



# CE GROUP

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**May 15, 2014**

Ms. Lynn Richardson c/o  
Chatham County Planning Department  
P.O. Box 87  
Pittsboro, NC 27312

**RE: The Retreat at Haw River  
Proposed Tertiary Treatment Facility with Storage and Reuse Spray Application  
Chatham County, NC**

Dear Ms. Richardson:

CE Group in association with Soil and Environmental Consultants has conducted site evaluation / pre-permitting for the development of +/- 80,000 GPD WWTP and Re-use Spray Irrigation Facility. Each firm has significant knowledge and experience with this technology and use within Piedmont, North Carolina.

Wastewater makeup from the project will be entirely domestic. The proposed treatment facilities will be constructed and conveyed to a licensed public utility for operation and maintenance. In addition to an 80,000 GPD WWTP, we anticipate +/- 65 acres of reuse spray irrigation area (non-conjunctive) and another 6.2 AC of conjunctive spray within the project. The project will also have an Incremental Weather Storage Pond to accommodate up to 9,000,000 Gallons along with an Upset Pond accommodating up to 400,000 gallons.

All improvements will be permitted and monitored in conjunction with the NCDENR NCAC 2U standards as regulated by the State.

Please contact us if you have any questions for need any additional information.

Respectfully submitted,

Mark P. Ashness, PE  
CE Group, Inc.





- MEMO
- TELEPHONE
- FIELD REPORT
- CALCULATIONS

AUTHOR: MPA

DATE: 02/17/2014

TIME:

PROJECT: The Retreat at Haw River

CLIENT:

SUBJECT: Preliminary Spray Area Calculations

PROJECT NO.: 125-17

<b>Wastewater Permitted Rate (with flow reduction)</b>						
Residential Units (with Flow Reduction)	393	Units	190.0	GPD	74,670	GPD (3.5 Bedroom Avg)
Amenity					1,200	GPD
Future Wastewater (Park Area)					4,000	GPD
<b>Sub-total</b>					<b>79,870</b>	<b>GPD (+/- 80,000 GPD)</b>
<b>Non Conjunctive Areas</b>						
	Area (ac.)		Loading rate (in/yr.)		Gallons/Day	
High Conductivity Soils	35.0		23.0		59,884	
Moderate Conductivity Soils	30.0		18.0		40,171	
<b>Sub-total</b>	65.0				100,055	GPD (+/- 100,000 GPD)
<b>Conjunctive Areas</b>	6.2	(ac.)				
<b>Preliminary Storage Requirements (Gallons)</b>						
Inclement Weather Storage	80,000	GPD	for	110.0	Days	<b>+/- 9 MG</b>
5 Day Upset Storage	80,000	GPD	for	5	Days	<b>+/- .4MG</b>



## Soil & Environmental Consultants, PA

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sandec.com

CE Group  
Attn: Mr. Mark Ashness  
301 Glenwood Avenue, Suite 220  
Raleigh, NC 27603

May 15, 2014  
Project #: 6748.S6

### Preliminary Soils Report

Ref: The Retreat at Haw River - Chatham County, NC (evaluation limited to proposed wetted areas).

#### Executive Summary:

Soil & Environmental Consultants, PA (S&EC) has performed a limited soil/site evaluation on the tract referenced above. The basis of this report is that these areas are being proposed to be used for a surface irrigation wastewater disposal system. The system daily flow was not provided to S&EC, therefore this report only discusses the soil evaluation, the dominant soil series on-site, and the general permeability classes based on the soil series.

This report is being prepared as a “draft report” for review and comment and it does not have all of the required information needed to complete a design of an irrigation system. The initial fieldwork was completed in March 2006, and various site reviews through 2013.

#### Introduction:

S&EC traversed limited areas on the property and observed landforms (slope, drainage patterns, past use, etc.) as well as soil conditions (depth, texture, structure, seasonal wetness, restrictive horizons, etc.) through the use of hand auger borings. This site is in the piedmont region of central Chatham County. The corresponding upland soil series identified on the tract are all named and the criteria for each series as described by the Natural Resource Conservation Service (NRCS) is provided. These soils are divided into groups based on like soil characteristics of the site.

#### Soil/Site Conditions: Proposed Spray Irrigation Areas

The target areas that could to be used for surface application of reuse quality water is approximately 95 acres, however based on projected loading rates only 65 acres may be needed for surface irrigation.

Based on the hand-auger borings previously performed on this site, the upland soils on this tract are similar to the Georgeville, Herndon, Badin soil series. There could be areas of inclusions of Cid, Lignum and Goldston soil series. Some lower soils such as the Chewacla and Wehadkee soil series are noted and these areas may also be utilized for surface application however soil amendments (sandy fill) may be needed. Please keep in mind that the attached soil descriptions are NOT the descriptions for your specific sight but rather the general pedon description provided by NRCS for that soil series.

The attached soil series sketch map approximates the location of each soil series and it can be used as a general guide. Additional fieldwork will be necessary for any detailed engineering planning. This additional fieldwork may include flagging the boundary between the soil series and locating that boundary either by GPS or a survey. That additional fieldwork will provide an accurate base map for use in sizing and locating a surface disposal field. S&EC has this scheduled to be completed.

After completing the detailed soil series map, the next step in the process will be to determine the rate that the wastewater can be applied to the site. The first step in this determination is to establish the average rate at which clean water will pass through each of the described units. This is accomplished by running multiple tests called Hydraulic Conductivity measurements for each soil horizon in each soil series mapped unit. Once these rates of water movement are established the process moves on to the Hydrologist. The Hydrologist analyzes the detailed soils information, conductivity results and his own tests results with the aid of a computer model to determine the application rate for each map unit. S&EC will provide these services for this project. I offer this explanation so that you will realize that at this point we can only compare projected permeabilities. S&EC cannot establish an accurate annual loading rate at this point. However these soil series should support an estimated annual loading rate of 18 to 23 inches per year. The compared permeability classes are located on the last page of each NRCS Profile description.

An example of this comparison is the Georgeville most restrictive permeability class at 0.6 to 2.0 inches per hour, and the Cid most restrictive layer has a permeability class of 0.06 to 0.2 inches per hour. Each soil series has the projected permeability class for each of its horizons listed on the same page. These numbers cannot be used to expect an application rate, only to make general comparisons. Since treated wastewater is used for irrigation, the permeability class or drainage rate for the soil series are generally calculated at a percentage (4 to 10%) of the permeability of the most restrictive horizon in the soil.

Likewise based on the NRCS information and utilizing the attached Table 1 for typical ranges of soil infiltration rates, an estimated value may be obtained based on the surface texture and site slope within the irrigated areas. The infiltration rate for Table 1 was obtained from the Sprinkler Irrigation Association, Sprinkler Irrigation (1969).

**Conclusion:**

The attached soil series sketch map gives an indication of the dominant soil types in the proposed wetted areas. The areas shown are approximately 95 acres in size and the estimated area that may be needed is approximately 65 acres in size. The accompanying NRCS data can be used as a general guide to project permeabilities within each soil unit. Typical infiltration rates can be obtained based on the NRCS data and site slope. However, as noted above, additional site work is needed. Again, the next step would be to get actual numbers from field observations for further calculations for the application rates. This process is normally required on all large wastewater systems. The proposed system will treat the wastewater to reuse standards and follow the NCAC 2U regulations as permitted by the State.

This report discusses the general location of soils for on-site surface wastewater dispersal, and does not constitute or imply any approval or granting of a permit as needed by the client from the State. S&EC is a professional consulting firm that specializes in the delineation of soil areas for wastewater disposal. As a professional consulting firm, S&EC is hired for its professional opinion in these matters. The rules governing wastewater treatment (interpreted and governed by local and state agencies) are evolving constantly, and in many cases, affected by the opinions of individuals employed by the governing agencies.

If you have any questions or require additional information then please give us a call.

Prepared by:

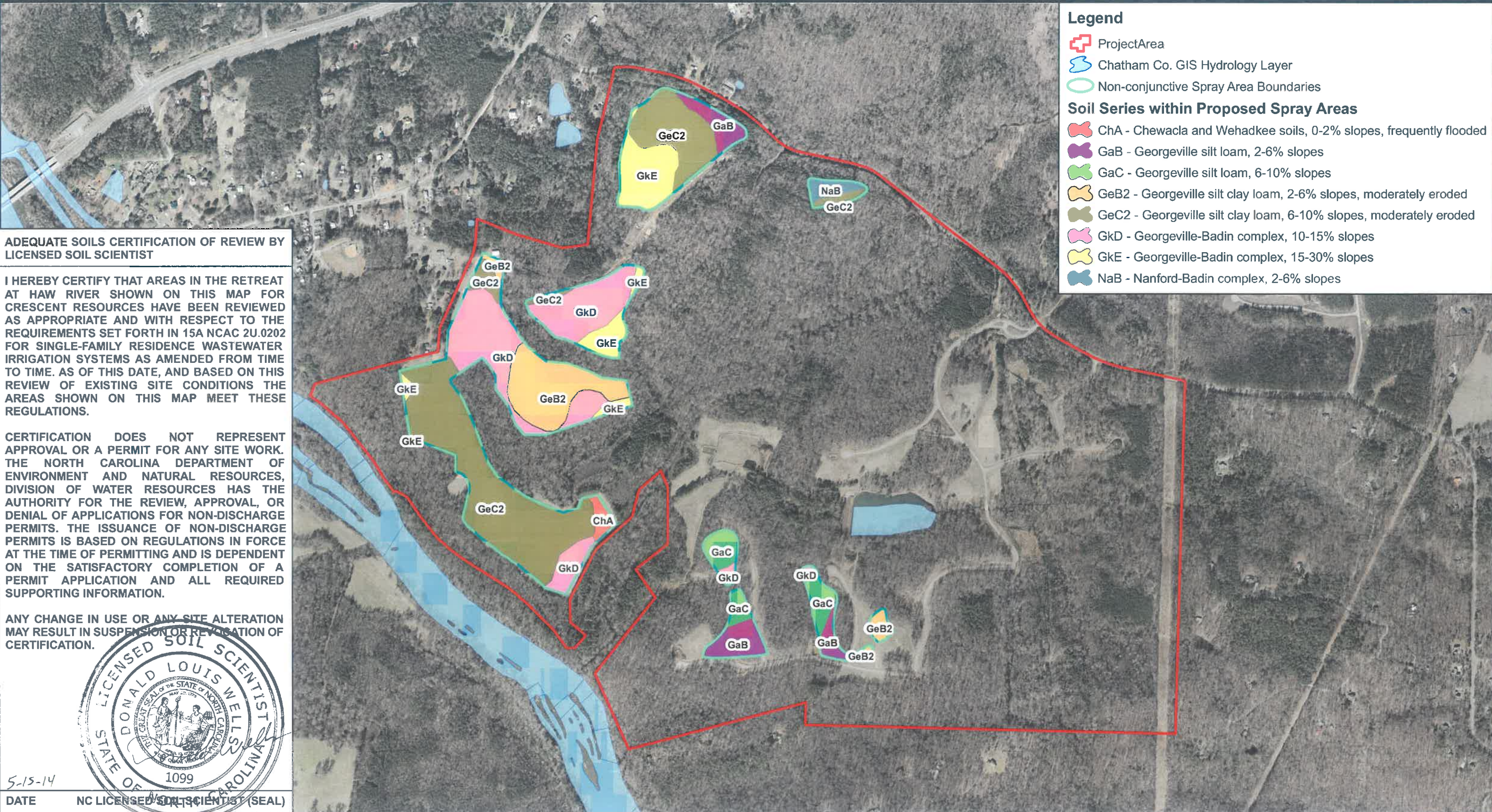
Soil & Environmental Consultants, PA

*Donald L. Wells* 5-15-14

Donald L. Wells

NC Licensed Soil Scientist





**Legend**

- Project Area
- Chatham Co. GIS Hydrology Layer
- Non-conjunctive Spray Area Boundaries

**Soil Series within Proposed Spray Areas**

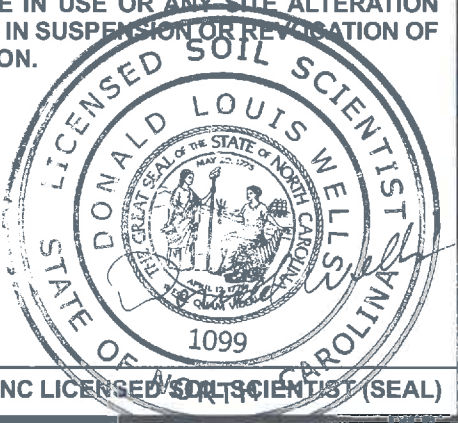
- ChA - Chewacla and Wehadkee soils, 0-2% slopes, frequently flooded
- GaB - Georgeville silt loam, 2-6% slopes
- GaC - Georgeville silt loam, 6-10% slopes
- GeB2 - Georgeville silt clay loam, 2-6% slopes, moderately eroded
- GeC2 - Georgeville silt clay loam, 6-10% slopes, moderately eroded
- GkD - Georgeville-Badin complex, 10-15% slopes
- GkE - Georgeville-Badin complex, 15-30% slopes
- NaB - Nanford-Badin complex, 2-6% slopes

**ADEQUATE SOILS CERTIFICATION OF REVIEW BY LICENSED SOIL SCIENTIST**

I HEREBY CERTIFY THAT AREAS IN THE RETREAT AT HAW RIVER SHOWN ON THIS MAP FOR CRESCENT RESOURCES HAVE BEEN REVIEWED AS APPROPRIATE AND WITH RESPECT TO THE REQUIREMENTS SET FORTH IN 15A NCAC 2U.0202 FOR SINGLE-FAMILY RESIDENCE WASTEWATER IRRIGATION SYSTEMS AS AMENDED FROM TIME TO TIME. AS OF THIS DATE, AND BASED ON THIS REVIEW OF EXISTING SITE CONDITIONS THE AREAS SHOWN ON THIS MAP MEET THESE REGULATIONS.

CERTIFICATION DOES NOT REPRESENT APPROVAL OR A PERMIT FOR ANY SITE WORK. THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF WATER RESOURCES HAS THE AUTHORITY FOR THE REVIEW, APPROVAL, OR DENIAL OF APPLICATIONS FOR NON-DISCHARGE PERMITS. THE ISSUANCE OF NON-DISCHARGE PERMITS IS BASED ON REGULATIONS IN FORCE AT THE TIME OF PERMITTING AND IS DEPENDENT ON THE SATISFACTORY COMPLETION OF A PERMIT APPLICATION AND ALL REQUIRED SUPPORTING INFORMATION.

ANY CHANGE IN USE OR ANY SITE ALTERATION MAY RESULT IN SUSPENSION OR REVOCATION OF CERTIFICATION.



5-15-14  
DATE NC LICENSED SOIL SCIENTIST (SEAL)

Project No. 6748.56	
Project Mgr.: DW	
Scale: 1" = 800'	
2014-05-08	

Soil Series within Proposed  
Non-conjunctive Spray Areas  
The Retreat at Haw River  
Chatham Co., NC

2013 Aerial from NCOneMap.com  
Soil Series from USDA

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**Table 1**

Typical ranges of soil infiltration rates by soil texture and slope.

Texture	Basic Infiltration Rate (in/hr)* Slope		
	0-3%	3-9%	9+ %
sands	1.0+	0.7+	0.5+
loamy sands	0.7-1.5	0.5-1.0	0.4-0.7
sandy loams and fine sandy loams	0.5-1.0	0.4-0.7	0.3-0.5
very fine sandy loam and silt loam	0.3-0.7	0.2-0.5	0.15-0.3
sandy clay loam and silty clay loam	0.2-0.4	0.15-0.25	0.1-0.15
clay and silty clay	0.1-0.2	0.1-0.15	< 0.1

Source: Sprinkler Irrigation Association, Sprinkler Irrigation (1969)

\* For good vegetative cover, these rates may be 25-50% greater. For poor surface conditions, rates may be as much as 50% less.

## GEORGEVILLE SERIES

The Georgeville series consists of very deep, well drained, moderately permeable soils that formed in material mostly weathered from fine-grained metavolcanic rocks of the Carolina Slate Belt. Slopes are 2 to 50 percent.

**TAXONOMIC CLASS:** Fine, kaolinitic, thermic Typic Kanhapludults

**TYPICAL PEDON:** Georgeville silt loam - forested. (Colors are for moist soil.)

**0e**--1 to 0 inches; decayed leaves and live roots.

**A**--0 to 4 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; many fine and common medium roots; strongly acid; abrupt smooth boundary. (2 to 9 inches thick)

**E**--4 to 6 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; strongly acid; abrupt broken boundary. (0 to 5 inches thick)

**Bt1**--6 to 10 inches; yellowish red (5YR 5/6) silt clay loam; weak fine subangular blocky structure; friable; common fine and few medium roots; few distinct clay films on faces of peds; common fine pores; strongly acid; clear smooth boundary.

**Bt2**--10 to 28 inches; red (2.5YR 4/8) clay; moderate fine subangular blocky structure; friable; few fine and medium roots; common distinct clay films on faces of peds; common fine pores; strongly acid; clear smooth boundary.

**Bt3**--28 to 41 inches; red (2.5YR 4/6) clay with few fine prominent strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine pores; strongly acid; gradual smooth boundary.

**Bt4**--41 to 53 inches; red (2.5YR 4/6) silty clay loam with few fine prominent yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; moderate coarse subangular blocky structure; friable; few fine roots; common distinct clay films on faces of peds; few fine pores; few fine flakes of mica; strongly acid; gradual smooth boundary. (Combined thickness of the Bt horizon ranges from 24 to 48 inches or more)

**BC**--53 to 63 inches; red (2.5YR 4/6) silty clay loam with common fine and medium prominent reddish yellow (7.5YR 6/8) and few fine distinct dark yellowish brown (10YR 4/6) mottles; weak coarse and very coarse subangular blocky structure; friable; few fine roots; few faint clay films on faces of peds; few fine flakes of mica; strongly acid. (5 to 25 inches thick)

**TYPE LOCATION:** Lancaster County, South Carolina; 6 miles northeast of Lancaster, South Carolina; 1.3 miles east of junction of State Highway 28 and 82; 60 feet south of State Highway 28; and 235 feet southeast of power pole no. COA31.

**RANGE IN CHARACTERISTICS:** Thickness of the clayey part of the Bt horizon ranges from 24 to 48 inches. Depth to the bottom of the clayey Bt horizon exceeds 30 inches. Depth to a lithic contact is more than 60 inches. The soil is very strongly acid to neutral in the A horizon and very strongly acid or strongly acid throughout the rest of the profile. Content of rock fragments ranges 0 to 20 percent in the A and E horizons, and 0 to 10 percent in the Bt, BC and C horizons. Few fine flakes of mica are in the lower part



of the solum of some pedons, and some pedons may have few fine manganese concretions in the surface and upper subsoil horizons.

The A horizon has hue of 5YR to 2.5Y, or it is neutral, value of 4 or 5 and chroma of 0 to 8. It is silt loam, loam, sandy loam, fine sandy loam, very fine sandy loam in the fine-earth fraction. Where eroded, the A horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is clay loam or silty clay loam.

The E horizon, where present, has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 8. It is silt loam, loam, sandy loam, fine sandy loam, very fine sandy loam in the fine-earth fraction.

The upper part of the Bt horizon of many pedons has hue of 2.5YR or 5YR, value of 4 or 5 and chroma of 6 to 8. The middle part of the Bt horizon, and in many pedons the upper part of the Bt horizon, has hue of 10R or 2.5YR, value of 4 or 5 and chroma of 6 to 8. The lower part of the Bt horizon has hue of 10R or 2.5YR, value of 4 or 5 and chroma of 6 to 8, commonly with mottles in shades of red, yellow, or brown. The Bt horizon is clay loam, silty clay loam, silty clay or clay. The particle-size control section averages more than 30 percent silt or more than 40 percent silt plus very fine sand, or less than 15 percent sand coarser than very fine sand..

The BC horizon has hue of 10R to 5YR, value of 4 to 6, and chroma of 6 to 8, commonly with mottles in shades of yellow or brown. It is silt loam, loam, silty clay loam, or clay loam.

The C horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 3 to 8, commonly with mottles in shades of brown, yellow, gray, or red. In some pedons, the C horizon is coarsely mottled in shades of red, brown, yellow or gray. The C horizon is silt loam, loam, very fine sandy loam, fine sandy loam, sandy loam, or silty clay loam saprolite of fine-grained metavolcanic rock.

**COMPETING SERIES:** These are the Appling, Aragon, Cataula, Cecil, Chestatee, Darley, Herndon, Hulett, Kolomaki, Mahan, Nanford, Nectar, Neeses, Pacolet, Spotsylvania, Tarrus, and Wedowee series. Appling, Cecil, Hulett, Pacolet, and Wedowee soils have less than 30 percent silt in the control section. Aragon soils have Bt horizons that are mottled in the upper part. Aragon and Nectar soils formed in weathered limestone, sandstone, shale, or siltstone. Chestatee soils have more than 15 percent by volume of coarse fragments throughout. Darley soils contain layers of fractured ironstone in the B horizon. Herndon soils have Bt horizons with hue of 5YR or yellower. Nanford and Tarrus soils have a depth to weathered bedrock of 40 to 60 inches. Spotsylvania soils have a lithologic discontinuity. Mahan soils formed in coastal plain sediments and have coarse fragments of ironstone.

**GEOGRAPHIC SETTING:** Georgeville soils are on gently sloping to moderately steep Piedmont uplands. Slopes are generally 6 to 15 percent but range from 2 to 50 percent. The soil formed in residuum weathered from fine-grained metavolcanic rocks. Mean annual precipitation ranges from 37 to 60 inches, mean annual temperature ranges from 59 to 66 degrees F, and the frost-free season ranges from 190 to 240 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** In addition to the competing Herndon, Nanford, and Tarrus series, these are the Alamance, Badin, Goldston, Gundy, Kirksey, Nason, Tatum, and Uwharrie series. Alamance and Kirksey soils are fine-silty. Goldston

soils are loamy-skeletal. Badin, Gundy, Nason, Tatum, and Uwharrie soils have mixed mineralogy.

**DRAINAGE AND PERMEABILITY:** Well drained; medium runoff; moderate permeability.

**USE AND VEGETATION:** Cleared areas are used for cotton, small grains, tobacco, corn, hay, and pasture. Forested areas are in mixed hardwood and pines.

**DISTRIBUTION AND EXTENT:** Piedmont of Alabama, Georgia, North Carolina, South Carolina, and Virginia. The series is extensive.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Cabarrus County, North Carolina, 1910.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:  
Ochric epipedon - the zone from the surface of the soil to 6 inches (A and E horizons)  
Argillic horizon - the zone from 6 to 53 inches (Bt1, Bt2, Bt3, and Bt4 horizons)

MLRA = 136

SIR = SC0014, SC0124 (ROCKY)

**ADDITIONAL DATA:**

**TABULAR SERIES DATA:**

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
SC0014	GEORGEVILLE	2-50	59-66	190-225	37-60	300-1100
SC0124	GEORGEVILLE	2-50	59-66	190-225	37-60	300-1100

SOI-5 FloodL FloodH Watertable Kind Months Bedrock Hardness

SC0014 NONE 6.0-6.0 - 60-60

SC0124 NONE 6.0-6.0 - 60-60

SOI-5 Depth Texture 3-Inch No-10 Clay% -CEC-

SC0014 0-6 L VFSL SIL 0-2 80-100 5-27 8-16

SC0014 0-6 SICL CL 0-2 90-100 27-35 8-16

SC0014 0-6 FSL SL 0-2 80-100 5-20 4-10

SC0014 6-10 SICL CL 0-1 90-100 27-35 6-10

SC0014 10-53 C SIC SICL 0-1 95-100 35-65 9-15

SC0014 53-63 SICL L SIL 0-5 90-100 15-40 7-15

SC0124 0-6 GR-L GR-SIL GR-VFSL 0-10 55-75 5-27 8-16

SC0124 0-6 SY-SIL SY-L SY-VFSL 0-5 70-80 5-27 8-16

SC0124 0-6 GR-FSL GR-SL 0-10 55-75 5-20 4-10

SC0124 6-0 SICL CL 0-1 90-100 27-35 6-10

SC0124 10-53 C SIC SICL 0-1 95-100 35-65 9-15

SC0124 53-63 SICL L SIL 0-5 90-100 15-40 7-15

SOI-5 Depth -pH- O.M. Salin Permeab Shnk-Swll

SC0014 0-6 4.5-7.3 .5-2. 0-0 0.6-2.0 LOW

SC0014 0-6 4.5-7.3 0.-.5 0-0 0.6-2.0 LOW

SC0014 0-6 4.5-6.0 .5-2. - 0.6-2.0 LOW

SC0014 6-10 4.5-5.5 0.-.5 0-0 0.6-2.0 LOW

SC0014 10-53 4.5-5.5 0.-.5 0-0 0.6-2.0 LOW

SC0014 53-63 4.5-5.5 0.-.5 0-0 0.6-2.0 LOW

SC0124 0-6 4.5-7.3 .5-2. 0-0 0.6-2.0 LOW

SC0124 0-6 4.5-7.3 .5-2. 0-0 0.6-2.0 LOW

SC0124 0-6 4.5-7.3 .5-2. - 0.6-2.0 LOW

SC0124 6-10 4.5-5.5 0.-.5 0-0 0.6-2.0 LOW

SC0124 10-53 4.5- 5.5 0.-.5 0- 0 0.6- 2.0 LOW  
SC0124 53-63 4.5- 5.5 0.-.5 0- 0 0.6- 2.0 LOW

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National Cooperative Soil Survey  
U.S.A.

LOCATION HERNDON

SC+AL GA NC VA

Established Series

Rev. DJD

05/2000

### HERNDON SERIES

The Herndon series consists of very deep, well drained, moderately permeable soils that formed in material mostly weathered from fine-grained metavolcanic rock of the Carolina Slate Belt. Slopes are 2 to 25 percent.

**TAXONOMIC CLASS:** Fine, kaolinitic, thermic Typic Kanhapludults

**TYPICAL PEDON:** Herndon silt loam--forested. (Colors are for moist soil.)

**A--**0 to 3 inches; very dark grayish brown (2.5Y 3/2) silt loam; weak fine granular structure; friable; many fine roots, few medium and coarse roots; 2 percent quartz gravel; very strongly acid; clear smooth boundary. (0 to 9 inches thick)

**E--**3 to 9 inches; pale olive (5Y 6/4) silt loam; weak fine granular structure; friable; many fine roots, few medium and coarse roots; 2 percent quartz gravel; few fine brown concretions; strongly acid; clear smooth boundary. (0 to 9 inches thick)

**BE--**9 to 14 inches; pale yellow (2.5Y 7/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; few fine, medium and coarse roots; 1 percent quartz gravel; strongly acid; clear smooth boundary. (0 to 6 inches thick)

**Bt1--**14 to 25 inches; yellowish brown (10YR 5/8) silty clay; few fine and medium distinct olive yellow (2.5Y 6/8) mottles, moderate medium subangular blocky structure; friable; few medium and coarse roots; few faint clay films on faces of peds; very strongly acid; clear smooth boundary. (8 to 30 inches thick)

**Bt2--**25 to 39 inches; strong brown (7.5YR 5/6) clay; few fine prominent reddish yellow (5YR 6/8) and few fine distinct brownish yellow (10YR 6/6) mottles; firm, hard; few medium and coarse roots; few dark brown concretions; few faint clay films on faces of peds; 1 percent fragments of partially weathered rock; very strongly acid; clear wavy boundary. (12 to 20 inches thick)

**Bt3--**39 to 48 inches; reddish yellow (7.5YR 7/8) silty clay loam; few fine prominent very pale brown (10YR 7/3), yellowish red (5YR 5/8), and olive yellow (5Y 6/8), and few fine faint strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; few faint clay films mostly on vertical faces of peds; 1 percent quartz gravel; very strongly acid; clear wavy boundary. (4 to 24 inches thick)

**C--**48 to 68 inches; strong brown (7.5YR 5/8), yellowish red (5YR 5/8), red (2.5YR 4/6), very pale brown (10YR 7/4), and very pale brown (10YR 8/2) silt loam; 80 percent saprolite that crushes easily; 10 percent slate channers; very strongly acid.

**TYPE LOCATION:** Saluda County, South Carolina; 8 miles north of Saluda; 1/4 mile south of Coleman's crossroad on west side of South Carolina Secondary Highway 78.

**RANGE IN CHARACTERISTICS:** Thickness of the clayey part of the Bt horizon ranges from 24 to 48 inches. Depth to the bottom of the clayey Bt horizon exceeds 30 inches. Depth to bedrock (R horizon) is more than 60 inches. The soil is very strongly acid to slightly acid in the A and E horizons and extremely acid to strongly acid in the B and C horizons. Content of rock fragments range from 0 to 35 percent in the A and E horizons, and 0 to 10 percent in the Bt and C horizons.

The A or Ap horizon has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 2 to 8. Horizons with value of 3 are less than 6 inches thick. The A horizon commonly is silt loam, loam, or very fine sandy loam in the fine-earth fraction. In some pedons, the A horizon is silty clay loam.

The E horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 3 to 6. It is silt loam, loam, or very fine sandy loam in the fine-earth fraction.

The BE horizon has hue of

The Bt horizon has hue of 5YR to 10YR, value of 4 to 7, and chroma of 4 to 8. Mottles in shades of brown, yellow, or red are in most pedons. The Bt horizon typically is silty clay loam, silty clay, or clay. The lower part of the Bt horizon ranges to silt loam, loam, silty clay loam, or clay loam. The particle-size control section averages more than 30 percent silt, or more than 40 percent silt plus very fine sand, or less than 15 percent sand coarser than very fine sand.

The BC horizon, where present, has hue of 5YR to 10 YR, value of 4 to 7, and chroma of 4 to 8. Mottles in shades of brown, yellow, red, or white may occur. It is silt loam, loam, silty clay loam, or clay loam.

The C horizon has hue of 2.5YR to 10YR, value of 4 to 7, and chroma of 3 to 8, or is mottled in shades of white, brown, yellow, or red. It is silt loam, loam, very fine sandy loam, silty clay loam saprolite.

**COMPETING SERIES:** These are the Appling, Aragon, Cataula, Cecil, Chestatee, Darley, Georgeville, Hulett, Kolomaki, Mahan, Nanford, Nectar, Neeses, Pacolet, Spotsylvania, Tarrus, and Wedowee series. Appling, Cecil, Hulett, Pacolet, and Wedowee soils have less than 30 percent silt in the control section. Aragon and Nectar soils formed in weathered limestone, sandstone, shale, or siltstone; also, Aragon soils have a Bt horizon that is mottled in the upper part. Cataula and Neeses soils have a layer that is partially dense and brittle. Chestatee soils have more than 15 percent by volume of coarse fragments throughout. Darley soils contain layers of fractured ironstone in the B horizon. Georgeville and Kolomaki soils have a Bt horizon with hue redder than 5YR; also, Kolomaki soils are on terraces on the southern Coastal Plain. Mahan soils formed in coastal plain sediments and have coarse fragments of ironstone. Spotsylvania soils have a lithologic discontinuity.

**GEOGRAPHIC SETTING:** Herndon soils are on gently sloping to moderately steep Piedmont Uplands. Slope gradients generally are 2 to 15 percent but range to 25 percent. The soil formed in residuum weathered from fine-grained metavolcanic rocks of the Carolina Slate Belt. The mean annual temperature ranges from 59 to 66 degrees F., the annual precipitation ranges from 37 to 60 inches, and the frost-free season ranges from 190 to 225 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** In addition to the competing Georgeville series, these are Alamance, Badin, Goldston, Gundy, Kirksey, Nanford, and Tarrus series. Alamance and Kirksey soils have a fine-silty particle size control section. Goldston soils are loamy-skeletal. Badin and Gundy soils have mixed mineralogy. Nanford and Tarrus soils have a depth to weathered bedrock of 40 to 60 inches.

**DRAINAGE AND PERMEABILITY:** Well drained; medium runoff; moderate permeability.

**USE AND VEGETATION:** Cleared areas are used primarily for cotton, small grains, corn, tobacco, hay, and pasture. Forested areas are dominantly in loblolly or shortleaf pine with some mixed hardwood.

**DISTRIBUTION AND EXTENT:** Alabama, Georgia, North Carolina, South Carolina, and Virginia. The series is extensive.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Statesville Area, North Carolina; 1901

**REMARKS:** The 1979 revision used the linear relationship between the thickness of the clayey Bt horizon and depth to the bottom of the clayey Bt horizon as series criteria instead of solum thickness. Diagnostic horizons and features recognized in this pedon are: Ochric epipedon - the zone from the surface of the soil to 14 inches (A, E, and BE horizons)

Argillic horizon - the zone from 14 to 48 inches (Bt1, Bt2, and Bt3 horizons)

MLRA = 136 SIR = SC0017

**ADDITIONAL DATA:**

**TABULAR SERIES DATA:**

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
SC0017	HERNDON	2- 25	59- 66	190-225	37- 60	300-1100

SOI-5	FloodL	FloodH	Watertable Kind	Months	Bedrock	Hardness
SC0017	NONE	6.0-6.0	-	60-60		

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
SC0017	0- 9	ST-L ST-SIL ST-VFSL	10- 30	75- 95	5-27	5- 11
SC0017	0- 9	L SIL VFSL	0- 2	85-100	5-27	5- 11
SC0017	0- 9	SICL	0- 2	95-100	27-35	5- 11
SC0017	9-48	SICL SIC C	0- 1	90-100	35-60	8- 12
SC0017	48-68	SIL L FSL	0- 2	85-100	10-27	6- 10

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swil
SC0017	0- 9	4.5- 6.5	.5-1.	0-0	0.6- 2.0	LOW
SC0017	0- 9	4.5- 6.5	.5-1.	0-0	0.6- 2.0	LOW
SC0017	0- 9	4.5- 6.5	0.-.5	0-0	0.6- 2.0	LOW
SC0017	9-48	3.6- 5.5	0.-.5	0-0	0.6- 2.0	LOW
SC0017	48-68	3.6- 5.5	0.-.5	0-0	0.6- 2.0	LOW

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National Cooperative Soil Survey  
U.S.A.

LOCATION BADIN

NC+AL SC VA

Established Series  
Rev. RBS:RLM:AG:DTA  
02/2003

## BADIN SERIES

The Badin series consists of moderately deep, well drained, moderately permeable soils that formed in residuum weathered from fine-grained metavolcanic rocks of the Carolina Slate Belt. These soils are on gently sloping to steep uplands in the Piedmont. Slopes range from 2 to 55 percent. Mean annual precipitation is 47 inches and mean annual temperature is 60 degrees F. near the type location.

**TAXONOMIC CLASS:** Fine, mixed, semiactive, thermic Typic Hapludults

**TYPICAL PEDON:** Badin channery silt loam, on a complex convex 4 percent slope in cultivated field. (Colors are for moist soil unless otherwise stated.)

**Ap**--0 to 6 inches; brown (7.5YR 5/4) channery silt loam; weak medium granular structure; very friable; common fine roots; slate fragments 1/8 inch to 2 inches in size and make up 35 percent by volume; moderately acid; abrupt wavy boundary. (2 to 8 inches thick)

**BA**--6 to 9 inches; strong brown (7.5YR 5/6) channery silty clay loam; weak medium subangular blocky structure; friable; common fine roots; few faint clay skins on faces of peds; slate fragments 1/8 inch to 2 inches in size and make up 25 percent by volume; moderately acid; clear wavy boundary. (0 to 4 inches thick)

**Bt1**--9 to 18 inches; yellowish red (5YR 5/8) silty clay; moderate medium subangular blocky structure; friable; few fine roots; common faint clay skins on faces of peds; 10 percent slate fragments; extremely acid; gradual wavy boundary.

**Bt2**--18 to 25 inches; mottled red (2.5YR 5/8), yellowish red (5YR 5/8), and strong brown (7.5YR 5/8) channery silty clay loam; weak medium subangular blocky structure; friable; few fine roots; few distinct clay skins on faces of peds; 30 percent slate fragments; extremely acid; clear irregular boundary. (Combined thickness of the Bt horizon is 10 to 28 inches.)

**Cr**--25 to 40 inches; weathered highly fractured fine-grained metavolcanic rock; few seams of silt loam in cracks.

**R**--40 inches; unweathered, fractured fine-grained metavolcanic rock.

**TYPE LOCATION:** Stanly County, North Carolina; 0.7 mile north of Anderson Grove Church in Albemarle on SR 1537; and 100 yards east of road in cultivated field.

**RANGE IN CHARACTERISTICS:** Solum thickness is 20 to 40 inches. Depth to weathered bedrock is 20 to 40 inches. Depth to hard bedrock is 40 inches or more. Reaction ranges from strongly acid to extremely acid in all horizons except where the surface has been limed. Limed soils are typically moderately acid or slightly acid in the A horizon. Rock fragment content is commonly 5 to 35 percent by volume in the A, E, BE, BA, and Bt horizons, and 20 to 60 percent in the BC and C horizons. Some pedons have individual horizons that have 0 to 5 percent rock fragments by volume. Fragments are dominantly channers.

The A or Ap horizon has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 8. In uneroded or slightly eroded pedons, it is silt loam, very fine sandy loam, or loam in the

fine earth fraction. In eroded pedons, the Ap horizon may be silty clay loam in the fine earth fraction.

The E horizon, where present, has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 4. It is silt loam, loam, or very fine sandy loam in the fine earth fraction.

The BA horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam, loam, or silty clay loam in the fine earth fraction.

The BE horizon, where present, has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 4 to 8. It is silt loam, loam, or silty clay loam in the fine earth fraction.

The Bt horizon has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 4 to 8. It is silty clay, silty clay loam, clay loam or clay in the fine earth fraction and has 35 to 60 percent clay and more than 30 percent silt.

The BC horizon, where present, has hue of 10YR TO 2.5YR, value of 4 to 6, and chroma of 4 to 8, or is mottled in shades of these colors. It is silty clay loam, clay loam, or silt loam in the fine-earth fraction.

The C horizon, where present, has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 3 to 8, or is mottled in shades of these colors. It is silty clay loam or silt loam saprolite, in the fine-earth fraction.

The Cr horizon is weathered, fractured fine-grained metavolcanic rock.

The R horizon is unweathered, fractured fine-grained metavolcanic rock.

**COMPETING SERIES:** These are the Albertville, Bengal, Brockroad, Carnasaw, Catharpin, Cunningham, Cuthbert, Galilee, Kirvin, Luverne, Masada, Mayodan, McQueen, Nason, Remlap, Sweatman, Tatum, Townley, Urland, Uwharrie, and Vance series in the same family. Albertville soils formed in residuum from shale and have a depth to soft bedrock of 40 to 60 inches. Bengal soils have a stony surface layer, high shrink-swell potential, and are slowly permeable. Brockroad and Catharpin soils have a lithologic discontinuity within the series control section. Carnasaw soils formed in residuum from shale and have a depth to soft bedrock of 40 to 60 inches. Cunningham soils formed in residuum from shale and have a depth to soft bedrock of 30 to 56 inches. Cuthbert and Galilee soils formed in residuum from sandstone and shale. Kirvin soils formed in residuum from shale and have a depth to soft bedrock of 40 to 60 inches. Luverne soils formed from stratified marine sediments. Masada and McQueen soils formed in alluvial sediments and are very deep. Mayodan soils formed in residuum from Triassic Basin sediments and are very deep. Nason and Tatum soils formed in residuum from schist and have a depth to soft bedrock of 40 to 60 inches. Remlap soils formed in residuum from interbedded shale and are very deep. Sweatman soils formed in marine sediments consisting of thinly bedded clayey shales and sandy and loamy material and are very deep. Townley soils formed in residuum from interbedded shale and sandstone. Urland soils formed in coastal plain sediments and stratified sandstone. Uwharrie and Vance soils are very deep. Of these series, only Catharpin, Masada, Mayodan, McQueen, Nason, Tatum, Uwharrie, and Vance soils occur in the Southern Piedmont MLRA 136.

**GEOGRAPHIC SETTING:** Badin soils are on gently sloping to steep uplands in the Piedmont. Slope gradients are commonly 4 to 25 percent, but range from 2 to 55 percent slopes. They formed in residuum weathered from fine-grained metavolcanic rocks such as argillites. Mean annual precipitation is 47 inches and mean annual air temperature is 60 degrees F. near the type location.

**GEOGRAPHICALLY ASSOCIATED SOILS:** In addition to the competing Uwharrie series, these are Callison, Cid, Georgeville, Goldston, Herndon, Kirksey, Lignum, Misenheimer, Montonia, Nanford, Pageland, Secrest, and Tarrus series. Cid soils are moderately well or somewhat poorly drained and are on toe slopes and around heads of drains. Georgeville and Herndon soils lack Cr horizons within 60 inches of the surface and occur on smoother landscapes. Goldston soils are shallow, lack continuous Bt horizons, and occur on more broken topography. Kirksey and Lignum soils have low chroma mottles in the control section and occur on smoother lower parts of the landscape. Misenheimer soils are shallow, lack a Bt horizon, and occur on smoother lower parts of the landscape. Montonia soils are fine-loamy. Nanford and Tarrus soils have a depth to weathered bedrock (Cr) of 40 to 60 inches. Pageland soils are Alfisols. Secrest soils have a fine-silty particle size control section.

**DRAINAGE AND PERMEABILITY:** Well drained; medium to very rapid runoff; moderate permeability.

**USE AND VEGETATION:** Used mainly for growing corn, small grain, soybeans, grain sorghum, mixed hay, and pasture. The remainder is in woodlands of oaks, hickory, loblolly pine, shortleaf pine, Virginia pine, and yellow-poplar. Common understory species are American holly, flowering dogwood, sourwood, and American hornbeam.

**DISTRIBUTION AND EXTENT:** Piedmont Plateau of North Carolina and Virginia. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Cabarrus County, North Carolina; 1983.

**REMARKS:** This soil was formerly included in the Nason and Tatum series. However, those soils are deeper than 40 inches to bedrock.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface of the soil to a depth of 9 inches (Ap and BA horizons).

Argillic horizon - the zone from a depth of 9 inches to a depth of 25 inches (Bt1 and Bt2 horizons).

Paralithic contact - the presence of weathered, fractured slate at a depth of 25 inches.

**ADDITIONAL DATA:** Soils similar to Badin were characterized as Herndon slaty silt loam (S65NC-84-5(1-5) by Beltsville laboratory. The COLE values are thought to be in error.

MLRA = 136

**TABULAR SERIES DATA:**

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0126	BADIN	2- 55	59- 63	190-240	40- 60	300-1100
NC0249	BADIN	2- 55	59- 63	190-240	40- 60	300-1100

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0126	NONE	6.0-6.0	-	20-40	SOFT		
NC0249	NONE	6.0-6.0	-	20-40	SOFT		

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-		
NC0126	0- 6	CN-SIL	CN-VFSL	CN-L	0- 10	50- 85	10-27	3- 8
NC0126	0- 6	CN-SICL			0- 10	60- 80	27-40	6- 10
NC0126	6-25	SIC	SICL	CN-SICL	0- 5	60-100	35-55	7- 12
NC0126	25-40	WB			-	-	-	-



NC0126 40-50 UWB	-	-	-	-
NC0249 0-6 SIL L	0-5	75-95	10-27	3-8
NC0249 0-6 SICL	0-5	75-95	27-40	6-10
NC0249 6-25 SIC SICL CN-SICL	0-5	60-100	35-55	7-12
NC0249 25-40 WB	-	-	-	-
NC0249 40-50 UWB	-	-	-	-

SOI-5 Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0126 0-6	3.5-6.5	1-.3	0-0	0.6-2.0	LOW
NC0126 0-6	3.5-6.5	.5-2	0-0	0.6-2.0	LOW
NC0126 6-25	3.5-5.5	0-.5	0-0	0.6-2.0	MODERATE
NC0126 25-40	-	-	-	-	-
NC0126 40-50	-	-	-	-	-
NC0249 0-6	3.5-6.5	1-.3	0-0	0.6-2.0	LOW
NC0249 0-6	3.5-6.5	.5-2	0-0	0.6-2.0	LOW
NC0249 6-25	3.5-5.5	0-.5	0-0	0.6-2.0	MODERATE
NC0249 25-40	-	-	-	-	-
NC0249 40-50	-	-	-	-	-

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National Cooperative Soil Survey  
U.S.A.

LOCATION CID NC+VA+SC

Established Series

Rev. CMM:DTK:AG:DTA

02/2003

### CID SERIES

The Cid series consists of moderately deep, moderately well drained or somewhat poorly drained soils on Piedmont uplands. These soils formed in residuum weathered from argillite and other fine-grained metavolcanic rocks. Slope ranges from 0 to 15 percent. Mean annual precipitation is 45 inches and mean annual temperature is 60 degrees F. near the type location.

**TAXONOMIC CLASS:** Fine, mixed, semiactive, thermic Aquic Hapludults

**TYPICAL PEDON:** Cid silt loam on a 3 percent side slopes -- forested. (Colors are for moist soil unless otherwise stated.)

**A--O** to 6 inches; grayish brown (10YR 5/2) silt loam; light gray (10YR 7/2) dry; moderate medium granular structure; very friable; many fine roots; 5 percent by volume slate channers; very strongly acid; clear wavy boundary. (2 to 8 inches thick)

**E--6** to 12 inches; light yellowish brown (2.5Y 6/4) silt loam; few fine faint brownish yellow (10YR 6/6) mottles; moderate medium granular structure; friable; common fine and medium roots; common fine pores; 5 percent by volume slate channers; very strongly acid; gradual wavy boundary. (0 to 8 inches thick)

**Bt1--12** to 19 inches; brownish yellow (10YR 6/6) silty clay loam; moderate medium angular blocky structure; friable slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine roots; common fine pores; common medium distinct pale yellow (2.5Y 7/4) iron depletions; very strongly acid; gradual wavy boundary.

**Bt2**--19 to 26 inches; olive yellow (2.5Y 6/6) silty clay; moderate medium angular blocky structure; firm, sticky, plastic; few medium roots; common fine pores; common distinct clay films on faces of peds; 5 percent by volume slate channers; common medium faint brownish yellow (10YR 6/6) masses of iron accumulation and common medium distinct light gray (10YR 7/1) iron depletions; very strongly acid; gradual wavy boundary.

(Combined thickness of the Bt horizons is 10 to 20 inches)

**BC**--26 to 29 inches; olive yellow (2.5Y 6/6) channery silty clay; weak medium subangular blocky structure; firm, sticky, plastic; few medium roots; 25 percent by volume slate channers; common medium distinct gray (10YR 6/1) iron depletions; very strongly acid; gradual wavy boundary. (0 to 6 inches thick)

**Cr**--29 to 34 inches; weathered moderately fractured argillite; thin seams of gray (10YR 6/1) silt loam in fractures.

**R**--34 inches; unweathered slightly fractured argillite.

**TYPE LOCATION:** Davidson County, North Carolina; 4.2 miles west of Denton on Flat Swamp Road; 0.5 miles north on N.C. Highway 8; 1/3 miles north on Shiptontown Road (State Road 2310); 100 feet west in pine forest.

**RANGE IN CHARACTERISTICS:** Solum thickness and depth to hard bedrock ranges from 20 to 40 inches. This soil is extremely acid to strongly acid unless limed. Content of coarse fragments, mainly channers, is 0 to 35 percent in the A and E horizons, 0 to 15 percent in the BA, BE, and Bt horizons, and 5 to 35 percent in the BC and BCg horizons. The A or Ap horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 to 4. It is silt loam, loam, or very fine sandy loam in the fine earth fraction.

The E horizon has hue of 10YR to 5Y, value of 6 or 7, and chroma of 2 to 4. It is silt loam, loam, or very fine sandy loam in the fine earth fraction.

The BA or BE horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 8. It is silt loam, loam, or silty clay loam.

The Bt horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 8, or is mottled in these colors. Redoximorphic accumulations in shades of red, brown, or yellow may be present. Redoximorphic depletions with chroma of 2 or less are within 24 inches of the upper boundary of this horizon. The Bt horizon is silty clay loam, silty clay, clay loam, or clay.

The BC horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 8.

Redoximorphic accumulations in shades of red, brown, or yellow and redoximorphic depletions in shades of gray, brown, and yellow are in most pedons. Texture is silty clay, silty clay loam, or clay in the fine earth fraction.

The BCg horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2. Redoximorphic accumulations in shades of red, yellow, and brown are present. Texture is silty clay, silty clay loam, or clay in the fine earth fraction.

The BCtg horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2. Redoximorphic accumulations in shades of red, yellow, and brown are present. Texture is silty clay, silty clay loam, or clay in the fine earth fraction.

The C horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 8. Redoximorphic accumulations in shades of red, brown, or yellow and redoximorphic depletions in shades of gray, brown, and yellow are in some pedons. Texture is silt loam, silty clay loam, or loam saprolite in the fine earth fraction.

The Cr horizon is weathered fractured argillite or other fine-grained metavolcanic bedrock.

The R horizon is unweathered, fractured argillite or other fine-grained metavolcanic rock. **COMPETING SERIES:** These are the Annemaine, Bush River (T), Craven, Creedmoor, Dogue, Eulonia, Gritney, Helena, Lignum, Mandale (T), Nemours, Nevarc, Newco, Prosperity (T), Rosenwall, Sacul, Stapp, Vinita, and Wolftever soils. Annemaine, Craven, Dogue, Eulonia, Gritney, Nemours, Nevarc, and Wolftever soils formed in marine sediments or alluvium and lack bedrock within a depth of 80 inches. Creedmoor soils have higher exchangeable aluminum and does not have bedrock within a depth of 40 inches. Helena soils are very deep. Lignum soils have a depth to soft bedrock of 40 to 60 inches. Mandale (T) soils have a depth to bedrock of greater than 60 inches. Newco and Stapp soils have red colors in the Bt horizon. Rosenwall, Sacul, and Vinita soils are underlain by shale or sandstone and contain fragments of those rocks.

**GEOGRAPHIC SETTING:** Cid soils are on undulating to gently sloping interstream divides, on lower side slopes, or on broad flats around the heads of drainageways on the uplands. Slope gradients are commonly 2 to 6 percent but range from 0 to 15 percent. These soils formed in residuum weathered from argillite and other fine-grained metavolcanic rocks. Mean annual precipitation is about 45 inches, and the mean annual temperature is about 60 degrees F. near the type location.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Lignum and Mandale (T) series and the Alamance, Badin, Callison, Georgeville, Goldston, Herndon, Kirksey, Misenheimer, Montonia, Nanford, Nason, Oakboro, Secrest, Tarrus, and Tatum soils. Alamance, Badin, Georgeville, Goldston, Herndon, Nanford, Nason, Tarrus, and Tatum soils are well drained. Alamance, Callison, Kirksey, Montonia, and Secrest soils have less than 35 percent clay in the Bt horizon. In addition, Kirksey soils have a depth to hard bedrock of 40 to 60 inches and Secrest soils have a depth to soft bedrock of 40 to 60 inches. Goldston and Misenheimer soils have loamy horizons less than 20 inches deep over a paralithic contact. Oakboro soils have less clay and are on flood plains.

**DRAINAGE AND PERMEABILITY:** Moderately well drained and somewhat poorly drained; slow to moderate runoff, slow permeability. This soil has a perched water table, 1.0 to 2.5 feet below the surface in the winter and spring.

**USE AND VEGETATION:** Used mostly for forest with minor acreage in pasture, crops, or idle. Woodland consists primarily of shortleaf pine, loblolly pine, Virginia pine, southern red oak, white oak, willow oak, sweetgum, red maple, flowering dogwood, American holly, blackgum, post oak, black oak, scarlet oak, and eastern red cedar. Crops grown include corn, soybeans, small grains, and hay.

**DISTRIBUTION AND EXTENT:** North Carolina, Virginia, and South Carolina. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Davidson County, North Carolina; 1985.

**REMARKS:** This series was formerly included with the Lignum series. It differs mainly in having hard bedrock between depths of 20 to 40 inches.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface of the soil to a depth of 12 inches (A and E horizons)

Argillic horizon - the zone from approximately 12 to 26 inches below the surface (Bt1 and Bt2 horizons)

Paralithic contact - the occurrence of soft, fractured bedrock at a depth of 29 inches (the upper boundary of the Cr horizon)

Lithic contact - the occurrence of hard fractured bedrock at a depth of 34 inches (the upper boundary of the R horizon)

MLRA = 136

SIR = NC0189

**ADDITIONAL DATA:**

**TABULAR SERIES DATA:**

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0189	CID	0-15	59-64	190-230	37-60	350-600

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0189	NONE	1.0-2.5	PERCHED	DEC-MAY	20-40	HARD	

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0189	0-12	SIL L VFSL	0-5	80-100	10-25	2-7
NC0189	0-12	CN-SIL CN-L CN-VFSL	0-10	50-80	10-25	2-7
NC0189	12-26	SICL SIC C	0-5	80-100	35-60	7-13
NC0189	26-29	CN-SIC CN-SICL SIC	0-10	60-100	35-60	7-13
NC0189	29-34	WB	-	-	-	-
NC0189	34	UWB	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0189	0-12	3.5-5.5	.5-2.	0-0	0.6-2.0	LOW
NC0189	0-12	3.5-5.5	.5-2.	0-0	0.6-2.0	LOW
NC0189	12-26	3.5-5.5	0.-.5	0-0	0.06-0.2	MODERATE
NC0189	26-29	3.5-5.5	0.-.5	0-0	0.06-0.2	MODERATE
NC0189	29-34	-	-	-	-	-
NC0189	34	-	-	-	-	-

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National Cooperative Soil Survey  
U.S.A.

LOCATION LIGNUM NC+SC VA

Established Series

Rev. NBP; DTA

02/2003

**LIGNUM SERIES**

Soils of the Lignum series are deep and moderately well and somewhat poorly drained. They formed in the residuum weathered from Carolina slate or other fine grained metavolcanic rocks. Slopes range from 0 to 15 percent. Mean annual precipitation is about 41 inches, and mean annual air temperature is about 57 degrees F.

**TAXONOMIC CLASS:** Fine, mixed, semiactive, thermic Aquic Hapludults

**TYPICAL PEDON:** Lignum silt loam - woods. (Colors are for moist soil.)

**A**--0 to 2 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; common fine and medium roots; very strongly acid; clear smooth boundary. (4 to 10 inches thick)

**E**--2 to 12 inches; very pale brown (10YR 7/3) silt loam; weak fine granular structure; friable; few fine and medium roots; few fine distinct reddish yellow (7.5YR 6/8) masses of iron accumulation; very strongly acid; clear wavy boundary. (0 to 8 inches thick)

**Bt1**--12 to 16 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium angular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; common distinct clay films on faces of peds; common fine prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; very strongly acid; gradual wavy boundary.

**Bt2**--16 to 35 inches; yellowish brown (10YR 5/4) silty clay; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common distinct clay films on faces of peds; common coarse prominent strong brown (7.5YR 5/8) masses of iron accumulations and common medium distinct light gray (10YR 7/2) iron depletions; very strongly acid; gradual wavy boundary. (Combined thickness of the Bt horizon is 16 to 36 inches)

**BCtg**--35 to 39 inches; light brownish gray (10YR 6/2) silty clay loam; weak fine subangular blocky structure; friable; few distinct clay films on faces of peds; many coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; very strongly acid; gradual wavy boundary. (0 to 18 inches thick)

**C**--39 to 56 inches; mottled light gray (10YR 7/2), strong brown (7.5YR 5/8), and very pale brown (10YR 8/2) silt loam saprolite; massive; friable; very strongly acid; abrupt smooth boundary. (0 to 15 inches thick)

**Cr**--56 to 65 inches; moderately hard, weathered bedrock.

**TYPE LOCATION:** Moore County, North Carolina; 10.1 miles southwest of Robbins on North Carolina Highways 24 and 27, about 1.4 miles north on Secondary Road 1281 from its intersection with North Carolina Highways 24 and 27, about 30 feet west of Secondary Road 1281, in a pine forest.

**RANGE IN CHARACTERISTICS:** Solum thickness is 20 to 40 inches. Depth to a paralithic contact of weathered bedrock (Cr) is 40 to 60 inches. Depth to a lithic contact of unweathered bedrock (R) is more than 60 inches. Silt content is more than 40 percent and generally more than 50 percent in the upper part of the solum. Rock fragments of quartz or slate range from 0 to 25 percent in the A and E horizons, 0 to 15 percent in the BE, B, and BC horizons, and 0 to 50 percent in the C horizon with more than 30 percent restricted to the lower part of the C horizon. The soil is very strongly acid or strongly acid throughout, except where surface layers have been limed.

The A or Ap horizon has hue of 7.5YR through 2.5Y, value of 4 through 7, and chroma of 1 through 4. It is silt loam, loam, or very fine sandy loam in the fine-earth fraction.

The E horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 1 through 6. It is loam, silt loam, or very fine sandy loam in the fine-earth fraction.

The BA or BE horizon, where present, has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 3 through 8. It is loam, silt loam, clay loam, or silty clay loam in the fine-earth fraction.

The Bt horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 3 through 8. Hue of 2.5Y is restricted to thin individual subhorizons. Iron or clay depletions

and accumulations in shades of gray, white, yellow, brown, and red are present in most pedons. The Bt horizon is silty clay loam, silty clay, clay loam, or clay in the fine-earth fraction.

The Btg horizon, where present, has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 0 to 2. It is silty clay loam, silty clay, clay loam, or clay in the fine-earth fraction.

The BCt or CBt horizon, where present, has hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 3 through 8. Iron or clay depletions and accumulations in shades of gray, white, yellow, brown, and red are present in most pedons. Texture is loam, silt loam, or silty clay loam in the fine-earth fraction.

The BCtg or CBtg horizon has hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 0 or 2. Texture is loam, silt loam, or silty clay loam in the fine-earth fraction. The C horizon colors are variable and commonly do not have a dominant color. It is very fine sandy loam, silty clay loam, or silt loam saprolite in the fine-earth fraction.

The Cr horizon is weathered, moderately hard, and slightly to moderately fractured argillite or other fine grained metavolcanic rock.

**COMPETING SERIES:** These are the Annemaine, Bush River (T), Cid, Creedmoor, Dogue, Gritney, Helena, Mandale (T), Prosperity (T), and Wolftever series in the same family. Annemaine soils formed in stratified clayey and loamy sediments on marine or stream terraces in the coastal plain and have a depth to bedrock of greater than 60 inches. Bush River (T), Helena, and Prosperity (T) soils formed in residuum from mixed felsic, intermediate, or mafic igneous high-grade rocks. Cid soils have a depth to paralithic contact of 20 to 40 inches. Creedmoor soils formed in Triassic Basin sediments and have a depth to bedrock of greater than 60 inches. Dogue and Wolftever soils have a depth to bedrock of greater than 60 inches and are located on low stream terraces. Gritney soils formed in coastal plain sediments and have a depth to bedrock of greater than 60 inches. Mandale (T) soils have a depth to bedrock of greater than 60 inches.

**GEOGRAPHIC SETTING:** Lignum soils are in depressions and on undulating uplands, in interstream divides, and around the heads of drainageways. Slope gradients are commonly 2 to 6 percent with a range of 0 to 15 percent. They formed in residuum weathered from argillite or other fine grained metavolcanic rocks. The mean annual air temperature is about 57 degrees F., and mean annual precipitation ranges from 38 to 45 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Cid and Mandale soils as well as the Alamance, Badin, Callison, Georgeville, Goldston, Gundy, Herndon, Kirksey, Misenheimer, Montonia, Nanford, Secrest, and Tarrus soils. Alamance, Badin, Georgeville, Goldston, Gundy, Herndon, Montonia, Nanford and Tarrus soils are well drained. Kirksey soils have a fine-silty particle size control section and a depth to hard bedrock of 40 to 60 inches. Misenheimer and Goldston soils are loamy and less than 20 inches to a paralithic contact. Secrest soils have a fine-silty particle size control section and a depth to soft bedrock of 40 to 60 inches.

**DRAINAGE AND PERMEABILITY:** Moderately well and somewhat poorly drained, moderate to slow runoff; very slow permeability.

**USE AND VEGETATION:** Used largely for forest with minor acreage in pasture. A small acreage is cultivated or idle. Crops include corn, soybeans, small grain and hay

grasses. Vegetation consists of white, black, red and scarlet oaks, red maple, blackgum, dogwood, and loblolly pine.

**DISTRIBUTION AND EXTENT:** North Carolina, South Carolina, and Virginia. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Culpeper County, Virginia, 1948. This area is now in the mesic piedmont area. Lignum soils were moved to a thermic area in Moore County, North Carolina. A new mesic counterpart will be established.

**REMARKS:** Diagnostic horizons and features recognized in this pedon are:

- a. Ochric epipedon - the zone from 0 to 12 inches (A and E horizons).
- b. Argillic horizon - the zone from 12 to 39 inches (Bt and BCgt horizons).
- c. Paralithic contact--the presence of weathered bedrock at 56 inches.

SIR = VA0011

MLRA = 136

REVISED = 7/5/93, MHC; 12/04/97, DTA; 07/15/00, DTA

**ADDITIONAL DATA:**

**TABULAR SERIES DATA:**

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
VA0011	LIGNUM	0-15	59- 66	175-225	38-55	150- 550

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
VA0011	NONE		1.0-2.5	PERCHED	DEC-MAY	40-60	SOFT

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
VA0011	0-12	SIL L VFSL	0-0	80-100	10-25	-
VA0011	12-39	SICL SIC C	0-5	75-100	35-55	-
VA0011	39-56	SCL GR-SCL GR-SICL	0-15	35- 80	20-40	-
VA0011	56-65	WB	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
VA0011	0-12	4.5-5.5	.5-2.	0-0	0.6- 2.0	LOW
VA0011	12-39	4.5-5.5	0-.5	0-0	0.0-0.06	MODERATE
VA0011	39-56	4.5-5.5	0-.5	0-0	0.2- 0.6	LOW
VA0011	56-65	-	-	-	-	-

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National Cooperative Soil Survey  
U.S.A.

LOCATION GOLDSTON NC+GA SC VA  
Established Series  
Rev. DJT:HS:RAG  
06/2001

**GOLDSTON SERIES**

The Goldston series consists of shallow, well drained to excessively drained, moderately rapidly permeable soils that formed in residuum weathered from fine-grained metavolcanic rocks in the Carolina Slate Belt. This soil averages

more than 35 percent coarse fragments by volume. Slope ranges from 2 to 60 percent. Mean annual precipitation is 47 inches and mean annual temperature is 60 degrees F. near the type location.

**TAXONOMIC CLASS:** Loamy-skeletal, siliceous, semiactive, thermic, shallow Typic Dystrudepts

**TYPICAL PEDON:** Goldston very channery silt loam--forested.

(Colors for moist soil unless otherwise stated.)

**0i**--1 to 0 inch; undecomposed organic litter.

**A**--0 to 1 inch; dark grayish brown (10YR 4/2) very channery silt loam; weak medium granular structure; friable; many fine and medium roots; slate fragments 1/4 inch to 3 inches in size comprise 40 percent by volume; very strongly acid; abrupt smooth boundary. (2 to 8 inches thick)

**E**--1 to 7 inches; brown (10YR 5/3) very channery silt loam; weak medium granular structure; friable; many fine and medium roots; slate fragments 1/4 inch to 3 inches in size comprise 40 percent by volume; very strongly acid; abrupt wavy boundary. (0 to 8 inches thick)

**Bw**--7 to 16 inches; brownish yellow (10YR 6/6) very channery silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; slate fragments 1/2 inch to 6 inches in size comprise 58 percent by volume; strongly acid; gradual wavy boundary. (6 to 12 inches thick)

**Cr**--16 to 36 inches; multicolored, weathered, fractured argillite; few seams of yellowish brown silt loam in cracks.

**R**--36 inches; hard fractured argillite.

**TYPE LOCATION:** Stanly County, North Carolina; from intersection of U.S. Highway 52 and NC Highway 49 in Richfield, 2.8 miles southwest on NC Highway 49; 150 feet south of NC 49 and 600 feet east of Big Bear Creek.

**RANGE IN CHARACTERISTICS:** Thickness of the solum and depth to a paralithic contact is 10 to 20 inches. This soil has a weighted average of more than 35 percent coarse fragments by volume. Depth to a lithic contact is 20 to 40 inches or more.

Reaction ranges from extremely acid to moderately acid in all horizons except where limed.

The A or Ap horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4.

Texture of the fine-earth fraction is silt loam or very fine sandy loam. Rock fragments, from 1/4 inch to 6 inches or more in size, comprise 15 to 60 percent by volume.

The E horizon has hue of 10YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. Texture of the fine-earth fraction is silt loam or very fine sandy loam. Rock fragments, from 1/4 inch to 6 inches or more in size, comprise 15 to 60 percent by volume.

The Bw or AC horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 3 to 8. Texture of the fine-earth fraction is silt loam or very fine sandy loam. Mottles in shades of brown, yellow and red are in some pedons. Rock fragments ranging from 1/2 inch to 6 inches or more in size comprise 35 to 70 percent by volume.

The Cr horizon is weathered fractured fine-grained metavolcanic rock.

The R horizon is unweathered fractured fine-grained metavolcanic rock.

**COMPETING SERIES:** There are no known competing series in the same family.

Those in closely related families are the Misenheimer, Montevallo, and Nashoba series.



Misenheimer soils are moderately well drained. Montevallo soils are shaly, have mixed mineralogy, and lack R horizons. Nashoba soils lack bedrock at depths less than 20 inches.

**GEOGRAPHIC SETTING:** Goldston soils are on narrow gently rolling interstream ridges and sloping to steep sides of ridges between intermittent and permanent streams in the southern Piedmont. Slopes are dominantly from 4 to 25 percent but range from 2 to 60 percent. These soils formed in residuum weathered from felsic slates. Mean annual precipitation is about 47 inches and mean annual temperature about 60 degrees F., near the type location.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Alamance, Badin, Georgeville, Herndon, Kirksey, Lignum, Misenheimer, Nanford, Tarrus, and Orange series. Alamance and Kirksey have a fine-loamy or fine-silty particle size class and have a depth to bedrock of greater than 20 inches. Badin, Georgeville, Herndon, Lignum, Nanford, Orange, and Tarrus soils have a fine particle size class and have a depth to bedrock of greater than 20 inches. Kirksey, Lignum, Misenheimer, and Orange soils have iron depletions of chroma of 2 or less.

**DRAINAGE AND PERMEABILITY:** Well drained to excessively drained; runoff is rapid and internal drainage is medium to rapid; moderately rapid permeability.

**USE AND VEGETATION:** Most of the areas are in forests of blackjack, white, post, and red oaks, hickory, dogwood, cedar, and shortleaf pine. About 1/3 to 1/2 of the areas have been cleared in the past but most have been allowed to revert to forest. Cleared areas are used mainly for growing grain sorghum, small grain, corn, pasture, and hay.

**DISTRIBUTION AND EXTENT:** The Southern Piedmont of Georgia, North Carolina, South Carolina, and Virginia. The series is extensive.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Chatham County, North Carolina; 1933.

**REMARKS:** The present concept excludes soils having hard bedrock at depths within 20 inches of the surface.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the soil surface to a depth of 7 inches.

Cambic horizon - the zone between depths of 7 and 16 inches.

Paralithic contact - the occurrence of weathered, fractured bedrock at a depth of 16 inches.

Lithic contact - the occurrence of hard fractured bedrock at a depth of 36 inches.

**ADDITIONAL DATA:**

**TABULAR SERIES DATA:**

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0033	GOLDSTON	2- 60	59- 63	190-240	40- 60	300- 700

SOI-5	FloodL	FloodH	Watertable Kind	Months	Bedrock	Hardness
NC0033	NONE	6.0-6.0	-	10-20	SOFT	

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0033	0- 7	CN-SIL	CN-VFSL	10- 20	50- 80	5-27 1-7
NC0033	0- 7	CNV-SIL	CNV-VFSL	20- 50	30- 80	5-15 1-5
NC0033	7-16	CNV-SIL	CNV-VFSL	20- 50	30- 80	5-27 1-6
NC0033	16-36	WB				

NC0033 36-46 UWB

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swil
NC0033	0-7	3.5-5.5	.5-2.	0-0	2.0-6.0	LOW
NC0033	0-7	3.5-5.5	.5-2.	0-0	2.0-6.0	LOW
NC0033	7-16	3.5-5.5	0-.5	0-0	2.0-6.0	LOW
NC0033	16-36	-	-	-	-	-
NC0033	36-46	-	-	-	-	-

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National Cooperative Soil Survey  
U.S.A.

LOCATION MISENHEIMER NC+VA

Established Series

Rev. RBS:RLM:ENH

09/2002

### MISENHEIMER SERIES

The Misenheimer series consists of shallow, moderately well drained, and somewhat poorly drained, moderately rapidly permeable soils that formed in residuum weathered from fine-grained metavolcanic rock. During wet seasons these soils have perched water tables. These soils are on nearly level to sloping broad ridges, in depressions and around the heads of drainageways in the Piedmont. Mean annual temperature is 60 degrees F., and mean annual precipitation is 47 inches near the type location. Slopes range from 0 to 15 percent.

**TAXONOMIC CLASS:** Loamy, siliceous, semiactive, thermic, shallow Aquic Dystrudepts

**TYPICAL PEDON:** Misenheimer channery silt loam on a 3 percent slope in a mixed pine and hardwood forest. (Colors are for moist soil unless otherwise stated.)

**Oi--**2 to 0 inches; undecomposed pine and hardwood litter.

**A--**0 to 2 inches; dark grayish brown (10YR 4/2) channery silt loam; weak medium granular structure; very friable; many fine and medium roots; slate fragments 1/4 to 1 inch in size comprise 20 percent by volume; extremely acid; abrupt smooth boundary. (2 to 4 inches thick)

**E--**2 to 7 inches; pale yellow (2.5Y 7/4) channery silt loam; weak fine granular structure; very friable; common medium roots; slate fragments 1/4 to 1 inch in size make up 15 percent by volume., extremely acid; abrupt smooth boundary. (0 to 6 inches thick)

**Bw--**7 to 14 inches; light yellowish brown (10YR 6/4) channery silt loam; weak fine platy structure that parts to weak fine and medium subangular blocky; friable; common fine roots in cracks; slate fragments 1/4 inch to 1 1/2 inches in size comprise 30 percent by volume; few fine faint brownish yellow (10YR 6/6) iron accumulations and few medium distinct light gray (2.5Y 7/2) iron depletions; extremely acid; gradual irregular boundary. (6 to 12 inches thick)

**Cr**--14 to 25 inches; multicolored weathered and fractured argillite; slate fragments 1/4 inch to 3 inches in size comprise more than 60 percent by volume; few seams of light brownish gray (2.5Y 6/2) silt loam in cracks; few seams of light brownish gray (2.5Y 6/2) silt loam in cracks; extremely acid; gradual irregular boundary.

**R**--25 inches; hard, slightly fractured argillite.

**TYPE LOCATION:** Stanly County, North Carolina; 0.4 mile northwest of Richfield on State Road 1005; 100 feet southwest of road in a mixed hardwood and pine forest.

**RANGE IN CHARACTERISTICS:** Solum thickness is less than 20 inches. Depth to a paralithic contact with weathered fractured fine-grained metavolcanic rock is 10 to 20 inches. Depth to hard fractured fine-grained metavolcanic rock is 20 to 40 inches or more. Reaction ranges from extremely acid to strongly acid in all horizons except where the surface has been limed. The A, B, and C horizons average collectively 15 to 35 percent coarse fragments.

The A or Ap horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 to 4. It is channery loam or channery silt loam.

The E horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 2 to 4. It is channery loam or channery silt loam.

The Bw horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 3 to 6. It is channery loam, channery silt loam or channery silty clay loam. Iron depletions with chroma of 2 or less are throughout the horizon.

The C horizon, where present, is multicolored channery silt loam or very channery silt loam. It has hue of 10YR, 2.5Y, or 5Y. The C horizon ranges from 25 to 60 percent of slate fragments.

The Cr horizon is multicolored weathered and fractured slate with nearly level bedding planes. It has 60 percent or more slate fragments.

The R horizon is fractured slate rock.

**COMPETING SERIES:** There are no known competing series in the same family. Those in closely related families are Goldston and Kirksey series. Goldston soils are well drained to excessively drained and loamy-skeletal. Kirksey soils have fine-silty Bt horizons and bedrock below 40 inches.

**GEOGRAPHIC SETTING:** Misenheimer soils are on nearly level to gently sloping broad ridges, in depressions, and around the heads of drainageways. Slopes range from 0 to 5 percent. These soils formed in residuum weathered from slates such as felsic argillites. Mean annual precipitation is 47 inches and mean annual temperature is 60 degrees F. near the type location.

**GEOGRAPHICALLY ASSOCIATED SOILS:** In addition to the closely related Goldston and Kirksey series, these are the Badin, Cid, Nanford, and Tarrus series. Badin, Nanford, and Tarrus soils are well drained and have a fine particle size class. In addition, Nanford and Tarrus soils have a depth to paralithic contact with soft bedrock at 40 to 60 inches and Badin soils have a depth to paralithic contact with soft bedrock at 20 to 40 inches. These soils are on more rolling topography. Cid soils have a fine particle size control class and a depth to paralithic contact with soft bedrock at 20 to 40 inches.

**DRAINAGE AND PERMEABILITY:** Moderately well drained and somewhat poorly drained; runoff is slow and permeability is moderate to moderately rapid. Misenheimer

soils have perched water tables in wet seasons because the slate beds are nearly level and impede the downward movement of water.

**USE AND VEGETATION:** Used for crops and forests. Crops include corn, soybeans, sorghum, and small grain. Forests consist of white oak, post oak, blackjack oak, red maple, blackgum, hickory, eastern redcedar, willow oak, and shortleaf pine.

**DISTRIBUTION AND EXTENT:** Piedmont Plateau of North Carolina and possibly South Carolina and Virginia. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Raleigh, North Carolina

**SERIES ESTABLISHED:** Cabarrus County, North Carolina; 1983.

**REMARKS:** This soil was formerly included with the Goldston series. Goldston soils are well drained.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone between the surface and depth of 7 inches.

Cambic horizon - The zone between depth of 7 and 14 inches.

Paralithic contact - The occurrence of soft bedrock at a depth of 14 inches.

Lithic contact - The occurrence of hard bedrock at a depth of 25 inches.

**ADDITIONAL DATA:** Soils of the Misenheimer series were characterized as Goldston slaty silt loam, moderately well drained (S65NC-84-3(1-4) by the Beltsville Laboratory. The B3 horizon is now a Cr horizon.

SIR/OSD Report:

**SOI-5 Soil Name Slope Airtemp FrFr/Seas Precip Elevation**  
NC0127 MISENHEIME 0-15 59-63 190-240 40- 60 300- 700

**SOI-5 FloodL FloodH Waterble Kind Months Bedrock Hardness**  
NC0127 NONE 1.0-1.5 PERCHED DEC-APR 10-20 SOFT

**SOI-5 Depth Texture 3-Inch No-10 Clay% -CEC-**  
NC0127 0- 7 CN-SIL CN-L 0- 15 55- 80 7-27 2-6  
NC0127 7-14 CN-SIL CN-L CN-SICL 0- 15 55- 80 7-35 1-7  
NC0127 14-25 WB - - - -

**SOI-5 Depth -pH- O.M. Salin Permeab Shnk-Swll**  
NC0127 0- 7 3.5- 5.5 .5-1. 0- 0 0.6- 6.0 LOW

NC0127 7-14 3.5- 5.5 0.-.5 0- 0 0.6- 6.0 LOW

NC0127 14-25 - - - -

NC0127 25-35 - - - -