**2013 California Envirothon**

**100**

**Soils Station Test**

**Total = 100 points**

**Suggested time is 35 minutes**

**Introduction:** Sustainable Rangeland Management requires more than a casual knowledge of the soils underfoot. Which soils support perennial grasses; which soils might be preferable if a house or structure is built; what soils provide the right mix of properties for sustaining the preferred habitat of a particular bird or animal species; which soils should be excluded for cattle grazing when they are wet…these, and a dozen more, are all questions that require a more intimate knowledge of rangeland soils. Let’s dig in and see what we can learn.

All Questions are worth **4 POINTS** unless marked otherwise.

Answer the following questions by making observations in the soil pit and the surrounding area. **Write the LETTER of your MULTIPLE CHOICE answer in the box on the left.**

1. What is the thickness of the surface layer? **(3 points)**

 A. 0 to 4 centimeters

 B. 4 to 8 centimeters

 C. 8 to 15 centimeters

 D. 15 to 30 centimeters

2. What is the MOIST color of the surface layer? **(3 points)**

 A. Olive brown or dark olive brown

 B. Dark yellowish brown

 C. Dark grayish brown or very dark grayish brown

 D. Brown or dark brown

 E. Gray or grayish brown

3. What is the texture of the surface layer?

 A. Sand or loamy sand

 B. Sandy loam or fine sandy loam

 C. Loam or silt loam

 D. Clay loam or sandy clay loam

4. What is the dominant structure of the surface layer? **(3 points)**

 A. Massive or no structure

 B. Subangular blocky or blocky

 C. Prismatic

 D. Granular or crumb

 E. Platy

5. How thick is the subsoil? **(3 points)**

 A. Less than 10 centimeters

 B. Between 10 and 20 centimeters

 C. Between 20 and 40 centimeters

 D. Between 40 and 80 centimeters

 E. More than 80 centimeters

6. What is the MOIST color of the subsoil? **(3 points)**

 A. Olive brown or dark olive brown

 B. Dark yellowish brown

 C. Light yellowish brown or yellowish brown

 D. Pale brown or brown

 E. Light olive brown

7. What is the texture of the subsoil?

 A. Sand or loamy sand

 B. Sandy loam or fine sandy loam

 C. Loam or silt loam

 D. Clay loam or sandy clay loam

 8. What is the dominant structure of the subsoil? **(3 points)**

 A. Massive or no structure

 B. Subangular blocky or blocky

 C. Prismatic

 D. Granular or crumb

 E. Platy

9. Using the provided **clinometer**, measure the percent slope of the land between the marked stakes. Percent slope is the vertical feet of rise or fall for every 100 feet of horizontal run. **(3 points)**

 A. 0 to 2 percent

 B. 2 to 4 percent

 C. 4 to 8 percent

 D. 8 to 15 percent

 E. 15 to 25 percent

 F. 25 to 50 percent

10. What is your assessment of the type and severity of erosion that has occurred in the area surrounding the soil pit? **(3 points)**

 A. No erosion apparent (less than 1 centimeter)

 B. Slight erosion (1 to 3 centimeters), mostly sheet erosion

 C. Slight erosion (1 to 3 centimeters, mostly rills

 D. Moderate erosion (3 to 10 centimeters), mostly sheet erosion

 E. Moderate erosion (3 to 10 centimeters), mostly rills

 F. Severe erosion (more than 10 centimeters), mostly rills with some gullies

11. In the pit there are visible layers of contrasting material. What are these layers called and what is the complete set of these layers in a soil pit referred to?

 A. Pedons, profile

 B. Horizons, profile

 C. Horizons, regolith

 D. Pedons, regolith

E. Pedons, lithosphere

F. Horizons, lithosphere

**Answer the remaining questions using your knowledge of soils and soil processes.**

12. “Topsoil” and “Subsoil” are common terms when describing soils. Which layer(s) are generally considered to be equivalent to topsoil and subsoil, respectively?

 A. A, topsoil and B, subsoil

 B. A and B, topsoil and C, subsoil

 C. A, topsoil and B and C, subsoil

 D. A and B, topsoil and C and R, subsoil

E. A, topsoil and B, C and R, subsoil

13. The amount of different sizes of mineral particles in a soil defines the soil’s \_\_\_\_?

 A. profile

 B. pore space

 C. texture

 D. structure

E. water-holding capacity

14. Use the textural triangle and supplied data to determine the textural classes of these two soils. Soil 1: Sand % 40, Clay % 23 and Soil 2: Sand % 25, Clay % 33.

A. Loam, sandy clay loam

 B. Clay loam, silty clay loam

 C. Sandy clay loam, clay loam

 D. Loam, clay loam

 E. Silty clay loam, loam



15. How do plant roots get the water they need for plant growth?

 A. Roots will extend into moist areas of soil

 B. Roots contract when dry and water moves into the open spaces

 C. Roots will move through any soil to find water they need

 D. Water vapor moves from wet soil areas to the roots

 E. A and C

 F. B and D

16. As a biologist walking over a large rangeland property being considered for a permanent easement, you notice that the soils on north-facing slopes support denser vegetation and have more species diversity than soils on south-facing slopes. What is the most likely reason for this difference?

 A. Soil texture differences

 B. Variable rainfall patterns

 C. Increased solar radiation on the north slopes

 D. Higher available water capacity on north slopes

E. Higher soil temperatures on the south slopes

17. Which of the following is part of the soil organic matter? Choose the correct answer.

A. Earthworms and their wastes

 B. Organic molecules identifiable only under a microscope

 C. Decomposed tissues of plants and animals

 D. Soil microorganisms

E. A, B, C and D

 F. A and C

18. Observation of a soil pit often shows evidence of color differences in the soil. Sometimes these color differences form the basis for separating the different soil layers from each other as they indicate that soil processes are occurring or have occurred. What might a layer with a mixture of orange and grey colors indicate has occurred there?

A. Episodes of periodic waterlogging

B. Movement of clay into this layer

C. Long term water saturation, probable water table here at one time

D. Removal of organic matter or humus from this layer

E. Removal of clay and organic matter or humus from this layer

19. What is the main result of compaction and what is the major soil factor affecting it?

 A. Increased soil weight, most affected by soil texture

 B. Increased number of small size pores, most affected by soil texture

 C. Decreased soil density, most affected by soil moisture content

 D. Decreased porosity, most affected by soil moisture content

 E. Decreased subsoil permeability, most affected by soil texture

 F. Decreased subsoil permeability, most affected by soil moisture content

20. List at least three factors, soil or otherwise, that will affect infiltration rates. Describe their specific effect on infiltration rates. Be specific. Use reverse of this sheet for your answer. **(6 points)**

21. How would having a soil with an argillic layer (layer of increased clay content) affect the ecological site and the plant production on this site as compared to a soil which is sandy throughout? **(6 points)**

22. List as many soil-forming factors as you can think of. Choose two and describe their effect on soil development in the soils in the swales versus the soils on the side slopes of this site. **(8 points)**

23. Soils are formed from parent materials. List three and describe the mechanisms by which they arrive at their destinations. **(6 points)**

24. Consider compaction and discuss the comparative effects on rangeland from compaction caused by cows, vehicle traffic, and human foot traffic. **(6 points)**

25. **\*BONUS\*** What is the relationship between soil structure and soil porosity? **(3 points)**