CHAPTER 9. HAPLUSTALFS AND USTOCHREPTS OF THE BAILEY SURFACE

ARIDIC HAPLUSTALFS AND USTOCHREPTS DOMINANT: MAPPING UNIT K, EXTEE-VEAL COMPLEX

MAPPING UNIT COMPOSITION

Series or variant	Subgroup	Particle-size family	Percentage of mapping unit
EXTEE	ARIDIC HAPLUSTALFS	FINE-LOAMY	40
VEAL	ARIDIC USTOCHREPTS	FINE-LOAMY	35
Newell, calcic variant	Aridic Argiustolls	Fine-loamy	10
Other inclusions (Farwell, calcic variant, Keeney, Veal, petrocalcic variant)			15

LOCATION, LANDSCAPE, SOIL OCCURRENCE, VEGETATION

Soils of unit K occur in two large blowouts in the southern part of the area. The Ustochrepts, Veal soils, occur side by side with the Haplustalfs, Extee soils, the only difference being that the argillic horizon has been wind-truncated in the Ustochrepts but not in the Haplustalfs. With the argillic horizon gone, the calcic horizon that once was beneath it becomes diagnostic for the Ustochrepts. Veal and Extee soils occur in an intricate pattern, with Extee soils tending to occur in slight microlows where the argillic horizon has been preserved. Very minor areas of Ustochrepts with petrocalcic horizons occur in several small, low knolls near Farm Road 1731 (see Site 54). These soils show on the airphoto as small, light-colored areas. Mollisols are usually absent despite relatively fine textures and soil occurrence in a depression. Several factors are responsible for absence of Mollisols. In the eastern of the two delineations of this unit, runoff from bordering dunes is a minor factor. In most of the other delineations, the soils are sloping, thus water from adjacent dunes does not stand but runs off. Very minor areas of Mollisols do occur in some of the microlows, however (see Site 52).

Vegetation observed in mapping unit K consists of blue grama, snakeweed, soapweed, zinnia, buffalo grass, prickly pear, three-awn, hairy grama, and catclaw.

TYPICAL PEDONS AND RANGES IN SELECTED PROPERTIES

Pedon 51b is a typical pedon for Extee. See table 59 for characteristics of Pedon 51b. Ranges in color and texture follow; underlined entries are typical. Two underlined entries indicate that it is typical for both entries to occur in the stated horizon.

The A horizon has hue of 7.5YR through 10YR, value of 4 through 6 (5) dry, 2 through 4 (3) moist, and chroma of 2 through 3. It is fine sandy loam or loamy fine sand.

The B2t horizon has hue of 2.5YR through 7.5YR, value of 4 through 6 dry, 3 through 5 moist, and chroma of 4 through 6. It is sandy clay loam or

heavy fine sandy loam.

The K2 horizon has hue of 7.5YR through 10YR, value of 8 through 9 dry, 7 through 8 moist, and chroma of 2 through 4. It is sandy clay loam or clay loam.

Pedon 51a is a typical pedon for Veal. See table 59 for characteristics of Pedon 51a. Ranges in color and texture follow; underlined entries are typical. Two underlined entries for a given feature indicate that it is typical for both entries to occur in the stated horizon.

The A horizon has hue of 7.5YR through 10YR, value of 5 through 6 (5,5.5) dry, 3 through 4 (3,3.5) moist, and chroma of 2 through 3 (2.5). It is loamy fine sand and fine sandy loam.

The K2 horizon has hue of 7.5YR through 10YR, value of 8 through 9 dry, 7 through 8 moist, and chroma of 2 through 4. It is clay loam or sandy clay loam. The K horizon is thick and the material beneath it is not known.

STUDY SITES

Sites 51 and 52, complex patterns of Inceptisols and Alfisols

The largest blowouts occur as the Bailey surface, in the southern part of the area (fig. 19). In these large blowouts, most Mollisols border dunes that contribute runoff to level or nearly level areas (mapping unit J). But some parts of the large blowouts have distinct slopes where water runs off and these soils generally lack mollic epipedons.

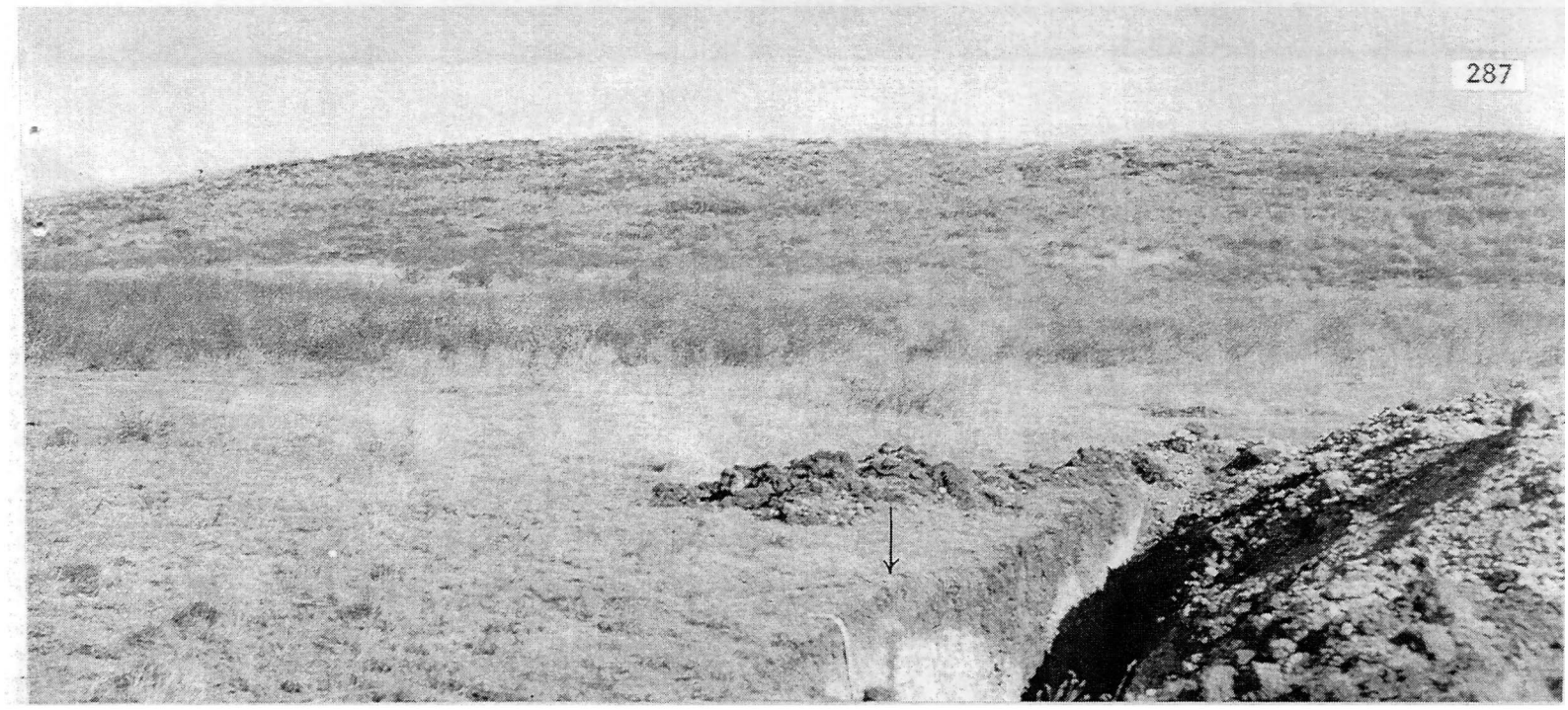
Sites 51 and 52 illustrate complex patterns of Inceptisols and Alfisols in the study area, the occasional occurrence of Mollisols, and the effect of strong erosion on the argillic horizon and soil classification. All soils of the blowout have the prominent calcic horizon of Bailey age; some of them have an argillic horizon, and a few have a mollic epipedon.

Although Birdwell sediments are thick in the large dune east of the blowout (see Sites 35-39), they are very thin or absent in the blowout itself, which is dominated by materials of Bailey age. Hale sediments, which must have been the main source of Birdwell sediments, are generally sparse or absent. The relationships indicate that winds of Birdwell time removed most post-Bailey sediments from the blowout, and that the blowout must have been in existence for a very long time -- since the beginning of Bailey time. In places along margins of the blowout, Hale sediments are preserved beneath Birdwell and Roosevelt sediments but are at the surface only in a few minor areas.

Site 51

The study trench (figs. 88-91, 118) is oriented east-west. Two pedons were sampled: an Inceptisol in the west end of the trench, and an Alfisol in the east end (figs. 118, 119). Table 59 gives characteristics of the sampled pedons.

Pedon 51a (fig. 118), an Aridic Ustochrept, is in the west end of the trench. The A11 horizon of Pedon 51a has abundant sand and little silt, clay and carbonate, and is thought to have formed in Birdwell sediments.



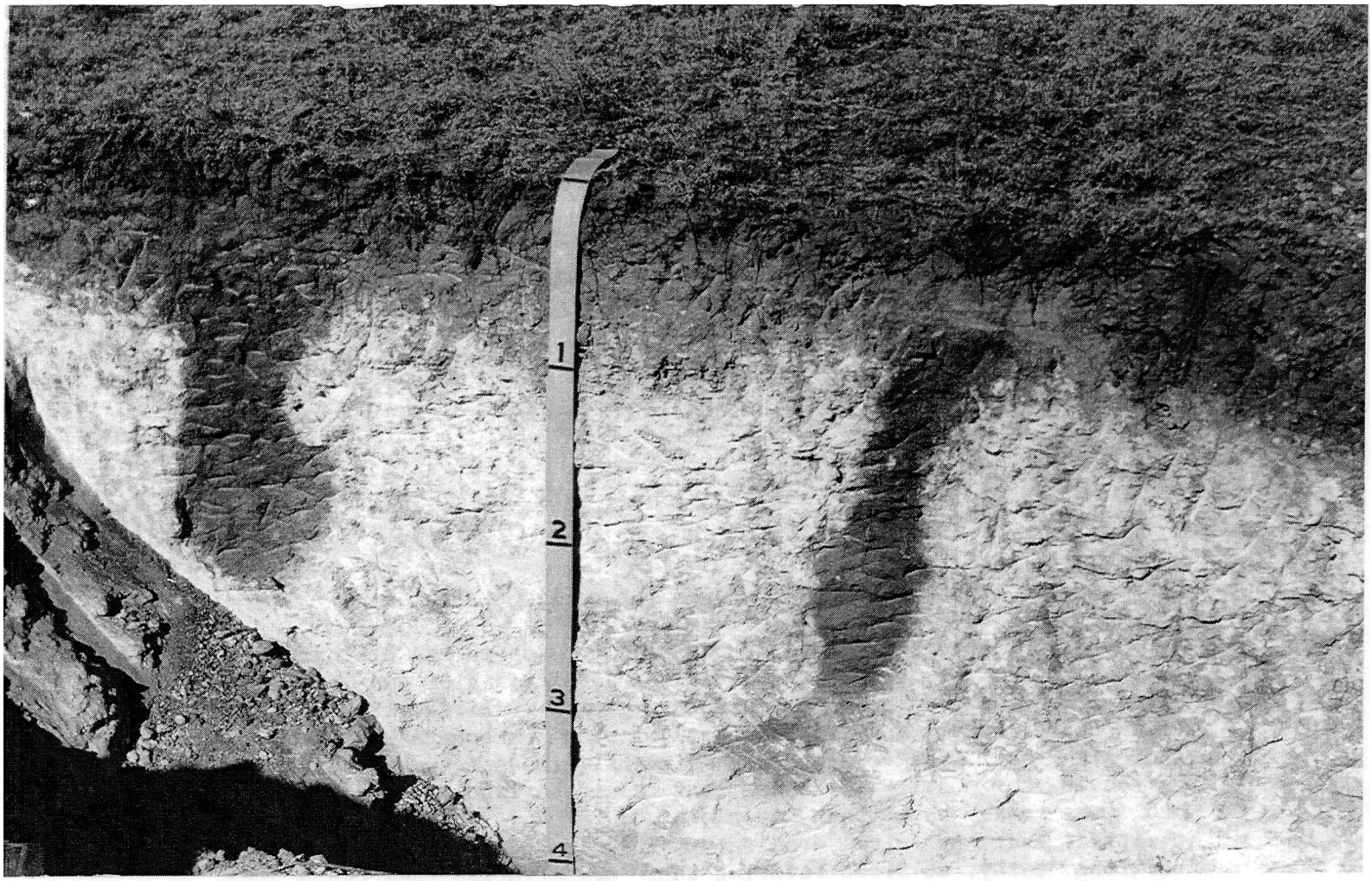


Figure 118. Upper. Landscape of the Bailey surface and east-west study trench at Site 51. Arrow locates boundary between Inceptisols in foreground, left of trench, and the Alfisols exposed in the far end of the trench. A Birdwell dune is in the background and on the skyline. The view is east.

Lower. The Aridic Ustochrept, Veal, at Site 51a, sampled between the pipes. The young pipes are too small for a pedon and are considered a part of the morphological range of the Veal soils. Scale is in feet.

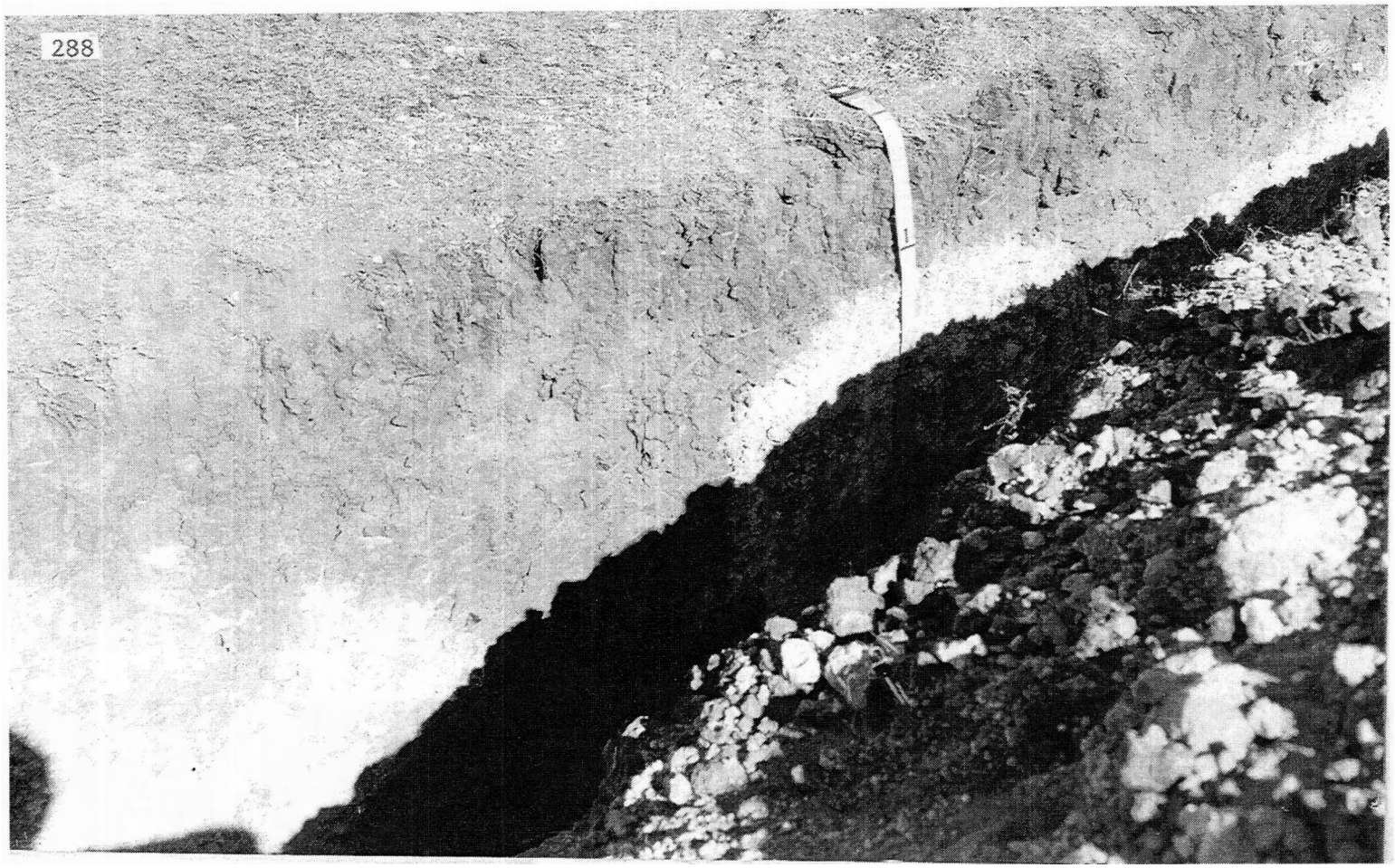


Figure 119. The Aridic Haplustalf, Extee, at Site 51b. The two downward extensions of the Bt horizon, one on each side of the tape, are thought to be true pipes, and not an eolian groove, because the maximum of silicate clay extends into the calcic horizon with no evidence of a discontinuity. Scale is in feet.

The epipedon is not quite dark enough for mollic (table 59).

Several factors indicate strong wind erosion in the blowout, and that it was a source of eolian sediments for development of the large dune to the east. Presence of sand-size carbonate grains in Birdwell strata of the dune (see Pedon 35b), and shallowness of the carbonate horizon at Pedon 51a indicate that wind erosion in Birdwell time penetrated to the top of the carbonate horizon. The prominent calcic horizon is very near the surface and must once have been overlain by a Bt horizon that has since been stripped away by wind erosion. This is indicated by the presence of Bt horizons nearby, at sites favoring their preservation (see Pedon 51b).

A small, reddish brown pipe occurs on each side of the sampled pedon (fig. 118). Similar pipes have developed in cavities once occupied by large roots (Gile and Grossman, 1979, p. 186). Both pipes contrast greatly with

the adjacent calcic horizon since they are coarser-textured and contain very little carbonate. The pipes consist of reddish brown, Bt-like material and must once have been connected to an argillic horizon. The relationships suggest that a post-Bailey deposit, possibly of Hale age, was once present at the surface. Decay of large roots could have created cavities; as the roots gradually decayed, fine earth from the surface could have moved downward into the soils. The pipes could then have formed in these more pervious materials.

Although upper horizons of Pedon 51b are quite dark, chromas are too high for a mollic epipedon (table 59). The Bt horizon in Pedon 51b has been preserved only because the calcic horizon is more resistant to erosion and is slightly higher to the west, where it has established a base level of erosion higher than the Bt horizon.

A large pipe occurs to the left of Pedon 51b. The pipe is wider and deeper than the two pipes near Pedon 51a and extends at least to the bottom of the trench, where at 130 cm depth the pipe is 90 cm wide and noncalcareous. Texture is clay in the upper part of the pipe and even at 130 cm depth is a sandy clay loam. Thus the pipe must be older than the two small pipes near Pedon 51a and may have been present throughout most of the development of these soils instead of representing a much later addition of sediment from the surface.

Site 52

Site 52 (figs. 88-91, 120, 121) is closer to the center of the blowout. Site 52 also illustrates soils with and without argillic horizon, and, in addition, illustrates a Mollisol well away from slopes that could contribute runoff. Table 59 gives soil characteristics.

Figure 120 locates subgroups and the sampled pedons along a surveyed line. Very slight differences in elevation exert major control on soil occurrence. Inceptisols occur almost wholly in the southern, higher part of the trench exposure; Mollisols occur only in the northern, slightly lower part. Upper horizons of Pedon 52a (figs. 120, 121) meet the requirements of the mollic epipedon, and illustrate that local conditions -- very slight lows in the landscape, only a few cm lower than the highs -- can create the conditions for dark color values and low chroma required for the mollic epipedon.

The relationships also indicate another contributing factor to the occurrence of Inceptisols and Mollisols at Site 52. An area in the low that lacks pipes also lacks both a mollic epipedon and an argillic horizon (fig. 121). This is because the prominent calcic horizon is so near the surface that it increases color value, precluding a mollic epipedon. Thus the Bt material of the pipes is essential for preservation of both the argillic horizon and the mollic epipedon. The pipes are thought to be true pipes, and not eolian grooves, because the clay maximum extends into the high-carbonate calcic horizon.

In Pedon 52b, the Inceptisol, the high-carbonate horizon is very near the surface (fig. 121). This soil occurs on the topographic high in the trench exposure (fig. 120). The base level of erosion established by the erosion-resistant calcic horizon on the slight highs would tend to protect soils in the slight lows from erosion, thus preserving the mollic epipedon

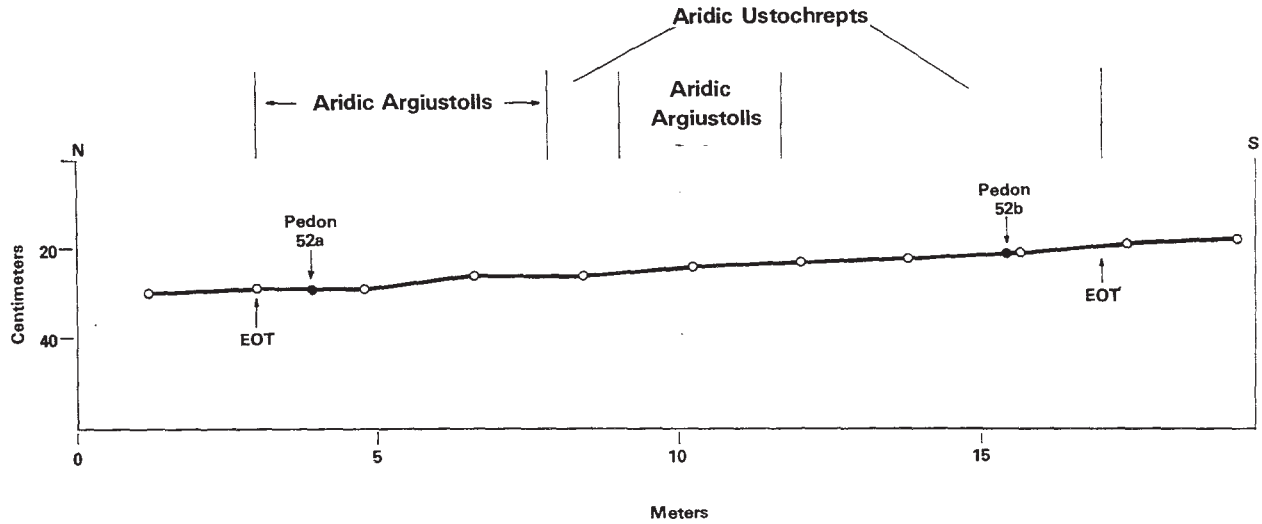


Figure 120. Cross section of land surface along study trench at Site 52. Aridic Argiustolls occur only in very slight topographic lows. Aridic Ustochrepts occur on very slight topographic highs, but also occur in the lows between pipes, where prominent calcic horizon is near the surface, increasing color value and precluding a mollic epipedon. EOT = end of study trench.

and the Mollisols. Also, runoff from these slight highs would increase the moisture for development of the mollic epipedon and the argillic horizon in the lows.

Site 53, Haplustalf of Bailey age

Site 53 is in a moisture exclosure (Soil Moisture Site 3, Appendix). Bailey sediments, deeply buried at Site 41 just south, are at the land surface at Site 53. Data for Pedon 53 are in table 60; photographs of the soil and landscape have been presented (Gile 1981, p. 54). Site 53 is visible in the 1981 aerial photograph as a small white spot caused by high-carbonate material in the trench fill (fig. 84). Pedon 53 has mixed mineralogy (table 51). However, the 89.8 percent of resistant minerals is very close to the siliceous mineralogy class, which must have more than 90 percent resistant minerals.

The boundary between the silicate clay and carbonate accumulations is not abrupt; and the silicate clay maximum is not well above the carbonate but extends into it and is partly engulfed by it (table 60). These factors suggest that both accumulations may have formed in parent materials of the same age. Carbonate in the upper part of the carbonate horizon is thought to be younger than in the lower, partly because of carbonate accumulation higher in the soil as the horizon below gradually became less pervious due to accumulated carbonate and clay. A shift to the drier climate at the end of the Tahoka pluvial may also have been a factor since lower effective moisture would cause carbonate accumulation at shallower depths.

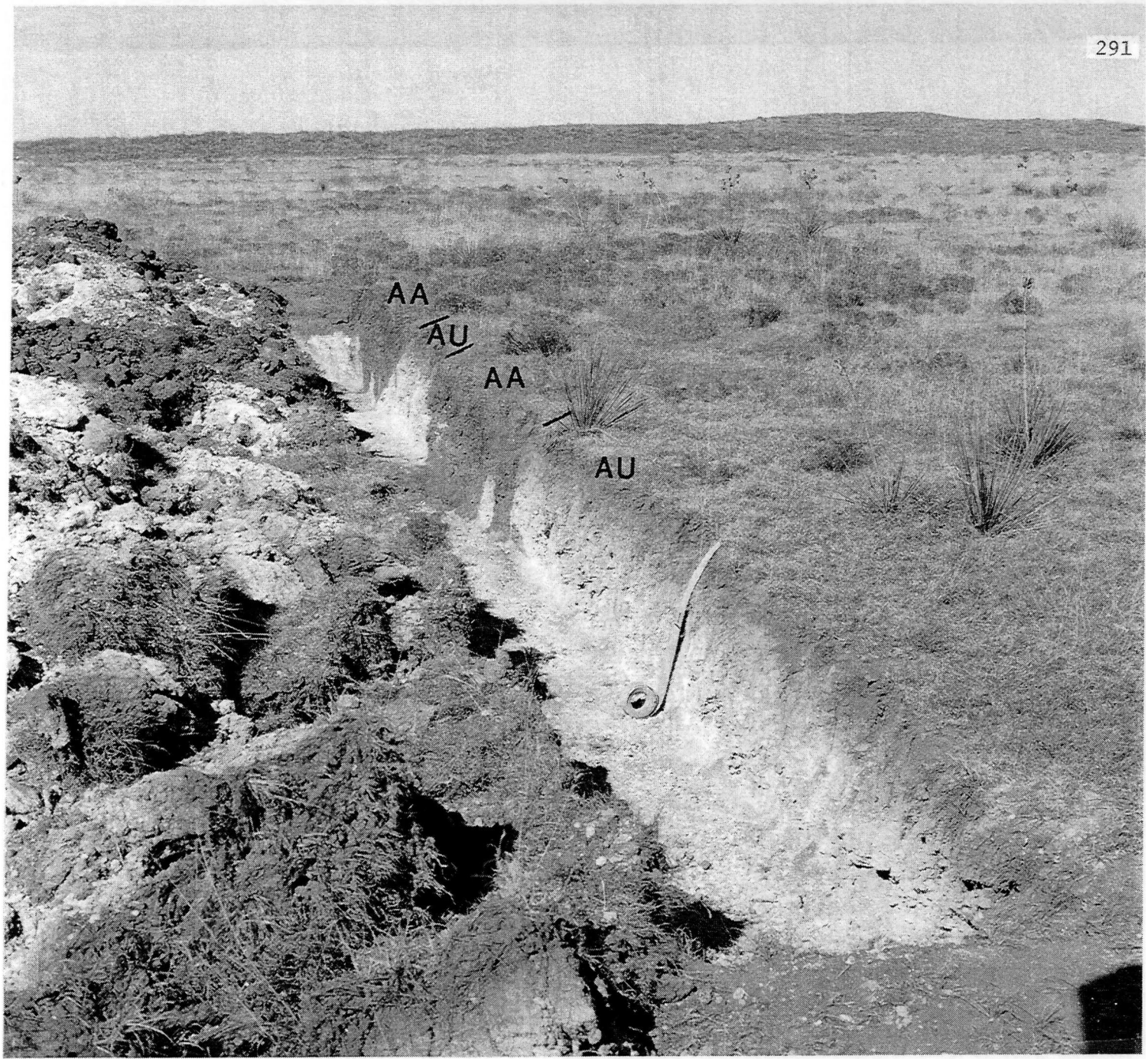


Figure 121. Landscape view of the Bailey surface and north-south study trench at Site 52. Subgroups between lines along soil surface (see fig. 120) identified as AA = Aridic Argiustolls; AU = Aridic Ustochrepts. The tape is at Pedon 52b, the Aridic Ustochrept. The view is north. Photographed October 1977. Scale is in feet.

Table 59. Characteristics of soils in a large blowout of Bailey age, Sites 51 and 52[1/]

Sediment	Horizon	Depth, cm	Hue	Value/chroma Dry	Value/chroma Moist	Structure	Dry consistence	pH	Lower boundary	Textural class	Sand 2.0-0.05 mm	Silt 0.05-0.002 mm	Clay < 0.002 mm
Aridic Ustochrept, Veal, Pedon 51a[2/]													
Bailey	A1	0-5	7.5YR	5/2.5	3/2.5		s,sh		as	fsl	74.2	15.1	10.7
	A3ca	5-15	7.5YR	5.5/2.5	3.5/2.5	1m, csbk	sh		as	fsl	69.7	14.7	15.6
	K1	15-25	7.5YR	8/2	7/4	1msbk	h		cw	scl	55.1	19.7	25.2
	K21	25-39	7.5YR	8/2	7/4	2mpl	h,sh		cw	scl	46.0	25.6	28.4
	K22	39-70	7.5YR	8/3	7/4	1msbk	h,vh		cw	cl			
	K23	70-117	7.5YR	9/2	8/3	1msbk	h,vh		cw	cl			
	K3	117-140	5YR	7/4	5.5/4	m	sh			fsl			
Aridic Haplustalf, Extee, Pedon 51b[3/]													
Bailey	A1	0-5	7.5YR	5/3	3/3	1mpl	s,sh	7.0	as	fsl	65.4	20.8	13.8
	B21t	5-15	7.5YR	4/3	3/3	2cpr-	vh	7.6	as	fsl	71.7	14.9	13.4
			5YR	5/4	4/4	2csbk							
	B22tca	15-36	2.5YR	4/6	3/6	2cpr- 2csbk	vh			scl	64.3	7.4	28.3
	K	36- (not sampled - see Pedon 51a)											
Aridic Argiustoll, Newell, calcic variant, Pedon 52a[4/]													
Bailey	A1	0-5	7.5YR	5/3	3.5/3	fsl	s	7.0	as	fsl	79.2	10.2	10.6
	B11t	5-13	5YR	4.5/4	3/3	1cpr- 1csbk	h	7.2	cw	lfs	82.3	6.6	11.1
	B12t	13-27	5YR	4.5/3	3/3	1cpr- 1csbk	vh	7.4	cw	fsl	74.7	6.5	18.8
	B21tca	27-44	3YR	5/6	4/6	1cpr- 1csbk	vh	7.6	cw	scl	68.6	6.8	24.6
	B22tca	44-65	3YR	5.5/6	4/6	1cpr- 1csbk	vh	7.6	aw	scl	66.5	5.8	27.7
	K2	65-76	7.5YR	9/3	8/3	1f,msbk	h,vh	7.6		scl	40.3	34.4	25.3
Aridic Ustochrept, Veal, Pedon 52b[5/]													
Bailey	A11	0-10	7.5YR	5/3	3.4/3		s	7.6	as	lfs	80.0	10.9	9.1
	A12ca	10-25	7.5YR	5/2	4/2	1msbk	h		cw	fsl	66.5	15.7	17.8
	K1	25-43	7.5YR	9/3	8/3	1msbk	h		cw	cl	37.9	31.3	30.8
	K2	43-56	7.5YR	9/2	8/2	1f,msbk	vh			cl	25.7	44.4	29.9

1/ Subordinate colors and additional characteristics are footnoted to pertinent soils. All K horizons effervesce strongly throughout; other horizons are noncalcareous unless otherwise indicated. A few centimeters of post-Bailey sediments may occur at the surface.

2/ All horizons effervesce strongly with HCl. A3ca: has a few fine carbonate nodules and filaments. K1: parts 7.5YR 5/3, dry, and 5YR 5/4, dry.

3/ The upper two horizons are noncalcareous and most of the B22tca effervesces strongly with HCl; a few parts are noncalcareous. B21t: colors given are approximately equal in amount. B22tca: a few carbonate nodules and filaments.

4/ B12t: parts 5YR 54/, dry, in intricate pattern (parts 1-3 mm diameter) throughout; most parts effervesce weakly. B21tca, B22tca: few carbonate filaments on ped faces; some ped interiors effervesce weakly but most are noncalcareous.

5/ A11: effervesces weakly. A12ca: effervesces strongly; few parts 10YR 8/2, dry.

Table 60. Data for the Aridic Haplustalf Extee, S75TX-17-3, at Site 53[1/]

Sediment	Horizon	Depth	Particle size distribution, mm: Sand 2-1	Sand 1-0.5	Sand 0.5-0.25	Sand 0.25-0.1	Sand 0.1-0.05	Silt 0.05-0.002	Clay < 0.002	Clay < 0.0002	Carbonate < 2	Carbonate < 0.002	Organic C	Ext. Fe	Bulk density	pH	Textural class	Dominant dry color
		cm	%												g/cc			
Bailey II	A1	0-5	0.1	3.3	9.1	39.9	26.5	12.9	8.2	0.6	1	0	0.67	0.4		8.1	fsl	7.5YR 5/3
	B1	5-19	tr	2.7	8.8	39.7	27.6	9.3	11.9	5.1	6	0	0.52	0.3	1.60	8.1	fsl	7.5YR 5/3
	B2tca	19-42	0.6	4.9	10.9	30.5	19.6	14.2	19.3	7.7	14	3	0.15	0.2	1.64	8.2	scl	5YR 5/6
	K21	42-65	0.4	4.1	8.4	21.1	13.7	26.5	25.8	5.4	43	15	0.06	0.2	1.75	8.1	scl	7.5YR 9/4
	K22	65-94	2.2	5.7	7.4	19.2	13.8	25.8	25.9	4.8	47	16	0.01	0.2	1.78	8.3	scl	7.5YR 9/4
	K31	94-133	0.3	4.6	11.6	34.1	20.2	12.7	16.5	6.6	10	2	0.01	0.3	1.69	8.3	scl	7.5YR 6/4
	K32	133-161	0.3	4.4	11.2	33.6	20.2	15.1	15.2	4.8	15	3	0.04	0.2	1.83	8.3	scl	5YR 6/4
	K33	161-181	0.7	5.6	12.2	38.1	19.2	11.8	12.4	3.0	9	2	0.05	0.2	1.75	8.2	scl	7.5YR 7/4
	Bca	181-197	0.1	3.6	10.1	40.6	20.6	5.4	19.6	9.0	1	0	0.02	0.3	1.78	8.1	fsl	7.5YR 7/4
Bailey I	B1tcab	197-224	0.4	4.0	9.1	36.3	16.9	6.3	27.0	12.2	5	0	0.04	0.3	1.70	8.1	scl	5YR 6/6
	B21tcab	224-250	0.7	4.1	9.4	33.8	17.5	6.4	28.1	13.7	7	0	0.03	0.3	1.91	7.8	scl	5YR 5/4
	B22tcab	250-286	0.5	4.0	9.1	34.7	19.2	6.7	25.8	11.6	4	0	0.02	0.4	1.77	8.1	scl	5YR 6/6

1/ Particle-size distribution is by method 3A1 (Soil Conservation Service, 1972); organic carbon, method 6A1a; extractable Fe, method 6C2b; bulk density, method 4A1h; pH, method 8C1a (1 : 1 H_2O).

This soil does not meet the clay distribution requirements of the Paleustalfs, since the clay decreases by more than 20 percent of its maximum within 1.5 m of the surface (table 60). Carbonate clay is included in the clay data shown in table 60; when carbonate clay is excluded, as it must be (Soil Survey Staff, 1975; Guy D. Smith, personal communication, January 1981), the pedon fails the requirements for Paleustalfs by an even wider margin. These requirements would seldom be met in K horizons because of the diluent effect of carbonate on silicate clay.

The K horizon has substantially less carbonate than in soils of Bailey I age (see Site 43). Since the buried Bt horizon is older than Bailey II (table 60), it is grouped with Bailey I. However, the character of horizons beneath the buried Bt horizon is not known. The buried Bt horizon may have formed in an isolated deposit late in Bailey I time; later, it could have been buried and preserved by Bailey II sediments. This could be a major reason for the prominent morphological difference from older soils of Bailey I (fig. 2). Although the buried Bt horizon contains a small amount of carbonate (table 60), it occurs as occasional downward extensions from the soil of Bailey II, and the Bt material between these downward extensions is noncalcareous. Clearly, the Bt horizon was noncalcareous before it was buried by sediments of Bailey II.

Site 54, development of the stage IV carbonate horizon

Horizons of carbonate accumulation may be ordered in four stages of development (fig. 10), and are more common in soils of arid regions than they are in this semiarid area. The geomorphic arrangement of soils that illustrate the carbonate stages is less apparent here than in other areas because carbonate horizons do not occur at all in the soils younger than Birdwell (fig. 2). Although carbonate horizons usually do not occur in soils of Birdwell age, weak stage I carbonate horizons do occur in them if

carbonate grains are in the parent materials (see Sites 39, 43). Prominent stage III horizons are common in soils of Bailey age as previously discussed (see Sites 43 and 50-53), but stage IV horizons are not. Site 54 illustrates localized development of the stage IV horizon, and shows the factors necessary for its development in semiarid soils that are of Bailey age and that formed in parent materials with virtually no carbonate, so that pedogenic carbonate must have been derived largely or wholly from dustfall.

Site 53, discussed in the previous section, occurs just upslope of Site 54. At Site 53, the carbonate horizon in Bailey II sediments is stage III and a buried Bt horizon is at 197 cm depth. But at Site 54 a buried Bt horizon is much nearer the surface, and the carbonate horizon is stage IV. Site 54 occurs on two small knolls, a few meters wide, that are several decimeters higher than adjacent north-trending drainageways (fig. 84). The only stage IV carbonate horizon found in the study area occurs in these knolls. Site 54 consists of two parts, 54a and 54b. Site 54a is an undisturbed knoll just west of the frontage road; Site 54b is a knoll along the frontage road.

The knoll at Site 54a shows as a light-colored spot on the aerial photograph. Here erosion has brought high-carbonate horizons practically to the surface, which is mantled with carbonate-cemented fragments. A small hand-dug pit showed an Aca horizon from 0-5 cm depth. Texture is gravelly sandy loam, with the gravel fragments consisting of indurated carbonate fragments ranging from 2 mm to 2 cm in diameter. A K1 horizon occurs from 5-12 cm depth. The K1 is a very gravelly sand with many indurated carbonate fragments, mostly from ½ to 3 cm diameter, from a formerly continuously cemented horizon. The K2m horizon occurs from 12-40 cm depth, and has a stage IV horizon in its upper part, with a laminar horizon underlain by a plugged horizon. The stage IV horizon is a petrocalcic horizon, diagnostic for the Ustochrepts (table 4).

At 40 cm depth the K2m horizon abruptly overlies nonindurated high-carbonate material. Evidence to be discussed indicates that this high-carbonate material is a buried, former argillic horizon that has now been engulfed by carbonate descending from the K2m horizon. At about 75 cm depth, noncalcareous, B3-like material was encountered with the auger. High-carbonate material occurred at a depth of about 1 m, and is thought to have accumulated while an overlying B horizon was developing. The B3-like material and underlying carbonate are suggestive of a former B2t horizon above; conclusive evidence of this is shown at Site 54b, along the frontage road (fig. 84) in the next knoll to the east.

Although the soil surface has been disturbed at Site 54b, the stage IV horizon is generally in place and has been exposed by erosion along the frontage road. A small pit showed that K2m horizon is underlain by a fine sandy loam Bt horizon, 5YR 5.5/5, dry, noncalcareous in prism interiors, but with tongues of carbonate descending from the petrocalcic horizon and occurring between the prisms. The reddish, noncalcareous interiors of prisms are 2 to 8 cm wide; the carbonate tongues between the prisms narrow with depth, and range from about 1 to 20 mm wide. Clearly, the wetting front has preferentially descended between the prisms to form the tongues. The carbonate tongues are shallow and wetted at times under current moisture. Thus the tongues must still be enlarging, although substantial volumes of low-carbonate zones remain in the prisms.

An auger showed noncalcareous B3-like material similar to that at Site 54a, at about 75 cm depth. At 90 cm depth a few carbonate nodules were encountered, and high-carbonate material was found at about 1 m depth.

A similar situation is shown just east of the roadside fence, where the road grader has scraped the thin stage IV horizon away. In places the situation is like that at Site 54a, with high-carbonate material directly beneath the petrocalcic horizon, and the reddish, B2t horizon absent. An auger boring in this nonindurated carbonate horizon passed through a clay maximum of fine sandy loam, and at 90 cm depth encountered less red, noncalcareous, B3-like material, a loamy fine sand. Visible carbonate is at a depth of about 130 cm.

The effectiveness of buried argillic horizons in holding up the wetting front, and in thus precipitating carbonate along the top of the buried horizons, has been observed at a number of places in arid regions. The evidence at Site 54 indicates that the same phenomenon can occur in semiarid regions, and that development of the stage IV horizon at Site 54 was caused primarily by two factors: (1) shallowness of the buried argillic horizon, which held up the wetting front, and (2) soil erosion, which (by decreasing depth to the carbonate maximum) speeded carbonate-plugging and development of the stage IV laminar horizon.

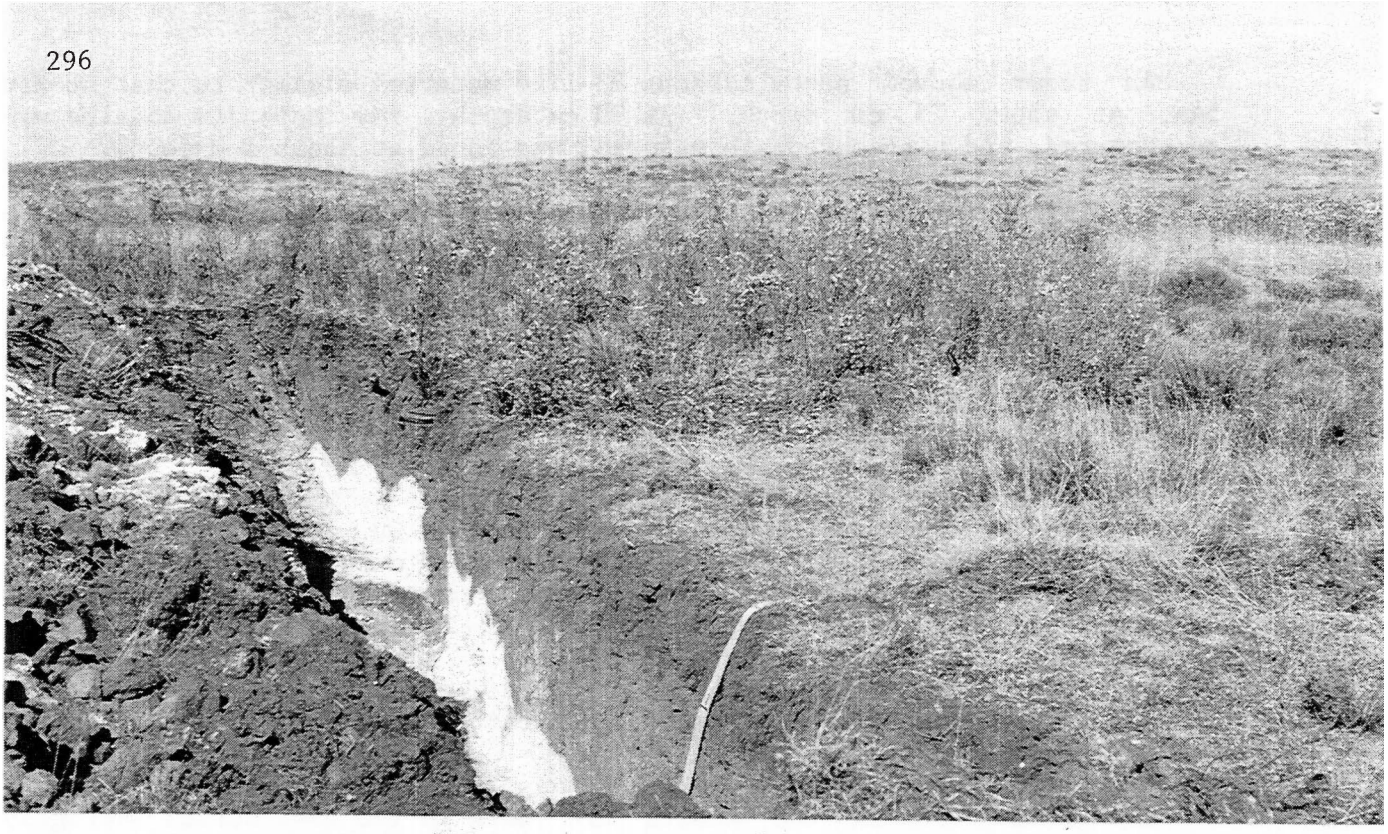
Low areas between the knolls are dark in the 1941 aerial photograph (fig. 83) and are drains that head in the high dune to the south. Dominant soils in the drains are fine-loamy Ustochrepts that are calcareous throughout. A shallow trench in one of these drains showed a soil that is quite dark in the upper few centimeters. But carbonate increases and color lightens just below the dark A horizon, which is not thick enough for a mollic epipedon. A fine sandy loam A horizon extends to about 25 cm depth. Below this a sandy clay loam B horizon extends to 40 cm depth, where scattered small hard carbonate nodules occur. A nonindurated K2 horizon starts at 45 cm depth. It is not known whether the soils in the drains are the same age as soils in the knolls, or are analogues of the buried soils in the knolls. This aspect needs further study.

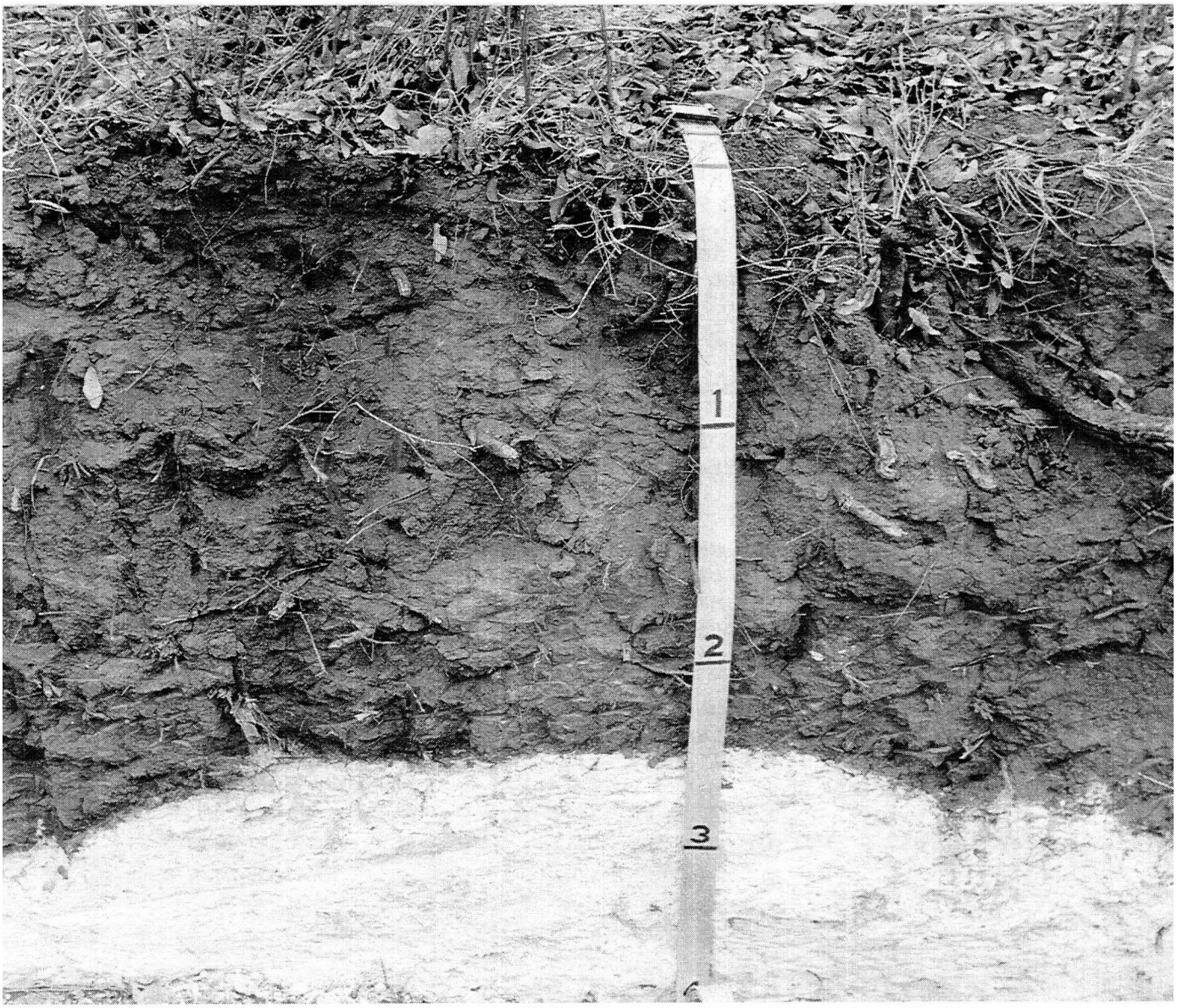
Site 55, oak-nonoak transition

Very few oak shrubs occur in the large blowouts because sandy surficial layers (see Site 40) are less common there. Site 55 (figs. 83, 84, 122) illustrates one area in a large blowout that does have oak. The study trench (fig. 122) extends from oak into nonoak vegetation. Table 61 gives soil characteristics.

The study trench was oriented north-south and was about 10 m long. The northern 7 m was in oak and the remainder was in nonoak vegetation. Pedon 55a, under oak, was sampled about 2 m from the north end of the trench and Pedon 55b, under nonoak vegetation, was sampled about 1 m from the south end.

Both sampled pedons (table 61) have slightly more clay, and distinctly more silt in the surface horizon than in the horizon just beneath; and the soil under oak has slightly more of both silt and clay than the soil under nonoak vegetation. Both soils have a surficial zone of loamy fine sand (table 61) that is 31 cm thick under oak but only 15 cm thick under nonoak vegetation. Origin of the thicker zone under oak is not known; the sandy

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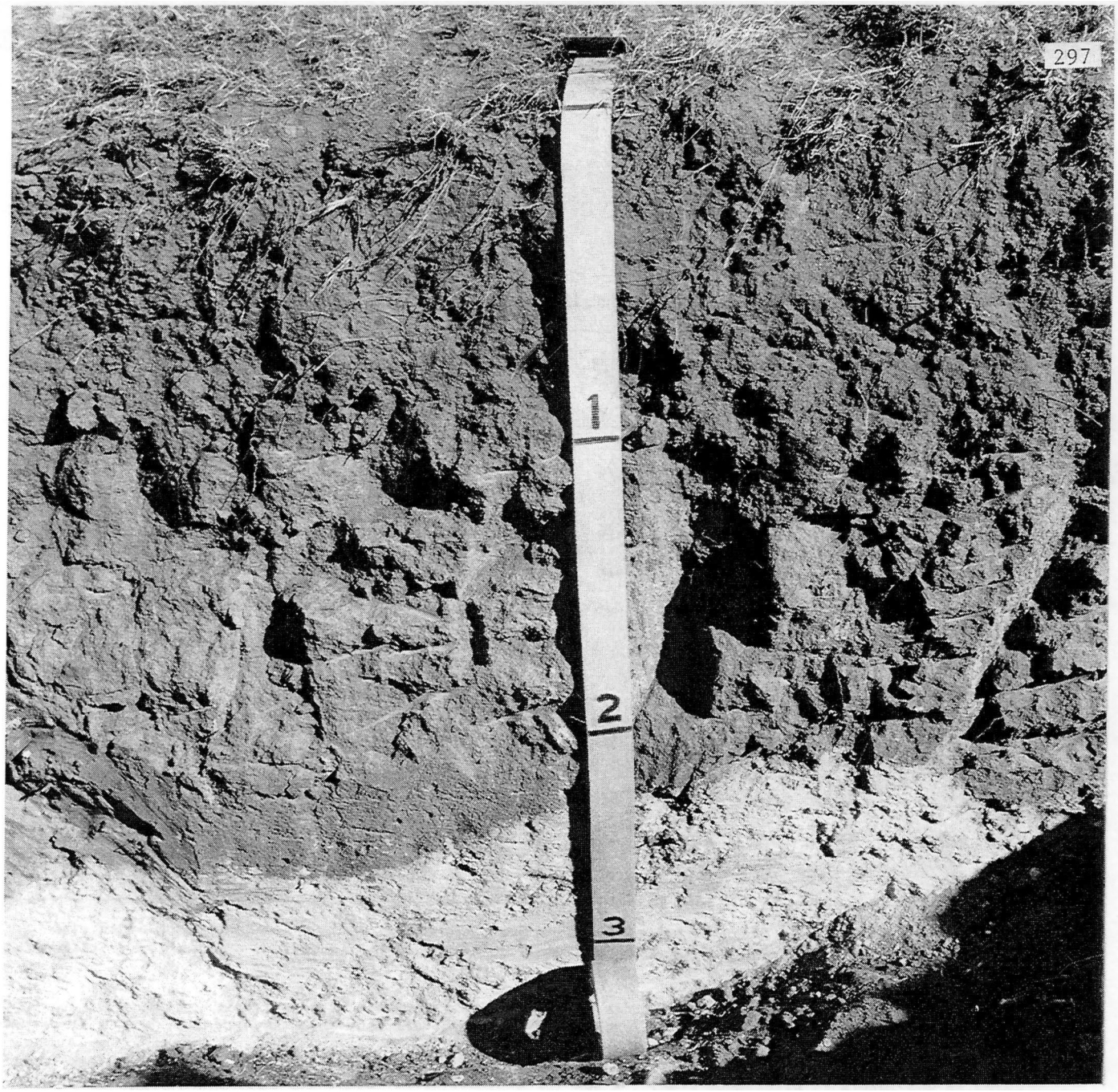

Figure 122. Opposite page, upper. View of the study trench from oak into non-oak vegetation at Site 55. The light-colored calcic horizon is thought to represent a soil of Bailey age, truncated by wind and then buried by Hale sediments. The view is north. Photographed November 1976.

Opposite page, lower. The Aridic Haplustalf Farwell, calcic variant, under oak vegetation at Site 55a. Scale is in feet.

Above. The Aridic Haplustalf Farwell, calcic variant, under nonoak vegetation at Site 55b. Scale is in feet.

Table 61. Characteristics of Aridic Haplustalfs, Farwell, calcic variant, in large blowout, Site 55[1/]

Sediment	Horizon	Depth, cm	Hue	Value/chroma Dry	Value/chroma Moist	Structure	Dry-consistence	pH	Lower boundary	Textural class	Sand 2.0-0.05 mm	Silt 0.05-0.002 mm	Clay < 0.002 mm
Pedon 55a, oak[2/]													
H	A1	0-9	7.5YR	4.5/3	3/3	m	s	6.8	cs	lfs	79.9	11.3	8.8
	B11t	9-22	6YR	5/4	3.5/4	m	s	7.0	cw	lfs	87.9	4.8	7.3
	B12t	22-31	6YR	5/4	4/4	lcsbk	h	7.2	cw	lfs	86.1	4.2	9.7
	B21t	31-55	3YR	5/6	4/6	lcpr-lcsbk	vh	8.0	cw	fsl	79.4	3.6	17.0
	B22t	55-74	3YR	5/6	4/6	lcpr-lcsbk	vh	8.4	as	fsl	82.0	2.6	15.4
	B23tca	74-78	3YR	5/6	4/6	lcpr-lcsbk	vh	8.4	as	fsl	78.2	4.8	18.0
Ba	K2b	78-93	5YR	8/3	7/3	lcsbk	vh	8.8	as	cl	40.5	24.1	35.4
Pedon 55b, nonoak[3/]													
H	A11	0-6	6YR	5/3.5	3/3.5	m,lfcr	s	6.8	as	lfs	81.7	10.8	7.5
	A12	6-15	6YR	5/3.5	3/3.5	m	s	7.4	as	lfs	86.8	6.2	7.0
	B1t	15-27	5YR	4/4	3/4	lcpr-m	sh	8.0	as	fsl	81.1	6.9	12.0
	B21t	27-38	5YR	5/4	4/4	lcpr-lmsbk	vh	8.4	as	scl	67.4	11.1	21.5
	B22tca	38-58	5YR	6/4	5/4	lcpr-lcsbk	h,vh	8.4	cw	fsl	81.3	5.7	13.0
	B23tca	58-72	5YR	6/4	5/4	lcpr-lcsbk	h,vh	8.4	as	fsl	81.8	6.1	12.1
Ba	K2b	72-98	5YR	8/3	7/3	m	vh	8.8		scl	62.7	13.9	23.4

1/ Subordinate colors and other comments are footnoted to pertinent soils. All K horizons effervesce strongly throughout; other horizons are noncalcareous unless otherwise indicated. Sediments identified as H = Hale, Ba = Bailey.

2/ B23tca: discontinuous carbonate coatings on peds; these effervesce, but ped interiors are noncalcareous. K2: ped coatings and crack fillings are 7.5YR 9/1, dry. There are many indurated nodules, ½ to 2 cm diameter.

3/ B21t: parts 5YR 4/3, dry; effervesces weakly. B22tca: a few spots of carbonate, 1-2 mm diameter. Most parts of ped interiors effervesce weakly, a few are noncalcareous. B23tca: patchy carbonate coatings and filaments on prism faces; some parts of ped interiors noncalcareous and others effervesce weakly. K2: ped coatings are 7.5YR 9/1, dry. There are many indurated nodules.

zone may have been locally thickened by Birdwell sediments. Such thickening could have been followed by migration of oak from the dunes into the blowout.

Soils under both oak and nonoak vegetation have argillic and prominent calcic horizons, but there are distinct differences between the two soils. The pH values of upper horizons are slightly lower under oak than under nonoak vegetation (table 61). The argillic horizon under oak is redder, harder, and more difficult to remove than the argillic horizon under grass. Structure under nonoak vegetation tends to be somewhat more distinct (prisms are more apparent) than under oak, but is related to depth to the K horizon. Under oak, no prisms could be found where the K horizon was shallower than about 80 cm (in the southern part of the oak portion of the trench). But where depth to the K horizon is greater than about 80 cm, prisms are present. And these prisms are carbonate-coated, but not closer than about 65 cm from the soil surface. The argillic horizon under oak is slightly redder than under nonoak vegetation (table 61).

Pipe-like features (downward extensions of the argillic horizon) are prominent in the trench (fig. 122). True pipes are thought to have been caused by differences in moisture concentration initiated by some means such as root decay (see Site 51). But the curved undulations in the top of the calcic horizon and the abrupt contact between the argillic and calcic horizons suggest the possibility of wind erosion down to the calcic horizon, forming grooves in it, and then the deposition of younger sediments.

Nearly continuous carbonate coatings on all prism faces are prominent in the soil under nonoak vegetation. The carbonate coatings extend from the calcic horizon upward to within 30 to 35 cm of the surface. There is more visible carbonate within the lower parts of prisms under nonoak than under oak. Lower parts of prism interiors are largely noncalcareous under nonoak and are usually wholly noncalcareous under oak.

Root distribution differs markedly between oak and nonoak vegetation. Under nonoak the roots are fine and, beneath the A horizon, are confined mainly to surfaces of prisms. The roots extend to the prominent calcic horizon. Under oak, large roots occur throughout the argillic horizon instead of being confined to surfaces of prisms. The difference in root size, number and distribution may be partly responsible for the observed differences in structure and carbonate occurrence. Growth of large roots, through time, would tend to disrupt prisms, the surfaces of which are favorable sites of carbonate accumulation in soils under grass. The oak roots generally do not penetrate the high-carbonate K horizon except for occasional small parts that have less carbonate than usual.

The distinct morphological differences suggest that both the oak and nonoak vegetation have been in place for some time, and that the boundary between them has also been quite stable. The period of time is unknown.

GLOSSARY

ACTIVE. ACTIVE blowouts and dunes are those that are presently losing or receiving substantial amounts of sand, as indicated by scarcity or absence of vegetation and the associated light-colored, sandy surface; missing sediments or soil horizons (in areas of erosion); and fresh, unmodified appearance of the sediments (in areas of deposition).

ALLUVIUM. Sediments deposited on land by streams.

BENCH. A long, narrow, relatively level or gently inclined strip or platform of land, earth, or rock, bounded by steeper slopes above and below....(Bates and Jackson, 1980).

BLOWOUT. A general term for a small saucer-, cup-, or trough-shaped hollow or depression formed by wind erosion on a preexisting dune or other sand deposit, esp. in an area of shifting sand or loose soil, or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where readily recognizable, is commonly included (Bates and Jackson, 1980). As used in this book, "blowout" designates only the level or nearly level bottom associated with a blowout dune. Areas above the blowout are designated dune and/or rim.

BURIED. Refers to geomorphic surfaces and soils that formed in the past and that were later buried by younger sediments.

CALCAREOUS. Containing sufficient free calcium carbonate or calcium-magnesium carbonate to effervesce visibly when treated with cold 0.1N hydrochloric acid (Soil Science Society of America, 1978).

CREST. SEE DUNE CREST.

CLAY BANDS. Thin, roughly horizontal, and dominantly to wholly pedogenic accumulations of silicate clay (termed lamellae in Soil Survey Staff, 1975). The adjective "clay" does not denote texture of the band but instead indicates the manner of clay occurrence in the horizon.

COLLUVIUM. Sediments deposited by concentrated surface runoff of sheet erosion, usually at the base of slopes (Bates and Jackson, 1980).

CROTOVINA. A former animal burrow in one soil horizon that has been filled with organic matter or material from another horizon. Also spelled "krotovina" (Soil Science Society of America, 1978).

DUNE. A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand, sometimes volcanic ash), either bare or covered by vegetation, capable of movement from place to place but always retaining its characteristic shape (Bates and Jackson, 1980).

DUNE CREST. The highest part of the dune. Some dune crests are level or nearly level transversely; other crests are very narrow and no part is level transversely.

DUNE SIDE. That part of the dune below the crest. Divided into three general parts -- the upper side, near the crest; the lower side, near the blowout or trough; and the central side, between upper and lower sides.

ELUVIATION. The removal of soil material in suspension or in solution from the upper part of a soil, or from the soil surface, to deeper horizons. The A2 horizon is an eluvial horizon.

EOLIAN SEDIMENTS. Sediments deposited by wind.

FORESET. Pertaining to or forming a steep and advancing frontal slope, or the sediments deposited on such a slope (Bates and Jackson, 1980).

GEOMORPHIC SURFACE. This term was used by Ruhe and Scholtes (1956) as equivalent to soil landscape. The term was later defined (Ruhe, 1967) as part of the land that may be defined in space and time. As used here, the term is commonly shortened to "surface" for brevity. At stable sites a given geomorphic surface has a characteristic assemblage of soil horizons (See Chapter 2).

HOLOCENE. The later of two epochs of geologic time comprising the Quaternary period; the first is the Pleistocene. The boundary between the Holocene and the Pleistocene is generally considered to be about 10,000 years B.P. (Fairbridge, 1968; Hopkins, 1975).

Table 62 shows time division for the Holocene and the Pleistocene.

Table 62. Time divisions of the Holocene and Pleistocene

Epoch	Years B.P.1/	
Holocene	Late	2,500 to present
	Middle	2,500 to 7,500
	Early	7,500 to 10,000
Pleistocene	Late	10,000 to 250,000
	Middle	250,000 to 900,000
	Early	900,000 to 2,000,000

1/ Years B.P. = years before 1950, following the custom for reporting radiocarbon ages.

ILLUVIATION. A process by which material moved in water from upper horizons of a soil, or from the soil surface, accumulates in lower horizons by deposition either from solution (e.g., carbonate) or from suspension (e.g., silicate clay). The Bt horizon contains illuvial clay.

LAMINAR HORIZON. A horizon consisting of thin carbonate layers, usually ranging from white to brown in color, that are about parallel, roughly horizontal and more or less planar. In most soils the laminar horizon overlies a PLUGGED HORIZON.

MORPHOGENETIC SEQUENCES OF CARBONATE ACCUMULATION. Two morphogenetic sequences of carbonate accumulation, one in low-gravel and one in high-gravel materials. Carbonate morphology occurs in stages of increasing development that accord with increasing carbonate accumulation and increasing age of soil (Gile et al., 1966).

NONCALCAREOUS. Containing insufficient free calcium carbonate or calcium-magnesium carbonate to effervesce visibly when treated with cold 0.1N hydrochloric acid (Soil Science Society of America, 1978).

PARENT MATERIALS. The materials (such as eolian materials or alluvium) in which soil formation started. Materials in dustfall that have moved downward into soils during their development are not considered parent materials because dustfall occurred at various times after soil development started.

PEDOGENESIS. Of or relating to soil development, including obliteration of the original organization of the parent material (e.g., mixing of sedimentary strata), and the development of such genetic soil features as soil horizons, clay skins, structure, and carbonate filaments.

PEDON. A small volume of soil that, as a minimum, includes all genetic horizons of the soil at the land surface, but may also include one or more buried soils, as determined by the lower limit of the studied horizon. The pedon is roughly hexagonal in cross section; it has a surface area of 1 to 10 square meters and lateral dimensions ranging from about 1 to 3 m, depending on variability in horizons. If the horizons are continuous and of uniform thickness, the diameter of the pedon is one meter.

PIPE. A roughly vertical, commonly funnel-shaped zone of soil material that differs markedly from adjacent horizons. In the study area, the pipes contain Bt material and have less carbonate than adjacent horizons.

PLEISTOCENE. The earlier of two epochs in the Quaternary Period (table 62), extending from about 10,000 to 2,000,000 years B.P. In the Southwest, the Pleistocene Epoch was characterized by alternating PLUVIAL and INTERPLUVIAL intervals.

PLUVIAL. An interval when there was considerably more effective moisture than now. In the Southern High Plains the last major pluvial is termed the Tahoka pluvial, which extended from about 13,000 to prior to 20,000 years age (Haynes, 1975). Intervals between the pluvials are termed INTERPLUVIALS.

PLUGGED HORIZON. A horizon with so much pedogenic carbonate that the horizon is only slowly pervious to downward movement of soil water. Development of the plugged horizon initiates lateral movement of water and development of the LAMINAR HORIZON.

QUATERNARY. The youngest period of geologic time, consisting of the HOLOCENE and PLEISTOCENE, and having a duration of about 2 million years (table 62).

RIM. The border, margin, edge, or face of a land form....(Bates and Jackson, 1980). In this study the term is used primarily to designate eolian deposits that encircle, or nearly encircle small blowouts.

SANDHILLS. An area in which sand forms distinct hills or ridges.

STABLE SURFACE OR SOIL. An area that shows little or no evidence of erosion in the form of rills, drainageways, blowouts or missing horizons.

STAGE OF CARBONATE ACCUMULATION. Degree of carbonate accumulation, as indicated by morphology. The stages are ordered from I to IV by increasing carbonate accumulation that is closely related to age. The stages occur in two MORPHOGENETIC SEQUENCES of carbonate accumulation -- one in low-gravel and one in high-gravel materials (Gile et al.,1966).

TROUGH. A linear topographic low between dunes.

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APPENDIX. NSSL LABORATORY DATA AND DESCRIPTIONS OF SAMPLED PEDONS

Eleven pedons were analyzed by the NSSL. Eight of these were sampled at soil moisture sites in 1975. Samples from three additional pedons were submitted to the laboratory in 1978. The site and laboratory sample numbers are summarized below.

Pedons analyzed by the NSSL

Soil moisture site number	Site or subsite number (frontispiece)	Laboratory sample number
	1975	
1	43	S75TX-17-2
2	41	S75TX-17-1
3	53	S75TX-17-3
4	5	S75TX-17-4
5	6	S75TX-17-5
6	22	S75TX-17-6
7	7	S75TX-17-7
8	4	S75TX-17-8
	1978	
	3b	S78TX-17-3
	18c-4	S78TX-17-1
	21	S78TX-17-2

Following are names for vegetation listed at the various moisture sites and not given in Chapter 1: red three awn (*Aristida longiseta*), bundle flower (*Desmanthus* sp.), Riddell's groundsel (*Senecio Riddellii*), cotton flower (*Gossypianthus lanuginosa*), prairie greenthread (*Thelesperma megapotamicum*), woolly white (*Hymenopappus flavescens*), dryland sedge (*Cyperus uniflorus*), scarlet globemallow (*Sphaeralcea coccinea*), fall witchgrass (*Leptoloma cognatum*), plains blackfoot (*Melampodium leucanthum*), James nail-wort (*Paronychia Jamesii*), bladderpod (*Lesquerella sp.*) wild alfalfa (*Psoralea tenuiflora*), dotted gayfeather (*Liatris punctata*), white aster (*Leucelene ericoides*) lyreleaf greeneyes (*Berlandiera lyrata*), western ragweed (*Ambrosia psilostachya*), hairy evolvulus (*Evolvulus nutallianus*), stemmed bitterweed (*Hymenoxys scaposa*), scarlet gaura (*Gaura coccinea*), ring muhly (*Muhlenbergia torreyi*), giant dropseed (*Sporobulus giganteus*), mesa dropseed (*Sporobulusflexuosus*), spectacle-pod (*Dithyrea Wislizenii*), rushpea (*Hoffmanseggia densiflora*), fleabane (*Erigeron sp.*),gummy lovegrass (*Eragrostis curtipedicellata*), kuhnia (*Kuhnia eupatorioides*), tumble windmill grass (*Chloris verticillata*), needle-and-thread (*Stipa comata*), red lovegrass (*Eragrostis oxylepis*), four o'clock (*Mirabilis linearois*), sundrop (*Calylophus serrulatus*), dalea (*Dalea lanata*), tumble lovegrass (*Eragrostis sessilispica*), cryptantha (*Cryptantha Jamesii*), wild flax (*Linum rigidum*), spiny haplopappus (*Machaeranthura Pinnatifida*), and erect dayflower (*Commelina erecta*).

Soil: Texico.
Soil classification: Psammentic Haplustalf, mixed, thermic.
Pedon no.: S75TX-17-1.

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GENERAL METHODS- - -1A,1B1B,2A1,2B   SAMPLE NOS. 760239-760248

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	COFS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTE II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - -)				FINE (- - SAND - -)					(- - SILT - -)							
		(- - - PCT LT 2MM - - -)																
000-004	A1	88.6	6.6	4.8	4.1	.2	2.2	13.5	56.1	16.6	3.9	2.7		72.0		85		.50
004-017	B1t	84.5	4.8	10.7	10.2	TR	1.9	11.5	51.3	19.8	2.7	2.1		64.7		95		.45
017-037	B21t	82.6	5.1	12.3	11.3	TR	3.3	11.0	42.8	25.5	3.1	2.0		57.1		92		.43
037-054	B22tca	82.0	4.8	13.2	11.1	.1	2.3	7.8	48.1	23.7	3.0	1.8		58.3		84		.39
054-078	B31tca	84.0	3.4	12.6	11.4	.1	1.0	4.4	52.8	25.7	1.9	1.5		58.3		90		.39
078-094	B32tca	85.3	3.5	11.2	10.5	.1	.8	7.6	58.8	18.0	2.0	1.5		67.3		94		.40
094-095	C1&B33t																	
095-130	C2	81.4	5.3	13.3	11.2	.1	1.9	9.5	45.4	24.5	3.5	1.8		56.9		84		.41
095-130	C2	84.8	3.6	11.6	9.9	TR	3.6	18.1	47.6	15.5	2.5	1.1		69.3		85		.37
130-160	C3	89.3	3.1	7.6	6.9	.1	10.3	26.6	42.3	10.0	1.7	1.4		79.3		91		.46

DEPTH CM	VOL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	6E1B LT 2 PCT	3A1A LT .002 PCT	8C1A 1/1 H2O	8C1E 1/2 CACL
	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)	(- - WEIGHT - -)	(- - - PCT LT 75 - - -)					(BULK DENSITY)			(- - - WATER CONTENT - - -)				CARBONATE		(- - PH - -)	
000-004	0	0	0	0	0	18	0	1.50B					2.4		0		7.2	6.6
004-017	0	0	0	0	0	24	0	1.54	1.61	.015		10.9	4.8	.09	0		7.2	6.6
017-037	0	0	0	0	0	29	0	1.54	1.62	.017		12.5	5.3	.11	TR		7.4	7.0
037-054	0	0	0	0	0	28	0	1.50	1.59	.020		13.5	5.2	.12	TR		8.2	7.6
054-078	0	0	0	0	0	26	0	1.51	1.56	.011		13.1	4.9	.12	TR		8.1	7.7
078-094	0	0	0	0	0	22	0	1.57	1.63	.013		14.1	4.5	.15	TR		8.3	7.7
094-095																		
095-130	0	0	0	0	0	28	0	1.51	1.58	.015		12.3	5.4	.10	TR		8.1	7.6
095-130	0	0	0	0	0	22	0	1.63	1.68	.010		9.9	4.3	.09	TR		8.2	7.7
130-160	0	0	0	0	0	14	0	1.60B					3.5		TR		8.1	7.7

DEPTH CM	6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	6C2B EXT FE PCT	TOTL PCT	6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	6H1A BACL TEA	6G1E KCL EXT	5A3A EXTB ACTY	5A6A NHAC	8D1 NHAC TO CLAY	8D3 CA TO MG	5F1 SAT NHAC PCT	5C3 EXTB ACTY PCT	5C1 NHAC PCT
	(ORGANIC MATTER)			IRON	PHOS	(- - EXTRACTABLE BASES 5B4A - -)					ACTY	AL	(CAT EXCH)		RATIO	RATIO	CA	(BASE SAT)	
						(- - - MEQ / 100 G - - -)													
000-004	.47	.043	11	.3		3.6	.7	.0	.4	4.7	.6		5.3	4.2	.88	5.1	86	89	112
004-017	.53	.054	10	.4		6.8	1.1	.0	.5	8.4	1.0		9.4	8.1	.76	6.2	84	89	104
017-037	.33	.032	10	.5		8.1	1.1	TR	.4	9.6	.9		10.5	8.7	.71	7.4	93	91	110
037-054	.16	.023	7	.5			1.0	.0	.4					8.3	.63				
054-078	.24			.5			.9	TR	.3					7.7	.61				
078-094	.11			.4			.9	.1	.3					7.2	.64				
094-095																			
095-130	.01			.5			1.4	.1	.3					8.1	.61				
095-130	.10			.4			1.2	.3	.3					6.4	.55				
130-160	.09			.3			1.6	.1	.3					4.8	.63				

DEPTH CM	8E1 REST OHM-CM	8C1B PH	8A H2O PCT	5D2 NA ESP PCT	5E NA SAR	8D5 SALT TOTL SOLU PPM	6F1A GYP PCT	8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	4F1 LQID LMIT	4F2 PLST INDX
	(SATURATED PASTE)							(- - - SATURATION EXTRACT 8A1 - - -)	(- - - MEQ / LITER - - -)									ATTERBERG PCT	
000-004																			
004-017																			
017-037																			
037-054																			
054-078																			
078-094	5800	7.9	25.1					.27											
094-095																			
095-130																			
095-130																			
130-160																			

CLAY MINERALOGY (7A2C).
017-37 MM3 MI3 KK2.
130-210 MI3 MM3 KK2.
COMMENTS: MM IS POORLY ORDERED, MOSTLY A LOW CHARGE MONTMORILLONITE.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA.
SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
017-37 VFNS - RE85 QZ81 FP2 ZR1 TM SP BK FD14 CL CB EP GN. FNES - RE93 QZ89 CD3 FK7 (328 GRAINS).
130-210 VFNS - RE91 QZ88 FR1 TM1 ZR1 SP FD8 TE8' GN.
COMMENTS: WEIGHTED AVERAGE OF 90.4 PCT. RESISTANT MINERALS IN B21T. BORDERLINE TO MIXED FAMILY MINERALOGY.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS CL = CHLORITE EP = EPIDOTE FD = FELDSPARS QZ = QUARTZ TM = TOURMALINE
ZR = ZIRCON FK = POTASSIUM FELDSPAR CB = CARBONATE AGGREGATES CD = CHALCEDONY SE = SPHENE
BK = BROOKITE GN = GARNET TE = TREMOLITE.

(A) NO SAMPLE
(B) ESTIMATED

Soil Moisture Site #2

Soil: Texico.
Soil classification: Psammentic Haplustalf, mixed, thermic.
Pedon no.: S75TX-17-1.
Location: In exclosure that is 175 feet west of Farm Road 1731, at a point about 2100 feet north of the junction between Farm Roads 1731 and 746.
Geomorphic surface: Birdwell.
Landform and slope: The crest of the dune ridge is nearly level longitudinally, with only slight undulations. The north and south sides of the exclosure are about on the shoulder of the crest, just above the more steeply sloping ridge sides. The crest is level transversely for only several m; this level part then slopes to the steeper part of the ridge side. Along the west side of the exclosure, for example, the crest is level for only about 2 m north-south, then each side slopes about 5 percent before slope increases to 10 percent (the upper sides of the ridges slope 10 percent to north and south).
Elevation: 3950.
Parent material: Eolian sediments.

Perennial vegetation (a sideoats grama - purple three-awn community): Purple three-awn, sideoats grama, dryland sedge, plains blackfoot, Riddell's groundsel, prairie greenthread, wild flax, dotted gayfeather, soapweed, woolly white, James nail-wort, stemmed bitterweed, sand dropseed, wolftail, gummy lovegrass, fleabane, spiny haplopappus, wild alfalfa, and bladderpod.

Soils samples collected by: Dan Blackstock, Russ Pettit, and George Threlkeld, October 13, 1975.
Soil described by: L. H. Gile.

Soil surface: Barren areas 10-30 cm diameter occupy about 30-40 percent of the area with barren areas smaller than this occurring between individual plants. The soil surface in these barren areas is generally smooth, with undulations of 1-2 mm. The smooth surface is the top of a crust about 1 mm thick. The clumps of vegetation preserve a surface that is commonly about 4-5 cm higher than the barren areas, suggesting some erosion between the clumps.

A1 760239 0-4 cm. Dark reddish brown (5YR 3/4 dry, 5YR 4/4 moist) fine sand; weak very fine crumb structure; soft, very friable; few roots except beneath plants where roots are common; noncalcareous; neutral; abrupt smooth boundary.

B1t 760240 4-17 cm. Dark reddish brown (5YR 3/3 dry, 5YR 4/4 moist) loamy fine sand; weak coarse prismatic, massive internally; hard, friable; few roots except beneath plants, where roots are common; noncalcareous; neutral; clear wavy boundary

B21t 760241 17-37 cm. Red (2.5YR-5YR 5/6 dry, 2.5YR-5YR 3/6 moist) loamy fine sand; weak coarse prismatic, massive internally; slightly hard and hard, friable; few roots; noncalcareous; moderately alkaline; clear wavy boundary.

B22tca 760242 37-54 cm. Yellowish red (slightly redder than 5YR 5/6 dry, 5YR 3/6 moist); fine sandy loam; compound weak coarse prismatic and weak coarse subangular blocky structure; slightly hard and hard, friable; few roots; common very fine tubular pores; common carbonate filaments on ped faces and in pores; most parts effervesce weakly, few spots noncalcareous; moderately alkaline; clear wavy boundary.

B31tca 760243 54-78 cm. Yellowish red (5YR 5/6 dry, and 5YR 4/6 moist) loamy fine sand; compound very weak coarse prismatic and very weak medium subangular blocky structure; slightly hard, very friable; few roots; few carbonate filaments on ped faces; effervesces weakly; moderately alkaline; clear wavy boundary.

B32tca 760244 78-94 cm. Yellowish red (5YR 5/6 dry, 4/6 moist) light loamy fine sand; massive; slightly hard, very friable; few roots; very few carbonate filaments; effervesces weakly; moderately alkaline, abrupt smooth boundary.

C1&B33t 760245 94-95 cm. Reddish yellow (7.5YR 8/6 dry, 7.5YR 6/6 moist) fine sand; massive and single grain; soft and loose; very few roots; effervesces weakly; moderately alkaline; abrupt smooth boundary (not sampled).

C2 760246 95-130 cm. Yellowish red (5YR 5/6 dry, 5YR 4/6 moist), massive slightly hard, very friable; very few roots; consists of fine sandy loam, generally without macroscopic stratification, dominant in upper parts of the horizon, and loamy fine sand with macroscopic stratification, dominant in the center of the horizon; very few carbonate filaments; effervesces weakly; moderately alkaline; clear wavy boundary.

C3 760248 130-160 cm. Yellowish red (5YR 5/6 dry, 4/6 moist); alternating zones of (1) light fine sandy loam, commonly ranging from 5 to 10 cm thick, in which strata cannot be seen or are faintly visible, and (2) coarser-textured material (loamy fine sand and fine sand) in which strata 1-2 mm thick are evident; massive; slightly hard, very friable; very few roots; noncalcareous except for occasional strata of sand, 0.5-1 cm thick, which effervesce weakly; moderately alkaline.

Soil: Farwell, thin variant.
Soil classification : Aridic Haplustalf, coarse-loamy, mixed, thermic.
Pedon no.: S75TX-17-2.

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GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760249-760259

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FMES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR TT .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B (PCT LT 2MM)																
		SAND									SILT							
000-015	A1	83.9	10.0	6.1	4.1	.1	2.4	11.0	48.2	22.2	7.3	2.7		61.7		67		.44
015-032	B11t	82.4	7.0	10.6	8.1	TR	2.8	10.5	46.7	22.4	5.0	2.0		60.0		76		.43
032-057	B12t	71.4	11.6	17.0	13.2	TR	2.8	9.0	37.6	22.0	7.2	4.4		49.4		78		.39
057-076	B2t	68.2	12.8	19.0	14.6	TR	2.6	8.4	35.0	22.2	7.5	5.3		46.0		77		.37
076-096	B11tb	71.8	11.9	16.3	12.5	.1	2.8	9.3	37.4	22.2	7.2	4.7		49.6		77		.38
096-120	B12tb	75.4	7.7	16.9	13.5	.1	3.1	9.6	38.8	23.8	5.0	2.7		51.6		80		.39
120-142	B2tb	72.7	6.6	20.7	17.3	.1	3.0	8.9	38.9	21.8	4.8	1.8		50.9		84		.42
142-159	B3tcab	74.4	6.7	18.9	14.1	.1	3.7	8.9	38.4	23.3	5.1	1.6		51.1		75		.43
159-187	K21b2	53.9	22.6	23.5	1.7	13.9	8.4	6.3	14.2	11.1	7.0	15.6		42.8		7	9	.30
187-238	K22b2	44.4	28.2	27.4	2.3	2.3	4.9	5.9	17.4	13.9	7.0	21.2		30.5		8	7	.22
238-265	K3b2	53.7	22.6	23.7	4.3	1.3	4.5	6.6	25.1	16.2	6.4	16.2		37.5		18	11	.29

DEPTH CM	VOL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	6E1B LT 2 PCT	6A1A LT .002 PCT	8C1A 1/1 H2O	8C1B 1/2 CACL
	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) WEIGHT (PCT LT 75)							(BULK DENSITY)			(WATER CONTENT)				(CARBONATE)		(PH)	
000-015	0	0	0	0	0	26	0	1.50A					2.7		TR		7.1	6.9
015-032	0	0	0	0	0	27	0	1.50	1.57	.015		10.8	4.6	.09	TR		7.0	6.7
032-057	0	0	0	0	0	39	0	1.45	1.56	.025		18.1	6.7	.17	TR		7.2	6.7
057-076	0	0	0	0	0	42	0	1.53	1.65	.026		14.6	7.1	.11	0		7.1	6.6
076-096	0	0	0	0	0	39	0	1.64	1.70	.012		10.6	6.2	.07	0		7.2	6.7
096-120	0	0	0	0	0	35	0	1.63	1.70	.014		12.6	6.6	.10	TR		7.3	6.9
120-142	0	0	0	0	0	37	0	1.60	1.70	.021		14.8	8.7	.10	TR		7.5	7.2
142-159	0	0	0	0	0	35	0	1.57	1.71	.029		17.7	8.1	.15	TR		7.8	7.5
159-187	0	0	0	0	0	52	0						7.1		67	15	8.1	7.7
187-238	0	0	0	0	0	63	0						6.0		62	20	8.3	7.6
238-265	0	0	0	0	0	54	0						6.9		39	13	8.5	8.1

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6E1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	EXTRACTABLE BASES 5B4A 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TRA G	AL 6G1B KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(MEQ / 100 G)													
000-015	.54	.046	12	.3			.7	TR	.4					4.8	.79				
015-032	.44	.046	10	.4			1.2	.1	.5		1.4			6.8	.64				
032-057	.45	.053	8	.6			2.1	TR	.7					10.3	.61				
057-076	.38	.047	8	.6		8.5	2.3	.1	.6	11.5	1.6		13.1	11.2	.59	3.7	76	88	103
076-096	.23			.5		7.0	2.0	.1	.5	9.6	1.1		10.7	9.4	.58	3.5	74	90	102
096-120	.17			.5			2.1	.1	.6		1.1			9.4	.56				
120-142	.16			.6			2.8	.1	.7					11.7	.57				
142-159	.14			.6			2.9	.1	.6					11.4	.60				
159-187	.15			.1			1.6	.1	.2					3.9	.17				
187-238	.11			.1			3.0	.1	.2					4.7	.17				
238-265	.08			.2			4.6	.2	.3					7.2	.30				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	8A1A EC MMHOS/CM	6N1B CA	6O1B MG	SATURATION EXTRACT 8A1 6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LIMIT PCT	4F2 PLST INDX
									(MEQ / LITER)										
000-015																			
015-032																			
032-057																			
057-076																			
076-096																			
096-120	3600	7.4	29.9					.43											
120-142																			
142-159																			
159-187																			
187-238																			
238-265																			

CLAY MINERALOGY (7A2C).
057-76 MI4 MM3 KK3.
120-142 MI4 KK3 MM2 MC1.
238-265 MT3 CA3 MI2 KK2.
COMMENTS: MM IS POORLY ORDERED, MOSTLY A LOW CHARGE MONTMORILLONITE.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CA = CALCITE MM = MONTMORILLONITE-MICA
MC = MONTMORILLONITE-CHLORITE.

SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
056-76 VFNS - RE90 QZ89 FE1 TM ZR SP FD10 CL GN HN. FNES - RE96 QZ95 CD1 FE4 (352 GRAINS).
120-142 VFNS - RE87 QZ85 FE1 TM ZR SP FD12 HN1 MS SO VR.
238-265 VFNS - RE69 QZ66 FE1 ZR1 TM SP CB19 FD11 HN MS GN.
COMMENTS: WEIGHTED AVERAGE OF 94 PCT. RESISTANT MINERALS IN THE B2T.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS CL = CHLORITE FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE QZ = QUARTZ
TM = TOURMALINE ZR = ZIRCON FK = POTASSIUM FELDSPAR CB = CARBONATE AGGREGATES CD = CHALCEDONY
SP = SPHENE GN = GARNET SO = STAUROLITE VR = VERMICULITE.

(A) ESTIMATED

Soil Moisture Site #1

Soil: Farwell, thin variant.
Soil classification: Aridic Haplustalf, coarse-loamy, mixed thermic.
Pedon no.: S75TX-17-2.
Location: In exclosure about 150 feet west of Farm Road 1731, at a point about 1300 feet north of the junction between Farm Roads 1731 and 746.
Geomorphic surface: Birdwell.
Landform and slope: The northern edge of a nearly level plain. The site is level.
Elevation: 3930 feet.
Parent material: Eolian sediments.

Perennial vegetation (a blue grama - buffalo grass community): Sand sagebrush, blue grama, zinnia, red three-awn, bundle flower, snakeweed, Riddell's groundsel, catclaw mimosa, buffalo grass, cotton flower, prairie green-thread, woolly white, soapweed, dryland sedge, scarlet globemallow, fall witchgrass, and sideoats grama.

Soil samples collected by: Dan Blackstock and George Threlkeld, October 14, 1975.
Soil described by: L. H. Gile.
Soil surface: Covered with vegetation except for occasional barren patches, 10-30 cm across, which occupy about 10-15 percent of the area; numerous barren patches of smaller size occur between clumps of vegetation. The barren patches have a smooth surface which is the top of a thin (less than 1 mm) crust. The barren areas are generally about 1-2 cm (in places 5 cm) lower than the fine earth in grass clumps.

A1 760249 0-15 cm. Brown (7.5YR 5/3 dry) or dark brown (7.5YR 3.5/3 moist) loamy fine sand; breaks out as very weak coarse subangular blocks which commonly fracture into weak medium and coarse plates; soft, very friable; few roots between plants, roots common beneath them; noncalcareous; neutral; clear wavy boundary.

B11t 760250 15-32 cm. Reddish brown (5YR dry, 3.5/4 moist) loamy fine sand; weak coarse subangular blocky structure; slightly hard, friable; few roots; noncalcareous; mildly alkaline; clear wavy boundary.

B12t 760251 32-57 cm. Reddish brown (5YR 5/4 dry, 3.5/4 moist) heavy fine sandy loam; compound weak coarse prismatic and weak coarse subangular blocky structure; hard, friable; few roots; few fine tubular pores; noncalcareous; mildly alkaline; clear wavy boundary.

B2t 760252 57-76 cm. Reddish brown (6YR 5/4 dry, 3.5/4 moist) fine sandy loam; compound weak coarse prismatic and weak medium and coarse subangular blocky structure; very hard, firm; few roots; common fine and very fine tubular pores; noncalcareous; mildly alkaline; clear wavy boundary.

B11tb 760253 76-96. Reddish brown (5YR 5/4 dry, 4/4 moist) fine sandy loam; compound weak coarse prismatic and very weak coarse subangular blocky; very hard, friable; reddish clay coatings on sand grains; crotovina 15-20 cm diameter, filled with loose, fine earth; common fine and very fine tubular pores; noncalcareous; mildly alkaline; clear wavy boundary.

B12tb 760254 96-120 cm. Red (3.5YR 5/6 dry, 4/6 moist) fine sandy loam; compound weak coarse prismatic and weak medium subangular blocky; slightly hard, friable; common fine tubular pores; reddish clay coatings on sand grains; crotovina, about 10 cm wide, extends from horizon above, into and through this horizon, terminating (in cross section) in the horizon below; very few roots (mostly on faces of prisms) except for crotovina, where fine roots are common; noncalcareous; mildly alkaline, clear wavy boundary.

B2tb 760255 120-142 cm. Red (2.5YR 5/6 dry, 3.5/6 moist) sandy clay loam; compound weak coarse prismatic and weak medium and coarse subangular blocky; hard, friable; very few roots; common fine and very fine tubular pores; clay coatings on sand grains; noncalcareous; moderately alkaline; clear wavy boundary.

B3tcab 760256 142-159 cm. Red (2.5YR 5/6 dry, 3.5/6 moist) heavy fine sandy loam; compound weak coarse prismatic and weak coarse subangular blocky; hard, friable; very few roots; carbonate filaments on faces of some prisms, especially in lower part of horizon; common fine and very fine tubular pores; the lower 2 cm has texture of light sandy clay loam and has carbonate as filaments and grain coatings; most parts of this lower 2 cm effervesce strongly and a few parts are noncalcareous, remainder of horizon is noncalcareous; moderately alkaline; abrupt smooth boundary.

K21b2 760257 159-187 cm. Dominantly pink (7.5YR 8/4 dry, 6.5/4 moist), with smaller amount of 7.5YR 9/4 dry, 8/4 moist; the whiter material occurs as fillings between peds; most of material sufficiently cemented that it cannot be textured, but repeated breakings and wettings give a texture of sandy clay loam; horizon as a whole takes water readily; horizon very firm in place and breaks out as weak medium subangular blocky; generally the blocks are very hard; only a very few fine roots, which occur in some of the few softer areas; indurated nodules are common, take water only slowly, and generally cannot be broken with the hands; effervesces strongly; moderately alkaline; clear wavy boundary.

K22b2 760258 187-238 cm. Dominantly pink, (7.5YR 9/4 dry, 7/4 moist) sandy clay loam; weak coarse subangular blocky structure; generally hard and very hard, with only a few indurated nodules; occasional single fine roots, occurring at intervals usually 20-30 cm apart; effervesces strongly; moderately alkaline; clear wavy boundary.

K3b2 760259 238-265 cm. About equal parts of pink (7.5YR 8/4 dry, 7/4 moist) and pink (7.5YR 7/4 dry) or light brown (7.5YR 6/4 moist) with small amounts of 7.5YR 9/4 dry, and 8/4 moist; sandy clay loam; weak coarse subangular blocky; mostly slightly hard and hard, with a few parts very hard; generally no roots, but one root, brittle and dead-appearing, occurs in a root channel about 3 mm in diameter; the whitest parts occur as scattered carbonate nodules; effervesces strongly; moderately alkaline.

Soil: Extee.
Soil classification: Aridic Haplustalf, fine-loamy, mixed, thermic.
Pedon no.: S75TX-17-3.

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LINCOLN, NEBRASKA

GENERAL METHODS- - -1A,1B1B,2A1,2B   SAMPLE NOS. 760260-760271

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - PCT LT 2MM - -)				FINE (- - SAND				- -)	(- - SILT	- -)						
000-005	A1	78.9	12.9	8.2	.6	.1	3.3	9.1	39.9	26.5	9.4	3.5		52.4		7		.52
005-019	B1	78.8	9.3	11.9	5.1	TR	2.7	8.8	39.7	27.6	6.7	2.6		51.2		43	12	.45
019-042	B2tca	66.5	14.2	19.3	7.7	.6	4.9	10.9	30.5	19.6	5.6	8.6		46.9		40	16	.35
042-065	K21	47.7	26.5	25.8	5.4	.4	4.1	8.4	21.1	13.7	5.1	21.4		34.0		21	11	.24
065-094	K22	48.3	25.8	25.9	4.8	2.2	5.7	7.4	19.2	13.8	5.6	20.2		34.5		19	10	.23
094-133	K31	70.8	12.7	16.5	6.6	.3	4.6	11.6	34.1	20.2	6.4	6.3		50.6		40	15	.39
133-161	K32	69.7	15.1	15.2	4.8	.3	4.4	11.2	33.6	20.2	6.4	8.7		49.5		32	12	.37
161-181	K33	75.8	11.8	12.4	3.0	.7	5.6	12.2	38.1	19.2	6.4	5.4		56.6		24	10	.43
181-197	Bca	75.0	5.4	19.6	9.0	.1	3.6	10.1	40.6	20.6	4.2	1.2		54.4		46	20	.40
197-224	B1tcab	66.7	6.3	27.0	12.2	.4	4.0	9.1	36.3	16.9	4.0	2.3		49.8		45	27	.41
224-250	B21tcab	65.5	6.4	28.1	13.7	.7	4.1	9.4	33.8	17.5	3.2	3.2		48.0		49	28	.42
250-286	B22tcab	67.5	6.7	25.8	11.6	.5	4.0	9.1	34.7	19.2	4.2	2.5		48.3		45	26	.42

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	WEIGHT 75-20 PCT LT 75	WEIGHT 20-5 PCT LT 75	WEIGHT 5-2 PCT LT 75	WEIGHT LT .074 PCT LT 75	WEIGHT 20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
000-005	TR	0	0	TR	TR	34	TR	1.50A					4.3		1	0	8.1	7.6
005-019	0	0	0	0	0	35	0	1.49	1.60	.024		15.4	5.4	.15	6	0	8.1	7.7
019-042	0	0	0	C	0	59	0	1.60	1.64	.008		13.5	6.8	.11	14	3	8.2	7.7
042-065	0	0	0	0	0	60	0	1.63	1.75	.024		16.6	6.2	.17	43	15	8.1	7.9
065-094	5	0	0	4	2	40	6	1.65	1.78	.024		15.0	6.0	.15	47	16	8.3	7.8
094-133	3	0	0	2	2	38	4	1.59	1.69	.020		15.9	6.5	.15	10	2	8.3	7.9
133-161	4	0	0	4	1	38	5	1.77	1.83	.011		13.3	5.6	.13	15	3	8.3	7.8
161-181	0	0	0	0	0	35	0	1.69	1.75	.012		12.9	5.3	.13	9	2	8.2	7.8
181-197	0	0	0	C	0	35	0	1.67	1.78	.022		13.3	7.8	.09	1	0	8.1	7.8
197-224	0	0	0	0	0	42	0	1.59	1.70	.023		17.6	11.1	.10	5	0	8.1	7.7
224-250	1	0	0	TR	1	42		1.65	1.91	.050		13.3	11.7	.03	7	0	7.8	7.6
250-286	1	0	0	1	1	42	2	1.63	1.77	.028		18.1	10.9	.12	4	0	8.1	7.7

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - MEQ / 100 G - -)													
000-005	.67	.064	10	.4			.8	.0	.5					8.4	1.02				
005-019	.52	.050	10	.3			1.0	.0	.4					8.0	.67				
019-042	.15	.015	10	.2			1.9	TR	.3					5.8	.30				
042-065	.06	.009	7	.2			2.9	TR	.3					6.9	.27				
065-094	.01			.2			4.4	TR	.4					9.7	.37				
094-133	.01			.3			4.5	TR	.4					9.1	.55				
133-161	.04			.2			4.0	.1	.4					7.7	.51				
161-181	.05			.2			3.8	.1	.3					7.2	.58				
181-197	.02			.3			4.6	.1	.6					11.5	.59				
197-224	.04			.3			6.8	.1	.8					16.7	.62				
224-250	.03			.3			6.6	.1	.9					18.1	.64				
250-286	.02			.4			5.7	.0	.8					17.2	.67				

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	NA 8A H2O PCT	NA 5D2 ESP PCT	5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 3A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(- - MEQ / LITER - -)										
000-005																			
005-019																			
019-042																			
042-065																			
065-094																			
094-133	4100	7.9	31.5					.32											
133-161																			
161-181																			
181-197																			
197-224																			
224-250																			
250-286																			

CLAY MINERALOGY (7A2C).
019-42 CA3 MM2 MI2 KK1.
181-197 MT3 MI3 KK2 QZ1 FD1 CA1.
250-286 MT4 MI3 KK2 MC1 QZ1 CA1.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MT = MONTMORILLONITE MI = MICA KK = KAOLINITE CA = CALCITE QZ = QUARTZ MM = MONTMORILLONITE-MICA
MC = MONTMORILLONITE-CHLORITE FD = FELDSPAR.

SAND MINERALOGY (7B1) PLACEMENT: MIXED.
019-42 VFNS - RE58 QZ57 FE1 TM ZR SP CB31 FD10 GN EP AU HN. FNES - QZ65 CD1 CB30 FK4 (340 GRAINS).
181-197 VFNS - RE84 QZ82 FE1 ZR1 TM SP FD14 CB1 MS VR GN HN.
250-286 VFNS - RE87 QZ86 FE1 TM ZR FD9 CB3 HN GN AU.
COMMENTS: WEIGHTED AVERAGE OF 64 PCT. RESISTANT MINERALS IN THE B2TCA. WEIGHTED AVERAGE OF 91 PCT. RESISTANT MINERALS IN THE B2TCA ON A CARBONATE-FREE BASE. PEDON SILICEOUS ON CARBONATE-FREE BASE.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS EP = EPIDOTE FD = FELDSPARS HN = HORNBLENDE MS = MUSCOVITE QZ = QUARTZ
TM = TOURMALINE ZR = ZIRCON FK = POTASSIUM FELDSPAR CB = CARBONATE AGGREGATES CD = CHALCEDONY
GN = GARNET AU = AUGITE SP = SPHENE VR = VERMICULITE.

(A) ESTIMATED

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IHC900I EXECUTION TERMINATING DUE TO ERROR COUNT FOR ERROR NUMBER  217

IHC217I FIOCS - END OF DATA SET ON UNIT    5

TRACEBACK ROUTINE  CALLED FROM ISN    REG. 14    REG. 15    REG.  0    REG.  1

          IBCOM#                      000548CC   00055908   00000060   00054880

          MAIN                        000198F2   010524E0   000BEC8C   00076FF8

ENTRY POINT=  010524E0
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Soil Moisture Site #3

Soil: Extee.
Soil classification: Aridic Haplustalf, fine-loamy, mixed, thermic.
Pedon no.: S75TX-17-3.
Location: In exclosure about 160 feet west of Farm Road 1731, about 0.5 mile north of the junction between Farm Roads 1731 and 746.
Geomorphic surface: Bailey II.
Landform and slope: Located in the northern part of a broad depression (blowout). Slope is about 1 percent to the northwest.
Elevation: 3935.
Parent material: Eolian sediments.

Perennial vegetation (a blue grama - soapweed community): Snakeweed, Riddell's groundsel, zinnia, buffalo grass, prairie greenthread, wild alfalfa, dotted gayfeather, scarlet globemallow, white aster, lyreleaf greeneyes, western ragweed, hairy evolvulus, stemmed bitterweed, scarlet gaura, ring muhly, purple 3-awn, blue grama, prickly pear, and soapweed.

Soils samples collected by: Dan Blackstock and George Threlkeld, October 14, 1975.
Soils described by: L. H. Gile.

Soil surface: Scattered barren areas, 10-30 cm diameter, are connected by smaller barren areas about 5 cm in diameter. Some of the barren areas are level with the soil around the plant clumps and other barren areas range up to 1-2 cm lower. The surface is smooth and constitutes the top of a crust that breaks out as plates 2-3 mm thick. Parts of the crusts are coated with a black lichen.

A1 760260 0-5 cm. Brown (7.5YR 5/3 dry) or dark brown (7.5YR 3.5/3 moist) fine sandy loam; weak fine and very fine crumb; soft, very friable; few roots except under grass clumps, where roots are common; effervesces strongly; moderately alkaline; clear smooth boundary.

B1 760261 5-19 cm. Brown (7.5YR 5/3 dry) or dark brown (7.5YR 3.5/3 moist) with a few parts slightly redder and lighter in color; fine sandy loam; massive; slightly hard, friable; few roots; few carbonate nodules, ½ to 3 cm diameter, most are indurated and thinly stained with brown fine earth; effervesces strongly; moderately alkaline; clear wavy boundary.

B2tca 760262 19-42 cm. Dominantly yellowish red (5YR 5/6 dry, 4/6 moist) with smaller amounts of 5YR 6/6 dry, 5/6 moist, and 5YR 8/4 dry, 7/4 moist; heavy sandy clay loam; weak medium and coarse subangular blocky structure; very hard, firm; few roots; common carbonate filaments and nodules; reddish parts effervese weakly, rest effervesce strongly; moderately alkaline; clear wavy boundary.

K21 760263 42-65 cm. Pink (7.5YR 9/4 dry, 8/4 moist) sandy clay loam; weak medium and coarse subangular blocky structure; hard and very hard, with some nodules, 1-3 cm diameter, extremely hard and indurated; most parts firm, a few friable and some extremely firm; very few fine roots; effervesces strongly; moderately akaline; clear wavy boundary.

K22 760264 65-94 cm. Dominantly pink (7.5YR 9/4 dry, 8/4 moist) with small amount of 7.5YR 6/4 dry, 7.5YR 5/4 moist; sandy clay loam; weak medium and coarse subangular blocky structure; mostly hard and very hard, most parts firm, a few friable, and a few extremely hard and indurated nodules; effervesces strongly; moderately alkaline; clear wavy boundary.

K31 760265 94-133 cm. Dominantly light brown (7.5YR 6/4 dry) or brown (7.5YR 5/4 moist) with lesser amount of 7.5YR 9/4 dry, 7.5YR 7/4 moist; sandy clay loam; weak medium and coarse subangular blocky structure; light brown material is very hard, friable; no roots; vertical cylindroids, 1-3 cm diameter, extend through this horizon and into the underlying horizon, at horizontal intervals of 2-6 cm; most are extremely hard and indurated; effervesces strongly; moderately alkaline; clear wavy boundary.

K32 760266 133-161 cm. Dominantly light reddish brown (5YR 6/4 dry)or yellowish red (5YR 5/6 moist) light sandy clay loam; weak coarse subangular blocky structure; most parts hard and very hard, friable, some carbonate nodules indurated; no roots; most nodules in cylindroidal form, 2-3 cm thick, extending vertically through the horizon; effervesces strongly; moderately alkaline; clear wavy boundary.

K33 760267 161-181 cm. Dominantly pink (7.5YR 7/4 dry) or light brown (7.5YR 6/4 moist) sandy clay loam, with smaller amount 7.5YR 8/3 dry, 7.5YR 6/4 moist, massive; very hard and hard, firm; no roots; effervesces strongly; moderately alkaline; clear wavy boundary.

Bca 760268 181-197 cm. An irregularly and discontinuously cemented horizon, white (10YR 9/2 dry) or light gray (10YR 7/2 moist) and 7.5YR 7/4 dry, 7.5YR 5/4 moist, separated by darker, low-carbonate zones; high-carbonate part commonly consists of upper layer of discontinuously cemented K-fabric, 1-2 cm thick; a middle layer 3-4 cm thick of browner, low-carbonate fine sandy loam which has discontinuous lenses of carbonate, 1-5 cm thick; and a layer of irregularly cemented carbonate that rests on the horizon below; most K-fabric extremely hard, extremely firm; no roots; effervesces strongly; moderately alkaline; abrupt smooth boundary.

B1tcab 760269 197-224 cm. Reddish yellow (5YR 6/6 dry) or yellowish red (5YR 5/6 moist) heavy fine sandy loam; weak coarse subangular blocky structure; very and extremely hard, friable; no roots; common black (Mn? Fe?) spots, 1-2 mm diameter, on ped faces; few very fine tubular pores; carbonate fillings between prisms descend from the overlying horizon and extend continuously to the bottom of the pit; fillings are about 3-5 mm thick and easily removed with the knife; noncalcareous, except for fillings between prism faces, which effervesce strongly; moderately alkaline; clear wavy boundary.

B21tcab 760270 224-250 cm. Dominantly reddish brown (5YR 5/4 dry, 4/4 moist) sandy clay loam; with lesser amount 7.5YR 9/2 dry, 7/2 moist; weak medium and coarse subangular blocky structure; very hard, friable; common carbonate filaments and nodules, and coatings on prism faces; common black (Mn? Fe?) spots, 1-2 mm diameter, some of which are faintly coated with carbonate; most parts effervesce strongly, a few effervesce weakly; moderately alkaline; clear wavy boundary.

B22tcab 760271 250-286 cm. Dominantly reddish yellow (5YR 6/6 dry) or yellowish red (5YR 4.5/6 moist) sandy clay loam; coarse angular and subangular blocky structure; very and extremely hard, friable; a few carbonate filaments and nodules; few fine tubular pores; common black spots (Mn? Fe?) 1-3 mm diameter; peds have thin carbonate coatings which effervesce strongly; most ped interiors effervesce weakly, some are noncalcareous; moderately alkaline.

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SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

Soil: Tivoli.
Soil classification: Typic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-4.

GENERAL METHODS- - -1A,1B1B,2A1,2B   SAMPLE NOS. 760272-760280

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - -) PCT LT 2MM																
000-011	A1	90.8	5.2	4.0	1.2	TR	2.1	14.5	53.8	20.4	4.1	1.1		70.4		30	4	.83
011-020	A2	96.5	1.6	1.9	.2	TR	3.4	20.1	59.0	14.0	1.2	.4		82.5		11		.68
020-033	B1	97.0	1.0	2.0	.2	TR	4.2	22.9	57.1	12.8	.7	.3		84.2		10		.70
033-052	B21&Bt	97.2	1.0	1.8		.0	2.9	23.6	59.3	11.4	.3	.7		85.8				.67
052-082	B22&Bt	97.5	.9	1.6		TR	3.0	22.6	59.1	12.8	.3	.6		84.7				.69
082-109	B31	97.1	1.2	1.7		TR	4.8	24.2	56.1	12.0	.1	1.1		85.1				.59
109-137	B32	96.9	1.8	1.3		.1	6.2	25.9	51.9	12.8	1.5	.3		84.1				1.08
137-165	B1b	96.1	1.4	2.5		.0	6.2	26.7	53.1	10.1	1.0	.4		86.0				.52
165-198	B2b&Bt	94.2	2.3	3.5		.1	4.9	22.7	55.4	11.1	1.9	.4		83.1				.46

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	GT 75 PCT	WEIGHT 75-20	20-5	5-2	LT .074	20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
			(- - - PCT LT 75 - - -)															
000-011	0	0	0	0	0	18	0				8.0A		3.3		TR	0	7.5	7.2
011-020	0	0	0	0	0	9	0				3.1A		1.3		TR		7.4	6.9
020-033	0	0	0	0	0	8	0				2.8A		1.4		TR		7.2	6.6
033-052	0	0	0	0	0	6	0				3.2A		1.2		0		6.9	6.3
052-082	0	0	0	0	0	7	0				1.9A		1.1		0		7.2	6.5
082-109	0	0	0	0	0	7	0				3.4A		1.0		0		7.1	6.4
109-137	0	0	0	0	0	8	0				2.5A		1.4		0		7.2	6.4
137-165	0	0	0	0	0	8	0	1.68	1.69	.002	4.0A	4.2	1.3	.05	TR		7.3	6.7
165-198	0	0	0	0	0	11	0	1.68	1.71	.006	4.5A	4.2	1.6	.04	TR		7.5	6.7

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - - MEQ / 100 G - - -)													
000-011	.97	.067	14	.2			.7	.0	.4					6.2	1.55				
011-020	.29	.024	12	.1			.3	.0	.2					2.4	1.26				
020-033	.15	.016	9	.1			.2	.0	.2					1.6	.40				
033-052	.10	.010	10	.1		1.2	.2	.0	.2	1.6	.2		1.8	1.4	.78	6.0	86	89	114
052-082	.06			.1		1.0	.3	.0	.2	1.5	.0		1.5	1.2	.75	3.3	83	100	125
082-109	.08			.1		1.0	.3	.0	.2	1.5	.2		1.7	1.3	.76	3.3	77	88	115
109-137	.08			.2		1.0	.4	TR	.2	1.6	.1		1.7	1.4	1.08	2.5	71	94	114
137-165	.07			.2		1.1	.5	.0	.2	1.8	.3		2.1	1.6	.64	2.2	69	86	113
165-198	.06			.2		1.5	.6	.0	.2	2.3	TR		2.3	2.2	.63	2.5	68	100	105

DEPTH CM	(SATURATED PASTE) 8E1 RESI OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(- - - MEQ / LITER - - -)										
000-011																			
011-020																			
020-033																			
033-052																			
052-082																			
082-109	27000	7.3	23.0					.13											
109-137																			
137-165																			
165-198																			

CLAY MINERALOGY (7A2C).
033-52 MI3 MM2 KK2.
165-198 MI3 MM2 KK2.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA.

SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
033-52 VFNS - RE85 QZ84 FE1 ZR FD14 GN1. FNFS - RE95 QZ88 CD7 FK5 (338 GRAINS).
165-198 VFNS - RE93 QZ90 FE1 ZR1 SP RU FD7 HN AU.
COMMENTS: WEIGHTED AVERAGE OF 94 PCT. RESISTANT MINERALS IN THE B21&BT.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS FD = FELDSPARS HN = HORNBLENDE QZ = QUARTZ ZR = ZIRCON
FK = POTASSIUM FELDSPAR CD = CHALCEDONY RU = RUTILE GN = GARNET SP = SPHENE AU = AUGITE.

(A) METHOD 4B1A

Soil Moisture Site #4

Soil: Tivoli.
Soil classification: Typic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-4.
Location: In exclosure about 50 feet west of Farm Road 1731, about 1.2 mile north of the junction between Farm Road 1731 and 746, and about 425 feet north of gate on west side of road.
Geomorphic surface: Muleshoe.
Landform and slope: Lower part of side of dune ridge. Slope is 3 percent to the south.
Elevation: 3930.
Parent material: Eolian sediments.

Perennial vegetation (an oak community): Shinnery oak, giant dropseed, soapweed, and sumac.

Soil samples collected by: B.L. Allen, Dan Blackstock, and George Threlkeld, Oct. 15, 1975.
Soil described by: L.H. Gile.

Soil surface: Covered with a layer of oak leaves and twigs about 1 cm thick.

A1 760272 0-11 cm. Dark grayish brown (10YR 4.5/2 dry) or very dark brown (10YR 2/2 moist) fine sand; massive; soft, very friable; fine roots range from few to common, with most being less than about 1 mm diameter; noncalcareous; neutral; clear wavy boundary.

A2 760273 11-20 cm. Yellowish brown (9YR 5/4 dry) or dark brown (10YR 4/3 moist) fine sand; massive; soft, very friable; roots common and many are large, ranging up to 6 cm diameter; noncalcareous; neutral; clear wavy boundary.

B1 760274 20-33 cm. Light brown (7.5YR 6/4 dry) or dark brown (7.5YR 4/4 moist) fine sand; massive; soft, very friable; roots are generally few but are common in places and range up to 5 cm diameter; few volumes of 9YR 7/3 dry, 5/3 moist, commonly range from approximately 2 to 10 cm diameter, some are roughly circular in cross section and others are of irregular shape; noncalcareous; neutral; clear wavy boundary.

B21&Bt 760275 33-52 cm. Dominantly light brown (7.5YR 6/4 dry) or dark brown (7.5YR 4/4 moist) fine sand; massive; slightly hard, very friable; few roots, generally 1-2 mm diameter, in places up to 5 mm diameter; scattered volumes of irregular shape, colored 7.5YR 7/4 dry, 7.5YR 5/4 moist; a discontinuous band of clay accumulation, about 1 mm thick and colored 5YR 6/6 dry, 5/6 moist, extends for about 50 cm in the center of the horizon, then disappears; noncalcareous; mildly alkaline; clear wavy boundary.

B22&Bt 760276 52-82 cm. Light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; few roots, generally 1-2 mm in diameter, a few about 1 cm diameter and one 6 cm diamter; two discontinuous, roughly horizontal bands of clay accumulation about 1 mm thick occur in the center of the horizon and are 3-4 cm apart; noncalcareous; mildly alkaline; clear wavy boundary.

B31 760277 82-109 cm. Light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; few roots; slightly acid; clear wavy boundary.

B32 760278 109-137 cm. Light reddish brown (6YR 6/4 dry) reddish brown (6YR 4.5/4 moist) fine sand; massive; mostly soft, few parts slightly hard; very friable; few roots; slightly acid; clear wavy boundary.

B1b 760279 137-165 cm. Light reddish brown (5YR 6/4 dry) or reddish brown (5YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; very few roots, slightly acid; clear wavy boundary.

B2b&Bt 760280 165-198 cm. Dominantly light reddish brown (5YR 6/4 dry) or reddish brown (5YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; very few roots; horizon has six roughly horizontal bands of clay accumulation, colored 5YR 5/6 dry, 4/6 moist, and from 2-8 cm apart; they range from 1-3 thick, being thickest in the upper part of the horizon; there are also several discontinuous clay bands; slightly acid.

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.
Pedon no: S75TX-17-5.

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GENERAL METHODS- - -1A,1B1B,2A1,2B   SAMPLE NOS. 760281-760290

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - -)				FINE (- - SAND - -)					(- - SILT - -)							
		(- - - PCT LT 2MM - - -)																
000-013	A1	90.6	6.2	3.2		.1	7.1	20.3	46.2	16.9	4.6	1.6		73.7				1.38
013-039	A2	96.4	2.5	1.1		.1	8.4	24.1	50.5	13.3	1.9	.6		83.1				1.36
039-056	B21&Bt	95.5	2.6	1.9		TR	7.0	22.6	50.9	15.0	1.8	.8		80.5				.68
056-082	B22&Bt	95.1	2.4	2.5		.1	7.2	23.4	51.6	12.8	1.6	.8		82.3				.60
082-109	B31	93.5	3.6	2.9		.1	5.8	20.4	50.2	17.0	2.6	1.0		76.5				.48
109-139	B32&Bt	92.0	4.6	3.4		.1	7.6	23.2	48.2	12.9	2.7	1.9		79.1				.50
139-181	C	90.1	6.0	3.9		TR	6.5	21.7	48.9	13.0	3.3	2.7		77.1				.49
181-208	B11tb	88.6	7.1	4.3		.1	6.3	22.7	48.8	10.7	3.2	3.9		77.9				.40
208-226	B12tb	87.4	8.5	4.1		.1	5.3	22.0	49.3	10.7	3.0	5.5		76.7				.46
226-247	B2tb	78.8	10.5	10.7		.2	5.7	20.4	43.6	8.9	3.4	7.1		69.9				.47

DEPTH CM	VOL. GT 2 PCT	GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	PH 8C1E 1/2 CACL
	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2)	(- - WEIGHT - -)	(- - - PCT LT 75 - - -)					(BULK DENSITY)			(- - - WATER CONTENT - - -)							
000-013	0	0	0	0	0	17	0	1.50A			9.3B		4.4		0		7.0	6.5
013-039	0	0	0	0	0	10	0	1.50A			3.1B		1.5		TR		6.9	6.3
039-056	0	0	0	0	0	10	0	1.60A			4.1B		1.3		0		7.3	6.6
056-082	0	0	0	0	0	10	0	1.62	1.63	.002	4.7B	4.5	1.5	.05	0		7.8	6.9
082-109	0	0	0	0	0	14	0	1.66	1.68	.004	5.2B	4.8	1.4	.06	0		7.8	7.0
109-139	0	0	0	0	0	14	0	1.65	1.68	.006	5.4B	5.0	1.7	.05	0		7.8	7.0
139-181	0	0	0	0	0	16	0	1.67	1.69	.004	6.3B	4.7	1.9	.05	0		7.2	6.4
181-208	0	0	0	0	0	17	0	1.70	1.71	.002	7.2B	4.4	1.7	.05	TR		7.3	6.5
208-226	0	0	0	0	0	18	0	1.70	1.73	.006	8.9B	6.4	1.9	.08	0		7.0	6.4
226-247	0	0	0	0	0	26	0	1.80	1.84	.007	15.3B	10.5	5.0	.10	0		7.2	6.7

DEPTH CM	ORGANIC MATTER 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- -EXTRACTABLE BASES 5B4A- -)				(- - - MEQ / 100 G - - -)									
000-013	.66	.053	12	.2		4.4	.6	.0	.2	5.2	.6		5.8	4.7	1.47	7.3	94	90	111
013-039	.13	.016	8	.1			.2	.0	.2		.4			1.6	1.45				
039-056	.08	.008	10	.1		1.6	.3	TR	.2	2.1	.4		2.5	1.9	1.00	5.3	84	84	111
056-082	.07	.010	7	.2		1.6	.5	.0	.2	2.3	.0		2.3	2.1	.84	3.2	76	100	110
082-109	.09			.2		1.5	.5	.0	.2	2.2	.0		2.2	2.0	.69	3.0	75	100	110
109-139	.06			.2		1.7	.6	TR	.3	2.6	.0		2.6	2.2	.65	2.8	77	100	118
139-181	.06			.2		1.8	.6	TR	.3	2.7	TR		2.7	2.5	.64	3.0	72	100	108
181-208	.04			.2			.5	TR	.2					2.1	.49				
208-226	.03			.2		1.9	.5	TR	.2	2.6	.0		2.6	2.4	.59	3.8	79	100	108
226-247	.07			.4		5.0	1.4	.1	.4	6.9	.4		7.3	4.5	.42	3.6	111	95	153

DEPTH CM	(SATURATED PASTE) 8B1 REST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
								(- - SATURATION EXTRACT 8A1 - -)	(- - - MEQ / LITER - - -)										
000-013																			
013-039																			
039-056																			
056-082																			
082-109	19000	8.1	21.2					.23											
109-139																			
139-181																			
181-208																			
208-226																			
226-247																			

CLAY MINERALOGY (7A2C).
226-247 MM3 MI3 KK2 MC1.
COMMENTS: MM IS POORLY ORDERED, MOSTLY LOW CHARGE MONTMORILLONITE.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA MC = MONTMORILLONITE-CHLORITE.

SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
056-82 VFNS - RE87 QZ95 FE1 ZR1 TM SP FD13 KY GN. FNES - RE96 QZ96 FK4 (320 GRAINS).
226-247 VFNS - RE89 QZ87 ZR1 FE TM SP FD10 GS AU GN CL.
COMMENTS: WEIGHTED AVERAGE OF 95 PCT. RESISTANT MINERALS IN THE B22&BT.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS CL = CHLORITE FD = FELDSPARS GS = GLASS QZ = QUARTZ TM = TOURMALINE
ZR = ZIRCON FK = POTASSIUM FELDSPAR SP = SPHENE KY = KYANITE GN = GARNET AU = AUGITE.

(A) ESTIMATE
(B)) BY METHOD 4B1A

Soil Moisture Site #5

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-5.
Location: In exclosure about 130 feet west of Farm Road 1731, about 1.3 mile north of the junction between Farm Roads 1731 and 746, and 800 feet north of gate on west side of road.
Geomorphic surface: Muleshoe.
Landform and slope: Gently undulating trough between dune ridges. Slope is variable within the exclosure, being slightly (about 1 percent) to the south on the east side, and slightly to the north on the west side.
Elevation: 3925 feet.
Parent material: Eolian sediments.

Perennial vegetation (an oak community): Sand sagebrush, soapweed, little bluestem, mesa dropseed, sand dropseed, spectacle-pod, rushpea, fleabane, sideoats grama, gummy lovegrass, purple three-awn, kuhnia, and shinnery oak.

Soil samples collected by: B. L. Allen, Dan Blackstock, and George Threlkeld, October 15, 1975.
Soil described by: L. H. Gile.

Soil surface: The surface is variable. In places it is covered by about 1 cm of oak leaves and twigs; in others the surface is not covered and is barren. The latter surface is smooth in places and in others has a thin veneer of loose sand. The crust breaks out as fragile plates 1-3 cm across and 2-4 cm thick.

A1 760281 0-13 cm. Brown (10YR 5/3 dry) or very dark grayish brown (10YR 3/2 moist) sand; massive; soft, very friable; common fine roots; slightly acid; abrupt wavy boundary.

A2 760282 13-39 cm. Pale brown (9YR 6.5/3 dry) or brown (10YR 4.5/3 moist) fine sand; massive; slightly hard and soft, very friable; roots common, most ranging from 1 mm-3 cm diameter; noncalcareous; mildly alkaline; clear wavy boundary.

B21&Bt 760283 39-56 cm. Dominantly light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; few roots, ranging from 1 mm-1 cm diameter; horizon has two discontinuous bands of clay accumulation and two continuous bands, 5YR 5/6 dry, 3.5/6 moist, 1-2 mm thick, with texture of loamy fine sand; bands range from 2-6 cm apart; very few circular volumes, 2-3 cm diameter, 7.5YR 7.5/4 dry; noncalcareous; mildly alkaline; clear wavy boundary.

B22&Bt 760284 56-82 cm. Dominantly light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; few roots, ranging from 1-5 mm diameter; several roughly circular, light colored volumes, 2-3 cm diameter, that may be root channel fillings; horizon has four to six bands of clay accumulation, ranging from 1-3 mm thick and 2-4 cm apart, 5YR 5/6 dry, 3.5/6 moist, with texture of loamy fine sand; in places the bands disappear laterally but on this end of trench usually appear again where wall of trench is scraped back; bands generally sparse or absent in west end of trench; undulations in bands are common, ranging up to about 6 cm; noncalcareous; mildly alkaline; clear wavy boundary.

B31 760285 82-109 cm. Light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) fine sand; massive; slightly hard, very friable; very few roots; noncalcareous; moderately alkaline; clear wavy boundary.

B32&Bt 760286 109-139 cm. Light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) sand; massive; slightly hard, friable; very few roots; one clay-enriched band, about 1 mm thick, 5YR 5/6 dry, 3.5/6 moist, occurs discontinuously in center of horizon; noncalcareous; moderately alkaline; clear wavy boundary.

C 760287 139-181 cm. Light brown (7.5YR 6/4 dry) or brown (7.5YR 4.5/4 moist) sand; massive; slightly hard, very friable; very few roots; noncalcareous; moderately alkaline; clear wavy boundary.

B11tb 760288 181-208 cm. Dominantly pale brown (10YR 6.5/3) or brown (10YR 4.5/3 moist) with few parts slightly lighter in color; sand; massive; slightly hard and hard, very friable; very few roots; few very fine tubular pores; noncalcareous; neutral; clear wavy boundary.

B12tb 760289 208-226 cm. Pale brown (10YR 6.5/3 dry) or yellowish brown (10YR 5/4 moist) sand; very weak medium subangular blocky structure; slightly hard, very friable; few very fine tubular pores; noncalcareous; neutral; clear wavy boundary.

B2tb 760290 226-247 cm. Dominantly gray (5Y 6/1 dry, 5/1 moist) with some 5Y 7/1 dry; few mottles of 10YR 4/3 dry and 7.5YR 5/4 dry; fine sandy loam; weak coarse subangular blocky structure; very hard, very firm; very hard in place and difficult to remove; very few roots; common very fine and fine tubular pores; slightly acid.

Soil: Texico.
Soil classification: Psammentic Haplustalf, mixed, thermic.
Pedon no.: S75TX-17-6.

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LINCOLN, NEBRASKA

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760291-760300

DEPTH CM	HORIZON	PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B: SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	SAND VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	SILT COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	RATIO INTB II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	8D1 15-BAR TO CLAY
		PCT LT 2MM																
000-012	A1	90.8	6.6	2.6		.1	4.3	21.4	51.4	13.6	4.1	2.5		77.2				1.12
012-046	A2	97.2	2.4	.4		TR	5.9	25.9	56.3	9.1	1.3	1.1		88.1				2.75
046-066	A2&Bt	94.4	2.2	3.4		TR	5.9	27.4	54.4	6.7	.9	1.3		87.7				.53
066-092	B2t	94.5	1.1	4.4	2.9	.1	8.3	27.5	51.8	6.8	.8	.3		87.7		66		.39
092-112	B31&Bt	94.5	1.3	4.2	3.1	.1	10.6	29.2	48.0	6.6	.9	.4		87.9		74		.40
112-131	B32&Bt	94.3	1.7	4.0	2.7	.2	7.2	26.9	50.6	9.4	1.5	.2		84.9		68		.43
131-141	B1tb	89.5	1.4	9.1	5.5	.1	6.3	23.8	49.7	9.6	1.0	.4		79.9		60		.35
141-164	B2tb	83.3	2.8	13.9	11.9	TR	6.3	21.7	47.5	7.8	2.5	.3		75.5		86		.46
164-205	B31tb	88.8	3.5	7.7	7.4	.2	10.9	26.7	45.1	5.9	2.9	.6		82.9		96		.52
205-235	B32tb	92.7	2.3	5.0	4.4	.1	8.7	27.3	50.4	6.2	1.7	.6		86.5		88		.46

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	BULK DENSITY 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	WATER CONTENT 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	PH 8C1A 1/1 H2O	8C1B 1/2 CACL
		PCT LT 75																
000-012	0	0	0	0	0	16	0	1.50A			8.3B		2.9		0		7.0	6.5
012-046	0	0	0	0	0	7	0	1.50A			2.2B		1.1		0		6.8	6.1
046-066	0	0	0	0	0	8	0	1.60A			4.7B		1.8		0		6.7	6.1
066-092	0	0	0	0	0	8	0	1.65	1.72	.014	4.4B	7.6	1.7	.10	0		7.0	6.4
092-112	0	0	0	0	0	8	0	1.66	1.71	.010	4.8B	7.9	1.7	.10	0		7.0	6.3
112-131	0	0	0	0	0	10	0	1.72	1.72	.000	3.8B	6.8	1.7	.09	0		6.5	5.7
131-141	0	0	0	0	0	15	0	1.65	1.70	.010	8.9B	6.8	3.2	.06	0		6.4	5.9
141-164	0	0	0	0	0	20	0	1.70	1.78	.016	18.9B	10.9	6.4	.08	0		6.1	5.8
164-205	0	0	0	0	0	14	0	1.72	1.78	.012	11.5B	7.8	4.0	.07	0		6.4	6.0
205-235	0	0	0	0	0	10	0	1.73	1.76	.006	7.3B	5.4	2.3	.05	0		6.8	6.2

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2B CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA G	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						MEQ / 100 G													
000-012	.81	.058	14	.2		4.4	.6	.0	.2	5.2	.3		5.5	4.7	1.81	7.3	94	95	111
012-046	.13	.009	14	.2		1.3	.2	TR	.1	1.6	.0		1.6	1.3	3.25	6.5	100	100	123
046-066	.11	.014	8	.2		2.1	.6	TR	.2	2.9	.0		2.9	2.7	.79	3.5	78	100	107
066-092	.08	.012	7	.2		1.9	.7	TR	.2	2.8	.0		2.8	2.6	.59	2.7	73	100	108
092-112	.05	.008	6	.2		1.6	.7	TR	.2	2.5	.1		2.6	2.4	.57	2.3	67	96	104
112-131	.09			.2		1.3	.6	TR	.2	2.1	.1		2.2	2.0	.50	2.2	65	95	105
131-141	.07			.3		2.6	1.1	.1	.3	4.1	.5		4.6	4.0	.29	2.4	65	89	103
141-164	.11			.4		5.2	2.7	.1	.5	7.9	1.4		9.3	8.2	.89	2.5	63	85	96
164-205	.04			.3		3.7	1.5	.1	.3	5.6	.6		6.2	5.4	.70	2.5	69	90	104
205-235	.02			.2		2.3	.9	.1	.2	3.5	.2		3.7	3.4	.68	2.6	68	95	103

DEPTH CM	(SATURATED PASTE) 8E1 REST OHM-CM	8C1B PH	8A H2O	NA 5D2 ESP	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
			PCT	PCT					MEQ / LITER										
000-012																			
012-046																			
046-066																			
066-092																			
092-112	19000	7.1	19.7					.16											
112-131																			
131-141																			
141-164																			
164-205																			
205-235																			

CLAY MINERALOGY (7A2C).
066-92 MI3 MM2 KK2 MC1.
205-235 MI3 MM3 KK2.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA MC = MONTMORILLONITE-CHLORITE.
SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
066-92 VFNS - RE89 QZ87 FE1 TM1 ZR SP FD11 GN HN. FNES - RE94 QZ94 FK6 (332 GRAINS).
205-235 VFNS - RE91 QZ88 FE2 TM1 ZR FD8 CL1.
COMMENTS: WEIGHTED AVERAGE OF 95 PCT. RESISTANT MINERALS IN THE B2T.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS CL = CHLORITE FD = FELDSPARS HN = HORNBLENDE QZ = QUARTZ TM = TOURMALINE
ZR = ZIRCON FK = POTASSIUM FELDSPAR SP = SPHENE GN = GARNET.

(A) ESTIMATED
(B) METHOD 4B1A

Soil Moisture Site #6

Soil: Texico.
Soil classification: Psammentic Haplustalf, mixed thermic.
Pedon no.: S75TX-17-6.
Location: In exclosure about 150 feet west of Farm Road 1731, about 1.4 mile north of the junction between Farm Roads 1731 and 746, and about 140 feet north of Soil Moisture Site #5.
Geomorphic surface: Longview.
Landform and slope: Crest of dune ridge oriented approximately east-west. The crest (where the exclosure is located) slopes about 2 percent to the north.
Parent material: Eolian sediments.

Perennial vegetation (an oak community): Shinnery oak, sand dropseed, purple 3-awn, little bluestem, kuhnia, soapweed, sand sagebrush, and prickly pear.

Soil samples collected by: Dan Blackstock and George Threlkeld, October 16, 1975.
Soil described by: L. H. Gile

Soil surface: Layer of shrub leaves and twigs (mostly oak) about 1 cm thick, except for area around the moisture tubes, where it is partly bare.

A1 760291 0-12 cm. Brown (10YR 5.5/3 dry) or very dark brown (10YR 2/2 moist) loamy fine sand; massive; soft, very friable and loose; fine roots common; noncalcareous; neutral; abrupt wavy boundary.

A2 760292 12-46 cm. Very pale brown (10YR 7/3 dry) or brown (10YR 5/3 moist) fine sand; massive; soft and slightly hard, very friable; roots common and range from 1 mm-3 cm diameter; slightly acid; abrupt wavy and irregular boundary.

A2&Bt 760293 46-66 cm. Dominantly very pale brown (10YR 7/3 dry) or brown (10YR 5/3 moist); with lesser amounts reddish brown (5YR 5/4 dry,4/4 moist); the brown A2 material is fine sand, the reddish brown Bt material is loamy fine sand; weak medium subangular blocky structure; mostly hard, with a few parts slightly hard; few roots, ranging from 1-5 mm thick; the Bt part occurs as discontinuous clay bands and as irregularly shaped volumes between the bands; noncalcareous; neutral; abrupt smooth boundary (bottom of clay band).

B2t 760294 66-92 cm. Dominantly light reddish brown (5YR 6/4 dry) or reddish brown (5YR 5/4 moist) loamy fine sand; massive; slightly hard, very friable; few roots, ranging from 1-5 mm diameter; horizon has four essentially horizontal bands of clay accumulation, with the uppermost being about 1 cm thick, the second usually being about 1 cm thick but in places only ½ cm thick, and the third and fourth ranging from 1-4 mm thick; distance between the bands ranges from 6-10 cm; the bands are light fine sandy loam, have color of 5YR 4.5/6 dry, 3.5/6 moist and are hard and firm; noncalcareous; mildly alkaline; abrupt smooth boundary.

B31&Bt 760295 92-112 cm. Dominantly light reddish brown (6YR 6/4 dry) or reddish brown (6YR 4.5/5 moist) sand; massive; slightly hard, very friable; few roots; horizon has four to six bands of clay accumulation ranging from 1-3 mm in thickness, and from 1-3 cm apart; noncalcareous; mildly alkaline; clear wavy boundary.

B32&Bt 760296 112-131 cm. Reddish yellow (6YR 6/5 dry) or yellowish red (6YR 4.5/5 moist) fine sand; massive; slightly hard, very friable; few roots; one discontinuous clay band, about 1 mm thick; noncalcareous; neutral; clear wavy boundary.

B1tb 760297 131-141 cm. About equal parts of light reddish brown (5YR 6/4 dry) or reddish brown (6YR 4.5/4 moist) and yellowish red (5YR 5/6 dry, 3.5/6 moist) loamy fine sand; massive; slightly hard, very friable; few roots; noncalcareous; neutral; clear smooth boundary.

B2tb 760298 141-164 cm. Red (2.5YR 5/6 dry, 2.5YR 4/6 moist) fine sandy loam; very hard, friable; compound weak coarse prismatic and very weak subangular blocky structure; generally few roots except for faces of prisms, where fine roots are common; noncalcareous; neutral; clear wavy boundary.

B31tb 760299 164-205 cm. Reddish yellow (5YR 6/6 dry) or yellowish red (5YR 4.5/6 moist) light fine sandy loam; compound weak coarse prismatic and weak coarse subangular blocky structure; very hard, friable; very few roots except for faces of prisms, where fine roots are common; noncalcareous; neutral; clear wavy boundary.

B32tb 760300 205-235 cm. Dominantly reddish yellow (5YR 6/6 dry) or yellowish red (5YR 4.5/6 moist) fine sand; massive; slightly hard, friable; very few roots; few parts of 5YR 5/6 dry, 3.5/6 moist, occur as clay bands; noncalcareous; neutral.

Soil: Tivoli.
Soil classification: Typic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-7.

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SOIL CONSERVATION SERVICE, MTSC
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

GENERAL METHODS- - -1A,1B1B,2A1,2B   SAMPLE NOS. 760301-760309

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY PCT	NON-CO3-CLAY PCT	RATIO 8D1 15-BAR TO CLAY
		(- - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - -) PCT LT 2MM																
000-011	A1	92.9	3.8	3.3	1.5	.2	8.1	23.5	49.2	11.9	3.3	.5		81.0		45		.70
011-034	A2	97.3	1.0	1.7		.3	9.9	25.9	50.1	11.1	.8	.2		86.2				.65
034-053	B1	97.1	.6	2.3		.3	8.9	24.9	51.4	11.6	.5	.1		85.5				.39
053-081	B21&Bt	96.0	1.7	2.3		.4	8.9	25.0	50.8	10.9	1.4	.3		85.1				.39
081-111	B22	93.7	2.8	3.5		.2	8.1	23.6	50.9	10.9	2.6	.2		82.8				.34
111-143	B2b&Bt	95.6	1.2	3.2		.3	10.5	27.4	49.8	7.6	1.0	.2		88.0				.38
143-164	C1b&Bt	97.1	.8	2.1		.3	9.9	26.5	52.7	7.7	.4	.4		89.4				.33
164-191	C2b	97.0	1.4	1.6		.2	6.8	22.1	55.1	12.8	1.2	.2		84.2				.56
191-221	Btb2	81.6	1.7	16.7		.1	7.0	19.8	43.9	10.8	1.5	.2		70.8				.41

DEPTH CM	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) VOL. GT 2 PCT	WEIGHT GT 75 PCT	75-20 (PCT LT 75)	20-5	5-2	LT .074	20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(WATER CONTENT) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(PH) 8C1A 1/1 H2O	8C1E 1/2 CACL
000-011	0	0	0	0	0	13	0				5.0A		2.3		0		7.0	6.4
011-034	0	0	0	0	0	7	0				3.2A		1.1		0		7.2	6.5
034-053	0	0	0	0	0	8	0				3.5A		.9		TR		7.4	6.7
053-081	0	0	0	0	0	9	0				3.9A		.9		TR		7.4	6.7
081-111	0	0	0	0	0	12	0				5.1A		1.2		TR		7.4	6.7
111-143	0	0	0	0	0	8	0				4.2A		1.2		TR		7.1	6.4
143-164	0	0	0	0	0	6	0				2.5A		.7		0		6.3	5.5
164-191	0	0	0	0	0	9	0				3.0A		.9		0		6.2	5.3
191-221	0	0	0	0	0	24	0	1.85	1.92	.013	20.5A	9.1	6.9	.04	0		6.4	5.8

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(EXTRACTABLE BASES 5B4A) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - - MEQ / 100 G - - -)													
000-011	.52	.041	13	.2		3.6	.5	TR	.2	4.3	.1		4.4	3.7	1.12	7.2	97	98	116
011-034	.15	.015	10	.1		1.6	.2	.0	.1	1.9	.0		1.9	1.4	.82	8.0	114	100	136
034-053	.08	.013	6	.1			.3	TR	.1		.0			1.3	.57				
053-081	.06	.008	8	.1			.4	TR	.2		.0			1.5	.65				
081-111	.06			.2			.6	TR	.2					1.8	.51				
111-143	.05			.1			.5	TR	.2					1.6	.50				
143-164	.00			.1		.7	.2	TR	.1	1.0	.0		1.0	.9	.43	3.5	78	100	111
164-191	.00			.1		.5	.2	TR	.1	.8	.0		.8	.7	.44	2.5	71	100	114
191-221	.01			.3		7.0	1.8	.2	.3	9.3	1.2		10.5	9.6	.57	3.9	73	89	97

DEPTH CM	(SATURATED PASTE) 8E1 RESIST OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(SATURATION EXTRACT 8A1) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT PCT	4F2 PLST INDX
									(- - - MEQ / LITER - - -)										
000-011																			
011-034																			
034-053																			
053-081																			
081-111	18000	7.7	20.4					.23											
111-143																			
143-164																			
164-191																			
191-221																			

CLAY MINERALOGY (7A2C).
081-111 MI3 MM2 KK2.
191-221 MI3 MM3 KK2 MC1.
COMMENTS: MM MOSTLY LOW CHARGE MONTMORILLONITE.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA MC = MONTMORILLONITE-CHLORITE.
SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
081-111 VFNS - RE88 QZ85 FE1 ZR2 TM SP RU FD12 HN. FNES - RE93 QZ93 FK7 (330 GRAINS).
111-143 VFNS - RE86 QZ84 FE1 TM1 ZR SP FD14 EP HN.
191-221 VFNS - RE90 QZ88 FE1 TM ZR SP FD/ GN.
COMMENTS: WEIGHTED AVERAGE OF 93 PCT. RESISTANT MINERALS IN THE B22.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS EP = EPIDOTE FD = FELDSPARS HN = HORNBLENDE QZ = QUARTZ TM = TOURMALINE
ZR = ZIRCON FK = POTASSIUM FELDSPAR SP = SPHENE RU = RUTILE.

(A) METHOD 4B1A

Soil Moisture Site #7

Soil: Tivoli.
Soil classification: Typic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-7.
Location: In exclosure about 75 feet west of Farm Road 1731, about 1.5 mile north of the junction between Farm Road 1731 and 746.
Geomorphic surface: Muleshoe.
Landform and slope: In the northern part of a broad, gently undulating plain. There is slight variability of slope within the exclosure, but the area of the sample site and moisture tubes slopes about 1 percent to the north.
Parent material: Eolian sediments.

Perennial vegetation (an oak community): Shinnery oak, sand dropseed, giant dropseed, purple 3-awn, tumble windmill grass, Riddell's groundsel, kuhnia, and prickly pear.

Soil samples collected by: Dan Blackstock and George Threlkeld, October 16, 1975.
Soil described by: L. H. Gile.

Soil surface: Generally covered by a thin (1 mm-1 cm) layer of leaves and twigs (mostly from oak). There are a few patches, 10-20 cm across, with fine earth at the surface. The latter has a smooth-topped crust in some places, and in others the fine earth is slightly mixed with twigs and leaves.

A1 760301 0-11 cm. Grayish brown (10YR 5/2 dry) or very dark grayish brown (10YR 3/2 moist) sand; massive; soft, very friable; fine roots common in some areas, only few in others; noncalcareous; mildly alkaline; clear wavy boundary.

A2 760302 11-34 cm. Dominantly light brownish gray (10YR 6.5/3 dry) or dark brown (10YR 4/3 moist) with lesser amount 10YR 7/3 dry, 10YR 5/3 moist; fine sand; massive; soft, very friable; few roots in some parts, common in others, ranging from less than 1 mm-3 cm in diameter; noncalcareous; neutral; clear wavy boundary.

B1 760303 34-53 cm. Very pale brown (10YR 7/4 dry) or yellowish brown (10YR 5/4 moist) in fine pattern with 10YR 6/4 dry, 10YR 4/4 moist; fine sand; massive; slightly hard, very friable; few roots; noncalcareous; mildly alkaline; clear wavy boundary.

B21&Bt 760304 53-81 cm. Pink (7.5YR 7/4 dry) or brown (7.5YR 5/4 moist) fine sand; massive; soft, very friable; few roots; one discontinuous band of clay accumulation, 5YR 5/4 dry, ½-1 mm thick, occurring as segments a few cm in length, separated by much wider zones in which the band is absent; noncalcareous, mildly alkaline; clear wavy boundary.

B22 760305 81-111 cm. Light brown (7.5YR 6/4 dry) or dark brown (7.5YR 4/4 moist) fine sand; massive:slightly hard, very friable; few roots; noncalcareous; mildly alkaline; clear wavy boundary.

B2b&Bt 760306 111-143 cm. Very pale brown (9YR 7/4 dry) or yellowish brown (9YR 5/4 moist) sand; massive; hard and slightly hard, very friable; very few roots, horizon usually has about four, mostly continuous, clay-enriched bands, colored 5YR 5/6 dry, 5YR 4.5/6 moist; most bands are from 2-3 mm thick, with one being about ½ cm thick; bands usually 5-6 cm apart, varying from 4-12 cm apart; slightly acid; clear wavy boundary.

C1b&Bt 760307 143-164 cm. Very pale brown (10YR 7/3 dry) or yellowish brown (10YR 5/4 moist) fine sand; massive; slightly hard, very friable; two clay-enriched bands, 5YR 5/4 dry, are continuous, approximately 2 mm thick, and range from 5-10 cm apart; slightly acid; clear wavy boundary.

C2b 760308 164-191 cm. Very pale brown (10YR 8/3 dry) or pale brown (10YR 6/3 moist) fine sand; massive; soft, very friable; very few roots; slightly acid; abrupt wavy boundary.

Btb2 760309 191-221 cm. Dominantly light brownish gray (2.5YR 6/2 dry) or grayish brown (2.5YR 5/2 moist) and 10YR 7/4 dry, 10YR 5/4 moist, and 10YR 8/1 dry, 7/1 moist; fine sandy loam in upper few cm, then a sandy clay loam; weak coarse subangular blocky structure; very hard, very firm; very few roots except along some ped faces; clay skins, 10YR 4/3 dry, on some ped faces along with a concentration of fine roots; slightly acid.

Soil: Tivoli.
Soil classification: Typic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-8.

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NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

GENERAL METHODS- - -1A,1B1B,2A1,2B SAMPLE NOS. 760637-760645

DEPTH CM	HORIZON	SAND 2-.05	SILT .05-.002	CLAY LT .002	FINE CLAY LT .0002	VCOS 2-1	CORS 1-.5	MEDS .5-.25	FNES .25-.10	VFNS .10-.05	COSI .05-.02	FNSI .02-.002	VFSI .005-.002	SAND 2-.10	INTR II .2-.02	FINE CLAY TO CLAY	NON-CO3-CLAY	BD1 15-BAR TO CLAY
		(- - - - - - - - - - - - - - PARTICLE SIZE ANALYSIS, LT 2MM, 3A1, 3A1A, 3A1B - - - - - - - - - -)																
					PINE	(- - - - - SAND - - - - -)					(- - -SILT- - - -)							
		(- PCT LT 2MM -)																
000-012	A1	91.9	3.9	4.2	1.0	.3	5.9	23.6	49.6	12.5	3.6	.3		79.4		24		.48
012-031	A2	94.4	1.7	3.9	.5	.1	5.9	24.0	49.9	14.5	1.4	.3		79.9		13		.41
031-061	B21	95.3	.8	3.9	.8	TR	7.5	26.0	50.2	11.6	.6	.2		83.7		21		.41
061-084	B22	96.3	1.6	2.1	.4	TR	5.6	24.4	51.9	14.4	1.3	.3		81.9		19		.71
084-112	B31	96.5	1.3	2.2	1.3	TR	4.2	22.7	53.9	15.7	.9	.4		80.8		59		.45
112-151	B32	95.0	3.0	2.0	.4	TR	3.1	19.1	55.3	17.5	2.8	.2		77.5		20		.40
151-168	B1b	95.2	3.0	1.8	.4	TR	3.4	22.3	55.0	14.5	2.6	.4		80.7		22		.50
168-182	B21tb	80.3	5.9	13.8	8.7	.0	2.6	14.4	46.6	16.7	4.0	1.9		63.6		63		.41
182-206	B22tb	82.5	7.6	9.9	6.2	TR	2.9	15.1	45.0	19.5	5.6	2.0		63.0		63		.43

DEPTH CM	VOL. GT 2 PCT	(PARTICLE SIZE ANALYSIS, MM, 3B, 3B1, 3B2) GT 75 PCT	75-20	20-5	5-2	LT .074	20-2 PCT LT20	(BULK DENSITY) 4A1D 1/3-BAR G/CC	4A1H OVEN DRY G/CC	4D1 COLE	(- - - -WATER CONTENT- - - -) 4B1C 1/10 BAR PCT	4B1C 1/3-BAR PCT	4B2 15-BAR PCT	4C1 WRD CM/CM	CARBONATE 6E1B LT 2 PCT	3A1A LT .002 PCT	(- -PH - -) 8C1A 1/1 H2O	8C1E 1/2 CACL
		(- - - PCT LT 75 - - -)																
000-012	0	0	0	0	0	14	0				6.2A		2.0		TR		7.1	6.7
012-031	0	0	0	0	0	12	0				3.9A		1.6		0		6.8	6.4
031-061	0	0	0	0	0	10	0				4.7A		1.6		0		7.1	6.2
061-084	0	0	0	0	0	9	0				3.0A		1.5		0		6.9	5.9
084-112	0	0	0	0	0	9	0				3.3A		1.0		0		6.6	5.9
112-151	0	0	0	0	0	14	0				3.7A		.8		0		7.0	6.0
151-168	0	0	0	0	0	10	0				4.0A		.9		0		6.9	6.3
168-182	0	0	0	0	0	28	0				20.1A		5.7		0		6.9	6.4
182-206	0	0	0	0	0	27	0				16.3A		4.3		0		6.1	5.6

DEPTH CM	(ORGANIC MATTER) 6A1A ORGN CARB PCT	6B1A NITG PCT	C/N	IRON 6C2B EXT FE PCT	PHOS TOTL PCT	(- -EXTRACTABLE BASES 5B4A- -) 6N2E CA	6O2D MG	6P2B NA	6Q2B K	SUM EXTB	ACTY 6H1A BACL TEA	AL 6G1E KCL EXT	(CAT EXCH) 5A3A EXTB ACTY	5A6A NHAC	RATIO 8D1 NHAC TO CLAY	RATIO 8D3 CA TO MG	CA 5F1 SAT NHAC PCT	(BASE SAT) 5C3 EXTB ACTY PCT	5C1 NHAC PCT
						(- - - - - - - - - - - -MEQ / 100					G- - - - - - - - - -)								
000-012	.44	.056	8	.2			.6	TR	.3		.4			3.5	.83				
012-031	.24	.038	6	.2		2.0	.4	TR	.2	2.6	.4		3.0	2.3	.59	5.0	87	87	113
031-061	.16	.020	8	.2		1.7	.4	TR	.2	2.3	.4		2.7	2.2	.56	4.3	77	85	105
061-084	.10	.015	7	.2		1.3	.3	TR	.2	1.8	.2		2.0	1.9	.58	4.3	68	90	95
084-112	.07			.2		1.0	.4	TR	.1	1.5	.3		1.8	1.4	.47	2.5	71	83	107
112-151	.04			.2		1.0	.3	TR	.1	1.4	.1		1.5	1.4	.45	3.3	71	93	100
151-168	.04			.2		1.1	.4	TR	.2	1.7	.1		1.8	1.5	.48	2.8	73	94	113
168-182	.13			.4		5.7	1.8	TR	.4	7.9	1.4		9.3	8.1	.59	3.2	70	85	98
182-206	.07			.3		4.4	1.4	.1	.3	6.2	1.1		7.3	6.2	.63	3.1	71	85	100

DEPTH CM	(SATURATED PASTE) 8E1 RESI OHM-CM	8C1B PH	8A H2O PCT	NA 5D2 ESP PCT	NA 5E SAR	SALT 8D5 TOTL SOLU PPM	GYP 6F1A PCT	(- - - - - - - - - SATURATION EXTRACT 8A1- - - - - - - - -) 8A1A EC MMHOS/CM	6N1B CA	6O1B MG	6P1B NA	6Q1B K	6I1A CO3	6J1A HCO3	6K1A CL	6L1A SO4	6M1A NO3	ATTERBERG 4F1 LQID LMIT	4F2 PLST INDX
								(- - - - - - - - - - MEQ / LITER - - - - - - - - - - -)											
000-012																			
012-031																			
031-061																			
061-084																			
084-112	24000	7.2	22.6					.17											
112-151																			
151-168																			
168-182																			
182-206																			

CLAY MINERALOGY (7A2C).
031-61 MI3 KK2 MM1.
168-182 MM3 MI3 KK3.
RELATIVE AMOUNTS: (X-RAY) 5 = DOMINANT 4 = ABUNDANT 3 = MODERATE 2 = SMALL 1 = TRACE.
MINERAL CODE: MI = MICA KK = KAOLINITE MM = MONTMORILLONITE-MICA.
SAND MINERALOGY (7B1) PLACEMENT: SILICEOUS.
031-61 VFNS - RE88 QZ85 FE2 TM -ZR SP FD11 MS GN. FNES - RE94 QZ91 CD3 FK6 (342 GRAINS).
168-182 VFNS - RE86 QZ83 FE2 ZR1 TM SP FD14 GN.
COMMENTS: WEIGHTED AVERAGE OF 94 PCT. RESISTANT MINERALS IN THE B21.
RELATIVE AMOUNTS: AS PERCENT
MINERAL CODE: RE = RESISTANT MINERALS FD = FELDSPARS MS = MUSCOVITE QZ = QUARTZ TM = TOURMALINE ZR = ZIRCON
FK = POTASSIUM FELDSPAR CD = CHALCEDONY SP = SPHENE GN = GARNET.

(A) METHOD 4B1A

IHC900I EXECUTION TERMINATING DUE TO ERROR COUNT FOR ERROR NUMBER 217

IHC217I FIOCS - END OF DATA SET ON UNIT 5

TRACEBACK	ROUTINE	CALLED FROM ISN	REG. 14	REG. 15	REG. 0	REG. 1
	IBCOM		000690CC	0006A108	0000005D	00069080
	MAIN		000193BA	01066CE0	000CA8BC	0008B7F8

ENTRY POINT= 01066CE0

Soil Moisture Site #8

Soil: Tivoli.
Soil classification: Typic Ustipsamment, mixed, thermic.
Pedon no.: S75TX-17-8.
Location: In exclosure about 800 feet east of Farm Road 1731, about 1.1 mile north of the junction between Farm Roads 1731 and 746, and about100 feet south of dirt road.
Geomorphic surface: Muleshoe.
Landform and slope: Lower side of slight ridge, near margin of broad depression. Slope is 4 percent to the east where the moisture tubes and west end of the sample trench are located. Slope decreases to the east and is nearly level on the east side of the exclosure.
Parent material: Eolian sediments.

Perennial vegetation (a sumac - red lovegrass community): Sand sagebrush, western ragweed, woolly white, purple 3-awn, needle-and-thread, sand bluestem, little bluestem, red lovegrass, fall witchgrass, four o'clock, sumac, queen's delight, hairy grama, kuhnia, sundrop, dalea, tumble lovegrass, cryptantha, wild flax, prairie green-thread, rushpea, spiny haplopappus, and erect dayflower.

Soil samples collected by: L. H. Gile, November 8, 1975.
Soil described by: L. H. Gile.

Soil surface: Barren between clumps of vegetation; 50-60 percent of the surface has barren areas ranging from 20-50 cm diameter. The barren areas are partially covered by a discontinuous, loose litter of stems and leaves. Where undisturbed the surface has a fragile crust 1-5 mm thick, which breaks out as plates 1-3 cm in diameter.

A1 760637 0-12 cm. Brown (7.5YR 5/4 dry) or dark brown (7.5YR 3/4 moist) fine sand; massive; soft, very friable, some parts loose; fine roots common; noncalcareous; moderately alkaline; abrupt wavy boundary.

A2 760638) 12-31 cm. Dominantly light brown (7.5YR 6/4 dry) or brown (7.5YR 5/4 moist) with some parts slightly darker as in the A1, and some slightly redder as in the B21; fine sand; massive; slightly hard, very friable; few roots; noncalcareous; moderately alkaline clear wavy boundary.

B21 760639 31-61 cm. Yellowish red (5YR 5.5/6 dry, 5YR 4/6 moist) fine sand; massive; slightly hard, very friable; few roots, mostly 1-2 mm diameter, but several up to 5 cm diameter; scattered crotovinas, with one being diagonal, about 35 cm long and 10 cm wide, filled with loose material including sand, fecal pellets and fine roots; noncalcareous; moderately alkaline; clear wavy boundary.

B22 760640 61-84 cm. Reddish yellow (5YR 6/6 dry) or yellowish red (5YR 4/6 moist) fine sand; massive; slightly hard, very friable; few roots, mostly 1-2 mm diameter, but several 8-10 cm diameter; several crotovinas, with the longest being diagonal, about 45 cm long and 10 cm wide, most of which is tightly packed with fine sand which is lighter in color than the main part of the horizon; organic material, fecal pellets, and loose sand occur along the lower margin and the east end of the crotovina; noncalcareous; moderately alkaline; clear wavy boundary.

B31 760641 84-112 cm. Reddish yellow (6YR 6/6 dry) or yellowish red (6YR 4/6 moist) fine sand; massive; slightly hard, very friable; very few roots; noncalcareous; moderately alkaline; clear wavy boundary.

B32 760642 112-151 cm. Reddish yellow (6YR 6/6 dry) or yellowish red (6YR 4/6 moist) fine sand; massive; slightly hard, very friable; very few roots; noncalcareous; moderately alkaline; abrupt wavy boundary.

B1b 760643 151-168 cm. Dominantly light reddish brown (5YR 6/4 dry) or reddish brown (5YR 5/4 moist) with parts 5YR 6/6 dry; fine sand; massive; slightly hard, very friable; very few roots; noncalcareous; moderately alkaline; abrupt smooth boundary.

B21tb 760644 168-182 cm. Reddish brown (5YR 5/4 dry, 4/4 moist) fine sandy loam; very hard, friable; compound very weak coarse prismatic and weak coarse subangular blocky structure; very few roots, about 1 mm and less in diameter; moderately alkaline; noncalcareous; clear wavy boundary.

B22tb 760645 182-206 cm. Yellowish brown (9YR 5/4 dry) or dark yellowish brown (9YR 4/4 moist) with a few parts of 5YR hue; loamy fine sand; very hard, friable; compound very weak coarse prismatic and very weak coarse subangular blocky structure; very few roots, 1 mm and less in diameter; noncalcareous; neutral.

Pedon S78TX-17-1

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.

U. S. DEPARTMENT OF AGRICULTURE
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LINCOLN, NEBRASKA

GENERAL METHODS 1B1A, 2A1, 2B

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -) CLAY LT .002	SILT .002 -.05	SAND .05 -2	(- -CLAY- -) FINE LT .0002	CO3 LT .002	(- -SILT- -) FINE .002 -.02	COARSE .02 -.05	VF .05 -.10	(- - - - - -SAND- - - - - -) F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2	(-COARSE FRACTIONS(MM)-) 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - PCT OF <2MM						(3A1)	- - - - - - - - - - - -					<- PCT OF <75MM(3B1) ->				
79 237	1S	0- 15	A1	3.2	4.6	92.2			0.8	3.8	7.5	46.3	28.5	9.6	0.3	--	--	--	85	--
79 238	2S	15- 28	A2	2.4	1.8	95.8			0.4	1.4	7.3	52.5	27.1	8.7	0.2	--	--	--	88	--
79 239	3S	28- 49	B1	2.8	1.3	95.9			--	1.3	5.8	48.3	34.1	7.7	--	--	--	--	90	--
79 240	4S	49- 69	B21&Bt	3.2	1.7	95.1			0.4	1.3	5.9	49.3	31.0	8.8	0.1	--	--	--	89	--
79 241	5S	69- 94	B22&Bt	2.0	2.6	95.4			--	2.6	8.7	50.0	27.3	9.3	0.1	--	--	--	87	--
79 242	6S	94-114	C	1.6	3.0	95.4			--	3.0	9.3	51.5	26.3	8.1	0.2	--	--	--	86	--

SAMPLE NO.	HZN NO.	ORGN TOTAL C 6A1C	N 6B1B	EXTR TOTAL P 6S1A	S 6R3A	(- - DITH-CIT - -) EXTRACTABLE FE 6C2B	AL 6G7A	MN 6D2A	CEC 8D1	(RATIO/CLAY) 15 BAR 8D1	(ATTERBERG) - LIMITS - LL 4F1	PI 4F	(- BULK DENSITY -) FIELD MOIST 4A3A	1/3 BAR 4A1D	OVEN DRY 4A1H	COLE WHOLE SOIL 4D1	(- - -WATER CONTENT - -) FIELD MOIST 4B4	1/10 BAR 4B1C	1/3 BAR 4B1C	15 BAR 4B2	WRD WHOLE SOIL 4C1
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
79 237	1									0.59										1.9	
79 238	2									0.46										1.1	
79 239	3									0.50										1.4	
79 240	4									0.38										1.2	
79 241	5									0.50										1.0	
79 242	6									0.63										1.0	

SAMPLE NO.	HZN NO.	(- NH4OAC EXTRACTABLE BASES -) CA 5B4A 6N2E	MG 5B4A 6O2D	NA 5B4A 6P2B	K 5B4A 6Q2B	SUM BASES	ACID- ITY 6H2B	EXTR AL 6G1E	(- - - -CEC - - -) SUM CATS 5A3A	NH4- OAC 5A8A	BASES + AL 5A3B	AL SAT 5G1	-BASE SAT- SUM 5C3	NH4 5C1	CO3 AS CACO3 <2MM 6E1B	RES. OHMS /CM 8E1	(- - - -PH - - -) CACL2 .01M 8C1E 1:2	H2O 8C1A 1:1
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->						
79 237	1																6.3	6.9
79 238	2																5.7	6.3
79 239	3																6.1	6.7
79 240	4																6.1	6.7
79 241	5																6.0	6.7
79 242	6																5.8	6.4

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Pedon S78TX-17-1

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.
Location: East rim of blowout dune, about 1100 feet east of Farm Road 1731, at a point that is about 8500 feet north of the junction between Farm Road 1731 and 746, and that is about 2300 feet north of gate on east side of road.
Geomorphic surface: Longview.
Landform and slope: Near crest of blowout dune, nearly level.
Parent material: Eolian sediments.
Soil samples collected by: L. H. Gile, November 9, 1976.
Soil described by: L. H. Gile.

A1 79P237 0-15 cm. Brown (9YR 5/3, dry) or dark brown (9YR 3/3, moist) sand; massive; soft, very friable; few roots; noncalcareous; neutral, clear wavy boundary.

A2 79P238 15-28 cm. Very pale brown (9YR 7/4, dry) or yellowish brown (9YR 5/4, moist) fine sand; massive; soft, very friable; roots few and common; slightly acid; clear wavy boundary.

B1 79P239 28-49 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 5/4, moist) sand; massive; slightly hard, very friable; roots common; noncalcareous; neutral; abrupt wavy boundary.

B21&Bt 79P240 49-69 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 5/4, moist) sand; massive; slightly hard, very friable; roots few and common; two discontinuous clay bands, 1-2 mm thick; noncalcareous; neutral; abrupt smooth boundary.

B22&Bt 79P241 69-94 cm. Light reddish brown (6YR 6.5/4, dry) or reddish brown (6YR 5/4, moist) fine sand; massive; slightly hard, very friable; few roots; usually about five continuous clay bands, 2 mm thick in upper part of horizon and about 1 mm thick in lower part; noncalcareous; neutral; abrupt smooth boundary.

C 79P242 94-114 cm. Light reddish brown (6YR 6.5/4, dry) or reddish brown (6YR 5/4, moist) fine sand; massive; slightly hard, very friable; noncalcareous; neutral.

Pedon S78TX-17-2

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.

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GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - ->												<- PCT OF <75MM (3B1) ->				
79 243	1S	0- 5	A11	2.4	2.3	95.3			1.6	0.7	6.4	50.7	31.9	6.3	--	--	--	--	89	--
79 244	2S	5- 16	A12	2.8	2.4	94.8			1.6	0.8	8.6	59.3	22.5	4.4	--	--	--	--	86	--
79 245	3S	16- 25	B11	3.2	2.1	94.7			0.4	1.7	13.5	57.8	20.4	3.0	--	--	--	--	81	--
79 246	4S	25- 32	B12	2.8	1.8	95.4			--	1.8	9.0	59.1	23.1	4.2	--	--	--	--	86	--
79 247	5S	32- 53	B21&Bt	2.0	2.0	96.0			1.2	0.8	9.6	58.8	23.2	4.4	--	--	--	--	86	--
79 248	6S	53- 71	B22&Bt	2.8	9.5	87.7			0.8	8.7	10.3	51.4	22.1	3.9	--	--	--	--	77	--
79 249	7S	71- 86	B23&Bt	2.0	1.7	96.3			1.2	0.5	10.9	69.3	12.9	3.2	--	--	--	--	85	--
79 250	8S	86-106	B3&Bt	1.9	5.1	93.0			0.4	4.7	11.3	48.7	22.5	10.3	0.2	--	--	--	82	--
79 251	9S	106-128	C	1.6	3.3	95.1			--	3.3	13.4	51.9	20.9	8.8	0.1	--	--	--	82	--

SAMPLE NO.	HZN NO.	ORGN C 6A1C	TOTAL N 6B1B	EXTR P 6S1A	TOTAL S 6R3A	DITH-CIT EXTRACTABLE FE 6C2B	AL 6G7A	MN 6D2A	CEC 8D1	RATIO/CLAY 15 BAR 8D1	ATTERBERG LIMITS LL 4F1	PI 4F	BULK DENSITY FIELD MOIST 4A3A	1/3 BAR 4A1D	OVEN DRY 4A1B	COLE WHOLE SOIL 4D1	WATER CONTENT FIELD MOIST 4B4	1/10 BAR 4B1C	1/3 BAR 4B1C	15 BAR 4B2	WRD WHOLE SOIL 4C1
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
79 243	1									0.54										1.3	
79 244	2									0.54										1.5	
79 245	3									0.41										1.3	
79 246	4									0.46										1.3	
79 247	5									0.60										1.2	
79 248	6									0.46										1.3	
79 249	7									0.60										1.2	
79 250	8									0.32										0.6	
79 251	9									0.63										1.0	

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA 5B4A 6N2E	MG 5B4A 6Q2D	NA 5B4A 6P2B	K 5B4A 6Q2B	SUM BASES	ACID-ITY 6H2B	EXTR AL 6G1E	CEC SUM CATS 5A3A	CEC NH4-OAC 5A8A	BASES + AL 5A3B	AL SAT 5G1	BASE SAT SUM 5C3	NH4 OAC 5C1	CO3 AS CACO3 <2MM 6E1B	RES. OHMS /CM 8E1	PH CACL2 .01M 8C1E 1:2	PH H2O 8C1A 1:1
		<- - - - - - - - - - - - - - - - MEQ / 100 G - - - - - - - - - - - - - ->										<- - - - -PCT - - - ->						
79 243	1														--		6.4	7.0
79 244	2																6.3	6.9
79 245	3																6.1	6.7
79 246	4																6.1	6.7
79 247	5																6.1	6.7
79 248	6																6.1	6.7
79 249	7														--		6.1	6.9
79 250	8																6.0	6.6
79 251	9																5.6	6.2

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Pedon S78TX-17-2

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.
Location: North rim of blowout dune, about 2300 feet east of Farm Road 1731, at a point that is about 7000 feet north of the junction between Farm Roads 1731 and 746 and that is about 1100 feet north of gate on east side of road; due east of large blowout that has its western edge about 350 feet east of Farm Road 1731.
Geomorphic surface: Longview.
Landform and slope: Near crest of blowout dune, nearly level.
Parent materials: Eolian sediments.
Soil samples collected by: L. H. Gile, November 1, 1977.
Soil described by: L. H. Gile.

A11 79P243 0-5 cm. Light brown (7.5YR 6/3, dry) or dark brown (7.5YR 4/3, moist) fine sand; massive; soft, very friable; few roots; noncalcareous; neutral; abrupt smooth boundary.

A12 79P244 5-16 cm. Brown (7.5YR 5/4, dry) or dark brown (7.5YR 3.5/4, moist) fine sand; massive; soft, very friable; few roots; noncalcareous; neutral; clear wavy boundary.

B11 79P245 16-25 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 4/4, moist) fine sand; massive; soft, very friable; few roots; noncalcareous; neutral; clear wavy boundary.

B12 79P246 25-32 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 4/4, moist) fine sand; massive; soft, very friable; few roots; noncalcareous; neutral; abrupt smooth boundary.

B21&Bt 79P247 32-53 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 5/4, moist) fine sand; massive; slightly hard, very friable; few roots; two continuous clay bands, 2-3 mm thick, color 5YR 5/4, dry; noncalcareous; neutral; abrupt smooth boundary.

B22&Bt 79P248 53-71 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 5/4, moist) fine sand; massive;slightly hard, very friable; few roots; three continuous clay bands, 2-3 mm thick, color 5YR 5/4, dry; noncalcareous; neutral; abrupt smooth boundary.

B23&Bt 79P249 71-86 cm. Light reddish brown (5YR 6/4, dry or reddish brown (5YR 5/4, moist) fine sand; massive; slightly hard, very friable; few roots; one continuous clay band about 2 mm thick, color 5YR 5/4, dry; noncalcareous; neutral; abrupt wavy boundary.

B3&Bt 79P250 86-106 cm. Light reddish brown (6YR 6/4, dry) or reddish brown (6YR 4.5/4, moist) sand;massive; slightly hard, very friable; very few roots; two discontinuous clay bands, about 1 mm thick, 5YR 5/4, dry; noncalcareous; neutral; clear wavy boundary.

C 79P251 106-128 cm. Light reddish brown (6YR 6/4, dry) or reddish brown (6YR 4.5/4, moist) fine sand; massive; slightly hard, very friable; very few roots; noncalcareous; neutral.

Pedon S78TX-17-3

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	HZN NO.	DEPTH (CM)	HORIZON	TOTAL CLAY LT .002	TOTAL SILT .002 -.05	TOTAL SAND .05 -2	CLAY FINE LT .0002	CLAY CO3 LT .002	SILT FINE .002 -.02	SILT COARSE .02 -.05	SAND VF .05 -.10	SAND F .10 -.25	SAND M .25 -.50	SAND C .5 -1	SAND VC 1 -2	COARSE FRACTIONS (MM) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
				<- - - - - - - - - - - - PCT OF <2MM						(3A1)	- - - - - - - - - - - -					<- PCT OF <75MM (3B1)				
79 220	1S	0- 20	C	1.6	2.2	96.2			--	2.2	14.8	73.3	7.4	0.7	--	--	--	--	81	--
79 231	2S	20- 46	A1b	1.6	2.5	95.9			0.8	1.7	11.3	60.6	20.3	3.7	--	--	--	--	85	--
79 232	3S	46- 66	B1b&Bt	4.4	1.9	93.7			--	1.9	6.9	46.2	27.4	13.0	0.2	--	--	--	87	--
79 233	4S	66- 84	B21b&Bt	4.0	1.7	94.3			--	1.7	5.3	44.8	35.8	8.3	0.1	--	--	--	89	--
79 234	5S	84-101	B22b&Bt	3.6	1.0	95.4			--	1.0	4.8	40.6	33.6	16.1	0.3	--	--	--	91	--
79 235	6S	101-127	B3b&Bt	2.8	1.5	95.7			--	1.5	5.2	38.4	37.9	14.1	0.1	TR	--	--	90	TR
79 236	7S	127-150	Ab2	1.2	0.6	98.2			--	0.6	5.2	64.2	25.9	2.9	--	--	--	--	93	--

SAMPLE NO.	HZN NO.	ORGN C 6A1C	TOTAL N 6B1B	EXTR P 6S1A	TOTAL S 6R3A	DITH-CIT EXTRACTABLE FE 6C2B	AL 6G7A	MN 6D2A	CEC 8D1	RATIO/CLAY 15 BAR 8D1	ATTERBERG LIMITS LL 4F1	PI 4F	BULK DENSITY FIELD MOIST 4A3A	1/3 BAR 4A1D	OVEN DRY 4A1H	COLE WHOLE SOIL 4D1	WATER CONTENT FIELD MOIST 4B4	1/10 BAR 4B1C	1/3 BAR 4B1C	15 BAR 4B2	WRD WHOLE SOIL 4C1
		<- - - - - - -PCT OF <2MM - - - - - - ->									PCT <0.4MM		<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
79 230	1									0.75										1.2	
79 231	2									0.63										1.0	
79 232	3									0.43										1.9	
79 233	4									0.45										1.8	
79 234	5									0.42										1.5	
79 235	6									0.36										1.0	
79 236	7									0.67										0.8	

SAMPLE NO.	HZN NO.	NH4OAC EXTRACTABLE BASES CA 5B4A 6N2E	MG 5B4A 6O2D	NA 5B4A 6P2B	K 5B4A 6Q2B	SUM BASES	ACID-ITY 6H2B	EXTR AL 6G1E	CEC SUM CATS 5A3A	CEC NH4-OAC 5A8A	BASES + AL 5A3B	AL SAT 5G1	BASE SAT SUM 5C3	NH4 OAC 5C1	CO3 AS CACO3 <2MM 6E1B	RES. OHMS /CM 8E1	PH CACL2 .01M 8C1E	H2O 8C1A
		<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->										<- - - - -PCT - - - ->					1:2	1:1
79 230	1														--		6.7	7.5
79 231	2														--		6.4	7.0
79 232	3														--		6.2	6.9
79 233	4																6.2	6.9
79 234	5																5.9	6.6
79 235	6																5.8	6.4
79 236	7																5.9	6.5

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Pedon S78TX-17-3

Soil: Circleback.
Soil classification: Alfic Ustipsamment, mixed, thermic.
Location: North side of dune ridge, on west face of large blowout about 350 feet east of Farm Road 1731, at a point about 7000 feet north of the junction between Farm Roads 1731 and 746.
Geomorphic surface: Longview.
Landform and slope: North side of dune ridge that slopes 15% to the north.
Parent materials: Eolian sediments.
Soil samples collected by: L. H. Gile, March 22, 1977.
Soil described by: L. H. Gile.

C 79P230 0-20 cm. Light brown (7.5YR 6/4, dry) or brown (7.5YR 4.5/4, moist) fine sand; massive; soft, very friable; generally few roots, common in places; noncalcareous; neutral; abrupt wavy boundary.

A1b 79P231 20-46 cm. Brown (8YR 5.5/3, dry) or dark brown (8YR 4/3, moist) fine sand; massive; slightly hard, very friable; few roots; noncalcareous; neutral; clear wavy boundary.

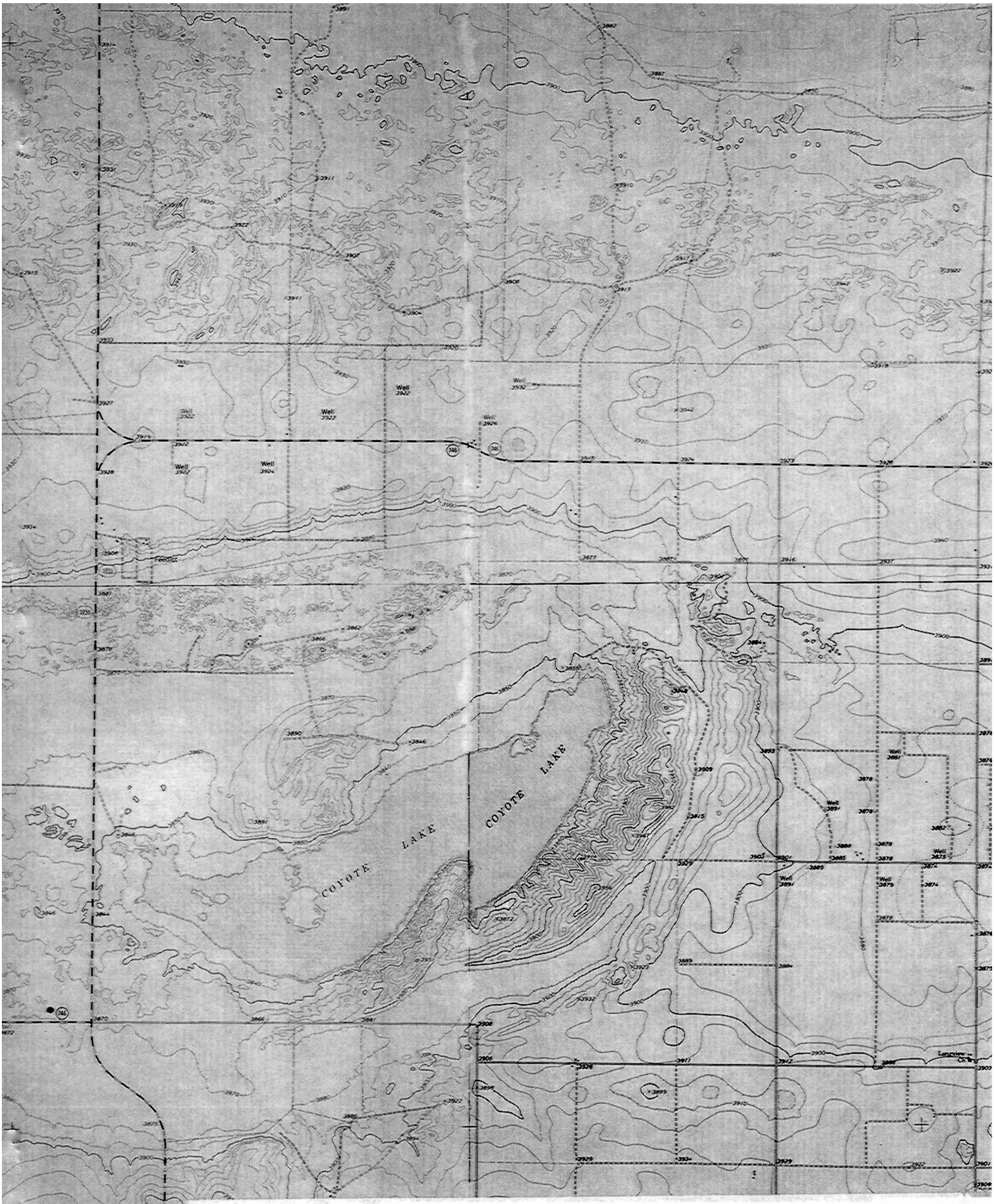
B1b&Bt 79P232 46-66 cm. Light brown (7.5YR 6/4, dry) or brown (7.5YR 4.5/4, moist) sand; massive; slightly hard, very friable; few roots; two discontinuous clay bands, 3-5 mm thick; noncalcareous; neutral; abrupt wavy boundary.

B21b&Bt 79P233 66-84 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 4.5/4, moist) sand; massive; slightly hard, very friable; few roots; three clay bands, 3-5 mm thick; noncalcareous; neutral; abrupt smooth boundary.

B22b&Bt 79P234 84-101 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 5/4, moist) sand; massive; slightly hard, very friable; few roots; four clay bands, 1-3 mm thick; noncalcareous; neutral; abrupt smooth boundary.

B3b&Bt 79P235 101-127 cm. Light reddish brown (5YR 6/4, dry) or reddish brown (5YR 5/4, moist) sand; massive; slightly hard, very friable; few roots; five clay bands, 1-2 mm thick; noncalcareous; neutral; abrupt smooth boundary.

Ab2 79P236 127-150 cm. Light brown (7.5YR 6.5/4, dry) or brown (7.5YR 5.5/4, moist) fine sand; massive; slightly hard, very friable; very few roots; noncalcareous; neutral.



Topographic map of most of the area shown on the front flyleaves, assembled from parts of the Birdwell Ranch, Stegall, Baileyboro, and Baileyboro NE 7.5 minute quadrangles.

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