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NEON Site-Level Plot Summary
Konza Prairie Biological Station, Relocatable (KONA)

Document Information

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Site Background

The KONA site is located near Manhattan, Kansas in the Major Land Resource Area (MLRA) 76 – Bluestem Hills and near MLRA 106 - Nebraska and Kansas Loess-Drift Hills. The KONA site consists of 679 acres and is located at the northern part of the Flint Hills. This area is all on cultivated land, with common crops being wheat, corn, and soybeans. This is a region of nearly level to strongly sloping areas that consist of very deep soils that formed in loess, colluvium, and alluvium.

Site Information

Elevation ranges from approximately 1000 feet to 1200 feet above sea level.

Soil mapping consisted of 23 different map units. Major soil series on the site include Smolan, Chase, Tully, Wymore, Reading, Irwin, and Kahola.

Landform positions that these soils occur on are loess and colluvial shoulders, back slopes, and foot slopes; and alluvial stream terraces.

Analysis of Plots for Sampling

Soil map unit, geology, and landform were identified for each plot, and each unique combination of these three features was labeled as a landform setting. The landforms identified on the KONA site were loess and colluvial shoulders, back slopes, and foot slopes; and alluvial stream terraces. The pre-selected sampling plots occurred in 11 of the 23 map units located across the site. The analysis resulted in 19 plots (out of a total of 34) being selected for field description, sampling, and lab characterization. The 15 plots not sampled either occurred in non-typical settings or were were in the same landform setting as one of the 19 chosen plots.

The selected plots are located in map units that represent approximately 87 percent of the NEON site area at KONA (Table 1). Approximately 13 percent of the NEON site area was located in map units that were not sampled (Table 2).

Map Unit Symbol	Map Unit Name	% Total Area
3923	Smolan silty clay loam: 3 to 7 percent slopes: eroded	22
3919	Smolan silt loam: 1 to 3 percent slopes	19
4400	Kahola silt loam: rarely flooded	9
4350	Chase silty clay loam: rarely flooded	9
4784	Tully silty clay loam: 3 to 7 percent slopes: eroded	7
7170	Reading silt loam: rarely flooded	5
7174	Reading silt loam: 1 to 3 percent slopes	5
7213	Reading silt loam: moderately wet: very rarely flooded	5
7680	Wymore silty clay loam: 0 to 1 percent slopes	4
7682	Wymore silty clay loam: 1 to 3 percent slopes: eroded	3
4674	Irwin silty clay loam: 3 to 7 percent slopes: eroded	1
	Total	**87**

Table 1. Names and areal coverages of soil map units that were sampled at KONA.

Map Unit Symbol	Map Unit Name	% Total Area
4782	Tully silty clay loam: 1 to 3 percent slopes: eroded	5.2
7123	Eudora silt loam: rarely flooded	1.7
7132	Stonehouse-Eudora complex: rarely flooded	1.6
4781	Tully silty clay loam: 1 to 3 percent slopes	1.4
7104	Belvue silt loam: rarely flooded	1.3
4050	Ivan and Kennebec silt loams: occasionally flooded	0.9
7681	Wymore silty clay loam: 1 to 3 percent slopes	0.3
3920	Smolan silt loam: 3 to 7 percent slopes	0.3
7690	Wymore-Kennebec complex: 0 to 17 percent slopes	0.0
4590	Clime-Sogn complex: 3 to 20 percent slopes	0.0
4783	Tully silty clay loam: 3 to 7 percent slopes	0.0
4053	Ivan silty clay loam: channeled	0.0
	Total	**12.8**

Table 2. Names and areal coverages of soil map units that were not sampled at KONA.

The selected sample plots are representative of the map units in which they occur. Because the individual landform positions were too small to map out into separate polygons, some of these

map units cover multiple landform positions. However, when different major landform positions were located within a map unit, we aimed to sample each different landform.

Plot Findings

The 19 pedons sampled represent 11 soil map units, all of which were in cultivated land.. The components sampled were Irwin, Kahola, Reading, Smolan, Tully, and Wymore.

In 5 of the plots, we described minor components that occurred in the map units in order to capture the different landform positions. These minor components were typical for the plot in which they were located and represent the soil complexity of the KONA site. The sampled soil usually fell within the Range in Characteristics (RIC) of the named series, except for some outliers (noted below). Not all landform positions located across the site were captured within the 34 allocated NEON plots. Although these areas are of minor extent to the overall site, they might be important for establishing the variability of the soils at the KONA site.

Parent Material – The KONA site has three main kinds of parent material: loess, colluvium, and alluvium. We differentiated between loess and colluvium based on the presence of rock fragments in the sampling pit. Loess does not contain rock fragments whereas colluvium does. Loess in the area is considered to be colluviated in that it has been reworked and redeposited after primary air-fall deposition. The colluvial reworking does not affect soil interpretations compared to primary loess. Plots KONA_003, 004, 006, 013, 019, 020, 023, 027, 030, and 035 consisted of soils formed in loess. Plots KONA_017 and 022 consisted of soils formed in colluvium. Plots KONA_002, 005, 011, 016, and 048 consisted of soils formed in alluvium. Plots KONA_008 and 057 consisted of soils formed in loess over colluvium.

Summary of Soils

Overall, the sampled plots represented the breadth of soils at the KONA site. Nine of the soils sampled had an eroded surface, which is common in cultivated land in the area. Out of the soils sampled, Irwin, Smolan, Wymore, and Tully are hillslopes soils on uplands. Tully soils occur on the lowest elevation area on footslopes. Irwin, Smolan, and Wymore soils occur on similar landforms (backslopes, shoulders, and summits) with Wymore soils usually on slightly higher positions. All the upland soils can be minor components within other upland soil map units. Kahola and Reading are alluvial soils that occur on floodplains and stream terraces, respectively.

Wymore was the most sampled soil series with 6 pedons (KONA_004, 013, 020, 023, 027, and 030). Wymore soils are very deep, moderately well drained, heavy clay soils. Wymore soils are developed in loess and have redoximorphic features occurring between 30 and 60 cm depth. All six of these plots occurred on a backslope on a hillslope landform and were formed in loess. Wymore soils have an increase in clay content in the subsoil (i.e. an argillic horizon) and have a fine particle size class. Clay content ranged from 35 to 51 percent. Plot KONA_013 was well drained instead of moderately well drained and did not have any redoximorphic features occurring within the upper 100 cm. Wymore soils also have a dark surface (i.e. mollic epipedon), and plots in the Wymore series had dark surfaces that ranged from 24 to 63 cm thick. One

exception was KONA_027, which had an eroded surface and only 7 cm of dark color. Both plots KONA_013 and KONA_027 are taxadjuncts to the Wymore series because of the differences. Plots KONA_023 and 030 are minor components in Smolan silt loam, 1 to 3 percent slopes and Smolan silty clay loam, 3 to 7 percent slopes, map units, respectively, but Wymore was the dominant soil type for those plots. Smolan is similar to Wymore soils, with Wymore soils having redoximorphic features occurring at shallower depths.

The second most common soil sampled was Smolan with 5 pedons collected in plots KONA_003, 006, 008, 019, and 035. Smolan soils are very deep, moderately well to well drained, heavy clay soils that formed in loess and usually have redder colors (7YR hue) in the subsoil. All the sampled Smolan soils occurred on shoulders and backslopes of hillslopes and were developed in loess with one plot (KONA_008) having colluvium occurring at 65 cm depth. These soils have an argillic horizon with a fine particle size class. Clay content of the subsoils ranged from 33 to 50 percent. Smolan soils should have a mollic epipedon over 50 cm thick. Most of these pedons had some amount of an eroded surface. Only plot KONA_006 had a mollic epipedon over 50 cm (52 cm thick). Plots KONA_003 and 035 had mollic epipedons ranging from 32 to 37 cm thick. Plots KONA_008 and 019 had the dark surface mostly eroded away with only 12 to 15 cm thick. Lab data showed that plots KONA_008 and 019 had higher organic matter than originally thought in field. Plot KONA_006 showed some signs of wetness and had some redoximorphic depletions occurring within the upper 50 cm. All the Smolan samples were taxadjuncts to the Smolan series because of the thinner dark surface horizons, which are due to erosion and some occurrence of redoximorphic depletions, although these differences do not affect the use and management of the soils.

Four plots were located in Reading soils: KONA_002, 011, 016, and 048. Reading soils are very deep, well drained to moderately well drained soils that formed in alluvium. All the sampled Reading soils occurred on stream terraces and were formed in alluvium. These soils have an argillic horizon with a fine-silty particle size class. Clay content ranged from 30 to 37 percent in the subsoils of plots KONA_002, 011, and 016. Plot KONA_048 had higher clay content in the subsoil ranging from 35 to 43 percent. Reading soils should have a mollic epipedon over 50 cm thick. Plots KONA_002, 011, and 048 had dark colors over 50 cm, ranging from 73 to over 100 cm thick. Plot KONA_016 had an eroded surface with dark colors only 33 cm thickness. However, lab data showed that KONA_016 had high organic matter to a deeper depth than what was estimated in the field. Both plots KONA_016 and KONA_048 are taxadjuncts to the series because of the higher subsoil clay content and thinner, eroded surface horizon, although these differences do not affect the use and management of the soils.

Two samples of Tully were collected at plots KONA_017 and 022. Tully soils are very deep, well drained, heavy clay soils that formed in colluvium. All the Tully soils occurred on footslopes on hillslopes and formed in colluvium. Tully soils have an argillic horizon with a fine particle size class. Clay content ranged from 36 to 44 percent clay in the subsoils of the samples. Tully soils should have a mollic epipedon over 50 cm thick. Plot KONA_017 had dark colors of 65 cm thickness. Plot KONA_022 had an eroded surface with dark colors only going to 36 cm thick and is in an eroded map unit, thereby making this plot a taxadjunct to the series, although lab data showed that this plot had high organic matter to a deeper depth than what was thought in the field. Plot KONA_017 is a minor component in a Chase silty clay loam, rarely flooded map

unit, but Tully is the dominant soil type for the plot. The difference between Tully and Chase soils is that Tully soils occur on slightly higher areas on footslopes above the floodplains and formed in colluvium. Chase soils occur on floodplains, formed in alluvium, and are somewhat poorly drained.

There was a Kahola soil sampled at plot KONA_005. Kahola soils are very deep, well drained soils that occur on floodplains and formed in alluvium. This plot was on a slightly higher area in the toeslope. Typical Kahola soils do not have an argillic horizon, however this soil did have an argillic horizon at a depth of 77 cm, indicating that this soil is a taxadjunct. Clay content in the subsoil ranged from 24 to 32 percent in the upper part and then increased to 44 percent in the argillic horizon. The upper 77 cm of the pedon matches a typical Kahola soil and is probably a more recent deposition on top of the older, lower part with the clay increase.

There was an Irwin soil sampled at plot KONA_057. Irwin soils are deep to very deep, well drained soils that occur on hillslopes and formed in loess over colluvium or residuum. This soil was on a backslope and was formed in loess over colluvium. This soil had an argillic horizon with a fine particle size class. Clay content ranged from 43 to 44 percent in the subsoil. Irwin soils should have a mollic epipedon over 50 cm thick. This soil is in an eroded map unit with a mollic epipedon of 46 cm thickness and therefore didn’t meet this requirement, thereby making it a taxadjunct.