ABSTRACT

BRADLEY, SHANNON NICOLE. Ecosystem Services Provided by Alluvial Soils Across an Urban to Rural Gradient. (Under the direction of Dr. Matthew C. Ricker).

The Chewacla soil series (fine-loamy, mixed, active, thermic Fluvaquentic Dystrudepts) is mapped extensively (513,000 ha) on floodplains of the southeastern United States, yet alluvial soils have been under studied in the region. This research examined how current watershed land-uses (forested, urban, agriculture, mixed) affect the floodplain and its ecosystem services. Urban and agricultural land cover have significant influence on morphology and soil organic carbon (SOC) pools. Agricultural watersheds had fine-loamy to coarse-loamy alluvial soil textural classes and higher SOC concentration ($p = 0.01$) while urban watersheds had coarse-loamy to sandy textured soils with lower SOC ($p = 0.04$). In addition, we observed buried surface horizons (Ab) in 44% of pedons indicating that carbon is being stored at depth which contributes to ecosystem services like SOC storage, root production, and denitrification.

Another common issue in floodplains of the region is that Chewacla series soils are predicted to be somewhat poorly drained, but are commonly mapped as a complex/association with up to 45% inclusions of hydric soils. We used the National Wetlands Inventory (NWI) hydrology classes within floodplains to locate areas that likely contain hydric soils. Field verification was done for 124 locations where soil drainage class and hydric indicator status were quantified. By using NWI polygons, floodplain units can be spatially separated into consociations of Chewacla units (with 10% hydric inclusions) and predominantly hydric undifferentiated groups (60% hydric soils within). We applied our spatial predictions to Wake County, North Carolina and our data suggest that the floodplain units in the county only contain 19% hydric soils (3,596 ha), when spatially averaged, compared to the 45% (8,604 ha) currently predicted by soil survey. Landscape factors such as stream sinuosity, stream gradient, hydraulic

gradient, distance from the stream, and distance to nearest potential blockage (bridge, culvert, dam) were all significantly ($p < 0.05$) related to the location of hydric soils within Piedmont floodplains. Our spatial separations allow for visualization of the location of predominant wetland areas along streams, which is important for land-use planning.

Ecosystem Services Provided by Alluvial Soils Across an Urban to Rural Gradient

by
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A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Soil Science

Raleigh, North Carolina
2021

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BIOGRAPHY

Shannon was born in a rural town called Danville in Central Pennsylvania where she attended high school. During her senior year of high school, she did a co-op job at the Montour County Conservation District where she gained some experience in environmental and agricultural science. She attended Bloomsburg University and played women's rugby all 4 years of attendance. While at Bloomsburg, she worked on 2 GIS projects, participating in Soil Judging and received an internship at Columbia County GIS office. She graduated in 2018 with a bachelor's degree in environmental Geoscience and minor in Spatial Analysis & GIS. After graduation Shannon returned to work at Montour County Conservation District for a few months before attending North Carolina State University for M.S. in Soil Science. At NCSU she worked in the Pedology & Land-Use Lab in the Department of Crop & Soil Science under Dr. Matt Ricker.

ACKNOWLEDGMENTS

I would like to start by thanking my advisor, Dr. Matt Ricker, for bringing me to NCSU and giving me this incredible opportunity of a master's degree and research. You have taught me so much of my soil's knowledge from Bloomsburg to now. I want to thank you for believing in me, giving me a fascinating project, providing guidance, providing your time in lab/field/writing, and most importantly helping me leave central PA. I am forever grateful to have taken every class you offered at Bloomsburg and then reaching out afterwards. I would also like to thank Dr. Rich McLaughlin and Dr. Karl Wegmann for serving on my committee and giving advice and time for the project. Thank you to Dr. Dean Hesterberg, Dr. Mike Vepraskas, and Chris Moritz for letting me use your equipment and giving input throughout my research.

I owe much more than this paragraph to Reuben Wilson for the help he has given me on this project. From trudging through frozen wetlands, to augering my soils to 200 cm in 100^{o} F weather, to discussing my random thoughts about soil- you were such a big part of this project and my graduate career. I am so grateful to have had you through it all, and I am excited to see what the future holds given your knowledge, skill, and passion.

Last, I would like to thank my family and friends for their support. Thank you to my friends from home and new Raleigh friends for cheering me on and giving me things to do outside of school/work. Special thank you to Noah DeWitt for helping me with stats, listening to my every problem, and doing fun things with me. Thank you to my mom who has always been there for me and raised me to be a strong independent woman like herself. Thank you to my family- Dad, Sabrina, Aunt Sabrina & family, grandparents, and extended family for your love, support, and for believing in me always.

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CHAPTER 1

Complex morphology and carbon dynamics of floodplain soils in the North Carolina Piedmont

Abstract

The Chewacla soil series (fine-loamy, mixed, active, thermic, Fluvaquentic Dystrudept) is mapped on 513,000 ha of floodplains across the Southeastern United States and is known to be highly variable on the landscape. Many alluvial soils in this region formed in legacy sediment eroded from upland soils during intense agriculture in the late 1800s to early 1900s. The floodplains had aggraded, and subsequent down cutting into sediment has caused stream incision of the bottomlands. Current land-use on uplands draining into floodplains is changing from agricultural towards suburban and urban land uses. This study examined how land-use (>70% forested land), (>40% agricultural land), (>40% urban and >20% impervious surface), and mixed (forested/urban, agricultural/forested) within watersheds affect the floodplain, alluvial soil genesis, and soil ecosystem services. Landcover within the drainage basin was determined to significantly influence soil organic carbon (SOC) pools and their vertical distribution. Soils draining agricultural basins had fine-loamy to coarse-loamy particle size classes, and higher SOC pools than urban basins with coarse-loamy to sandy soils and less SOC. Buried surfaces were found in 44% of pedons sampled, indicating the storage of carbon at depth. Average carbon content dropped with depth in the profile but was not statistically different between the A and Ab horizons. The system is not typical as it only averages 36 ± 25% total root mass in the top 20 cm of the profile extending downward for nutrients or water uptake. In the past, alluvial soils were grouped into a single soil series designation based on commonalities of legacy sediment parent material, drainage class, and flooding frequency. Land-use planning for forestry, utilities, and

recreation within broad map units such as the Chewacla series is challenging due to the complicated past and current land-use dynamics, which control sedimentation and alluvial soil morphology we observe on the landscape today.

Introduction

The Chewacla soil series (fine-loamy, mixed, active, thermic, Fluvaquentic Dystrudept) is mapped on 513,000 ha across the Southeast United States. The soil is formed from alluvium and is commonly identified by thick layers of legacy sediment. Legacy sediment is sediment displaced from anthropogenic activity (in this case, intense past agriculture) and deposited as alluvium over older stable surfaces (James, 2013). Chewacla is a somewhat poorly drained (SPD) soil mapped primarily in the Piedmont but extends into the Coastal Plain (CP) physiographic province as sediment delivered by major rivers (Meade, 1982; Phillips, 1992). In the Piedmont, Chewacla also crosses through many unique geologic soil systems (Felsic Crystalline, Slate Belt, Triassic Basins), unlike most upland soils that are distinct in each soil system (Figure 1-1). The average size of Chewacla map units in North Carolina (NC) (n = 7,282 map units) is 24 ± 87 (standard deviation) ha (minimum = 0.0002 ha, maximum = 2,631 ha) encompassing many small order floodplains per unit (Soil Survey Staff, 2020). Land planners often struggle with the soil series due to its wide range of characteristics associated with the official soil series description (OSD) (possible Munsell colors include hues 5YR to 2.5Y, 3 to 4 values, 2 to 6 chromas, and 8 of 12 possible soil texture classes). Alluvial soils are frequently mapped as undifferentiated groups containing an estimated 20-45% hydric soils within (Soil Survey Staff, 2020). The uncertainty regarding abundance and location of hydric soils within Piedmont floodplains makes these areas problematic in large-scale modelling efforts and land use planning.

The economy between the 1860s and 1930s in the Southeast USA relied heavily on cash crop farming (tobacco and cotton), using as much land for profit as possible. This cash-crop farming was accomplished by cutting down forests and tilling soils to increase cropland. The combination of bare soils and poor agricultural practices caused erosion of upland soils and the concomitant aggradation of the eroded soils (legacy sediment) on valley bottom floodplains. Bottomlands were back-filled with eroded sediment until they eventually down cut, especially after small mill and earthen dams were breached and hillslope soil conservation practices began (Happ, 1945; Costa, 1975; Trimble, 2008). The sediment displaced onto floodplains, which is often now exposed along incised cut banks, has dramatically changed alluvial soil systems. Current surface water quality is affected by excess non-point source sediment volumes generated from erosion of modern floodplains (Neary et al., 1988). Pre-European floodplains of the southeast USA likely looked and functioned significantly different from those observed today, with meandering to anastomosing channels and low stream banks connecting to riparian marshes with organic horizons over thin gleyed layers, gravel, or rock (Walter & Merritts, 2008).

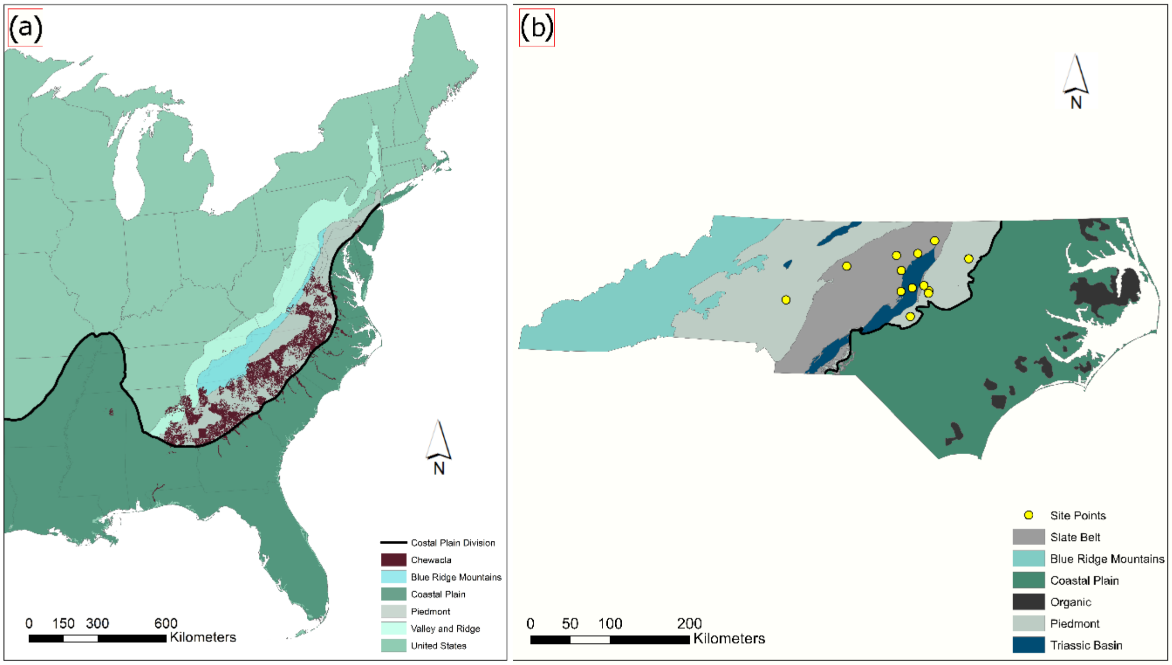

Figure 1-1: (a) Map of the extent of Chewacla soil series mapped across the eastern USA encompassing 513,000 ha from Mississippi to Pennsylvania on different physiographic provinces, most notably the Piedmont and Coastal Plain that are separated by the black line. (b) Map of 13 sites used to study the Chewacla soil series in North Carolina, spanning multiple distinct soil systems within the Piedmont.

The Chewacla soil morphology that we see today is influenced by past and current human activity. Basin land cover can affect floodplain soil characteristics such as morphology, texture, hydraulic conductivity, seasonally high-water table, distribution of nutrients, and biotic activity (Hardison et al., 2015). Urbanization increases impervious surfaces and contributes to pollution of the environment affecting downstream terrestrial and aquatic systems. More impervious surfaces produce high runoff and channelization, which causes flash floods that often incise into legacy sediment on the floodplain. Hardison et al. (2009) observed more significant incision in floodplains with higher percentages of impervious surface in the watershed and had less predictable, but deeper on average, groundwater levels than rural watersheds. Urban streams typically contain larger quantities of pollutants, contributing to heavy metals and contaminants observed in the riparian system (Groffman et al., 2003; Walsh et al., 2005; Hardison et al., 2009). In forested or mixed-use watersheds, we expect higher infiltration in uplands allowing stormwater to regulate naturally through the system (Schoonover et al., 2007). The degree to which current land-use affects adjacent floodplains is a challenge to interpret because the floodplains have not yet recovered from the rapid introduction of massive volumes of legacy sediment. Therefore, it is often difficult to pinpoint the drivers of complex morphologies and characteristics observed in alluvial bottomlands (Jackson et al., 2005; Schoonover et al., 2007).

Soils are the largest terrestrial carbon sink on the planet containing approximately 1460 to 1550 Pg of organic carbon (SOC) (Eswaran et al., 1995; Batjes, 1999; Lal, 2003). The storage and build-up of terrestrial carbon are important to stabilizing and ultimately reducing the atmospheric concentration of greenhouse gases such as CO_2 (Lal, 2003). Floodplains are large contributors to global SOC pools from litter inputs of riparian vegetation and frequent wetting and shading (Batjes, 1996). Floodplains make up 0.5 to 8.0% of the estimated global carbon budget while only taking up roughly 1 million km^2 of land (~0.7% of the terrestrial total) (Sutfin et al., 2017). Also, most SOC studies only quantify carbon to 1 m depths, estimating carbon storage to be negligible below this depth (Batjes, 1996). Contrary to upland soils where this assumption is typically valid, many soils formed in depositional landscapes (alluvial, aeolian, volcanic) have buried carbon-rich surfaces at depths >1 m. Lack of deep SOC data in the global carbon budget likely leads to underestimating the importance of soil carbon storage (D'Elia et al., 2017). Alluvial soils in the Piedmont of NC may store carbon more efficiently than contiguous uplands due to legacy sediment deposition. Carbon that was once produced in marsh and floodplain lowlands can be preserved and stable when buried under >1 m of sediment, therefore limiting CO_2 loss to the atmosphere (Trimble, 2008; Boye et al., 2017).

Vegetation within these systems has also changed dramatically since European colonization. In the Piedmont of NC, riparian forests typically consist of established trees such as tulip poplar *(Liriodendron tulipifera* L.), sweetgum (*Liquidambar styraciflua* L.), red maple (*Acer rubrum* L.), ironwood (*Carpinus caroliniana* Walter), and American holly (*Ilex opaca* Aiton). Various invasive species are common in the understory, including Chinese privet (*Ligustrum sinense* Lour.) and Japanese stilt grass (*Microstegium vimineum* (Trin.) A. Camus). After significant sediment deposition, many floodplains undergo plant recolonization and formation of new topsoil surfaces (Jolley et al., 2010). Current small order floodplains in the Piedmont have variable flood reoccurrence intervals of < 2 to 500 years for 1^{st} through 3^{rd} order streams (Ruhlman & Nutter, 1999) and depths to groundwater (Turner et al., 2015). Plants have trouble surviving on large caps of legacy sediment for these reasons and can have up to 95% mortality rate of seedlings planted in restoration sites (Voli et al., 2009; Merritts et al., 2011). However, Sweeney et al., 2019 countered that 60% of seedlings could survive on restored legacy sediments of depths up to 1.5 m thickness. Nutrients may also be scarce within the upper 30-100 cm of legacy sediments but increase in the buried surface horizons that plants can access through deep roots (James et al., 2015).

The variable nature of alluvial soils requires more concentrated studies to quantify specific ecosystem services provided by floodplains. Our goals for this research are to examine floodplain soils mapped as the Chewacla series. Through these efforts, we seek to determine if 1) current land-uses are affecting soil morphology and carbon distribution in both soil and total root pools, and 2) provide estimates for how alluvial soil genesis and morphology affect intrinsic soil characteristics related to ecosystem services and land use interpretations such as carbon and nutrient storage, and root growth.

Area of Interest

For this study, we focused on floodplains mapped as the Chewacla soil series in the NC Piedmont. The Piedmont region is between the Blue Ridge Mountains to the west and the CP to the east. Its rolling hills encompass many geological formations that have weathered intensely to form deep soils in metamorphic, metavolcanic, and metasedimentary rocks. Sub-physiographic regions (referred to as soil systems) include Felsic Crystalline, Slate Belt, and Triassic Basins (NCGS, n.d.). Typically, the highly weathered Piedmont upland soils contain iron oxides (hematite) mapped as Kanhapludults (kaolinitic, Ultisols) (NCSU, 1999). Soils vary across sub-provinces with siltier soils formed in the Slate Belt, while Triassic basin soils have 2:1 clay mineralogy with shrink-swell potential. Sub-physiographic provinces are used for soil mapping boundaries based on different geologic parent materials and inherent properties for land-use interpretations. However, floodplain soil series, like Chewacla, are mapped near streams within all these regions in 33 out of 35 Piedmont counties in NC (Soil Survey Staff, 2014).

Materials and Methods

Site Selection and GIS

Thirteen riparian sites mapped as the Chewacla soil series were selected for intensive field study in NC's Piedmont region. Soil data were obtained from the Soil Survey Geographic Database (SSURGO). Sites were selected on floodplains associated with 1st through 4th Strahler order streams (Strahler, 1957). Geographic Information System (GIS) was used to delineate watersheds contributing to each sample point using Digital Elevation Models (DEM). Study watersheds were evaluated for size in hectares, slope, land cover, and physiographic province location. The sites spatially represent the NC Piedmont and the various typical land-use types of this region (Figure 1-1). Land cover and impervious surfaces were calculated using National

Land Cover Dataset (NLCD) (MRLA, 2011). Sites were grouped by the predominant watershed land cover; classified as forested (greater than 70% forested land), agriculture (>40% agricultural land), urban (>40% urban land and >20% impervious surface), or mixed with a combination of land cover within a watershed (e.g., urban/agriculture, agriculture/forest).

SSURGO polygons were examined in GIS in order to determine the effort necessary for the mapping of large contiguous Chewacla map units compared to adjacent upland units. We compared the average size (ha) of the Chewacla unit relative to the average size of adjacent upland units. Chewacla units were also buffered by 50 m, and the ratio of the total number (#) of upland map units to 1 Chewacla unit was determined. These calculations provide an estimate of how much effort was put into mapping upland soil units compared to adjacent bottomlands.

We utilized the Natural Resources Conservation Service (NRCS) databases, which contain lab data for 12 Chewacla series pedons for comparison with our field data. However, we removed one pedon from our comparison dataset due to erroneous soil classification. Ten of the 11 NRCS pedons were mapped in the CP physiographic province and provide a dataset for statistical comparison to our data from the Piedmont. Additional pedon data (n = 10) from a similar taxonomic CP alluvial soil, the Tawcaw series (Fine, kaolinitic, thermic Fluvaquentic Dystrudept), were used as a further comparison to understand differences in alluvial soil properties across physiographic boundaries (see Ricker & Lockaby, 2015).

Data Collection

Each site was assessed by soil auger transects perpendicular to the stream channel, and representative stream cut banks were excavated for profile soil sampling. Human alterations such as telephone or sewer lines, trails, or constructed levees around sites were noted. Floodplain widths ranged from 60 to 300 m. Transect were measured across the floodplain width and flagged every 10 m. Auger borings were taken every 10 to 20 m across a transect depending on the total width, typically with 4 to 6 borings per site. The auger samples (n = 58) were described until basal gravel, rock, or 200 cm were reached.

A representative cut bank of the stream was excavated (n = 13) for sampling, and soil characteristics were described. The face was described to 200 cm or until basal gravel, or rock was exposed. Important characteristics such as charcoal, buried wood, manganese concentrations, and iron nodules were noted per horizon. Samples of each horizon of the cut bank face were taken from the bottom up to ensure that the upper horizons did not contaminate lower ones. Bulk density (BD), roots, and bulk laboratory samples were collected from each horizon in the bank face. Buried A horizons indicate an older precolonial parent material that is distinct from the above legacy sediment. The parent material age change is noted with a number prefix increase (i.e., 2Ab) relative to the above horizons of post-colonial material. Soils were classified using the Keys to Soil Taxonomy 12th edition (Soil Survey Staff, 2014). Classifications to the subgroup level were completed for each pedon, in addition to epipedons, diagnostic horizons, family particle size class, and drainage class. Hydric status was determined using Field Indicators of Hydric Soils in the United States for Major Land Resource Region (MLRR) Piedmont (P) (USDA, NRCS, 2016).

Sample Analysis

Soil samples were placed with ice in a cooler for transport from the field and stored in a freezer overnight until laboratory analysis could be run. Samples from each horizon were analyzed for pH using the 1:1 deionized (DI) water (Soil Survey Staff, 2014). Twenty grams of soil were mixed with 20 mL of DI water and tested with a Metter-Toledo pH meter. Bulk density was collected using the core method (5x5 cm cylinder) from each horizon in the cut bank's face and dried for measurement at 105˚ C for 24 hours (Soil Survey Staff, 2014). The texture was determined using the hydrometer method (Grossman & Reinsch, 2002). Sandy texture classes (sand, loamy sand, sandy loam) were wet sieved to quantify sand size distribution and apply texture modifiers (very coarse, coarse, fine, very fine).

Known volumes of soil were collected from each horizon for root density calculations. A cylinder corer (10x10 cm) was inserted horizontally into the cut bank face for each described horizon. The intact root cores were stored at 4 °C until washing using a hose and 2 mm (number 10) sieve. The roots were collected with tweezers and separated according to size (coarse roots >2 mm, fine <2 mm) and live versus dead fractions (Vogt & Persson, 1991; Robertson & Dixon, 1993). The roots were then dried overnight at 60 °C. Root density was determined using the mass of roots present per unit volume for the horizon (Watson & Kelsey, 2006). Statistical analysis on roots showed no significant differences between fine, fine + coarse, alive, and dead root combinations, so total root density (fine + coarse, live + dead) was used for subsequent calculations and statistical comparisons.

Total soil carbon and nitrogen were measured at the North Carolina State University Environmental and Agricultural Testing Service lab. Two-millimeter sieved soils were tested using the thermal combustion method on a Perkin Elmer 2400 C/N analyzer (Perkin Elmer, Waltham, MA). SOC pools were calculated for each horizon using carbon concentration (%), bulk density, and horizon depth (Pluske et al., 2020) to 100 cm for statistical comparison. Samples were also analyzed for Al, Fe, and P content using Mehlich 3 extractions (AgroEcoLab, UMD, 2016).

Statistical Analysis

Two data groups were analyzed and compared with alluvial soil characteristics for this study: watershed/basin and pedon scale characteristics. For basin characteristics, we examined agricultural, forest, and urban land cover (% total), basin slope (%), basin size (ha), and combined soil profile characteristics (carbon, nitrogen, phosphorous, total roots). Horizon data evaluate relationships within the profile that may explain differences in alluvial soil genesis, morphology, and interpretations. Variables that were compared included bulk density, pH, texture (sand, silt, clay %), depths, carbon, nitrogen, phosphorous, root density, horizon designation, and Munsell soil color. To statistically evaluate these linear regressions, TukeyHSD pairwise comparisons, and student t-tests were applied to data with significance level at $\alpha = 0.05$. Linear regression was used to evaluate relationships between basin land-uses to soil properties and soil properties amongst themselves. Pairwise comparisons were used on categorical data such as differences between basin types, sample site locations, soil morphological properties (contains buried surfaces vs. no buried surfaces), and horizon designations. T-tests were used to determine statistical difference between physiographic provinces and compare soil properties in the upper 0-100 cm to 100-200 cm depths.

Results

Effort Analysis

The average size of a Chewacla map unit in the Piedmont of NC was significantly larger ($p < 0.0001$) 24 ± 87 ha (minimum = 0.0002 ha, maximum = 2,631 ha) compared to contiguous upland units which average 10 ± 49 ha (minimum = 0.00002 ha, maximum = 9,854 ha). For every Chewacla unit mapped, there were 14.6 contiguous upland units. This can be interpreted as upland units receiving nearly 15 times the effort when mapped compared to floodplains (Table 1-

1). Within the 50 m buffer of Chewacla units, 227 unique soil series were identified in the contiguous uplands.

Table 1-1: Effort analysis of the Chewacla soil series map unit across the Piedmont of NC. Means with different letters are significantly different ($p < 0.001$) according to Student's t-test.

	Chewacla Units	Contiguous Upland Units†
Average size (ha)	24 ± 87 a	10 ± 49 b
Map units per 50 m (#)	7,282	106,341
Land cover in NC Piedmont (ha)	165,943	4,979,661

†Total upland series = 227

Basin Characteristics

The most common classification to the subgroup level observed throughout Chewacla units in our study were Fluvaquentic Dystrudepts (n = 23) and Fluventic Dystrudepts (n = 22) which represent 63% of the total soil descriptions (n = 71). Other classifications observed were Typic Udifluvents (n = 11), Fluvaquentic Endoaquepts (n = 7), Anthroportic Udorthents (n = 3), Fluvaquentic Humaquepts (n = 2), a Fluventic Humic Dystrudept, a Typic Kanhapludult (mantled terrace), and a Typic Udipsamment (Table 1-2). Family particle size classes were most commonly coarse-loamy (57% total, mean clay content 12%); but some pedons were fine-loamy (27% total, mean clay content 21%), sandy (9% total, mean clay content 7%), and fine-silty (7% total, mean clay content 21%). Textures observed ranged from sand to clay, encompassing 8 of the 12 USDA soil texture classes. Basin land-use impacted alluvial soil morphologies. This is most noted in texture and stratification of recent sediment. Soils in more urban basins typically had coarser textures with human artifacts in the matrix which would classify as Entisols. The basins with more agricultural land had loamy textures that closely corresponded to the Chewacla OSD (Soil Survey Staff, 2020). Buried horizons were observed in all types of basin land-uses (Figure 1-2). Drainage classes observed within Chewacla units were SPD (n = 37), moderately well drained (MWD, n = 22), poorly drained (PD, n = 6), and well drained (WD, n = 6) (Table 1-2). Only 8% of soils observed met hydric indicators and depth to redox features was not significant in relation to any basin land-use.

Table 1-2: Percentages representing the correct Chewacla classificaiton (Fine-loamy, mixed, active, thermic, Fluvaquentic Dystrudept) met by the data

	Fluvaquentic Dystrudept	Fluvenic Dystrudept	Somewhat poorly drained	Fine- loamy	Coarse-loamy
Number of descriptions matching (n)	23	22	37	19	41
% of total	32%	31%	52%	27%	57%

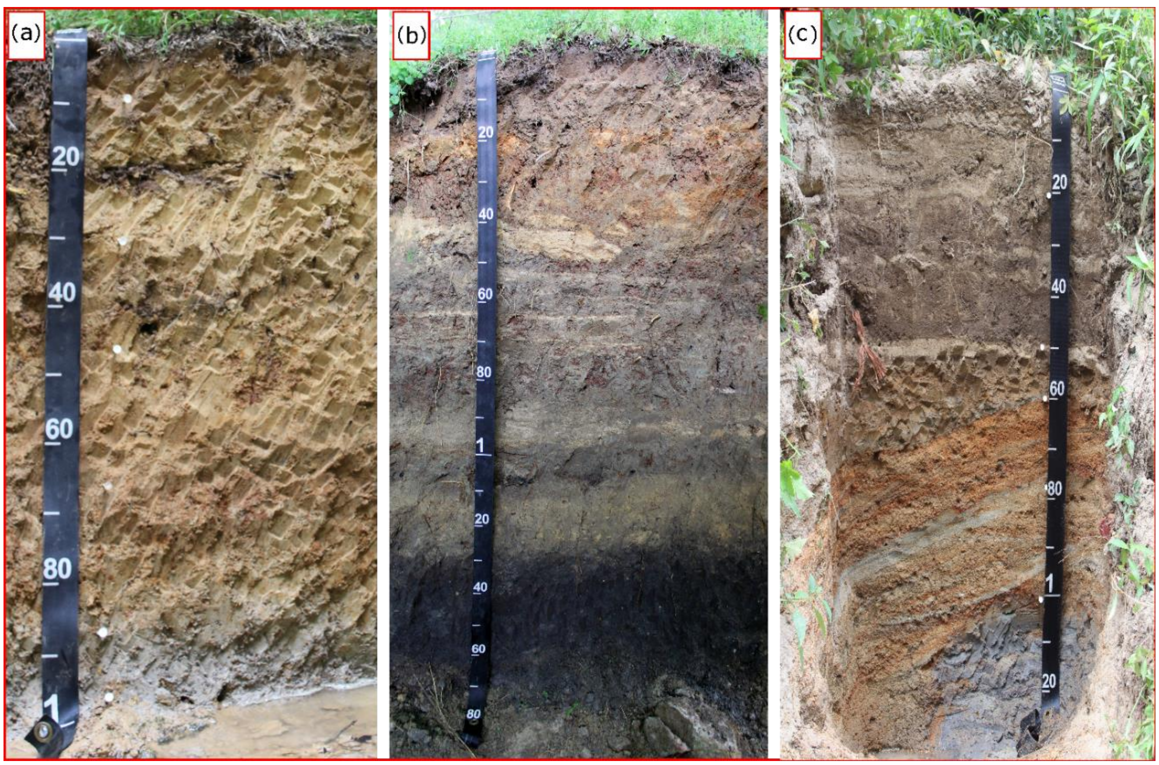

Figure 1-2: Various morphologies observed within Chewacla series map units (a) shallow soil profile with loamy Bw horizons (5-90 cm), Bg horizon (90-100 cm), above rounded basal gravels (>100 cm), (b) typical thick buried surface (Umbric epipedon at 130 cm) that stores significant carbon at depth, (c) sandy Entisol located in an urban watershed showing stratification of coarse sands (multiple C horizons, 0-100 cm).

Alluvial soils in urban watersheds had numerically less SOC to 100 cm (mean 54 ± 12 Mg C ha^{-1}) than the others and agriculturally dominated watersheds had higher mean SOC to 100 cm (107 ± 9 Mg C ha^{-1}), but neither were statistically significant ($p = 0.11$). However, there was a significant linear relationship between SOC pool in the top 100 cm with urban and agricultural land percentage within the watershed (Figure 1-3). Generally, mean SOC pools were higher in alluvial soils with more agricultural land in the basin and lower in watersheds with more urban areas. Urban watersheds also had a significant linear relationship with phosphorous concentration to 100 cm showing elevated phosphorous in more urban watersheds ($p = 0.002$, $r^2 = 0.59$). In addition to land-use, SOC was compared across physiographic provinces, but there was no significant difference between carbon in the Piedmont Chewacla pedons versus units from the CP (Tawcaw or NRCS CP Chewacla series; Figure 1-4).

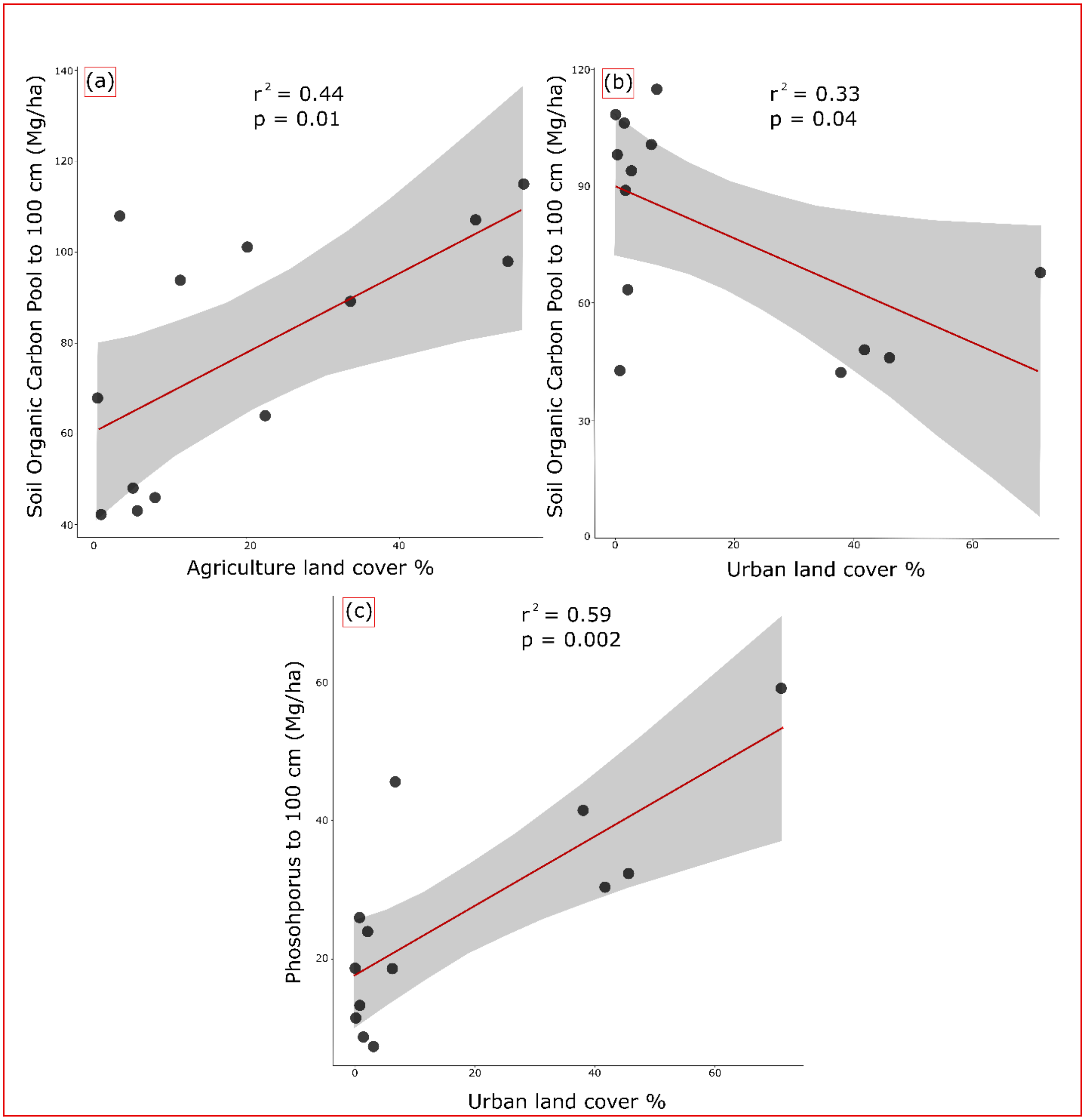

Figure 1-3: Linear regressions of significant (α = 0.05) basin and alluvial soil characteristics, gray shading represents the 95% confidence intervals (a) SOC pools versusagricultural land (b) SOC pools versus urban land (c) phosphorous in alluvial soils versus urban land in the watershed.

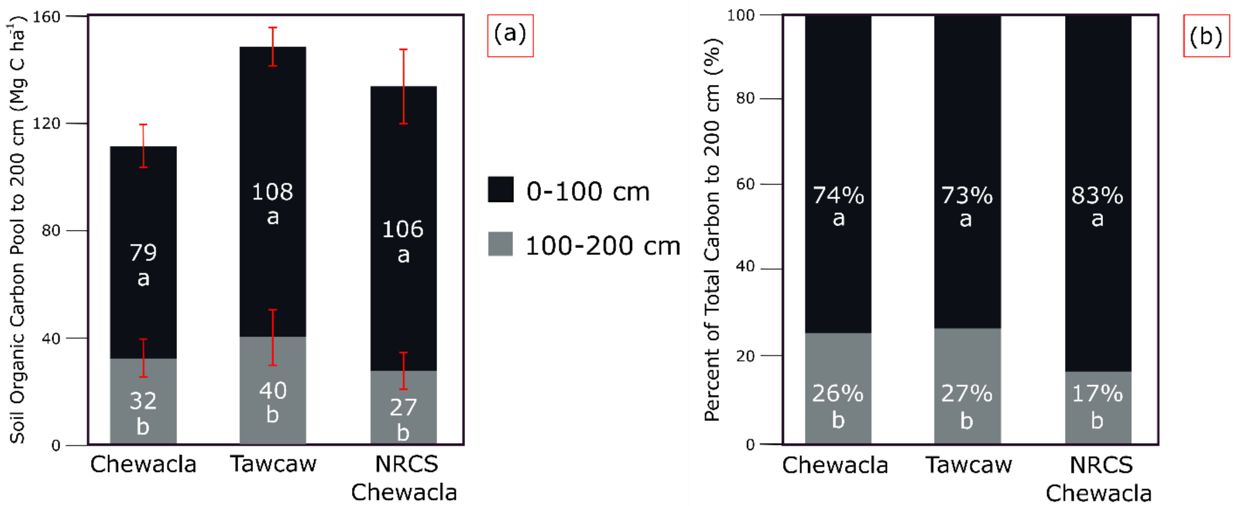

Figure 1-4: (a) Bar graph showing mean total SOC pools per soil survey unit for upper 100 cm and 100-200 cm with standard error bars. (b) Bar graph comparing proportional SOC pool average distributions at 0-100 cm and 100-200 cm. Groups of data include this study's Chewacla pedons (n = 13), Tawcaw series (n = 10) from Ricker and Lockaby (2015), and NRCS pedon data (n = 11) from Chewacla units in the CP. Distributions were compared using student t-tests of averages above 100 cm to below 100 cm and to the other groups ($\alpha = 0.05$). All upper distributions came out significantly different from the lower >100 cm and there was no significant difference between soil groups.

Profile Characteristics

Within alluvial soils characteristics such as total carbon, nitrogen, textures, bulk density, nutrients, and root density varied. The average depth of legacy sediment or depth until a buried surface was observed was 103 ± 45 cm. Legacy sediment, typically denoted as B horizons, had significantly less sand ($p < 0.001$) and more clay content ($p < 0.001$) than the rest of the post-settlement alluvial soil profile. Bulk densities increased with depth due to the compaction from the soil above ($p < 0.001$, $r^2 = 0.36$) (Figure 1-5). Forty-two percent of alluvial soils we observed had buried surfaces. Buried A horizons were significantly ($p < 0.001$) more compacted (mean BD = 1.25 ± 0.17 g cm^{-3}) than the A horizons at the surface (mean BD = 1.06 ± 0.09 g cm^{-3}).

Carbon concentration was typically higher in surface A horizons (mean C = 1.16 ± 0.96%), but had high values for Ab horizons as well (mean C = 0.82 ± 0.37%) ($p = 0.01$, Figure

1-6). Our data contained an outlier for soil carbon in an A/Oib horizon that contained 25% organic matter and 10% carbon for the buried surface horizon. Without the outlier, A horizons and Ab horizons were still statistically similar to one another ($p = 0.29$) and different from the other horizons ($p < 0.001$). Figure 1-6 shows the sequence of carbon with depth for all data points with mean C concentration of 1.16 ± 0.96% in A horizons and 1.64 ± 2.87% in Ab horizons. The linear trend between carbon and depth is significant with the outlier removed ($p < 0.001$, $r^2 = 0.14$). Carbon was inversely related to bulk density where soils with high carbon had low bulk densities ($p < 0.001$, $r^2 = 0.28$) (Figure 1-5). For bulk density, A horizons control the linearity containing high carbon with low bulk densities whereas Ab horizons have higher bulk densities and intermediate amounts of carbon (Figure 1-5). SOC in the upper 100 cm differed significantly ($p = 0.001$) from the lower 100-200 cm of the soil (average SOC 0-100 cm = 79 ± 28.2 Mg C ha^{-1}, vs. 100-200 cm = 32 ± 24.9 Mg C ha^{-1}). This trend was similar to the CP Tawcaw soil series (mean SOC 0-100 cm = 108 ± 21.8 Mg C ha^{-1} vs. 100-200 cm = 40 ± 31.6 Mg C ha^{-1}, $p < 0.01$) (Ricker & Lockaby, 2015) and NRCS Chewacla data from the CP (average SOC 0-100 cm = 106 ± 45.2 Mg C ha^{-1} vs. 100-200 cm = 27 ± 21.9 Mg C ha^{-1}, $p < 0.001$) (Figure 1-4).

Total root density (live + dead, coarse + fine) was correlated to variables representing factors that promote and inhibit root growth. Roots were inversely correlated to soil depth, showing that roots were more common in upper horizons ($p < 0.001$, $r^2 = 0.21$). Roots were significantly higher in A horizons (1.87 ± 1.17 kg m^{-3}) than any other horizons (average 0.30-0.39 kg m^{-3}) ($p < 0.001$). Consequently, roots were less abundant in deep horizons with higher bulk densities ($p < 0.001$, $r^2 = 0.25$). Carbon and nitrogen are key factors in plant growth, and our data showed a significant positive linear relationship between these edaphic factors and root density ($p < 0.001$, $r^2 = 0.24$ carbon, $r^2 = 0.29$ nitrogen). Many of the root density distributions we observed in alluvial soils were controlled by the A horizons, because there are significantly more roots in upper parts of soils (Figure 1-5).

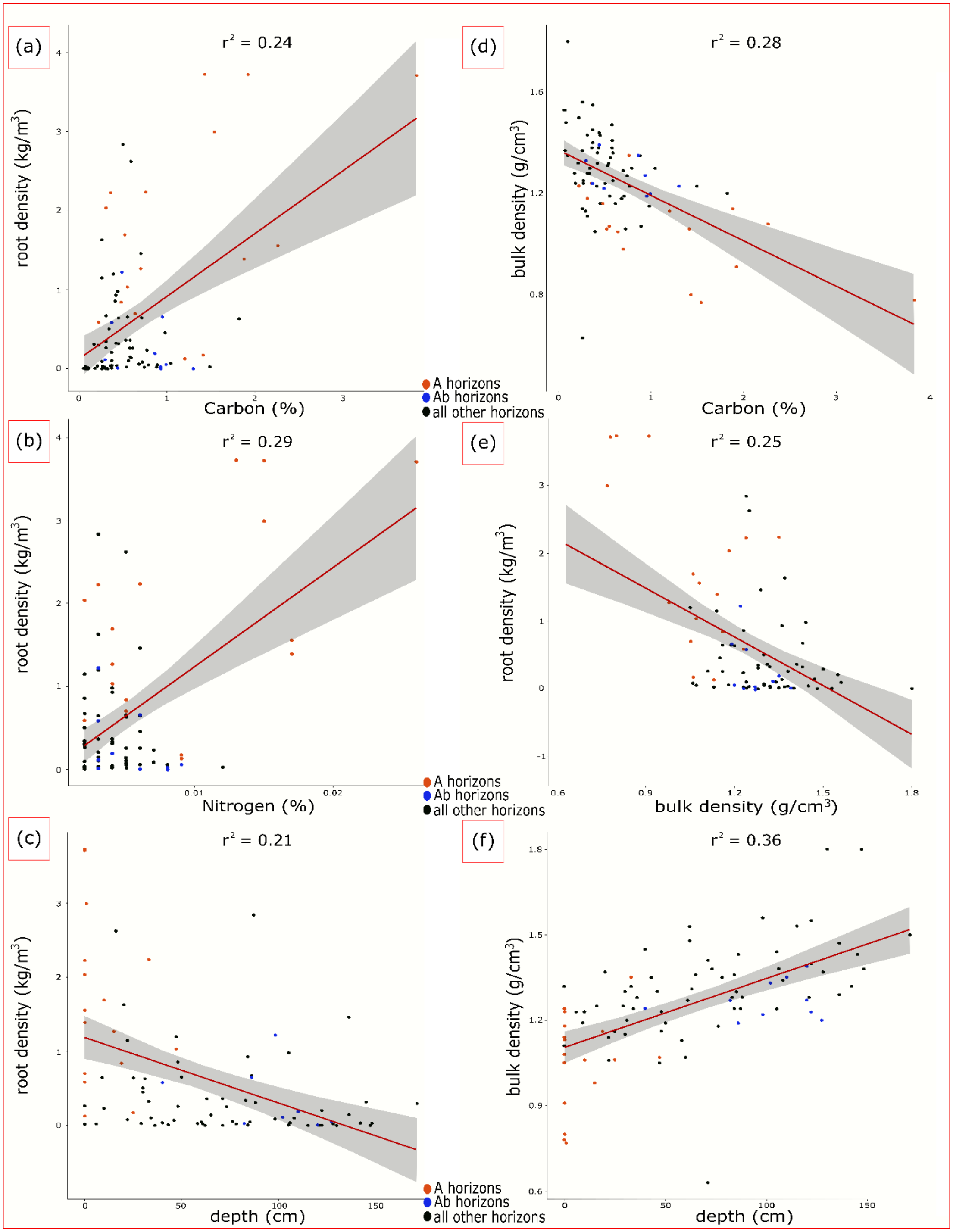

Figure 1-5: Significant linear regressions of horizon and soil characteristics with the gray shading representing the 95% confidence intervals. All regressions were significant at $p < 0.001$. (a) higher root densities in horizons with greater carbon concentration (b) root density increases with total nitrogen concentration (c) root density decreases with depth (d) bulk density decreased with increased carbon (e) root density decreases as bulk density increased and (f) bulk density increased with depth.

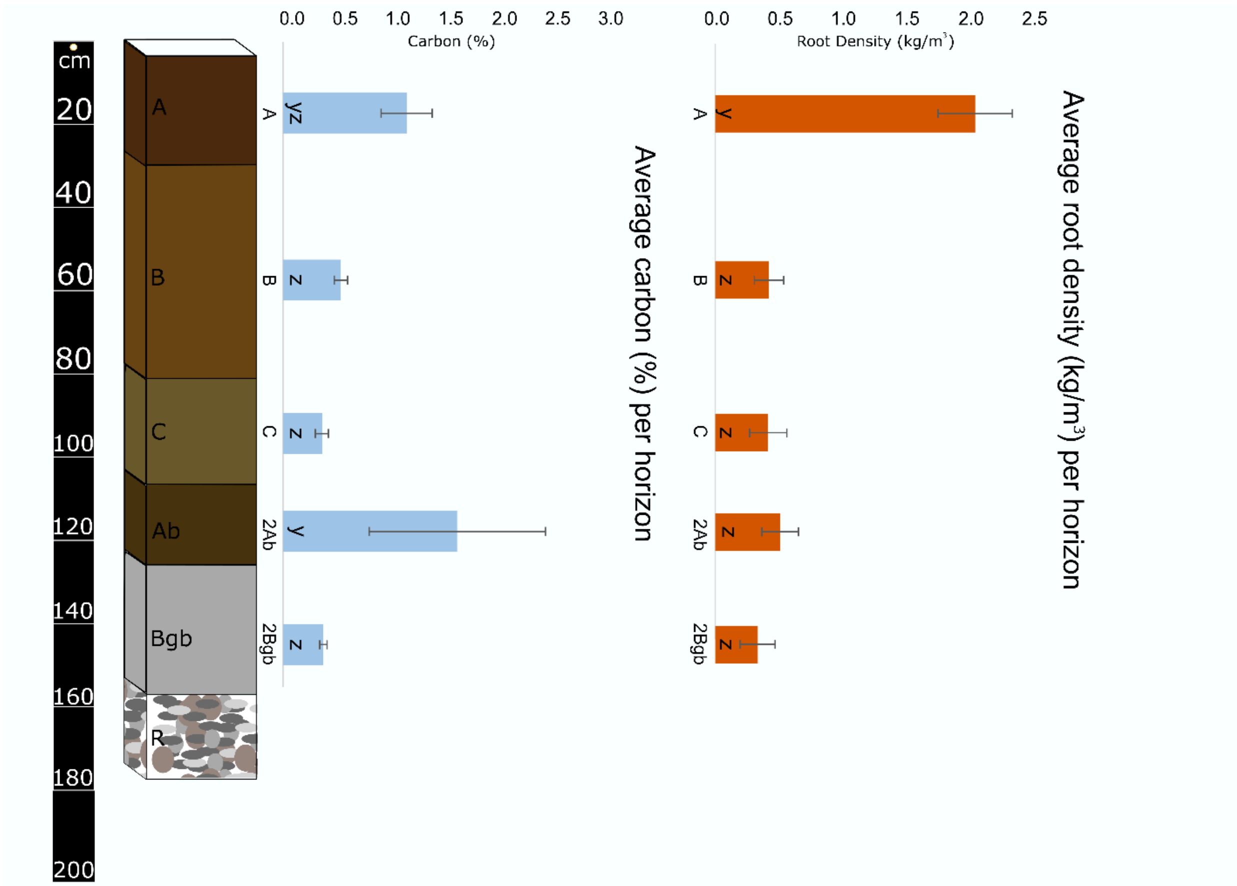

Figure 1-6: Example diagram of the Chewacla soil series based on field described morphology and mean laboratory data with standard error bars. For this figure, outliers were not removed. Mean horizon depths were: A (0-27 cm), B (27-75 cm), C (75-103 cm), Ab (103-124 cm), Bgb (124-153 cm) over basal rounded gravels (C, Cg) or bedrock (R). In this study 94% of sampled pedons contained A horizons (A, A/C, AB, AC, Ap, Au), 90% contained B horizons (BA, BC, BCc, Bcm, Bg, Bw), 77% contained C horizons (C, C', C/A, Cg, Cm, Cu), 42% contained Ab horizons, and 24% contained Bgb horizons. Letters "y" and "z" were used to note statistically similar values between horizons.

Discussion

Effort Analysis

Minimal effort was put into mapping the Chewacla soil series compared to contiguous uplands (see Table 1-1). In the past, soil mapping was done primarily for agricultural uses and soils that were not useful for agriculture were given little attention due to constraints on resources and time. For this reason, the Chewacla soil series is known as the "junk drawer" or "garbage can" to soil scientists because it can be any alluvial soil that floods. Mapping riparian areas so broadly fails to identify important landscape features such as hydric soils to avoid in land use planning or buried surfaces that have ability to remove ground water nitrate (Gold et al., 2007). The 50 m buffer applied to Chewacla polygons returned 227 soil series mapped next to these floodplain soils and the upland units were significantly smaller compared to those in the floodplain. This shows how many different landscapes the Chewacla series cross cuts. Roughly 3% of the Piedmont in NC is mapped as Chewacla concentrated around streams of all sizes. The extensive mapping of nearly all floodplains in the southeastern Piedmont and lack of mapping effort provide evidence for the need to remap riparian areas that contain hydric soils or have disproportionately high ecosystem services like water quality improvement or carbon storage potential.

Basin Characteristics

The soil series Chewacla is a catch-all for flooded land that filled in from intense agriculture during European settlement. The series spans multiple physiographic regions (Piedmont and CP) and continues through various soil systems with distinct upland mineralogy within the Piedmont (Soil Survey Staff, 2020). Typically, soil is formed and mapped based on climate, organisms, relief, parent material, and time (Jenny, 1941). In the case of regional floodplains, the parent material is alluvium, but is derived from watersheds with different lithologies, or parent materials. Alluvial soils form from water transported deposits that have eroded from uplands which impart inherent physical and chemical properties to the soils formed in connected bottomlands. Upland soils within the Piedmont vary, and are mapped based on geology and landscape position. For example, upland soils at the summit landscape position are mapped as Cecil or Pacolet in the Felsic Crystalline belts, but in the Slatebelt their counterpart is the Georgeville or Tarrus series, and within the Triassic Basins, Creedmoor series is mapped.

In addition to geology within the Piedmont, the Chewacla series is mapped across physiographic regions into the CP. This mapping was done because the alluvium produced from erosion of Piedmont uplands was transported and deposited in the flat sections of the Upper CP along major rivers (Phillips, 1992). The Chewacla soil series is mapped differently in the CP than Piedmont and expands from 1st order streams to large rivers (approx. 5-6th order) encompassing either the entire floodplain (60 m average width in Piedmont) to partial lateral sections of a much larger floodplain on the CP (Soil Survey Staff, 2020). Although similar in parent material, the processes influencing alluvial soil formation (vegetation, climate, topography) are so different that new soil series should be created to replace Chewacla units on the CP (Sutfin et al., 2016). Blazejewski et al. (2009) and Faulkner (1998) found significant relationships between size of watershed (< 20 km^2 sites) and alluvium thickness. However, we found no significant relationship between watershed factors and alluvium thickness, similar to results reported by (Jackson et al., 2005). Various studies have also found no significant relationship between stream order and depth to buried horizons, similar to data generated in our study (Jackson et al., 2005; Blazejewski et al., 2009).

Chewacla map units are also in watersheds with different land-uses that can dramatically influence alluvial soil formation. The 13 sites in this study differed in classification and ecosystem services, having major implications for assuming similarity based on previous land-use. Alluvial soils are a product of their watershed, including upland soil properties and amount of runoff (Costa, 1975; Hupp & Bazemore, 1993; Thorson et al., 1998; Walter & Merritts, 2008; Ricker et al., 2012). Conservation agriculture and best management practices are advised now to not only preserve soil, but to prevent eroded soil and nutrients from traveling into streams/waterways (Trimble, 2008). Urban land has high impervious surface cover forcing much of the rainfall on that land to runoff into streams/waterways rather than to percolate into the ground (Schoonover et al., 2007). Previous studies have shown an increase in runoff in urban areas that will move quickly and produce flashy hydrology through floodplains compared to the more stable forested or agricultural land (Schoonover et al., 2006). Ricker et al. (2012) observed thicker alluvium deposits in basins with higher impervious surfaces, however, this trend was not observed in our current study.

The heavy runoff in urban watersheds leads to valley scour and infilling with more coarse sediments that contain lower soil organic carbon content (Ricker et al., 2012; Hoffman et al., 2013). The flashy high-volume floods from urban watersheds deposit more coarse sediment due to the high velocity of overbank flow in the floodplain (Arnold & Gibbons, 1996; Paul & Meyer, 2001). The intense floods frequently wash out newly laid sediment and plant litter, lowering organic matter stored in soils (Bilby, 1988; Hardison et al., 2009). Another problem with riparian zones draining urban areas is the low groundwater table due to channel incision and channelization of water (Amerman, 1973; Summerell et al., 2004; Hardison et al., 2009; Turner et al., 2015). These landscape factors can decrease native hydrophytic plant growth and biotic activity on the floodplain (Wolman, 1967; Groffman et al., 2003), while invasive species may become more abundant (Aronson et al., 2017). Noe and Hupp (2005) noted that modern mineral sediments deposited on floodplains contained phosphorous which could explain the increase in soil phosphorous as urban land increases in the region. In a USGS study, lawns and streets were determined to produce 80% of urban storm water phosphorous within drainage basins contributed primarily by lawn care fertilizer and leaf litter (Waschbusch et al., 1999).

Past agricultural land-use eroded uplands and aggraded lowlands; however, soils within current agricultural basins are not morphologically different from those formed in forested or mixed land use basins. In our study, alluvial soils in agricultural settings did have numerically, but not significantly, higher carbon pools in the upper 100 cm ($p = 0.11$) compared to other predominant land uses. Carbon may accumulate or build up in agricultural floodplains because of stability relative to flashy hydrology common in urban settings. Sediment fluxes eroded off current agricultural land may also have more SOC fixed to mineral surfaces (allochthonous carbon) that deposits on floodplains (Lowrance et al., 1984). Alternatively, it is possible that floodplains in modern incised streams act more similar to uplands than floodplains and accumulate the majority of SOC through biotic activity (autochthonous carbon) that is sheltered and cooled from riparian vegetation (Hoffman et al., 2013). In all floodplains, both processes of carbon deposition and formation on the floodplain occur, but few studies have been successful at separating contributions of both processes (Hupp et al., 2019). It is also possible that there are no observable differences in alluvium SOC storage based on current land-uses because the streams are still equilibrating from intense sediment input and aggradation from agriculture in the late 19th to early 20th century (Groffman et al., 2003; Jackson et al., 2005; Ricker et al., 2012).

The Chewacla soil series in the Piedmont of NC had an average of 110 ± 33 Mg C ha^{-1} to 2 m depth. Global carbon budgets often focus very little on specific types of Inceptisols, instead grouping them all together (Bohn 1976, 1982; Buringh, 1984; Kimble, 1990). The Inceptisol soil order encompasses such a wide range of characteristics that it is difficult to determine the value of SOC contributed by this broad classification. The calculations used in global budgets are often measured to 1 m because uplands typically lack substantial carbon below this depth. Eswaran et al. (1994) used U.S. soil taxonomy to estimate carbon storage globally and determined

Inceptisols to have 2nd highest mean values behind Histosols. Kern (1994) used ecosystem designations (i.e. temperate forest, swamp, etc.) and U.S. soil taxonomy to the great group level finding values similar to our study to 1 m where forested systems had 109-159 Mg C ha^{-1} and Inceptisols had an average of 117 Mg C ha^{-1}. Mean SOC pools by great group classification were also similar to values in our study with Fluvents averaging 94 Mg C ha^{-1}, Ochrepts averaging 90 Mg C ha^{-1}, and Udifluvents averaging 82 Mg C ha^{-1}. The mean carbon pool from total roots within the Chewacla profile is estimated to be 7 ± 4 Mg C ha^{-1} which represents about 7 ± 5% of the total pedon carbon pool.

Riparian soils provide important locations for forestry operations, utility crossings, recreational facilities, and farmland. Studies have shown that forestry yields are greatly varied within floodplains (Hall, 1988). Other uses, such as utility crossings and farmland, require accurate soil data regarding seasonal surface and ground water tables and soil texture to plan uses accordingly (Bilby, 1988). Floodplains in the Piedmont of NC can be mapped properly based on defining basin characteristics that predict alluvial soil properties. Based on this study, land-use within the basin is a controlling factor of the present soil horizon characteristics, where floodplains draining urban watersheds produce significantly different alluvial soils compared to other land-uses. In addition, mapping units should not continue across physiographic provinces because the alluvium parent material is derived from alternate upland geologies and major soil forming factors like climate and biota change over the spatial scale of physiographic regions. A new series or soil-landscape model for alluvial soil genesis should be considered to explain and plan for these differences in floodplain interpretations. Not only is land-use planning affected by the consolidation of alluvial soils into broad landscape units (specifically undifferentiated groups), but potential ecosystem services are estimated and predicted incorrectly as shown in urban versus agricultural systems.

Profile Characteristics

The individual horizon characteristics of the Chewacla soil series show properties common to legacy sediment and pre-colonial alluvial systems. Legacy sediment eroded from uplands in the late 1800s to early 1900s is now present in floodplains as a red-brown loamy surface layer that can be over 200 cm in total depth (Happ, 1945; Trimble, 2008; Ricker & Lockaby, 2015). These horizons of legacy sediment within the profile are currently observed as Bw horizons that have weak pedogenic development due to age, finer textures with lower sand percentage compared to the rest of the profile, and yellow or reddish-brown colors (10YR and 7.5YR hues). Out of the 71 soils examined in our study, 77% had B horizons present. Other soils observed without B horizons were Entisols that had sandy A and C horizons which were a product of frequent high energy flooding in urban watersheds. The legacy sediment within Piedmont riparian zones buried pre-colonial surfaces to an average depth of 103 ± 45 cm. By burying the previous surface, additional weight is added which significantly increases bulk density with depth (Gifford & Roderick, 2003; Ricker & Lockaby, 2015).

Depth distribution of carbon throughout the alluvial profiles of Chewacla units are largely controlled by A and Ab horizon characteristics. A horizons averaged 1.16% carbon which was statistically similar to Ab horizons that had a mean of 0.82% carbon. Wade et al. (2020) observed a similar trend and values in South Carolina’s Piedmont estimating higher carbon (1.2%) in surface horizons declining to around 0.34% in Ab horizons. There was a downward trend of carbon with depth within the profile, but it is not highly predictive overall at r^2=0.14. Jobbagy and Jackson (2000), reported decreasing carbon concentration with depth, but there is an appreciable amount of carbon below 1 m in global soils. Deep carbon storage has been attributed to decreasing SOC turnover with depth, higher C inputs at depth from roots, dissolved organic carbon leaching, and bioturbation mixing C into lower parts of soil. In our study, the r^2 value is lower because the Ab horizons had an irregular carbon concentration than the surrounding subsoil horizons, based on carbon concentration they produce an irregular increase in the linear trend around 80-130 cm depth (Figure 1-6). In addition, soil carbon is closely related to bulk density (Xu et al., 2015). The significant positive linear regression of carbon to bulk density is influenced by A horizons giving the higher carbon and lower bulk density ranges, but more dense Ab horizons follow this trend as well. Therefore, a pedotransfer approach to estimate bulk density of a soil based on carbon may prove useful for alluvial soils (Xu et al., 2015).

Most soil carbon is estimated in the top 30 cm of agricultural soils and upper 1 m for global budgets. Operationally, soil classification is defined to 2 m (Soil Survey Staff, 2014), and therefore relatively shallow sampling has implications for underestimating deep soil carbon in alluvial soils. Even at 1 m sampling depths the carbon in many buried surfaces would not be accounted for in global SOC budgets (Batjes, 1996; Richter & Mobley, 2009; Zabowski et al., 2011; Yost & Hartemink, 2020). In total, 44% of Chewacla soil descriptions in the Piedmont had buried surface horizons that are storing carbon at depth (>1 m) and in the CP there can be as much as 4 m of legacy sediment above buried surfaces (Hupp et al., 2009). These data are similar to D'Elia et al. (2017) who observed 65% of 23 soil pedons contained deep buried surfaces in a California floodplain. There is a significant lack of information regarding carbon storage potential of soils with buried horizons in alluvial, volcanic, and aeolian deposits. The lack of carbon estimation in buried surfaces like this is an issue for global and local carbon budgets (Chaopricha & Marin-Spiotta, 2014; Ricker & Lockaby, 2015).

We found that the Piedmont Chewacla soil series had an average of 32% of total carbon below 100 cm (Figure 1-4). Previous floodplain studies have found 50% (Pena-Ramirez et al., 2009), 3-48% (Zabowki et al., 2011), 24% (James et al., 2015), 27-56% (Ricker & Lockaby, 2015), mean 43% (D'Elia et al., 2017), and 45% (Wade et al., 2020) of total SOC at depths greater than 1 m illustrating the need for deeper measurements in landscapes with buried horizons (Chaopricha & Marin-Spiotta, 2014). Soil carbon at depth provides ecological and societal benefits, especially within the alluvial system. Denitrification of stream water and runoff can occur in the subsurface of saturated alluvial soils due to high OM content at depth (Hill & Cardaci, 2004). In a study of Georgia CP riparian forest soils, Lowrance et al. (1984) concluded that denitrification outputs were larger than the input of nitrogen coming from agricultural runoff which creates an efficient system for removing nutrients. Buried surfaces are also high in microbial activity creating subsurface regions for biochemical processes that can contribute to water quality improvement (Gurwick et al., 2008a, 2008b).

Roots in riparian systems are essential for bank stabilization, carbon cycling, and delivering oxygen, water, and nutrients to the soil (Pierret et al., 2007). Jobbagy and Jackson (2000) reported the top 20 cm of soil contains almost 2/3 of roots within the profile. In our study approximately 1/3 of total roots existed in the top 20 cm, averaging 36% of the profile root weight. Root distribution varies based on soil properties and dominant vegetation, as noted in Jackson et al. (1996). Roots may also extend deeper for nutrients in the profile to access buried surfaces (McCully, 1995; Pierret et al., 2007). Likewise, soil nutrients may become elevated where dense root concentrations were at one period of time (relict surfaces), adding to the SOC pool via decomposition and mineralization (Ricker et al., 2014). Root restrictions (petroferric contacts) were noted at 2 site locations which had dense cemented iron-manganese layers. The presence of cemented layers was relatively infrequent (3% of total pedons described), but in alluvial soils where they form it restricts root distribution to the shallow horizons above the contact and increases variability in the spatial location of roots across pedon observations.

Conclusion

The lack of research and mapping effort in floodplains of the southeastern USA is evident based on both the extent of the Chewacla soil series mapped across Physiographic regions as well as the vast morphological differences within map units. Past and current land-use within drainage basins affects morphology and nutrients, which is especially evident in urban watersheds that produce sandier soils and lower SOC. Carbon stored deep (>1 m) within alluvial profiles may be underrepresented by carbon budgets, as our data indicate that 32% of the total SOC pool in Chewacla units is stored below 1 m. Roots within the system may be responding to nutrients at depth, only averaging 36% in the top 20 cm, but are not as abundant in buried surfaces compared to topsoil A horizons. Field data collected from current Chewacla soil series map units are complex and highly variable because of the large differences between geology, land-use, and drainage basin area. High spatial variability in physical and chemical soil characteristics makes SOC modelling and land-use planning challenging in floodplains and updated soil-landscape models are needed to more accurately map alluvial soils in the Southeast region.

CHAPTER 2

Separating Hydric Components from Piedmont Floodplain Soil Map Units for Improved Land-Use Planning in North Carolina

Abstract

The Chewacla soil series (fine-loamy, mixed, thermic Fluvaquentic Dystrudepts) is mapped extensively (513,000 ha) on floodplains of the southeastern United States. Chewacla is a somewhat poorly drained soil commonly mapped as a complex/association with the hydric soil series Wehadkee (fine-loamy, mixed, thermic Fluvaquentic Endoaquepts). In North Carolina, Chewacla is mapped along streams in 33 Piedmont counties, 9 mapped undifferentiated groups that contain 40-45% hydric inclusions. Land-uses such as forestry, recreational facilities, and utility corridors require more specific information about hydric components of Chewacla map units for planning and management purposes.

The National Wetlands Inventory (NWI) hydrology classes within floodplains was used to locate areas that may contain hydric soils. Field verification was done for 124 locations where soil drainage class and hydric indicator status were quantified. NWI polygons were used to separate floodplain units into consociations of Chewacla units (with 10% hydric inclusions) and predominantly Wehadkee undifferentiated groups (60% hydric soils within). Spatial predictions were applied to Wake County, NC, which has 19,120 ha of mapped undifferentiated floodplain with 45% hydric inclusions. This analysis indicated that the floodplain units in the county only contain 19% hydric soils (3,596 ha), when spatially averaged, compared to the 45% (8,604 ha) currently mapped. Thepatial separations allowed for visualization of the location of wetland areas along streams, which is important for land-use planning. Landscape and stream factors such as stream sinuosity, stream gradient, hydraulic gradient, distance from stream, and distance

to nearest potential blockage (bridge, culvert, dam) were all significantly ($p < 0.05$) related to the location of hydric soils within Piedmont floodplains. By gathering field information on soils mapped as Chewacla and using GIS to separate the hydric components of the floodplain, soil surveys can be improved to provide valuable information to end-users regarding management of alluvial landscapes in the southeastern USA.

Introduction

Riparian soils in the Piedmont of North Carolina (NC) are poorly understood and were rarely studied in the past. Soils in floodplains of this region are commonly mapped as the Chewacla soil series (Fine-loamy, mixed, active, thermic, Fluvaquentic Dystrudept). In NC, the Chewacla series is mapped as either a consociation with 5% hydric inclusions or as an undifferentiated group with 20-45% hydric inclusions depending on the county boundaries, which correspond to soil survey areas. A consociation is a map unit in which one soil series/component dominates with similar smaller components within that do not affect land-use planning of the map unit. An undifferentiated group contains 2 or more different components that can be separated, but typically are not due to limited land-use such as flooding or slope (Soil Science Division Staff, 2017). Land-uses such as forestry operations, recreational facilities, and utility crossings frequently occur in floodplain soils. Broad soil survey units along floodplains are problematic for land use planning because they provide little information to end users about the abundance and location of hydric soils within.

Riparian areas or floodplains are defined as the boundary between aquatic and upland systems (Sedell et al., 1991; Naiman et al., 2005). Riparian areas flood frequently and alluvial soil formation is a product of sediment flux derived from the upland drainage basin which is controlled by bordering topography, stream size, and vegetation (Bilby, 1988). Due to the nature of floodplain soil genesis, alluvial soils derived from similar flood events are often homogenous in texture or have stratified layers reflecting different magnitudes of flooding (Happ, 1945; Swanson et al., 1982). Water tables in floodplain soils fluctuate seasonally and typically have periods of standing water and surface soil saturation outside of the growing season (winter-spring) with varied duration of dry periods occurring during the summer, depending on alluvial landscape characteristics (Hall, 1988).

Hydric soils are defined as soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Environmental Laboratory, 1987). In saturated soils with anaerobic conditions, microbes use iron and manganese as electron acceptors due to lack of oxygen, forming redoximorphic features. When ferric iron (Fe^{3+}) is reduced to ferrous iron (Fe^{2+}) it becomes soluble and locations in soil that have lost ferrous iron appear as gray redoximorphic depletions. Iron exposed to oxygen in the soil will turn to a red or yellow color indicating ferric iron (Vepraskas & Sprecher, 1997). Redox features are used to identify hydric soils based on Munsell value and chroma, abundance, and depth criteria (USDA, 2016).

The National Wetlands Inventory (NWI) is produced by the U.S. Fish and Wildlife Service as spatial polygons representing wetlands. This dataset was created specifically to inventory and map wetland fish and wildlife habitat, as well as for use by resource managers to identify areas for flood protection and pollution control. Polygons are characterized by a combination of variables representing system (marine, estuarine, riverine, lacustrine, palustrine), class (dominant vegetation or bottom cover), and water regime (saturation frequency) (Cowardin et al., 1979). In NC, the NWI spatial dataset is derived from 1980s color infrared leaf-off aerial imagery by identifying surface water/saturated soils and is validated with soil surveys and field verification (U.S. Fish and Wildlife Service, 2019). Discrepancies in NWI are usually in drier to seasonally or temporarily saturated wetlands, due to difficulty interpreting aerial imagery (Tiner, 1997). To jurisdictionally meet wetland status the location must meet 3 characteristics: hydric soil, hydric vegetation, and hydrology (Environmental Laboratory, 1987). NWI maps cannot be assumed wetland without proof of all 3 hydric characteristics and thus a combination with soil survey data may help identify wetlands at the floodplain scale. Various studies have looked at NWI accuracy using both field and remote sensing verification to identify wet flooded areas using Landsat satellite imagery. Together these studies have found that remote sensing imagery is a valuable resource for identifying areas that will flood, but have not been able to distinguish components within the larger landscape that may accumulate more water and create hydric soils. (Baker et al., 2006; Ireland et al., 2015; Guidugli-Cook et al., 2017).

Another way to distinguish wetland landscapes is the use of Digital Elevation Models (DEM). These datasets are raster layers representing elevations of the surface of the earth. By using DEMs, landscape features are easier to identify and often low lying and depressional areas accumulate water creating hydric soil (Vepraskas & Sprecher, 1997). Studies have used DEMs to identify landscape features that are associated with hydric soils that previous mapping efforts have not separated. The research involves finding locations using digital terrain that accumulate water (Gallant & Dowling, 2003; Summerell et al., 2004; Murphy et al., 2009; Grabs, 2012; Beaudette, 2013; Gillin et al., 2015; Fink & Drohan, 2016; Wu & Lane, 2017). For stream restoration, Rosgen stream classification identifies channel morphological potential by identifying stability and classifying each valley and stream type. Rosgen classification considers stream width, stream depth, width/depth ratio, floodplain width, entrenchment ratio, stream sinuosity, curvature of stream, slope of stream, and stream pool/riffle features (Rosgen, 1997).

By identifying how water and floodplains interact, one can identify locations subject to saturation and the formation of hydric soils.

Streams in the Piedmont are severely incised within legacy sediment (James, 2013). The almost vertical banks are the result of rapid aggradation of bottomlands from eroded upland soil during the 1860s to 1920s (Happ, 1945; Trimble, 2008). The sediment filled in most pre-colonial channels, especially in areas with water-controlled dam structures (Walter & Merritts, 2008). Once the dams were breached or abandoned, increased volumes of water in the riparian corridor allowed streams to cut into the filled valley bottoms. Today we see the result of this as hydrologic disconnect of floodplains from streams (Costa, 1975). Alluvial soils commonly have a morphology representing time periods of deposition and land-use (Walter & Merritts, 2008; Ricker et al., 2012; Wegmann et al. 2012). Piedmont alluvial soils formed in legacy sediment typically have a thin ochric epipedon (light colored A horizon) and a loamy cambic horizon (Bw horizons) that contains redox features. In many regional floodplains it is common to observe buried hydric soils underneath legacy sediment. These soils are distinct from the overlying anthropogenic deposits in that they typically have thick A horizons that contain large amounts of organic material, over a lighter Bg horizon and basal gravels or rock (Happ, 1945; Costa, 1975; D'elia et al., 2017). Soil profiles in Piedmont floodplains can vary significantly in color, depths, textures, and horizons (Wade et al., 2020; UC Davis, 2019).

This study used a combination of NWI field verification and digital terrain analysis to separate hydric soil components from floodplain map units in the Piedmont of NC. Previous studies have shown that NWI is not always a reliable indicator of where wetlands are on the landscape. When many of the spatial data products were being developed there were not enough resources to field verify each wetland and drier wetlands were mapped sparingly (Tiner, 1997).

In addition, Summerell et al. (2004) discussed how difficult digital terrain mapping was for floodplains with incision into deep legacy sediment. Through field verification of NWI we were able to identify locations containing hydric soils and describe fluvial landscape characteristics that can predict the presence of hydric soils.

Due to the recency of many legacy sediment deposits, the varying landscape, and the lack of previous studies; this leaves many discrepancies in reliably mapping hydric soil locations within Piedmont floodplains. The morphology also poses issues with identifying hydric soils within. To our knowledge, no studies have used NWI and digital terrain methods to separate hydric components of floodplain soil survey map units in the Piedmont region of the Southeast USA. Therefore, the goals of this study were to 1) combine soil survey and NWI spatial data layers to better predict hydric soil locations, 2) field validate NWI polygons in floodplains and 3) identify landscape features that are significantly related to saturation and formation of alluvial hydric soils.

Materials and Methods

Site Description

This study focused on bottomland soils in the Piedmont physiographic region of NC. The Piedmont region covers approximately 21,000,000 ha in the United States, from Alabama to New Jersey (Cohen, 2000). Various rocks makeup the basement geology of the Piedmont including metamorphic, metavolcanic, and metasedimentary suites with intrusions of younger granitic rocks (NCGS, n.d.). North Carolina has 35 counties that contain Piedmont landscapes, bordered by the Coastal Plain to the east and Blue Ridge Mountains to the west. Upland Piedmont soils in the region are usually mapped as Kanhapludults that contain highly weathered 1:1 clays and high amounts of iron oxides (primarily hematite) that gives the subsoil a red color

(NCSU, 1999). Piedmont floodplains are often characterized by thick layers of reddish-brown fine-loamy textured deposits (legacy sediment) derived from eroded topsoil during poor agricultural practices after European settlement (Happ, 1945; Trimble, 2008). Regional differences in stream and watershed characteristics such as basin size, lithology, upland land-use, and the history of dam construction (and breaching), result in complex and variable riparian soil characteristics in the Piedmont (Megonigal et al., 1993).

We studied soils mapped as Chewacla series in 9 NC counties (Figure 2-1). Counties differed in map unit type (consociation and undifferentiated group) and physiographic sub-province (Felsic Crystalline, Slate Belt, Triassic Basin). Map units contain 5% inclusions of hydric soils in Chewacla consociations and 20-45% hydric inclusions in undifferentiated groups. Hydric soils included in Piedmont floodplains are typically Wehadkee (Fine-loamy, mixed, active, nonacid, thermic, Fluvaquentic Endoaquepts) or Chastain (Fine, mixed, semiactive, acid, thermic Fluvaquentic Endoaquepts) series (Soil Survey Staff, 2020). Sites were selected on floodplains of streams of smaller order (Strahler 1^{st}-5^{th}) ranging from 36 to 11,000 ha drainage basins. Watersheds varied in land-use from primarily forested (70-89%, n = 28), agricultural land (43-56%, n = 37), urban (42-71%, n = 24), with additional mixed land-use watersheds (n = 35). Many streams throughout this area have been affected by human activity such as straightening, dredging and levee build-up, damming, and filling for construction purposes. Areas of obvious human influence were avoided in our field studies.

National Wetlands Inventory Data

The NWI provides locations and descriptions for wetlands across the United States and for this study we were interested in the water regime for nontidal wetlands given to the polygon represented by letters A-K. Most wetland polygons mapped in Piedmont floodplains have class

A, and C with occasional B, H, and F classes. Water Regime class A is the driest hydrology representing areas that are temporarily flooded and codes >A typically have longer hydroperiods. For example, class C is seasonally flooded, class B is seasonally saturated, class F is semi permanently flooded, and class H represents permanently flooded polygons (U.S. Fish and Wildlife, 2019). Field validation points were randomly generated within floodplains grouped into the following categories: no NWI polygon, NWI class A, and NWI classes greater than A (collectively B, C, H, F) for comparison to hydric soil indicators at each point.

Field Validation

One hundred and twenty-four locations throughout the NC Piedmont were field observed and described for hydric soil status. As seen in Figure 2-1, points were randomly selected from Chewacla map units that contained NWI polygons with varied water regimes. Soil observations were dug with a spade or hand augered to 50+ cm and described. Soils were categorized into nonhydric and hydric soil classes based on the Indicators for Land Resource Region (LRR) P identified from the *Field Indicators of Hydric Soils in the United States* (USDA, 2016).

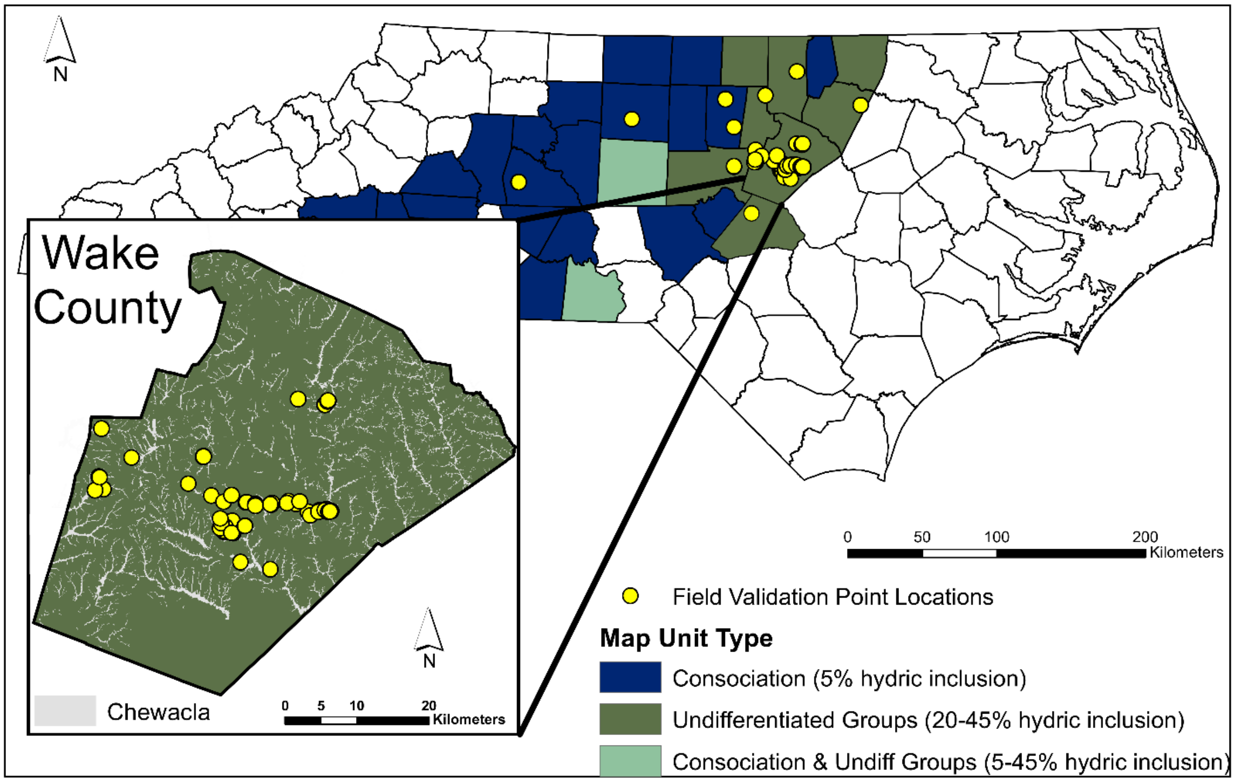

Figure 2-1: Map of field validation points in Chewacla map units within the North Carolina Piedmont. Dark blue counties (n = 22) represent floodplains mapped as a Chewacla consociations with predicted 5% hydric inclusions. Olive green colored counties (n = 8) represent Chewacla map units mapped as an undifferentiated group containing larger inclusions of hydric soils. Mint green represents counties (n = 2) that have floodplains mapped as both Chewacla consociations and undifferentiated groups (Soil Survey Staff, 2020).

Points from field validation within Chewacla floodplain map units were grouped into categories based on their location within NWI polygons. Categories from predicted driest-wettest hydroperiod were “not within NWI”, “class A NWI”, and “classes >A NWI”. Points that were hydric soils within each category were counted and indicator status recorded. To estimate the percent hydric soils within each category, the count of hydric soils was divided by total count in each category and multiplied by 100. Hydric soils percent per NWI hydrology class can be used to represent the map unit type and percent hydric inclusions within the floodplain soil map unit.

Soil properties were spatially analyzed to separate hydric components from the floodplain. By field validating 124 points across diverse Piedmont floodplains and NWI polygons, we determined which areas of floodplain map units are likely to be hydric spatially. By layering and merging the NWI polygons with the soil survey Chewacla map units, 2 new units were created on the floodplain. The 2 new units represent areas likely nonhydric and hydric that, combined with stream and land characteristics, can provide more precise information about wetland locations than the current map units provide.

GIS Land Characteristics

Digital Elevation Models (DEM) derived from LiDAR at a 1-meter resolution were used to analyze characteristics of the floodplain. DEM tiles were downloaded from North Carolina's Spatial Data Download provided by NC Floodplain Mapping Program (NC Risk Management Office, 2018). Quantitative properties at each field point (n = 124) including Strahler stream order, drainage basin area (ha), stream gradient (%), stream sinuosity (m/m), floodplain width (m), distance from stream (m), height above nearest drainage (HAND) (m), hydraulic gradient (HAND/distance from stream) (m/m), and distance to nearest stream obstruction (m) (dam, road, culvert, etc.) were measured. These characteristics were chosen based on field observations and common geomorphological phenomena that may alter floodplain morphology. Typically, more incised streams with tall cut banks that channelize flow produce less hydric soils, especially close to the active channel and natural levee (Rosgen, 1997).

There are various landscape and geomorphic factors that can be related to the formation of hydric soils in floodplains. Stream order based on Strahler's method counts channel segments coming together at identical magnitudes to increase order. Streams at higher orders will be larger and typically less confined on a less steep gradient, therefore overbank flow is more frequent between the floodplain and channel (Rosgen, 1997). Drainage basin size measures the area of the watershed that flows into a point with larger watersheds having more water and higher stream order (Strahler, 1957). Stream gradient is the slope of the stream channel and in many cases higher gradient streams will channelize flow and not allow for overbank deposition and prolonged ponding. Stream sinuosity is a measure of how straight/curved a stream is by measuring real stream channel distance divided by distance covered. A sinuosity higher than 1.0 represents a stream with curves or meanders that allows more overbank flow and ponding of water. Wider unconfined floodplains allow for lateral movement of the stream down the valley, creating more alluvial landforms such as oxbows or meander scars that pond surface water and intersect the ground water table (Rosgen, 1997). Distance from stream, HAND, and hydraulic gradient may help determine if the incision of streams into the floodplain is a factor in hydric soil formation and spatial location within the riparian corridor (Groffman et al., 2003). Hydric soils may not exist close to incised streams due to groundwater cutoff (Poff et al., 1997). Because many floodplains in the Southeast Piedmont are closely bordered by upland development, anthropogenic interference may also affect alluvial soil characteristics. Channel obstructions such as roads, bridges, culverts, dams, or animal blockages (such as beaver dams) may pond water, allowing for the formation of hydric soils within small floodplains (Walter & Merritts, 2008).

Stream Order classification was quantified using the "stream order" tool in ESRI ArcMap. Stream gradient and sinuosity were measured on 300-meter stream segments, measured 150 m longitudinally upstream and downstream from the sampled soil location. Streams were drawn based on GIS "flow accumulation" tool from flow direction d8 layer. Segments of the stream were analyzed using the "Stream_Gradient_26_Sinuosity_v10" toolbox that adds vertices to endpoints and calculate based on line-segmented streams and elevation from the DEM. Stream gradient was recorded in percent (Diltz, 2015). Floodplain widths were measured manually based on a combination of slopes breaks (0-3% floodplain, >3% upland) and the delineated soil map unit width. Distance from stream was created by using the "Euclidean Distance" tool in GIS. HAND layer was created by using the "Flow Distance" tool in GIS created from the layer output from "Flow Direction" tool D-infinity (dinf) setting (Nobre et al., 2011). Hydraulic gradient was created using the "Raster Calculator" tool dividing HAND layer by distance from stream. Distance to nearest obstruction was manually measured as the distance from the soil sample point to a part of stream that can be or is currently obstructed such as road crossings, culverts, or dams that form a lake/pond using 2019 ArcMap basemap aerial imagery.

Statistical Analyses

Study site soil, floodplain, and stream characteristics were represented by name of location, NWI hydrology class, hydric status determined by hydric indicators, and depth to redox depletions (field observed). Analyses of soil pedons and features were done using RStudio (RStudio Team, 2020). ANOVA and Tukey honest significant difference (HSD) pairwise comparison tables were created to determine differences between hydric and nonhydric soil by landscape characteristic (Olleveant et al., 1999). Statistical tests were considered significant at $\alpha = 0.05$ for all calculations. Boxplots were created to visualize median, upper and lower quartiles, and outliers within the datasets.

Individual landscape characteristics, on their own, may not determine or predict whether a floodplain soil at a given location will be hydric or not. Therefore, multiple characteristics were combined into logistic regression to determine which combined landscape/hydrologic variables best predict alluvial soil hydric status. RStudio was used to create logistic regressions producing AIC, R-squared values, p-values, and F statistics for each analysis.

GIS Spatial Separation of Hydric Soils

Chewacla soil map units were selected out of the Soil Survey Geographic Database (SSURGO) for all Piedmont counties in NC (Soil Survey Staff, 2020). Units of Chewacla within Wake County were selected for additional analysis because the floodplains are mapped as undifferentiated groups and it is the second most populated county in NC which requires refined hydric soil information for planning purposes. Wetland polygons from NWI were merged into Chewacla units within Wake County (U.S. Fish and Wildlife Service, 2019) and classified into hydrology class A (temporarily flooded) and classes >A (seasonally to permanently flooded). Units were edited using ArcGIS editor and advanced editor toolbar to remove or combine polygons less than 1 ha in size (Soil Science Division Staff, 2017). Map units created were given hydric inclusion information based on NWI field validation done previously with 124 points. Class A and no NWI units were combined to form Chewacla consociations, representing units with 10% hydric and 5% well-drained inclusions. Classes >A units were merged to create Wehadkee undifferentiated groups representing 60% hydric soils, with 40% nonhydric inclusions (Figure 2-2).

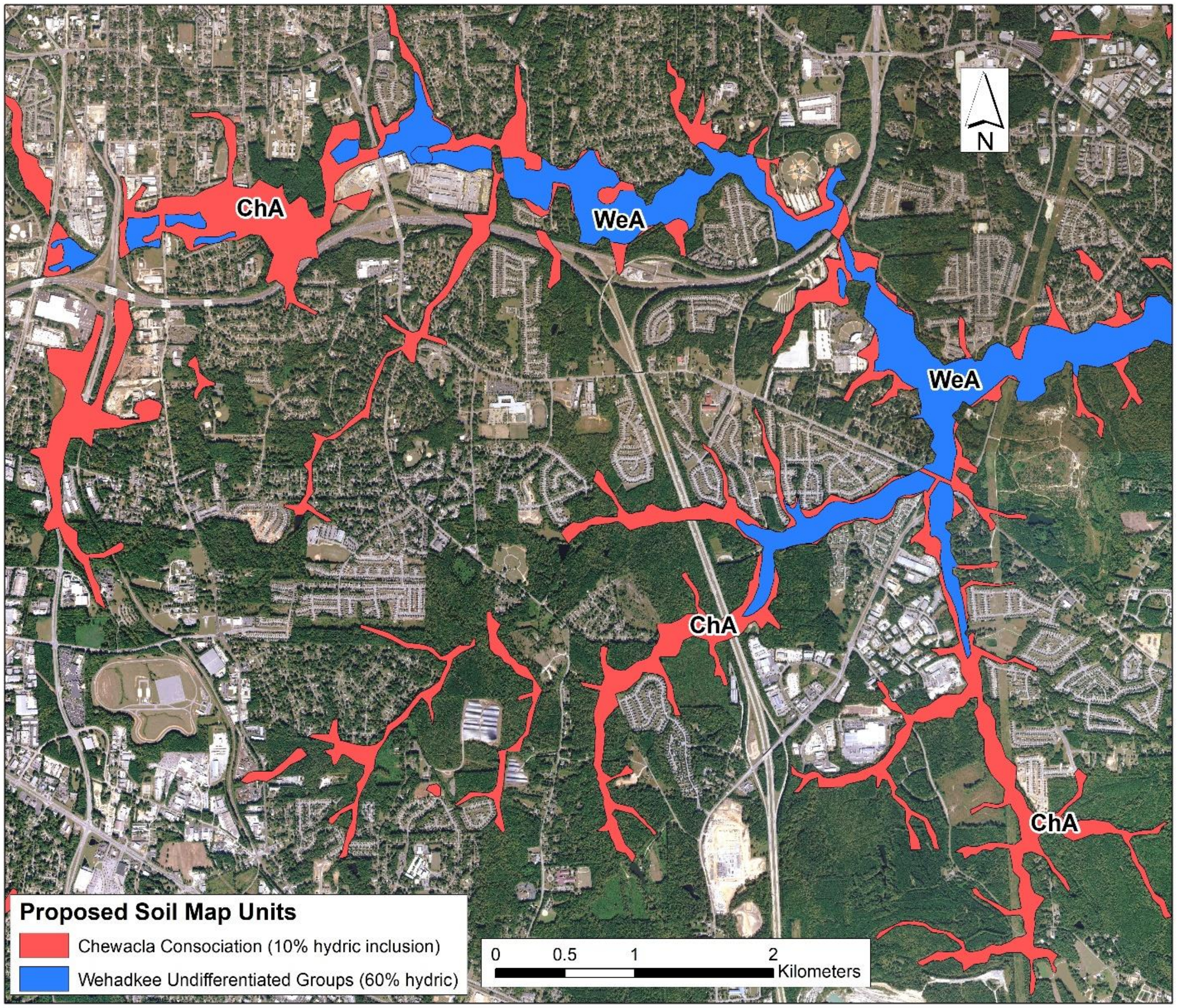

Figure 2-2: Map illustrating soil separation for North Carolina Piedmont floodplains. Current soil survey data represents the entire floodplain as a single map unit of Chewacla Undifferentiated Group with 45% predicted hydric soils within. This example map shows more defined spatial areas of likely nonhydric soils and areas likely to be hydric (WeA) based on combined soil survey-NWI datasets and 124 field observations in the region.

Results

Field Soil Description and Sampling

Points were classified as hydric when the description from the field met a hydric indicator. Thirty out of 124 soil pedons (24%) met hydric criteria. Hydric indicators that were met were A11: Depleted Below Dark Surface, F2: Loamy Gleyed Matrix, F3: Depleted Matrix, F6: Redox Dark Surface, and F19: Piedmont Floodplain Soils (Figure 2-3). All pedons that met at least one hydric indicator were considered hydric excluding 6 pedons that solely met F19 as an indicator (because F19 is only a test indicator in LRR P). Drainage classes based on depth to common redox depletions ranged from poorly drained to well drained, with 34 pedons poorly-drained (PD), 62 somewhat poorly drained (SPD), and 28 moderately well (MWD) and well drained (WD). Thirty-three pedons in the SPD class had redox depletions within 30 cm of the soil surface. In these cases, the free water at a shallow depth may occur frequently but drains for a considerable period of the growing season.

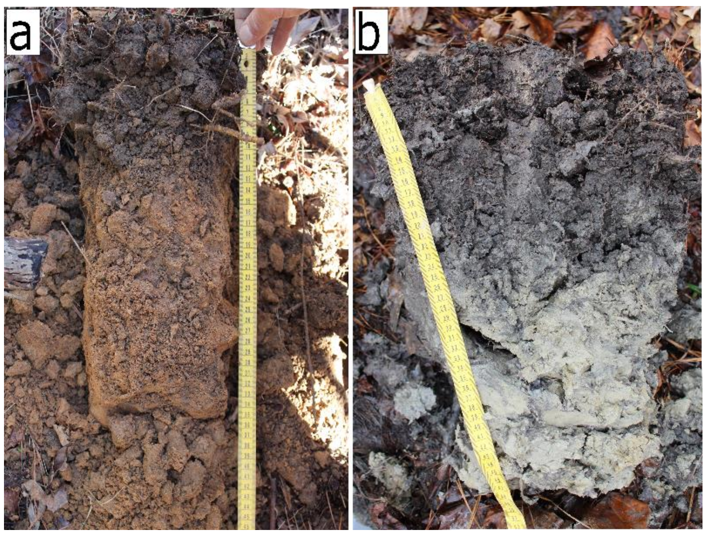

Figure 2-3: Representative soil pedons in Wake County floodplains mapped as Chewacla undifferentiated groups (45% hydric inclusions). (a) is a nonhydric soil with a drainage class of somewhat poorly drained. (b) is a hydric soil meeting hydric indicators A11 and F3.

National Wetlands Inventory Data Validation

Tables were created to determine hydric soil percentages within each NWI water regime. Sixty field pedons were selected and sampled outside of NWI polygon boundaries, 30 were in class A NWI polygons (temporarily flooded), and 34 in NWI classes >A (seasonally saturated/flooded, to permanently flooded). The category of points that are not within NWI polygons had 8 out of 60 hydric soils, representing 13% of sampled areas. Points in class A had 2 out of 30 hydric soils, representing 7% hydric inclusions within. Classes greater than A water regimes had 20 out of 34 soils hydric at 59% hydric (Table 2-1). Classes A and no NWI areas were grouped together because of similar hydric areas with a mean 10% hydric inclusions per polygon for mapping purposes.

Table 2-1: Table of 124 points used in field validation results. Areas with no NWI and class A NWI produced low hydric probability compared to NWI classes >A.

	No NWI mapped	NWI hydrology class A	NWI hydrology classes >A
Pedons sampled, n	60	30	34
Hydric soil observations, #	8	2	20
Accuracy of NWI, % hydric	**13%**	**7%**	**59%**

Spatial Separation of Map Units and Regional Land Area

Based on results from field validation (Table 2-1), current soil survey Chewacla floodplain map units were separated into two soil map units: Chewacla consociations (no NWI + NWI A areas) and Wehadkee undifferentiated groups (areas within NWI >A polygons). These new spatially separated units were assigned a % hydric soils (Chewacla (10%), Wehadkee (60%)) and applied in Wake County (Table 2-2). The total area of current mapped Chewacla undifferentiated groups in Wake County is 19,120 ha. Our separation created Chewacla consociation units on 15,752 ha and Wehadkee undifferentiated groups on 3,368 ha of floodplain (Table 2-2). Nonhydric soils are predicted to be in 90% of consociations and 40% of undifferentiated groups totaling to 14,737 ha. Hydric soils are predicted to represent 10% of consociations and 60% of undifferentiated groups coving 3,596 ha of floodplains. Based on our analysis of Wake County the floodplains contain 81% nonhydric soils and an average of 19% hydric soils (Table 2-2).

Table 2-2: Soil map unit sizes and proportions of hydric soils for wake county. A total of 19,120 ha of undifferentiated soil was separated into 2 units of Chewacla consociation and Wehadkee undifferentiated groups based on field validation results.

Soil map	% Chewacla and other nonhydric soils	% Wehadkee and other hydric soils	Total (ha)	Chewacla and other nonhydric soils (ha)	Wehadkee and other hydric soils (ha)
Original map composition (NRCS)	55%	45%	19,120	10,516	8,604
Updated map Chewacla Consociation	90%	10%	15,752	14,177	1,575
Updated map Wehadkee undifferentiated group	40%	60%	3,368	1,347	2,021
Updated county spatially averaged composition	81%	19%	19,120	15,524	3,596

Landscape Characteristics Related to Floodplain Hydric Soil Formation

Stream gradient ($p = 0.017$), stream sinuosity ($p = 0.001$), floodplain width ($p = 0.028$), HAND ($p = 0.012$), distance from stream ($p < 0.001$), hydraulic gradient ($p = 0.002$), and distance to nearest stream obstruction ($p = 0.011$) were significantly different between hydric and nonhydric soil locations (Figure 2-4). Stream order, drainage basin size, and distance to nearest stream blockage downstream were not statistically different at $\alpha = 0.05$. Combining multiple factors into logistic regression resulted in statistically significant results ($p < 0.001$). However, R-squared values for these logistic regressions were low and ranged from 0.037 to 0.146 (Table 2-3). Significant multivariate analyses included all variables ($n = 11$), 6 variables, 2 variables, and best single variable models (distance from stream). Overall, addition of more predictors did little to improve the models compared to the 2 and single variable models. The most significant 2 variable model included distance from stream + stream sinuosity created the most significant results according to p value and R-squared (Table 2-3).

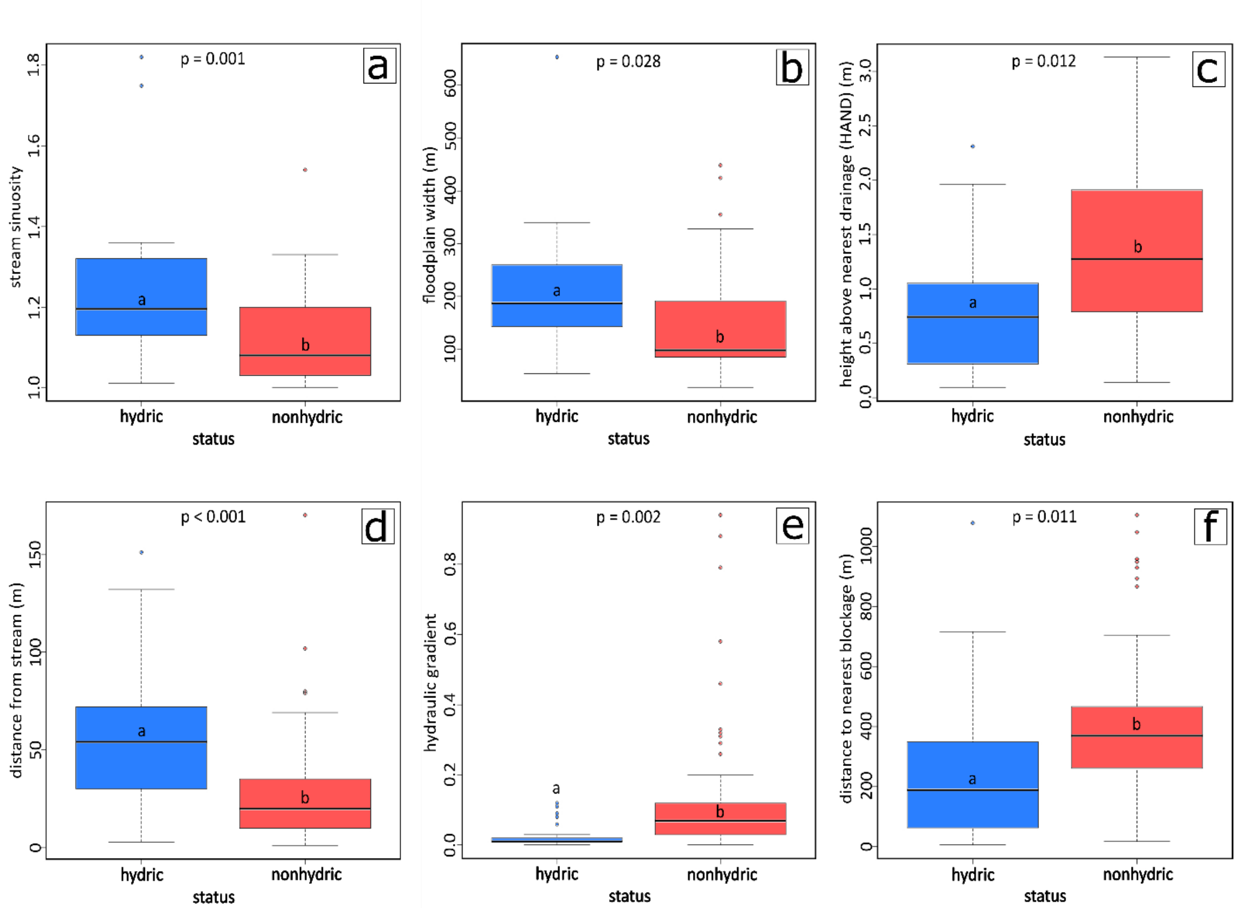

Figure 2-4: Boxplots showing significantly different medians for landscape predictors between hydric and nonhydric floodplain soil locations. Means were compared using Tukey's HSD pairwise comparison. Boxplots showing (a) significantly higher sinuosity at hydric soil locations compared to nonhydric soil locations, (b) significantly wider floodplains in hydric soil locations (c) point height above stream level is significantly higher in nonhydric soil locations (d) hydric soils occurred significantly farther away from the stream channel compared to nonhydric locations (e) hydraulic gradient is significantly lower in hydric soil locations (f) hydric soils are located significantly closer to stream obstructions than nonhydric soils.

Table 2-3: Various landscape and stream variables and combinations used in logistic regression to predict alluvial soil being hydric**.**

Analysis	AIC	p value	R-squared	F statistic
All variables	120.69	0.004	0.065	8.42
6 variables †	112.21	0.004	0.065	8.50
Distance from stream + sinuosity	128.25	< 0.001	0.147	21.03
Distance from stream	134.06	< 0.001	0.146	20.87

† sinuosity + hydraulic gradient + distance from stream + distance to blockage + distance to upstream blockage + drainage basin size

Discussion

National Wetland Inventory polygons and field verification were useful tools when combined to determine where nonhydric soils are within floodplains (Tiner, 1997; Wu & Lane, 2017). Other studies have also found that the combination of NWI and landscape/stream characteristics can possibly indicate hydric soils better than NWI data alone which has been determined to have field validated accuracies from 43- 74% (DiBello et al., 2016; Gage et al., 2019). Similarly, we found areas mapped with NWI hydrology classes >A only contained 60% hydric soils, with substantial areas of somewhat poorly drained soils within the units. Counties have mapped Chewacla and hydric inclusions following different mapping standards over time (Piedmont soil surveys completed 1960-2006), none of which accurately portray the amount of hydric soils present in regional floodplains. In some cases, the mapping of floodplains as hydric soils was done to avoid development in the area due to something like flooding frequency or slope (Gallant & Dowling, 2003; Murphy et al., 2009). However, small order floodplains in the Piedmont have complex geomorphology due to past land-use and aggregation of legacy sediment (Trimble, 2008).

Piedmont alluvial soils, like the Chewacla series, are unique in that they are mapped across all the soil systems of the Piedmont (Felsic Crystalline, Mixed Mafic/Felsic, Slate Belt, Triassic Basins) as well as across the major physiographic boundary from the Piedmont into the

Coastal Plain (Soil Survey Staff, 2020; NCGS, n.d.). Floodplains with watersheds draining different physiographic provinces and land cover most likely differ in the mineral composition of parent material and should be analyzed separately from one another (Lindbo, 1997). Infilling of small Piedmont floodplains hinders our ability to locate areas with hydric soils relative to larger Coastal Plain floodplains where fluvial landforms, such as low-lying meander scars, are easily identified from aerial images and DEMs (Ricker & Lockaby, 2015). Lack of identifiable fluvial landform boundaries in the semi-confined valleys of the Piedmont likely creates many discrepancies in the location of hydric soil indicators. Separating undifferentiated units at a 1:24,000 scale is possible and resourceful by minimizing extra fieldwork by planners (Puckett et al., 1990). Units of hydric undifferentiated groups encompassing NWI >A hydrologic groups should be studied further using floodplain and stream characteristics to geospatially model the location of hydric soil landforms.

Field Soil Description and Sampling

Field descriptions within previously mapped soil survey and NWI units suggest hydric soil location and abundance within these landscapes are largely unknown. Piedmont floodplains are relatively young landscapes that have not had time to adjust to changing hydrology due to erosion and sedimentation dynamics. It is possible that some soils have not yet formed redoximorphic features to the extent of hydric indicators due to the parent material eroded from uplands with predominantly crystalline iron or high inputs of alternate electron acceptors such as Mn with eroding sediment and dissolved nitrate with ground and surface waters. Hydric indicator, F21, or Red Parent Materials (RPM) was created to address saturation in soils with a hue 7.5YR or redder matrix (USDA, 2016). The indicator was created for places where redox features are not prominent in highly saturated conditions (Elless et al., 1996; Rabenhorst, 2011;

Ford, 2014). Overall, a study of hydric indicator, F21, revealed that in order to classify the soil as hydric they recommend laboratory acquired Color Change Propensity Index (CCPI) data or declaring it as potential problematic soil if within the regions of RPM (Mack et al., 2019). In addition to the bright red-yellow colors seen in Piedmont floodplains, the favored thermodynamics of the systems may explain the lack of redox features observed. These systems also frequently receive runoff from agriculture providing nitrate to reduce first. Manganese is also present in most soils in both exchangeable and organic matter associated forms to reduce early on, especially in regions weathered from rocks with heavy concentrations of biotite (McDaniel & Buol, 1991).

In addition to these factors, Piedmont floodplains sit between relatively steep hillslopes and incised streams creating a steep gradient for groundwater flow. The groundwater in these systems may be moving fast enough to provide oxygen to soils and inhibit iron reduction (Megonigal et al., 1993; Marcais et al., 2017). In waterlogged soils, the system will reduce what is thermodynamically favored first and move down the sequence of reduction (O_2, NO^{3-}, Mn^{4+}, Fe^{3+},…, H^+) (Ponnamperuma, 1972; Ohlsson, 1979). Therefore, current field indicators may not be sufficient by themselves and additional well or laboratory data may be required to positively identify Piedmont alluvial wetlands. Twenty soils we observed had a matrix value ≥ 4 and chroma of 3. Under hydric indicator, F19 Piedmont Floodplain Soils, a soil with chroma 3 or less can be hydric if it contains 20% or more distinct or prominent redox concentrations. Six of the 20 chroma 3 soils (30%) made hydric indicator F19. Based on our observations, these soils average 5.6% concentrations and 7.8% depletions (by volume) within 25 cm of the surface. Often Piedmont floodplain soils will have iron depletions to the surface, but not classify as hydric due to the lack of iron concentrations required for F19. The redox features within 30 cm of the surface show that free water is not permanent and drains for periods of the growing season (Soil Survey Staff, 2020). For these reasons, F19 may need to be reevaluated in this region, adding criteria for location and abundance of depletions starting at the soil surface. In order to validate F19 and other problematic floodplain soils for hydric status, monitoring well hydroperiod and Indicator of Reduction in Soil (IRIS) data should be gathered to identify saturation periods relative to observed morphology (Castenson & Rabenhorst, 2006; Berkowitz & Sallee, 2011).

National Wetlands Inventory Data Validation

We determined that NWI data was more useful in identifying locations that are nonhydric. Through field validation, we determined that areas without NWI delineations and areas of NWI water regime A (temporarily flooded) were likely nonhydric soils with only 10% inclusion of hydric soils. Wu and Lane (2017) similarly concluded that 59.2% of NWI polygons mapped in the prairie pothole region of North Dakota currently did not have visible water and 37% of units mapped have visibly dried since NWI polygons were delineated from 1980s imagery. DiBello et al., (2016) found that NWI had poorly predicted vernal pool locations in New England with only 43% of identified vernal pools present within NWI datasets. Another study attempted to separate hydric soil from nonhydric in an undifferentiated group in Pennsylvania's Northern Appalachians. Their use of curvature, flow accumulation, slope, depressions, and total wetness index (TWI) aided in predicting hydric soils with 67% accuracy (Fink & Drohan, 2016). Some studies grouped riparian areas with hydric soils due to the flooding frequency and saturation observed in regions (Gallant & Dowling, 2003; Murphy et al., 2009) while others have used DEM and aerial imagery to identify and validate NWI polygons (Wu & Lane, 2017). The NWI provides resources to start looking at regions of interest, for example Gage et al. (2019) concluded NWI polygons have 74% accuracy compared to their field validation using 3-factor wetland delineation (hydric soils, hydrophytic vegetation, and hydrology present). In the case of Munger et al. (1998) the Conservation Biologists used NWI to identify regions likely preferred by Columbia Spotted Treefrogs (*Rana luteiventris*) and Pacific Treefrogs (*Hyla regilla*). In areas of NWI >A water regime we found hydric soils 59% of the time, indicating wetter site conditions and longer saturation in the floodplain. There are known examples of NWI polygons including up to 40% nonhydric soil within (Tiner, 1997). The discrepancies are likely in areas like this study that have complicated geomorphology and parent material (Summerell et al., 2004). We recognize that remote sensing is not ideal on its own for identifying hydric soils, especially in floodplains with unique temporal hydrology which is difficult to capture in imagery (Baker, 2006; Guidugli-Cook et al., 2017; Wu & Lane, 2017). For these reasons, areas we predict to be 60% hydric soils (NWI >A floodplain polygons) need to be further field validated by land managers prior to decisions regarding potential uses.

Spatial Separation of Map Units and Regional Land Area

Through field validation we were able to identify areas that can be mapped as hydric undifferentiated groups consisting of mostly the Wehadkee soil series. In Wake County, these areas represent 3,368 ha of the 19,120 ha of the floodplains that are currently mapped. This hydric soil within predicted Wehadkee undifferentiated groups plus the 10% as an inclusion in predicted Chewacla consociations for Wake County represents 19% hydric soil within floodplains, which is currently mapped as 45%. This shows that there is likely less hydric soil in these areas than map units currently predict. Our data suggests that all counties where the Chewacla soil series is mapped could use our proposed map unit separation. This research suggests that counties that mapped Chewacla as a consociation (5% hydric inclusions) are underestimating hydric soils within floodplains and counties where Chewacla was mapped as an undifferentiated group with 40-45% hydric inclusions are overestimating hydric soils within. In Florida, a team proposed creating a map unit between a complex and undifferentiated group called an intriplex that would identify areas “so intricately associated that they appear at random” to help soil surveyors that were delineating soil in tedious grid patterns in areas dominated by nonpatterned karst topography (Puckett et al., 1990). Studies suggest ways to validate and determine map unit composition (Steers & Hajek, 1979; Brus et al., 2011) but, as far as we know there are no studies validating Soil Survey’s undifferentiated group estimates in floodplain landscapes.

Landscape Characteristics Related to Floodplain Hydric Soil Formation

Out of 11 stream and landscape characteristics we tested to understand the location of hydric soils in Piedmont floodplains, 8 were significantly different at $\alpha = 0.05$ representing locations of hydric and nonhydric soils. We can look at characteristics of the floodplain system as a feedback loop, one variable change can affect another variable which impacts the entire alluvial soil system. We observed higher sinuosity for streams around hydric soil locations similar to Frasson et al. (2019). Floodplains were statistically wider in areas where soils met hydric criteria and hydric soil locations were significantly farther from streams, which may indicate local hillslope water additions are the primary driver of hydric soil formation in these landscapes (Grabs et al., 2012). Similarly, the metrics for HAND and hydraulic gradient suggest surface water in incised streams rarely contributes to floodplain groundwater levels creating a “hydrologic disconnect” decreasing groundwater depth as more incision occurs (Amerman, 1973; Summerell et al., 2004; Hardison et al., 2009; Turner et al., 2015). Hydric soils were located statistically closer to stream blockages, probably due to backflow from underfit or clogged water passages increasing soil inundation (Zedler, 2000). Overall, we can use landscape features to predict where hydric soils are likely to be in Piedmont floodplains based on features that influence surface and groundwater levels.

The size of floodplains in this region presents an issue for spatially locating hydric soils. The geomorphology of Piedmont floodplains may vary greatly depending on width of the alluvial bottomland and parent material (Hack, 1982; Turner, 2015; Guidugli-Cook et al., 2017; NCGS, n.d.). Our data suggest that these relatively narrow floodplains may be influenced more by groundwater seepage from side slopes rather than surface water of the stream (Marcais et al., 2017). This may be occurring because incision of the streams caused channelized flow that rarely overtops banks to the floodplain (Rulman & Nutter, 1999; Turner et al., 2015). The width of the floodplain (averaging 160 m) poses issues for soil mapping as well. Soil maps were typically created at an order 2 scale, remotely sensed at 1:24,000 and field validated (Soil Science Division Staff, 2017). Portions of the floodplain at this scale may not properly separate to delineate hydric soil units and broad generalizations must be made.

Multivariate Analysis

Currently there is no single identifier or combination of floodplain and stream characteristic to predict hydric soil status in riparian areas (Zedler, 2000). Our research on landscape and stream characteristics shows significant relationships with landscape attributes, however, single and multivariate analyses did not produce high enough R-squared values to accurately predict locations of hydric soils (Balakrishnan & Cohen, 1991). Chewacla map units vary greatly along the Piedmont of NC and our current estimates were done in sites that represent multiple basins of varying sizes with different upland parent materials and basin land-use characteristics. The region's past and current land-use plays a significant role in shaping the characteristics of fluvial systems (Costa, 1975; Groffman et al., 2003; Trimble, 2008). In addition, soils tend to be older and more developed (Inceptisols) on alluvial lowlands draining mature forested watersheds compared to newly formed soils (Entisols) formed in urban watersheds (Magilligan & Stamp, 1997; Groffman, 2003). Therefore, certain landscape variables may be useful for one site and not predictive for another (Lindbo, 1997).

In order to get better statistical relationships, we propose strategic investigation of the hydric soil Wehadkee undifferentiated group created from the merging of Chewacla soil units and NWI >A hydrology data. More data on hydric soil abundance is needed to change the 60% hydric map units to 75% or greater that is required for a consociation at 1:24,000 scale. Future research will need to group similar watersheds together by physiographic province, land cover, and floodplain size. By grouping similar areas, new mapping techniques for spatially locating hydric soils can be developed along with geospatial models for mapping these areas digitally. We predict that regionally similar floodplain and stream characteristics aid in the better prediction and mapping of Piedmont alluvial soil resources for improved land use planning purposes.

Conclusions

The results from this work shows that current Piedmont floodplain soils are highly variable. Soils range from poorly drained to well drained. These soils also have many basin, landscape, and stream factors that play a role in forming the varied morphologies we observed. We know that it is possible to make a separation between likely hydric and nonhydric soils within current map units. By using NWI and field validation, locations of each type are identifiable for mapping. Our separation method does have issues regarding unit size and map unit composition percent confidence. Our methods were successful at identifying areas of nonhydric soil with only 10% inclusion of hydric soils, however, our confidence in the hydric

Wehadkee undifferentiated group is not at a consociation level yet (60% hydric undifferentiated group would need 75% confidence to become a consociation). By applying land and stream characteristics and evaluating similar areas for dominant characteristics, new consociations of hydric soils within these undifferentiated groups can be created.

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APPENDICES

Appendices A1 includes tables relevant to Chapter 1 and Appendices A2 includes tables relevant to Chapter 2.

Appendix A1

Table A1a: Chewacla soil series pedon locations

		GPS location	
Site	Pedon	Latitude	Longitude
Breeze Farm	BRE_FACE	36˚ 09’ 36.25”	-79˚ 06’ 55.72”
	BRE1	36˚ 09’ 37.32”	-79˚ 06’ 56.38”
	BRE2	36˚ 09’ 36.86”	-79˚ 06’ 56.00”
	BRE4	36˚ 09’ 35.78”	-79˚ 06’ 55.09”
	BRE5	36˚ 09’ 35.30”	-79˚ 06’ 55.72”
Butner Beef Farm	BUT_FACE	36˚ 10’ 52.15”	-78˚ 48’ 58.54”
	BUT1	36˚ 10’ 53.44”	-78˚ 49’ 00.49”
	BUT2	36˚ 10’ 52.90”	-78˚ 48’ 59.72”
	BUT3	36˚ 10’ 52.48”	-78˚ 48’ 59.23”
	BUT5	36˚ 10’ 51.83”	-78˚ 48’ 57.96”
Centennial Campus	CENT_FACE	35˚ 45’ 38.33”	-78˚ 40’ 02.98”
	CENT1	35˚ 45’ 38.01”	-78˚ 40’ 03.53”
	CENT2	35˚ 45’ 37.19”	-78˚ 40’ 03.59”
	CENT3	35˚ 45’ 36.83”	-78˚ 40’ 04.44”
	CENT4	35˚ 45’ 36.36”	-78˚ 40’ 04.82”
	CENT5	35˚ 45’ 37.73”	-78˚ 40’ 05.21”
Johnston Mill Nature Preserve	JMIL_FACE	35˚ 59’ 21.96”	-79˚ 03’ 00.09”
	JMIL1	35˚ 59’ 24.32”	-79˚ 02’ 58.31”
	JMIL2	35˚ 59’ 22.83”	-79˚ 02’ 58.86”
	JMIL3	35˚ 59’ 22.43”	-79˚ 02’ 59.41”
	JMIL6	35˚ 59’ 24.82”	-79˚ 02’ 59.98”
	JMIL7	35˚ 59’ 24.32”	-79˚ 03’ 00.09”
Lake Wheeler Field	LWF_FACE	35˚ 43’ 50.98”	-78˚ 40’ 10.78”
	LWF1	35˚ 43’ 51.36”	-78˚ 40’ 11.61”
	LWF2	35˚ 43’ 50.92”	-78˚ 40’ 12.27”
	LWF3	35˚ 43’ 50.36”	-78˚ 40’ 12.93”
	LWF4	35˚ 43’ 49.99”	-78˚ 40’ 13.61”
Murphy Farm	MF1	36˚ 07’ 08.05”	-78˚ 06’ 21.80”
	MF2	36˚ 07’ 08.14”	-78˚ 06’ 22.21”
	MF4	36˚ 07’ 08.80”	-78˚ 06’ 22.68”
	MF5_FACE	36˚ 07’ 09.12”	-78˚ 06’ 23.20”
	MF6	36˚ 07’ 09.74”	-78˚ 06’ 23.56”
Oxford	OX1	36˚ 19’ 28.73”	-78˚ 34’ 52.15”
	OX2	36˚ 19’ 29.00”	-78˚ 34’ 51.25”
	OX3	36˚ 19’ 29.33”	-78˚ 34’ 50.78”
	OX4_FACE	36˚ 19’ 30.02”	-78˚ 34’ 50.09”
	OX5	36˚ 19’ 30.33”	-78˚ 34’ 49.87”
Parkers Creek	PARK1	35˚ 45’ 09.13”	-79˚ 03’ 03.14”
	PARK2	35˚ 45’ 09.17”	-79˚ 03’ 03.91”
	PARK3_FACE	35˚ 45’ 09.57”	-79˚ 03’ 04.57”
	PARK4	35˚ 45’ 09.71”	-79˚ 03’ 05.47”

Table A1a (continued)**:**

	PARK5	35˚ 45’ 10.11”	-79˚ 03’ 05.86”
	PARK6	35˚ 45’ 10.41”	-79˚ 03’ 06.52”
Raven Rock	RR1	35˚ 28’0 8.27”	-78˚ 55’ 20.06”
	RR2	35˚ 28’ 08.13”	-78˚ 55’ 19.88”
	RR3	35˚ 28’ 07.47”	-78˚ 55’ 20.17”
	RR4_FACE	35˚ 28’ 07.55”	-78˚ 55’ 20.56”
	RR5	35˚ 28’ 07.32”	-78˚ 55’ 20.81”
	RR6	35˚ 28’ 06.80”	-78˚ 55’ 20.81”
Schenck Forest	SHNK_FACE	35˚ 49’ 04.78”	-78˚ 44’ 00.81”
	SHNK1	35˚ 49’ 03.54”	-78˚ 44’ 01.11”
	SHNK2	35˚ 49’ 04.30”	-78˚ 44’ 00.98”
	SHNK3	35˚ 49’ 05.37”	-78˚ 44’ 00.43”
	SHNK4	35˚ 49’ 05.87”	-78˚ 44’ 00.29”
	SHNK5	35˚ 49’ 06.64”	-78˚ 44’ 00.06”
Sloan Park	SP1_FACE	35˚ 38’ 45.93”	-80˚ 38’ 53.61”
	SP2	35˚ 38’ 44.58”	-80˚ 38’ 53.39”
	SP3	35˚ 38’ 44.21”	-80˚ 38’ 52.73”
	SP4	35˚ 38’ 43.91”	-80˚ 38’ 52.32”
	SVAL3_FACE	36˚ 02’ 05.27”	-79˚ 48’ 38.63”
Spring Valley	SVAL2	36˚ 02’ 04.69”	-79˚ 48’ 38.63”
Park	SVAL5	36˚ 02’ 04.43”	-79˚ 48’ 38.22”
	SVAL6	36˚ 02’ 05.60”	-79˚ 48’ 38.24”
Thomas Brooks	TB1_FACE	35˚ 47’ 35.11”	-78˚ 53’ 39.49”
Park	TB2	35˚ 47’ 34.63”	-78˚ 53’ 39.21”
	TB3	35˚ 47’ 34.11”	-78˚ 53’ 38.80”
	TB4	35˚ 47’ 33.70”	-78˚ 53’ 38.03”
	TB5	35˚ 47’ 33.29”	-78˚ 53’ 37.40”
	TB6	35˚ 47’ 32.67”	-78˚ 53’ 36.83”

Table A1b-1: Summary basin data

Pedon	Category†	Forest (%)	Ag (%)	Urban (%)	Impervious surface (%)	Depth to buried surface (cm)	Depth to redox depletions (cm)	Slope (%)	Basin (ha)
BRE	a	38.8	49.9	0.8	0.5	94	66	5.5	340.9
BUT	f	84.2	5.7	0.7	0.5	78	31	5.0	513.1
CENT	m	16.2	0.9	37.8	21.6	147	37	8.0	3339.8
JMIL	f	71.3	11.2	2.8	1.6	117	78	7.9	5858.2
LWF	a	14.4	56.1	6.6	4.0	103	118	6.1	192.6
MF	m	54.1	33.6	1.6	0.9	125	52	5.0	2236.7
OX	m	50.1	20.1	6.0	3.6	171	58	5.0	2035.7
PARK	f	88.8	3.3	0.0	0.1	0	37	11.0	448.7
RR	m	55.2	22.4	2.1	1.1	152	41	8.5	2708.9
SHNK	u	19.8	7.9	45.7	24.9	120	120	8.5	1131.2
SP	a	32.3	54.2	0.5	0.6	63	71	7.9	2708.0
SVAL	u	2.8	0.6	71.2	40.9	114	90	5.9	3602.5
TB	u	18.7	5.3	41.7	19.9	62	56	7.6	476.6

† a = agricultural site, f = forested site, u = urban site, m = mixed site (ag/urban, forest/ag, etc.)

Table A1b-2: Summary basin data

Pedon	SOC total (Mg ha^{-1})	SOC to 100 cm (Mg C ha^{-1})	SOC > 100 cm (Mg C ha^{-1})	Root C pool (Mg C ha^{-1})	P total (mg kg^{-1})	P to 100 cm (mg kg^{-1})	Average depth (cm)	Root density (kg m^{-3})	Root density to 100 cm (kg m^{-3})
BRE	107	107	0	2	26.05	26.05	108	0.46	0.46
BUT	79	43	36	12	13.27	13.27	149	2.06	3.23
CENT	68	42	26	11	56.79	41.4	170	1.65	1.99
JMIL	160	94	66	1	7.78	7.78	188	0.36	0.49
LWF	157	115	42	0	132.55	45.59	167	0.12	0.13
MF	96	89	7	6	8.91	8.91	135	1.13	1.61
OX	126	101	25	12	18.60	18.6	186	1.52	2.21
PARK	108	108	0	8	18.48	18.48	70	1.97	1.97
RR	151	64	87	9	68.55	24.03	164	1.00	1.05
SHNK	73	46	27	4	71.98	32.44	186	0.52	0.73
SP	132	98	34	0	22.07	12.19	203	0.04	0.03
SVAL	114	68	46	12	74.27	59.1	188	1.36	0.14
TB	70	48	22	11	40.64	30.36	174	1.47	1.96

Table A1c-1: Breeze Farm pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-9	1.88	0.17	11.06	29.43	9.59	0.58	11.46	1.14	4.72	1.39
Bw1	9-30	0.71	0.06	11.83	11.38	17.73	0.64	4.79	1.19	4.61	0.65
Bw2	30-46	0.98	0.06	16.33	9.09	21.64	0.34	0.00	1.15	4.57	0.46
Bw3	46-65	1.04	0.05	20.80	20.03	20.27	0.06	0.00	1.30	4.66	0.07
Bg1	65-85	0.59	0.05	11.80	14.13	22.88	0.13	0.00	1.36	4.81	0.14
Bg2	85-95	0.79	0.05	15.80	15.66	24.26	0.02	9.79	1.30	5.14	0.05

Table A1c-2: Butner Beef Farm pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
Ap	0-19	1.54	0.15	10.27	55.63	5.06	6.55	13.27	0.77	5.34	7.39
AE	19-33	0.48	0.05	9.60	51.54	8.01	5.16	0.00	1.16	5.53	8.07
EA	33-43	0.42	0.04	10.50	47.61	8.11	0.22	0.00	1.32	5.38	0.48
E	43-62	0.1	0.02	10.00	53.08	9.28	0.08	0.00	1.35	5.14	0.10
Bcm/E (Mn)	62-115	0.06	0.02	6.00	66.77	7.44	0.05	0.00	1.53	5.80	0.02
Bcm/E	62-115	0.08	0.02	8.00	68.79	8.81	0.00	0.00	1.48	5.59	0.02
Bg	115-130	0.07	0.02	7.00	64.51	13.17	0.00	0.00	1.53	6.06	0.00
BCcm	130-147	0.1	0.02	10.00	69.91	14.55	0.01	0.00	1.80	6.34	0.02
Cmg/Cdg	147+	0.1	0.02	5.00	76.16	16.42	0.01	0.00	1.80	6.74	0.00

Table A1c-3: Centennial Campus pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
C	0-10	0.31	0.02	15.50	94.97	2.51	1.03	0.00	1.18	6.02	2.46
A/Bw	10-22	0.52	0.04	13.00	87.21	4.80	0.99	0.00	1.06	6.01	1.77
C'	22-47	0.26	0.02	13.00	87.70	5.53	1.51	0.00	1.14	6.19	1.29
C/Bw	47-87	0.39	0.03	13.00	82.68	6.05	2.71	25.28	1.05	6.28	1.42
Bw	87-98	0.5	0.03	16.67	74.73	11.18	2.38	16.12	1.24	5.67	4.53
A/C	98-122	0.49	0.03	16.33	74.81	11.15	1.58	15.39	1.22	5.45	1.37
Bg	122-145	0.37	0.03	12.33	69.87	13.67	0.26	0.00	1.55	6.21	0.23

Table A1c-4: Johnston Mill Nature Preserve pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-10	2.26	0.17	13.29	36.39	10.68	0.83	7.53	1.08	6.72	1.77
Bw1	10-22	0.77	0.07	11.00	18.39	19.55	0.14	0.00	1.23	6.40	0.23
Bw2	22-48	0.72	0.07	10.29	2.91	20.66	0.14	0.25	1.06	5.00	0.11
Bw3	48-76	0.61	0.06	10.17	2.37	30.41	0.35	0.00	1.16	5.08	0.26
Bg1	76-108	0.68	0.06	11.33	3.04	30.29	0.09	0.00	1.18	4.99	0.06
Bg2	108-127	0.56	0.05	11.20	28.42	20.98	0.09	0.00	1.34	5.21	0.10
2Ab	127-145	0.99	0.09	11.00	21.38	24.73	0.05	0.00	1.20	5.10	0.05
2Bgb	145-171	0.45	0.04	11.25	28.06	19.60	0.41	0.00	1.43	4.88	0.32
2Cg	171-192	0.22	0.02	11.00	61.53	13.58	0.31	0.00	1.50	5.37	0.29

Table A1c-5: Lake Wheeler Field pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-6	1.2	0.09	13.33	82.14	3.07	0.05	19.72	1.13	5.89	0.20
Bw	6-36	1.49	0.12	12.42	28.66	26.85	0.03	6.10	1.23	5.10	0.02
BC	36-61	0.33	0.02	16.50	80.32	12.43	0.32	14.45	1.28	4.71	0.31
C1	61-78	0.74	0.04	18.50	57.01	17.05	0.01	0.00	1.27	4.60	0.02
C2	78-98	0.88	0.05	17.60	58.29	14.51	0.02	5.33	1.35	4.27	0.02
Cg	98-110	0.26	0.02	13.00	83.19	4.95	0.04	36.89	1.56	4.58	0.09
2Ab	110-136	0.86	0.04	21.50	73.31	13.78	0.22	25.48	1.35	4.87	0.19
2Bgb	136-145	0.58	0.03	19.33	79.34	10.58	0.06	24.59	1.47	4.92	0.14

Table A1c-6: Murphy Farm pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-20	3.84	0.26	14.77	43.40	9.94	3.37	8.91	0.78	5.71	3.71
Bg1	20-34	0.26	0.03	8.67	52.81	19.39	1.76	0.00	1.37	5.42	2.60
Bg2	34-58	0.37	0.03	12.33	38.85	32.35	0.11	0.00	1.24	4.73	0.10
Bg3	58-88	0.29	0.02	14.50	29.19	45.80	0.03	0.00	1.13	5.68	0.02
BC	88-128	0.17	0.02	8.50	36.65	37.52	0.57	0.00	1.28	5.94	0.31
2C	128-134	0.07	0.02	7.00	57.70	27.02	0.01	0.00	1.37	6.14	0.03

Table A1c-7: Oxford pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
Au	0-33	1.43	0.13	11.00	53.71	8.74	5.76	7.18	0.80	6.25	3.81
AB	33-73	0.76	0.06	12.67	52.07	13.64	4.00	11.41	1.35	5.94	2.24
Bw	73-106	0.58	0.05	11.60	33.07	19.74	0.93	0.00	1.38	5.84	0.59
BC	106-121	0.43	0.04	10.75	35.64	17.66	0.03	0.00	1.38	5.91	0.04
Cm	121-136	0.31	0.02	15.50	72.66	12.06	0.00	0.00	1.28	5.64	0.00
Cg	136-143+	0.7	0.06	11.67	40.66	20.95	0.68	0.00	1.29	5.64	2.45

Table A1c-8: Parkers Creek pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-16	1.92	0.15	12.80	48.74	7.73	5.21	3.21	0.91	5.50	7.01
Bw1	16-31	0.59	0.05	11.80	40.27	12.52	1.96	0.00	1.25	5.51	2.79
Bw2	31-50	1.82	0.05	36.40	48.38	12.08	0.62	0.00	1.20	5.53	0.69
Bw3	50-63	0.55	0.05	11.00	39.89	15.15	0.40	15.27	1.19	5.63	0.65
Bw4	63-83	0.53	0.04	13.25	41.40	17.08	0.35	0.00	1.31	5.84	0.36
Bw5	83-93+	0.31	0.02	15.50	38.70	18.23	0.16	0.00	1.28	6.07	0.34

Table A1c-9: Raven Rock State Park pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-15	0.64	0.05	12.80	82.89	3.19	0.55	11.60	1.05	4.89	0.74
A/C1	15-47	0.7	0.04	17.50	81.35	6.87	3.80	2.05	0.98	5.07	2.41
A/C2	47-71	0.55	0.04	13.75	82.90	5.02	1.20	3.08	1.07	4.97	1.06
C	71-86	0.26	0.02	13.00	86.52	4.31	0.00	3.90	0.63	5.09	0.00
2Ab/C1	86-120	0.95	0.06	15.83	57.41	15.77	1.10	6.81	1.19	4.39	0.65
2Ab/C2	120-144	0.93	0.06	15.50	86.54	3.71	0.88	22.24	1.27	4.67	0.79
3A/Oeb	144-172	10.68	0.08	19.75	79.50	3.94	0.91	18.87	0.83	5.70	1.34

Table A1c-10: Schenck Forest pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
A	0-30	0.22	0.02	22.00	81.55	5.62	0.94	5.53	1.23	4.62	0.67
Bw1	30-48	0.34	0.02	17.00	65.77	9.82	0.44	8.01	1.30	4.80	0.52
Bw2	48-71	0.41	0.02	41.00	61.66	14.89	1.07	8.30	1.23	4.64	0.98
Bw3	71-86	0.58	0.03	19.33	49.34	18.89	1.10	0.00	1.41	4.58	1.53
C	86-120	0.31	0.02	15.50	69.48	11.72	1.28	5.34	1.43	4.63	0.79
2Ab	120-142	0.44	0.03	14.67	80.47	8.60	0.01	9.78	1.39	4.89	0.01
2Bgb	142-160+	0.21	0.02	21.00	84.98	7.96	0.03	35.02	1.32	5.27	0.03

Table A1c-11: Sloan Park pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
^Bw1	0-29	0.54	0.04	13.50	26.03	26.21	0.02	0.00	1.32	5.41	0.02
^Bw2	29-60	0.27	0.02	13.50	63.86	15.65	0.04	5.89	1.25	5.43	0.03
^Bt	60-82	0.89	0.08	11.13	4.21	66.25	0.05	0.00	1.07	5.54	0.05
2Ab	82-102	0.93	0.08	11.63	29.35	32.09	0.02	6.29	1.27	5.65	0.02
2Ab/Bg	102-148	0.3	0.03	10.00	26.18	34.38	0.23	0.00	1.33	5.74	0.11
2Cg	148-176+	0.36	0.03	12.00	26.84	38.92	0.04	9.89	1.38	5.94	0.03

Table A1c-12: Spring Valley Park pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
C	0-28	0.31	0.02	15.50	89.13	3.71	0.62	13.30	1.11	6.48	0.48
2Aub	28-57	1.41	0.09	15.67	66.37	8.17	0.23	13.79	1.06	6.12	0.17
2BC	57-67	0.37	0.04	9.25	52.21	17.74	0.02	5.02	1.45	5.47	0.04
3C	67-84	0.27	0.02	27.00	93.34	3.74	0.00	7.22	1.24	6.48	0.00
3Cu	84-107	0.18	0.02	18.00	90.94	4.93	0.01	19.77	1.24	6.31	0.01
4Ab	107-135+	1.3	0.08	16.25	60.72	16.40	10.70	15.17	1.23	6.53	7.47

Table A1c-13: Thomas Brooks Park pedon horizon data from sample cut bank

Horizon	Depth (cm)	C (%)	N (%)	C/N ratio	Sand (%)	Clay (%)	Root SOC (Mg C ha^{-1})	P (mg kg^{-1})	BD (g cm^{-3})	pH	Root (kg m^{-3})
AC	0-25	0.36	0.03	12.00	86.29	2.63	2.75	9.09	1.24	5.59	2.33
C	25-40	0.45	0.03	15.00	84.72	3.71	1.67	9.09	1.16	5.37	2.33
2A/C	40-84	0.37	0.03	12.33	76.93	5.60	4.11	6.32	1.24	5.37	1.92
2Bw	84-105	0.42	0.04	10.50	65.02	9.26	1.29	5.85	1.36	5.10	1.26
2Bg	105-122	0.44	0.04	11.00	64.83	10.73	0.81	0.00	1.44	5.15	0.98
2Cg	122-137+	0.37	0.02	37.00	85.13	3.73	0.01	10.28	1.40	5.36	0.01

Table A1d-1: Profile description from the Breeze Farm (BRE1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	brown (7.5YR 4/4) loam; weak granular structure; friable; common fine and coarse roots; clear boundary
AB	11-29	yellowish red (5YR 4/6) loam; moderate granular structure; firm; common fine roots; clear boundary
Bw1	29-42	yellowish red (5YR 4/6) clay loam; weak subangular blocky structure; firm; common fine roots; few dark reddish brown (5YR 3/2) masses of manganese; clear boundary
Bw2	42-59	yellowish red (5YR 4/6) clay loam; weak subangular blocky structure; friable; common fine roots; common dark reddish brown (5YR 3/2) masses of manganese; clear boundary
BC	59-89	yellowish red (5YR 4/6) clay loam; weak subangular blocky structure; friable; common fine roots; lithochromatic colors of dark reddish brown (5YR 3/2) and manganese
2R	89+	

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Lirodendron tulipifera, Acer rubrum, Fagus grandifolia Ehrh*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-Loamy, thermic, Fluventic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 89+ cm
Other Notes: edge of riparian zone next to colluvium

Table A1d-2: Profile description from the Breeze Farm (BRE2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	dark yellowish brown (10YR 4/4) silt loam; moderate granular structure; friable; many fine and common coarse roots; abrupt boundary
Bw1	11-24	strong brown (7.5YR 4/6) silt loam; weak subangular blocky structure; friable; common fine roots; strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
Bw2	24-39	strong brown (7.5YR 5/6) silt loam; weak subangular blocky structure; friable; common fine roots; few iron depletions with chroma 3; few strong brown (7.5YR 4/6) masses of oxidized iron; gradual boundary
Bw3	39-70	strong brown (7.5YR 5/6) silt loam; weak subangular blocky structure; friable; common fine roots; common iron depletions with chroma 3; few strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
Bw4	70-99	pale brown (10YR 6/3) silt loam; weak subangular blocky structure; friable; common fine roots; common light gray (2.5Y 7/2) masses of depleted iron; few strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
2Cg	99-133	light gray (2.5Y 7/1) silty clay loam; moderate subangular blocky structure; firm; common fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; abrupt boundary
2C	133-155	light brownish gray (2.5Y 6/2) clay loam; structureless massive; friable; common fine roots; many strong brown (7.5YR 4/6) and black (7.5YR 2.5/1) masses of iron and manganese
3R	155+	

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Fraxinus pennsylvanica, Lirodendron tulipifera, Quercus phellos*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-Loamy, thermic, Fluventic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 70cm
Other Notes:

Table A1d-3: Profile description from the Breeze Farm (BRE3FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-9	brown (7.5YR 4/3) silt loam; strong subangular blocky structure; friable; few coarse and many fine roots; clear smooth boundary
Bw1	9-30	light yellowish brown (10YR 6/4) silt loam; moderate subangular blocky structure; friable; few coarse and common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; few dark reddish brown (2.5YR 3/4) masses of oxidized iron; clear smooth boundary
Bw2	30-46	yellowish brown (10YR 5/4) silt loam; moderate subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual smooth boundary
Bw3	46-65	brown (10YR 5/3) silt loam; weak subangular blocky structure; very friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual smooth boundary
Bg1	65-85	light brownish gray (2.5Y 6/2) silt loam; moderate subangular blocky structure; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; common red (2.5YR 4/6) masses of oxidized iron; abrupt smooth boundary
Bg2	85-95	gray (10YR 5/1) silt loam; moderate subangular blocky structure; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron
2R	95+	

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Platanus occidentalis, Liquidambar styraciflua, Carpinus caroliniana*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-Loamy, thermic, Fluventic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 65cm
Other Notes:

Table A1d-4: Profile description from the Breeze Farm (BRE4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
AB	0-17	brown (7.5YR 5/4) silt loam; weak granular and subangular blocky structure; friable; many fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bw1	17-70	brown (7.5YR 5/4) silt loam; weak subangular blocky structure; friable; many fine roots; common yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
Bg1	70-94	light brownish gray (2.5Y 6/2) silt loam; moderate subangular block structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
2Ab	94-109	dark gray (2.5Y 4/1) loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Cg	109-119	gray (2.5Y 5/1) gravelly fine sandy loam; structureless massive; very friable; few fine roots; basal gravels present
2R	119+	Basal gravels

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Lirodendron tulipifera, Nyssa sylvatica*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-Loamy, thermic, Fluventic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 70cm
Other Notes:

Table A1d-5: Profile description from the Breeze Farm (BRE4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-8	dark yellowish brown (10YR 4/4) loam; weak subangular blocky structure; friable; many fine roots; clear boundary
Bw1	8-34	light yellowish brown (10YR 6/4) silt loam; weak subangular blocky structure; very friable; few coarse and common fine roots; few strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
Bw2	34-66	light yellowish brown (10YR 6/4) clay loam; weak subangular blocky structure; friable; common fine roots; few light gray (10YR 7/1) masses of depleted iron; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
C	66-84	yellowish brown (10YR 5/6) fine sandy loam; structureless massive; very friable; few light gray (10YR 7/1) masses of depleted iron; common strong brown (7.5YR 4/6) masses of oxidized iron; basal gravels present
2R	84+	Basal gravels

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Nyssa sylvatica, Lirodendron tulipifera, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-Loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: Somewhat poorly drained
Depth to Free Water: 34cm
Other Notes:

Table A1d-6: Profile description from the Butner Beef Lab (BUT1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-20	brown (10YR 4/3) silt loam; weak subangular blocky structure; friable; common fine and many coarse roots; common grayish brown (10YR 5/2) masses of depleted iron; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Bg1	20-37	grayish brown (2.5Y 5/2) loam; moderate subangular blocky structure; friable; common fine and many coarse roots; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Bg2	37-68	gray (10YR 6/1) loamy sand; weak subangular blocky structure; friable; few fine roots; common yellowish brown (10YR 5/8) masses of oxidized iron; gradual boundary
Bg3	68-100	gray (2.5Y 6/1) fine sandy loam; weak subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 4/6) masses and pore linings of oxidized iron; few black (10YR 2/1) concentrations of manganese; gradual boundary
Cg	100- 139	light brownish gray (10YR 6/2) gravely loamy sand; structureless massive; very friable

Described By: S. Bradley & A.R. Wilson - 06/17/19
Dominant Vegetation: *Quercus bicolor*, *Nyssa sylvatica*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Coarse-Loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: Poorly drained
Depth to Free Water: 0cm
Other Notes: within a small ephemeral channel parallel to larger main stream, hydric indicator: F2, F19

Table A1d7: Profile description from the Butner Beef Lab (BUT2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-14	brown (10YR 4/3) loam; weak granular; very friable; common coarse and many fine roots; abrupt boundary
EB	14-36	yellowish brown (10YR 5/4) loamy fine sand; weak subangular blocky structure; very friable; many fine and coarse roots; clear boundary
Bw1	36-56	light yellowish brown (10YR 6/4) loam; weak subangular blocky structure; friable; many fine roots; common gray (10YR 6/1) masses of depleted iron; few strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
Bw2	56-95	light yellowish brown (2.5Y 6/3) fine sandy loam; moderate subangular blocky structure; friable; many fine roots; common gray (10YR 6/1) masses of depleted iron; common yellowish brown (10YR 5/8) masses of concentrated iron; clear boundary
Bg1	95-124	gray (10YR 6/1) sandy clay loam; moderate subangular blocky structure; friable; few fine roots; strong brown (7.5YR 5/8) masses of concentrated iron; gradual boundary
Bg2	124-144	gray (10YR 6/1) sandy loam; moderate subangular blocky structure; friable; few fine roots; many yellowish brown (10YR 5/8) masses of oxidized iron; abrupt boundary
2R	144+	

Described By: S. Bradley & A.R. Wilson - 06/17/19
Dominant Vegetation: *Quercus bicolor, Lirodendron tulipifera, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Coarse-Loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: Somewhat poorly drained
Depth to Free Water: 36cm
Other Notes: within a small ephemeral channel parallel to larger main stream

Table A1d-8: Profile description from the Butner Beef Lab (BUT3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	brown (10YR 4/3) loam; weak granular structure; very friable; common coarse and many fine roots; abrupt boundary
E	15-27	light yellowish brown (10YR 6/4) loamy sand; weak subangular blocky structure; friable; common fine roots; clear boundary
Bw	27-49	pale brown (10YR 6/3) loam; weak subangular blocky structure; friable; few fine roots; common yellowish brown (10YR 5/8) masses of oxidized iron; clear boundary
Bg1	49-82	light gray (2.5Y 7/2) loam; weak subangular blocky structure; very friable; few fine roots; common strong brown (7.5YR 5/8) masses of concentrated iron; gradual boundary
Bg2	82-98	light gray (10YR 7/2) fine sandy loam; weak subangular blocky structure; friable; few fine roots; common reddish yellow (7.5YR 6/8) masses of oxidized iron; gradual boundary
BC	98-116	light yellowish brown (10YR 6/4) sandy loam; weak subangular blocky structure; very friable; few fine roots; few light gray (2.5Y 7/2) masses of depleted iron; common strong brown (7.5YR 5/8) masses of concentrated iron; clear boundary
C	116-142	yellowish brown (10YR 5/4) loamy sand; single grained structureless; very friable; few fine roots; few light brownish gray (10YR 6/2) masses of depleted iron; common strong brown (7.5YR 4/6) masses of iron concentrations; abrupt boundary
2B’gb	142-155	light gray (7.5YR 7/1) loam; moderate subangular blocky structure; friable; common fine and coarse dead roots; common reddish yellow (7.5YR 7/6) masses of concentrated iron; common black (7.5YR 2.5/1) masses of oxidized manganese; abrupt boundary
3R	155+	

Described By: S. Bradley & A.R. Wilson - 06/17/19
Dominant Vegetation: *Quercus bicolor, Carpinus caroliniana, Betula nigra*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Coarse-Loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: Somewhat poorly drained
Depth to Free Water: 49cm
Other Notes: within a small ephemeral channel parallel to larger main stream

Table A1d-9: Profile description from the Butner Beef Lab (BUT4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-9	brown (10YR 4/3) loam; moderate subangular blocky structure; friable; few coarse and many fine roots; clear boundary
Bw1	9-28	brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; common fine and coarse roots; few grayish brown (10YR 5/2) masses of depleted iron; common dark reddish brown (5YR 3/4) masses of oxidized iron; clear boundary
Bw2	28-58	brown (10YR 5/3) loam; weak subangular blocky structure; friable; common fine roots; few gray (7.5YR 5/1) masses of depleted iron; common yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
Bg	58-78	gray (7.5YR 4/1) loam; weak subangular blocky structure; friable; few fine roots; common dark reddish brown (5YR 3/4) masses of oxidized iron; abrupt boundary
2Ab1	78-100	very dark gray (7.5YR 3/1) clay loam; moderate subangular blocky structure; friable; common fine roots; common yellowish red (5YR 4/6) masses and pore linings of oxidized iron; clear boundary
2Ab2	100-128	dark gray (10YR 4/1) clay loam; moderate subangular blocky structure; firm; common fine roots; common yellowish red (5YR 4/6) masses and pore linings of oxidized iron; clear boundary
2Cg	128-159	gray (10YR 5/1) sandy clay loam; structureless massive; very friable; few fine roots; abrupt boundary to rock
3R	159+	

Described By: S. Bradley & A.R. Wilson - 06/17/19
Dominant Vegetation: *Liquidambar styraciflua, Carpinus caroliniana, Lirodendron tulipifera, Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Coarse-Loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: Somewhat poorly drained
Depth to Free Water: 9cm
Other Notes: within a small ephemeral channel parallel to larger main stream

Table A1d-10: Profile description from the Butner Beef Lab (BUT5FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Ap	0-19	brown (7.5YR 4/4) fine sandy loam; weak granular structure; friable; few coarse and many fine roots; clear smooth boundary
AE	19-33	brown (7.5YR 5/4) loam; weak subangular blocky structure; friable; common fine and coarse roots; clear smooth boundary
EA	33-43	yellowish brown (10YR 5/4) loam; weak subangular blocky structure; friable; common fine roots; clear smooth boundary
Ec	43-62	pale brown (10YR 6/3) fine sandy loam; weak prismatic breaking into subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 5/8) concentrations of oxidized iron; common black (7.5YR 2.5/1) concentrations of manganese; diffuse irregular boundary
Bc/E	62-115	matrix of brown (7.5YR 4/3) and yellowish brown (10YR 5/4) with albic tongues colored pale yellow (2.5Y 7/3) fine sandy loam; strong prismatic structure; very firm; common fine and few coarse roots along prism faces; common light brownish gray (10YR 6/2) masses of depletions; common strong brown (7.5YR 4/6) masses of cemented oxidized iron; many black (7.5YR 2.5/1) masses of cemented manganese; does not slake in water; diffuse irregular boundary
Bg	115-130	light brownish gray (10YR 6/2) fine sandy loam; moderate prismatic structure; friable; common fine dead roots; common light gray (10YR 7/1) depletions; common strong brown (7.5YR 4/6) masses of cemented depletions; common strong brown (7.5YR 4/6) masses of cemented oxidized iron; few black (7.5YR 2.5/1) cemented concentrations of manganese; clear wavy boundary
BCc	130-147	brown (7.5YR 4/4) fine sandy loam; moderate subangular blocky structure; very friable; common gray (7.5YR 6/1) depletions; many strong brown (7.5YR 4/6) masses of oxidized iron; common very dark brown (10YR 2/2) manganese concentrations; slaked in water; clear wavy boundary
Cdg	147+	gray (7.5YR 5/1) very gravelly sandy loam; structureless massive; friable but very firm in place; sparked with strike of shovel; common strong brown (7.5YR 4/6) concentrations of iron; common black (7.5YR 2.5/1) manganese concentrations; slakes in water

Described By: S. Bradley & A.R. Wilson - 06/17/19
Dominant Vegetation: *Lirodendron tulipifera, Acer rubrum, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Coarse-Loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 62cm

Other Notes: glossic with tonguing E horizons into B’s with strong iron and manganese concentrations, cementations, prismatic structure, and firmness, Cdg horizon sparked with hammer contact

Table A1d-11: Profile description from the Centennial Campus (Cent_FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C	0-10	Brown (7.5YR 4/4) fine sand; structureless single grain; very friable; many fine and few coarse roots; clear boundary
A/Bw	10-22	brown (7.5YR 5/4) loamy fine sand; weak subangular blocky structure; very friable; common fine and few coarse roots; stratified horizon; clear boundary
C’	22-47	brown (7.5YR 4/4) loamy fine sand; structureless single gain; very friable; common fine and coarse and few very coarse roots; stratified horizon; clear boundary
C/Bw	47-87	strong brown (7.5YR 4/6) loamy fine sand; weak subangular blocky structure; very friable; common fine and coarse and very coarse roots; stratified horizon; clear boundary
Bw	87-98	brown (7.5YR 4/4) fine sandy loam; moderate subangular blocky structure; friable; common fine roots; few strong brown (7.5YR 5/6) masses of oxidized iron; gradual boundary
A/C	98-122	brown (7.5YR 4/4) fine sandy loam; weak subangular blocky structure; friable; common fine roots; few strong brown (7.5YR 5/6) masses of oxidized iron; clear boundary
Bg	122-145+	dark gray (7.5YR 4/1) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common faint pinkish gray (7.5YR 6/2) masses of depleted iron; common yellowish red (5YR 5/8) masses of oxidized iron; common charcoal present

Described By: S. Bradley & A.R. Wilson - 05/31/19
Dominant Vegetation: *Betula nigra, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: sandy, thermic, Fluventic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 122cm
Other Notes:

Table A1d-12: Profile description from the Centennial Campus (Cent1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C	0-12	dark yellowish brown (10YR 4/4) sandy loam; structureless single grain; very friable; many fine roots; abrupt boundary
Bw	12-31	dark brown (7.5YR 3/4) fine sandy loam; weak subangular blocky structure; friable; common fine roots; clear boundary
Bw/C	31-59	brown (10YR 4/3) loam; weak subangular blocky structure; firm; common fine roots; common distinct light brownish gray (2.5Y 6/2) masses of depleted iron; common prominent yellowish red (5YR 5/8) masses of oxidized iron; clear boundary
Bg1	59-88	gray (2.5Y 6/1) sandy clay loam; moderate subangular blocky structure; firm; common fine roots; common prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bg2	88-109	gray (10YR 6/1) sandy clay loam; moderate subangular blocky structure; firm; few fine roots; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Cg	109-134	bluish gray (5PB 5/0) fine sandy loam; structureless massive; firm; few fine roots; common prominent strong brown (7.5YR 5/8) masses of oxidized iron; abrupt boundary
2Cg	134-147	gray (7.5YR 5/1) fine sandy loam; structureless massive; firm; few fine roots; common prominent strong brown (7.5YR 5/6) masses of oxidized iron; abrupt boundary
3R	147+	

Described By: S. Bradley & A.R. Wilson - 05/31/19
Dominant Vegetation: *Betula nigra, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: Somewhat poorly drained
Depth to Free Water: 31cm
Other Notes:

Table A1d-13: Profile description from the Centennial Campus (Cent2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	brown (7.5YR 4/4) fine sandy loam; weak granular structure; friable; many fine roots; clear boundary
Bw1	4-64	brown (10YR 5/3) clay loam; weak subangular blocky structure; friable; common fine roots; common distinct strong brown (7.5YR 4/6) masses of oxidized iron; common faint light brownish gray (10YR 6/2) masses of depleted iron; clear boundary
Bw2	64-90	brown (10YR 4/3) loam; weak subangular blocky structure; firm; common fine roots; common distinct light brownish gray (2.5Y 6/2) masses of depleted iron; common prominent yellowish red (5YR 5/8) masses of oxidized iron; clear boundary
Bw3	90-114	yellowish brown (10YR 5/4) clay loam; weak subangular blocky structure; firm; few fine roots; few prominent gray (2.5Y 6/1) masses of depleted iron; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bg1	114-144	gray (10YR 6/1) sandy clay loam; moderate subangular blocky structure; firm; few coarse and fine roots; common prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Bg2	144-163	gray (2.5Y 6/1) sandy clay loam; moderate subangular blocky structure; firm; common fine roots; common faint gray (10YR 6/1) iron depletions; common prominent yellowish red (5YR 4/6) and strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Cg1	163-182	bluish gray (5PB 5/0) sandy clay loam; structureless massive; very firm; common fine roots; few prominent yellowish red (5YR 4/6) masses of oxidized iron; abrupt boundary
Cg2	182-196	bluish gray (5PB 4/0) sandy clay loam; structureless massive; very firm; few fine roots; few prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
3R	196+	

Described By: S. Bradley & A.R. Wilson - 05/31/19
Dominant Vegetation: *Pinus taeda, Quercus bicolor, Acer rubrum, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: Moderately well drained
Depth to Free Water: 64cm
Other Notes:

Table A1d-14: Profile description from the Centennial Campus (Cent3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-3	dark brown (7.5YR 3/2) loam; weak granular structure; very friable; many fine roots; clear boundary
Bw1	3-39	brown (10YR 4/3) loam; weak subangular blocky structure; friable; few fine roots; few distinct gray (10YR 5/1) masses of depleted iron; few prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bw2	39-85	brown (10YR 5/3) sandy clay loam; weak subangular blocky structure; friable; few distinct gray (10YR 5/1) masses of depleted iron; common prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bg1	85-124	gray (7.5YR 6/1) clay; moderate subangular blocky structure; firm; common fine roots; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Bg2	124-159	gray (7.5YR 6/1) clay; moderate subangular blocky structure; firm; common fine roots; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Cg	159-166	bluish gray (5PB 4/0) sandy clay; structureless massive; very firm; common fine roots; few prominent gray (2.5Y 6/1) masses of depleted iron; few prominent strong brown (7.5YR 5/8) masses of oxidized iron; abrupt boundary
2Ab1	166-180	very dark gray (7.5YR 3/1) clay loam; weak subangular blocky structure; friable; many fine roots; common distinct gray (10YR 5/1) masses of depleted iron; clear boundary
2Ab2	180-203	black (2.5Y 2.5/1) fine sandy loam; moderate subangular blocky structure; friable; few fine roots; wood debris throughout
3R	203+	

Described By: S. Bradley & A.R. Wilson - 05/31/19
Dominant Vegetation: *Pinus taedas*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 3cm
Other Notes:

Table A1d-15: Profile description from the Centennial Campus (Cent4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
BA	0-40	brown (7.5YR 5/4) loam; weak subangular blocky structure; friable; common fine roots; few prominent gray (7.5YR 6/1) masses of depleted iron; few distinct strong brown (7.5YR 4/6) and yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
Bg1	40-66	gray (10YR 5/1) loam; moderate subangular blocky structure; firm; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Bg2	66-81	gray (10YR 5/1) clay loam; weak subangular blocky structure; firm; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Cg1	81-105	dark gray (10YR 4/1) fine sandy loam; moderate subangular blocky structure; firm; many fine roots and few coarse roots; few faint gray (2.5Y 6/1) masses of depleted iron; abrupt boundary
2Cg2	105-119	gray (2.5Y 6/1) coarse sandy loam; weak subangular blocky structure; very friable; few prominent light olive brown (2.5Y 5/6) masses of iron concentrations; abrupt boundary
2C	119-132	dark yellowish brown (10YR 4/4) very gravely coarse sandy loam; saprolite; structureless massive; very friable; common fine roots
3R	132+	Basal gravel

Described By: S. Bradley & A.R. Wilson - 05/31/19
Dominant Vegetation: *Pinus taeda*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 80 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: somewhat poorly drained
Depth to Free Water: 0cm
Other Notes:

Table A1d-16: Profile description from the Centennial Campus (Cent5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-3	dark brown (7.5YR 3/2) loam; weak granular; very friable; many fine roots; clear boundary
Bw	3-44	dark gray (7.5YR 4/1) loam; weak subangular blocky structure; friable; common fine and few coarse roots; few distinct light gray (7.5YR 7/1) masses of depleted iron; few distinct strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bg	44-68	dark gray (7.5YR 4/1) clay loam; weak subangular blocky structure; friable; few fine and coarse roots; few faint gray (7.5YR 6/1) masses of depleted iron; common prominent strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Cg1	68-100	gray (10YR 6/1) clay; structureless massive; friable; common fine roots; common faint gray (7.5YR 6/1) masses of depleted iron; common prominent dark gray (5YR 4/1) masses; many yellowish red (5YR 5/8) pore linings of oxidized iron; abrupt boundary
B’g	100-127	dark gray (7.5YR 4/1) sandy clay loam; weak subangular blocky structure; firm; common fine roots; common prominent yellowish brown (10YR 5/8) masses of oxidized iron; clear boundary
2Ab	127-163	dark gray (10YR 4/1) sandy loam; weak subangular blocky structure; friable; plant debris from previous beaver dam present; abrupt boundary
2C	163-198	yellowish brown (10YR 5/6) coarse sandy loam; structureless massive; friable; few gray (10YR 5/1) masses of depleted iron; many faint strong brown (7.5YR 4/6) masses of oxidized iron
3R	198+	

Described By: S. Bradley & A.R. Wilson - 05/31/19
Dominant Vegetation: *Pinus taeda*, *Platanus occidentalis*, *Betula nigra*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 100 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: poorly drained
Depth to Free Water: 3cm
Other Notes: hydric soil indicator: F3

Table A1d-17: Profile description from the Johnston Mill Nature Preserve (JMIL1) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	dark yellowish brown (10YR 4/4) silt loam; weak subangular blocky structure; friable; common fine roots; clear boundary
AB	15-32	dark yellowish brown (10YR 3/4) silt loam; weak subangular blocky structure; friable; common fine and few coarse roots; clear boundary
Bw1	32-65	strong brown (7.5YR 4/6) silt loam; weak subangular blocky structure; friable; common fine roots; common light yellowish brown (2.5Y 6/4) iron depletions; few very dark brown (10YR 2/2) masses of Manganese concentrations; gradual boundary
Bw2	65-98	strong brown (7.5YR 4/6) silt loam; weak subangular blocky structure; friable; few fine roots; common pale yellow (2.5Y 6/3) masses of depleted iron; common very dark brown (10YR 2/2) masses of concentrated Manganese; clear boundary
Bw3	98-135	yellowish brown (10YR 5/4) silt loam; weak subangular blocky structure; friable; few fine roots; few large angular gravels; common light gray (5Y 7/2) masses of depleted iron; common strong brown (7.5YR 4/6) masses of concentrated iron; clear boundary
Bw4	135-166	yellowish brown (10YR 5/6) loam; weak subangular blocky structure; friable; few fine roots; common light gray (2.5Y 7/2) masses of depleted iron; few dark yellowish brown (10YR 4/6) masses of oxidized iron and many black (10YR 2/1) masses of manganese concentrations; abrupt boundary
2R	166+	

Described By: S. Bradley & A.R. Wilson - 06/11/19
Dominant Vegetation: *Fraxinus pennsylvanica, Acer rubrum, Lirodendron tulipifera*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 80 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-silty, thermic, Fluventic Dystrudept
Drainage Class: well drained
Depth to Free Water: 192+cm
Other Notes:

Table A1d-18: Profile description from the Johnston Mill Nature Preserve (JMIL2) site

Horizon	Depth (cm)	Description
A	0-11	dark yellowish brown (10YR 4/4) silt loam; weak granular structure; friable; few coarse and many fine roots; clear boundary
Bw1	11-44	brown (10YR 4/3) silty clay loam; moderate subangular blocky structure; friable; common fine roots; clear boundary
Bw2	44-93	yellowish red (5YR 4/6) silty clay loam; weak subangular blocky structure; very friable; common fine roots; few light gray (2.5Y 7/2) masses of depleted iron; few very dark gray (10YR 3/1) masses of manganese concentrations; gradual boundary
Bw3	93-132	strong brown (7.5YR 4/6) silty clay loam; weak subangular blocky structure; very friable; few fine roots; common light yellowish gray (10YR 6/2) masses of depleted iron; common black (10YR 2/1) masses of manganese concentrations; gradual boundary
Bw4	132-160	strong brown (7.5YR 4/6) clay loam; moderate subangular blocky structure; friable; common light brownish gray (10YR 6/2) masses of depleted iron; common black (10YR 2/1) masses of manganese concentrations; clear boundary
Bw5	160-178	strong brown (7.5YR 4/6) clay loam; moderate subangular blocky structure; friable; common white (7.5YR 8/1) masses of depleted iron; common strong brown (7.5YR 4/6) masses of concentrated iron; gradual boundary
BC	178-200+	light yellowish brown (10YR 6/4) loam; moderate subangular blocky structure; friable; few fine roots; many gray (10YR 6/1) masses of depleted iron; many strong brown (7.5YR 5/6) masses of depleted iron

Described By: S. Bradley & A.R. Wilson - 06/11/19
Dominant Vegetation: *Carpinus caroliniana*, *Quercus bicolor*, *Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-silty, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 44cm
Other Notes:

Table A1d-19: Profile description from the Johnston Mill Nature Preserve (JMIL3) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	dark brown (7.5YR 3/4) silt loam; weak granular structure; friable; many fine and few coarse roots; clear boundary
Bw1	15-47	brown (7.5YR 4/4) silt loam; weak subangular blocky structure; friable; many fine roots; clear boundary
Bw2	47-70	brown (7.5YR 5/4) silt loam; weak subangular blocky structure; friable; few fine roots; common gray (10YR 6/2) masses of depleted iron; common yellowish red (5YR 4/6) pore linings of oxidized iron; gradual boundary
Bg1	70-106	gray (10YR 5/1) silt loam; moderate subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual boundary
Bg2	106-147	grayish brown (10YR 5/2) silt loam; moderate subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bg3	147-167	light gray (10YR 7/1) silt loam; moderate subangular blocky structure; friable; few fine roots; few dark brown (7.5YR 3/2) and common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
C	167-196+	brown (10YR 4/4) gravely silty clay loam; structureless massive; friable; few fine roots; common light brownish gray (2.5Y 6/2) masses of depleted iron; few dark red (2.5YR 3/6) and yellowish brown (10YR 5/8) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson - 06/11/19
Dominant Vegetation: *Acer rubrum*, *Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 47cm
Other Notes:

Table A1d-20: Profile description from the Johnston Mill Nature Preserve (JMIL5) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	dark brown (7.5YR 3/4) silty clay loam; moderate subangular blocky structure; friable; many fine and few coarse roots; clear boundary
Bw1	7-29	brown (7.5YR 4/4) silty clay loam; moderate subangular blocky structure; friable; many fine and few coarse roots; clear boundary
Bw2	29-54	brown (7.5YR 5/4) silty clay loam; weak subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) masses of depleted iron; common dark brown (7.5YR 3/4) masses of oxidized iron; clear boundary
Bw3	54-97	brown (7.5YR 5/4) silty clay loam; moderate subangular blocky structure; friable; few fine roots; common gray (10YR 5/1) masses of depleted iron; common yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
Bg	97-125	grayish brown (10YR 5/2) silty clay loam; weak subangular blocky structure; friable; few fine roots; yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
2Ab	125-148	very dark gray (10YR 3/1) silty clay loam; moderate subangular blocky structure; friable; common fine roots; common gray (7.5YR 6/1) masses of depleted iron; common yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
2Bgb1	148-166	dark gray (10YR 4/1) silty clay loam; moderate subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
2Bgb2	166-193+	gray (2.5Y 6/1) clay loam; structureless massive; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Fraxinus pennsylvanica, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-silty, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 29cm
Other Notes:

Table A1d-21: Profile description from the Johnston Mill Nature Preserve (JMIL6) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-13	dark brown (7.5YR 3/2) silt loam; weak subangular blocky structure; friable; few coarse and common fine roots; clear boundary
Bw1	13-40	brown (7.5YR 4/4) silty clay loam; moderate subangular blocky structure; friable; common fine roots; clear boundary
Bw2	40-73	yellowish brown (10YR 5/4) silty clay loam; moderate subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) masses of depleted iron; common yellowish red (5YR 4/6) masses of oxidized iron; gradual boundary
Bg	73-99	grayish brown (10YR 5/2) silty clay loam; weak subangular blocky structure; friable; strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
2Ab	99-117	dark gray (7.5YR 4/1) silty clay loam; strong subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 5/8) and black (7.5YR 2.5/1) masses of oxidized iron and manganese; clear boundary
2Bgb1	117-157	gray (7.5YR 6/1) silty clay loam; strong subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 5/8) and very dark brown (7.5YR 2.5/2) masses of oxidized iron and manganese; clear boundary
2Bgb2	157-197+	gray (10YR 6/1) silty clay loam; weak subangular blocky structure; friable; few coarse roots; common yellowish brown (10YR 6/1) and very dark brown (7.5YR 2.5/2) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Quercus bicolor, Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-silty, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 40cm
Other Notes:

Table A1d-22: Profile description from the Johnston Mill Nature Preserve (JMIL7) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-9	dark brown (7.5YR 3/3) silt loam; weak granular; friable; common coarse and many fine roots; clear boundary
Bw1	9-35	brown (7.5YR 4/4) loam; weak subangular blocky; friable; few coarse and common fine roots; clear boundary
Bw2	35-62	strong brown (7.5YR 4/6) loam; moderate subangular blocky structure; friable; common fine roots; few very dark brown (10YR 2/2) masses of concentrations; clear boundary
Bw3	62-97	strong brown (7.5YR 4/6) loam; moderate subangular blocky structure; friable; few fine roots; few very dark brown (10YR 2/2) masses of concentrations; clear boundary
Bw4	97-148	strong brown (7.5YR 4/6) fine sandy loam; weak subangular blocky structure; friable; few fine roots; common light gray (2.5Y 7/2) masses of depleted iron; few strong brown (7.5YR 5/8) and few very dark brown (7.5YR 2.5/3) concentrations; clear boundary
Bw5	148-177	strong brown (7.5YR 4/6) loam; weak subangular blocky structure; friable; few fine roots; common light gray (2.5Y 7/2) masses of depleted iron; few strong brown (7.5YR 5/8) and few very dark brown (7.5YR 2.5/3) masses of concentrated iron; clear boundary
Bw6	177-192+	dark brown (7.5YR 3/4) loam; weak subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) masses of depleted iron; few very dark brown (7.5YR 2.5/3) masses of concentrated iron

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Acer rubrum, Liquidambar styraciflua, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 97cm
Other Notes:

Table A1d-23: Profile description from the Johnston Mill Nature Preserve (JMIL_FACE) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-10	dark brown (7.5YR 3/3) silt loam; weak granular structure; friable; many fine roots; clear smooth boundary
Bw1	10-22	brown (7.5YR 4/4) silt loam; weak subangular blocky structure; friable; few coarse and common fine roots; clear smooth boundary
Bw2	22-48	brown (7.5YR 4/4) silt loam; moderate subangular blocky structure; friable; common fine roots; gradual wavy boundary
Bw3	48-76	brown (7.5YR 4/4) silty clay loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of concentrated iron; gradual smooth boundary
Bg1	76-108	light brownish gray (2.5Y 6/2) silty clay loam; moderate subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of concentrated iron; clear wavy boundary
Bg2	108-127	grayish brown (10YR 5/2) silt loam; weak subangular blocky structure; friable; common fine roots and few coarse roots; common strong brown (7.5YR 4/6) and dark brown (7.5YR 3/2) concentrations; clear wavy boundary
2Ab	127-145	very dark grayish brown (10YR 3/2) silt loam; strong granular and moderate subangular blocky structure; common fine roots; common dark yellowish brown (10YR 4/4) masses of oxidized iron; clear wavy boundary
2Bgb	145-171	dark grayish brown (10YR 4/2) silt loam; moderate subangular blocky structure; friable; common fine roots; common yellowish red (5YR 4/6) and common black (5YR 2.5/1) masses of concentrated iron and manganese; clear wavy boundary
2Cg	171-192	gray (10YR 6/1) sandy loam; structureless massive; friable; common fine roots; common strong brown (7.5YR 4/6); abrupt boundary
3R	192+	

Described By: S. Bradley & A.R. Wilson - 07/09/19
Dominant Vegetation: *Acer rubrum, Liquidambar styraciflua, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: Fine-silty, thermic, Fluventic Dystrudept
Drainage Class: well drained
Depth to Free Water: 192+cm
Other Notes:

Table A1d-24: Profile description from the Lake Wheeler Field Lab (LWF1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	dark brown (10YR 3/3) loam; moderate granular structure; friable; many fine roots; clear boundary
Bw1	5-33	brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; common fine and coarse roots; clear boundary
Bw2	33-54	strong brown (7.5YR 4/6) sandy loam; weak subangular structure; very friable; abrupt boundary
Bg	54-77	gray (7.5YR 5/1) coarse sandy loam; weak subangular blocky structure; very friable; common prominent strong brown (7.5YR 5/8) masses of oxidized iron; stratified layers; abrupt boundary
C	77-126	brown (10YR 4/3) loamy sand to sandy loam stratified; massive; very friable to friable; few fine and coarse roots; common prominent strong brown (7.5YR 5/8) masses of oxidized iron; stratified layers; clear boundary
Cg	126-147	dark grayish brown (10YR 4/2) sandy loam; massive; friable few fine roots; common prominent yellowish red (5YR 5/8) masses of oxidized iron; stratified layers; abrupt boundary
2A/Bgb	147-230	very dark gray to very dark grayish brown (10YR 3/1 to 10YR 4/1) loam; weak subangular blocky structure; few fine roots; wet layer; abrupt boundary
3R	203+	

Described By: S. Bradley & A.R. Wilson - 05/10/19
Dominant Vegetation: *Ligustrum sinense, Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: well drained
Depth to Free Water: 230+cm
Other Notes:

Table A1d-25: Profile description from the Lake Wheeler Field Lab (LWF2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	dark yellowish brown (10YR 3/4) loam; moderate granular structure; friable; common fine roots; clear boundary
Bw1	5-35	brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; common fine and coarse roots; clear boundary
Bw2	35-65	strong brown (7.5YR 4/6) sandy loam; weak subangular blocky structure; very friable; few fine and coarse roots; common distinct dark reddish brown (5YR 3/4) masses of oxidized iron; abrupt boundary
2Abg	65-86	dark grayish brown (10YR 4/2) loam; moderate subangular blocky structure; friable; common fine roots; common prominent yellowish red (5YR 4/6) masses of oxidized iron; clear boundary
2C	86-111	light yellowish brown (10YR 6/4) loamy sand; massive; very friable; few fine roots; common prominent reddish yellow (7.5YR 6/8) masses and pore linings of oxidized iron; 10 percent gravels present; abrupt boundary
3R	111+	

Described By: S. Bradley & A.R. Wilson - 05/10/19
Dominant Vegetation: *Ligustrum sinense, Acer rubrum, Liquidambar styraciflua, Smilax rotundifolia*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 111+cm
Other Notes:

Table A1d-26: Profile description from the Lake Wheeler Field Lab (LWF3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	brown (10YR 4/3) loamy sand; weak granular structure; very friable; common fine roots; moderately acidic; clear boundary
C	7-66	light yellowish brown (10YR 6/4) loamy sand; single grained; very friable; few coarse roots and common fine roots; few prominent brownish yellow (10YR 6/8) masses of oxidized iron; abrupt boundary
2Ab	66-77	brown (10YR 4/3) loam; weak subangular blocky structure; friable; common fine and coarse roots; common prominent yellowish red (5YR 5/8) masses of oxidized iron; clear boundary
2Bgb1	77-99	grayish brown (10YR 5/2) clay loam; weak subangular blocky structure; friable; common fine and coarse roots; common prominent yellowish red (5YR 4/6) pore linings and masses of oxidized iron; clear boundary
2Bgb2	99-138	dark gray (7.5YR 4/1) loam; moderate subangular blocky structure; friable; few fine and coarse roots; common prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
3A’b1	138-160	very dark gray (7.5YR 3/1) loam; strong subangular blocky structure; friable; few fine roots; common prominent strong brown (7.5YR 5/6) pore linings of oxidized iron; clear boundary
3A’b2	160-194	black (2.5Y 2.5/1) sandy loam; moderate subangular blocky structure; friable; few fine roots; clear boundary
3Cg	194+	dark gray (7.5YR 4/1) gravely sandy loam; massive; very friable; many gravels ~30%

Described By: S. Bradley & A.R. Wilson - 05/10/19
Dominant Vegetation: *Ligustrum sinense*, *Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: moderately well drained
Depth to Free Water: 194+cm
Other Notes:

Table A1d-27: Profile description from the Lake Wheeler Field Lab (LWF4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	dark brown (10YR 3/3) loam; strong granular structure; friable; many fine roots; moderately acidic, clear boundary
Bw1	5-19	brown (10YR 4/3) loam; weak subangular blocky structure; friable; common fine roots; clear boundary
Bw2	19-59	brown (10YR 4/3) sandy loam; moderate subangular blocky structure; friable; few fine and coarse roots; common dark grayish brown (10YR 4/2) masses of depleted iron; common prominent yellowish red (5YR 4/6) masses of oxidized iron and few prominent black (2.5Y 2.5/1) manganese concentrations; abrupt boundary
C	59-80	yellowish brown (10YR 5/4) sandy loam; weak subangular blocky structure; friable; few distinct light brownish gray (2.5Y 6/2) masses of depleted iron; common distinct and prominent strong brown (7.5YR 5/6) and (7.5YR 5/8) masses of oxidized iron; stratified; abrupt boundary
Cg	80-92	gray (10YR 5/1) loam; massive; friable; few fine roots; common prominent strong brown (7.5YR 4/6) masses of oxidized iron; lake depleted; clear boundary
2Ab1	92-122	very dark gray (10YR 3/1) loam; moderate subangular blocky structure; friable; common fine roots; few prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Ab2	122-156	black (2.5Y 2.5/1) sandy loam; moderate subangular blocky structure; friable; common fine roots; abrupt boundary
2Cg	156+	dark gray (10YR 4/1) very gravely sand; single grain; very friable; many mica

Described By: S. Bradley & A.R. Wilson - 05/10/19
Dominant Vegetation: *Ligustrum sinense, Acer rubrum, Fraxinus pennsylvanica*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: poorly drained
Depth to Free Water: 19cm
Other Notes: hydric soil indicator: F19

Table A1d-28: Profile description from the Lake Wheeler Field Lab (LWF_FACE) site
Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-6	brown (7.5YR 4/2) loamy sand; moderate granular structure; very friable; common fine and coarse roots; moderately acidic; clear boundary
Bw	6-36	brown (7.5YR 4/3) sandy loam; weak subangular blocky structure; friable; common fine and few coarse roots; strongly acidic; clear boundary
BC	36-61	strong brown (7.5YR 5/8) coarse sandy loam; weak subangular blocky structure; very friable; few fine and coarse roots; common distinct strong brown (7.5YR 4/6) masses of oxidized iron; common prominent light brownish gray (10YR 6/2) masses of depleted iron; stratified; very strongly acidic; clear boundary
C1	61-78	brown (10YR 5/3) sandy loam; weak subangular blocky structure; friable; few fine and coarse roots; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; stratified; very strongly acidic; clear boundary
C2	78-98	dark gray (7.5YR 4/1) loamy sand; weak subangular blocky structure; very friable; few fine roots; many prominent strong brown (7.5YR 4/6) masses of oxidized iron; few prominent pinkish white (7.5YR 8/1) masses of depleted iron; extremely acidic, clear boundary
Cg	98-110	dark gray (7.5YR 4/1) loamy sand; weak subangular blocky structure; very friable; few fine roots; common prominent yellowish red (5YR 4/6) masses and pore linings of oxidized iron; stratified; very strongly acidic; abrupt boundary
2Ab	110-136	very dark gray (10YR 3/1) fine sandy loam; moderate subangular blocky structure; friable; common fine and coarse roots; few prominent strong brown (7.5YR 4/6) masses of oxidized iron; stratified; very strongly acidic; clear boundary
2Bgb	136-145	very dark gray (7.5YR 3/1) fine sandy loam; moderate subangular blocky structure; friable; few fine roots; few prominent strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
3R	145+	

Described By: S. Bradley & A.R. Wilson - 05/10/19
Dominant Vegetation: *Ligustrum sinense, Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 36cm
Other Notes:

Table A1d-29: Profile description from the Murphy Farm (MF1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-9	dark yellowish brown (10YR 3/4) loam; weak granular; friable; common fine roots; clear boundary
AB	9-29	dark yellowish brown (10YR 3/4) loam; weak subangular blocky structure; friable; common fine roots; abrupt boundary
Bw1	29-63	dark yellowish brown (10YR 4/4) sandy loam; moderate subangular blocky structure; friable; few coarse and fine roots; few pore linings of black (10YR 2/1) organic colors; angular rocks present; clear boundary
Bw2	63-79	brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; few fine roots; few pore linings of light brownish gray (10YR 6/2) of depleted iron; few strong brown (7.5YR 4/6) masses of oxidized iron; angular rocks present clear boundary
Bw3	79-94	strong brown (7.5YR 4/6) loam; weak subangular blocky structure; firm; few fine roots; few light brownish gray (10YR 6/2) pore linings of depleted iron; few dark reddish brown (2.5YR 3/4) masses of oxidized iron; angular rocks present clear boundary
C	94-113	brown (7.5YR 5/4) clay loam; structureless massive; firm; few fine roots; many light brownish gray (2.5Y 6/2) masses of depleted iron; few black (10YR 2/1) manganese concentrations; common strong brown (7.5YR 4/6) and common red (2.5YR 4/6) masses of oxidized iron
2R	113+	

Described By: S. Bradley & A.R. Wilson - 06/24/19
Dominant Vegetation: *Carpinus caroliniana, Ilex opaca, Ulmus rubra*
Parent Materials: Alluvium and colluvium
Landform: Riparian floodplain
Location: 10 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 63cm
Other Notes:

Table A1d-30: Profile description from the Murphy Farm (MF2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-23	very dark grayish brown (10YR 3/2) loam; weak granular structure; very friable; many fine roots; clear boundary
Bw1	23-55	brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; many fine and common coarse roots; clear boundary
Bw2	55-86	brown (10YR 4/3) loam; moderate subangular blocky structure; firm; common fine roots; common grayish brown (10YR 6/2) depleted iron; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
Bg	86-94	grayish brown (10YR 5/2) loam; moderate subangular blocky structure; firm; common fine roots; many strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
2Ab	94-116	very dark gray (10YR 3/1) loam; moderate subangular blocky structure; very friable; few fine roots; charcoal present; abrupt boundary
2Cg	116-134	dark gray (10YR 4/1) loam; structureless single grain; very friable; common fine roots; abrupt boundary
3Oeb	134-142	black (10YR 2/1) mucky peat; many fine and few coarse roots; abrupt boundary
3C'g	142-168	gray (10YR 5/1) very gravelly coarse sandy loam; structureless single grain; very friable; few fine roots
4R	168+	

Described By: S. Bradley & A.R. Wilson – 06/24/19
Dominant Vegetation: *Quercus bicolor, Carpinus caroliniana*, *Ilex opaca*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 10 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Humudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 55cm
Other Notes:

Table A1d-31: Profile description from the Murphy Farm (MF4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-16	brown (7.5YR 4/3) silt loam; weak granular; friable; many fine roots; clear boundary
A2	16-26	brown (10YR 4/3) fine sandy loam; weak subangular blocky structure; very friable; common fine and coarse roots; clear boundary
Bw1	26-45	brown (10YR 5/3) fine sandy loam; weak subangular blocky structure; friable; few fine roots; few black (10YR 2/1) concentrations and nodules of manganese; few dark reddish brown (5YR 3/4) masses of oxidized iron; clear boundary
Bw2	45-62	yellowish brown (10YR 5/4) loam; moderate subangular blocky structure; friable; few fine roots; few black (10YR 2/1) concentrations and nodules of manganese; common strong brown (7.5YR 4/6) nodules and concentrations of iron nodules; clear boundary
Bg1	62-100	light brownish gray (10YR 6/2) loam; moderate subangular blocky structure; friable; few fine roots; few black (10YR 2/1) concentrations and nodules of manganese; common strong brown (7.5YR 4/6) nodules and concentrations of iron nodules; gradual boundary
Bg2	100-131	light brownish gray (10YR 6/2) sandy clay loam; moderate subangular blocky structure; friable; few fine roots; few black (10YR 2/1) concentrations and nodules of manganese; many strong brown (7.5YR 4/6) nodules and concentrations of iron nodules; clear boundary
C	131-148	strong brown (7.5YR 4/6) sandy clay loam; structureless massive; friable; few fine roots; common gray (10YR 6/1) iron depletions; many yellowish red (5YR 4/6) masses of oxidized iron
2R	148+	

Described By: S. Bradley & A.R. Wilson – 06/24/19
Dominant Vegetation: *Lirodendron tulipifera*, *Carpinus caroliniana*, *Ilex opaca*, *Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 30 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 62cm
Other Notes:

Table A1d-32: Profile description from the Murphy Farm (MF5FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-20	very dark gray (7.5YR 3/1) loam; moderate granular and weak subangular blocky structure; friable; many fine and common coarse roots; gradual irregular boundary
Bg1	20-34	grayish brown (10YR 5/2) loam; weak subangular blocky structure; friable; common fine and few coarse roots; common gray (10YR 6/1) masses of depleted iron; common strong brown (7.5YR 5/8) masses of oxidized iron; gradual smooth boundary
Bg2	34-58	light brownish gray (10YR 6/2) clay loam; moderate subangular blocky structure; firm; common fine roots; common dark brown (7.5YR 3/2) and strong brown (7.5YR 5/8) masses and nodules of oxidized iron; few yellowish red (5YR 4/6) masses of oxidized iron; gradual smooth boundary
Bg3	58-88	light brownish gray (10YR 6/2) clay; moderate subangular blocky structure; firm; few fine roots; many strong brown (7.5YR 5/8) masses of oxidized iron; gradual smooth boundary
BCg	88-128	grayish brown (10YR 5/2) and strong brown (7.5YR 4/6) matrix colors clay loam; moderate subangular and angular blocky structures; friable; common fine and few coarse roots; common yellowish red (5YR 4/6) masses of oxidized iron; abrupt wavy boundary
2C	128-136	dark reddish brown (5YR 3/4) sandy clay loam; structureless massive; friable; few black (10YR 2/1) spots of black manganese
3R	136+	

Described By: S. Bradley & A.R. Wilson – 06/24/19
Dominant Vegetation: *Quercus bicolor, Ilex opaca, Acer rubrum, Carya glabra*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 50 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Humaquept
Drainage Class: poorly drained
Depth to Free Water: 6cm
Other Notes: Hydric soil indicator: F19

Table A1d-33: Profile description from the Murphy Farm (MF6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	very dark grayish brown (10YR 3/2) loam; weak granular structure; very friable; few coarse and many fine roots; abrupt smooth boundary
EB	11-27	yellowish brown (10YR 5/4) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; common black (10YR 2/1) masses of manganese; clear smooth boundary
Bt1	27-58	brown (10YR 5/3) clay loam; moderate subangular blocky structure; friable; few fine roots; common black (10YR 2/1) masses of manganese; common yellowish red (5YR 4/6) masses of oxidized iron; clear smooth boundary
Bt2	58-82	yellowish brown (10YR 5/6) clay; moderate subangular and angular blocky structure; firm; few fine and coarse roots; common grayish brown (10YR 5/2) masses of depleted iron; many yellowish brown (10YR 5/8) masses of oxidized iron; gradual smooth boundary
Cg	82-112	gray (2.5Y 6/1) sandy clay loam; structureless massive; firm; few fine roots; common yellowish red (5YR 5/8) and yellowish brown (10YR 5/8) masses of oxidized iron; abrupt wavy boundary
2R	112+	

Described By: S. Bradley & A.R. Wilson – 06/24/19
Dominant Vegetation: *Quercus bicolor, Ilex opaca, Acer rubrum, Carya glabra*
Parent Materials: Fluvial sediments
Landform: Old Terrace
Location: 70 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Typic Kanhapludult
Drainage Class: somewhat poorly drained
Depth to Free Water: 58cm
Other Notes: old terrace soil, mantled terrace

Table A1d-34: Profile description from the Oxford (Ox1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-30	Brown (7.5YR 4/4) loam; moderate granular/subangular blocky structure; friable; common fine roots; clear smooth boundary
Bg1	30-73	Grayish brown (10YR 5/2) clay loam; weak subangular blocky structure; firm; common fine roots; common black (10YR 2/1) masses of oxidized manganese; many strong brown (7.5YR 4/6) masses of oxidized iron; gradual smooth boundary
Bg2	73-110	Grayish brown (10YR 5/2) clay loam; weak subangular blocky structure; friable; common coarse roots; common black (10YR 2/1) masses of oxidized manganese; many strong brown (7.5YR 4/6) masses of oxidized iron; clear smooth boundary
Cg1	110-164	Dark grayish brown (2.5Y 4/2) clay loam; structureless massive; firm; common fine roots; few dark gray (2.5Y 4/1) iron depletions; many strong brown (7.5YR 4/6) masses of oxidized iron; gradual smooth boundary
Cg2	164-194+	Dark gray (2.5Y 4/1) clay loam; structureless massive; firm; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 08/08/19
Dominant Vegetation: *Quercus bicolor, Celtis laevigata*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: somewhat poorly drained
Depth to Free Water: 30cm
Other Notes:

Table A1d-35: Profile description from the Oxford (Ox2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-30	Brown (7.5YR 4/4) loam; weak granular/subangular blocky structure; friable; many fine and few coarse roots; few strong brown (7.5YR 4/6) masses of oxidized iron; clear smooth boundary
Bg1	30-71	Grayish brown (10YR 5/2) loam; weak subangular blocky structure; friable; common fine roots; common black (10YR 2/1) masses of oxidized manganese; common strong brown (7.5YR 4/6) pore linings of oxidized iron; gradual smooth boundary
Bg2	71-118	Grayish brown (10YR 5/2) clay loam; weak subangular blocky structure/structureless massive; firm; common fine roots; common black (10YR 2/1) masses of oxidized manganese; many strong brown (7.5YR 4/6) pore linings of oxidized iron; gradual smooth boundary
Cg1	118-154	Light brownish gray (10YR 6/2) fine sandy loam; structureless massive; friable; few fine roots; common black (10YR 2/1) masses of oxidized manganese; common strong brown (7.5YR 4/6) masses of oxidized iron; clear smooth boundary
Cg2	154-198+	gray (2.5Y 6/1) fine sandy loam; structureless massive; friable; few fine roots; common strong brown (7.5YR 4/6) pore linings of oxidized iron; few dark brown (7.5YR 3/4) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 08/08/19
Dominant Vegetation: *Fraxinus pennsylvanica*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: somewhat poorly drained
Depth to Free Water: 30cm
Other Notes:

Table A1d-36: Profile description from the Oxford (Ox3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-7	Dark brown (10YR 3/3) loam; weak granular structure; friable; many fine roots; clear smooth boundary
A2	7-30	brown (7.5YR 4/4) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common charcoal present; clear smooth boundary
Bw	30-87	Brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual smooth boundary
BCg	87-141	Grayish brown (10YR 5/2) clay loam; weak subangular blocky/structureless massive; firm; few fine roots; few very dark brown (10YR 2/2) masses of oxidized manganese; common strong brown (7.5YR 4/6) masses of oxidized iron; clear smooth boundary
Cg	141-168	Dark grayish brown (10YR 4/2) clay loam; structureless massive; firm; few fine roots; common strong brown (7.5YR 4/6) pore linings of oxidized iron; few dark brown (7.5YR 3/2) masses of oxidized iron; abrupt smooth boundary
Cg/2Ab	168-194+	Dark gray (10YR 4/1) clay loam; structureless massive; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; common black (10YR 2/1) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 08/08/19
Dominant Vegetation: *Celtis laevigatas*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 30cm
Other Notes:

Table A1d-37: Profile description from the Oxford (Ox4FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Au	0-33	Dark brown (10YR 3/3) sandy loam; moderate granular structure; friable; many fine and common coarse roots; gradual smooth boundary
AB	33-73	brown (7.5YR 4/4) loam; moderate granular/weak subangular blocky structure; friable; many fine and few coarse roots; clear smooth boundary
Bw	73-106	Brown (7.5YR 4/3) loam; weak subangular blocky structure; friable; common fine roots; few light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 4/6) masses of oxidized iron; common black (7.5YR 5/1) masses of oxidized iron; abrupt smooth boundary
BC	106-121	Dark brown (7.5YR 3/3) loam; weak subangular blocky structure; friable; few fine and few coarse roots; common light brownish gray (10YR 6/2) iron depletions; common black (7.5YR 2.5/1) masses of oxidized manganese; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt smooth boundary
Cm	121-136	Dark reddish brown (5YR 3/4) coarse sandy loam; weak platy structure; firm; few coarse roots; common grayish brown (10YR 5/2) iron depletions; common black (5YR 2.5/1) masses of oxidized manganese; abrupt smooth boundary
Cg	136-143+	Gray (7.5YR 6/1) loam; weak subangular blocky structure; friable; few coarse roots; common strong brown (7.5YR 4/6) masses of oxidized iron; common yellowish brown (10YR 5/8) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 08/08/19
Dominant Vegetation: *Celtis laevigata*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Humic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 106cm
Other Notes: masses of cemented manganese in Cm layer that did not slake in water

Table A1d-38: Profile description from the Oxford (Ox5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-10	Brown (7.5YR 4/4) loam; weak granular structure; friable; many fine roots; clear smooth boundary
A2	10-39	Brown (7.5YR 4/4) clay loam; weak subangular blocky structure; friable; common coarse and common fine roots; few black (10YR 2/1) masses of oxidized manganese; clear smooth boundary
Bw1	39-68	Yellowish brown (10YR 5/4) loam; weak subangular blocky structure; friable; common fine roots; few black (10YR 2/1) masses of oxidized manganese; common yellowish red (5YR 4/6) masses of oxidized iron; clear smooth boundary
Bw2	68-93	Brown (10YR 5/3) loam; structureless massive/weak subangular blocky structure; few fine roots; firm; common black (10YR 2/1) masses of oxidized manganese; common yellowish red (5YR 4/6) masses of oxidized iron; clear smooth boundary
C	93-126	Brown (10YR 5/3) loam; structureless massive; common fine roots; firm; common gray (10YR 6/1) iron depletions; common black (10YR 2/1) masses of oxidized manganese; common yellowish red (5YR 4/6) masses of oxidized iron; clear smooth boundary
Cg1	126-152	Grayish brown (10YR 5/2) clay loam; structureless massive; firm; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt smooth boundary
Cg2	152-174	Gray (10YR 5/1) clay loam/sand stratified; structureless massive; common fine roots; common yellowish brown (10YR 5/8) masses of oxidized iron; detritus present; clear smooth boundary
2Ab	174-201+	Dark gray (10YR 4/1) clay loam; structureless massive; friable; common yellowish brown (10YR 5/8) masses of oxidized iron; detritus present

Described By: S. Bradley & A.R. Wilson – 08/08/19
Dominant Vegetation: *Celtis laevigata*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 93cm
Other Notes:

Table A1d-39: Profile description from the Parkers Creek (PARK1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-7	Dark yellowish brown (10YR 3/4) loam; moderate granular structure; very friable; many fine roots; clear smooth boundary
A2	7-29	Brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; common coarse and common fine roots; common yellowish brown (7.5YR 5/8) masses of oxidized manganese; common black (7.5YR 2.5/1) masses of oxidized manganese; clear smooth boundary
BA	29-38	Brown (7.5YR 4/4) loam; weak subangular blocky structure; friable; common fine roots; brown (7.5YR 5/2) iron depletions; common black (7.5YR 2.5/1) masses of oxidized manganese; common strong brown (7/5YR 4/6) masses of oxidized iron; clear smooth boundary
C	38-62	Strong brown (7.5YR 4/6) silt loam; structureless massive; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; few black (7.5YR 2.5/1) masses of oxidized manganese; common brown (7.5YR 4/4) masses of oxidized iron; clear smooth boundary
2R	62+	

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Quercus bicolor*, *Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 29cm
Other Notes:

Table A1d-40: Profile description from the Parkers Creek (PARK2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-9	brown (10YR 4/3) loam; moderate granular structure; friable; many fine roots; clear smooth boundary
BA	9-19	Brown (7.5YR 4/4) silt loam; weak subangular blocky structure; friable; common fine roots; clear smooth boundary
C	19-42	Strong brown (7.5YR 4/6) loam; structureless massive; very friable; common coarse and few fine roots; yellowish red (5YR 4/6) iron depletions; common black (7.5YR 2.5/1) masses of oxidized manganese
2R	42+	

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Acer rubrum Liquidambar styraciflua, Pinus taeda*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 42+cm
Other Notes:

Table A1d-41: Profile description from the Parkers Creek (PARK3FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-16	brown (10YR 4/3) loam; moderate granular structure; friable; many fine and many coarse roots; abrupt smooth boundary
Bw1	16-31	Yellowish brown (10YR 5/4) loam; moderate subangular blocky structure; firm; many fine and common coarse roots; few light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 5/8) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; clear smooth boundary
Bw2	31-50	Brown (7.5YR 5/4) loam; moderate subangular blocky structure; friable; common fine and common coarse roots; common light brownish gray (10YR 6/2) iron depletions; few black (10YR 2/1) masses of oxidized manganese; common strong brown (7/5YR 5/8) masses of oxidized iron; common charcoal; gradual smooth boundary
Bw3	50-63	Brown (10YR 5/3) loam; moderate subangular blocky structure; firm; common fine roots; common light brownish gray (10YR 6/2) iron depletions; few black (10YR 2/1) masses of oxidized manganese; common strong brown (7.5YR 5/8) and (7.5YR 4/6) masses of oxidized iron; gradual smooth boundary
Bw4	63-83	Brown (10YR 5/3) loam; moderate subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; common black (10YR 2/1) masses of oxidized manganese; common strong brown (7.5YR 5/8) masses of oxidized iron; iron nodules present; gradual smooth boundary
Bw5	83-93	Pale brown (10YR 6/3) loam; moderate subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; common black (10YR 2/1) masses of oxidized manganese; many strong brown (7.5YR 5/8) masses of oxidized iron; iron nodules present
2R	93+	

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Platanus occidentalis, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 16cm
Other Notes:

Table A1d-42: Profile description from the Parkers Creek (PARK4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-6	Very dark grayish brown (10YR 3/2) silt loam; weak granular structure; very friable; many fine roots; clear smooth boundary
A2	6-25	Dark yellowish brown (10YR 4/4) silt loam; moderate subangular blocky structure; friable; many fine and common coarse roots; few black (10YR 2/1) masses of oxidized manganese; abrupt smooth boundary
C	25-54	Light yellowish brown (10YR 6/4) silt loam; structureless massive; very friable; common fine roots
2R	54+	

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Acer rubrum, Quercus bicolor, Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 54+cm
Other Notes:

Table A1d-43: Profile description from the Parkers Creek (PARK5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	Brown (10YR 4/3) loam; weak granular structure; very friable; many fine roots; common rounded coarse fragments present; abrupt smooth boundary
C	15-44	Dark yellowish brown (10YR 4/4) gravelly silt loam; structureless massive; very friable
2R	44+	

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Acer rubrum, Quercus bicolor, Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 44+cm
Other Notes:

Table A1d-44: Profile description from the Parkers Creek (PARK6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-12	Dark brown (10YR 3/3) silt loam; moderate granular structure; friable; many fine roots; clear smooth boundary
A2	12-26	Dark yellowish brown (10YR 4/4) loam; weak granular to weak subangular blocky structure; friable; common fine roots; few black (10YR 2/1) masses of oxidized manganese; clear smooth boundary
BA	26-38	Dark yellowish brown (10YR 5/4) silt loam; weak subangular blocky structure; friable; common fine roots; few black (10YR 2/1) masses of oxidized manganese; common charcoal; clear smooth boundary
C	68-74	Yellowish brown (10YR 5/4) silt loam; weak subangular blocky structure; very friable; common fine roots; few light brownish gray (10YR 6/2) iron depletions; few black (10YR 2/1) masses of oxidized manganese
2R	74+	

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Acer rubrum, Quercus bicolor, Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy skeletal, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 68cm
Other Notes:

Table A1d-45: Profile description from the Parkers Creek (PARK7) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-23	Dark brown (10YR 3/3) loam; moderate granular to weak subangular blocky structure; friable; many fine roots; abrupt smooth boundary
Bw1	23-55	yellowish brown (10YR 5/4) loam; weak subangular blocky structure; friable; common fine and common coarse roots; few black (10YR 2/1) masses of oxidized manganese; clear smooth boundary
Bw2	55-68	brown (10YR 5/3) silt loam; weak subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; few black (10YR 2/1) masses of oxidized manganese; clear smooth boundary
Bw3	68-89	Pale brown (10YR 6/3) silt loam; weak subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; few black (10YR 2/1) masses of oxidized manganese; clear smooth boundary
BCg	89-105	Dark grayish brown (10YR 4/2) clay loam; weak subangular blocky structure; friable; few black (7.5YR 2.5/1) masses of oxidized manganese, few dark reddish brown (5YR 3/4) masses of oxidized iron; common strong brown (7.5YR 4/6) masses of oxidized iron; few fine roots; clear smooth boundary
Cg	105-119	Dark grayish brown (10YR 4/2) clay loam; structureless massive; firm; common black (7.5YR 2.5/1) masses of oxidized manganese; common strong brown (7.5YR 4/6) masses of oxidized iron; few fine roots
2R	119+	Basal gravel

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Acer rubrum, Quercus bicolor, Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 80 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 55cm
Other Notes:

Table A1d-46: Profile description from the Raven Rock State Park (RR1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
AC	0-21	Very dark grayish brown (10YR 3/2) sandy loam; weak granular structure; very friable; many fine and common coarse roots; many mica present; abrupt smooth boundary
Bg1	21-41	gray (10YR 5/1) sandy loam; weak subangular blocky structure; very friable; common fine; common dark yellowish brown (10YR 4/6) masses of oxidized iron; many mica present; abrupt smooth boundary
Bg2	41-64	gray (10YR 5/1) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common dark yellowish brown (10YR 4/6) masses of oxidized iron; many mica present; clear smooth boundary
Bg3	64-118	gray (2.5Y 6/1) fine sandy loam; weak subangular blocky structure; friable; many fine and few coarse roots; many strong brown (7.5YR 5/8) masses of oxidized iron; many mica present; clear smooth boundary
BCg	118-191	gray (2.5Y 6/1) fine sandy loam; structureless massive; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron, common strong brown (7.5YR 5/8) masses of oxidized iron; many mica present; clear smooth boundary
Cg	191-203	gray (2.5Y 6/1) fine sandy loam; structureless massive; friable; many strong brown (7.5YR 4/6) masses of oxidized iron; common fine roots; many mica present

Described By: S. Bradley & A.R. Wilson – 08/12/19
Dominant Vegetation: *Tracheophyta*, *Liquidambar styraciflua*, *Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 30 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: poorly drained
Depth to Free Water: 21 cm
Other Notes: hydric soil indicator: F19

Table A1d-47: Profile description from the Raven Rock State Park (RR2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-3	Grayish brown (10YR 5/2) sand; single grain; loose; many fine roots; abrupt smooth boundary
AC	3-27	Brown (10YR 4/3) fine sandy loam; weak granular to weak subangular blocky structure; very friable; many fine roots; clear smooth boundary
Bw1	27-53	Brown (10YR 5/3) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; few light brownish gray (10YR 6/2) iron depletions; gradual smooth boundary
Bw2	53-97	Yellowish brown (10YR 5/4) fine sandy loam; moderate subangular blocky structure; very friable; common fine roots; few light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 5/8) masses of oxidized iron; clear smooth boundary
Bg	97-154	Light brownish gray (10YR 6/2) fine sandy loam; moderate subangular blocky structure; friable; common fine roots; common yellowish brown (10YR 5/8) masses of oxidized iron; common strong brown (7.5YR 4/6) masses of oxidized iron; common very dark gray (7.5YR 3/1) masses of oxidized iron; common charcoal present; abrupt smooth boundary
2Ab	154-171	Very dark gray (7.5YR 3/1) sandy loam; moderate subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; buried wood present; abrupt smooth boundary
2A/C	171-192	Gray (2.5Y 5/1) loamy sand; weak subangular blocky to structureless massive structure; friable; common fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; common charcoal present; abrupt smooth boundary
3Ab	192-207	Very dark gray (2.5Y 3/1) loam; strong subangular blocky structure; firm; many fine roots; buried wood present; clear smooth boundary
3Cg	207-220+	Gray (10YR 5/1) very gravely coarse sand; single grain; loose; few fine roots

Described By: S. Bradley & A.R. Wilson – 08/12/19
Dominant Vegetation: *Carpinus caroliniana, Acer rubrum, Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 27 cm
Other Notes:

Table A1d-48: Profile description from the Raven Rock State Park (RR3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C	0-7	Grayish brown (10YR 5/2) sand; single grain; loose; many fine roots; abrupt smooth boundary
AC	7-40	Brown (10YR 5/3) fine sandy loam; weak subangular blocky structure; very friable; common fine and common coarse roots; clear smooth boundary
Bw1	40-103	Brown (10YR 5/3) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; gradual smooth boundary
Bw2	103-143	brown (10YR 4/3) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 4/6) masses of oxidized iron; clear smooth boundary
Cg	143-158	Dark gray (10YR 4/1) fine sandy loam; structureless massive; friable; many fine roots; few gray (10YR 6/1) iron depletions; common yellowish brown (10YR 5/8) masses of oxidized iron; abrupt smooth boundary
2Ab	158-186	Very dark gray (10YR 3/1) fine sandy loam; moderate subangular blocky structure; friable; common fine roots; few gray (10YR 6/1) iron depletions; common strong brown (7.5YR 5/8) masses of oxidized iron; abrupt smooth boundary
2A/Cg	186-201	Dark gray (10YR 3/1) and light gray (2.5Y 7/1) loamy sand; weak subangular blocky to structureless massive structure; friable; common fine roots; abrupt smooth boundary
3A/Oib	201-211+	black (10YR 2/1) sandy loam with 25% detritus; weak subangular blocky structure; friable; basal gravels below

Described By: S. Bradley & A.R. Wilson – 08/12/19
Dominant Vegetation: *Quercus bicolor*, *Carpinus caroliniana*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 10 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 103 cm
Other Notes: levee

Table A1d-49: Profile description from the Raven Rock State Park (RR4FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	brown (10YR 4/3) loamy fine sand; weak subangular blocky; very friable; many fine and few coarse roots; clear wavy boundary
A/C1	15-47	Brown (10YR 4/3) and pale brown (2.5Y 7/3) loamy fine sand; weak subangular blocky structure; very friable; common fine roots; gradual wavy boundary
A/C2	47-71	Brown (10YR 4/3) and light gray (2.5Y 7/2) loamy sand; weak subangular blocky structure; very friable; common fine and few coarse roots; common gray (10YR 6/1) iron depletions; common yellowish brown (10YR 5/8) masses of oxidized iron; abrupt smooth boundary
C	71-86	Olive brown (2.5Y 4/3) loamy sand; weak subangular blocky structure; very friable; common fine roots; common light brownish gray (2.5Y 6/2) iron depletions; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt smooth boundary
2A/C1	86-120	gray (10YR 5/1) and light brownish gray (10YR 6/2) fine sandy loam; moderate structure; friable; common fine roots; few gray (10YR 5/1) iron depletions; common strong brown (10YR 4/6) masses of oxidized iron; common charcoal present; clear smooth boundary
2A/C2	120-144	dark gray (10YR 4/1) loamy sand; weak subangular blocky structure; very friable; common fine roots; few light brownish gray (10YR 6/1) iron depletions; common strong brown (7.5YR 4/6) masses of oxidized iron; common black (10YR 2/1) masses of oxidized manganese; common charcoal present; abrupt smooth boundary
3A/Oib	144-172	black (10YR 2/1) loamy sand; moderate subangular blocky structure; friable; common fine roots; common charcoal present; 25% detritus present
2R	172+	Basal gravels

Described By: S. Bradley & A.R. Wilson – 08/12/19
Dominant Vegetation: *Liquidambar styraciflua, Quercus bicolor, Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 47 cm
Other Notes:

Table A1d-50: Profile description from the Raven Rock State Park (RR5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
AC	0-5	Very dark grayish brown (10YR 3/2) sand; single grain; loose; many fine roots; abrupt smooth boundary
Bw	5-36	Yellowish brown (10YR 5/4) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; clear wavy boundary
Bg	36-79	Grayish brown (10YR 5/2) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common gray (10YR 6/1) iron depletions; common strong brown (10YR 5/8) masses of oxidized iron; clear smooth boundary
BC	79-102	Brown (10YR 5/3) fine sandy loam; weak subangular blocky structure; very friable; few fine roots; common light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 4/6) masses of oxidized iron; common strong brown (7.5YR 5/8) masses of oxidized iron
2R	102+	Basal gravels

Described By: S. Bradley & A.R. Wilson – 08/12/19
Dominant Vegetation: *Pinus taeda, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 10 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 36 cm
Other Notes:

Table A1d-51: Profile description from the Raven Rock State Park (RR6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	Very dark grayish brown (10YR 3/2) fine sandy loam; weak granular structure; very friable; many fine roots; abrupt smooth boundary
Bw1	11-39	Yellowish brown (10YR 5/4) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; light gray (10YR 7/1) iron depletions; few yellowish brown (10YR 5/8) masses of oxidized iron; few very dark gray (10YR 3/1) masses of oxidized iron; clear wavy boundary
Bw2	39-63	brown (10YR 5/3) fine sandy loam; weak subangular blocky structure; firm; few fine roots; common light brownish gray (10YR 6/2) iron depletions; common strong brown (10YR 5/8) masses of oxidized iron; few very dark gray (10YR 3/1) masses of oxidized iron; clear smooth boundary
Bw3	63-74	Yellowish brown (10YR 5/6) very gravely fine sandy loam; weak subangular blocky structure; friable; few fine roots; common light brownish gray (10YR 6/2) iron depletions; common strong brown (7.5YR 5/8) masses of oxidized iron
2R	74+	Basal gravels

Described By: S. Bradley & A.R. Wilson – 08/12/19
Dominant Vegetation: *Pinus taeda, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: poorly drained
Depth to Free Water: 11 cm
Other Notes: hydric soil indicator: F19

Table A1d-52: Profile description from the Schenck Forest (Carl Alwin Memorial Forest) (SHNK1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-10	dark brown (7.5Y 3/4) loam; weak granular structure; very friable; common fine and coarse roots; abrupt boundary.
A2	10-29	dark yellowish brown (10YR 3/4) fine sandy loam; weak subangular blocky structure; friable; common fine roots; abrupt boundary.
Bw1	29-54	dark yellowish brown (10YR 4/4) sandy loam; weak subangular blocky structure; very friable; clear boundary.
Bw2	54-117	strong brown (7.5YR 4/6) sandy clay loam; moderate subangular blocky structure; firm; clear boundary.
Bw3	117-179	dark yellowish brown (10YR 4/6) sandy clay loam; moderate subangular blocky structure; friable; few coarse roots; common prominent yellowish red (5YR 5/8) masses of oxidized iron; few prominent dark gray (7.5YR 4/1) masses of depleted iron; clear boundary.
C	179-203+	brown (7.5YR 4/4) sandy clay loam; massive; very friable; few fine and coarse roots; saprolite

Described By: S. Bradley & A.R. Wilson – 05/17/19
Dominant Vegetation: *Pinus taeda*, *Lirodendron tulipifera*, *Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 117 cm
Other Notes:

Table A1d-53: Profile description from the Schenck Forest (Carl Alwin Memorial Forest) (SHNK2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-11	brown (10YR 4/3) coarse sandy loam; weak granular structure; very friable; common fine roots; clear boundary
A2	11-30	dark brown (7.5YR 3/4) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; clear boundary
Bw1	30-49	dark yellowish brown (10YR 4/6) sandy clay loam; weak subangular blocky structure; very friable; few fine roots; common faint yellowish red (5YR 4/6) masses of oxidized iron; abrupt boundary
Bw2	49-107	yellowish brown (10YR 5/4) sandy clay loam; moderate subangular blocky structure; friable; few coarse roots; clear boundary
Bw3	107-140	yellowish brown (10YR 5/6) sandy clay loam; moderate subangular blocky structure; friable; abrupt boundary
2R	140+	

Described By: S. Bradley & A.R. Wilson – 05/17/19
Dominant Vegetation: *Pinus taeda, Lirodendron tulipifera, Carpinus caroliniana*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: well drained
Depth to Free Water: 140+ cm
Other Notes:

Table A1d-54: Profile description from the Schenck Forest (Carl Alwin Memorial Forest) (SHNK3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	brown (10YR 4/3) coarse sandy loam; weak granular structure; very friable; many fine roots; clear boundary
Bw1	11-39	dark yellowish brown (10YR 4/4) sandy loam; weak subangular blocky structure; very friable; common fine roots; clear boundary
Bw2	39-66	brown (7.5YR 4/4) sandy clay loam; weak subangular blocky structure; very friable; common fine roots; clear boundary
Bw3	66-137	reddish brown (5YR 4/4) sandy loam; moderate subangular blocky structure; very friable; common fine and few coarse roots; gradual boundary
Bw4	137-188	strong brown (7.5YR 4/6) sandy loam; moderate subangular blocky structure; friable; few fine roots; gradual boundary
Bw5	188-208+	dark yellowish brown (10YR 4/4) coarse sandy loam; moderate subangular blocky structure; friable

Described By: S. Bradley & A.R. Wilson – 05/17/19
Dominant Vegetation: *Quercus bicolor, Betula nigra, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: well drained
Depth to Free Water: 208+ cm
Other Notes:

Table A1d-55: Profile description from the Schenck Forest (Carl Alwin Memorial Forest) (SHNK4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C	0-18	dark yellowish brown (10YR 4/4) sandy loam; weak granular structure; very friable; many fine roots; abrupt boundary
A	18-34	brown (7.5YR 4/4) loam; weak granular structure; very friable; few coarse and many fine roots; clear boundary
Bw1	34-76	strong brown (7.5YR 4/6) sandy loam; weak subangular blocky structure; friable; few coarse and many fine roots; clear boundary
Bw2	76-112	strong brown (7.5YR 4/6) sandy loam; moderate subangular blocky structure; friable; common fine roots; clear boundary
Bw3	112-145	yellowish brown (10YR 5/4) sandy clay loam; strong subangular blocky structure; friable; few fine roots; common distinct strong brown (7.5YR 4/6) masses of oxidized iron; common distinct light brownish gray (2.5Y 6/2) masses of depleted iron; common charcoal present; clear boundary
Bw4	145-191	yellowish brown (10YR 5/6) fine sandy loam; strong subangular blocky structure; friable; few fine roots; common faint strong brown (7.5YR 4/6) masses of oxidized iron; common prominent gray (2.5Y 6/1) masses of depleted iron; abrupt boundary
Bg	191-217	bluish gray (5B 6/0) sandy clay loam; strong subangular blocky structure; firm; few fine roots; common prominent strong brown (7.5YR 5/8) masses of oxidized iron; abrupt boundary
2R	217+	

Described By: S. Bradley & A.R. Wilson – 05/17/19
Dominant Vegetation: *Carpinus caroliniana*, *Liquidambar styraciflua*, *Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 112 cm
Other Notes:

Table A1d-56: Profile description from the Schenck Forest (Carl Alwin Memorial Forest) (SHNK5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-13	dark yellowish brown (10YR 4/4) loam; weak granular structure; friable; many fine and coarse roots; clear boundary
Bw1	13-54	dark yellowish brown (10YR 3/6) loam; weak subangular blocky structure; friable; many fine and coarse roots; few prominent very dark brown (10YR 2/2) manganese concentrations; clear boundary
Bw2	54-98	yellowish brown (10YR 5/4) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common distinct strong brown (7.5YR 4/6) masses of oxidized iron; common distinct light brownish gray (10YR 6/2) masses of depleted iron; abrupt boundary
Bw3	98-171	strong brown (7.5YR 5/6) sandy clay loam; weak subangular blocky structure; friable; few fine roots; many faint strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
Bg	171-185	grayish blue (5B 6/0) sandy clay loam; moderate subangular blocky structure; firm; few fine roots; common prominent strong brown (7.5YR 4/6) masses of oxidized iron
2R	185+	

Described By: S. Bradley & A.R. Wilson – 05/17/19
Dominant Vegetation: *Carpinus caroliniana, Pinus taeda, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 54 cm
Other Notes: wet depression by sewer line

Table A1d-57: Profile description from the Schenck Forest (Carl Alwin Memorial Forest) (SHNK6FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-30	dark brown (7.5YR 3/4) loamy fine sand; weak granular structure; very friable; many fine and coarse roots; clear boundary
Bw1	30-48	brown (7.5YR 4/4) fine sandy loam; weak subangular blocky structure; very friable; common fine roots; clear boundary
Bw2	48-71	brown (7.5YR 4/4) fine sandy loam; weak subangular blocky structure; very friable; common fine and coarse roots; clear boundary
Bw3	71-86	brown (7.5YR 4/4) loam; weak subangular blocky structure; very friable; common fine and coarse roots; clear boundary
C	86-120	brown (7.5YR 4/4)fine sandy loam; weak subangular blocky structure; very friable; common fine roots; few faint dark reddish brown (5YR 3/4) masses of oxidized iron; few light brownish gray (10YR 6/2) masses of depleted iron; clear boundary
2Ab	120-142	dark brown (7.5YR 3/2) loamy sand; weak subangular blocky structure; friable; few fine roots; few prominent strong brown (7.5YR 5/6) masses of oxidized iron; clear boundary
2Bgb	142-160+	dark gray (10YR 4/1) loamy sand; weak subangular blocky structure; very friable; few fine roots; many prominent dark brown (7.5YR 3/4) and strong brown (7.5YR 4/6) masses and pore linings of oxidized iron

Described By: S. Bradley & A.R. Wilson – 05/17/19
Dominant Vegetation: *Carpinus caroliniana, Pinus taeda, Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 86 cm
Other Notes:

Table A1d-58: Profile description from Sloan Park (SP1FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Bw1	0-29	Yellow red (5YR 4/6) loam; weak subangular blocky structure; friable; common fine and few coarse roots; clear smooth boundary
Bw2	29-60	Yellow red (5YR 4/6) fine sandy loam; weak angular blocky structure; friable; common fine and few coarse roots; pinkish gray (7.5YR 6/2) iron depletions; black (7.5YR 2.5/1) oxidized manganese; common charcoal; abrupt smooth boundary
^Bt	60-82	Yellowish red (5YR 4/6) clay; strong angular blocky structure; very firm; common fine roots; yellowish red (5YR 5/8) pore linings of oxidized iron; abrupt smooth boundary
2Ab	82-102	Dark gray (7.5YR 4/1) clay loam; moderate prismatic structure; very firm; common fine roots; few strong brown (7.5YR 4/6) pore linings of oxidized iron; common black (7.5YR 2.5/1) masses of oxidized manganese; gradual irregular boundary
2Ab/Bgb	102-148	Dark gray (7.5YR 4/1) and gray (10YR 6/1) clay loam; strong prismatic structure; very firm; few fine roots; common black (7.5YR 2.5/1) pore linings of oxidized iron; many strong brown (7.5YR 4/6) masses of oxidized iron; few yellowish red (5YR 4/6) masses of oxidized iron; gradual wavy boundary
2Cg	148-176+	Gray (10YR 4/1) clay loam; structureless massive; friable; few fine roots; few gray (10B 6/0) iron depletions; common black (7.5YR 2.5/1) masses of oxidized manganese; many strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/25/19
Dominant Vegetation: *Betula nigra, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 0 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Anthroportic Udorthent
Drainage Class: somewhat poorly drained
Depth to Free Water: 29 cm (episaturated)
Other Notes: Human influenced soil where pond was filled in with clay; cut bank had a top cut back causing Bw1 horizon at top

Table A1d-59: Profile description from Sloan Park (SP2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	Very dark brown (10YR 2/1) loam; weak granular structure; friable; many fine and many coarse roots; abrupt smooth boundary
Bw	15-62	Brown (7.5YR 4/4) sandy loam; weak angular blocky structure; friable; common fine and common coarse roots; abrupt smooth boundary
^Bt	62-86	Brown (7.5YR 4/4) clay; strong subangular blocky to weak prismatic structure; very firm; common fine roots; clear smooth boundary
2Ab	86-95	Black (7.5YR 2.5/1) loam; moderate subangular blocky structure; firm; few fine roots; common strong brown (7.5YR 4/6) pore linings of oxidized iron; clear boundary
2Bgb1	95-132	Brown (7.5YR 5/2) loam; weak subangular blocky structure; very friable; few fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
2Bgb2	132-163	Gray (7.5YR 5/1) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; common black (7.5YR 2.5/1) masses of oxidized manganese; clear boundary
2BCbg	163-186	Very dark gray (7.5YR 4/1) sandy loam; weak subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Cg1	186-200	Gray (2.5Y 6/1) sandy clay loam; structureless massive; firm; few fine roots; few black (7.5YR 2.5/1) masses of oxidized manganese; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Cg1	200-220+	Gray (2.5Y 6/1) coarse sandy loam; structureless massive; very friable; few fine roots; common reddish yellow (7.5YR 6/8) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/25/19
Dominant Vegetation: *Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Anthroportic Udorthent
Drainage Class: moderately well drained
Depth to Free Water: 95 cm
Other Notes: Human influenced soil where pond was filled in with clay

Table A1d-60: Profile description from Sloan Park (SP3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-10	Dark brown (7.5YR 3/3) loam; moderate granular to moderate subangular blocky structure; friable; common fine and few coarse roots; common mica present; clear smooth boundary
Bw	10-69	Dark reddish brown (5YR 3/4) sandy clay loam; weak subangular blocky structure; friable; common fine roots; common mica present; abrupt smooth boundary
2Ab	69-96	Very dark gray (7.5YR 3/1) loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) pore linings of oxidized iron; clear boundary
2Bgb1	96-139	Light brownish gray (10YR 6/2) clay loam; moderate subangular blocky structure; firm; common fine roots; common strong brown (7.5YR 5/8) pore linings of oxidized iron; common very dark gray (7.5YR 3/1) masses of oxidized manganese; clear boundary
2Bgb2	139-204+	Gray (10YR 6/1) clay loam; moderate subangular blocky structure; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; common black (5YR 2.5/1) masses of oxidized manganese; clear boundary

Described By: S. Bradley & A.R. Wilson – 07/25/19
Dominant Vegetation: *Microstegium vimineum, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Anthroportic Udorthent
Drainage Class: moderately well drained
Depth to Free Water: 96 cm
Other Notes: Human influenced soil where pond was filled in with clay

Table A1d-61: Profile description from Sloan Park (SP4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	brown (7.5YR 4/3) clay loam; moderate subangular blocky structure; friable; common fine roots; gradual smooth boundary
Bw	15-40	Brown (7.5YR 4/3) sandy clay loam; weak subangular blocky structure; friable; common fine and common coarse roots; common yellowish red (5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; abrupt smooth boundary
2Ab	40-63	dark gray (7.5YR 4/1) loam; weak subangular blocky structure; friable; few fine roots; common yellowish red (5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; clear boundary
2Bgb1	63-107	Gray (7.5YR 6/1) clay loam; weak subangular blocky structure; friable to firm; common fine roots; many strong brown (7.5YR 4/6) pore linings of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; gradual boundary
2BCgb1	107-169	Gray (10YR 6/1) clay; weak angular blocky structure to structureless massive; friable; common fine roots; many strong brown (7.5YR 4/6) pore linings of oxidized iron; common yellowish red (5YR 4/6) masses of oxidized iron; few black (7.5YR 2.5/1) masses of oxidized manganese; abrupt boundary
2Cg1	169-195	Gray (10YR 5/1) sandy clay loam; structureless massive; friable; few fine roots; common yellowish red (5YR 5/8) masses of oxidized iron; few black (5YR 2.5/1) masses of oxidized manganese; clear boundary
2Cg2	195-211+	Gray (10YR 5/1) coarse sandy loam; structureless massive; very friable; few fine roots; common yellowish brown (7.5YR 5/6) masses of oxidized iron; mica present

Described By: S. Bradley & A.R. Wilson – 07/25/19
Dominant Vegetation: *Microstegium vimineum, Lirodendron tulipifera, Juglans regia*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Endoaquept
Drainage Class: somewhat poorly drained
Depth to Free Water: 40 cm
Other Notes: Human influenced soil where pond was filled in with clay

Table A1d-62: Profile description from Spring Valley (SVAL1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-25	brown (10YR 4/3) sandy clay loam; weak granular to weak subangular blocky structure; friable; many fine roots; clear boundary
AB	25-60	dark yellowish brown (10YR 4/4) clay loam; weak subangular blocky structure; firm; common fine roots; few strong brown (7.5YR 4/6) masses of oxidized iron; gradual boundary
Bg	60-108	grayish brown (10YR 5/2) sandy clay loam; weak subangular blocky structure; firm; clear fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of manganese; abrupt boundary
2Ab	108-119	Gray (10YR 5/1) sandy loam; moderate subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; abrupt boundary
2C	119-127	brown (10YR 5/3) coarse sand; single grain; very friable; few fine roots; common strong brown (7.5YR 4/6) pore linings of oxidized iron; clear boundary
2Cg1	127-178	Gray (2.5Y 5/1) loamy sand; single grain; very friable; few fine roots; common dark yellowish brown (10YR 4/6) masses of oxidized iron; abrupt boundary
2Cg2	178-214+	Dark gray (10YR 4/1) very coarse sandy loam; single grain; very friable; few fine roots; few strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/18/19
Dominant Vegetation: low grassy veg
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 10 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 60 cm
Other Notes:

Table A1d-63: Profile description from Spring Valley (SVAL3FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C	0-28	Olive brown (2.5Y 4/3) sand; single grain; very friable; common fine roots; clear smooth boundary
2Aub	28-57	Very dark grayish brown (10YR 3/2) fine sandy loam; weak granular structure; very friable; common fine roots; bailer twine and candy wrapper human artifacts; abrupt smooth boundary
2BCg	57-67	Dark gray (2.5Y 4/1) sandy loam; moderate subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; abrupt wavy boundary
3C	67-84	Brown (7.5YR 4/3) and yellowish brown (10YR 5/4) sand; single grain; very friable; few fine roots; common light brownish gray (2.5Y 6/2) masses of reduced iron; common strong brown (7.5YR 4/6) masses of oxidized iron; common black (10YR 2/1) masses of oxidized manganese; clear wavy boundary
3Cu	84-107	Brown (7.5YR 4/3) and yellowish brown (10YR 5/4) sand; single grain; very friable; few fine roots; common light brownish gray (2.5Y 6/2) masses of reduced iron; common strong brown (7.5YR 4/6) masses of oxidized iron; common black (10YR 2/1) masses of oxidized manganese; red plastic cup and plastic water bottle human artifacts present; abrupt irregular wavy boundary
4Ab	107-135+	Dark gray (10YR 4/1) sandy loam; moderate subangular blocky structure; firm; few fine roots; buried wood present

Described By: S. Bradley & A.R. Wilson – 07/18/19
Dominant Vegetation: *Microstegium vimineum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 00 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: sandy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 57 cm
Other Notes:

Table A1d-64: Profile description from Spring Valley (SVAL5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	Dark grayish brown (10YR 4/2) loam; moderate granular structure; friable; moderate fine roots; abrupt boundary
AB	5-19	Brown (7YR 4/4) loam; weak granular to weak subangular blocky structure; friable; common fine roots; clear boundary
Bw1	19-47	Brown (7.5YR 4/4) fine sandy loam; weak subangular blocky structure; very friable; few fine roots; clear boundary
Bw2	47-118	Brown (10YR 5/3) silty clay loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; common grayish brown (10YR 5/2) masses of reduced iron; gradual boundary
2Ab	118-143	Dark grayish brown (10YR 4/2) clay loam; moderate subangular blocky structure; friable; common fine roots; many strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Bgb1	143-167	Gray (2.5Y 5/1) clay loam; weak subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; clear boundary
2Cg1	167-206+	Gray (2.5Y 6/1) sandy loam; single grain; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 07/18/19
Dominant Vegetation: *Quercus bicolor*, *Nyssa sylvatica*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: fine-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 47 cm
Other Notes:

Table A1d-65: Profile description from Spring Valley (SVAL6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C1	0-11	Dark yellowish brown (10YR 4/4) loamy sand; single grain; very friable; common fine roots; clear boundary
C2	11-25	Brown (10YR 5/3) loamy sand; single grain; very friable; few fine roots; clear boundary
C3	25-66	Brown (10YR 4/3) coarse sandy loam; single grain; very friable; common fine roots; clear boundary
2AC	66-123	Brown (10YR 4/3) sandy loam; weak granular to weak subangular blocky structure; very friable; common fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; gradual boundary
2Aub	123-155	Brown (7.5YR 4/4) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; aluminum can lid human artifact present; clear boundary
3Bwb1	155-181	Brown (7.5YR 4/3) coarse sandy loam; weak subangular blocky structure; friable; common fine and common coarse roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Bwb2	181-195+	Brown (7.5YR 4/4) loamy sand; weak subangular blocky structure; very friable; common fine and few coarse roots; many strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/18/19
Dominant Vegetation: *Acer rubrum, Quercus bicolor*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 30 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: well drained
Depth to Free Water: 195+ cm
Other Notes: location on levee

Table A1d-66: Profile description from Thomas Brooks (TB1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-16	Dark grayish brown (10YR 4/2) loam; moderate granular to weak subangular blocky structure; very friable; many fine and few coarse roots; clear boundary
AC	16-30	Brown (10YR 4/3) sandy loam; moderate subangular blocky structure; very friable; common fine and few coarse roots; clear boundary
CA	30-48	Brown (10YR 4/3) fine sandy loam; weak subangular blocky structure; friable; common fine roots; few strong brown (7.5YR 4/6) pore linings of oxidized iron; common grayish brown (10YR 5/2) masses of reduced iron; clear boundary
C	48-81	Pale brown (2.5Y 7/3) sandy loam; structureless massive; very friable; few fine roots; few yellowish brown (10YR 5/6) masses of oxidized iron; few white (2.5Y 8/1) masses of reduced iron; gradual boundary
CB	81-119	Pale brown (10YR 6/3) fine sandy loam; weak subangular blocky structure; very friable; many few and few coarse roots; common strong brown (7.5YR 5/8) masses of oxidized iron; common gray (2.5Y 6/1) masses of reduced iron; gradual boundary
2BC	119-150	Grayish brown (10YR 5/2) sandy loam; weak subangular blocky structure; friable; few fine and fine coarse roots; common yellowish brown (10YR 5/8) masses of oxidized iron; clear boundary
2Cg1	150-175	Gray (10YR 5/1) fine sandy loam; structureless massive; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Cg2	175-204+	Gray (10YR 6/1) fine sandy loam; structureless massive; friable; common yellowish brown (10YR 5/8) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Liquidambar styraciflua*, *Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Typic Udifluvent
Drainage Class: somewhat poorly drained
Depth to Free Water: 30 cm
Other Notes:

Table A1d-67: Profile description from Thomas Brooks (TB2FACE) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
AC	0-25	Yellowish brown (10YR 5/4) loamy sand; weak subangular blocky structure; very friable; many fine and common coarse roots; clear smooth boundary
C	25-40	Pale brown (10YR 6/3) loamy sand; single grain; very friable; many fine and common coarse roots; few black (10YR 2/1) masses of oxidized manganese; gradual smooth boundary
2A/C	40-84	Dark yellowish brown (10YR 4/4) and light yellowish brown (10YR 6/4) loamy sand; single grain to weak subangular blocky structure; friable; common fine and common coarse roots; gradual smooth boundary
2Bw	84-105	Yellowish brown (10YR 5/8) sandy loam; moderate subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; clear smooth boundary
2Bg	105-122	Grayish brown (10YR 5/2) sandy loam; weak subangular blocky structure; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear smooth boundary
2Cg	122-137+	Light brownish gray (10YR 6/2) loamy sand; structureless massive to single grain; very friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Quercus bicolor, Acer rubrum*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 00 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: well drained
Depth to Free Water: 137+ cm
Other Notes:

Table A1d-68: Profile description from Thomas Brooks (TB3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-20	Dark brown (10YR 3/3) loam; moderate granular to weak subangular blocky structure; very friable; many few and common coarse roots; clear boundary
A/C	20-58	Light yellowish brown (10YR 6/4) sandy loam and sand; weak granular structure; very friable; common fine roots; clear boundary
C	58-74	Brownish yellow (10Yr 6/6) sand; single grain; very friable to loose; few fine roots; abrupt boundary
2Bg1	74-110	Light yellowish brown (10YR 6/2) clay loam; moderate subangular blocky structure; friable; many fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual boundary
2Bg2	110-137	Light yellowish brown (10YR 6/2) silt loam; weak subangular blocky structure; very friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2Cg1	137-180	Gray (10YR 5/1) clay loam; structureless massive; friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; common charcoal present; clear boundary
2Cg2	180-208+	Gray (10YR 6/1) coarse sand; single grain; very friable; few fine roots; few strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Celtis laevigata*, *Acer rubrum*, *Liquidambar styraciflua*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 20 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluventic Dystrudept
Drainage Class: moderately well drained
Depth to Free Water: 74 cm
Other Notes:

Table A1d-69: Profile description from Thomas Brooks (TB4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-17	Dark brown (10YR 3/3) silt loam; weak subangular blocky structure; friable; many fine and few coarse roots; clear boundary
C	17-29	Yellowish brown (10YR 5/4) sand; weak subangular blocky structure; friable; few fine roots; few yellowish brown (10YR 5/8) masses of oxidized iron; few grayish brown (10YR 5/2) masses of reduced iron; gradual smooth boundary
2Ab	29-49	Grayish brown (10YR 5/2) sandy clay loam; weak subangular blocky structure; friable; common fine and few coarse roots; common strong brown (7.5YR 4/6) masses of oxidized iron; clear boundary
2C	49-76	Dark yellowish brown (10YR 4/6) sand; single grain; loose; few fine roots; clear boundary
3Bg	76-109	Light brownish gray (10YR 6/2) loam; weak subangular blocky structure; very friable; few fine and few coarse roots; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual boundary
3BCg	109-152	Gray (10YR 6/1) sandy loam; structureless massive; friable; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; gradual boundary
3BC	152-172	Pale brown (10YR 6/3) fine sandy loam; weak subangular blocky structure; friable; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; common gray (10YR 6/1) masses of reduced iron; clear boundary
4Bw	172-203+	Light yellowish brown (10YR 6/4) fine sandy loam; weak subangular blocky structure; friable; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; common light gray (10YR 7/2) masses of reduced iron

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 40 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 17 cm
Other Notes:

Table A1d-70: Profile description from Thomas Brooks (TB5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-10	Very dark grayish brown (10YR 3/2) sandy loam; weak granular to subangular blocky structure; very friable; common fine and common coarse roots; clear boundary
AC	10-28	Dark yellowish brown (10YR 4/4) and brown (10YR 4/3) sandy loam; weak subangular blocky structure; very friable; few fine and few coarse roots; gradual smooth boundary
C	28-53	Pale brown (10YR 6/3) sandy loam; weak subangular blocky structure; friable; few fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; clear boundary
2Bg1	53-70	Grayish brown (10YR 5/2) silt loam; weak subangular blocky structure; firm; few fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; gradual boundary
2Bg2	70-112	gray (10YR 6/1) silt loam; weak subangular blocky structure; very friable; common fine roots; common strong brown (7.5YR 4/6) masses of oxidized iron; few black (10YR 2/1) masses of oxidized manganese; gradual boundary
2Bg3	112-173	Light gray (10YR 7/1) fine sandy loam; weak subangular blocky structure; friable; common fine roots; common yellowish brown (10YR 5/8) masses of oxidized iron; common black (10YR 2/1) masses of oxidized manganese; gradual boundary
2BCg	173-203	light brown (10YR 7/1) sandy loam; weak subangular blocky structure to structureless massive; very friable; common yellowish brown (10YR 5/8) masses of oxidized iron; common black (10YR 2/1) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Platanus occidentalis, Fraxinus pennsylvanica*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 60 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: coarse-loamy, thermic, Fluvaquentic Dystrudept
Drainage Class: somewhat poorly drained
Depth to Free Water: 53 cm
Other Notes:

Table A1d-71: Profile description from Thomas Brooks (TB6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	Brown (10YR 4/3) loam; moderate granular to weak granular to subangular blocky structure; very friable; many fine and common coarse roots; clear boundary
AC	15-27	Yellowish brown (10YR 5/4) fine sandy loam; weak subangular blocky structure; friable; many fine and few coarse roots; clear smooth boundary
C1	27-73	Pale brown (10YR 6/3) loamy sand; weak subangular blocky structure to structureless massive; very friable; few fine roots; common yellowish brown (10YR 5/8) masses of oxidized iron; common light gray (10YR 7/2) masses of reduced iron; clear boundary
C2	73-89+	Yellowish brown (10YR 5/4) sand; single grain; loose; few fine roots; common strong brown (7.5YR 5/8) masses of oxidized iron; few light brownish gray (10YR 6/2) masses of reduced iron; 5% rounded gravels

Described By: S. Bradley & A.R. Wilson – 07/24/19
Dominant Vegetation: *Platanus occidentalis*
Parent Materials: Alluvium
Landform: Riparian floodplain
Location: 80 meters from stream bank
Land Surface Shape: Linear/linear Slope: 0-3%
Classification: sandy, thermic, Typic Udipsamment
Drainage Class: somewhat poorly drained
Depth to Free Water: 27 cm
Other Notes:

Appendix 2

Table A2a: Chewacla soil series pedon locations

Site	Pedon	GPS location	
		Latitude	Longitude
Lake Wheeler	LWFCh1	35˚ 43’ 32.33”	-78˚ 41’ 25.38”
	LWFCh2	35˚ 43’ 38.45”	-78˚ 41’ 26.67”
	LWFCh3	35˚ 43’ 42.11”	-78˚ 42’ 29.57”
	LWFCh4	35˚ 43’ 48.53”	-78˚ 42’ 01.69”
	LWFCh5	35˚ 43’ 48.45”	-78˚ 41’ 29.86”
	LWFCh6	35˚ 44’ 14.38”	-78˚ 41’ 21.81”
	LWFCh7	35˚ 44’ 24.28”	-78˚ 42’ 29.40”
	LWFCh8	35˚ 43’ 29.07”	-78˚ 42’ 05.76”
	LWFWe1	35˚ 43’ 19.24”	-78˚ 41’ 26.01”
	LWFWe2	35˚ 43’ 18.88”	-78˚ 41’ 16.57”
	LWFWe3	35˚ 43’ 22.59”	-78˚ 42’ 05.76”
	LWFWe4	35˚ 43’ 25.72”	-78˚ 41’ 22.00”
	LWFWe5	35˚ 43’ 32.34”	-78˚ 42’ 13.69”
	LWFWe6	35˚ 44’ 01.44”	-78˚ 41’ 33.79”
	LWFWe7	35˚ 44’ 04.81”	-78˚ 42’ 21.52”
	LWFWe8	35˚ 44’ 11.17”	-78˚ 41’ 33.76”
Walnut Creek	WCCh20	35˚ 45’ 33.30”	-78˚ 36’ 17.66”
	WCCh21	35˚ 45’ 40.18”	-78˚ 42’ 09.35”
	WCCh22	35˚ 45’ 36.76”	-78˚ 39’ 55.35”
	WCCh23	35˚ 45’ 33.32”	-78˚ 37’ 41.34”
	WCCh24	35˚ 46’ 09.74”	-78˚ 41’ 25.79”
	WCCh25	35˚ 45’ 01.47”	-78˚ 33’ 17.92”
	WCCh26	35˚ 47’ 01.82”	-78˚ 45’ 23.43”
	WCCh27	35˚ 45’ 05.18”	-78˚ 32’ 41.50”
	WCWe22	35˚ 45’ 27.58”	-78˚ 37’ 46.75”
	WCWe23	35˚ 44’ 57.23”	-78˚ 33’ 16.02”
	WCWe24	35˚ 45’ 41.37”	-78˚ 36’ 10.35”
	WCWe25	35˚ 45’ 29.69”	-78˚ 35’ 27.20”
	WCWe26	35˚ 44’ 57.58”	-78˚ 32’ 16.20”
	WCWe27	35˚ 45’ 31.52”	-78˚ 39’ 19.81”
	WCWe28	35˚ 46’ 09.63”	-78˚ 43’ 16.10”
	WCWe29	35˚ 44’ 53.97”	-78˚ 34’ 22.13”
	WCside	35˚ 44’ 36.67”	-78˚ 34’ 11.34”
	WCnew1	35˚ 45’ 29.49”	-78˚ 39’ 14.62”
	WCnew2	35˚ 45’ 22.58”	-78˚ 39’ 14.62”
	WCnew4	35˚ 45’ 29.53”	-78˚ 35’ 09.40”
	WCnew5	35˚ 45’ 40.39”	-78˚ 33’ 12.51”
	WCnew6	35˚ 44’ 57.07”	-78˚ 33’ 23.60”

Table A2a (continued)**:**

Walnut Creek	WCnew7	35˚ 44’ 53.38”	-78˚ 32’ 49.49”
	WCnew8	35˚ 44’ 54.34”	-78˚ 32’ 30.01”
	WCnew9	35˚ 44’ 55.10”	-78˚ 32’ 21.50”
	WCnew10	35˚ 44’ 58.81”	-78˚ 32’ 49.49”
WRAL Soccer Park	WRAL2	35˚ 53’ 12.79”	-78° 32' 29.79"
	WRALnew1	35˚ 53’ 10.97”	-78˚ 32’ 31.06”
	WRALnew2	35˚ 53’ 14.88”	-78˚ 32’ 29.28”
	WRALnew3	35˚ 53’ 13.60”	-78˚ 32’ 28.23”
	WRALnew4	35˚ 52’ 57.07”	-78˚ 32’ 46.09”
	WRALnew5	35˚ 52’ 55.76”	-78˚ 32’ 48.20”
2 Men & a Truck	2mentruck	35˚ 53’ 21.97”	-78° 35' 15.55"
Lake Wheeler Lake	Lake Wheeler Lake	35˚ 41’ 08.50”	-78° 40' 37.37"
White Deer Park	White Deer	35˚ 40’ 35.54”	-78° 37' 50.71"
RTP Volleyball	RTP	35˚ 51’ 11.09”	-78° 53' 26.25"
Morrisville Park	Morris	35˚ 49’ 00.20”	-78° 50' 38.68"
White Oak Interfluve	WO1	35˚ 46’ 33.31”	-78° 54' 00.39"
	WO2	35˚ 46’ 39.43”	-78° 53' 13.73"

Table A2b: Summary of landscape and stream characteristics

Pedon	Steam order	Stream gradient (%)	Floodplain width (m)	Stream sinuosity (m m^{-1})	Point distance from stream (m)	HAND (m)	Hydraulic gradient (m m^{-1})	Distance to upstream blockage (m)	Distance to downstream blockage (m)	Distance to nearest blockage (m)
BRE-FACE	1	0.53	84	1.14	3	0.86	0.29	734	466	466
BRE-1	2	0.53	84	1.14	23	1.95	0.08	734	466	466
BRE-2	2	0.53	84	1.14	12	1.18	0.10	734	466	466
BRE-4	1	0.53	84	1.14	6	0.65	0.11	734	466	466
BRE-5	1	0.53	84	1.14	10	0.96	0.10	734	466	466
BUT-FACE	2	0.64	98	1.02	2	0.14	0.07	336	702	336
BUT-2	2	0.64	98	1.02	34	1.54	0.05	336	702	336
BUT-3	2	0.64	98	1.02	16	1.32	0.08	336	702	336
CENT-1	3	0.07	209	1.01	20	0.68	0.03	636	359	359
CENT-2	3	0.07	209	1.01	40	0.89	0.02	636	359	359
JMIL-FACE	4	0.11	325	1.07	1	0.79	0.79	691	914	691
JMIL-1b	4	0.11	325	1.07	40	2.03	0.05	691	914	691
JMIL-2b	4	0.11	325	1.07	40	2.56	0.06	691	914	691
JMIL-3b	4	0.11	325	1.07	20	1.99	0.10	691	914	691
JMIL-6b	4	0.11	325	1.07	26	2.09	0.08	691	914	691
JMIL-7b	4	0.11	325	1.07	8	2.66	0.33	691	914	691
LWF-Face	1	0.95	107	1.19	1	0.18	0.18	451	784	451
LWF-1	1	0.95	107	1.19	20	0.61	0.03	451	784	451
LWF-2	1	0.95	107	1.19	34	1.18	0.03	451	784	451
LWF-3	1	0.95	107	1.19	12	0.56	0.05	451	784	451
MF-1	4	0.01	77	1.54	4	1.07	0.27	216	704	216
MF-2	4	0.01	77	1.54	7	0.37	0.05	216	704	216
MF-4	4	0.01	77	1.54	28	1.43	0.05	216	704	216
MF-6	4	0.01	77	1.54	64	2.28	0.04	216	704	216
OX-1	4	0.00	90	1.08	69	0.77	0.01	261	442	261
OX-2	4	0.00	90	1.08	47	0.73	0.02	261	442	261

Table A2b (continued)**:**

OX-3	4	0.00	90	1.08	30	0.89	0.03	261	442	261
OX-4FACE	4	0.00	90	1.08	5	0.61	0.12	261	442	261
OX-5	4	0.00	90	1.08	6	0.91	0.15	261	442	261
PARK-2	1	1.34	84	1.11	20	0.98	0.05	196	417	196
PARK4	1	1.34	84	1.11	12	0.96	0.08	196	417	196
PARK5	1	1.34	84	1.11	13	1.34	0.10	196	417	196
PARK6	1	1.34	84	1.11	23	1.40	0.06	196	417	196
RR-3	4	0.22	88	1.20	10	0.81	0.08	2442	893	893
RR-4FACE	4	0.22	88	1.20	3	0.95	0.32	2442	893	893
RR-5	4	0.22	88	1.20	13	1.68	0.13	2442	893	893
SHNK-FACE	3	0.27	120	1.33	7	1.42	0.20	392	457	392
SHNK-1	3	0.27	120	1.33	48	2.16	0.05	392	457	392
SHNK-2	3	0.27	120	1.33	24	2.04	0.09	392	457	392
SHNK-3	3	0.27	120	1.33	10	1.87	0.19	392	457	392
SHNK-4	3	0.27	120	1.33	27	1.77	0.07	392	457	392
SHNK-5	3	0.27	120	1.33	50	1.53	0.03	392	457	392
SP-2	3	0.14	85	1.03	10	3.13	0.31	342	362	342
SP-3	3	0.14	85	1.03	30	3.06	0.10	342	362	342
SVAL-FACE	3	0.11	63	1.00	3	1.37	0.46	263	997	263
SVAL-2	3	0.11	63	1.00	16	2.54	0.16	263	997	263
SVAL-5	3	0.11	63	1.00	15	2.01	0.13	263	997	263
SVAL-6	3	0.11	63	1.00	23	2.67	0.12	263	997	263
TB-FACE	3	0.14	159	1.08	5	0.99	0.20	419	505	419
TB-1	3	0.14	159	1.08	20	1.41	0.07	419	505	419
TB-3	3	0.14	159	1.08	13	1.27	0.10	419	505	419
TB-5	3	0.14	159	1.08	56	1.39	0.02	419	505	419
LWF-CH6	1	1.59	79	1.23	28	2.07	0.07	315	523	315
WC-CH22	3	0.46	317	1.01	1	0.88	0.88	336	702	336
Morris	3	0.22	109	1.33	5	1.30	0.26	287	283	283
WD	2	0.01	51	1.06	12	0.41	0.03	1127	174	174

Table A2b (continued)**:**

BUT-1	2	0.64	98	1.02	60	1.26	0.02	336	702	336
CENT-5	3	0.07	209	1.01	100	0.61	0.01	636	359	359
LWF-4	1	0.95	107	1.19	17	1.09	0.06	451	784	451
MF-FACE	4	0.01	77	1.54	45	1.71	0.04	216	704	216
RR-1	4	0.22	88	1.20	22	2.07	0.09	2442	893	893
RR-6	4	0.22	88	1.20	23	2.32	0.10	2442	893	893
SP-4	3	0.14	85	1.03	43	2.05	0.05	342	362	342
LWF-We1	3	0.58	107	1.16	56	0.67	0.01	1980	152	152
LWF-We2	3	0.16	165	1.13	8	0.69	0.09	425	54	54
LWF-We4	2	1.44	140	1.36	26	0.09	0.00	183	230	183
LWF-We7	2	4.14	97	1.29	40	0.39	0.01	25	1918	25
LWF-CH1	2	1.09	98	1.36	30	0.75	0.02	1169	1077	1077
LWF-CH2	3	1.09	54	1.36	45	0.78	0.02	629	26	26
LWF-CH5	2	1.02	105	1.19	17	1.96	0.12	1440	493	493
LWF-CH8	3	0.86	192	1.19	89	2.31	0.03	717	222	222
WC-We29	4	0.08	340	1.03	48	0.80	0.02	1004	716	716
WC-We24	4	0.21	259	1.27	72	0.76	0.01	196	277	196
WC-WE28	3	2.55	181	1.20	91	1.05	0.01	189	64	64
WC-CH24	3	0.03	173	1.18	8	0.91	0.11	5	510	5
WC-CH27	5	0.11	260	1.09	151	1.17	0.01	35	947	35
WC_side	4	0.11	185	1.02	40	0.52	0.01	315	571	315
WO1	3	0.09	170	1.09	20	1.61	0.08	217	99	99
WO2	3	0.68	196	1.32	3	0.19	0.06	1396	75	75
Wheel	3	0.08	653	1.82	124	0.73	0.01	378	1110	378
BUT-5	2	0.64	98	1.02	20	1.59	0.08	336	702	336
CENT-3	3	0.07	209	1.01	60	0.76	0.01	636	359	359
CENT-4	3	0.07	209	1.01	80	0.77	0.01	636	359	359
PARK-1	1	1.34	84	1.11	40	1.20	0.03	196	417	196
PARK-FACE	1	1.34	84	1.11	1	0.58	0.58	196	417	196
RR-2	4	0.22	88	1.20	20	2.02	0.10	2442	893	893

Table A2b (continued)**:**

TB-4	3	0.14	159	1.08	35	1.06	0.03	419	505	419
TB-6	3	0.14	159	1.08	79	1.20	0.02	419	505	419
LWF-We3	3	0.59	226	1.16	12	0.84	0.07	1386	1104	1104
LWF-We5	3	0.59	289	1.06	20	1.11	0.06	1047	1404	1047
LWF-We6	2	0.81	94	1.16	50	1.80	0.04	1210	949	949
LWF-We8	2	1.15	87	1.20	25	1.64	0.07	929	1220	929
LWF-CH3	3	0.59	106	1.13	22	1.10	0.05	1741	198	198
LWF-CH4	2	0.82	54	1.33	15	0.36	0.02	867	1904	867
LWF-CH7	1	1.52	191	1.21	102	2.61	0.03	555	1289	555
WC-We22	4	0.23	280	1.00	6	0.29	0.05	142	507	142
WC-We23	5	0.09	232	1.03	17	0.89	0.05	958	1807	958
WC-We25	4	0.79	328	1.07	55	0.57	0.01	848	705	705
WC-We26	5	0.05	314	1.23	66	0.21	0.00	659	285	285
WC-We27	3	0.20	172	1.02	21	1.86	0.09	237	664	237
WC-CH21	3	0.81	96	1.00	61	2.11	0.03	133	878	133
WC-CH20	3	0.48	27	1.02	3	0.49	0.16	182	212	182
WC-CH23	4	0.39	425	1.00	170	1.34	0.01	284	343	284
WC-CH25	4	0.02	91	1.03	34	2.68	0.08	198	18	18
WC-CH26	2	0.86	86	1.04	43	1.84	0.04	370	611	370
RTP	3	0.11	118	1.22	10	1.45	0.14	220	189	189
WRAL2	1	0.53	448	1.10	33	0.52	0.02	381	108	108
Durant	2	0.26	89	1.29	4	0.46	0.11	441	117	117
SP-FACE_1	3	0.14	85	1.03	2	2.13	0.94	342	362	342
JMIL-5b	4	0.11	325	1.07	10	1.91	0.19	691	914	691

Table A2c-1: Profile description from Lake Wheeler Field (LWFWe1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	very dark grayish brown (10YR 3/2) loam; 2% dark grayish brown (10YR 4/2) faint redox depletions in pore linings; 2% dark yellowish brown (10YR 4/6) prominent redox concentrations in pore linings; charcoal present
Bg1	15-28	dark gray (10YR 4/1) clay loam; 5% gray (10YR 5/1) faint redox depletions in pore linings; 30% strong brown (7.5YR 4/6) prominent redox concentrations in pore linings; charcoal present
Bg2	28-42	dark gray (10YR 4/1) clay loam; 1% gray (10YR 5/1) faint redox depletions in pore linings; 1% strong brown (7.5YR 4/6) prominent redox concentrations in pore linings; charcoal present
Bg3	42-50+	dark gray (2.5Y 4/1) clay loam; 5% gray (10YR 5/1) faint redox depletions in pore linings; 35% dark yellowish brown (10YR 4/6) prominent redox concentrations in pore linings; charcoal present

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: water ponding around
Hydric indicator: A11, F3

Table A2c-2: Profile description from Lake Wheeler Field (LWFWe2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Oi	0-4	very dark grayish brown (10YR 3/2) mucky surface
Bg1	4-20	black (10YR 2/1) loam; 2% gray (10YR 5/1) distinct redox depletions in pore linings
Bg2	20-50+	dark gray (2.5Y 4/1) clay loam; 2% gray (10YR 5/1) faint redox depletions in pore linings

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 4 cm
Other Notes: directly next to braided stream, sinking
Hydric indicator: A4, A10, A11, F3

Table A2c-3: Profile description from Lake Wheeler Field (LWFWe4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Oi	0-4	very dark grayish brown (10YR 3/2) mucky surface
A	4-9	dark olive brown (2.5Y 3/3) loam
Bg1	9-25	dark gray (2.5Y 4/1) loam; 5% grayish brown (10YR 5/2) faint redox depletions in pore linings; 20% yellowish red (5YR 4/6) prominent pore lining concentrations; manganese concentrations present
Bg2	25-50+	dark gray (10YR 4/1) loam; 15% gray (10YR 5/1) faint redox depletions in pore linings; 20% yellowish red (5YR 4/6) prominent pore lining concentrations; 20% sand pockets within

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 9 cm
Other Notes: wetland grass, water fills in hole
Hydric indicator: F3, F19

Table A2c-4: Profile description from Lake Wheeler Field (LWFWe7) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Oe	0-13	black (10YR 2/1) mucky surface with 20% fibers
AOa	13-24	black (2.5Y 2.5/1) loam; 6% gray (2.5Y 5/1) distinct redox depletions in masses; 10% fibers
Bg1	24-41	light brownish gray (2.5Y 6/2) clay loam; 25% very dark grayish brown (2.5Y 3/1) redox depletions in pore linings; 15% yellowish brown (10YR 5/8) prominent pore lining concentrations
Bg2	41-50+	light brownish gray (2.5Y 6/2) clay loam; 20% very dark grayish brown (2.5Y 3/1) redox depletions in pore linings; 20% dark yellowish brown (10YR 4/6) prominent pore lining concentrations

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 13 cm
Other Notes: water fills in hole
Hydric indicator: A3, A10, A11, F3

Table A2c-5: Profile description from Lake Wheeler Field (LWFCh1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	very dark grayish brown (10YR 3/2) loam
Bw1	5-25	very dark grayish brown (10YR 3/2) coarse gravely loam; 10% dark gray (10YR 4/1) redox depletions in masses; 15% strong brown (7.5YR 4/6) pore lining concentrations
Bw2	25-50+	very dark gray (10YR 3/1) coarse gravely fine sandy loam; 10% dark gray (10YR 4/1) redox depletions in masses; 35% strong brown (7.5YR 4/6) pore lining concentrations

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 5 cm
Other Notes: micaceous, bottom of catena
Hydric indicator: F6, F19

Table A2c-6: Profile description from Lake Wheeler Field (LWFCh2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
CA	0-5	dark grayish brown (10YR 4/2) fine sandy loam; sandy cap
Bg1	5-16	dark gray (10YR 4/1) loam; 6% yellowish red (5YR 4/6) redox concentrations in pore linings; 12% strong brown (7.5YR 4/6) pore lining concentrations; 6% black (10YR 2/1) pore lining concentrations of manganese
Bg2	16-31	dark grayish brown (10YR 4/2) loam; 12% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% gray (10YR 5/1) iron mass depletions
Bg3	31-50+	dark gray (2.5Y 4/1) fine sandy loam; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings; 10% yellowish red (5YR 4/6) redox concentrations in pore linings; 10% grayish brown (10YR 5/2) iron mass depletions

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 5 cm
Other Notes: micaceous, no water in hole
Hydric indicator: F3

Table A2c-7: Profile description from Lake Wheeler Field (LWFCh5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	very dark gray (7.5YR 3/1) loam
Ap	4-22	very dark grayish brown (10YR 3/2) loam; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% gray (10YR 6/1) masses of iron depletions; dark black pockets in root channels
C	22-39	yellowish brown (10YR 5/4) loamy sand; 15% strong brown (7.5YR 5/8) redox concentrations in pore linings; 20% light brownish gray (10YR 6/2) iron mass depletions
2Ab	39-50+	dark grayish brown (2.5Y 4/2) loam; 15% strong brown (7.5YR 4/6) redox concentrations in pore linings; 10% pinkish gray (7.5YR 6/2) iron mass depletions; charcoal

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 4 cm
Other Notes: old pasture, grass
Hydric indicator: F6

Table A2c-9: Profile description from Walnut Creek (WCWe24) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-1	very dark grayish brown (10YR 3/2) loam
Bg1	1-10	dark gray (10YR 4/1) loam; 35% strong brown (7.5YR 4/6) redox concentrations in pore linings
Bg2	10-20	dark gray (10YR 4/1) loam; 15% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% grayish brown (10YR 5/2) iron depletions in pore linings
Bg3	20-27	dark grayish brown (10YR 4/2) sandy loam; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% grayish brown (10YR 5/2) iron depletions in pore linings
Cg	27-50+	dark grayish brown (10YR 4/2) loamy sand; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings; 8% gray (10YR 6/1) iron depletions in pore linings

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 1 cm
Other Notes: water fills hole, standing water
Hydric indicator: F3

Table A2c-10: Profile description from Walnut Creek (WCWe28) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-2	very dark grayish brown (10YR 3/2) sandy loam; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings and masses; 10% pinkish gray (7.5YR 6/2) iron depletions in masses
C	2-7	dark olive brown (2.5Y 3/3) fine sandy loam; 15% yellowish brown (10YR 5/8) redox concentrations in pore linings and masses; 15% light brownish gray (10YR 6/2) iron depletions in masses
2Ab	7-13	dark gray (10YR 4/1) loam; 30% yellowish red (5YR 4/6) redox concentrations in pore linings and masses; 5% grayish brown (10YR 5/2) iron depletions in masses
2Bgb	13-20	dark grayish brown (10YR 4/2) loam; 35% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% grayish brown (10YR 5/2) iron depletions in pore linings and masses
R	20+	

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 1 cm
Other Notes: layer of rock at 20cm, standing water
Hydric indicator: F3, F19

Table A2c-11: Profile description from Walnut Creek (WCWe29) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	dark brown (7.5YR 3/2) loam; 2% light brownish gray (10YR 6/2) iron depletions in masses
Bw	11-23	dark grayish brown (10YR 4/2) loam; 2% gray (10YR 5/1) iron depletions in pore linings
Bg1	23-41	dark grayish brown (10YR 4/2) loam; 8% strong brown (7.5YR 4/6) redox concentrations in masses; 5% pinkish gray (7.5YR 6/2) iron depletions in masses
Bg2	41-50+	dark grayish brown (10YR 4/2) loam; 17% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% black (10YR 2/1) concentrations of manganese in pore linings; 2% gray (10YR 5/1) iron depletions in masses

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 1 cm
Other Notes:
Hydric indicator: F3

Table A2c-13: Profile description from Walnut Creek (WCCh27) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
AOa	0-13	very dark grayish brown (10YR 3/2) silt loam; 5% yellowish brown (10YR 5/8) prominent redox concentrations in pore linings; 5% gray (10YR 5/1) iron depletions in masses
BCg	13-29	N50 (N 5/0) silty clay loam; 13% strong brown (7.5YR 4/6) redox concentrations in pore linings; 12% 10YR48 (10YR 4/8) redox concentrations in pore linings; 5% N60 (N 6/0) iron depletions in masses; massive structure
Cg	29-50+	gray (10YR 5/1) clay; 13% yellowish red (5YR 4/6) redox concentrations in pore linings; 12% yellowish brown (10YR 5/8) redox concentrations in pore linings; 5% gray (2.5Y 6/1) iron depletions in masses

Described By: S. Bradley & A.R. Wilson – 02/06/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: standing water
Hydric indicator: A11, F2, F3, F6, F19

Table A2c-14: Profile description from White Oak Interfluve (WO2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-15	brown (10YR 4/3) loam; 2% gray (10YR 5/1) iron depletions in masses
Bg1	15-28	gray (10YR 6/1) clay loam; 20% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% black (10YR 2/1) concentrations of manganese in masses
Bg2	28-50+	dark gray (10YR 4/1) clay loam; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings; 10% black (10YR 2/1) faint redox concentrations in masses; 10% light gray (10Y 7/0) iron depletions in pore linings

Described By: S. Bradley & A.R. Wilson – 02/20/20202
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: hole fills with water, braided channels
Hydric indicator: F3

Table A2c-15: Profile description from Walnut Creek Side (WCs) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-8	brown (10YR 5/3) loam; 10% yellowish brown (10YR 5/8) redox concentrations in pore linings; 40% grayish brown (10YR 5/2) iron depletions in masses
Bg1	8-21	grayish brown (10YR 5/2) silt loam; 15% strong brown (7.5YR 4/6) redox concentrations in pore linings; 5% gray (10YR 6/1) iron depletions in pore linings
Bg2	21-42+	gray (10YR 5/1) silty clay loam; 15% strong brown (7.5YR 4/6) redox concentrations in pore linings; 2% gray (10YR 6/1) iron depletions in pore linings

Described By: S. Bradley & A.R. Wilson – 02/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: hole fills with water, braided channels
Hydric indicator: F3

Table A2c-16: Profile description from White Oak Creek Interfluve (WO1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-10	brown (10YR 4/3) silt loam; 5% dark yellowish brown (10YR 4/6) redox concentrations in pore linings; 20% gray (10YR 5/1) iron depletions in pore linings
Bg1	10-28	gray (10YR 5/1) silty clay loam; 15% dark yellowish brown (10YR 4/6) redox concentrations in pore linings
Bg2	28-50+	gray (10YR 6/1) silty clay loam; 15% yellowish brown (10YR 5/8) redox concentrations in pore linings

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator: F3

Table A2c-17: Profile description from WRAL soccer park (WRALnew2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-10	dark grayish brown (10YR 4/2) silty clay; 5% strong brown (7.5YR 4/6) redox concentrations in pore linings; 20% grayish brown (10YR 5/2) iron depletions in pore linings
Bg1	10-22	gray (10YR 5/1) clay loam; 20% strong brown (7.5YR 4/6) redox concentrations in pore linings; 5% very dark brown (7.5YR 2.5/2) concentrations of manganese
Bg2	22-50+	gray (10YR 5/1) clay loam; 15% strong brown (7.5YR 5/8) redox concentrations in pore linings; 2% black (10YR 2/1) masses of concentrated iron; charcoal present; oxyaquic

Described By: S. Bradley & A.R. Wilson – 02/27/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: oxyaquic
Hydric indicator: F3

Table A2c-18: Profile description from WRAL soccer park (WRALnew3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	brown (7.5YR 4/3) loam; 2% strong brown (7.5YR 4/6) redox concentrations in pore linings; 10% brown (7.5YR 5/2) iron depletions in pore linings
Bw	4-25	brown (10YR 4/3) loam; 15% brown (7.5YR 4/4) redox concentrations in pore linings; 20% grayish brown (10YR 5/2) iron depletions in pore linings
Bg	25-33	grayish brown (10YR 5/2) loam; 10% strong brown (7.5YR 4/6) redox concentrations in pore linings; 10% brown (7.5YR 4/4) redox concentrations in pore linings; 8% black (10YR 2/1) concentrations of manganese
B’w	33-50+	brown (10YR 5/3) loam; 25% strong brown (7.5YR 4/6) redox concentrations in pore linings; 25% grayish brown (10YR 5/2) masses of depleted iron; charcoal present

Described By: S. Bradley & A.R. Wilson – 02/27/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator: F19

Table A2c-19: Profile description from WRAL soccer park (WRALnew1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-6	very dark gray (7.5YR 3/1) loam; 5% dark gray (7.5YR 4/1) iron depletions in pore linings
Bw	6-18	brown (10YR 5/3) loam; 20% brown (7.5YR 4/4) redox concentrations in pore linings; 5% black (10YR 2/1) masses of oxidized manganese; 20% grayish brown (10YR 5/2) iron depletions in pore linings
Bg	18-39+	grayish brown (10YR 5/2) loam; 15% strong brown (7.5YR 4/6) redox concentrations in pore linings; 15% brown (7.5YR 4/4) redox concentrations in pore linings; 10% black (10YR 2/1) concentrations of manganese

Described By: S. Bradley & A.R. Wilson – 02/27/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 6 cm
Other Notes:
Hydric indicator: F3, F19

Table A2c-20: Profile description from WRAL soccer park (WRALnew4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	very dark gray (10YR 3/1) loam; 40% dark gray (10YR 4/1) iron depletions in pore linings
Bg1	7-12	gray (10YR 5/1) loam; 5% strong brown (7.5YR 4/6) redox concentrations in pore linings
Bg2	12-31	gray (10YR 5/1) clay loam; 20% strong brown (7.5YR 4/6) redox concentrations in pore linings
Bg3	31-46+	grayish brown (10YR 5/2) clay loam; 30% strong brown (7.5YR 4/6) redox concentrations in pore linings

Described By: S. Bradley & A.R. Wilson – 02/27/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 7cm
Other Notes:
Hydric indicator: F3, F19

Table A2c-21: Profile description from WRAL soccer park (WRALnew5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	dark grayish brown (10YR 4/2) loam; 30% grayish brown (10YR 5/2) iron depletions in pore linings; 5% yellowish brown (10YR 5/8) iron redox concentrations in pore linings
Bg1	4-28	grayish brown (10YR 5/2) clay loam; 20% dark yellowish brown (10YR 4/6) redox concentrations in pore linings
Bg2	28-53+	gray (10YR 5/1) clay loam; 30% strong brown (7.5YR 4/6) redox concentrations in pore linings

Described By: S. Bradley & A.R. Wilson – 02/27/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: ponded water
Hydric indicator: F3, F19

Table A2c-22: Profile description from Walnut Creek (new7) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-6	dark gray (10YR 4/1) loam; 20% gray (10YR 5/1) iron depletions in pore linings; 15% strong brown (7.5YR 4/6) iron redox concentrations in pore linings
Bg1	6-21	gray (10YR 6/1) sandy clay loam; 20% strong brown (7.5YR 4/6) redox concentrations in pore linings; 3% black (10YR 2/1) redox concentrations of manganese
Bg2	21-39+	gray (10YR 6/1) sandy clay loam; 50% yellowish brown (10YR 5/8) redox concentrations in pore linings

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator: F3, F19

Table A2c-22: Profile description from Walnut Creek (new6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-9	dark brown (10YR 3/3) fine sandy loam; 2% strong brown (7.5YR 4/6) iron redox concentrations in pore linings
A/C	9-30+	60% dark gray (10YR 4/1) and 10% light olive brown (2.5Y 5/3) loam and loamy fine sand; 25% strong brown (7.5YR 4/6) redox concentrations in pore linings; 5% black (10YR 2/1) redox concentrations of manganese

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: stratified, many mica flakes
Hydric indicator: F3, F19

Table A2c-23: Profile description from Walnut Creek (new10) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-6	very dark grayish brown (10YR 3/2) loam
AB	6-14	brown (10YR 4/3) loam; 5% dark gray (10YR 4/1) redox iron depletions
Bw1	14-29	brown (10YR 4/3) loam; 5% brown (7.5YR 5/2) redox iron depletions
Bw2	29-38+	brown (7.5YR 4/3) loam; 8% brown (7.5YR 5/2) redox iron depletions

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 6 cm
Other Notes:
Hydric indicator:

Table A2c-24: Profile description from Walnut Creek (new8) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	very dark grayish brown (10YR 3/2) loam
Bw1	5-23	dark brown (10YR 3/3) sandy loam; 5% dark grayish brown (10YR 4/2) redox iron depletions; 2% dark yellowish brown (10YR 4/6) masses of redox iron concentrations
Bw2	23-42+	dark brown (7.5YR 3/3) sandy loam; 5% brown (7.5YR 2/2) redox iron depletions; 20% strong brown (7.5YR 5/8) masses of redox iron concentrations

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 5 cm
Other Notes: many streams unrecorded on topo maps
Hydric indicator:

Table A2c-25: Profile description from Walnut Creek (new9) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-6	dark brown (10YR 3/3) loam
AB	6-14	brown (7.5YR 4/4) clay loam; 1% grayish brown (10YR 5/2) redox iron depletions; 2% strong brown (7.5YR 4/6) masses of redox iron concentrations
Bw	14-36+	brown (7.5YR 4/4) clay loam; 2% brown (7.5YR 5/2) redox iron depletions; 15% strong brown (7.5YR 4/6) masses of redox iron concentrations; 1% black (10YR 2/1) redox concentrations of manganese

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 14 cm
Other Notes: very good structure, angular blocky
Hydric indicator:

Table A2c-26: Profile description from Walnut Creek (new4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-3	very dark gray (10YR 3/1) mucky sandy loam; 15% dark gray (10YR 4/1) redox iron depletions in pore linings; 15% strong brown (7.5YR 4/6) pore linings of redox iron concentrations
ABg1	3-20	dark gray (10YR 4/1) mucky sandy loam; 10% strong brown (7.5YR 4/6) pore linings of redox iron concentrations
ABg2	20-36+	dark gray (10YR 4/1) mucky sandy loam; 3% strong brown (7.5YR 4/6) pore linings of redox iron concentrations

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: water fills in hole, mucky
Hydric indicator: F3

Table A2c-27: Profile description from Walnut Creek (new5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	dark brown (7.5YR 3/3) loam; 25% strong brown (7.5YR 4/6) pore linings of redox iron concentrations
ABg1	5-15	dark gray (10YR 4/1) loam; 15% strong brown (7.5YR 4/6) pore linings of redox iron concentrations; 7% gray (10YR 5/1) pore linings of redox iron depletions
ABg2	15-30+	dark gray (10YR 4/1) loam; 15% strong brown (7.5YR 4/6) pore linings of redox iron concentrations; 15% gray (10YR 6/1) pore linings of redox iron depletions

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator: F3

Table A2c-28: Profile description from Walnut Creek (new2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	very dark grayish brown (10YR 3/2) mucky sandy loam
Bg1	7-15	gray (10YR 5/1) silty clay loam; 5% strong brown (7.5YR 4/6) pore linings of redox iron concentrations
Bg2	15-36	gray (10YR 5/1) sandy clay loam; 20% strong brown (7.5YR 4/6) pore linings of redox iron concentrations
Bg3	36-50+	gray (10YR 5/1) sandy clay loam; 20% strong brown (7.5YR 4/6) pore linings of redox iron concentrations

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 7 cm
Other Notes:
Hydric indicator: F3, F19

Table A2c-29: Profile description from Walnut Creek (new1) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-3	dark brown (10YR 3/2) loam; 5% brown (7.5YR 5/2) pore linings of redox iron depletions; 5% 7/yellowish red (7.5YR 4/6) pore linings of iron redox concentrations
Bg	3-21	dark grayish brown (10YR 4/2) loam; 5% yellowish red (5YR 4/6) pore linings of redox iron concentrations
Cg	21-42+	grayish brown (10YR 5/2) coarse sandy clay loam; 20% strong brown (7.5YR 5/6) pore linings of redox iron concentrations; 5% gray (10YR 6/1) iron redox depletions

Described By: S. Bradley & A.R. Wilson – 02/27/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: water fills in hole, oxyaquic
Hydric indicator: F3, F19

Table A2c-30: Profile description from Lake Wheeler Field (LWFWe3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-10	brown (10YR 5/3) loam
BA	10-24	brown (7.5YR 5/4) loam; 8% strong brown (7.5YR 4/6) pore linings of redox iron concentrations; 8% brown (7.5YR 5/2) iron redox depletions
Bw	24-33	brown (7.5YR 5/4) fine sandy loam; 30% strong brown (7.5YR 4/6) pore linings of redox iron concentrations; 15% grayish brown (10YR 5/2) iron redox depletions
Bg	33-50+	light brownish gray (10YR 6/2) fine sandy loam; 30% dark yellowish brown (10YR 4/4) pore linings and masses of redox iron concentrations; 30% strong brown (7.5YR 4/6) pore linings and masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 10 cm
Other Notes:
Hydric indicator:

Table A2c-31: Profile description from Lake Wheeler Field (LWFWe5) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Oi	0-3	very dark grayish brown (10YR 3/2)
A	3-11	brown (10YR 4/3) sandy loam
Bw	11-30	brown (10YR 4/3) loam; 10% dark yellowish brown (10YR 4/6) pore linings of redox iron concentrations; 8% dark grayish brown (10YR 4/2) iron redox depletions; 1% black (10YR 2/1) masses of oxidized manganese
Ab	30-50+	dark grayish brown (10YR 4/2) loam; 10% strong brown (7.5YR 4/6) pore linings of redox iron concentrations; 15% gray (10YR 5/1) iron redox depletions

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 10 cm
Other Notes:
Hydric indicator:

Table A2c-32: Profile description from Lake Wheeler Field (LWFWe6) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Ap	0-10	dark brown (10YR 3/3) loam; 5% strong brown (7.5YR 4/6) pore linings of oxidized iron
Bw1	10-26	brown (7.5YR 5/4) fine sandy loam; 40% yellowish red (5YR 4/6) masses of redox iron concentrations; 10% grayish brown (10YR 5/2) iron redox depletions
Bw2	26-36	brown (7.5YR 4/4) fine sandy loam; 30% yellowish red (5YR 4/6) masses of redox iron concentrations; 15% pinkish gray (7.5YR 6/2) iron redox depletions
Bw3	36-50+	brown (7.5YR 5/4) fine sandy loam; 30% strong brown (7.5YR 4/6) masses of redox iron concentrations; 15% light brownish gray (10YR 6/2) iron redox depletions

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 10 cm
Other Notes:
Hydric indicator:

Table A2c-33: Profile description from Lake Wheeler Field (LWFWe8) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-5	dark brown (10YR 3/3) sandy loam
AB	5-18	brown (7.5YR 4/4) loam; 5% strong brown (7.5YR 4/6) masses of redox iron concentrations; 2% very dark brown (7.5YR 2.5/2) masses of oxidized manganese; 10% grayish brown (10YR 5/2) iron redox depletions
Bw1	18-32	brown (7.5YR 5/4) loam; 20% yellowish red (5YR 4/6) masses of redox iron concentrations; 15% pinkish gray (7.5YR 6/2) iron redox depletions
Bw2	32-50+	brown (10YR 5/3) loam; 30% strong brown (7.5YR 4/6) masses of redox iron concentrations; 10% light brownish gray (10YR 6/2) iron redox depletions

Described By: S. Bradley & A.R. Wilson – 01/16/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 5 cm
Other Notes:
Hydric indicator:

Table A2c-34: Profile description from Lake Wheeler Field (LWFCh3) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Oi	0-2	very dark grayish brown (10YR 3/2)
A	2-10	dark brown (10YR 3/3) loam
Ap	10-20	brown (10YR 4/3) loam
Bw1	20-32	brown (10YR 5/3) sandy loam; 2% yellowish brown (10YR 5/8) masses of redox iron concentrations; 10% gray (10YR 6/1) iron redox depletions
Bw2	32-50+	brown (10YR 5/3) sandy loam; 15% strong brown (7.5YR 4/6) masses of redox iron concentrations; 30% gray (10YR 6/1) iron redox depletions; 5% very dark grayish brown (10YR 3/2) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 20 cm
Other Notes:
Hydric indicator:

Table A2c-35: Profile description from Lake Wheeler Field (LWFCh4) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-8	dark brown (7.5YR 3/3) loam
Bw1	8-30	yellowish red (5YR 4/6) sandy clay loam; 15% yellowish red (2.5YR 4/6) masses of redox iron concentrations; 8% light brownish gray (10YR 6/2) iron redox depletions
Bw2	30-50+	yellowish red (5YR 4/6) sandy clay loam; 20% yellowish red (2.5YR 4/6) masses of redox iron concentrations; 15% light brownish gray (10YR 6/2) iron redox depletions

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 8 cm
Other Notes: lithochromatic colors in B horizons
Hydric indicator:

Table A2c-36: Profile description from Lake Wheeler Field (LWFCh6) site Horizon Depth (cm) Description		
Horizon	Depth (cm)	Description
Oe	0-3	black (10YR 2/1)
AOa	3-25	black (10YR 2/1) loam
A	25-44	very dark gray (10YR 3/1) loam
AC	44-50+	very dark gray (10YR 3/1) sandy loam

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 50+ cm
Other Notes: no redox features, severely incised
Hydric indicator:

Table A2c-37: Profile description from Lake Wheeler Field (LWFCh7) site Horizon Depth (cm) Description		
Horizon	Depth (cm)	Description
Oi	0-5	very dark brown (7.5YR 2.5/2)
A	5-13	very dark grayish brown (10YR 3/2) fine sandy loam; 5% strong brown (7.5YR 4/6) pore linings of oxidized iron; 25% dark grayish brown (10YR 4/2) pore linings of reduced iron
BgE	13-26	grayish brown (10YR 5/2) fine sandy loam; 10% strong brown (7.5YR 4/6) masses of oxidized iron
Bt	26-50+	light yellowish brown (2.5Y 6/3) fine sandy loam; 5% gray (2.5Y 6/1) masses of reduced iron; 45% yellowish brown (10YR 5/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 01/09/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 5+ cm
Other Notes: no stream visible
Hydric indicator:

Table A2c-38: Profile description from Walnut Creek (WCWe22) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
AC	0-13	very dark grayish brown (10YR 3/2) fine sandy loam; 2% dark yellowish brown (10YR 4/6) pore linings of oxidized iron; 10% light brownish gray (10YR 6/2) masses of reduced iron
Bw1	13-25	dark brown (10YR 3/3) loamy fine sand; 2% dark yellowish brown (10YR 4/6) masses of oxidized iron; 10% gray (10YR 6/1) masses of reduced iron
Bw2	25-50+	dark yellowish brown (10YR 4/4) fine sandy loam; 2% strong brown (7.5YR 4/6) pore linings of oxidized iron; 10% light brownish gray (10YR 6/2) masses of reduced iron

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator:

Table A2c-39: Profile description from Walnut Creek (WCWe23) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	dark brown (10YR 3/3) silt loam
AB	7-19	dark yellowish brown (10YR 3/4) silt loam
Bw1	19-39	brown (10YR 4/3) loam; 10% strong brown (7.5YR 4/6) masses of oxidized iron; 5% gray (10YR 5/1) masses of reduced iron
Bw2	39-50+	dark yellowish brown (10YR 4/4) fine sandy loam; 15% strong brown (7.5YR 4/6) masses of oxidized iron; 10% grayish brown (10YR 5/2) masses of reduced iron; 5% black (10YR 2/1) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator:

Table A2c-40: Profile description from Walnut Creek (WCWe25) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	dark brown (10YR 3/3) loam
Bw1	11-21	brown (7.5YR 4/4) sandy loam; 2% strong brown (7.5YR 5/8) pore linings of oxidized iron; 2% pinkish gray (7.5YR 6/2) pore linings of reduced iron
Bw2	21-37	brown (7.5YR 4/3) sandy loam; 15% strong brown (7.5YR 5/6) pore linings of oxidized iron; 1% light brownish gray (10YR 6/2) pore linings of reduced iron
Bg	37-50+	dark grayish brown (10YR 4/2) sandy loam; 20% strong brown (7.5YR 4/6) masses of oxidized iron; 2% grayish brown (10YR 5/2) masses of reduced iron

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 11 cm
Other Notes:
Hydric indicator:

Table A2c-41: Profile description from Walnut Creek (WCWe26) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-6	dark brown (10YR 3/3) loam; 5% gray (10YR 5/1) masses of iron depletions; 5% strong brown (7.5YR 4/6) pore linings of oxidized iron
BA	6-17	brown (7.5YR 4/3) silt loam; 5% strong brown (7.5YR 4/6) pore linings of oxidized iron; 10% gray (7.5YR 5/1) masses of reduced iron
Bw	17-38	brown (10YR 5/3) silty clay loam; 15% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% grayish brown (10YR 5/2) pore linings of reduced iron
Bg	38-57+	grayish brown (10YR 5/2) silty clay; 15% strong brown (7.5YR 4/6) masses of oxidized iron; 20% gray (10YR 5/1) masses of reduced iron

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator:

Table A2c-42: Profile description from Walnut Creek (WCWe27) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A1	0-5	very dark brown (7.5YR 2.5/3) loam
A2	5-9	brown (7.5YR 4/3) loam; 3% strong brown (7.5YR 4/6) masses of oxidized iron; 5% light brownish gray (10YR 6/2) masses of reduced iron
BA	9-15	brown (7.5YR 4/3) loam; 3% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% gray (7.5YR 5/1) masses of reduced iron
C	15-31	80% light yellowish brown (10YR 6/4) and 10% very dark grayish brown (10YR 3/2) loamy sand; 5% strong brown (7.5YR 5/8) masses of oxidized iron; 5% light brownish gray (10YR 6/2) pore linings of reduced iron
Ab	31-50+	brown (7.5YR 4/4) loam; 12% strong brown (7.5YR 4/6) masses of oxidized iron; 2% brown (7.5YR 4/2) masses of reduced iron

Described By: S. Bradley & A.R. Wilson – 01/23/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 5 cm
Other Notes:
Hydric indicator:

Table A2c-43: Profile description from Walnut Creek (WCCh20) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	very dark grayish brown (10YR 3/2) fine sandy loam
Cu	4-16	80% light yellowish brown (2.5Y 6/3) and 20% light olive brown (2.5Y 5/4) stratified coarse sand to loamy sand
C1	16-26	20% light yellowish brown (2.5Y 6/3) and 76% light olive brown (2.5Y 4/4) stratified coarse sand to loamy sand; 1% yellowish brown (10YR 5/8) pore linings of oxidized iron; 3% light brownish gray (2.5Y 6/2) pore linings of depleted iron
C2	26-50+	6% light olive brown (2.5Y 5/3) and 85% dark yellowish brown (10YR 3/4) stratified coarse sand to loamy sand; 4% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% light brownish gray (2.5Y 6/2) pore linings of depleted iron

Described By: S. Bradley & A.R. Wilson – 02/06/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 5 cm
Other Notes:
Hydric indicator:

Table A2c-44: Profile description from Walnut Creek (WCCh21) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	dark brown (7.5YR 3/2) loam; 2% strong brown (7.5YR 5/8) pore linings of iron redox concentrations; 2% grayish brown (10YR 5/2) pore linings of iron redox depletions
Bw	4-17	brown (7.5YR 4/4) loam; 5% strong brown (7.5YR 4/6) pore linings of iron redox concentrations; 5% brown (7.5YR 5/2) pore linings of iron redox depletions
2Bt	17-50+	yellowish red (5YR 4/6) clay loam; 5% reddish gray (5YR 5/2) pore linings and masses of iron redox depletions

Described By: S. Bradley & A.R. Wilson – 02/06/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator:

Table A2c-45: Profile description from Walnut Creek (WCCh23) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
Au	0-4	dark brown (7.5YR 3/2) loam; 2% strong brown (7.5YR 5/8) pore linings of iron redox concentrations
A	4-11	dark brown (7.5YR 3/2) loam; 5% strong brown (7.5YR 4/6) pore linings of iron redox concentrations; 5% gray (7.5YR 5/1) pore linings of iron redox depletions
Bw1	11-23	50% dark yellowish brown (10YR 4/4) and 45% yellowish red (5YR 4/6) loam; 5% grayish brown (10YR 5/2) masses of iron redox depletions
Bw2	23-50+	45% dark yellowish brown (10YR 4/4) and 50% yellowish red (5YR 4/6) loam; 5% grayish brown (10YR 5/2) masses of iron redox depletions

Described By: S. Bradley & A.R. Wilson – 02/06/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 4 cm
Other Notes:
Hydric indicator:

Table A2c-46: Profile description from Walnut Creek (WCCh25) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	dark brown (7.5YR 3/2) fine sandy loam
BA	7-16	brown (7.5YR 4/3) loamy fine sand
Bw1	16-25	brown (10YR 5/3) loamy fine sand; 2% strong brown (7.5YR 4/6) pore linings of oxidized iron; 1% light brownish gray (10YR 6/2) masses of depleted iron
Bw2	52-39	brown (10YR 5/3) loamy fine sand; 1% strong brown (7.5YR 4/6) pore linings of oxidized iron; 2% light brownish gray (10YR 6/2) masses of depleted iron
2Ab	39-50+	dark brown (10YR 3/3) fine sandy loam; 2% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% gray (10YR 5/1) masses of depleted iron

Described By: S. Bradley & A.R. Wilson – 02/06/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 16 cm
Other Notes:
Hydric indicator:

Table A2c-47: Profile description from Walnut Creek (WCCh26) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	dark yellowish brown (10YR 3/4) and dark yellowish brown (10YR 4/4) loamy fine sand; 3% strong brown (7.5YR 5/8) masses of iron redox concentrations; 7% light brownish gray (10YR 6/2) masses of depleted iron
C1	11-23	dark yellowish brown (10YR 4/4) gravelly coarse sandy loam with 20% medium gravels; 3% strong brown (7.5YR 4/6) masses of iron redox concentrations; 7% light brownish gray (10YR 6/2) masses of depleted iron
C2	23-42	brown (10YR 4/3) very gravelly fine sandy loam with 40% medium gravels; 5% strong brown (7.5YR 4/6) masses of iron redox concentrations; 5% light brownish gray (10YR 6/2) masses of depleted iron
C3	42-50+	brown (7.5YR 5/4) gravelly fine sandy loam with 30% medium gravels; 35% strong brown (7.5YR 5/8) masses of iron redox concentrations; 2% light brownish gray (10YR 6/2) masses of depleted iron

Described By: S. Bradley & A.R. Wilson – 02/06/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 0 cm
Other Notes:
Hydric indicator:

Table A2c-48: Profile description from RTP Volleyball (RTP) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-4	brown (10YR 4/3) silt loam
Bw1	4-19	brown (10YR 4/3) silt loam; 2% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% light brownish gray (10YR 6/2) pore linings of depleted iron
Bw2	19-41	brown (10YR 4/3) silt loam; 5% strong brown (7.5YR 5/8) pore linings of oxidized iron; 5% gray (10YR 6/1) pore linings of depleted iron
Bw3	41-50+	brown (10YR 5/3) silt loam; 10% strong brown (7.5YR 5/8) pore linings of oxidized iron; 10% light brownish gray (10YR 6/2) pore linings of depleted iron; 3% black (10YR 2/1) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 02/13/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 4 cm
Other Notes: incised stream nearby
Hydric indicator:

Table A2c-49: Profile description from Morrisville Community Park (Morris) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-11	brown (10YR 4/3) fine sandy loam
A/C	11-41	brown (10YR 4/3) and yellowish brown (10YR 5/4) fine sandy loam and loamy fine sand
Ab	41-50+	brown (7.5YR 4/4) fine sandy loam; 8% strong brown (7.5YR 4/6) pore linings of oxidized iron; 3% gray (10YR 6/1) pore linings of depleted iron

Described By: S. Bradley & A.R. Wilson – 02/13/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 4 cm
Other Notes: incised stream nearby
Hydric indicator:

Table A2c-50: Profile description from Durant Park (Durant) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	very dark grayish brown (10YR 3/2) loam
C1	7-31	light yellowish brown (10YR 6/4) coarse sand; 6% dark yellowish brown (10YR 4/6) pore linings of oxidized iron; 10% light gray (10YR 7/1) pore linings of depleted iron; 8% gravels
C2	31-41	light yellowish brown (10YR 6/4) coarse sandy loam; 6% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% light gray (5YR 7/1) pore linings of depleted iron
2Ab	41-50	dark gray (205Y 4/1) loam; 20% strong brown (7.5YR 4/6) pore linings of oxidized iron; 5% light gray (10YR 7/1) pore linings of depleted iron
2Cg	50-64+	very dark grayish brown (205Y 3/1) sandy loam; 15% strong brown (7.5YR 4/6) pore linings of oxidized iron

Described By: S. Bradley & A.R. Wilson – 02/13/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 7 cm
Other Notes: incised stream nearby
Hydric indicator:

Table A2c-51: Profile description from Lake Wheeler Lake (Wheeler) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-7	dark grayish brown (2.5Y 4/2) loam; 3% strong brown (7.5YR 4/6) pore linings of oxidized iron; 2% gray (10YR 5/1) pore linings of depleted iron
C1	7-31	gray (2.5Y 5/1) loam; 20% strong brown (7.5YR 4/6) masses of oxidized iron; 3% black (5YR 2.5/1) masses of oxidized manganese

Described By: S. Bradley & A.R. Wilson – 02/13/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: poorly drained
Depth to Free Water: 0 cm
Other Notes: hole filled with water
Hydric indicator: F3, F19

Table A2c-52: Profile description from WRAL Soccer Park (WRAL2) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
A	0-14	brown (10YR 4/3) loam; 1% grayish brown (10YR 5/2) pore linings of depleted iron
Bw1	14-28	brown (10YR 4/3) silt loam; 2% gray (10YR 5/1) pore linings of depleted iron; 6% dark yellowish brown (10YR 4/6) masses of oxidized iron
Bw2	28-39	brown (10YR 5/3) loam; 10% light brownish gray (light brownish gray) pore linings of depleted iron; 20% dark yellowish brown (10YR 4/6) masses of oxidized iron
Bw3	39-55+	brown (10YR 5/3) clay loam; 5% grayish brown (10YR 5/2) pore linings of depleted iron; 20% yellowish brown (10YR 5/8) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 02/20/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 14 cm
Other Notes:
Hydric indicator:

Table A2c-53: Profile description from White Deer Park (WD) site Horizon Depth (cm) Description

Horizon	Depth (cm)	Description
C	0-11	80% light yellowish brown (2.5Y 6/3) and 20% very dark grayish brown (10YR 3/2) coarse sand
A	11-19	dark brown (10YR 3/3) fine sandy loam
Bw	19-37	dark yellowish brown (10YR 3/4) sandy loam
Bg	37-55+	grayish brown (10YR 5/2) clay loam; 2% gray (10YR 5/1) pore linings of depleted iron; 20% strong brown (7.5YR 4/6) masses of oxidized iron

Described By: S. Bradley & A.R. Wilson – 02/13/2020
Parent Materials: Alluvium
Landform: Riparian floodplain
Drainage Class: somewhat poorly drained
Depth to Free Water: 37 cm
Other Notes:
Hydric indicator: