



NEON Site-Level Plot Summary

Delta Junction, Alaska (DEJU)

Document Information

Date

August 2018

Author

Dennis Mulligan, Soil Scientist, Wasilla, AK

Site Background

The Delta Junction (DEJU) NEON site is near Delta Junction, Alaska and is bounded on all sides by Army Base Fort Greely. The site is in Major Land Resource Area (MLRA) 228 – Interior Alaska Mountains, but is very close to the MLRA 229 - Interior Alaska Lowlands boundary. The site consists of 7,395 acres and major geomorphic landforms are outwash and till plains with a lateral moraine running along the western site boundary. Elevations at the site range from approximately 442 to 594 m (1450 to 1950 feet) above sea level.

Site Information

The parent material at the DEJU site is dominantly loess over gravelly glacial till and outwash. The dominant land cover is regenerating spruce and aspen forest. A large portion of the area burned in 1999 during the Donnelly Flats fire and again in 2006 in the Jarvis Creek fire. This is a controlling reason for the regenerating spruce and aspen forest. The understory consists mainly of willow and rose.

The dominant soils that occupy the area are the Donnelly, Butchlake, Southpaw and Nenana series. Soils of minor occurrence include the Ninchuun, Babble, Salchaket, Jarvis series and Terric Hemistels. Landforms that these soils occur on are outwash plains, moraines, stream terraces and floodplains.

Analysis of Plots for Sampling

Soil map units and landforms were the two major features employed for determining plots to be sampled. Plots were chosen based primarily on the relative dominance of a given map unit, the best representation of the land form and whether the plot location looked representative of the map unit delineation. The Soil Survey of the Fort Greely and Donnelly Training Area, Alaska (Pink, 2003) consisted of 16 distinct map units, while the NEON pre-selected sampling plots occurred in only 8 of these map units (Tables 1-3). Two distributed plots at DEJU occur on soil map units of very minor extent and in total comprise less than 3 percent of the area (Table 2). The plot evaluation process resulted in 18 plots being selected for field description, sampling,



and lab characterization. The plots not sampled either occurred in non-typical soil settings or contained soils similar to the 18 chosen plots.

Map unit Symbol	Soil Map Unit Name	% Site Area	# Plots Sampled
604	Babel mucky silt loam, 0 to 15 percent slopes	1.7	1
610	Butchlake-Southpaw complex, 0 to 12 percent slopes	19.7	4
618	Donnelly-Nenana complex, 0 to 3 percent slopes	28.5	6
639	Nenana silt loam, 0 to 3 percent slopes	19.8	4
643	Ninchuun silt loam, 0 to 15 percent slopes	1.4	1
666	Typic Aquiturbels, 0 to 7 percent slopes	9.8	2
	Totals	80.9	18

Table 1. Major soil map units sampled at the DEJU site.

Map unit symbol	Map Unit Name	% Total site area
651	Tanana silt loam	1.4
655	Terric Hemistels-Typic Aquiturbels-Water complex, 0 to 3 percent slopes	0.9
	Totals	2.3

Table 2. Minor soil map units at DEJU containing NEON plots that were not sampled.

Map unit symbol	Map Unit Name	% Total site area
609	Butchlake-Nomercy Lake complex, 0 to 80 percent slopes	2.8
611	Butchlake-Southpaw complex, 0 to 35 percent slopes	0.4
612	Butchlake-Southpaw complex, subalpine, 0 to 35 percent slopes	1.1
616	Donnelly silt loam, 0 to 3 percent slopes	4.4
629	Jarvis very fine sandy loam	0.5
646	Nomercy Lake-Butchlake-Water complex, 0 to 35 percent slopes	6.9
668	Typic Aquiturbels, subalpine, 0 to 7 percent slopes	0.7
	Totals	16.8

Table 3. Soil map units at DEJU that do not contain NEON plots.

Plot Findings

The soils identified for sampling based on preliminary analysis are Babel, Butchlake, Southpaw, Donnelly, Nenana, Ninchuun and Typic Aquiturbels. The 18 plots sampled represent the most extensive soil map units on the site. The major soil components that were actually observed and



sampled are Donnelly, Southpaw, Butchlake, Nenana and Terric Hemistels. Soils that were expected but not observed were Babel, Ninchuun and Typic Aquiturbels. One reason these soils may have been missed in the sampling effort is the recent fire history of the area. The permafrost at the DEJU site is in the subgelic temperature class, the warmest type of permafrost. Natural or man-made disturbances, such as fire, in these areas alter the thermal balance in the soils and the permafrost thaws. Once the permafrost has thawed the soil is able to drain freely and the soil develops much like its neighboring non-permafrost soils. Without permafrost, the Babel and Ninchuun soils would be identified as Butchlake and Southpaw soils, respectively.

Landforms— DEJU_007, 011, 013, 016, 018, and 045 occur on rolling glacial plains. Plots DEJU_004, 005, 008, 010, 012, 014, 017, 023, 024, 025 and 027 occur on relatively level outwash plains. Plot DEJU_022 occurs in a concave depression on the outwash plains.

Parent Material—The DEJU site is dominated by parent material from glacial outwash and till both covered by a thin layer of loess. Closed depressions that are frozen and wet have developed thick (>20 cm) organic horizons over the outwash or till deposits. Plots sampled in areas dominated by outwash contained the Donnelly and Nenana soils, with Terric Hemistels in depressions. Plots sampled in the areas dominated by till contained the Southpaw and Butchlake soils.

Plots DEJU_004, 005, 008, 010, 012, 013, 014, 017, 023, 025, 027 and 045 are formed from outwash. Plot DEJU_022 formed in an outwash depression and had soil with a thick organic layer and permafrost. Plots DEJU_007, 011, 016, 018, and 024 formed in glacial till.

Summary of Soils

The main objective for this characterization effort was to sample the dominant soil series as determined by map unit and landform occurrence: These soil series include Donnelly, Southpaw, Butchlake and Nenana. One area of Terric Hemistels was also sampled. The most common soils were the Donnelly soils (10 plots), Southpaw (3 plots), Butchlake (2 plots), Nenana (2 plots) and Terric Hemistels (1 plot). The soil field characteristics and diagnostic features observed at the plots are described below in more detail.

Plots identified as the Donnelly component were DEJU_004, 005, 008, 010, 014, 017, 023, 025, 027 and DEJU_045. Donnelly soils developed in a very thin (<30 cm) layer of loess that overlies sandy and gravelly glacial outwash. The Donnelly soils observed in plots have ochric epipedons and cambic subsurface horizons.

Diagnostic features observed in plots identified as Donnelly:

An ochric epipedon is present at all the plots identified as Donnelly. Also, all plots, apart from DEJU_004, 005 and 027, have a relatively thin (<20 cm) surface organic layer which is included in the ochric epipedon. Plots DEJU_004 and 005 lack an O horizon, therefore the ochric epipedon is formed entirely in mineral soil. Plots DEJU_008, 014, 025 and 045 have O and A horizons that combined form the ochric epipedon. Plots



DEJU_010, 017, and 023 lack A horizons. As such, the organic layer combined with some portion of the cambic horizon qualify as an ochric epipedon.

Cambic horizon - All the DEJU plots identified as Donnelly have good cambic horizons with colors 1 to 2 hues redder (10YR and 7.5YR) than the parent material, which has 2.5Y hue. The soils have moderate soil structure in the Bw horizons.

Lithologic Discontinuity - All of the plots identified as Donnelly have a lithologic discontinuity where the loess mantle ends and the sandy and gravelly outwash begins. The depth of the lithologic discontinuity for Donnelly soils is less than 30 cm from the mineral soil surface. The thickness of the loess mantle for the plots identified as Donnelly ranges from 8 to 29 cm with an average of 20 cm.

Distributed plots identified as the Nenana component were DEJU_012 and 013. Nenana soils have a thicker (30 to 100 cm) layer of loess that overlies sandy and gravelly glacial outwash.

Diagnostic features observed in plots identified as Nenana:

Ochric Epipedon - Present in both of the plots identified as Nenana. Both plots have a relatively thin (<20 cm) organic layer. Plot DEJU_013 lacks an A horizon, therefore the organic layer combined with some portion of the cambic horizon qualify as an ochric epipedon. At DEJU_012 the combined thickness of the O horizon and the A horizon make up the ochric epipedon.

Cambic Horizon - Both plots have good cambic horizons with colors 1 to 2 hues redder (10YR and 7.5YR) than the parent material 2.5Y and moderate soil structure in the Bw horizons.

Lithologic Discontinuity - Like Donnelly, Nenana soils have a lithologic discontinuity between the loess surface and the sandy and gravelly subsoil. In Nenana soils this discontinuity occurs between 30 and 100 cm. The thicknesses of the loess mantle for these plots are 36 cm (DEJU_012) and 67 cm (DEJU_013).

Distributed plots identified as the Southpaw component were DEJU_007, 016 and 024. Southpaw soils have a loess 40 to 84 cm thick that overlies loamy skeletal glacial till. The particle size class section for Southpaw is coarse loamy, and a weighted average of the coarse fragment in the control section is less than 35 percent.

Diagnostic features observed in plots identified as Southpaw:

Ochric Epipedon - Present in all of the plots identified as Southpaw. All three plots have a relatively thin (<20 cm) organic layer. Plot DEJU_016 lacks an A horizon, meaning the organic layer combined with some portion of the cambic horizon qualify as an ochric epipedon. At plots DEJU_007 and 024, the combined thickness of the O horizon and the A horizon make up the ochric epipedon.



Cambic Horizon - Plots DEJU_007 and 024 have good cambic horizons with colors 1 to 2 hues redder (10YR and 7.5YR) than the parent material 2.5Y and moderate soil structure in the Bw horizons. The soil observed at plot DEJU_16 lacks the redder color and has only weak structure but would be considered a similar soil to Southpaw for mapping purposes.

Distributed plots identified as the Butchlake component were DEJU_011 and 018. Butchlake soils have a loess cap 0 to 40 cm thick that overlies loamy skeletal glacial till. The particle size class section for Butchlake is Loamy skeletal, a weighted average of the coarse fragment in the control section is greater than 35 percent.

Diagnostic features observed in plots identified as Butchlake:

Ochric Epipedon - Present in all of the plots identified as Butchlake. Both plots have a relatively thin (<20 cm) organic layer. Combined with the A horizon, these make up the ochric epipedon.

Cambic Horizon - Plot DEJU_018 has a good cambic horizon with colors 2 hues redder (7.5YR) than the parent material 2.5Y and soil structure in the Bw horizons. The soil observed at plot DEJU_011 lacks the redder color and has only weak structure but would be considered a similar soil for mapping purposes.

The one plot identified as Terric Hemistel was DEJU_022. These soils are in concave areas and have accumulated thick organic mats (>40 cm). Terric Hemistels are types of Gelisols that have a 30 cm thickness of mineral material within 100 cm of the soil surface. The pedon that was described and sampled exhibited cryoturbation features (frost churning and discontinuous horizons).

Diagnostic features common for Terric Hemistels:

Hemic and Sapric Soil Materials - DEJU_022 has 24 cm each of hemic (Oe) and sapric (Oa) soil material. The Hemic soil material is dominant in the upper 50 cm.

Permafrost - This plot has permafrost at 63 cm.

A mineral horizon 30 cm or more thick - This pedon has mineral horizons 52 cm thick in the upper 100 cm.

References

Pink, Trudy. 2003. Soil Survey of Fort Greely and Donnelly Training Area Alaska United States Department of Agriculture, Natural Resources Conservation Service; Department of the Army, U.S. Army Alaska; University of Alaska, Fairbanks, Agricultural and Forestry Experiment Station; Salcha-Delta Soil and Water Conservation District; and Alaska Soil and Water Conservation District.

