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NEON Site-Level Plot Summary
Klemme Research Station (OAES)

Document Information

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Site Background

The Klemme Research Station (OAES) NEON site is near Bessie, Oklahoma. The site is in Major Land Resource Area (MLRA) 78C – Central Rolling Red Plains, Eastern Part. The site consists of 1,534 acres in Washita County, Oklahoma.

Site Information

Elevation at OAES ranges from approximately 495 meters to 525 meters above sea level.

The soil parent materials at the OAES site are residuum and colluvium derived from the late Permian age Doxey Formation, which is composed of reddish sandstone and siltstone. Siltstone is present at the OAES site.

Land use at OAES is primarily rangeland with the plant community composed of short and mid-stature grasses and forbs.

The major soils on the site are the Cordell and Obaro series. The Cordell soils form in residuum and occur on sideslopes of ridges and hills. Obaro soils occur on summits, crests, and shoulders of ridges and hills. Obaro soils form in colluvium and residuum.

Analysis of Plots for Sampling

Soil map unit, landform, and major vegetative communities were criteria considered for each plot during the selection process. The Soil Survey of Washita County, Oklahoma (Moffat and Conradi, 1979) shows fourteen (14) map units across the OAES site. Two of the map units are miscellaneous areas. One of these units is water and the other a dam. Soil map units at OAES are listed in Tables 1 and 2. Seven soil map units at OAES contained no NEON plots and represent < 4 percent of the site area (Table 1). Four soil map units, including water, had NEON plots but were not sampled due to limited acreage (Table 1). These map units comprise about seven percent of the site area. Each of these map units contains one NEON plot, for a total of four

NEON plots in these units. Two soil map units contain 30 of the 34 NEON plots and represent approximately 90 percent of the site area (Table 2). One of the map units - Cordell silty clay loam - is a consociation, which means that Cordell is the dominant soil, but unnamed, similar soils (components) occur in the map unit delineations. The second map unit is a complex, which means that the unit contains Cordell soils and rock outcrop that could not be separated at the map scale. Unnamed soils similar to Cordell may also occur in the map unit delineations.
Preliminary analysis resulted in the selection of 15 distributed plots for sampling and lab characterization. The 19 plots not sampled either occurred in non-typical settings or had a similar landform and geomorphic setting as one of the chosen plots.

Table 1. Soil Map Units at OAES that were not sampled as part of this characterization effort.

Map unit symbol	Map unit name	# NEON plots	% Total site area
8	Carey silt loam, 3 to 5 percent slopes	0	0.1
10	Clairemont silt loam, 0 to 1 percent slopes, frequently flooded	0	0.7
31	Obaro silty clay loam, 3 to 5 percent slopes	0	0.5
	Dam	0	0.4
32	Obaro silty clay loam, 3 to 5 percent slopes, eroded	0	1.4
35	Port silt loam, 0 to 1 percent slopes, occasionally flooded	0	0.1
47	St. Paul silt loam, 1 to 3 percent slopes	0	0.5
53	Woodward-Clairemont complex, 0 to 12 percent slopes	0	<0.1
9	Clairemont silt loam, 0 to 1 percent slopes, occasionally flooded	1	0.7
30	Obaro silty clay loam, 1 to 3 percent slopes	1	3.4
37	Quinlan-Obaro complex, 5 to 12 percent slopes	1	1.2
W	Water	1	1.1
	Total		**10.2**

Table 2. Soil Map Units sampled at OAES.

Map unit symbol	Map unit name	# NEON plots	% Total site area
CdlC2	Cordell silty clay loam, 1 to 5 percent slopes, eroded	4	31.8
CRoF	Cordell-Rock outcrop complex, 1 to 20 percent slopes	11	58.1
	Total		**89.9**

The selected sample plots are representative of the map units in which they occur. They fall within the Range in Characteristics (RIC) of the individual major and minor soil components, with exception of a few outliers.

Plot Findings

With the exception of narrow, incised drainageways, the OAES site consists primarily of hills, ridges, and knolls that are underlain by the Doxey formation. This bedrock strongly influences the soils and results in reddish colored soils that vary in thickness by hillslope position. Soil depth and the presence or absence of colluvium above the bedrock are soil series criteria. The 15 pedons sampled represent primarily two soil series within the named soil map units. The major soils are the Cordell and Obaro series. Land use on all of the pedons sampled is rangeland (100 percent).

Landforms and parent material – Soils sampled and described as the Cordell series occur on sideslopes of narrow ridges, knolls and hills. The Cordell soils formed in residuum weathered from siltstone. Soils identified as the Obaro series generally occur on upper sideslopes of ridges or hills. Obaro soils formed in colluvium derived mainly from the underlying siltstone.

Summary of Soils

Soils sampled as Cordell are either very shallow (< 25 cm) or shallow (25 to 50 cm) over a lithic bedrock (siltstone) contact. The Cordell series classifies as a Lithic Haplustept. Soil horizons above bedrock (A, Bw, or BC) contain rock fragments that range from 5 to 85 percent by volume and generally 2-50 mm in size. Vegetation is sparse on the Cordell soil with purple threeawn, broom snakeweed, and catclaw acacia as the dominate vegetation. A biological crust occurred on some plots where vegetation cover was less than 50 percent of the soil surface.

Soils identified as Obaro range from moderately deep (50 to 90 cm) to deep (90 to 150 cm) over a lithic bedrock (siltstone) contact. Rock fragments range from 0 to 15 percent by volume for all horizons. Vegetation was dominated by little bluestem, which was a distinctive difference from the relatively sparsely vegetated Cordell soils.

Cordell-Rock outcrop complex

OAES_002 - The plot and pedon sampled are on a northeasterly facing backslope of a secondary, narrow ridge. The soil has a lithic (bedrock) contact at 26 cm. The pedon classifies as a Lithic Haplustept and fits the concept of the Cordell series and the Cordell-Rock outcrop complex map unit in which the plot occurs. Vegetation cover is sparse in the plot area.

OAES_003 - The plot and the pedon sampled are on a lower, southeasterly facing backslope above an incised drainageway that is dissecting the hillslope. The pedon has a bedrock contact at 10 cm at the base of the A horizon. The pedon lacks a B horizon and classifies as a Lithic Ustorthent. The pedon is too shallow for the Cordell series and is a taxadjunct (a soil that classifies differently but has similar use and management). No established local soil series exists for the Lithic Ustorthent, the pedon in an unnamed soil. The pedon, however is an expected component in the Cordell-Rock outcrop complex map unit, as the unit spans a soil to non-soil transition.

OAES_004 - This plot and the pedon sampled are on the rounded summit of a narrow NW-SE trending ridge. The B horizon extends to the 100 cm sample depth; no bedrock was encountered.

The pedon classifies as a Typic Haplustept and correlates to the Obaro series. The Obaro is an expected major component of the Cordell-Rock outcrop complex map unit. Vegetation cover was relatively dense and included little bluestem.

OAES_007 - This plot and the pedon sampled are on the shoulder and crest of a small spur ridge. The pedon has an A horizon from 0 to 15 cm over a Cr horizon from 15 to 30 cm. The pedon classifies as a Lithic Ustorthent. This pedon is a taxajunct to the Cordell series. No local soil series fits this classification. The pedon is an expected component in the map unit.

OAES_010 - This plot and the pedon sampled are on an upper sideslope of a small spur ridge. The pedon has a Bw horizon that extends to 100 cm. The pedon classifies as a Typic Haplustept and fits the criteria for the Obaro series. This is an expected component in the map unit at this hillslope position.

OAES_014 - This plot and the pedon sampled were on the upper sideslope of a narrow, rounded ridge. An erosional escarpment occurs above and separates the sideslope from the ridge summit. The pedon has a lithic contact at 84 cm. The pedon fits the criteria of the Obaro series and classifies as a Typic Haplustept. The pedon is an expected component in the Cordell map unit and may contain colluvium derived from the erosional escarpment.

OAES_015 - This plot and the pedon sampled are on the easterly sideslope of a dissected ridge. An entrenched drainageway exists about 5-6 meters south of the pedon. The pedon has a Cr horizon from 46 to 58 cm with a R horizon (lithic contact) beneath. The soil is similar to Cordell, which commonly lacks a Cr horizon. The pedon classifies as a Typic Haplustept and is an expected component in the map unit.

OAES_016 - The plot and pedon are on the rounded summit of a N-S trending ridge. The pedon has a lithic contact at 28 cm and fits the criteria for the Cordell series. The pedon classifies as a Lithic Haplustept and is representative of the map unit.

OAES_025 - The plot is on the middle sideslope that is gullied lower on the slope. The pedon has paralithic material (Cr horizon) directly beneath the A horizon and a lithic contact at 37 cm. It classifies as Lithic Orthent and is an unnamed taxajunct to the Cordell series. The soil is an expected component in the map unit at this slope position and the eroded nature of the slope.

OAES_029 - The plot is on the sideslope of an eroded spur ridge. Gullies have formed in the slope adjacent to the plot. The pedon is above but near the influence of the dissection. The pedon has a lithic contact at 79 cm with paralithic material (Cr horizon) above. The pedon classifies as a Typic Haplustept and correlates with the Obaro series. The Obaro soil is an expected component in the map unit.

OAES_030 - The plot is on a sideslope that descends to an incised drainageway. Secondary gullies are dissecting the sideslope. One of the gullies cuts through the plot. The pedon sampled has bedrock (lithic contact) at 25 cm and classifies as a Lithic Haplustept. The pedon correlates with the Cordell series and is representative of the map unit.

Cordell silty clay loam

OAES_005 – This plot and pedon are on the shoulder of a spur ridge. The pedon sampled has a lithic contact at 38 cm and classifies as a Lithic Haplustept. The pedon fits the Cordell series and is representative of the map unit. Agricultural terraces occur above and below the plot along the slope contours.

OAES_012 - This plot and pedon are on a rounded summit (crest) and shoulder of a N-S trending ridge. The pedon has a lithic contact at 17 cm and classifies as a Lithic Haplustept. The pedon fits the criteria for the Cordell series and is representative of the map unit.

OAES_019 - This pedon and plot occur on the shoulder at the south end of a ridge. An erosion scarp exists about 50 meters lower on the slope. The pedon has a shallow A and Cr horizon over a R (rock) horizon. The lithic contact occurs at 20 cm. The pedon classifies as a Lithic Ustorthent. The pedon is similar to the Cordell series except it lacks a Cambic (Bw) horizon. No named local series exists for this classification. This is an expected minor component in the map unit.

OAES_020 - The plot and pedon are on a sideslope of a primary ridge. The pedon has a lithic contact at 30 cm and a Cr horizon (paralithic material) from 10 to 30 cm. The pedon classifies as a Lithic Haplustept and correlates to the Cordell series. The pedon fits the map unit concept.

References

Moffat, H.H. and Conradi, A.J. 1979. Soil Survey of Washita County, Oklahoma. USDA Soil Conservation Service and Oklahoma Agriculture Experiment Station.