

2014

Soil Series of the Gordon Natural Area

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture

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Soil Series of the Gordon Natural Area

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture.
Official Soil Series Descriptions.

Available URL: <http://soils.usda.gov/technical/classification/osd/index.html>

[Accessed 28 April 2014]. USDA-NRCS, Lincoln, NE

Soil Series by Parent Material

Weathered Gneiss, Metagranite, or Diabase

Gladstone (Gd) - Fine-loamy, mixed, active, mesic Typic Hapludult

Parker (Pa) - Loamy-skeletal, mixed, semiactive, mesic Typic Dystrudept

Serpentinite

Chrome (Ch) - Fine, mixed, superactive, mesic Typic Hapludalf

Colluvium of Felsic Gneiss

Califon (Ca) - Fine-loamy, mixed, active, mesic Typic Fragiudult

Alluvium

Hatboro (Ha) - Fine-loamy, mixed, active, nonacid, mesic Fluvaquentic Endoaquept

CALIFON SERIES – (Ca)

Califon series consists of very deep, moderately well or somewhat poorly drained soils formed either in old till or on driftless landscapes in the Northern Piedmont in colluvium from granitic gneiss on upland flats or concave slope positions. Saturated hydraulic conductivity is moderately low. Slope ranges from 0 to 15 percent. Mean annual precipitation is about 40 to 45 inches, and mean annual air temperature is about 45 to 55 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, active, mesic Typic Fragiudults

TYPICAL PEDON: Califon loam - idle field. (Colors are for moist soil.)

Ap--0 to 10 inches, brown (10YR 4/3) loam; weak fine subangular blocky structure; firm; many fine roots; 2 percent subangular gravel of granite, quartzite and chert; moderately acid; clear smooth boundary. (1 to 11 inches)

BA--10 to 16 inches, strong brown (7.5YR 5/6) loam; weak medium subangular blocky structure; firm; many fine roots; krotovina and large root cavities filled with Ap material; 2 percent subangular gravel of granite, quartzite and chert; moderately acid; gradual smooth boundary. (0 to 7 inches thick)

Bt--16 to 23 inches, strong brown (7.5YR 5/6) clay loam; weak medium subangular blocky structure; firm; few fine roots; few distinct clay films on faces of peds and in pores; common medium and fine pores; few fine distinct brown (10YR 5/3) iron depletions; 10 percent subangular gravel of granite, quartzite and chert; strongly acid; clear smooth boundary. (7 to 18 inches thick)

Btx1--23 to 28 inches, strong brown (7.5YR 5/6) loam; weak very coarse prismatic structure parting to moderate medium and thick platy structure; very firm and brittle; few fine roots; few fine pores; many medium distinct yellowish brown (10YR 5/4) iron depletions and yellowish brown (10YR 5/8) iron concentrations; 10 percent subangular gravel of granitic gneiss; few fine faint clay films on faces of peds; common black (N 2.5/) manganese and iron stains; strongly acid; gradual smooth boundary. (Combined thickness of the Btx horizons 8 to 50 inches thick)

Btx2--28 to 33 inches, yellowish brown (10YR 5/4) loam; moderate medium and thick platy structure; very firm and brittle; many fine pores; few medium and many fine faint brown (7.5YR 5/4) iron depletions; 10 percent subangular gravel of granitic gneiss; common discontinuous distinct clay films on vertical and horizontal faces of peds; common black (N 2.5/) manganese and iron coatings; very strongly acid; gradual smooth boundary.

Btx3--33 to 43 inches, variegated with equal parts of yellowish red (5YR 5/6), strong brown (7.5YR 5/6) and gray (5YR 5/1) loam; moderate medium and thick platy structure; very firm and brittle; few fine pores; few discontinuous faint clay films on top faces of peds; 10 percent subangular gravel of granitic gneiss; very strongly acid; abrupt smooth boundary.

Btx4--43 to 50 inches, strong brown (7.5YR 5/6) loam; weak thick platy structure; very firm and brittle; few fine pores; common medium distinct light brownish gray (10YR 6/2) iron depletions; few patchy distinct clay films on faces of peds; common clay pockets; 10 percent subangular gravel, stones and boulders of granitic gneiss; very strongly acid; clear smooth boundary.

C--50 to 75 inches, yellowish brown (10YR 5/8) sandy loam and bands of yellowish red (5YR 5/8) and very pale brown (10YR 7/3); common black (N 2.5/) manganese coatings; structureless massive; friable; 10 percent granitic gneiss subangular gravel, stones and boulders; strongly acid.

TYPE LOCATION: Hunterdon County, New Jersey; Union Township; 1/4 mile east of Van Syckel, south side of road, 30 feet west of fence, 50 feet in from road; USGS High Bridge Quad

RANGE IN CHARACTERISTICS: Solum thickness 35 to 60 inches. Depth to top of the fragipan ranges from 20 to 30 inches. Depth to hard granitic gneiss bedrock ranges from 6 feet to 20 feet. The particle size control section averages 27 to 35 percent clay. Unlimed reaction ranges from moderately to slightly acid near the surface and strongly to very strongly acid in the lower part of the solum and the C horizon. Individual horizons within the solum or C horizons have up to 25 percent, mostly subangular or angular gravel, cobbles or stones.

The Ap horizon has hue of 10YR with values of 4 or 5 and chroma of 2 through 4. In uncultivated areas, thin A horizons are dominantly very dark grayish brown (10YR 3/2). The A horizons are loam or gravelly loam. Structure is weak or moderate, fine granular or subangular blocky.

The Bt and Btx horizons have hues of 10YR through 5YR, values of 5 or 6, and chroma of 4 through 8. Redoximorphic features are few, common or many, fine or medium, distinct or prominent and have hues of 10YR through 5YR, values of 5 through 7 and chromas of 1 through 8, but 2 chroma is absent in the upper 10 inches of the argillic horizon. Very dark manganese stains are common. The Bt horizons are loam, clay loam, silt loam or sandy clay loam. Textures of the Btx horizons are sandy clay loam, sandy loam, loam and clay loam. Though clay in any one subhorizon may range from 18 to 40 percent, the Bt horizon averages from 27 to 35 percent and the Btx horizon from 18 to 27 percent. Clay films are common on secondary ped faces but are few in some subhorizons. It has weak or moderate, medium subangular blocky structure. The Bt horizons are friable or firm. Structure in the upper parts of the Btx is weak very coarse prismatic parting to weak or moderate, thick or very thick platy.

The C horizons are similar to the Bt and Btx horizons but have more redoximorphic features. The C horizons are sandy loam, sandy clay loam, loam, clay loam or loamy sand. In pedons where the C horizon extends into saprolite, many fine or very fine angular pebbles are present.

COMPETING SERIES: These are the [Annandale](#), [Delassus](#), [Meckesville](#), [Tonti](#), and [Watson](#) series. Annandale soils lack iron depletions within a depth of 40 inches. Delassus soils formed in loess and underlying residuum weathered from granite or similar igneous rocks. Meckesville soils have hues of 5YR or redder in the fragipan. Tonti soils have bedrock at depths of less than 6 feet. Watson soils lack rock fragments dominated by sandstone, siltstone, shale or quartzite.

GEOGRAPHIC SETTING: Califon soils formed either in deeply weathered old till or colluvium derived predominantly from granitic gneiss. Slope gradients range from 0 to 15 percent. Climate is humid temperate. Average annual air temperature is 45 to 55 degrees F. and average annual precipitation is 40 to 45 inches. Frost free days range from 130 to 170 days and elevations range from 200 to 1100 feet above sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing [Annandale](#) soils and the [Cokesbury](#), [Gladstone](#), and [Parker](#) soils. The well drained Annandale, Gladstone, and Parker soils lack low chroma redox features in the sola. The poorly drained Cokesbury soils have low chroma redox features immediately below the Ap or A horizon and the Gladstone and Parker soils lack fragipans. Parker soils are skeletal and lack an argillic horizon as well.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Califon soils are moderately well or somewhat poorly drained. Saturated hydraulic conductivity is moderately low in the fragipan and moderately high in the substratum.

USE AND VEGETATION: Only a small part of the Califon soils are now cultivated. They are used mainly for growing pasture, hay and woodland. Natural vegetation is red maple, pin oak, yellow poplar and elm.

DISTRIBUTION AND EXTENT: MLRA 148. In North-central New Jersey and southeastern Pennsylvania. These soils are moderate in extent (24,000 acres)

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Bucks County, Pennsylvania; 1941

REMARKS: The 03/2005 revision places Califon soils in an active family based on sampled pedon 83NJ019001, analyzed by the NSSL. The pedon description was updated to currently used horizon nomenclature and redoximorphic feature terminology. Additionally, competing series were also updated.

10/2007 revision distinguishes two landscape positions and parent materials on which Califon occurs: old till of North-central New Jersey and East-central Pennsylvania (MLRA 144A/140) and driftless colluvial landscapes of the Northern Piedmont (MLRA148). Associated with terminal moraines, these landscapes and parent materials intermix geographically. Also, this revision includes competing series and other sections on the OSD were revised and updates this soil to the 10th Edition of the Keys to Soil Taxonomy. Minor revisions to nomenclature within the description were done. This pedon has been entered into NASIS and has pedon ID# 81NJ019001.

Diagnostic horizons and soil characteristics recognized in this pedon are

Ochric epipedon--the zone from 0 to 23 inches (Ap and BA horizons)

Argillic horizon--the zone from 10 to 50 inches (BA and Bt horizons)

Fragipan--the zone from 23 to 50 inches having very firm moist consistence (Btx horizons)

CHROME SERIES – (Ch)

The Chrome series consists of moderately deep, well drained soils. They formed in residuum weathered mostly from serpentine. They are on convex upland slopes of 0 to 45 percent. Saturated hydraulic conductivity is moderately high to high. Mean annual precipitation is 43 inches. Mean annual temperature is 52 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, mesic Typic Hapludalfs

TYPICAL PEDON: Chrome silt loam, 3 to 8 percent slopes, moderately eroded on a southeast facing slope in an early succession woodland. (Colors are for moist interior soil unless otherwise noted.)

Ap--0 to 7 inches; dark olive brown (2.5Y 3/3), light yellowish brown (2.5Y 6/3) dry; silt loam; moderate fine and very fine granular structure; friable, slightly sticky, slightly plastic; many very fine roots throughout; many medium pores; 8 percent subangular channers; slightly acid; abrupt smooth boundary. (3 to 8 inches thick)

Bt--7 to 23 inches; dark yellowish brown (10YR 4/4) channery clay loam; moderate medium subangular blocky structure; friable, moderately sticky, very plastic; common fine roots throughout; common very fine pores ; few distinct clay films on faces of ped; 25 percent subangular channers; moderately acid; clear wavy boundary. (5 to 20 inches thick)

C--23 to 30 inches; dark yellowish brown (10YR 4/4) very channery clay loam; massive; firm, moderately sticky, very plastic; few medium roots throughout; few medium pores; Common distinct clay films on rock fragments; 40 percent channers and 10 percent angular flags; neutral; abrupt irregular boundary. (0 to 20 inches thick)

R--30 inches; dark grayish green (5GY 4/2) exterior, dry serpentine bedrock.

TYPE LOCATION: Delaware County, Pennsylvania; Middletown Township; about .375 miles east-southeast of Lima, along the south side of Route 1 about 3200 feet east of the junction of Route 452 (North Pennell Road) and about 200 feet south of Route 1 and about 125 feet southeast of entrance to Riddle Memorial Hospital off of US Route 1 on a southeast facing slope in a early succession woodland.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 10 to 35 inches. Depth to bedrock is 20 to 40 inches. Rock fragments mostly of serpentine range from 0 to 30 percent in the solum and from 10 to 80 percent in the C horizon. Reaction ranges from moderately acid through neutral.

The A horizon has hue of 10YR or 5Y, value and chroma of 3 through 5. Fine-earth texture is loam, silt loam, clay loam or silty clay loam.

The Bt horizon has hue of 7.5YR through 2.5Y, value of 3 through 6 and chroma of 0 through 6. Fine-earth texture is silt clay loam, clay loam, silty clay or clay. Average percent clay in the control section is greater than 35.

The C horizon, where present, has hue of 7.5YR through 5GY, value of 3 through 6 and chroma of 0 through 6. Fine-earth texture is silty clay loam, clay loam, clay, sandy clay loam or sandy loam.

COMPETING

SERIES: [Briggsville](#), [Edenton](#), [Eldean](#), [Lamoille](#), [Newnata](#), [Paintcreek](#), [Redbrush](#), [Upshur](#), [Woodsfield](#),

and [Wynn](#) are in the same family. Briggsville, Eldean, Lamoille, Newnata, Paintcreek, Upshur, Woodsfield and Wynn soils have bedrock at a depth greater than 40 inches. Briggsville soils have carbonates ranging in depths from 20 to 40 inches and have no rock fragments in the control section. Edenton soils have a paralithic contact with calcareous shale and limestone within depths of 20 to 40 and have fragments of glacial gravel. Eldean soils have carbonates within depths of 18 to 36 inches and have dominant rock fragments composed of glacial chert, limestone and shale gravel. Lamoille soils have a rock fragment of more than 35 percent in the lower half of the series control section and have matrix hues of 10YR or 2.5Y in the lower third of the series control section. Newnata soils have a lithic contact with limestone bedrock within depths of 40 to 60 inches. Paintcreek soils have a lithic contact of dolomite bedrock at depths greater than 60 inches. Redbrush soils have dominant rock fragments in the particle control section of quartz and mafic gneiss gravel and cobbles and have a lithic contact with mafic gneiss bedrock within depths of 20 to 40 inches. Upshur soils have hues 5YR or redder in the subsoil and have a sand content of less than 10 percent sand in the particle-size control section. The Woodsfield soils have rock fragments consisting of shale, siltstone and sandstone. Wynn soils have rock fragments composed of glacial limestone gravel and cobbles and have a paralithic contact with calcareous shale and limestone within depths of 20 to 40 inches.

GEOGRAPHIC SETTING: Chrome soils are on nearly level to steep convex uplands of the Northern Piedmont. Slopes range from 0 to 45 percent. They formed in residuum weathered from serpentine, or from other basic rocks high in magnesium. Climate is humid and temperate with mean annual precipitation of 38 to 46 inches; mean annual temperature ranges from 45 to 55 degrees F. The frost-free season ranges from 170 to 200 days.

GEOGRAPHICALLY ASSOCIATED

SOILS: [Aldino](#), [Baile](#), [Chester](#), [Conowingo](#), [Glenelg](#), [Glenville](#), [Legore](#), [Manor](#), [Montalto](#), Mount Lucus, [Neshaminy](#), [Relay](#) and [Watchung](#) soils are on adjacent uplands. [Comus](#), [Codus](#) and [Hatboro](#) soils are on nearby floodplains. Aldino and Glenville soils have fragipans. Baile, Watchung and Hatboro soils are poorly drained. Chester, Glenelg, Comus, Legore, Manor, Montalto, Neshaminy and Relay soils have bedrock deeper than 40 inches. Conowingo soils are somewhat poorly drained. Mount Lucus and Codorus soils are moderately well and somewhat poorly drained.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained. Runoff is medium to very rapid. Saturated hydraulic conductivity is moderately high to high.

USE AND VEGETATION: Typical vegetation is described as pine-savannah. Unfavorable physical and chemical properties of serpentine soils, such as shallowness, stoniness, low available water capacity and high levels of iron and magnesium and low levels of silica and calcium make these soils unfavorable for plant growth, especially in mixed hardwoods, resulting in a unique prairie-pine ecosystem termed barrens". In some instances these soils may contain plant toxic levels of nickel, chromium and cobalt (Mansburg, 1984). Approximately 90 percent of the Chrome soils are in woodland or in pasture. About 10 percent of the soils are cultivated.

DISTRIBUTION AND EXTENT: Maryland and Pennsylvania. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Montgomery County, Maryland, 1959.

REMARKS: Previously updated in 3/90. The 4/2004 EJM-EAW revision added superactive cation-exchange activity class. Extensive revisions in 10/2008 as it was re-described for updating needs. User pedon ID in NASIS: 07PA045001. This series is proposed to be listed as a rare or unique soil series.

Diagnostic horizons and other features recognized in this pedon are:

- a. Ochric epipedon - the zone from the surface to a depth of 7 inches (Ap horizon).
- b. Argillic horizon - the zone from about 7 to 23 inches (Bt horizon).
- c. Lithic Contact 30 inches (R horizon)

GLADSTONE SERIES – (Gd)

The Gladstone series consists of very deep, well drained soils formed in residuum and colluvium from granitic gneiss. Saturated hydraulic conductivity is moderately high to high. They occur on upland divides and rolling foothills of the Highlands section of Appalachian province, the Reading Prong section of the New England province and the Gettysburg-Newark Lowland and the Piedmont Upland sections of the Northern Piedmont province. Slopes range from 0 to 65 percent. Mean annual temperature is 52 degrees F. and mean annual precipitation is 44 inches.

TAXONOMIC CLASS: Fine-loamy, mixed, active, mesic Typic Hapludults

TYPICAL PEDON: Gladstone gravelly loam-cultivated. (Colors are for moist soil unless otherwise noted).

Ap--0 to 10 inches, brown (10YR 4/3) gravelly loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; 20 percent subangular gravel; moderately acid; abrupt smooth boundary. (6 to 13 inches)

BA--10 to 15 inches, brown (7.5YR 5/4) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; 10 percent subangular gravel; moderately acid; clear wavy boundary. (0 to 6 inches thick)

Bt1--15 to 24 inches, brown (7.5YR 4/4) gravelly loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few clay films on ped faces; 25 percent subangular gravel; strongly acid; clear wavy boundary.

Bt2--24 to 40 inches, strong brown (7.5YR 5/6) gravelly loam; weak coarse prismatic structure parting to moderate medium subangular blocky; friable, slightly sticky, slightly plastic; few fine roots; common clay films on ped faces and root channels; 30 percent subangular gravel; strongly acid; clear wavy boundary. (Combined thickness of Bt horizons 13 to 40 inches thick)

C--40 to 66 inches, strong brown (7.5YR 5/8) very gravelly sandy loam; massive; very friable, nonsticky, nonplastic; few very fine roots; 40 percent subangular gravel; strongly acid; gradual irregular boundary. (10 to 40 inches thick)

R--66 + inches, very pale brown (10YR 7/3) and black (10YR 2/1) highly fractured partially weathered granitic gneiss bedrock.

TYPE LOCATION: Somerset County, New Jersey. Northeast of intersection of Anderson Hill Road and Stone Fence Road in Bernardsville Township. Approximately 40 feet north of Stone Fence Road. USGS Bernardsville Quadrangle Lat.40 degrees 44 minutes 12 seconds N and Long. 74 degrees 34 minutes 32 seconds W . NAD 83

RANGE IN CHARACTERISTICS: Solum thickness ranges from 30 to 50 inches. Depth to granitic gneiss bedrock is 60 inches or more. The bedrock may be strongly weathered in the upper part. Gravel content ranges from 5 to 35 percent throughout the solum, and 10 to 40 percent in the C horizons. Fragments, larger than 3 inches in diameter, range from 0 to 20 percent by volume in the surface layer and 0 to 10 percent in the subsoil and substratum layers. The control section averages 20 to 30 clay and 30 to 50 percent silt with less than 35

percent total rock fragments. Reaction is strongly or very strongly acid throughout the soil, unless limed. Areas that have been limed range to moderately acid in the upper part of the profile.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma ranging from 2 through 5. The A horizons have hues of 10YR or 7.5YR with a value of 3 and chroma of 1 or 2. Texture of the fine earth is loam or sandy loam. Structure is dominantly moderate, fine and medium granular but ranges from weak, coarse granular to moderate, fine and medium subangular blocky.

The BA or E horizon has hue of 10YR or 7.5YR, value and chroma of 3 through 6. Texture of the fine earth is loam or sandy loam with weak medium or coarse subangular blocky structure.

The Bt horizons have hue of 10YR, 7.5YR or 5YR, value of 4 or 5, and chroma ranging from 4 through 8. Texture of the fine earth is, loam, sandy clay loam or clay loam with clay content ranging from 20 to 34 percent. Structure ranges from weak to strong, medium and coarse subangular or angular blocky with friable or firm consistence.

In some pedons a BC horizon is present. Colors are similar to those of the overlying Bt horizon. Textures are dominantly sandy loam and distinctly grittier than those of the overlying horizon. Consistence is friable or firm and may be brittle.

The C horizons have hue ranging from 2.5Y through 5YR, value ranging from 4 through 7, and chroma from 4 through 8. Texture of the fine earth is dominantly sandy loam or loam, but thin subhorizons may be loamy sand or sandy clay loam. Structure is weak fine subangular blocky or the horizons are massive. Consistence is friable to firm.

COMPETING SERIES: These are the, [Arcola](#), [Bedington](#), [Bucks](#), [Collington](#), [Edgemont](#), [Edneytown](#), [Freehold](#), [Germania](#), [Gilpin](#), [Joanna](#), [Leedsville](#), [e](#), [Millstone](#), [Pennval](#), Pigeonroosts, [Pineville](#), [Quakertown](#), [Rayne](#), [Shelocta](#), [Syenite](#) and [Wist](#) series are in the same family. Arcola soils are 20 to 40 inches deep to a siltstone or sandstone paralithic contact. Bedington, and Rayne soils formed in materials weathered from siltstone, shale or sandstone. Rayne soils are also 40 to 72 inches deep to bedrock. Bucks and Quakertown soils are 40 to 60 inches deep to sandstone, siltstone, or shale bedrock. Collington, Freehold and Wist soils formed in marine sediments containing glauconite. Edgemont soils formed in residuum weathered from quartzitic rocks and are 3.5 to 7 feet deep to bedrock. Edneytown soils have a solum thinner than 30 inches and lack 5YR color in the Bt. The Germania soils formed in alluvial fans Gilpin soils are 20 to 40 inches deep to shale or siltstone bedrock. Joanna and Leedsville soils formed in residuum from Triassic red sandstone and conglomerate containing quartz pebbles. The Millstone series are well drain soils on stream terraces and flood-plain steps. They formed in loamy alluvium. [Pigeonroost](#) soils are 20 to 40 inches deep to a gneissic paralithic contact and are formed in residuum affected by soil creep in the upper part and weathered from felsic to mafic, igneous and high-grade metamorphic rocks. Syenite soils are 20 to 40 inches deep formed in loess over granite residuum and have granite rock fragments. Pineville soils formed in colluvium from sandstone, shale, and siltstone. Shelocta soils formed in colluvium and residuum from shale, siltstone, and sandstone and are greater than 48 inches deep to bedrock. Pennval soils are formed in colluvium from interbedded shale and siltstone, or sandstone on footslopes of prominent valley ridges.

GEOGRAPHIC SETTING: Gladstone soils are on upland divides and rolling foot hills of the Highlands section of Appalachian Province, the Reading Prong Section of the New England province and the Gettysburg-Newark Lowland and the Piedmont Upland Sections of the Northern Piedmont province at elevations ranging between 250 and 1400 feet but dominantly between 400 and 1100 feet. The soils formed in colluvium and residuum from granitic gneiss and in some places the regolith appears to have been disturbed by glacial or paraglacial action. The underlying bedrock is granitic gneiss that, in many places, is highly weathered in the upper several inches. Slopes

are generally between 3 and 25 percent, but range from 0 to 65 percent. Climate is temperate and humid. Mean annual air temperature is 50 degrees to 55 degrees F., rainfall is 40 to 48 inches and frost free days range from 160 to 190.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Annandale](#), [Califon](#), [Cokesbury](#) and [Parker](#). Gladstone soils lack the fragipan horizons that are common to the Annadale, Califon and Cokesbury soils. They also lack the gray mottles common to the Califon and the dominant gray colors common to the Cokesbury soils. Gladstone soils have more clay in the subsoil horizons and less coarse fragment in the entire soil than is common to the Parker Soils.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Gladstone soils are well drained. Saturated hydraulic conductivity is moderately high in the subsoil and high in the substratum. Runoff is medium or high.

USE AND VEGETATION: Most non-stony areas are utilized for crop production. Dominant crops are corn, small grains, soybeans, fruit, hay and pasture. A portion of the gently sloping and sloping areas have been utilized for Urban development. Some of the sloping and stony wooded areas are being used for high cost residential development. Most areas with stony surface are in woodland. Tree species are dominantly upland oaks, yellow poplar, ash and hickory.

DISTRIBUTION AND EXTENT: Gladstone soils are currently recognized in New Jersey and Pennsylvania. Approximately 65,000 acres have been mapped.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Hunterdon County, New Jersey 1969.

REMARKS: Diagnostic horizons recognized in this pedon are:

- a. Ochric Epipedon - the zone from the surface to a depth of 10 inches (Ap horizon)
- b. Argillic horizon - the zone from 15 to 40 inches (Bt1 and Bt2 horizons)

Most uncleared areas have very or extremely stony or bouldery surface phases.

HATBORO SERIES – (Ha)

The Hatboro series consists of very deep and poorly drained soils formed in alluvium derived from metamorphic and crystalline rock. They are on flood plains. Slopes range from 0 to 3 percent. Saturated hydraulic conductivity is moderately high to high. Mean annual precipitation is 42 inches and mean annual temperature is 52 degrees F near the type location.

TAXONOMIC CLASS: Fine-loamy, mixed, active, nonacid, mesic Fluvaquentic Endoaquepts

TYPICAL PEDON: Hatboro silt loam on 0 to 3 percent slopes-woods. (Colors are for moist interior soil unless otherwise noted.)

A--0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots and common coarse roots throughout; common coarse pores; few fine faint yellowish brown (10YR 5/4) masses of oxidized iron on faces of peds; 4 percent angular channers; moderately acid; abrupt smooth boundary. (8 to 12 inches thick)

Bg1--9 to 27 inches; gray (10YR 5/1) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine, medium and few coarse roots throughout; few coarse pores; common medium distinct dark yellowish brown (10YR 4/4) masses of oxidized iron on horizontal faces of peds and common medium distinct grayish brown (2.5Y 5/2) iron depletions on faces of peds; common mica flakes; 2 percent angular channers and 5 percent rounded gravel; moderately acid; clear smooth boundary.

Bg2--27 to 44 inches; grayish brown (2.5Y 5/2) silt loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common medium and coarse roots throughout; few medium prominent gray (N 6/0) manganese masses on vertical faces of peds and common medium distinct strong brown (7.5YR 5/6) masses of oxidized iron on faces of peds; common mica flakes; 4 percent angular channers and 6 percent rounded gravel; moderately acid; clear smooth boundary. (Combined thickness of the Bg horizon is 28 to 48 inches)

Cg1--44 to 56 inches; light brownish gray (10YR 6/2) sandy clay loam; massive; friable, slightly sticky, slightly plastic; common medium distinct yellowish brown (10YR 5/8) masses of oxidized iron throughout and common medium faint gray (10YR 5/1) iron depletions throughout; few mica flakes; 2 percent angular channers and 10 percent rounded gravel; strongly acid; clear smooth boundary.

Cg2--56 to 70 inches; gray (10YR 6/1) gravelly sandy loam; structureless single grain; friable, slightly sticky, slightly plastic; common medium distinct strong brown (7.5YR 5/6) masses of oxidized iron throughout and common medium faint grayish brown (10YR 5/2) iron depletions throughout; 2 percent angular channers and 20 percent rounded gravel; strongly acid; clear smooth boundary.

Cg3--70 to 78 inches; light brownish gray (10YR 6/2) stratified gravelly sand; structureless single grain; friable, nonsticky, nonplastic; medium distinct gray (10YR 5/1) iron depletions throughout; 3 percent angular channers and 25 percent subrounded gravel; moderately acid.

TYPE LOCATION: Montgomery County, Pennsylvania; Upper Moreland Township, 1 mile south of Hatboro along Pennypack Creek, 1600 feet north of junction of Pennypack Road and Creek Road, 300 feet southwest of Business office, 20 feet east of Pennypack Creek in woods. Hatboro Quad; latitude. 40 degrees, 9 minutes, 17.9 seconds North, longitude. 75 degrees, 4 minutes, 34.1 seconds West

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 60 inches. Depth to bedrock ranges from 5 to 10 feet or more. Organic carbon decreases irregularly with depth or is greater than 0.2 percent directly above any strongly contrasting C horizon. The depth to strongly contrasting sand and gravel is more than 40 inches or the transition is greater than 5 inches. Content of gravel ranges from 0 to 10 percent in the solum and from 0 to 80 percent in the C horizon. Mica flakes are common in the solum, and the C horizon contains thin lenses of mica. Reaction ranges from very strongly acid through neutral to a depth of 30 inches and from moderately acid through slightly acid below 30 inches. Depth to low chroma redox depletions is 0 to 10 inches.

The Ap or A horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 through 4. It is sandy loam, loam, silt loam or fine sandy loam.

The B horizon has hue of 10YR through 5Y, value of 4 through 7, and chroma of 1 or 2, or is neutral with value of 4 through 7. Texture is sandy clay loam, clay loam, silty clay loam, or silt loam, loam, or fine sandy loam. Structure is weak, fine or medium subangular blocky.

The C horizon has hue of 10YR through 5Y value of 4 through 7, and chroma of 1 or 2, or is neutral with value of 4 through 7. Fine-earth texture is sandy clay loam, sandy loam, clay loam, silty clay loam, silt loam, fine sandy loam, or sand in the upper part and contains thin lenses of primarily mica flakes. The lower part is stratified sand, silt and clay sediments and gravel.

COMPETING SERIES: [Holly](#) soils are in the same family. Holly soils have solum that do not contain appreciable mica and that range between 20 to 44 inches thick.

GEOGRAPHIC SETTING: Hatboro soils are on nearly level flood plains. Slope gradients are between 0 and 3 percent. They formed in alluvium largely from schist, gneiss and other metamorphic and crystalline rocks. Climate is humid and temperate; mean annual precipitation ranges from 40 to 44 inches; mean annual temperature ranges from 52 to 55 degrees F.; the growing season ranges from 170 to 190 days.

GEOGRAPHICALLY ASSOCIATED SOILS: [Comus](#), [Codorus](#) and competing series [Holly](#) are on associated flood plains. [Baile](#), [Brandywine](#), [Chester](#), [Glenelg](#), [Glenville](#), [Manor](#), [Mt. Airy](#) and [Rowland](#) soils are on the uplands nearby. Brandywine, Chester, Comus, Glenelg, Manor and Mt. Airy are all well drained soils. Baile soils have an argillic horizon. Glenville soils are moderately well drained and somewhat poorly drained and have a fragipan. Holly soils have sola that do not contain appreciable mica and that range between 20 to 44 inches thick. The Rowland series consists of very deep, moderately well and somewhat poorly drained soils formed in alluvial sediments weathered from red and brown shale, sandstone, and conglomerate.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained. Saturated hydraulic conductivity is moderately high to high. Index surface runoff class is high or very high. These soils are subject to periodic stream overflow, which usually occurs during the winter and spring months.

USE AND VEGETATION: About 50 percent of the Hatboro soils are in pasture, 35 percent in woodland, and the remainder in cropland. Woodland areas are in mixed hardwoods.

DISTRIBUTION AND EXTENT: Southeastern Pennsylvania, northern Delaware, Maryland, North Carolina, northeast Tennessee and Virginia. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Montgomery County, Pennsylvania, 1965.

REMARKS: Hatboro soils were formerly included with the Wehadkee series.

The 2/99 revision places this soil in an active CEC activity class based on similar soils. The 7/2001 revision changes the classification from Typic Fluvaquents to Fluvaquentic Endoaquepts to reflect changes to cambic horizon criteria in Soil Taxonomy. Competing series were also updated. The 5/2003 revision expands the solum thickness from 40 to 60 inches to 30 to 60 inches to facilitate correlation activities in the MO14 region. The 9/2005 revision adds fine sandy loam to the RIC of the A, B and C horizons and changes horizon nomenclature. Competing series was also updated. Revision 1/2006 JHK-DHK: Pedon Description and type location updated. Revision 9/2008 Description and type location as well as competing and geographically associated soils updated.

Diagnostic horizons and features recognized in this pedon are:

- a. Ochric epipedon - the zone from 0 to 9 inches (Ap horizon).
- b. Cambic horizon - the zone from 9 to 44 inches (Bg1 and Bg2 horizons).

PARKER SERIES – (Pa)

The Parker series consists of very deep, somewhat excessively drained soils that formed in residuum derived from granitic gneiss bedrock. They occur on gently sloping to very steep slopes of ridges and hills. Slopes range from 3 to 70 percent.

TAXONOMIC CLASS: Loamy-skeletal, mixed, semiactive, mesic Typic Dystrudepts

TYPICAL PEDON: Parker very gravelly sandy loam, on a 24 percent slope, wooded. (Colors are for moist soil.)

O--3 to 0 inches; undecomposed tree leaves and twigs from oak, yellow poplar and ash. (0 to 8 inches thick)

Oe--0 to 7 inches; black (10YR 2/1) partially decomposed organic matter in spaces between angular stones, gravel and cobbles; strongly acid. (0 to 7 inches thick)

A--7 to 12 inches; dark brown (7.5YR 3/2) very gravelly sandy loam; strong coarse granular structure; friable; many fine and few large roots; 50 percent angular stones, cobbles and gravel; strongly acid; abrupt irregular boundary. (2 to 8 inches thick)

Bw1--12 to 27 inches; brown (7.5YR 4/4) very gravelly loam; moderate coarse granular structure; very friable; few fine and many large roots; 50 percent angular gravel, cobbles and stones; strongly acid; diffuse irregular boundary.

Bw2--27 to 38 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; moderate coarse granular and moderate fine subangular blocky structure; very friable; few fine and large roots; 50 percent angular stones, cobbles and gravel; very strongly acid; diffuse irregular boundary. (combined thickness of the Bw horizons is 15 to 35 inches)

C--38 to 72 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam; weak coarse granular structure; very friable; few fine roots; 60 percent angular stones, cobbles and gravel, mostly hard and unweathered; very strongly acid.

TYPE LOCATION: Morris Township, Morris County, New Jersey; 870 feet north of Hanover Avenue across the road from junction with Raynor Road; USGS Mendham, NJ topographic quadrangle; approximate coordinates lat. 40 degrees 50 minutes 06 seconds N and 74 degrees 31 minutes 24 seconds W, NAD83.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 40 inches. Depth to solid bedrock ranges from 5 to 10 feet or more. Rock fragments range from 35 to 70 percent by volume through the solum and 60 to 90 percent in the C horizon. Rock fragment sizes commonly range from gravel through stones but individual pedons are dominated by either gravel, cobbles or stone fragments. Rock fragments on the soil surface range to extremely stony. The silt and sand fractions are dominated by quartz, feldspar and various ferro-magnesium minerals derived from granitic gneiss or similar rocks. The soil usually contains very small amounts of mica. The fine-earth fraction of the control section typically has 10 to 18 percent clay. Texture of the fine-earth fraction throughout the solum and substratum is loam or sandy loam. Some pedons have a few faint clay films on faces of peds and in voids and bridging between sand grains. The soil is very strongly acid or strongly acid unless limed.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 1 through 4. It commonly has moderate or strong, medium or coarse granular structure.

Some pedons have an E horizon that has hue of 7.5YR or 10YR, value of 2 through 6, and chroma of 1 through 6.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. The abundant rock fragments interrupt structure, but the fine-earth fraction has moderate, medium and coarse granular or weak, fine or medium subangular blocky structure.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. Color patterns appear to be related to differential weathering of the banded gneiss (or related types) bedrock. Some pedons have a Cr horizon below 60 inches.

COMPETING SERIES: The are the [Brema](#), [Cardiff](#), [Greenlee](#), [Griffinsburg](#) (T), [Handshoe](#), [Konarock](#), [Northcove](#), [Watt](#), and [Wriston](#) (T) series. Brema soils are moderately deep to hard bedrock and have rock fragments consisting of hornblende schist, gneiss, quartz, feldspar crystals, or greenstone. Cardiff soils are deep to hard, fine-grained metamorphic bedrock and have rock fragments consisting of fine-grained metamorphic rocks such as slate or phyllite. Greenlee soils generally occur at elevations between 1500 and 3500 feet in the Southern Appalachian Mountains and developed in colluvium. Griffinsburg (T) and Konarock soils are moderately deep to hard bedrock. Handshoe soils have rock fragments dominated by sandstone and formed in colluvium. Northcove soils generally occur at elevations between 1200 and 3800 feet in the Southern Appalachian Mountains and developed in colluvium derived from low-grade metasedimentary rocks such as quartzite, phyllite, slate, metagraywacke and metasandstone. Watt soils are moderately deep to hard graphitic bedrock. Wriston (T) soils are moderately deep to hard sedimentary bedrock and have rock fragments consisting of finer-grained sedimentary rocks such as shale, siltstone or fine-grained sandstone.

GEOGRAPHIC SETTING: Parker soils formed in residuum derived from granitic gneiss bedrock. They are on ridges and hills in the uplands. Slopes of 15 percent are common but the range extends from 3 to 70 percent. The mean annual temperature ranges from 45 to 55 degrees F.; mean annual precipitation ranges from 40 to 48 inches; and the frost-free season ranges from 150 to 190 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Annandale](#), [Califon](#), [Edneyville](#) and [Washington](#) soils. Annandale, Edneyville and Washington soils have argillic horizons and less rock fragments throughout. Califon soils have redoximorphic features in the subsoil and substratum, have fragipans, and are at lower elevations in the landscape.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained. Moderately rapid permeability. Index Surface Runoff class ranges from very low to medium.

USE AND VEGETATION: Less than half of the Parker soils are cleared of trees and stones for growing crops. Most cleared areas are idle for a number of years and are in various stages of second growth forest dominantly of dogwood and red cedar. On Parker soils which have not been cleared but have been repeatedly logged, the vegetation is the oak-hickory forest.

DISTRIBUTION AND EXTENT: New Jersey and Virginia. The series is of moderate extent, with approximately 85,000 acres identified.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Upper Raritan River area, New Jersey, 1938.

REMARKS: The 11/2005 revision places Parker in a semiactive CEC activity class. This placement is based on the similar Gladstone series which has laboratory data for three pedons, all within the semiactive class.

Diagnostic horizons recognize in this pedon are:

- a. Ochric epipedon, the portion from 3 inches above the soil surface to 12 inches below the soil surface. (Oi, Oe, and A horizons)
- b. Cambic horizon, the part from 12 to 38 inches. (Bw1 and Bw2 horizons)

ADDITIONAL DATA: CEC class placement based on lab data from the related Gladstone series. Three Gladstone pedons from Hunterdon and Warren Counties have semiactive activity class.