2021 MD Envirothon – Soil/Land Use Station (Virtual)
Section I: Landscape and Soil Profile Features (76 points total)

Part A – Landscape Features (8 points total)

Use the pictures of the soil profile and the area surrounding the soil pit to select your answers.

1. Position (2 points)

□ Upland
□ Upland depression or drainageway
□ Terrace
□ Floodplain

2. Parent Material (2 points)

□ Residual
□ Colluvium
□ Recent alluvium
□ Old alluvium
□ Coastal plain sediments

3. Slope Characteristics (2 points)

Slope Class	Piedmont-Appalachian	Coastal Plain	Letter Designation
□ Nearly level	0-3%	0-2%	A
□ Gently sloping	3-8%	2-5%	B
□ Strongly sloping	8-15%	5-10%	C
□ Moderately steep	15-25%	10-15%	D
□ Steep	25-50%	15-25%	E
□ Very steep	50+%	25+%	F

4. Surface Stoniness or Rockiness (2 points)

□ None
□ Very stony (less than 30 ft. apart)
□ Rock outcrop (2 exposures within 100 ft)

Part B – Soil Profile Features (36 points total)

Use the pictures and videos from the soil pit and reference cards to select your answers.
References:

5. Check the major soil horizons visible in this profile (check all that are present): (4 points)

- □ O
- □ A
- □ E
- □ B
- □ C
- □ R

6. What is the current topsoil thickness, O and/or A horizon(s)? (2 points)

_____ inches

7. What is the topsoil structure? (1 points)

- □ Granular
- □ Blocky
- □ Single grain, massive, platy

Soil Color

8. Topsoil – A Horizon (2 points)

- □ Brown or dark brown
- □ Reddish brown
- □ Gray or grayish brown
- □ Black

9. Subsoil and Substratum – B and/or C horizon (2 points)

- □ Yellowish brown or red, no redox depletions (gray colors due to wetness)
- □ Yellowish brown or red, some redox depletions (gray colors due to wetness)
- □ Dominantly gray, with redox concentrations (brownish red colors due to wetness)

Soil Drainage

10. Depth to Redox Depletions (3 points)

- □ Directly under a thick black colored surface
- □ 0 to less than 10 inches
- □ 10 to less than 20 inches
- □ 20 to less than 40 inches
- □ 40 to less than 72 inches
- □ 72 inches or greater

11. Natural soil drainage class (3 points)

- □ Excessively well drained
- □ Well drained
- □ Moderately well drained
- □ Somewhat poorly drained
- □ Poorly drained
- □ Very poorly drained

Soil Depth

12. Effective rooting depth (2 points)

□ Very shallow (less than 10 inches)
□ Shallow (10 to less than 20 inches)
□ Moderately deep (20 to less than 40 inches)
□ Deep (40 to less than 60 inches)
□ Very deep (60 inches or greater)

13. Depth to bedrock (2 points)

□ Very shallow (less than 10 inches)
□ Shallow (10 to less than 20 inches)
□ Moderately deep (20 to less than 40 inches)
□ Deep (40 to less than 60 inches)
□ Very deep (60 inches or greater)

14. Rock Fragments – What is the percentage of rock fragments in and on the surface layer? (1 point)

□ Less than 15% gravel
□ 15-35% gravel
□ Greater than 35% gravel OR very stony or rock outcrop

Soil Texture

15. Topsoil – A horizon (3 points)

□ Coarse – sand, loamy sand
□ Moderately coarse – sandy loam
□ Medium – loam, silt loam, sandy clay loam
□ Moderately fine – silty clay loam, clay loam
□ Fine – clay, silty clay, sandy clay

16. Subsoil – B horizon (3 points)

□ Coarse – sand, loamy sand
□ Moderately coarse – sandy loam
□ Medium – loam, silt loam, sandy clay loam
□ Moderately fine – silty clay loam, clay loam
□ Fine – clay, silty clay, sandy clay

17. Percent clay in subsoil (used for tie breaker) _____ %

Soil Permeability

18. Topsoil – A horizon (2 points)

□ Rapid, >6.0 in/hr (coarse texture)
□ Moderately rapid, 2.0-6.0 in/hr (moderately coarse texture)
□ Moderate, 0.6-2.0 in/hr (medium texture)
□ Moderately slow, 0.2-0.6 in/hr (moderately fine texture)
□ Slow, <0.2 in/hr (fine texture)

19. Subsoil – B horizon (2 points)

□ Rapid, >6.0 in/hr (coarse texture)
□ Moderately rapid, 2.0-6.0 in/hr (moderately coarse texture)
□ Moderate, 0.6-2.0 in/hr (medium texture)
□ Moderately slow, 0.2-0.6 in/hr (moderately fine texture)
□ Slow, <0.2 in/hr (fine texture or fragipan present)

20. Soil Reaction (2 points)

Soil reaction was tested on a sample from the topsoil using the Helig-Truog pH kit. The picture shows the soil sample after reaction.

What is the pH of the soil sample? _____

21. Topsoil Color (1 point)

What is the Munsell color notation of the soil sample? _____
Hue Value/Chroma

22. Compaction (1 point)

Soil Compaction was tested using the wire flag test. Use the photos to assess compaction at this site.

□ Little to no compaction (good). Wire flag enters soil easily to a depth of 6 inches or more with little or no resistance
□ Some compaction (fair). Wire flag penetrates 4-6 inches into the soil with a lot of wiggling and moderate force
□ Compacted (poor). Wire flag penetrates 2-4 inches into the soil with force

Part C – Soil and Site Interpretations (32 points total)

Use your determinations from Landscape and Soil Profile Features (Parts A and B) to answer questions about soil and site interpretations.

Agricultural Suitability

23. Past Soil Erosion (2 points)

Past Soil Erosion = Original topsoil thickness (from information sign) minus current topsoil thickness

□ Slight (less than 3 inches of the original soil lost)
□ Moderate (3-8 inches of the original soil lost)
□ Severe (greater than 8 inches of the original soil lost)

24. Potential future erosion if cultivated or disturbed (2 points)

□ Slight (nearly level)
□ Moderate (gently sloping)
□ Severe (strongly sloping – very steep)

25. Major limiting factors (check all that apply): (2 points)

□ None
□ Flooding or ponding (Occasional or Frequent)
□ Slope (Gently sloping or greater)
□ Past erosion (Severe)
□ Effective rooting depth (less than 40 inches deep)
□ Drainage (less than 40 inches to redox depletions, gray colors due to wetness)
□ Coarse textures (Topsoil and Subsoil)
□ Very stony or Rock outcrop

26. Land Capability Class (3 points)

□	I	No limiting factors and nearly level
□	II	Gently sloping, or Moderately well drained, or Moderately deep
□	III	Strongly sloping, or Somewhat poorly drained, or Poorly drained, or Shallow, or Coarse textures
□	IV	Moderately steep, or Very poorly drained, or Occasionally flooded
□	V	Nearly level and very stony surface or rock outcrop, or frequently flooded
□	VI	Steep, or Gently sloping through steep and very stony surface or rock outcrop
□	VII	Very steep, or Very shallow
□	VIII	Swamp, tidal marsh, coastal beach, areas with >90% rock outcrop, or urban land

27. Best management practice(s) needed at this site (check all that apply): (4 points)
Use drainage class, slope, and Land Capability Class as criteria

□	Drainage	Moderately well, Somewhat poorly, Poorly, or Very poorly drained AND Land Capability Class less than or equivalent to IV
□	Irrigation	Excessively well drained AND Land Capability Class less than or equivalent to IV
□	Contour farming	Gently sloping AND Land Capability Class equivalent to II, III, or IV
□	Contour strip-cropping	Strongly sloping or Moderately steep AND Land Capability Class less than or equivalent to IV
□	Grassed waterway	Drainage way or swale which conveys concentrated runoff AND Land Capability Class less than or equivalent to IV
□	No-till farming	Land Capability Class less than or equivalent to IV
□	Cover crops	Land Capability Class less than or equivalent to IV
□	Permanent vegetation	Land Capability Class V, VI, VII, or VII

28. Is this a Hydric soil, i.e., poorly or very poorly drained? (2 points)

□ Yes
□ No

29. Is this Prime Farmland, i.e., Land Capability Class I or II? (2 points)

□ Yes
□ No

Soil Health

30. Using the Munsell Soil Color book notation for the topsoil color, it indicates this soil's health is: (1 point)

□ Good – Soil is dark brown or black in color, organic matter is visible in the topsoil layer; Value ≤ 3 AND Chroma ≤ 3
□ Fair – Soil is somewhat dark in color, little organic matter is visible in the topsoil layer; Any color that doesn't meet criteria for Good or Poor
□ Poor – Soil is bright to dull colored, no organic matter is visible in the topsoil layer; Value > 4 AND Chroma >4

31. Looking at the compaction in the topsoil, it indicates this soil's health is: (1 point)

□ Good – Little to no compaction, root growth unrestricted
□ Fair – Some compaction, root growth somewhat restricted
□ Poor – Compacted, root growth restricted, roots may be growing laterally

32. Looking at the structure/aggregation of the topsoil layer, it indicates this soil's health is: (1 point)

□ Good – Soil is granular, soft and crumbly, held together with many fine roots. Looks like cottage cheese
□ Fair – Soil is blocky and firmer with some fine roots
□ Poor – Soil is single grain, massive, or platy and hard to break apart. It has few or no fine roots.

33. Determine any nutrient management needs based on the soil test results on the information sign. Mark all that are needed: (5 points)

□ Lime (based on topsoil pH from information sign)
□ Nitrogen
□ Magnesium
□ Phosphorus (phosphate)
□ Potassium (potash)

Urban Suitability

34. Suitability for Septic Tank Absorption Fields: (2 points)
Check the appropriate suitability based on the <u>most limiting soil property</u>

	Soil Properties					Suitability: (check one)
More Limiting ↓	**Slope**	**Flooding**	**Depth to Bedrock**	**Depth to Redox Features**	**Subsoil Permeability**	
	Nearly level, gently sloping	None	> 72 inches	> 72 inches	Moderately rapid, moderate	□ Slight
	Strongly sloping	Rare	40-72 inches	40-72 inches	Moderately slow	□ Moderate
	Moderately steep to very steep	Frequent, Occasional	< 40 inches	< 40 inches	Slow, Rapid	□ Severe

35. Suitability for Lawns: (2 points)
Check the appropriate suitability based on the <u>most limiting soil property</u>

	Soil Properties					Suitability: (check one)
More Limiting ↓	**Slope**	**Topsoil Texture**	**Rock Fragments in/on Surface**	**Past Erosion**	**Depth to Redox Depletions**	
	Nearly level, gently sloping	Moderately coarse, Medium	< 15% gravel	Slight	> 24 inches	□ Slight
	Strongly sloping	Moderately Fine, Coarse	15-35% gravel	Moderate	12-24 inches	□ Moderate
	Moderately steep to very steep	Fine	> 35% gravel, or Very stony, or Rock outcrop	Severe	< 12 inches	□ Severe

36. Suitability for Dwellings with Basements: (2 points)
Check the appropriate suitability based on the most limiting soil property

	Soil Properties				
More Limiting ↓	**Slope**	**Flooding**	**Depth to Redox Depletions**	**Depth to Bedrock**	**Suitability: (check one)**
	Nearly level, gently sloping	None	> 72 inches	> 72 inches	□ Slight
	Strongly sloping	---	40-72 inches	40-72 inches	□ Moderate
	Moderately steep to very steep	Rare, Frequent, Occasional	< 40 inches	< 40 inches	□ Severe

Wildlife Suitability

37. Which wildlife habitat is this soil best suited for? (1 point)

□ Wetland wildlife
□ Upland wildlife