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NEON Site Level Plot Summary

Konza Prairie Biological Station (KONZ)

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Site Background

The Konza Prairie Biological Station is near Manhattan, Kansas. The site is in Major Land Resource Area (MLRA) 76 – Bluestem Hills. The KONZ site consists of 8616 acres and is located at the northern part of the Flint Hills. This area is part of the Tallgrass Prairie. This is a grassland region of steep-slopes overlain by shallow limestone soils usually unsuitable for cultivation.

Site Information

Elevation ranges from approximately 1000 feet to 1500 feet above sea level.

The parent materials at the KONZ site are residuum, colluvium, and local alluvium.

Land use is dominated by grassland, with a few areas of forested land.

Plant communities are dominated by tallgrass prairie including big bluestem, indiangrass, and switchgrass. Some areas arre in forested or brush plant communities

Major soil series on the site include Ivan, Benfield, Florence, Clime, Sogn, Tully, Irwin, and Reading.

Landform positions that these soils occur on are residual summits, shoulder, and back slopes; colluvial foot slopes and toeslopes; and alluvial drainageways.

Soil mapping consisted of 17 different map units.

Analysis of Plots for Sampling

Soil map unit, geology, landform, and major vegetative communities were four features identified for each plot during the pre-analysis. Each unique combination of these four features was labeled as a landform setting. The landforms identified on the KONZ site were residual hillslope with summits, shoulders, back slopes; colluvial hillslopes with foot slopes and toeslopes; and alluvial drainageways. The pre-selected sampling plots occurred in only 7 of the map units (out of a total of 17). The analysis resulted in 13 plots (out of a total of 34 plots) being selected for field description, field sampling, and lab characterization. The 21 plots not sampled either occurred in non-typical settings or were duplicates of one of the 13 chosen plots.

Approximately 90 percent of the NEON site area at KONZ consisted of map units that were sampled. These include:

Map Unit Symbol	Map Unit Name	% Total Site Area
4051	Ivan silt loam, channeled	4.42
4530	Benfield-Florence complex, 5 to 30 percent slopes	50.63
4550	Clime silty clay loam, 20 to 40 percent slopes, very stony	7.41
4590	Clime-Sogn complex, 3 to 20 percent slopes	23.59
4783	Tully silty clay loam, 3 to 7 percent slopes	4.08
7690	Wymore-Kennebec complex, 0 to 17 percent slopes	0.26
	Total	**90.39**

Approximately 10 percent of the NEON site area at KONZ consisted of map units that were not sampled:

Map Unit Symbol	Map Unit Name	% Total Site Area
4050	Ivan and Kennebec silt loams, occasionally flooded	0.23
4053	Ivan silty clay loam, channeled	0.95
4350	Chase silty clay loam, rarely flooded	0.61
4625	Dwight-Irwin complex, 1 to 3 percent slopes	3.33
4673	Irwin silty clay loam, 3 to 7 percent slopes	0.90
4674	Irwin silty clay loam, 3 to 7 percent slopes, eroded	0.27
4700	Ivan silty clay loam, 1 to 3 percent slopes	0.01
4735	Konza silty clay loam, 1 to 3 percent slopes	0.66
4784	Tully silty clay loam, 3 to 7 percent slopes, eroded	0.96
7170	Reading silt loam, rarely flooded	0.49
7174	Reading silt loam, 1 to 3 percent slopes	1.21

		Total	**9.62**

The selected sample plots are representative of the map units in which they occur. Some of these map units cover multiple landform positions, because the individual landform positions were too small to map out into separate polygons. With the selection process, we tried to make sure the different major landform positions within a map unit were sampled. In 5 of the 13 sampled plots, we described minor components that occurred in the map units because of all the different landform positions. These minor components were the typical soils for the plot they were in and represent the complexity of the KONZ site. They usually fell within the Range in Characteristics (RIC) of the named series with the exception of a few outliers (noted below). The random plot selection method missed some landform positions within map units. Although these areas are of minor extent to the overall site, they might be important for establishing the variability of the soils at the KONZ location.

Plot Findings

The 13 pedons sampled represent 6 soil map units. The components sampled were Ivan, Benfield, Florence, Clime, Sogn, Tully, Tuttle, and Kipson. Most of the plots sampled were in grassland (70%). Secondary land use was forested (25%).

Parent Material – The KONZ site area has many different kinds of parent material that includes: interbedded limestone and shale bedrock, colluvium, and alluvium. Plots KONZ_001 and KONZ_004 consisted of soils formed in residuum of shale or limestone. Plots KONZ_006, KONZ_012, KONZ_025, and KONZ_027 consisted of soils formed in colluvium. Plots KONZ_029 consisted of soils formed in alluvium. Plots KONZ_002, KONZ_010, KONZ_ 011, KONZ_016, KONZ_020, and KONZ_024 consisted of soils formed in colluvium over residuum.

Summary of Soils

No O horizons were described at any of the sites sampled. In the forest land sample sites there would be a thin layer of litter, but we did not feel that it was thick enough to be an O horizon. Overall we felt there was a good representation of soils sampled at the KONZ site.

Of the 13 plots sampled, Tully was the most sampled series with 4 pedons (KONZ_006, 012, 025, and 027). For plots KONZ_012 and 027, these are the dominant soil type for those plots, but are a minor component for the Ivan silt loam, channeled and Clime-Sogn complex, 3 to 20 percent slopes map units that are mapped for those plots. All the Tully soils occurred are on footslopes and toeslopes and were developed in colluvium. All the Tully samples were within the range of characteristics of the Tully Series. These soils all had a mollic epipedon over 50 centimeters thick. These soils also had an increase in clay content in the subsoil (i.e. an argillic horizon) and are fine, with a subsoil field estimated clay content ranging from about 40 to 60 percent. In the Ivan silt loam, channeled map unit, the Tully soils will occur in the footslopes and toeslopes above the Ivan soils. The Ivan soils are alluvial floodplain soils

and do not have as heavy of subsoil textures which usually range from 18% to 30%. In the Clime-Sogn complex, 3 to 20 percent slopes map units, the Tully soils occur in the footslopes below the Clime and Sogn soils. The Clime and Sogn soils are on the backslopes, shoulders and summits. Sogn soils have limestone bedrock occurring within 50 centimeters. Clime soils have shale bedrock occurring between 0.5 to 1.5 meters.

The second most common soil sampled was Clime in two plots (KONZ_002 and 011). The Clime soils are on backslopes and developed in colluvium over residuum. Clime is usually developed in just residuum. With both of these plots, there is colluvium from the residual limestone soils upslope on the surface. This is indicated by the rock fragments in the surface horizons. This is still within the range of characteristics of the Clime series. Both samples had bedrock occurring between 0.5 meters to 1 meter. Clime soils have a mollic epipedon 18 to 49 centimeters thick, which both of these pedons have. These soils have a fine textured subsoil, with a subsoil field estimated clay content ranging from about 41 to 52 percent.

There were two Florence soils sampled (KONZ_001 and 020). Plot KONZ_001 was on a summit. Plot KONZ_020 was on a backslope. Both samples had high amounts of rock fragment throughout the soil profile ranging from 4% to 40% in the surface horizons and 70% to 85% in the subsurface horizons. Plot KONZ_001 did meet the range in characteristics for a Florence soil. For plot KONZ_020, bedrock occurred at 52 centimeters. For the Florence series bedrock should occur in between 1 meter and 1.5 meters. The difference for KONZ_020 should not affect the use and management of the soil. These soils have an increase in clay content in the subsoil (i.e. an argillic horizon) and are fine, with a subsoil field estimated clay content ranging from about 37 to 56 percent.

There was a Sogn soil sampled (KONZ_004). This soil is on a shoulder and developed in residuum. The Sogn series should hit limestone bedrock within 50 centimeters. At this soil the limestone did come in at 27 centimeters. This soil fits within the range of characteristics of the Sogn series.

There was a Tuttle soil sampled (KONZ_024). For plot KONZ_024, this is the dominant soil type for this plot, but is a minor component for the Clime silty clay loam, 20 to 40 percent slopes, very stony map unit that is mapped for this plot. This soil is on a backslope and developed in colluvium over residuum. This soil has a fine textured subsoil, with a subsoil field estimated clay content ranging from about 38 to 44 percent. Tuttle soils are usually mapped in the same landform position as Clime silty clay loam, 20 to 40 percent slopes, very stony map unit is mapped. The difference is Tuttle soils will be deeper with bedrock coming in below 1 meter whereas for Clime bedrock occurs within 1 meter. Tuttle soils will also have a thicker mollic epipedon. Tuttle soils have a mollic epipedon will be greater than 50 centimeters thick. Clime soils have a mollic epipedon less than 50 centimeters thick.

There was a Kipson soil sampled (KONZ_016). For plot KONZ_016, this is the dominant soil type for this plot, but is a minor component for the Clime-Sogn complex, 3 to 20 percent slopes map unit that is mapped for this plot. This soil is on a backslope and developed in colluvium over residuum. This soil has shale bedrock occurring at 49 centimeters. This soil

has a loamy textured subsoil, with a subsoil field estimated clay content ranging from about 30 to 33 percent. The difference between Kipson and Clime is the depth to shale bedrock. For Kipson shale occurs with 50 centimeters. For Clime shale occurs between 50 and 100 centimeters. Varying depths to the bedrock is normal in these map units in MLRA 76.

There was an Ivan soil sampled (KONZ_029). For plot KONZ_029, this is the dominant soil type for this plot, but is a minor component for the Wymore-Kennebec complex, 0 to 17 percent slopes map unit that is mapped for those plots. This soil is on an upland drainageway and developed in alluvium. This soil is a taxadjunct to the Ivan series. Ivan soils usually have a fine-silty textured subsoil. This soil has a fine textured subsoil, with a subsoil field estimated clay content ranging from about 34 to 38 percent. In the Wymore-Kennebec complex, 0 to 17 percent slopes map unit, Ivan soils occur in the same landform as Kennebec soils. The difference between Ivan and Kennebec soils is that Ivan soils are slightly alkaline to moderately alkaline in pH, have free calcium carbonates in the profile, and will effervesce to hydrochloric acid. Kennebec soils tend to be moderately acid to neutral in pH. This soil sampled in this plot did react to hydrochloric acid. Wymore soils occur on the side slopes above the Kennebec and Ivan soils. There are other Ivan map units mapped in other drainageways in this site area. This soil sample would be similar to those areas.