay bridged sand grains; common soft to weakly cemented films of calcium carbonate, amount decreases with depth and is less than 2 percent in lower part of horizon; strongly effervescent ped surfaces, some noneffervescent ped interiors; moderately alkaline.

TYPE LOCATION: Randall County, Texas; from the intersection of U.S. Highways 87 and 60 in Canyon, 8.9 kilometers (5.5 miles) west on U.S. Highway 60, about 2.4 kilometers (1.5 miles) north on county road, 966 meters (0.6 mile) east and 644 m (0.4 mile) north in cultivated field or 854 m (2,800 ft.) east and 488 m (1,600 ft.) north of SE corner of sec. 7, Block 1. T. T. R. R. Survey; latitude: 35 degrees, 01 minute, 28 seconds N; longitude: 102 degrees, 01 minute, 03 seconds W; Bivins Lake, Texas USGS quad; NAD27.

RANGE IN CHARACTERISTICS: Soil moisture: An ustic moisture regime bordering on aridic. The soil moisture control section is dry in some or all parts for more than 180 but less than 205 days, cumulative, in normal years. July through August and December through February are the driest months. These soils are intermittently moist in September through November and March through June.

Mean annual soil temperature: 15 to 18 degrees C (59 to 64 degrees F)
Depth to argillic horizon: 15 to 36 cm (6 to 14 in)
Depth to secondary carbonates: 36 to 71 cm (14 to 28 in)
Depth to calcic horizon: 76 to 152 cm (30 to 60 in)
Solum thickness: more than 203 cm (80 in)
Particle-size control section: 35 to 50 percent silicate clay

A horizon:
Hue: 5YR to 10YR
Value: 3 to 5, 2 to 4 moist
Chroma: 2 or 3
Texture: Loam, clay loam
Effervescence: None to slight
Reaction: Neutral to moderately alkaline

Bt horizons:
Hue: 5YR or 7.5YR
Value: 3 to 5, 2 to 4 moist
Chroma: 2 to 6

Texture: Clay loam, clay
Visible calcium carbonate: Few films and threads at about 56 cm (22 in)
Effervescence: None to slight
Reaction: Slightly alkaline or moderately alkaline

Btk horizons:
Hue: 2.5 to 7.5YR
Value: 5 to 7, 4 to 6 moist
Chroma: 3 to 8
Texture: Clay loam, silty clay loam
Visible calcium carbonate: 15 to 60 percent as masses, films, threads, concretions, and nodules
Effervescence: Violent
Reaction: Moderately alkaline or strongly alkaline

B′t horizon below the calcic (where present):
Hue: 2.5YR to 7.5YR
Value: 5 to 7, 4 to 6 moist
Chroma: 3 to 8
Texture: Loam, sandy clay loam, clay loam
Visible calcium carbonate: Few threads, films, and nodules
Effervescence: Slight or strong
Reaction: Moderately alkaline or strongly alkaline

COMPETING SERIES: There are no other series in this family. Similar soils include the Acuff, Estacado, Pullman, and Pantex series.

Acuff series: Has 18 to 35 percent silicate clay in the particle-size control section.

Estacado series: Is calcareous in upper horizons and has 20 to 35 percent silicate clay in the particle-size control section.

Pantex and Pullman series: Have COLE of more than 0.06.

GEOGRAPHIC SETTING:
Parent material: Clayey, calcareous eolian sediments in the Blackwater Draw Formation of Pleistocene age
Landform: Nearly level to gently sloping plains and upper side slopes of playas and draws
Slopes: Dominantly less than 3 percent, but can range up to 5 percent
Mean annual air temperature: 14 to 17 degrees C (57 to 62 degrees F)
Mean annual precipitation: 432 to 533 mm (17 to 21 in)
Frost-free period: 180 to 220 days
Elevation: 793 to 1,524 m (2,600 to 5,000 ft.)
Thornthwaite annual P-E Index values: 30 to 34

GEOGRAPHICALLY ASSOCIATED SOILS: These are the similar Acuff, Estacado, and Pullman series and also the Amarillo, Pep, and Portales series.

Acuff, Amarillo, and Estacado soils: Are in landscape positions similar to those of the Olton series and average less than 35 percent clay in the particle-size control section.

Pep soils: Are in landscape positions similar to those of the Olton series and do not have an argillic horizon.

Portales soils: Are in slightly lower landscape positions and average less than 35 percent clay in the particle-size control section.

Pullman soils: Are in landscape positions similar to those of the Olton series and have COLE of more than 0.06.

DRAINAGE AND PERMEABILITY: Well drained. Moderately slow permeability. Runoff is low where slopes are 0 to 1 percent and medium where slopes are 1 to 5 percent.

USE AND VEGETATION: Mainly cultivated for cotton, sorghum, and winter wheat. A considerable acreage is irrigated. Climax native vegetation is dominantly shortgrasses with a few midgrasses and includes blue grama and buffalograss. Also included are lesser amounts of vine-mesquite, western wheatgrass, sideoats grama, galleta, tobosa, silver bluestem, wild alfalfa, and prairie clover. This soil has been correlated to the Deep Hardland (077CY022TX) range site in MLRA 77C.

DISTRIBUTION AND EXTENT: Southern High Plains, Southern Part (MLRA 77C in LRR H) of western Texas and eastern New Mexico. The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (SSRO) RESPONSIBLE: Temple, Texas

SERIES ESTABLISHED: Lamb County, Texas; 1960.

REMARKS: This is a Benchmark Series.

Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon: 0 to 38 cm (0 to 15 in) (A, Bt1 horizons)

Argillic horizon: 20 to 251 cm (8 to 99 in) (Bt1, Bt2, Btk1, Btk2, Btk3 horizons)

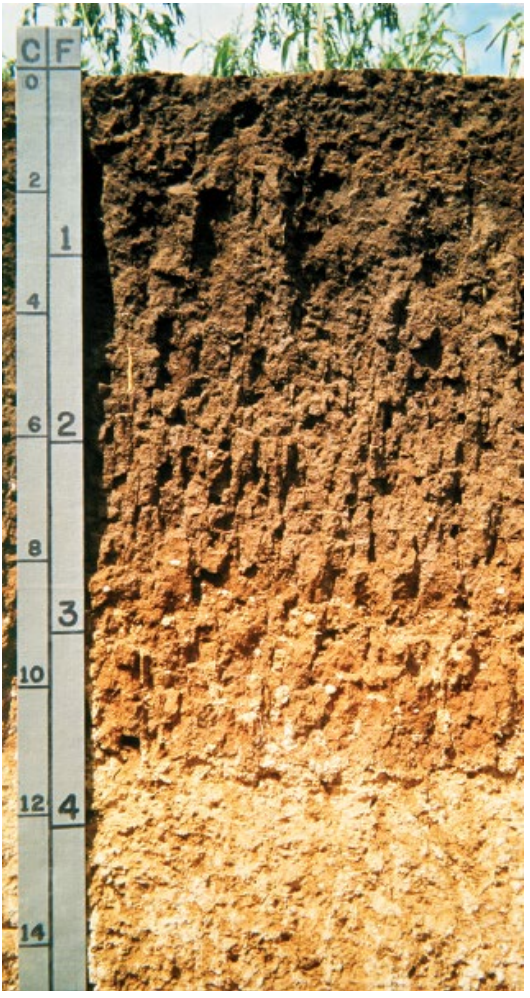
Calcic horizon: 79 to 191 cm (31 to 75 in) (Btk1, Btk2 horizons)

ADDITIONAL DATA: NSSL Characterization data: Sample Nos. S78TX-381-001 and S90TX-381-001, 001A, 001B, 001C, 001D

(Randall Co.); S81TX-069-001 (Castro Co.); S90TX-359-001, 001A, 001B, 001C, 001D (Oldham Co.); S81TX-069-001 and S93TX-069-001 (Castro Co.); and S92TX-369-001, 001B, 001C, 001D, 001E, 001F and S96TX-369-001, 002 (Parmer Co.). USDA-ARS Bulletin B-1727 "Olton Soils, Distribution, Importance, Variability and Management" 4-98, Paul W. Unger and Fred B. Pringle.

Taxonomic Version: Keys to Soil Taxonomy, Twelfth Edition, 2014.

Figure A-1



Profile of the Olton series.

APPENDIX

2

Detailed Map Unit Description

The following map unit description is typical of those produced by the Web Soil Survey (WSS). Note that for ease of use by the public in the U.S., metric units have been converted to English units.

OcA—Olton clay loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: f5sv
Elevation: 2,800 to 5,000 feet
Mean annual precipitation: 17 to 21 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 220 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Olton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the map unit.

Setting

Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey eolian deposits from the Blackwater Draw Formation of Pleistocene age

Typical profile

Ap - 0 to 8 inches: clay loam
Bt - 8 to 31 inches: clay loam
Btk1 - 31 to 48 inches: clay loam
Btk2 - 48 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmho/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic soil group: C
Ecological site: Deep Hardland 16-21″ PZ (R077CY022TX)
Hydric soil rating: No

Minor Components

Pullman soils

Percent of map unit: 7 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Hardland 16-21″ PZ (R077CY022TX)
Hydric soil rating: No

Acuff soils

Percent of map unit: 5 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Hardland 16-21″ PZ (R077CY022TX)
Hydric soil rating: No

Estacado soils

Percent of map unit: 3 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Hardland 16-21″ PZ (R077CY022TX)
Hydric soil rating: No

APPENDIX

3

NCSS Soil Characterization Database

The National Cooperative Soil Survey (NCSS) Soil Characterization Database contains the analytical results from the Kellogg Soil Survey Laboratory (KSSL) at the National Soil Survey Center (NSSC) in Lincoln, Nebraska, as well as the results from numerous cooperating State university laboratories in the United States. Properties measured in the laboratory serve as the basis for interpretations related to soil use and management. Standardized methodologies and procedures used in the laboratory are contained in the *Kellogg Soil Survey Laboratory Methods Manual*, Soil Survey Investigations Report (SSIR) No. 42 (by the Soil Survey Staff). The KSSL data are provided in reports (for example, Primary and Supplementary Characterization Data Sheets) and are available in various electronic forms, including online, tape, CD, and DVD.

The database includes pedons that represent the central concept of a soil series, pedons that represent the central concept of a map unit but not of a series, and pedons sampled to bracket a range of properties within a series or landscape. Not all analyses are conducted for every soil. Suites of analytical procedures are run based upon anticipated or known conditions regarding the nature of the soil being analyzed. Results are reported in tiers. For example, soils of arid environments are routinely analyzed for salts and carbonates as part of the standard analysis suite. Tables A-1 and A-2 show some of the primary characterization data and supplemental data for a pedon of Olton series sampled in Castro County, Texas, in 2006.

Table A-1

Primary Characterization Data

*** Primary Characterization Data ***

Pedon ID: S2006TX069003 (Castro, Texas)

Sampled as on Mar 29, 2006: Olton; Fine, mixed, superactive, thermic Calcic Haplustert
Revised to correlated: Olton; Fine, mixed, superactive, thermic Aridic Paleustolls

SSL - Project C2006USNL085 MLRA 77D
- Site ID S2006TX069003 Lat: 34° 20' 54.50" north Long: 102° 10' 55.09" west MLRA: 77D
- Pedon No. 06N0716
- General Methods 1B1A, 2A1, 2B

United States Department of Agriculture
Natural Resources Conservation Service
National Soil Survey Center
Kellogg Soil Survey Laboratory
Lincoln, Nebraska 68508-3866

Layer	Hori-zon	Orig Hzn	Depth (cm)	Field Label 1	Field Label 2	Field Label 3	Field Texture	Lab Texture
06N02986	Ap	Ap	0-12	S06TX069-003-1			CL	CL
06N02987	Bt1	Bt1	12-27	S06TX069-003-2			C	CL
06N02988	Bt2	Bt2	27-48	S06TX069-003-3			C	CL
06N02989	Btk	Btk	48-99	S06TX069-003-4			SCL	CL
06N02990	Btkk1	Btkk1	99-125	S06TX069-003-5			CL	C
06N02991	Btkk2	Btkk2	125-203	S06TX069-003-6			CL	CL

Pedon Calculations

Calculation Name	Result	Units of Measure
LE, Whole Soil, Summed to 1m	6	cm/m

PSDA & Rock Fragments				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-
					(- - - Total -- - - -)			(- - Clay - - -)		(- -- - Silt - - - -)		(- - - - - - - - - - - - Sand - - - - - - - - - - - -)					(Rock Fragments (mm))				
				Lab	Clay	Silt	Sand	Fine	CO_3	Fine	Coarse	VF	F	M	C	VC	(- -- - Weight - - - - -)				>2 mm
				Text-	<	.002	.05	<	<	.002	.02	.05	.10	.25	.5	1	2	5	20	.1-	wt %
	Depth			ure	.002	-.05	-2	.0002	.002	-.02	-.05	-.10	-.25	-.50	-1	-2	-5	-20	-75	75	whole
Layer	(cm)	Horz	Prep		(- % of <2mm Mineral Soil -)												(- - - % of <75mm - - -)				soil
					3A1a1a			3A1a1a	3A1a1a	3A1a1a		3A1a1a	3A1a1a	3A1a1a	3A1a1a	3A1a1a					
06N02986	0-12	Ap	S	cl	31.8	37.9	30.3	22.5		13.9	24.0	16.8	11.2	2.2	0.1	tr	--	--	--	14	--
06N02987	12-27	Bt1	S	cl	32.7	36.8	30.5	25.1		14.5	22.3	16.8	11.5	2.1	0.1	--	--	--	--	14	--
06N02988	27-48	Bt2	S	cl	39.0	33.9	27.1	28.8		13.8	20.1	13.8	11.4	1.9	tr	--	--	--	--	13	--
06N02989	48-99	Btk	S	cl	36.9	33.0	30.1	16.0	1.3	11.9	21.1	14.7	12.3	2.7	0.2	0.2	1	tr	--	16	1
06N02990	99-125	Btkk1	S	c	41.3	38.1	20.6	9.4	30.7	25.4	12.7	10.4	7.9	2.0	0.2	0.1	2	2	tr	14	4
06N02991	125-203	Btkk2	S	cl	38.3	40.3	21.4	9.7	24.5	26.7	13.6	10.8	8.4	1.7	0.3	0.2	1	2	--	13	3

Bulk Density & Moisture				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-
				(Bulk Density)		Cole	(----------Water Content----------						WRD	Aggst		
				33	Oven	Whole	6	10	33	1500	1500 kPa	Ratio	Whole	Stabl	(Ratio/Clay)	
	Depth			kPa	Dry	Soil	kPa	kPa	kPa	kPa	Moist	AD/ OD	Soil	2-0.5mm	CEC7	1500 kPa
Layer	(cm)	Horz	Prep	(- - - g cm^{-3} - - -)			(- - - - - - - - % of < 2mm - - - - - - - -)						cm^3 cm^{-3}	%		
				DbWR1	DbWR1				DbWR1	3C2a1a		3D1				
06N02986	0-12	Ap	S	1.27	1.52	0.062			25.0	13.3		1.036	0.15		0.62	0.42
06N02987	12-27	Bt1	S	1.39	1.71	0.072			25.6	14.2		1.039	0.16		0.62	0.43
06N02988	27-48	Bt2	S	1.39	1.73	0.076			26.9	16.0		1.045	0.15		0.61	0.41
06N02989	48-99	Btk	S	1.48	1.74	0.055			22.8	14.9		1.044	0.12		0.56	0.40
06N02990	99-125	Btkk1	S	1.43	1.50	0.016			22.8	9.3		1.017	0.19		0.17	0.23
06N02991	125-203	Btkk2	S	1.50	1.63	0.028			18.8	9.6		1.019	0.13		0.21	0.25

Carbon & Extractions				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-
				(- - - - - Total - - - - -)			Est	OC	C/N	(Dith-Cit Ext)			(- - - - Ammonium Oxalate Extraction - - - -)						(-Na Pyro-Phosphate-)			
	Depth			C	N	S	OC	(WB)	Ratio	Fe	Al	Mn	Al+½Fe	ODOE	Fe	Al	Si	Mn	C	Fe	Al	Mn
Layer	(cm)	Horz	Prep	(- - - - - % of <2 mm - - - - - -)						(- - - - - - - - - - % of < 2mm - - - - - - - - -)								mg kg^{-1}	(- - - % of < 2mm - - -)			
				4H2a	4H2a	4H2a				4G1	4G1	4G1		4G2	4G2	4G2	4G2	4G2				
06N02986	0-12	Ap	S	1.18	0.13	tr	1.2		9	0.9	0.1	tr	--	0.02	--	--	--	--				
06N02987	12-27	Bt1	S	0.65	0.09	tr	0.6		7	0.9	0.1	tr	0.13	0.02	0.08	0.09	0.06	268.3				
06N02988	27-48	Bt2	S	0.63	0.09	--	0.6		7	1.1	0.1	tr	0.16	0.02	0.09	0.12	0.07	249.2				
06N02989	48-99	Btk	S	0.69	0.09	--	0.3		4	1.0	0.1	tr	0.13	0.01	0.06	0.10	0.06	215.4				
06N02990	99-125	Btkk1	S	6.93	0.09	--	0.4		5	0.3	--	--	0.02	0.01	0.01	0.02	0.02	9.8				
06N02991	125-203	Btkk2	S	6.11	0.03	0.01	0.2		5	0.3	--	--	0.02	0.01	0.01	0.02	0.02	15.1				

CEC & Bases				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10--	-11-	-12-	-13-	-14-
				(- - - - - NH_4OAC Extractable Bases - - - -)								CEC8	CEC7	ECEC		(- - - - Base - - - -)	
								Sum	Acid-	Extr	KCl	Sum	NH_4	Bases	Al	(-- Saturation --)	
	Depth			Ca	Mg	Na	K	Bases	ity	Al	Mn	Cats	OAC	+Al	Sat	Sum	NH_4OAC
Layer	(cm)	Horz	Prep	(- - - - - - - - - - - - - - - - cmol(+) kg^{-1} - - - - - - - - - - - - - - - - - -)							mg kg^{-1}	(- - - - cmol(+) kg^{-1} - - -)				(- - - - - % - - - - -)	
				4B1a1a	4B1a1a	4B1a1a	4B1a1a		4B2b1a1					4B1a1a			
06N02986	0-12	Ap	S	13.0*	6.3	--	1.9	21.2	3.2			24.4	19.6			87	100
06N02987	12-27	Bt1	S	14.6*	5.9	--	1.1	21.6	2.4				20.4				100
06N02988	27-48	Bt2	S	18.6*	7.0	0.1	0.9	26.6	2.4				23.7				100
06N02989	48-99	Btk	S	50.2*	6.9	0.2	0.8	58.1					20.7				100
06N02990	99-125	Btkk1	S	45.6*	3.7	0.3	0.4	50.0					7.2				100
06N02991	125-203	Btkk2	S	46.4*	3.1	0.3	0.5	50.3					8.1				100

*Extractable Ca may contain Ca from calcium carbonate or gypsum. CEC7 base saturation set to 100.

Salt				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
				(- - - - Water Extracted From Saturated Paste																- - - -)	1:2		
																			Total	Elec	Elec	Exch	
	Depth			Ca	Mg	Na	K	CO_3	HCO_3	F	Cl	PO_4	Br	OAC	SO_4	NO2	NO_3	H_2O	Salts	Cond	Cond	Na	SAR
Layer	(cm)	Horz	Prep	(--- mmol(+) L^{-1} - -)				(- - - - mmol(-) L^{-1} - - - -)										(- - % - ---)		(- - dS m^{-1} - -)		%	
				4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2	4F2		4F2	4F1a1a1		
06N02986	0-12	Ap	S	2.5	1.6	0.3	0.6	--	3.7	--	0.7	tr	--	--	0.6	tr	0.1	56.3	--	0.52	0.28	--	tr
06N02987	12-27	Bt1	S																		0.24	--	
06N02988	27-48	Bt2	S																		0.19	tr	
06N02989	48-99	Btk	S																		0.18	1	
06N02990	99-125	Btkk1	S																		0.23	5	
06N02991	125-203	Btkk2	S	2.1	0.8	3.2	0.2	--	1.7	0.2	2.0	--	--	--	2.8	tr	tr	43.1	tr	0.72	0.29	2	3

pH & Carbonates				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-
				(- - - - pH					- - - -)	(- - Carbonate - -)		(- - Gypsum - - -)		
					$CaCl_2$					As $CaCO_3$		As $CaSO_4$*$2H_2O$		Resist
	Depth				0.01M	H_2O	Sat			<2mm	<20mm	<2mm	<20mm	ohms
Layer	(cm)	Horz	Prep	KCl	1:2	1:1	Paste	Oxid	NaF	(- - - - %			- - - -)	cm^{-1}
					4C1a2a	4C1a2a	4F2			4E1a1a1a1				
06N02986	0-12	Ap	S		6.8	7.1	7.1							
06N02987	12-27	Bt1	S		7.3	7.6				tr				
06N02988	27-48	Bt2	S		7.5	7.8				tr				
06N02989	48-99	Btk	S		7.8	8.2				3				
06N02990	99-125	Btkk1	S		7.9	8.5				54				
06N02991	125-203	Btkk2	S		7.8	8.3	8.0			49				

Phosphorous				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-
					(- Phosphorous -)										KCl
				Melanic	NZ	Acid	Anion Exch	Resin	Bray	Bray	Olsen	H_2O	Citric	Mehlich	Extr
	Depth			Index		Oxal	Available	Capacity	1	2			Acid	III	NO_3
Layer	(cm)	Horz	Prep		%	(- mg kg^{-1} -)									
					4D8a1	4G2									
06N02986	0-12	Ap	S		14	--									
06N02987	12-27	Bt1	S		18	82.2									
06N02988	27-48	Bt2	S		23	54.5									
06N02989	48-99	Btk	S		25	40.0									
06N02990	99-125	Btkk1	S		78	113.7									
06N02991	125-203	Btkk2	S		87	109.0									

Clay Mineralogy (<.002 mm)				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-
					X-Ray				Thermal				Elemental							EGME	Inter
													SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	K_2O	Na_2O	Retn	preta
	Depth		Fract	7A1a1																	tion
Layer	(cm)	Horz	ion	(- - - - - - peak size - - - - - -)					(- - - - % - - - - -)				(- % - - - - - - - - - - - - - - - - - -)							mg g^{-1}	
06N02986	0.0-12.0	Ap	tcly	MI 3	KK 2	QZ 1															CMIX
06N02988	27.0-48.0	Bt2	tcly	KK 2	QZ 1																CMIX
06N02991	125.0-203.0	Btkk2	tcly	CA 3	MI 1	KK 1															CMIX

FRACTION INTERPRETATION:

tcly - Total Clay <0.002 mm

MINERAL INTERPRETATION:

CA Calcite KK Kaolinite MI Mica QZ Quartz

RELATIVE PEAK SIZE: 5 Very Large 4 Large 3 Medium 2 Small 1 Very Small 6 No Peaks

INTERPRETATION (BY HORIZON):

CMIX - Mixed Clay

Sand - Silt Mineralogy (2.0-0.002 mm)				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-
				X-Ray					Thermal					Optical						EGME	Inter
													Tot Re	Grain Count						Retn	preta
	Depth		Fract											7B1a2							tion
Layer	(cm)	Horz	ion	(- -- - peak size - - - -)					(-- - - - % - - - -- -)				(- - - - - - - - - - - - -- - - - - - - % -- - - - - - - - - - - - - - - -)							mg g^{-1}	
06N02987	12.0-27.0	Bt1	csi										89	QZ 83	FK 8	CD 3	OP 2	PR 2	FE 1		SMIX
														PO tr	TM tr	ZR tr	FP tr	GN tr	GS tr		
														HN tr	MS tr	AR tr	BT tr	BY tr	CB tr		

FRACTION INTERPRETATION:

csi - Coarse Silt 0.02-0.05 mm

MINERAL INTERPRETATION:

AR Weatherable Aggregates	BT Biotite	BY Beryl	CB Carbonate Aggregates	CD Chert (Chalcedony
FE Iron Oxides (Goethite	FK Potassium Feldspar	FP Plagioclase Feldspar	GN Garnet	GS Glass
HN Hornblende	MS Muscovite	OP Opaques	PO Plant Opal	PR Pyroxene
QZ Quartz	TM Tourmaline	ZR Zircon		

INTERPRETATION (BY HORIZON):

SMIX - Mixed Sand

Table A-2

Supplementary Characterization Data

*** Supplementary Characterization Data ***

Pedon ID: S2006TX069003 (Castro, Texas)

Sampled as on Mar 29, 2006: Olton; Fine, mixed, superactive, thermic Calcic Haplustert
Revised to correlated: Olton; Fine, mixed, superactive, thermic Aridic Paleustolls

SSL - Project C2006USNL085 MLRA 77D
- Site ID S2006TX069003 Lat: 34° 20' 54.50" north Long: 102° 10' 55.09" west MLRA: 77D
- Pedon No. 06N0716
- General Methods 1B1A, 2A1, 2B

United States Department of Agriculture
Natural Resources Conservation Service
National Soil Survey Center
Kellogg Soil Survey Laboratory
Lincoln, Nebraska 68508-3866

Tier 1				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-	-21-	-22-	-23-	-24-	-25-
				(- - - - - - - - - - Engineering PSDA - - - - - - - - - - - - - - - - -)													(------ Cumulative Curve Fractions -----) (<75mm)								(Atter-		(Gradation)	
				Percentage Passing Sieve													USDA Less Than Diameters (mm) at								berg)		Uni-	Cur-
	Depth			3	2	3/2	1	3/4	3/8	4	10	40	200	20	5	2	1.	.5	.25	.10	.05	60	50	10	LL	PI	fmty	vtur
Layer	(cm)	Horz	Prep	(----------Inches----------)						(------Number-------)				(----Microns---)			(---------Millimeter----------)					(-----Percentile---)			(----%---)		CU	CC
06N02986	0-12	Ap	S	100	100	100	100	100	100	100	100	99	80	46	37	32	100	100	98	87	70	0.03	0.024	tr			83.7	0.2
06N02987	12-27	Bt1	S	100	100	100	100	100	100	100	100	99	80	47	38	33	100	100	98	86	70	0.03	0.022	tr			83.7	0.2
06N02988	27-48	Bt2	S	100	100	100	100	100	100	100	100	100	81	53	44	39	100	100	98	87	73	0.03	0.013	tr			76.9	0.1
06N02989	48-99	Btk	S	100	100	100	100	100	100	100	99	98	77	48	41	37	99	99	96	84	69	0.03	0.022	tr			88.9	0.1
06N02990	99-125	Btkk1	S	100	100	100	100	100	99	98	96	95	82	64	49	40	96	96	94	86	76	0.01	0.005	tr			38.2	0.3
06N02991	125-203	Btkk2	S	100	100	100	100	100	99	98	97	96	82	63	47	37	97	97	95	87	76	0.02	0.006	tr			41.0	0.3

Tier 2				-26-	-27-	-28-	-29-	-30-	-31-	-32-	-33-	-34-	-35-	-36-	-37-	-38-	-39-	-40-	-41-	-42-	-43-	-44-	-45-	-46-	-47-	-48-	-49-	-50-
				(- - - - - - - - - - - - - - - - - Weight Fractions - - - -- -- - - - - - - - - -)														(- - - - - - - --- - - - - Weight Per Unit Volume (g cm^{-3})- - - - - - -- - -)									(--Void---)	
				Whole Soil (mm)							<75 mm Fraction							Whole Soil				<2 mm Fraction					Ratios	
				>2	250	250	75	75	20	5		75	75	20	5			Soil Sur		Engineering		Soil Survey			Engineering		At 33 kPa	
	Depth				-UP	-75	-2	-20	-5	-2	<2	-2	-20	-5	-2	<2		33	Oven	Moist	Satur	33	1500	Oven	Moist	Satur	Whole	<2
Layer	(cm)	Horz	Prep	(---------- % of Whole Soil ----------)								(---- % of <75 mm -----)						kPa	-dry		-ated	kPa	kPa	-dry		-ated	Soil	mm
																						DbWR1		DbWR1				
06N02986	0-12	Ap	S	--			--	--	--	--	100	--	--	--	--	100		1.27	1.52	1.59	1.79	1.27	1.41	1.52	1.59	1.79	1.09	1.09
06N02987	12-27	Bt1	S	--			--	--	--	--	100	--	--	--	--	100		1.39	1.71	1.75	1.87	1.39	1.56	1.71	1.75	1.87	0.91	0.91
06N02988	27-48	Bt2	S	--			--	--	--	--	100	--	--	--	--	100		1.39	1.73	1.77	1.87	1.39	1.56	1.73	1.76	1.87	0.91	0.91
06N02989	48-99	Btk	S	1			1	--	tr	1	99	1	--	tr	1	99		1.49	1.75	1.83	1.93	1.48	1.59	1.74	1.82	1.92	0.78	0.79
06N02990	99-125	Btkk1	S	4			4	tr	2	2	96	4	tr	2	2	96		1.46	1.53	1.78	1.91	1.43	1.47	1.50	1.76	1.89	0.82	0.85
06N02991	125-203	Btkk2	S	3			3	--	2	1	97	3	--	2	1	97		1.51	1.64	1.78	1.94	1.50	1.57	1.63	1.78	1.93	0.75	0.77

Tier 3				-51-	-52-	-53-	-54-	-55-	-56-	-57-	-58-	-59-	-60-	-61-	-62-	-63-	-64-	-65-	-66-	-67-	-68-	-69-	-70-	-71-	-72-	-73-	-74-	-75-
				(- - - - - - - - - - - - - - - - - - Volume Fractions - - - - - - - - - - - - - - - -)													C	(- - - - - Ratios To Clay - - - -)				(-- Linear Extensiblity --)				(---WRD---)	
				Whole Soil (mm) At 33 kPa													/N	<2 mm Fraction				Whole Soil		<2 mm		Whole	<2
				>2	250	250	75	75	20	5		2-	.05-	LT		Pores	Rat	Fine	CEC		1500	LEP	33 kPa		to %		Soil	mm
	Depth				-UP	-75	-2	-20	-5	-2	<2	.05	.002	.002	D	F	-io	Clay	Sum	NH_{4-}	kPa	33	1500	Oven	1500	Oven		
Layer	(cm)	Horz	Prep	(---------- % of Whole Soil ----------															Cats	OAC	H_2O	kPa	kPa	-dry	kPa	-dry	(--in^3/in^3---)	
06N02986	0-12	Ap	S	--	--	--	--	--	--	--	100	14	18	15	20	32	9	0.71	0.77		0.42	0.195	3.5	6.2	3.5	6.2	0.15	0.15
06N02987	12-27	Bt1	S	--	--	--	--	--	--	--	100	16	19	17	12	36	7	0.77			0.43	0.220	3.9	7.2	3.9	7.2	0.16	0.16
06N02988	27-48	Bt2	S	--	--	--	--	--	--	--	100	14	18	20	10	38	7	0.74			0.41	0.195	3.7	7.6	3.9	7.6	0.15	0.15
06N02989	48-99	Btk	S	1	--	--	1	--	--	1	99	17	18	21	10	34	4	0.43			0.40	0.149	2.4	5.5	2.4	5.5	0.12	0.12
06N02990	99-125	Btkk1	S	2	--	--	2	tr	1	1	98	11	20	22	13	32	5	0.23			0.23	0.039	0.9	1.6	0.9	1.6	0.19	0.19
06N02991	125-203	Btkk2	S	1	--	--	2	--	1	1	99	12	23	21	16	27	5	0.25			0.25	0.073	1.5	2.8	1.5	2.8	0.13	0.14

Tier 4				-76-	-77-	-78-	-79-	-80-	-81-	-82-	-83-	-84-	-85-	-86-	-87-	-88-	-89-	-90-	-91-	-92-	-93-	-94-	-95-	-96-	-97-	-98-
				(- - - - - - - - - - - - - - - - - Weight Fractions - Clay Free - - - - - - - - - - - - - - - - - -)															Text -ure by PSDA	PSDA (mm)			pH	Elect.		Part- -icle
				(------------ Whole Soil -------------)						(---------------- <2 mm Fraction ----------------)										Sand	Silt	Clay	Ca	Res-	Con-	Den-
				>2	75	20	2-	.05-	<	(------------ Sands -----------)					(-- Silts -)		Cl			2-	.05-	<	Cl2	ist.	duct	sity
	Depth				-20	-2	.05	.002	.002	VC	C	M	F	VF	C	F	ay		PSDA	.05	.002	.002	.01M	ohms	dS m^{-1}	
Layer	(cm)	Horz	Prep	(--- % of >2 mm Sand and Silt ---)						(-----------------% of Sand and Silt -------------)									<2 mm	(---- % of 2 mm ----)			(-------- <2 mm ------)			g cm^{-3}
																						3A1a1a	4C1a2a		4F2	
06N02986	0-12	Ap	S	--	--	--	44	56	47	--	tr	3	16	25	35	20	47		cl	30.3	37.9	31.8	6.8		0.52	
06N02987	12-27	Bt1	S	--	--	--	45	55	49	--	tr	3	17	25	33	22	49		cl	30.5	36.8	32.7	7.3			
06N02988	27-48	Bt2	S	--	--	--	44	56	64	--	--	3	19	23	33	23	64		cl	27.1	33.9	39.0	7.5			
06N02989	48-99	Btk	S	2	2	2	47	51	58	tr	tr	4	19	23	33	19	58		cl	30.1	33.0	36.9	7.8			
06N02990	99-125	Btkk1	S	7	7	7	33	61	66	tr	tr	3	13	18	22	43	70		c	20.6	38.1	41.3	7.9			
06N02991	125-203	Btkk2	S	5	5	5	33	62	59	tr	tr	3	14	18	22	43	62		cl	21.4	40.3	38.3	7.8		0.72	

APPENDIX

4

Web Soil Survey

By Kenneth Scheffe and Soil Science Division Staff.

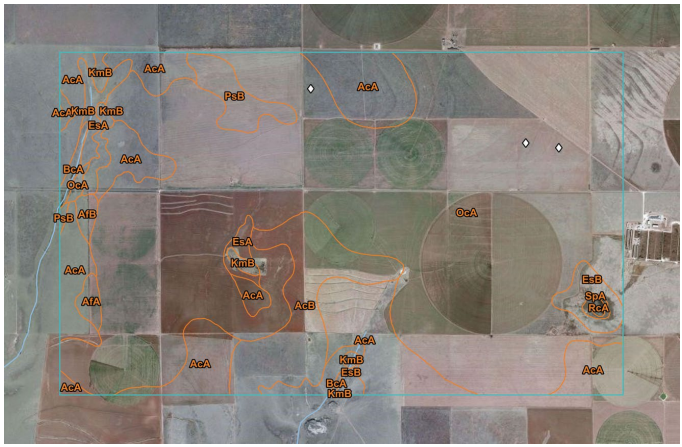
Soil Survey Maps and Map Products

Web Soil Survey (WSS) is the largest natural resource information delivery system in the world. It is the primary delivery mechanism for the maps and data of the National Cooperative Soil Survey and is operated by the USDA Natural Resources Conservation Service. Information can be displayed as maps (fig. A-2) or in tables. The user selects an area of interest on a map and then can view and print a soils map of the area. The user can also access additional soil data for the area. The mapping can be used for natural resource planning and management by landowners, townships, counties, and others. Some knowledge regarding soils data and map scale is necessary to avoid misunderstandings. WSS is updated and maintained as the single authoritative source of soil survey information.

The data system supporting WSS is the SSURGO (Soil Survey Geographic) database, which consists of spatial and tabular databases. SSURGO datasets consist of digital map data, tabular data, and information about how the maps and tables were created. The extent of a SSURGO dataset is a soil survey area, which may consist of a single county, multiple counties, or parts of multiple counties.

Soil maps generated in WSS show the soil map unit names and symbols. A legend of conventional and special symbols appearing on the soil maps (fig. A-3 and table A-3) is also generated. The maps are linked to information about the component soils and their properties for each map unit. Each map unit includes up to three major components and some minor components. Web Soil Survey allows map-based display and tabular data for: (1) soil properties and qualities, (2) interpretive ratings (suitabilities and limitations) for various uses, (3) soil reports, and (4) ecological site assessments.

Figure A-2



Soil map showing an area of interest on the Southern High Plains of western Texas and eastern New Mexico. The area is part of Major Land Resource Area 77C in Land Resource Area H. Note the distribution of map unit OcA (Olton clay loam, 0 to 1 percent slopes).

Figure A-3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Curry County and Southwest Part of Quay County, New Mexico
Survey Area Data: Version 11, Sep 29, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 9, 2010—Dec 31, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

The map legend and conventional symbols found on soil maps.

Table A-3

Map Unit Symbols and Names Displayed on the Soil Map for the Area of Interest

Curry County and Southwest Part of Quay County, New Mexico (NM669)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AcA	Acuff loam, 0 to 1 percent slopes	1,052.6	17.5%
AcB	Acuff loam, 1 to 3 percent slopes	373.9	6.2%
AfA	Amarillo fine sandy loam, 0 to 1 percent slopes	28.6	0.5%
AfB	Amarillo fine sandy loam, 1 to 3 percent slopes	23.6	0.4%
BcA	Bippus clay loam, 0 to 2 percent slopes, occasionally flooded	25.5	0.4%
EsA	Estacado loam, 0 to 1 percent slopes	86.0	1.4%
EsB	Estacado loam, 1 to 3 percent slopes	137.6	2.3%
KmB	Kimberson gravelly loam, 0 to 3 percent slopes	80.6	1.3%
OcA	Olton clay loam, 0 to 1 percent slopes	4,083.0	67.8%
PsB	Posey fine sandy loam, 1 to 3 percent slopes	113.4	1.9%
RcA	Ranco clay, 0 to 1 percent slopes, frequently ponded	5.6	0.1%
SpA	Sparenberg clay, 0 to 1 percent slopes, occasionally ponded	10.8	0.2%
Totals for Area of Interest		**6,021.1**	**100.0%**

Soil properties and qualities are presented as aggregate values or classes that were measured, observed, or estimated for each soil component of map units in the survey area. A broad array of physical and chemical properties, as well as soil qualities and features (such as depth, drainage class, and hydrologic soil group) are displayed on a thematic map and in tabular format.

Suitabilities and *limitations* are soil ratings for various uses, such as agricultural production, engineering, urban development, and waste and water management. Tables list the properties or qualities that limit a soil's suitability for given uses. The interpretations are displayed as thematic maps with a summary table for the soil map units in the selected area of interest.

For each map unit, a single value or rating is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation. Aggregation

is the process by which a set of component values is reduced to a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation is necessary because map units are delineated but individual components are not. For each component in a map unit, a corresponding percent composition is recorded. For example, a percent composition of 60 indicates that the corresponding component typically makes up approximately 60 percent of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods. Table A-4 lists the various aggregation methods.

Soil reports include various formatted tabular and narrative reports (tables) containing data for each soil map unit in the selected area of interest and for each component of each soil map unit. The reports contain soil interpretive information as well as basic soil properties and qualities,

Table A-4

Aggregation Methods

[These methods determine the attribute value for thematic maps of soil properties and interpretative ratings in WSS.]

Method	Description
Dominant Condition	Groups components in a map unit based on like-values for the attribute. For each group, percent composition becomes the sum of the percent composition of all components in the group. These groups therefore represent conditions rather than components. If more than one group shares the highest percent composition, a corresponding tie-breaker rule determines which value is returned.
Dominant Component	Returns the attribute value associated with the component that has the highest percent composition in the map unit. If more than one component shares the highest percent composition, a corresponding tie-breaker rule determines which value is returned.
Most Limiting	Suitable only for attributes used to generate a soil suitablity rating for a particular use. The most limiting result among all components of the map unit is returned. This method may or may not represent the dominant condition. The result may be based on the limitations of a map unit component of minor extent.

Table A-4.—continued

Method	Description
Least Limiting	Suitable only for attributes used to generate a soil suitablity rating for a particular use. The least limiting result among all components of the map unit is returned. This method may or may not represent the dominant condition. The result may be based on the limitations of a map unit component of minor extent.
Weighted Average	Computes a weighted average of the value for all components in the map unit. Percent composition is the weighting factor.
All Components	Returns the lowest or highest attribute value among all components of the map unit, depending on the corresponding tie-breaker rule. In this case, the tie-breaker rule indicates whether the lowest or highest value among all components is returned. For this aggregation method, percent composition ties cannot occur. The result returned represents either the minimum or the maximum value of the corresponding attribute throughout the map unit. The result may be based on a map unit component of minor extent.
Absence/ Presence	Returns a value, for all components of a map unit, that indicates if a condition is always present, never present, or partially present or whether the condition's presence or absence is unknown.
No Aggregation Necessary	Although the majority of soil attributes are associated with a component of a map unit, some are associated with a map unit as a whole. An attribute of a map unit does not have to be aggregated in order to render a corresponding thematic map. Therefore, the "aggregation method" for any attribute of a map unit is referred to as No Aggregation Necessary.
Component Percent Cutoff	Components whose percent composition is below the cutoff value are not considered. If no cutoff value is specified, all components in the database are considered.
Tie-Break Rule	Indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Table A-4.—continued

Method	Description
Interpret Nulls as Zero	Indicates if a null value for a component should be converted to zero before aggregation. This conversion is done only for map units that have at least one component for which the attribute value is not null.
Layer Options	For an attribute of a soil horizon, a fixed depth range must be specified. Either centimeters or inches may be used, but the bottom depth must be greater than the top depth. The top depth can be greater than zero. When "Surface Layer" is specified, only the surface layer or horizon is used to derive a value for a component. When "All Layers" is specified, all layers recorded for a component are considered when deriving the value for that component. Whenever more than one layer or horizon is considered, a weighted average value is returned based upon layer or horizon thickness.
Month Range	For an attribute that is recorded by month, a range of months must be specified.

but do not require aggregation of data. Soil reports are organized by category, such as "Recreational Development." A description of each report (table) is available.

Examples of Maps and Reports

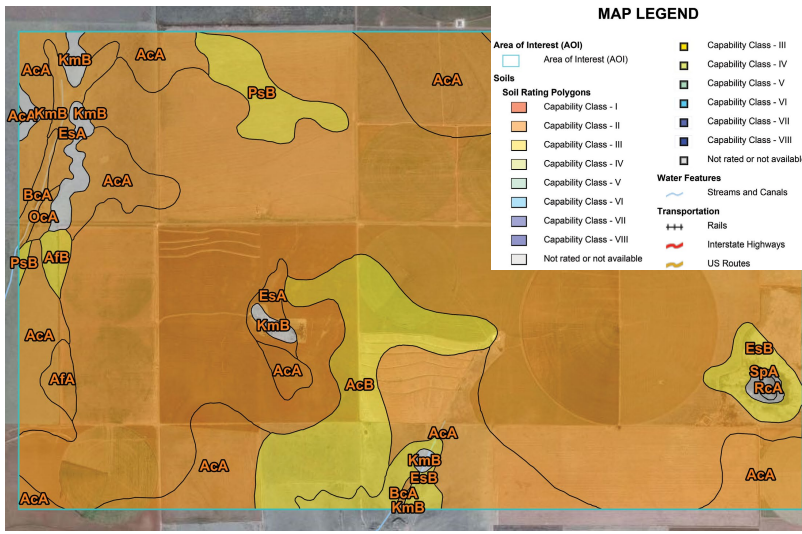
The following pages demonstrate a few of the many maps that can be generated in Web Soil Survey with the full integration of spatial and tabular databases. Over 100 thematic maps for various suitability or limitation ratings have been developed as well as almost 50 thematic maps of soil properties and qualities. Each thematic map includes a tabular report by map unit and component for the thematic data. In addition, over 60 tabular reports of various combinations of soil interpretations, properties, and features can be generated.

Land Capability Class

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (fig. A-4). 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 that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

Figure A-4



Map showing land capability class.

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 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 special conservation practices, 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 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.

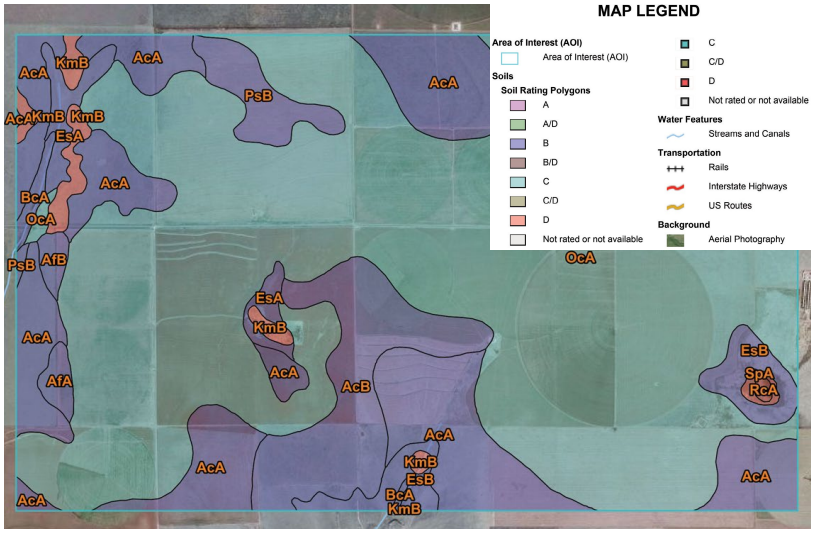
Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

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.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential (fig. A-5). 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 soils in the United States are assigned to four groups (A, B, C, and D)

Figure A-5



Map showing hydrologic soil groups. Soils in group A are most permeable and soils in group D least permeable. Dual classes (e.g., C/D) indicate hydrological soil groups for both the drained and undrained conditions.

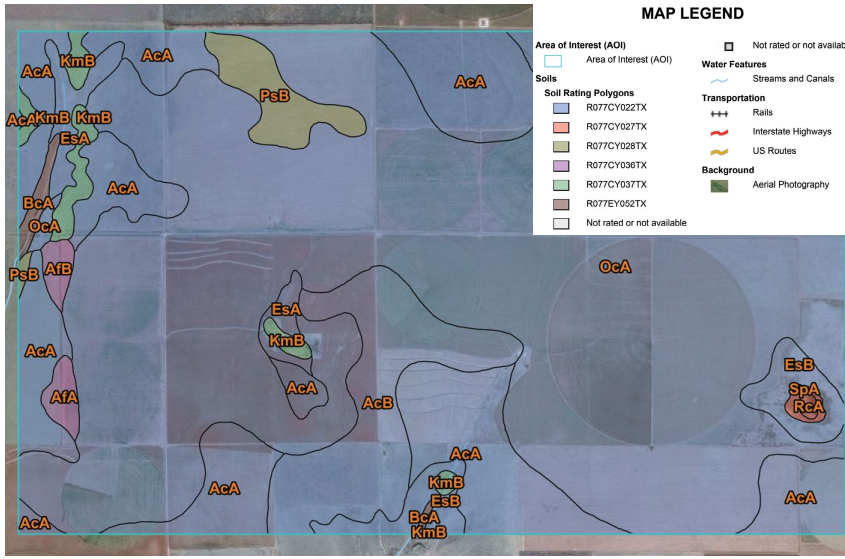
and three dual classes (A/D, B/D, and C/D) where the first letter is for drained areas and the second is for undrained areas. Only the soils that are in group D in their natural condition are assigned dual classes.

Ecological Site Assessments

Ecological site assessments document the ecological conditions and plant communities correlated to components of the soil map units. They provide maps (fig. A-6), descriptions, tables, illustrations, and photographs (fig. A-7). They include information on species composition, annual production, and growth curves and a state-and-transition diagram (fig. A-8).

An ecological site is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community.

Figure A-6



Map showing ecological sites. The dominant ecological site is Deep Hardland, 16-21" PZ (R077CY022TX).

Figure A-7

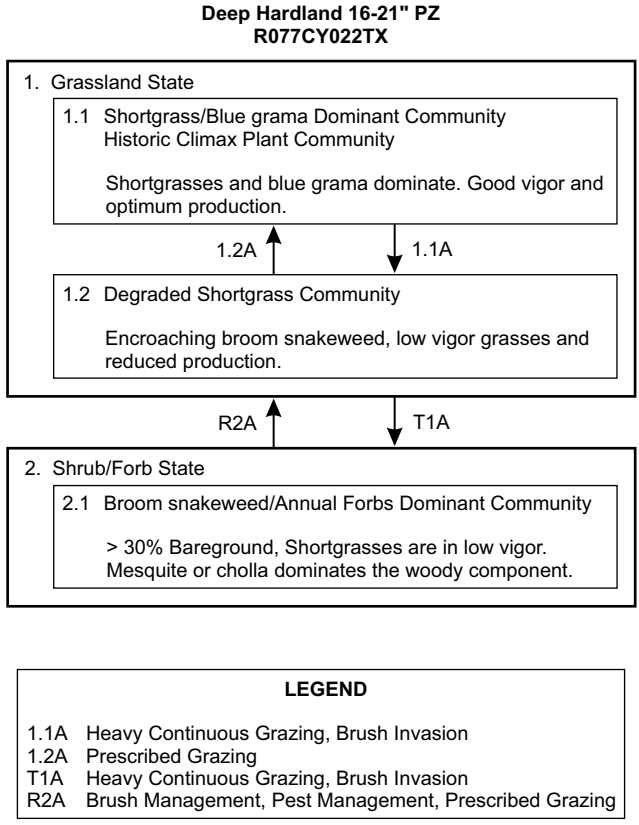
Shortgrass/blue gramma dominant community of the Deep Hardland ecological site (R077CY022TX).

The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

An ecological site name provides a general description of a particular ecological site. For example, "Loamy Upland" is the name of a rangeland ecological site. An ecological site ID is the symbol assigned to a particular ecological site.

The "Dominant Ecological Site" map identifies the dominant ecological site for each map unit, aggregated by dominant condition. Other ecological sites may occur within each map unit. Each map unit typically consists of one or more components (soils and/or miscellaneous areas). Each soil component is associated with an ecological site. Miscellaneous areas, such as Rock outcrop, Sand dunes, and Badlands, have little or no soil material and support little or no vegetation. These areas are not linked to an ecological site. The table "Ecological Sites by Map Unit Component" lists all of the ecological sites for each map unit component in the area of interest.

Figure A-8



State-and-transition model showing pathways and causes of change in the plant communities.

Engineering Properties

Table A-5 gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area. Included are hydrologic soil group, USDA texture, Unified and AASHTO classification, coarse fragments, percent of soil passing standard sieves, liquid limit, and plasticity index.

Soil Chemical Properties

Table A-6 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.

Table A-5

Engineering Properties and Classifications

Map unit symbol and soil name	Pct. of map unit	Hydro-logic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
AcA—Acuff loam, 0 to 1 percent slopes														
Acuff	85	B	0-12	Loam	CL, CL-ML	A-4, A-6	0- 0-0	0- 0-0	100-100 -100	100-100 -100	90-99-100	51-60-68	24-35 -39	6-13-19
			12-38	Clay loam, sandy clay loam, loam	CL	A-6, A-7-6	0- 0-0	0- 0-0	100-100 -100	100-100 -100	91-98-100	55-63-67	31-40 -45	13-19-22
			38-58	Clay loam, sandy clay loam	CL, SM	A-6, A-7-6	0- 0-0	0- 0-0	90-93-97	80-87-95	73-85-95	45-54-67	27-35 -45	5-14-24
			58-80	Clay loam, sandy clay loam, loam	CL, SC	A-6, A-7-6	0- 0-0	0- 0-0	93-96-99	86-91-98	78-89-98	45-55-69	27-37 -48	8-17-27
AcB—Acuff loam, 1 to 3 percent slopes														
Acuff	85	B	0-12	Loam	CL	A-6, A-4, A-7-6	0- 0-0	0- 0-0	100-100 -100	100-100 -100	90-98-100	60-67-74	27-36 -43	8-13-19
			12-38	Clay loam, sandy clay loam, loam	CL	A-6, A-7-6	0- 0-0	0- 0-0	100-100 -100	100-100 -100	91-98-100	55-63-67	31-40 -45	13-19-22
			38-58	Clay loam, sandy clay loam	CL, SM	A-6, A-4, A-7-6	0- 0-0	0- 0-0	90-93-97	80-87-95	73-85-95	45-54-67	27-35 -45	5-14-24
			58-80	Clay loam, sandy clay loam, loam	CL, SC	A-6, A-4, A-7-6	0- 0-0	0- 0-0	93-96-99	86-91-98	78-89-98	45-55-69	27-37 -48	8-17-27

Table A-6

Soil Chemical Properties

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
AcA—Acuff loam, 0 to 1 percent slopes								
Acuff	0-12	9.0-23	—	6.6-7.8	0	0	0.0-2.0	0-1
	12-38	16-25	—	6.6-8.4	0-2	0	0.0-2.0	0
	38-58	8.4-11	—	7.9-9.0	40-65	0	0.0-2.0	0-1
	58-80	14-20	—	7.9-8.4	15-70	0	0.0-2.0	0-1
AcB—Acuff loam, 1 to 3 percent slopes								
Acuff	0-12	11-23	—	6.6-7.8	0	0	0.0-2.0	0-1
	12-38	16-25	—	6.6-8.4	0-2	0	0.0-2.0	0-1
	38-58	8.4-11	—	7.9-9.0	40-65	0	0.0-2.0	0-1
	58-80	14-20	—	7.9-8.4	15-50	0	0.0-2.0	0-1
AfA—Amarillo fine sandy loam, 0 to 1 percent slopes								
Amarillo	0-10	8.6-17	—	6.6-8.4	0	0	0.0-2.0	0-1
	10-41	16-27	—	7.4-8.4	0-3	0	0.0-2.0	0-1
	41-56	9.6-13	—	7.9-9.0	40-65	0	0.0-2.0	0-1
	56-80	12-19	—	7.9-8.4	15-50	0	0.0-2.0	0-1

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