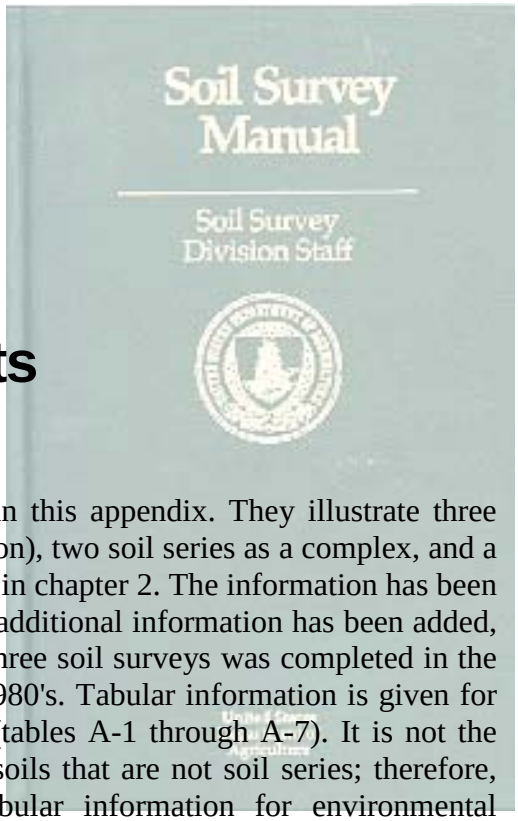
APPENDIX

2 Illustrative map units



Three map units from published soil surveys are in this appendix. They illustrate three kinds of map units: A single soil series (consociation), two soil series as a complex, and a single taxa above the soil series. These are defined in chapter 2. The information has been somewhat reorganized and rephrased. A small amount of additional information has been added, particularly in respect to the climate. Field work for the three soil surveys was completed in the late 1970's, and the reports were published in the early 1980's. Tabular information is given for the map units for which the named soils are soil series (tables A-1 through A-7). It is not the usual practice to provide tabular information for named soils that are not soil series; therefore, "Lithic Haplargids" lacks tabular information. The tabular information for environmental plantings, recreational development, and wildlife habitat has not been included. Yield information appears in the text. The discussion of interpretive properties and their class limits is mainly in chapter 3 or chapter 6 or given directly.

Single Soil Series (or Consociation)

"Sharpsburg silty clay loam, 5 to 9 percent slopes" illustrates a map unit in a single soil series. The information comes from the soil survey of Lancaster County, Nebraska (Brown et al., 1980), which is located in the southeastern part of the State. Sharpsburg soils are classified as fine, montmorillonitic, mesic Typic Argiudolls. The map scale is 1:15,840. The mean annual precipitation is 750 mm, the potential evaporation by the Thornthwaite method is about 700 mm, the mean annual air temperature is 11 °C, and the frost-free period (6 years in 10) is 170 to 180 days. About two-thirds of the county is in cropland.

Parent materials, landscape, and soil occurrence: Sharpsburg soils are developed in deep loess over till. In this map unit they occur on side slopes in irregular areas that are 1 to 250 hectares in size. An Aquic Argiudoll (Wymore series), developed in loess, occurs near drainageways on lower side slopes; these are the most extensive of the included soils. They have higher clay content in the subsoil than Sharpsburg soils. An Aquic Argiudoll in a fine family (Pawnee series) and a Typic Argiudoll in a fine-loamy family (Morrill series) are formed in glacial till on the steeper side slopes. A fine-silty Cumulic Hapludoll (Judson series) occurs in the colluvium at the base of the slopes. A fine-silty Mollic Udifluvent (Nodaway series) and a Cumulic Haplaquoll (Colo series) are formed in the alluvium.

Generalized soil description: Typically the surface layer of this Sharpsburg soil is very dark brown (moist), friable silty clay loam about 18 cm in thickness. The subsoil is dark brown, friable silty clay loam about 75 cm in thickness and the underlying material to 1.5 m is dark yellowish brown silty clay loam with grayish brown redoximorphic features.

Water-related information: Saturated hydraulic conductivity is moderately high. The available water capacity to 1.5 m is high (23 to 29 cm). Runoff is medium (Soil Survey Staff, 1951). Internal free water occurrence is very deep. Seasonally free water may occur at the top of the underlying glacial till where it can move laterally if the till is relatively shallow.

Agronomic information: This Sharpsburg soil is in land capability subclass IIIe. Organic matter content is moderate (2 to 4 percent in tillage zone) and natural fertility is high. The reaction of the surface layer ranges from strongly acid to slightly acid. The soil is well suited to grain sorghum (*Sorghum bicolor* L. Moench), soybeans (*Glycine Max* L. Moench), winter wheat (*Triticum aestivum* L.), and alfalfa (*Medicago Sativa* L.). Although corn (*Zea mays* L.) for grain is subject to drought damage, it is commonly grown. Yields in 1985 were:

Grain sorghum	5.3 t ha^{-1}
Soybeans	2.0 t ha^{-1}
Wheat	2.5 t ha^{-1}
Alfalfa	9 t ha^{-1}

The cropping system should limit the years of consecutive row crops and should include small grain and alfalfa to help control erosion and conserve water. Under intensive management, more years of row crops can be included. Water erosion control is a major concern. Terraces, grassed waterways, and the use of crop residue help to control erosion. The soil is well suited to grass. Introduced grasses, such as bromegrass (*Bromus* L.), can be used in the rotation. Native range grasses can be grazed in July and August when introduced grasses are semidormant. The range site is Silty which encompasses deep soils with silty clay loam to very fine sandy loam surface horizons that occur on nearly level to steep slopes. The average dry matter production is 4.4 t ha-1. Big bluestem (*Andropogon gerardii* vitman), little bluestem (*Schizchyrium scoparium (Michx*.) Nash), and switchgrass (*Panicum virgatum* L.) together account for 55 percent of the vegetation of the native range.

Nonagricultural information: Water perched on the glacial till is a hazard for buildings with basements. Artificial drainage, footing drains, and basement sump pumps can reduce or overcome seepage. Drainage outlets are generally available. Foundations should be designed to withstand the shrinking and swelling of the soil. Exposed subsoil and underlying material are lower in organic matter and fertility than the surface layer. The surface layer of the soil should be stockpiled and spread over lawn areas when construction and landscaping are completed. This soil has several limitations for septic tank absorption fields (table A1). The soil is not suited for sewage lagoons unless slope is modified. Roads should be placed on the contour to reduce the hazard of erosion.

Complex of Two Soil Series

"Bakeoven-Condon complex, 2 to 20 percent slopes," from the Soil Survey of Wasco County, Oregon, Northern Part (Green, 1982), illustrates a complex of two soil series. The soil survey area is in the north-central part of the State. Bakeoven soils are classified loamy-skeletal, mixed, mesic Lithic Haploxerolls. Condon soils are classified fine-silty, mixed, mesic Typic

Haploxerolls. The map scale is 1:20,000. In the mapped area, the mean annual precipitation is 250 to 350 mm, the Thornthwaite potential evapotranspiration is about 650 mm, the mean annual air temperature is 7 to 11 °C, and the frost-free period is 100 to 150 days. The soil survey area is about 75 percent rangeland and is used mainly for cattle-grazing. The remainder is divided about equally between forest land and cropland. Soft white winter wheat under summer fallow is the principal crop.

Parent materials, landscape, and soil occurrence: The map unit is applied to a large area of patterned ground referred to as -biscuit scabland.- The parent material is thin loess, and the underlying residuum is from basalt. The Lithic Haploxeroll, Bakeoven, occurs on ridgetops or side slopes; the Typic Haploxeroll, Condon, occurs on ridgetops or side slopes of circular or elongated mounds. Bakeoven occupies 50 to 85 percent of the area; Condon, 10 to 35 percent. Both occur over the same slope range. A Lithic Haploxeroll with a very stony surface horizon (Lickskillet series) is present in areas between the mounds, as well as unnamed shallow stony soils. In aggregate, these included soils make up to 15 percent of the map unit.

Generalized description: The Lithic Haploxeroll, Bakeoven, has a surface horizon of dark brown (moist) very cobbly loam about 8 cm thick. The subsoil is dark brown very cobbly loam and clay loam about 15 cm thick. Basalt bedrock is at a depth of about 20 cm. The Typic Haploxeroll, Condon, has a surface layer of very dark brown (moist) silt loam about 35 cm thick. The subsoil is mostly dark brown silt loam about 35 cm thick. Basalt bedrock is at a depth of about 70 cm.

Water-related information: The Lithic Haploxeroll (Bakeoven) has moderately high saturated hydraulic conductivity. Available water capacity is 1 to 3 cm to the base of potential rooting. The Typic Haploxeroll (Condon) has a moderately high saturated hydraulic conductivity. Available water capacity is 14 to 17 cm to the base of potential rooting. Runoff for the map unit overall is slow to rapid (Soil Survey Staff, 1951).

Agronomic information: The land capability subclass is VIIs. Effective rooting depth is 13 to 30 cm for the Lithic Haploxeroll (Bakeoven) and 50 to 100 cm for the Typic Haploxeroll (Condon). The Lithic Haploxeroll (Bakeoven) is in a Scabland range site and the Typic Haploxeroll (Condon), is in a Rolling Hills range site. The Scabland range site is restricted to Bakeoven soils. The Rolling Hills range site encompasses well-drained silt loams and very fine sandy loams that are formed in mostly loess and volcanic ash on broad ridgetops and rolling uplands. The Scabland range site produces about 0.4 t ha-1 of dry weight under normal conditions. Stiff sagebrush (*Artemisia rigida* (Nutt.) Gray) and Sandberg bluegrass (*Poa secunda* J. Presl.) account for 95 percent of the vegetation. The Rolling Hills range site produces 0.9 t ha-1 of dry weight under normal conditions. Bluebunch wheatgrass (*Agropyron spicatum* (Scrubn. and J.G. Smith) A. Heller) and Idaho fescue (*Festuca idahoensis* Elmer) account for 85 percent of the vegetation.

Nonagricultural information: These soils are limited in their use for building sites, water management, and waste disposal systems because of the shallow depth to bedrock.

Taxa Above the Soil Series

"Lithic Haplargids, moderately sloping" is a map unit in the Soil Survey of Sierra County Area, New Mexico (Neher, 1984). The county is located in the southwestern part of the State. The map scale is 1:48,000 for the portion of the survey under consideration. The mean annual precipitation is 200 to 250 mm, the potential evapotranspiration by the Thornthwaite method is about 1,300 mm, the mean annual air temperature is 14 to 18 °C, and the average frost-free period is 180 to 220 days. The majority of the land is used for livestock grazing, mainly cattle. Agricultural irrigation is practiced in less than 1 percent of the survey area.

Parent materials, landscape, and soil occurrence: The naming soils of the map unit are formed in transported sediments deposited on rock pediments. Slopes range from 1 to 15 percent. Areas are irregular and 70 to 200 ha in size. As much as 20 percent of the delineations consists in aggregate of Rock outcrop on hilltops and side slopes, small areas of Typic Haplargids on toe slopes and side slopes, and Petrocalcic Paleargids and Typic Paleorthids on low ridges at the lower elevations.

Generalized description: The representative pedon has a surface layer of brown (dry) fine sandy loam about 8 cm thick. The subsoil is strong brown sandy loam about 15 cm thick. The substratum is light brown very gravelly sandy loam about 8 cm thick over weathered sandstone 8 cm thick. Slightly altered sandstone is at a depth of about 40 cm.

Water related information: Saturated hydraulic conductivity is moderately slow to moderately high. Available water capacity is very low to low. Runoff is medium (Soil Survey Staff, 1951).

Agronomic information: The hazard of water erosion is moderate and that of wind erosion is high. The map unit is suited to livestock grazing, watershed, and wildlife habitat. The potential plant community is characterized by black gramma (Bouteloua eropoda (Torr.) Torr), bush muhly (Muhlenbergia porteri Scrib. Ex W.J. Beal), cane bluestem (Bothriohloa barbinodis (Lag.) Herter), and various woody plants. As the plant community deteriorates, there is an increase in three-awn (Aristida L.), broom snakeweed (Gutierrezia sarothrae (Pursh) Britton and Ruoby), annual forbes, and woody plants. The average annual production ranges from 0.3 to 0.8 t ha-1. Fences and pipelines for water are difficult to install because of the shallow depths to sandstone. The map unit is suited to livestock water developments and establishment of planned grazing systems, but it is not suited to mechanical brush control and rangeland seeding.

Nonagricultural information: The soils of this mapping unit are very limited in their use for building sites, water management, and waste disposal systems because of the shallow depth to bedrock.

Table A-1

Water transmission rates, field water regime, and certain restrictive physical features and processes for Sharpsburg silty clay loam, 5 to 9 percent slopes, and Bakeoven-Condon complex, 2 to 20 percent slopes.

Property[a]	Map Unit	Depth (cm)	Value or Class
Saturated Hydraulic Conductivity	Sharpsburg	0-18	4-10 µm/s
		18-112	1-4 µm/s
		112-150	1-4µm/s
	Bakeoven part	0-20	1-4 µm/s
	Condon part	0-66	4-10 µm/s
Hydrologic Group	Sharpsburg		B
	Bakeoven part		D
	Condon part		C
Bedrock Depth Hardness	Bakeoven part		13-30 cm, Hard
	Condon part		50-100 cm, Hard
Potential Frost Action	Sharpsburg		High
	Bakeoven part		Moderate
	Condon part		High

[a] No flooding. Free water occurence > 150 cm

Table A-2

Particle size distribution and engineering classification for Sharpsburg silty clay loam, 5 to 9 percent slopes, and Bakeoven-Condon complex, 2 to 20 percent slopes

Property	Map Unit	Depth (cm)	Value or Class
USDA texture	Sharpsburg	0-18	Silty clay loam
		18-112	Silty clay loam, Silty clay
		112-150	Silty clay loam
	Bakeoven part	0-20	Very cobbly loam
		≥20	Unweathered bedrock
	Condon part	0-66	Silt loam
		≥66	Unweathered bedrock
>75	Bakeoven part	0-20	25-45 pct
	Condon part	0-66	0 pct
Pass 4, 19, 40, 200	Sharpsburg	0-18	100, 100, 100, 95-100 pct
		18-112	100, 100, 100, 95-100 pct
		112-150	100, 100, 100, 95-100 pct
	Bakeoven	0-20	30-75, 20-60, 15-55, 15-45
	Condon	0-66	100, 100, 90-100, 80-90
Liquid Limit	Sharpsburg	0-18	35-55 pct
		18-112	35-60 pct
		112-150	35-50 pct
	Bakeoven	0-20	25-35 pct
	Condon	0-66	25-35 pct
Plastic Index	Sharpsburg	0-18	18-32 pct
		18-112	25-35 pct
		112-150	25-35 pct
	Bakeoven	0-20	5-10 pct
	Condon	0-66	5-10 pct
Unified, AASHTO Classifications[a]	Sharpsburg	0-18	CL, A-7
		18-112	CH, A-7
		112-150	CL, A-7
	Bakeoven	0-20	GM, A-1
	Condon	0-66	ML, A-4

[a] Only first of the placements is given.

Table A-3

Physical and chemical interpretive properties for Sharpsburg silty clay loam, 5 to 9 percent slopes, and Bakeoven-Condon complex, 2 to 20 percent slopes.

Property	Map Unit	Depth (cm)	Value or Class
Available Water Capacity	Sharpsburg	0-18	0.21-0.23
		18-112	0.18-0.20
		112-150	0.18-0.20
	Bakeoven part	0-20	0.06-0.14
	Condon part	0-66	0.20-0.25
Reaction (pH)	Sharpsburg	0-18	5.1-6.5
		18-112	5.1-7.3
		112-150	6.1-7.3
	Bakeoven part	0-20	6.1-7.3
	Condon part	0-66	6.1-7.3
Salinity	Sharpsburg	0-18	< 2 dSm^{-1}
		18-112	< 2 dSm^{-1}
		112-150	< 2 dSm^{-1}
	Bakeoven part	0-20	< 2 dSm^{-1}
	Condon part	0-66	< 2 dSm^{-1}
Shrink-swell Potential	Sharpsburg	0-18	Moderate
		18-112	High
		112-150	Moderate
	Bakeoven part	0-20	Low
	Condon part	0-66	Moderate