



# NEON Site-Level Plot Summary

## Smithsonian Environmental Research Center (SERC)

### Document Information

**Date**

August 2016

**Author**

Greg Taylor, Senior Regional Soil Scientist, Raleigh, NC; Ben Marshall, MLRA Project Leader, Frederick, MD; and David Verdone, MLRA Soil Scientist, Frederick, MD

### Site Background

The Smithsonian Environmental Research Center (SERC) is located in MLRA 149A Northern Coastal Plain, the Physiographic Division is the Atlantic Plain, Physiographic Province is the Coastal Plain, and Physiographic Section is the Embayed Section Land Resource Region is the Northern Atlantic Slope Diversified Farming Region (S). The site is located in Anne Arundel County, Maryland along the Rhode River, a sub-estuary of the Chesapeake Bay, and consists of 2,530 acres.

### Site Information

Elevation of sampled sites range from 7 to 360 feet (2 to 110 meters) along the higher portions of upland hill summits.

The parent material at the SERC site is predominantly fluvial marine deposits associated in a near-shore environment of the late Cretaceous seas, however there are some areas of alluvium and loess which may be overlying the fluvial marine deposits. Glauconite is a common mineral that was found in many of the sampled NEON plots. Glauconite forms under reducing conditions in sediments and such deposits are commonly found in nearshore sands and open oceans.

Land use is dominated by forest land and cropland.

Plant communities on sampled plots are predominately hardwoods, such as oak, hickory and sweet gum. Additionally, there are cropped fields.

Major soil series on the site include Adelphia, Annapolis, Collington, Cumberstone, Dodon, Donlonton, Holmdel, Hurlock, Marr, Mattapex, Sassafras, Sharptown, Wist, and Woodstown.

Landforms consist of uplands and hills including summits, shoulders, backslopes, footslopes, and toeslopes. There are also interflaves, nose slopes, side slopes, baseslopes and terraces.

Mean annual precipitation rate is 42 to 49 inches (1064 to 1240 mm) with an average of 45 inches (1143 mm). The mean annual air temperature is between 11 (52 Fahrenheit) and 15 (59 Fahrenheit) degrees Celsius.

Fahrenheit) degrees C, with an average of 13 (55 F) degrees C. Frost free days ranges from 190 to 250 with an average of 220 days.

## Analysis of Plots for Sampling

Plots to be sampled were selected by using 2013 NAIP imagery, SERC boundary and plot locations provided by NEON along with the MD003 soils layer. Slope maps, hillshade, and topographic layers were made using 10 meter DEM (digital elevation models). The main purpose of the initial evaluation was to capture the variability of the soil conditions present at the SERC site. The above mentioned tools and layers were studied and plots were selected using a simple decision paradigm: the plot potentially helps capture the variability of the site; the plot can actually be sampled (does it flood or will it be too wet to actually access and dig a pit in); the plot is not a repeat of another sampled plot; it is not within a transition area where soil properties are mixed, limiting the utility of the data.

The 34 plots provided as potential sampling locations were analyzed and determined to intersect with 13 map units within the portion of the soil survey covering SERC. Thirty-five soil map units cover the entire SERC property. This would provide coverage and analysis of approximately 40% of the map units present. Since less than half of the total area consisted of map units that had sample plots located within them, it was decided to sample all components, or soil series, identified as major map unit components.

Roughly 32.7 percent of the NEON site area (32.7% of the site's total map units) at SERC consisted of map units that were not sampled. These include:

<b>MUSYM</b>	<b>Mapunit Name</b>	<b>% Total SERC site area</b>	<b>Total Acres in SERC site area</b>
AdA	Adelphia-Holmdel complex, 0 to 2 percent slopes	0.9	23.4
AoB	Annapolis loamy sand, 2 to 5 percent slopes	0.2	5.4
AsA	Annapolis fine sandy loam, 0 to 2 percent slopes	0.7	18.8
AsE	Annapolis fine sandy loam, 15 to 25 percent slopes	0.1	3.5
CkA	Colemantown fine sandy loam, 0 to 2 percent slopes	0.3	7
CoA	Collington-Wist complex, 0 to 5 percent slopes	0.2	4.3
CoB	Collington-Wist complex, 2 to 5 percent slopes	2.2	56.4
CSF	Collington, Wist, and Westphalia soils, 25 to 40 percent slopes	0.2	4.5
CxB	Cumberstone-Mattapex complex, 2 to 5 percent slopes	0.4	10.9
DcA	Deale-Shadyoak complex, 0 to 2 percent slopes	0.2	5.8
DnA	Donlonton fine sandy loam, 0 to 2 percent slopes	1.4	36.2
HmC	Howell-Annapolis complex, 5 to 10 percent slopes	0.2	4.7
HME	Howell-Annapolis complex, 15 to 25 percent slopes	0.4	10.7
MDE	Marr and Dodon soils, 15 to 25 percent slopes	6	151.2
MDF	Marr and Dodon soils, 25 to 45 percent slopes	0.1	2.2

MZA	Mispollion and Transquaking soils, 0 to 1 percent slopes, tidally flooded	4.9	122.8
SoA	Shadyoak-Elkton complex, 0 to 2 percent slopes	5.7	143.9
UxB	Udorthents, loamy, sulfidic substratum, 0 to 5 percent slopes	0.2	4.7
W	Water	1.7	44.1
WBA	Widewater and Issue soils, 0 to 2 percent slopes, frequently flooded	6.7	170
	<b>Total</b>	<b>32.7</b>	<b>830.5</b>

Sampled map units represent approximately 67.2 percent of the NEON site area (67.2% of the site's total map units):

MUSYM	Mapunit Name	% Total SERC site area	Total Acres in SERC site area
AdB	Adelphia-Holmdel complex, 2 to 5 percent slopes	6.8	172.9
AsB	Annapolis fine sandy loam, 2 to 5 percent slopes	6.5	164.7
AsC	Annapolis fine sandy loam, 5 to 10 percent slopes	3	75.9
CmA	Colemantown silt loam, 0 to 2 percent slopes	4.6	117.5
CoC	Collington-Wist complex, 5 to 10 percent slopes	7	177.1
CRD	Collington and Annapolis soils, 10 to 15 percent slopes	8.4	211.3
CSE	Collington, Wist, and Westphalia soils, 15 to 25 percent slopes	2.8	71.1
CxA	Cumberstone-Mattapex complex, 0 to 2 percent slopes	2.3	57
DnB	Donlonton fine sandy loam, 2 to 5 percent slopes	7	176.4
MaB	Marr-Dodon complex, 2 to 5 percent slopes	4.2	107
MaC	Marr-Dodon complex, 5 to 10 percent slopes	5.6	141
MaD	Marr-Dodon complex, 10 to 15 percent slopes	5.1	128.1
SsA	Shrewsbury loam, 0 to 2 percent slopes	3.9	99.4
	<b>Total</b>	<b>67.2</b>	<b>1699.4</b>

Many of 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 component, except for a few outliers (noted below).

## Plot Findings

The 20 pedons sampled represent 11 soil map units. The major components found were Donlonton, Annapolis, Collington, Marr, Adelphia, Dodon, Holmdel, Hurlock, Sassafras, Sharptown, Wist, and Woodstown. Most of the plots sampled were forested (70%), while the others were cropped (30%).

**Landforms** – NEON Plots SERC\_004, 010, 011, 012, 013, 019, 020, 022, 025, and 026 consist of soil that were sampled on hillslopes. Plots SERC\_009, 030, and 068 consist of soil that were sampled on interfluves. Plots SERC 001, 006, 007, 014, 027, 028, and 029 consist of soil that

were sampled on a fluvio-marine terrace. Sampled plots were 50% from hillslopes, 15% from interfluvies, and 35% from a fluvio-marine terrace.

## Summary of Soils

The soils sample under forest cover did not have an organic horizon in the surface, as one might expect to find under forested conditions. The forested plots did have fresh leaf litter representing the previous year's growth. This is most likely because the soils on this area had been cultivated for a few centuries, and they still show evidence of the surface horizon being plowed at some time in the past.

The parent material at SERC consists of unconsolidated coastal plain sediments. These sediments are a combination of sandy, loamy and or clayey marine/and or fluvial marine sediments, transported and moved by water in the form of alluvium. Some of these materials may have been reworked through either or both wave and wind action. There are several different geological formations that are found on SERC, but the two most extensive ones are major the Nanjemoy Formation and the Calvert Formation. The Nanjemoy Formation contains various amounts of glauconite throughout it, while the Calvert Formation contains fine and very fine sand grains along with diatomaceous materials.

Based on the geology map, Plots SERC\_004, 006, 007, 010, 011, 012, 013, 014, 019, 020, 022, 025, 026, 027, 028, 029, 030, and 068 appear to have been sampled in either the Nanjemoy or the Calvert Formation. Plot SERC\_001 appear to have been sampled in Lowland deposits (formally the Talbot Formation). Plot SERC\_009 appear to have been sampled on Terrace deposits.

Based on the way they were described or identified at the time of sampling, SERC\_004, 006, 007, 009, 010, 012, 013, 014, 019, 020, 022, 025, 026, 027, 029, 030, and 068 were sampled in either the Nanjemoy or the Calvert Formation. Plots SERC\_001 and 028 were sampled in Lowland deposits (formally the Talbot Formation). Plot SERC\_011 appears to have been sampled in a different geological formation that may have been too small to be shown on the map. Based on the way the soils were described 85% of the soils were sampled on in either the Nanjemoy or the Calvert Formation, 10% of the soils were sampled in Lowland deposits (formally the Talbot Formation), 5% of the soils appears to have been sampled in a different geological formation that may have been too small to be shown on the map.

The plan was to sample at least one of every mapunit listed above which would provide coverage of 100%. However, after sampling at the SERC site for several days one mapunit was not sampled, the Marr and Dodon soils, 15 to 25 percent slopes unit (MDE). Three sample plots corresponded with the MDE mapunit: SERC\_005, SERC\_015 and SERC\_021. Although the MDE mapunit was not sampled, the soil components of this mapunit were sampled on other plots. Marr was sampled via SERC\_009 and SERC\_068 and Dodon was sampled via SERC\_022. The outcome was a sampling of 93% of the map units available. The following soil series were sampled:

Soil Series	Number of Samples
Adelphia	1
Annapolis	2
Collington	2
Dodon	1

Donlonton	6
Holmdel	1
Hurlock	1
Marr	2
Sassafras	1
Sharptown	1
Wist	1
Woodstown	1
<b>Total</b>	<b>20</b>

The following are soils that differed from the original map unit concept.

SERC\_001: The map unit was AdB-Adelphia-Holmdel complex, 2 to 5 percent slopes. The soil sampled at this location was Woodstown, which is moderately well drained. It lacked the glauconite that is normally found in Adelphia, and Holmdel soils.

SERC\_006: The map unit was AsC-Annapolis fine sandy loam, 5 to 10 percent slopes. The soil sampled at this location was Adelphia which is moderately well drained, fine-loamy with mixed mineralogy. Adelphia and Annapolis soils both contain glauconite however Adelphia soils contain less glauconite than Annapolis soils.

SERC\_007: The map unit was AsC-Annapolis fine sandy loam, 5 to 10 percent slopes. The soil sampled at this location was Donlonton, which is moderately well drained, fine-loamy with glauconitic mineralogy. The soil that was mapped here was Annapolis, which is well drained, fine-loamy with glauconitic mineralogy. minor component which one would expect to be in the mapunit.

SERC\_009: The map unit was MaC-Marr-Dodon complex, 5 to 10 percent slopes. The soil sampled at this location was Marr Taxajunct. It was identified as a taxadjunct because Marr is well drained and this pedon is moderately well drained.

SERC\_010: The map unit was CoC-Collington-Wist complex, 5 to 10 percent slopes. The soil sampled at this location was Wist Taxajunct. It was identified as a taxadjunct because Wist is well drained however it has a water table somewhere between 40 and 72 inches. This pedon appears to be moderately well drained, having a water table somewhere between 20 and 40 inches and is thus Aquic, not Typic.

SERC\_011: The map unit was MaB-Marr-Dodon complex, 2 to 5 percent slopes. The soil sampled at this location was Sassafras. It was identified as a Sassafras because the sand fraction were as predominately medium sized sands. Marr and Dodon both have a sand size fraction that is predominately fine and very fine sands.

SERC\_013: The map unit was SsA-Shrewsbury loam, 0 to 2 percent slopes. The soil sampled at this location was Donlonton. It was identified as a Donlonton because it was determined to be moderately well drained while Shrewsbury soils are poorly drained. Both soils are formed in materials that contain glauconite.

SERC\_014: The map unit was AdB-Adelphia-Holmdel complex, 2 to 5 percent slopes. The soil sampled at this location was Donlonton. It was identified as a Donlonton because it had more glauconite than the Adelphia and Holmdel series

SERC\_019: The map unit was SsA-Shrewsbury loam, 0 to 2 percent slopes. The soil sampled at this location was Donlonton. It was identified as a Donlonton because it was determined to be moderately well drained while Shrewsbury soils are poorly drained.

SERC\_020: The map unit was AsB-Annapolis fine sandy loam, 0 to 5 percent slopes. The soil sampled at this location was Holmdel Taxajunct. It was identified as a Holmdel Taxajunct because it was determined to be somewhat poorly drained while Annapolis is well drained.

SERC\_022: The map unit was MaD-Marr-Dodon complex, 10 to 15 percent slopes. The soil sampled at this location was Dodon Taxajunct. It was identified as a Dodon Taxajunct because it does not have the good Redoximorphic features in the form of iron depletions that are normally associated with Dodon soils.

SERC\_026: The map unit was SsA-Shrewsbury loam, 0 to 2 percent slopes. The soil sampled at this location was Donlonton Taxajunct. It was identified as a taxajunct because Donlonton is moderately well drained while Shrewsbury is poorly drained.

SERC\_028: The map unit was CxA-Cumberstone-Mattapex complex, 0 to 2 percent slopes. The soil sampled at this location was Sharptown. It was identified as a Sharptown because they differ in their amount of glauconite. Sharptown includes glauconite.

SERC\_029: The map unit was AdB-Adelphia-Holmdel complex, 2 to 5 percent slopes. The soil sampled at this location was Donlonton. Donlonton soils contain more glauconite than Adelphia and Holmdel soils.

SERC\_030: The map unit was DnB-Donlonton fine sandy loam, 2 to 5 percent slopes. The soil sampled at this location was Hurlock. It was identified as a Hurlock because it was determined to be somewhat poorly drained while Donlonton soils are moderately well drained.