2017

USDA, Natural Resources
Conservation Service
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Ecological Site Specialist

SOIL PROFILE STUDY GUIDE

The purpose of this study guide is to help familiarize you with different characteristics of soils that are important considerations for how the land is used.

Contents

Financial support for this Soil Study Guide and the Soil Profile Posters was provided by:

Soil Pit Profiles

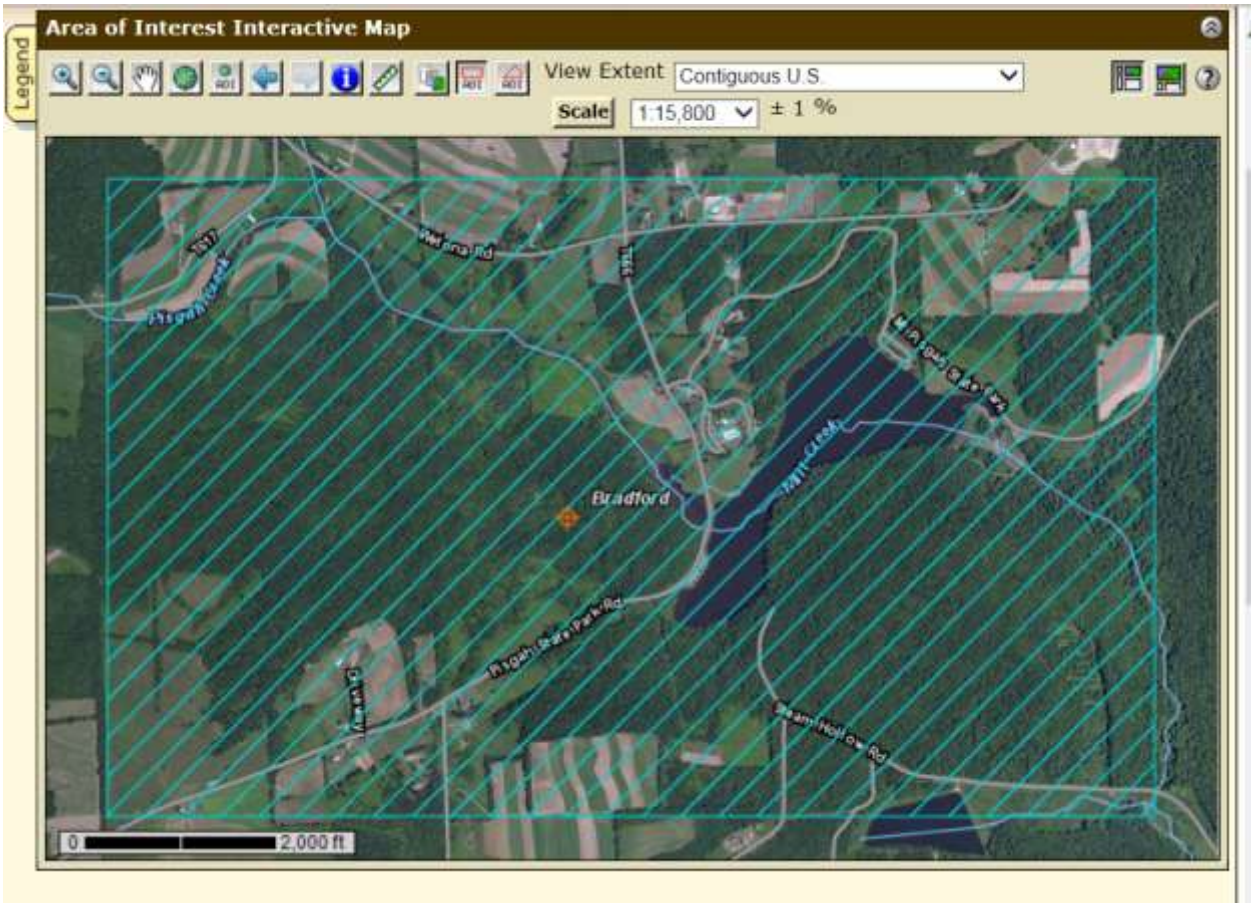
These five soil pits were excavated at Mount Pisgah State Park in Bradford County, PA. They represent several different landforms, drainage classes, and parent material. Bradford County is in the Glaciated Allegheny Plateau physiographic province. A physiographic province is a geographic region with a characteristic type of landscape and geology. These landscapes were covered by Northern Hardwood Forest trees like birch, beech, maple, elm, ash, and red maple. Oaks and pines were also part of the forests. Bradford County was glaciated about 17,000 to 22,000 years ago. The resulting soils formed on what is called Olean till (glacial till).

Till is the rock and soil debris that is churned up by glacial ice and is then deposited onto the ground as the glacier melts and retreats. Till consists of a mixture of materials in which the grain size ranges from microscopic clay particles to boulders. Often rock fragments will be rounded, because they have been tumbled and smoothed over by the movement of the ice.

The purpose of these soil pit profile posters and study guide is to help familiarize you with different characteristics of soils that are important considerations for how the land is used. We also want you to be able to identify the five soil forming factors as they pertain to these soils, and have an idea of how the factors influence the type of soil that is present. The total time to complete this study guide will vary with students' familiarity with soils information. It may take more than one class period to complete the guide.

General Soil Study

1. Answer the listed questions relating to each individual soil. Use the posters, and also familiarize yourself with the pedon description reports and the various maps at the end of this packet.
2. Create a printable version of a Websoilsurvey map of Mount Pisgah State Park – visit (https://websoilsurvey.nrcs.usda.gov/). You can either create just the printable map, or add it to the shopping cart which will also generate mapunit descriptions. Designate the scale to be 15,800 (see screenshot below). To make a specific scale on websoilsurvey, click on the scale button and follow the directions. You will need a ruler. Explore the different kinds of soils data that are available.



Student Study Sheets

Soil Pit Profile Poster #1

Holly **–** Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed. Holly is a wetland soil (hydric). This pit shows clear evidence of a high water table near the soil surface.

1. What is the evidence of a high water table? Describe the evidence. Look closely around 8 inches.

   _____

2. How deep do the redoximorphic features extend? Redoximorphic features are grey and orange mottles that form when iron-based minerals that give soil its brownish colors undergo a chemical transition due to anaerobic conditions. The chemical transition causes a color change. In a soil description, orange or black redox features are often referred to as masses of iron and/or manganese oxides. The grey colors are either designated with a 2 chroma soil color, or they might be called iron depletions.

   _____

3. An iron depletion is a redoximorphic feature of a hydric soil. It is gray in color with very little brown. What is the color of the soil at approximately 20 inches? Use the Munsell notation with hue value/chroma. (For example: if the Munsell color is 10YR/7/1, 10YR refers to the hue, 7 refers to value, and 1 refers to the chroma.

   _____

4. What change in the soil profile do you see around 32 – 36 inches?

   _____

5. What do you see at 37 inches that gives you a clear indication that this soil is hydric?

   _____

Use the Web soil survey, the pit description, the hillshade map, and the poster to identify the 5 soil forming factors for this Holly soil profile. Some are already given to you.

1. Parent material: _____
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: _____
5. Time: Relatively young in geologic time – Wisconsinan glaciation which was 17,000 to 22,000 years ago.

Soil Pit Profile Poster #2

Wellsboro **–** Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed.

1. As best you can tell what is the bottom of the A horizon?

   _____

2. Wellsboro soils are supposed to have a fragipan. A fragipan often has a markedly different color than the material above it, there might be a clear barrier to roots and often it will have vertical gray redoximorphic stripes called prisms. There will often be redoximorphic features above the pan where the water is perching. Do you see evidence of a fragipan in this profile?

   _____

3. One characteristic of glacial till are rock fragments that are subrounded to very rounded because they have been carried and polished by glacial ice. Rocks that are subrounded to rounded have smooth edges. They may not be exactly round in shape. Look at the relatively large rock in the bottom left part of the pit. Would you say that it is angular, sub-angular, subrounded, or rounded?

   _____

4. Where else might you find sub-rounded or rounded rock fragments other than in glacial till?

   _____

5. Is this pit till or alluvium?

   _____

Use the Web soil survey, the pit description, and the poster to identify the 5 soil forming factors for this Wellsboro soil profile. Some are already given to you.

1. Parent material: _____
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: _____
5. Time: Relatively young in geologic time – Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #3

Volusia - Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed.

1. As best you can tell, how deep is the A horizon?

   _____

2. At what depth is the high water table as best you can tell and why do you think that?

   _____

3. Volusia soils are supposed to have a fragipan. A fragipan often has a markedly different color than the material above it, there might be a clearer barrier to roots and/or often it will have vertical gray redoximorphic stripes called prisms. There will often be redoximorphic features above the pan where the water is perching. Do you see evidence of a fragipan in this profile and if so what and at what depth?

   _____

4. Do you see many rocks in the Volusia compared to the Wellsboro soil profile? What is the percentage of rock fragments in the A horizon according to the pedon description?

   _____

Use the Web soil survey, the pit description, and the poster to identify the 5 soil forming factors for this Volusia soil profile. Some are already given to you.

1. Parent material: _____
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: _____
5. Time: Relatively young in geologic time – Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #4

Linden **-** Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed. Linden soils are typically well drained (high water table 36 inches or deeper).

1. This Linden soil is moderately well drained. At what depth do you see possible evidence of a high water table?

   _____

2. A good farm soil will have very few obstructions for plant root growth within 30 inches of the surface. Do you think this is a good agricultural soil and why?

   _____

3. What is the pH of the surface horizon for this Linden soil? Describe this level of acidity and the availability of nutrients. (Use your soil pH reference handout to answer this)

   _____

4. What depth class is this soil to the best that you can tell? (see the depth class chart on page 22).

   _____

Use the Web soil survey, the pit description, and the poster to identify the 5 soil forming factors for this Linden soil profile. Some are already given to you.

1. Parent material: _____
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: _____

Time: Relatively young in geologic time – Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #5

Oquaga **–** Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed.

1. What change do you see at approximately 34 inches in the soil profile?

   _____

2. As best you can tell, how deep is the A horizon?

   _____

3. Compare soil profile photos of the Oquaga verses the Linden soil. What differences you see?

   _____

4. Which do you think is the better agricultural soil and why - Oquaga or Linden?

   _____

5. Do you see redoximorphic features in the Oquaga soil?

   _____

6. What do you assume is the drainage class of the Oquaga soil? (See page 22 for soil drainage classes)

   _____

Use the Web soil survey, the pit description, and the poster to identify the 5 soil forming factors for this Oquaga soil profile. Some are already given to you.

1. Parent material: _____
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: _____
5. Time: Relatively young in geologic time – Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile – Soil Suitability

Not all soils are created equal for all purposes and should be evaluated for different uses. If a soil is unsuitable, it might still be usable but costs will increase in order to accommodate the natural limitations of the site. For example, a stony, acidic, shallow soil is not well suited for crops. But adding lime, fertilizer, and installing an irrigation system will make production possible but at much higher cost than a naturally good farm soil. Evaluate each soil pit profile for the following uses: a home site with basement and for a septic tank with disposal field.

Soil suitability for a conventional septic system with disposal field

1. Slope of 25% or less
2. Soil is deeper than 20 inches
3. Evidence of high water table is greater than 20 inches
4. Flood plain sites and flood plain soils are unsuitable
5. Rock fragments within the profile in excess of 50% by volume (visual estimate) is a limitation or makes site unsuitable

Soil suitability for home site with basement

1. Depth to bedrock should be greater than 60 inches
2. Water table should be greater than 20 inches depth
3. Heavy soils such as clay, sandy clay, or silty clay are not suitable
4. Areas on flood plains are generally not suitable

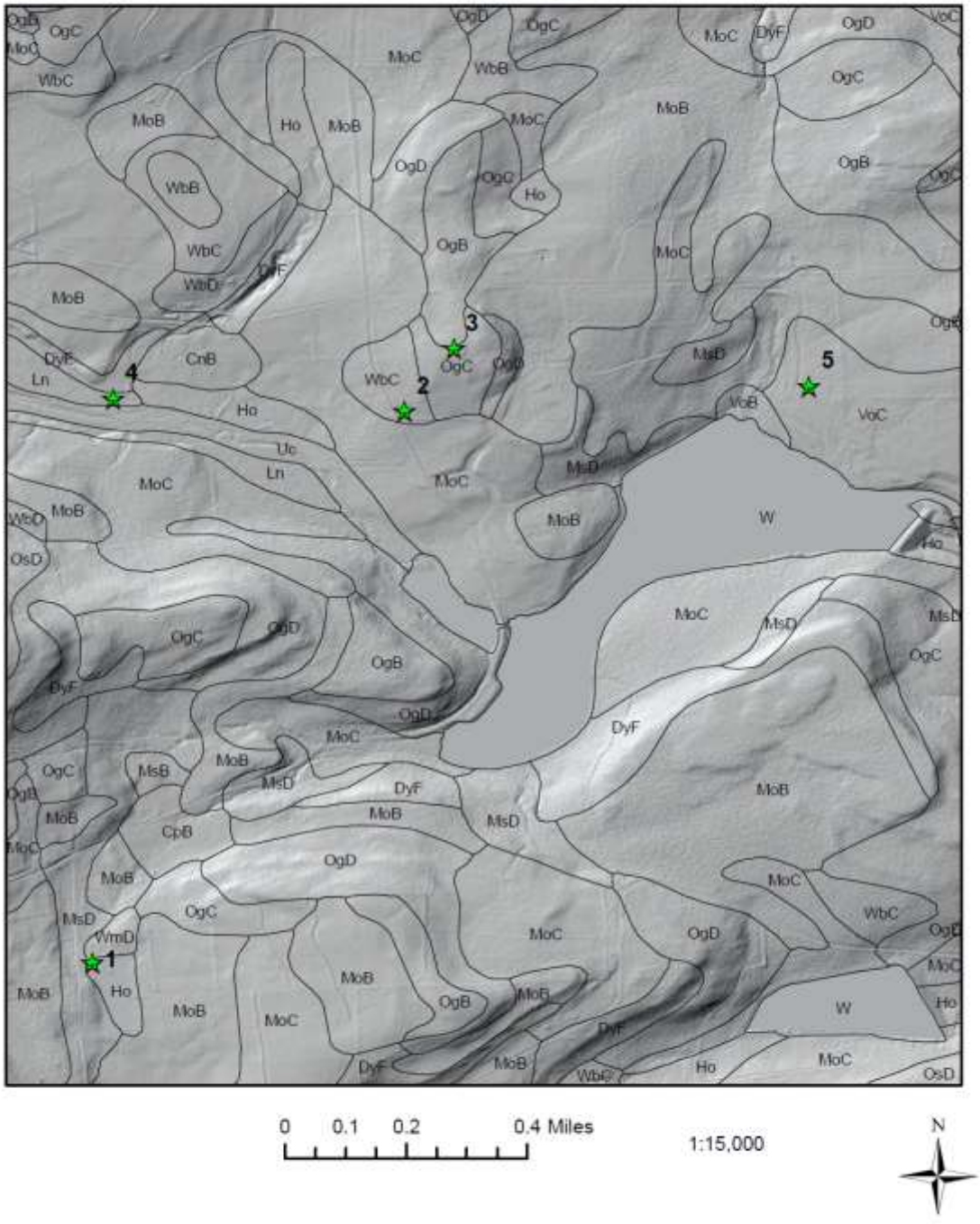
Soil Type		Suitable	Unsuitable	Why?
Holly	**Septic with Disposal Field**			
Holly	**Home site with basement**			
Oquaga	**Septic with Disposal Field**			
Oquaga	**Home site with basement**			
Linden	**Septic with Disposal Field**			
Linden	**Home site with basement**			
Wellsboro	**Septic with Disposal Field**			
Wellsboro	**Home site with basement**			
Volusia	**Septic with Disposal Field**			
Volusia	**Home site with basement**			

Soil Pit Locations – Soil Map

Soil Pit Locations - Mt. Pisgah State Park
Bradford County, PA

Soil Pit Location - hillshade map shows landforms

Soil Pit Locations - Mt. Pisgah State Park
Bradford County, PA
Hillshade Map



Pedon Description Reports

Holly

For User Pedon ID = 12PA610-001PEDON DESCRIPTION

Site Record ID: 1

Pedon Record ID: 1

Pedon ID: 12PA610-001

Site ID: 12PA610-001

Description Date: 11/22/2011 1:35:55 PM

Print Date: 12/13/2011

Describer: Yuri Plowden

Soil Name As Described/Sampled: **Holly**

Soil Name As Correlated: Holly

Classification: Fine-loamy, mixed, mesic Fluvaquentic Endoaquepts

Pedon Type: Taxadjunct to the series

Pedon Purpose: Full pedon description

Taxon Kind: Series

SSURGO MU: Ho - Holly soils

Non-MLRA Soil Survey Area: PA610 - Bradford and Sullivan Counties, Pennsylvania

MU: Ho - Holly soils

MLRA: 140 - Glaciated Allegheny Plateau and Catskill Mountains

Physiographic Division: AH - Appalachian Highlands

Physiographic Province: AP - Appalachian Plateau

Lat/Long: 41°47’40.4” north, 76°40’39.7” west

UTM: Datum WGS84

Location Description: Bradford County, Mount Pisgah State Park.

Landscape: plateau

Landform: swale

Microfeature:

Anthropogenic Feature:

Geomorphic Component:

Profile Pos: Toeslope

Slope: 1 percent

Shape: up/down: Concave; across: Concave

Complexity: Simple

Flooding:

Ponding: Occasional

Drainage: Very poorly drained

Runoff: Negligible

Permeability: Slow

Primary Earth Cover: Grass/herbaceous cover; Secondary Earth Cover:

Existing Vegetation: SOLID - goldenrod (Solidago); JUNCU - rush (Juncus)

Parent Materials: local alluvium over till

Bedrock:

Particle Size Control Section: 33 to 89 centimeters (13 to 35 inches)

Ap1 --- 0 to 10 centimeters (0 to 4 inches); dark gray (5YR 4/1) moist, silt loam; null percent sand; null percent silt; 17 percent clay; moderate fine granular structure; very friable, nonsticky, nonplastic; many fine roots throughout and common medium roots throughout; 3 percent (common) fine masses of oxidized iron on surfaces along root channels and 4 percent (common) fine yellowish red (5YR 5/6), moist, masses of oxidized iron in matrix; 7 percent nonflat rounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments; neutral, pH 6.6, Bromthymol blue; clear smooth boundary.

Ap2 --- 10 to 33 centimeters (4 to 13 inches); dark gray (7.5YR 4/1) moist, silt loam; null percent sand; null percent silt; 18 percent clay; weak medium granular structure; very friable, slightly sticky, slightly plastic; common fine roots throughout; 5 percent (common) fine prominent yellowish red (5YR 5/6), moist, masses of oxidized iron on surfaces along root channels and 10 percent (common) fine prominent yellowish red (5YR 5/6), moist, masses of oxidized iron in matrix; 7 percent nonflat rounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments; slightly acid, pH 6.2, Bromthymol blue; clear smooth boundary.

Bg1 --- 33 to 50 centimeters (13 to 20 inches); gray (7.5YR 5/1) moist, channery silt loam; null percent sand; null percent silt; 20 percent clay; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; moderately few very fine roots throughout; 15 percent (common) fine prominent yellowish brown (10YR 5/8), moist, masses of oxidized iron in matrix; 10 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments and 7 percent nonflat rounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments; moderately acid, pH 5.8, Chlorophenol red; abrupt smooth boundary.

Bg2 --- 50 to 89 centimeters (20 to 35 inches); gray (10YR 5/1) moist, silt loam; null percent sand; null percent silt; 27 percent clay; massive; friable, slightly sticky, slightly plastic; 15 percent (common) fine prominent strong brown (7.5YR 5/6), moist, masses of oxidized iron in matrix; 10 percent nonflat rounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments; moderately acid, pH 6, Chlorophenol red; clear smooth boundary.

C --- 89 centimeters (35 inches); single grain; loose; 95 percent nonflat rounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments.

Linden

For User Pedon ID = 12PA610-004PEDON DESCRIPTION

Site Record ID: 4

Pedon Record ID: 4

Pedon ID: 12PA610-004

Site ID: 12PA610-004

Description Date: 11/21/2011 1:09:28 PM

Print Date: 12/13/2011

Describer: Yuri Plowden

Pedon Notes: Text: Soil is mwd. Typical Linden is well drained.

Soil Name As Described/Sampled: **Linden**

Soil Name As Correlated: **Linden, variant**

Classification: Coarse-loamy, mesic Oxyaquic Dystrudepts

Pedon Type: Outside range of series

Pedon Purpose: Full pedon description

Taxon Kind: Family

SSURGO MU: Ln - Linden soils

Non-MLRA Soil Survey Area: PA610 - Bradford and Sullivan Counties, Pennsylvania

MU: Ln - Linden soils

MLRA: 140 - Glaciated Allegheny Plateau and Catskill Mountains

Physiographic Division: AH - Appalachian Highlands

Physiographic Province: AP - Appalachian Plateau

Lat/Long: 41°48’29.1” north, 76°40’37.9” west

UTM: Datum WGS84

Location Description: Mt Pisgah State Park, Bradford County, PA

Landscape: plateau

Landform: flood plain

Microfeature: mound

Geomorphic Component: Base Slope

Profile Pos: Toeslope

Slope: 2 percent

Shape: up/down: Convex; across: Convex

Complexity: Simple

Flooding: Rare

Ponding: None

Drainage: Moderately well drained

Runoff: Low

Primary Earth Cover: Crop cover; Secondary Earth Cover:

Parent Materials: alluvium

Particle Size Control Section: 41 to 100 centimeters (16.1 to 39.4 inches)

Diagnostic Features: Cambic horizon: 41 to 96 centimeters (16.1 to 37.8 inches)

Ap1 --- 0 to 13 centimeters (0 to 5 inches); dark reddish brown (5YR 3/2) moist, silt loam; null percent sand; null percent silt; 12 percent clay; moderate fine granular structure; very friable, nonsticky, nonplastic; many fine roots throughout; slightly acid, pH 6.2, Bromthymol blue.

Ap2 --- 13 to 41 centimeters (5 to 16 inches); dark reddish brown (5YR 3/3) moist, silt loam; null percent sand; null percent silt; 12 percent clay; weak medium granular structure; friable, nonsticky, nonplastic; common very coarse roots throughout and common fine roots throughout; moderately acid, pH 5.8, Chlorophenol red.

Bw1 --- 41 to 71 centimeters (16 to 28 inches); reddish brown (5YR 4/3) moist, silt loam; null percent sand; null percent silt; 14 percent clay; weak coarse subangular blocky structure; friable, slightly sticky, nonplastic; common fine roots throughout and moderately few medium roots throughout; moderately acid, pH 6, Chlorophenol red.

Bw2 --- 71 to 96 centimeters (28 to 38 inches); reddish brown (5YR 4/4) moist, loam; null percent sand; null percent silt; 14 percent clay; weak coarse subangular blocky structure; friable, nonsticky, nonplastic; moderately few fine roots throughout; 40 percent (many) medium distinct reddish gray (5YR 5/2), moist, iron depletions on faces of peds; 5 percent nonflat rounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments and 5 percent nonflat rounded 75 to 250 millimeters (3 to 10 inches) sandstone fragments; moderately acid, pH 6, Chlorophenol red.

C --- 96 to 120 centimeters (38 to 47 inches); dark reddish gray (5YR 4/2) moist, extremely channery sandy loam; null percent sand; null percent silt; 14 percent clay; weak fine subangular blocky structure; very friable, nonsticky, nonplastic; 2 percent (common) fine distinct reddish brown (5YR 4/4), moist, masses of oxidized iron in matrix; 30 percent nonflat subrounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments and 40 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 6, Chlorophenol red.

Oquaga

For User Pedon ID = 12PA610-005PEDON DESCRIPTION

Site Record ID: 5

Pedon Record ID: 5

Pedon ID: 12PA610-005

Site ID: 12PA610-005

Description Date: 11/21/2011 1:38:09 PM

Print Date: 12/13/2011

Describer: Yuri Plowden

Site Notes:

Pedon Notes: Text: C horizon was rippable rock. Could almost call it an R

Soil Name As Described/Sampled: **Oquaga**

Soil Name As Correlated: Oguaga

Classification: Loamy-skeletal, mixed, mesic Typic Dystrudepts

Pedon Type: Within range of series

Pedon Purpose: Full pedon description

Taxon Kind: Series

SSURGO MU: OgC - Oquaga channery silt loam, 8 to 15% slopes

Non-MLRA Soil Survey Area: PA610 - Bradford and Sullivan Counties, Pennsylvania

MU: OgC - Oquaga channery silt loam, 8 to 15% slopes

MLRA: 140 - Glaciated Allegheny Plateau and Catskill Mountains

Physiographic Division: AH - Appalachian Highlands

Physiographic Province: AP - Appalachian Plateau

Lat/Long: 41°48’33.1” north, 76°40’8.9” west

UTM: Datum WGS84

Location Description: Mt Pisgah State Park, Bradford County, PA

Landscape: plateau

Landform: hill

Microfeature:

Geomorphic Component: Interfluve

Profile Pos: Summit

Slope: 12 percent

Aspect: 225°

Shape: up/down: Convex; across: Convex

Complexity: Simple

Flooding: None

Ponding: None

Drainage: Well drained

Runoff: High

Primary Earth Cover: Tree cover; Secondary Earth Cover:

Parent Materials: thin till over reddish brown residuum weathered from sandstone

Particle Size Control Section: 25 to 85 centimeters (9.8 to 33.5 inches)

Diagnostic Features: Cambic horizon: 22 to 85 centimeters (8.7 to 33.5 inches)

Restrictions: Lithic bedrock: 100 centimeters (39.4 inches)

Ap --- 0 to 22 centimeters (0 to 9 inches); dark reddish brown (5YR 3/3) moist, very channery silt loam; null percent sand; null percent silt; 12 percent clay; weak fine granular structure; very friable, nonsticky, nonplastic; 35 percent flat subangular 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear smooth boundary.

Bw1 --- 22 to 56 centimeters (9 to 22 inches); reddish brown (5YR 4/3) moist, very gravelly loam; null percent sand; null percent silt; 13 percent clay; weak fine subangular blocky structure; friable, nonsticky, nonplastic; 10 percent flat subangular 150 to 380 millimeters (6 to 15 inches) sandstone fragments and 35 percent nonflat subangular 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments; moderately acid, pH 5.8, Chlorophenol red; clear wavy boundary.

Bw2 --- 56 to 85 centimeters (22 to 34 inches); dark reddish gray (5YR 4/2) moist, extremely flaggy loam; null percent sand; null percent silt; 13 percent clay; weak fine subangular blocky structure; friable, slightly sticky, nonplastic; 40 percent flat subangular 150 to 380 millimeters (6 to 15 inches) sandstone fragments and 35 percent flat subangular 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear wavy boundary.

C --- 85 centimeters (34 inches); dark reddish gray (5YR 4/2) moist, sandy loam stones; null percent sand; null percent silt; 12 percent clay; massive; loose, slightly sticky, nonplastic; extremely high excavation difficulty; 75 percent flat subangular 250 to 600 millimeters (10 to 24 inches) sandstone fragments and 20 percent flat subangular 150 to 380 millimeters (6 to 15 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red.

Volusia

For User Pedon ID = 12PA610-003PEDON DESCRIPTION

Site Record ID: 3
Pedon Record ID: 3
Pedon ID: 12PA610-003
Site ID: 12PA610-003
Description Date: 11/21/2011 11:20:24 AM
Print Date: 12/13/2011
Describer: Yuri Plowden
Site Notes:
Pedon Notes: Text: Slightly wetter Mardin, or slightly drier Volusia. There is an increase in clay with depth but if clay films are present, they are very faint. In lieu of clay films are pressurve faces.
Soil Name As Described/Sampled: **Volusia**
Soil Name As Correlated: **Mardin**
Classification: Coarse-loamy, mesic Typic Fragiudepts
Pedon Type: Map unit inclusion
Pedon Purpose: Full pedon description
Taxon Kind: Series
SSURGO MU: VoC - Volusia channery silt loam, 8 to 15% slopes
Non-MLRA Soil Survey Area: PA610 - Bradford and Sullivan Counties, Pennsylvania
MU: VoC - Volusia channery silt loam, 8 to 15% slopes
MLRA: 140 - Glaciated Allegheny Plateau and Catskill Mountains
Physiographic Division: AH - Appalachian Highlands
Physiographic Province: AP - Appalachian Plateau
MLRA Survey Office Management Area: 12-2 - Belmont, New York
Lat/Long: 41°48’30.3” north, 76°39’38” west
UTM: Datum WGS84
Location Description: Mt Pisgah State Park, Bradford County, PA
Landscape: plateau
Landform: hill
Geomorphic Component: Head Slope
Profile Pos: Backslope
Slope: 10 percent
Shape: up/down: Convex; across: Linear
Complexity: Complex
Flooding: None
Ponding: None

Drainage: Somewhat poorly drained

Primary Earth Cover: Grass/herbaceous cover; Parent Materials: till derived from siltstone

Bedrock:

Particle Size Control Section: 25 to 60 centimeters (9.8 to 23.6 inches)

Diagnostic Features: Cambic horizon: 24 to 60 centimeters (9.4 to 23.6 inches)

Restrictions: Fragipan: 60 centimeters (23.6 inches)

10 percent Slope -- Somewhat poorly drained

Ap --- 0 to 24 centimeters (0 to 9.5 inches); dark reddish brown (5YR 3/3) moist, silt loam; null percent sand; null percent silt; 12 percent clay; moderate very fine granular structure; very friable, nonsticky, nonplastic; many fine roots throughout; 10 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear smooth boundary.

Bw1 --- 24 to 45 centimeters (9.5 to 18 inches); brown (7.5YR 5/3) moist, channery silt loam; null percent sand; null percent silt; 13 percent clay; weak medium subangular blocky structure; friable, nonsticky, nonplastic; common very fine roots throughout; 2 percent (common) fine faint brown (7.5YR 5/4), moist, masses of oxidized iron in matrix; 20 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear smooth boundary.

Bw2 --- 45 to 60 centimeters (18 to 24 inches); brown (7.5YR 5/3) moist, gravelly silt loam; null percent sand; null percent silt; 15 percent clay; weak medium angular blocky structure; friable, nonsticky, nonplastic; moderately few very fine roots throughout; 5 percent (common) fine distinct gray (7.5YR 5/1), moist, iron depletions in matrix and 20 percent (many) medium distinct strong brown (7.5YR 5/6), moist, masses of oxidized iron in matrix; 15 percent nonflat subrounded 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear wavy boundary.

Bx1 --- 60 to 78 centimeters (24 to 31 inches); brown (7.5YR 4/3) moist, channery silt loam; null percent sand; null percent silt; 25 percent clay; weak very coarse prismatic structure; firm, slightly sticky, slightly plastic; 20 percent (many) medium distinct strong brown (7.5YR 5/6), moist, masses of oxidized iron on vertical faces of peds and 30 percent (many) coarse distinct gray (7.5YR 5/1), moist, iron depletions on vertical faces of peds; 3 percent nonflat rounded 150 to 250 millimeters (6 to 10 inches) sandstone fragments and 15 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.8, Chlorophenol red; clear wavy boundary.

Bx2 --- 78 to 103 centimeters (31 to 41 inches); brown (7.5YR 4/2) moist, cobbly loam; null percent sand; null percent silt; 25 percent clay; moderate very coarse prismatic structure; firm, slightly sticky, slightly plastic; 10 percent (common) medium prominent strong brown (7.5YR 5/6), moist, masses of oxidized iron on vertical faces of peds and 20 percent (many) coarse faint gray (7.5YR 5/1), moist, iron depletions on vertical faces of peds; 5 percent flat subrounded 150 to 380 millimeters (6 to 15 inches) sandstone fragments, 15 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments and 10 percent nonflat rounded 150 to 250 millimeters (6 to 10 inches) sandstone fragments; moderately acid, pH 6, Chlorophenol red.

Wellsboro

For User Pedon ID = 12PA610-002PEDON DESCRIPTION

Site Record ID: 2

Pedon Record ID: 2

Pedon ID: 12PA610-002

Site ID: 12PA610-002

Description Date: 11/21/2011 10:09:33 AM

Print Date: 12/13/2011

Describer: Yuri Plowden

Site Notes:

Pedon Notes:

Soil Name As Described/Sampled: **Wellsboro**

Soil Name As Correlated: Wellsboro, taxadjunct

Classification: Loamy-skeletal, mesic Fragic Dystrudepts

Pedon Type: Taxadjunct to the series

Pedon Purpose: Full pedon description

Taxon Kind: Family

SSURGO MU:

Lat/Long: 41°48’27.5” north, 76°40’12.7” west

UTM: Datum WGS84

Location Description: Mt Pisgah State Park, Bradford County, PA

Landscape: plateau

Landform: hill

Geomorphic Component: Side Slope

Profile Pos: Backslope

Slope: 15 percent

Elevation:

Aspect: 227°

Shape: up/down: Convex; across: Convex

Complexity: Complex

Flooding: None

Ponding: None

Drainage: Moderately well drained

Primary Earth Cover: Grass/herbaceous cover; Secondary Earth Cover:

Parent Materials: till derived from siltstone

Bedrock:

Particle Size Control Section: 25 to 100 centimeters (9.8 to 39.4 inches)

Diagnostic Features: Cambic horizon: 20 to 113 centimeters (7.9 to 44.5 inches)

Slope
Elevation
Aspect MAAT MSAT MWAT MAP Frost-Free Days Drainage Class Slope Length Upslope Length
15 percent 227° Moderately well

Ap --- 0 to 20 centimeters (0 to 8 inches); dark reddish brown (5YR 3/2) moist, channery silt loam; 25 percent sand; null percent silt; 17 percent clay; moderate fine granular structure; very friable, nonsticky, nonplastic; many fine roots throughout and common medium roots throughout; 10 percent nonflat subangular 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments and 10 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear smooth boundary.

Bw1 --- 20 to 49 centimeters (8 to 19 inches); dark reddish gray (5YR 4/2) moist, channery loam; 40 percent sand; null percent silt; 18 percent clay; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots throughout; 20 percent (few) faint silt coats on all faces of peds; 10 percent nonflat subangular 2 to 75 millimeters (0.1 to 3 inches) sandstone fragments and 10 percent flat subrounded 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.6, Chlorophenol red; clear wavy boundary.

Bw2 --- 49 to 89 centimeters (19 to 35 inches); reddish brown (2.5YR 4/3) moist, very flaggy loam; 40 percent sand; null percent silt; 20 percent clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; moderately few very fine roots matted around rock fragments; 2 percent (very few) faint clay films on rock fragments and 40 percent (common) distinct silt coats on all faces of peds; 35 percent flat subangular 150 to 380 millimeters (6 to 15 inches) sandstone fragments, 5 percent nonflat subrounded 75 to 250 millimeters (3 to 10 inches) sandstone fragments and 10 percent flat subangular 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.8, Chlorophenol red; clear wavy boundary.

Bw3 --- 89 to 114 centimeters (35 to 45 inches); reddish brown (2.5YR 4/3) moist, extremely flaggy loam; 40 percent sand; null percent silt; 20 percent clay; weak coarse subangular blocky structure; firm, slightly sticky, slightly plastic; brittle; very few very fine roots matted around rock fragments; 2 percent (very few) faint clay films on all faces of peds and 20 percent (few) distinct silt coats on rock fragments; 10 percent (common) coarse faint reddish gray (5YR 5/2), moist, iron depletions in matrix, 5 percent (common) coarse prominent yellowish red (5YR 4/6), moist, masses of oxidized iron in matrix and 2 percent (common) coarse distinct very dark gray (5YR 3/1), moist, iron depletions in matrix; 5 percent nonflat subrounded 75 to 250 millimeters (3 to 10 inches) sandstone fragments, 40 percent flat subangular 150 to 380 millimeters (6 to 15 inches) sandstone fragments and 15 percent flat subangular 2 to 150 millimeters (0.1 to 6 inches) sandstone fragments; moderately acid, pH 5.8, Chlorophenol red; About 35% of this horizon has fragic properties: firm consistence and brittle manner of failure. There are hints of prismatic structure, and 3% clay orientation on faces of peds.

Depth and Drainage Classes

Depth Classes

Depth Class	Depth
Very deep	> 60"
Deep	40 - 60"
Moderately Deep	20 - 40''
Shallow	10 - 20"
Very Shallow	0 - 10"

Drainage

Drainage	Depth to Evidence of Wetness
excessively drained	> 60"
somewhat excessively drained	> 60"
well-drained	> 40" (or 36")
moderately well-drained*	20-40''(or 18-36")
somewhat poorly drained	8-20"
poorly drained	0-8"
very poorly drained	0

*In Pennsylvania, moderately well drained soils sometimes have some redoximorphic features (mottles) between 10 and 20", but < 2% of the matrix.

Answer Key for Student Sheets

Soil Pit Profile Poster #1

Holly – Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed. Holly is a wetland soil (hydric). This pit shows clear evidence of a high water table near the soil surface.

1. What is that evidence of a high water table? Describe the evidence. Look closely around 8 inches.

   Answer: Gray and orange redoximorphic (mottles) features. Splotches of orange and gray, this is a characteristic feature of wetness in soils.

2. How deep do the redoximorphic features extend? Redoximorphic features are grey and orange mottles that form when iron-based minerals that give soil its brownish colors undergo a chemical transition due to anaerobic conditions. The chemical transition causes a color change. In a soil description, orange or black redox features are often referred to as masses of iron and/or manganese oxides. The grey colors are either designated with a 2 chroma soil color, or they might be called iron depletions.

   Answer: most evident within the top16 inches. But, some are found at 24 inches.

3. An iron depletion is a redoximorphic feature of a hydric soil. It is gray in color with very little brown. What is the color of the soil at approximately 20 inches? Use the Munsell notation with hue value/chroma. (For example: if the Munsell color is 10YR/7/1, 10YR refers to the hue, 7 refers to value, and 1 refers to the chroma.)

   Answer: 7.5 YR 5/1 or 10 YR 5/1 (from the description) or 10 YR 6/1 (Munsell chart – Chroma should be 1 or 2)

4. What change in the soil profile do you see around 32 – 36 inches?

   Answer: At about 35 inches it turns to gravel. This is somewhat typical of alluvial soils because they formed on the flood plains from the deposition of soil material by water.

5. What do you see at 37 inches that gives you a clear indication that this soil is hydric?

   Answer: water

Using the Web soil survey pit description, the hillshade map, and poster to identify the 5 soil forming factors for this Holly soil profile. Some are already given to you.

1. Parent material - *Alluvium*
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: *Swale or toe slope of the hill*
5. Time: Relatively young in geologic time- Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #2

Wellsboro – Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed.

1. As best you can tell what is the bottom of the A horizon?

   Answer: 20 to 25 centimeters

2. Wellsboro soils are supposed to have a fragipan. A fragipan often has a markedly different color than the material above it, there might be a clearer barrier to roots and often it will have vertical gray redoximorphic stripes called prisms. There will often be redoximorphic features above the pan where the water is perching. Do you see evidence of a fragipan in this profile?

   Answer: There is a little bit of redox at around 1 meter but no clear evidence of a fragipan.

3. One characteristic of glacial till are rock fragments that are subrounded to very rounded because they have been carried and polished by glacial ice. Rocks that are subrounded to rounded have smooth edges. They may not be exactly round in shape. Look at the relatively large rock in the bottom left part of the pit. Would you say that it is angular, sub-angular, subrounded, or rounded?

   Answer: subrounded to rounded

4. Where else might you find sub-rounded or rounded rock fragments other than in glacial till?

   Answer: in alluvium; water transport has a similar effect of smoothing rock fragments

5. Is this pit till or alluvium?

   Answer: till; not on a flood plain so it is not alluvium

Using the Web soil survey pit description and poster, answer questions 1 and 4 of the following questions for the Wellsboro soil profile.

1. Parent material: *Till*
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: *Hill slope or side slope*
5. Time: Relatively young in geologic time - Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #3

Volusia - Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed.

1. As best you can tell, how deep is the A horizon?

   Answer: 9 – 12 inches

2. At what depth is the high water table as best you can tell and why do you think that?

   Answer: around 18 – 24 inches; gray and orange redoximorphic features (mottles)

3. Volusia soils are supposed to have a fragipan. A fragipan often has a markedly different color than the material above it, there might be a clearer barrier to roots and/or often it will have vertical gray redoximorphic stripes called prisms. There will often be redoximorphic features above the pan where the water is perching. Do you see evidence of a fragipan in this profile and if so what and at what depth?

   Answer: yes; vertical gray stripes; redox above the stripes; no roots below 24 inches; pan is at about 24 inches (in the pit description a Bx is notation for a fragipan)

4. Do you see many rocks in the Volusia soil profile?

   Answer: no; this pit does not have a lot of rock fragments compared to Wellsboro. There are about 10% rock fragments in the A horizon according to the pedon description.

Using the Web soil survey pit description and poster, answer questions 1 and 4 of the following questions for the Volusia soil profile.

1. Parent material - *Till*
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: *Hill slope; head slope*
5. Time: Relatively young in geologic time – Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #4

Linden - Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed. Linden soils are typically well drained (high water table 36 inches or deeper).

1. This Linden soil is moderately well drained. At what depth do you see possible evidence of a high water table?

   Answer: At about 32 inches see slight orange and gray redoximorphic (mottles) features. Look at the left side of profile.

2. A good farm soil will have very few obstructions for plant root growth within 30 inches of the surface. Do you think this is a good agricultural soil and why?

   Answer: Yes, very few rocks if any. The high water table is 32 inches (below the main rooting zone). No fragipan.

3. What is the pH of the surface horizon for this Linden soil? Describe this level of acidity and the availability of nutrients. (Use your soil pH reference handout to answer this.)

   Answer: pH of the surface horizon is 6.2. This is slightly acid. Most plant nutrients are available at this pH.

4. What depth class is this soil to the best that you can tell? (see the depth class chart on page 22).

   Answer: The soil is deep (or maybe very deep). The pedon description describes a C horizon down to 47 inches. Deep soils are 40 to 60 inches. The soil could be deeper but we can't tell.

Using the Web soil survey pit description and poster, answer questions 1 and 4 of the following questions for the Linden soil profile.

1. Parent material: *Alluvium*
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: *Flood plain and or toe slope*
5. Time: Relatively young in geologic time - Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile Poster #5

Oquaga – Use the Pedon Description Report, the soil pit location maps, and the poster to answer the following questions. Use the Websoilsurvey map if needed.

1. What change do you see at approximately 34 inches in the soil profile?

   Answer: large rocks; many more rocks

2. As best you can tell, how deep is the A horizon?

   Answer: 8 – 9 inches (top A horizon is slightly darker; many more roots; roots tend to occupy the A horizon)

3. Compare soil profile photos of the Oquaga verses the Linden soil. What differences you see?

   Answer: Oquaga has many more rocks; Linden – doesn't have any big rocks, there may be differences in color too.

4. Which do you think is the better agricultural soil and why – Oquaga or Linden?

   Answer: Linden, because it has fewer rocks so it is easier to manage with farm equipment, pH is higher in the surface horizon, 6.2 vs. 5.6, and Oquaga has bedrock at 39 inches, so there is less soil material for plant roots to explore, and less soil to hold water.

5. Do you see redox features in the Oquaga soil?

   Answer: No

6. What do you assume is the drainage class of the Oquaga soil?

   Answer: Well drained; there is no evidence of a high water table within 36 inches of soil surface

Using the Web soil survey pit description and poster, answer questions 1 and 4 of the following questions for the Oquaga soil profile.

1. Parent material: _____*till*_____
2. Climate: Temperate
3. Living organisms: Oak and Northern Hardwood Forests
4. Landscape position: ___*Hilltop*_____
5. Time: Relatively young in geologic time - Wisconsinan glaciation which was 17,000 to 22,000 years ago

Soil Pit Profile - Soil Suitability

Not all soils are created equal for all purposes and should be evaluated for different uses. If a soil is unsuitable, it might still be usable but costs will increase in order to accommodate the natural limitations of the site. For example, a stony, acidic, shallow soil is not well suited for crops. But adding lime, fertilizer, and installing an irrigation system will make production possible but at much higher cost than a naturally good farm soil. Evaluate each soil pit profile for the following uses: a home site with basement and for a septic tank with disposal field.

Soil suitability for a conventional septic system with disposal field

1. Slope of 25% or less
2. Soil is deeper than 20 inches
3. Evidence of high water table is greater than 20 inches
4. Flood plain sites and flood plain soils are unsuitable
5. Rock fragments within the profile in excess of 50% by volume (visual estimate) is a limitation or makes site unsuitable

Soil suitability for home site with basement

1. Depth to bedrock should be greater than 60 inches
2. Water table should be greater than 20 inches depth
3. Heavy soils such as clay, sandy clay, or silty clay are not suitable
4. Areas on flood plains are generally not suitable

Soil Type		Suitable	Unsuitable	Why?
Holly	**Septic with Disposal Field**		✓	High water table is <20" to surface. Landform is a floodplain
Holly	**Home site with basement**		✓	High water table is <20" to surface. Landform is a floodplain
Oquaga	**Septic with Disposal Field**		✓	Too many rock fragments - they range from 35 to 95%
Oquaga	**Home site with basement**		✓	Depth to lithic bedrock is <60 (39 inches in pedon description)
Linden	**Septic with Disposal Field**		✓	Landform is a floodplain
Linden	**Home site with basement**		✓	Landform is a floodplain
Wellsboro	**Septic with Disposal Field**		✓	Too many rock fragments - they range from 20 to 60%
Wellsboro	**Home site with basement**	✓		From what we can tell, bedrock is >60", and water table is below 20 inches.
Volusia	**Septic with Disposal Field**		✓	Evidence of high water table at 18 to 24".
Volusia	**Home site with basement**		✓	Evidence of high water table at 18 to 24"