

2005 California Envirothon
Soils Station Test
Total = 100 points
Suggested time is 35 minutes

Please write your team number on top of each page. You may unstaple the test and work on questions in any order; however, pages should be returned to correct order when test is turned in. You may choose to split your team up and work on multiple questions at once or work on questions together. Please show all work, as you may receive partial credit. There is only one correct response for each question unless otherwise indicated. Where there is only one correct response, choose the one that best answers the question. Circle the letter or letters corresponding to the correct answer(s).

As humans have moved into the Oakhurst area, many cultural landscapes have developed, and the landscape here at ECCO is no exception.

Soil is one part of the cultural landscape. Your task is to assess changes to the soil and its hydrology relating to one of the cultural features, the amphitheatre, and how these changes affect existing cultural and natural landscapes.

There are two soil profiles to evaluate, marked "Profile 1" and "Profile 2". Be sure to answer the questions for the proper profile

DESCRIBE SOIL PROFILE 1

Answer the following questions by making observations in the soil pit.

1. What is the color of the surface layer? **(2 points)**
 - A. Very dark
 - B. Medium or bright
 - C. Very light
 - D. Drab or mottled

2. What is the texture of the surface layer? **(2 points)**
 - A. Coarse (Sand or loamy sand)
 - B. Medium (Loam, sandy loam, or silt loam)
 - C. Fine (Clay loam, sandy clay loam, or silty clay loam)
 - D. Very Fine (Clay, sandy clay, or silty clay)

3. What is the permeability of the surface layer? **(2 points)**
 - A. Rapid
 - B. Moderate
 - C. Slow

4. What is the thickness of the surface layer? **(2 points)**

- A. 20 inches or more
- B. 10 to 19 inches
- C. 4 to 9 inches
- D. Less than 4 inches

5. What is the color of the subsoil? **(2 points)**

- A. Very dark
- B. Medium or bright
- C. Very light
- D. Drab or mottled

6. What is the texture of the subsoil? **(2 points)**

- A. Coarse (Sand or loamy sand)
- B. Medium (Loam, sandy loam, or silt loam)
- C. Fine (Clay loam, sandy clay loam, or silty clay loam)
- D. Very Fine (Clay, sandy clay, or silty clay)

7. What is the permeability of the subsoil? **(2 points)**

- A. Rapid
- B. Moderate
- C. Slow

8. What is the depth of the soil to the parent material? **(2 points)**

- A. less than 10 inches
- B. 10 to 14 inches
- C. 14 to 19 inches
- D. 20 to 24 inches
- E. 25 to 29 inches
- F. 30 to 34 inches
- G. 35 to 40 inches
- H. More than 40 inches

9. What is the parent material of the soil at the pit location? **(2 points)**

- A. Hard Bedrock
- B. Soft Bedrock
- C. Loose or mixed materials
- D. Organic materials

DESCRIBE SOIL *PROFILE 2*

10. What is the color of the surface layer? (2 points)
A. Very dark
B. Medium or bright
C. Very light
D. Drab or mottled
11. What is the texture of the surface layer? (2 points)
A. Coarse (Sand or loamy sand)
B. Medium (Loam, sandy loam, or silt loam)
C. Fine (Clay loam, sandy clay loam, or silty clay loam)
D. Very Fine (Clay, sandy clay, or silty clay)
12. What is the permeability of the surface layer? (2 points)
A. Rapid
B. Moderate
C. Slow
13. What is the thickness of the surface layer? (2 points)
A. 20 inches or more
B. 10 to 19 inches
C. 4 to 9 inches
D. Less than 4 inches
14. What is the color of the subsoil? (2 points)
A. Very dark
B. Medium or bright
C. Very light
D. Drab or mottled
15. What is the texture of the subsoil? (2 points)
A. Coarse (Sand or loamy sand)
B. Medium (Loam, sandy loam, or silt loam)
C. Fine (Clay loam, sandy clay loam, or silty clay loam)
D. Very Fine (Clay, sandy clay, or silty clay)
16. What is the permeability of the subsoil? (2 points)
A. Rapid
B. Moderate
C. Slow

17. What is the depth of the soil to the parent material? **(2 points)**

- A. less than 10 inches
- B. 10 to 14 inches
- C. 14 to 19 inches
- D. 20 to 24 inches
- E. 25 to 29 inches
- F. 30 to 34 inches
- G. 35 to 40 inches
- H. More than 40 inches

18. What is the parent material of the soil at the pit location? **(2 points)**

- A. Hard Bedrock
- B. Soft Bedrock
- C. Loose or mixed materials
- D. Organic materials

19. What is the depth to water table? **(2 points)**

- A. more than 60 inches or not present
- B. 40 to 59 inches
- C. 20 to 39 inches
- D. less than 20 inches

DESCRIBE THE SITE

In this section we want to compare the site of previous landscape to the disturbed landscape.

20. What is the slope of the previous landscape? Measure the slope at the stakes marked with the **GREEN** flags. **(2 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
- G. More than 50 percent

21. What is the slope of the amphitheatre landscape? Measure the slope at the stakes marked with the **PINK** flags. (**2 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
 - G. More than 50 percent
22. What kind of erosion, if any, is occurring on the slopes of the amphitheatre? (There may be more than one correct answer) (**2 points**)
- A. None
 - B. Sheet & Rill erosion
 - C. Gully erosion
23. If there is any erosion, what evidence do you see? (There may be more than one correct answer) (**2 points**)
- A. There is no erosion
 - B. Rills are present
 - C. Gullies are present
 - D. Vegetation on slopes is taller
 - E. Deposition
24. The runoff from the amphitheatre slope has been routed along the base of the slope and out to the road, examine the area where the water runs to the road. Which side of the amphitheatre shows the most erosion? (**2 points**)
- A. The side nearest the lodge
 - B. The side farthest from the lodge
25. On the side that shows the least erosion, what is present that seems to help prevent erosion? (**2 points**)
- A. The water is running over bedrock
 - B. The water runs through vegetation
 - C. The water runs faster
 - D. The water can absorb more sunlight due to decreased shade

26. Rate Soil Profile 2 using the USDA Land Capability Classification System. Use your answers from questions 10 through 21 and the information provided below to help you make the determination. Use the following table to assign a Land Capability Class to the soil. Choose the Land Capability Class for the single most limiting item. Limitations increase as you move from the top to the bottom of the table. Write your answer in the box to the left. (**8 points—two points are subtracted for each class difference from the correct answer**)

- A. Class I
- B. Class II
- C. Class III
- D. Class IV
- E. Class VI
- F. Class VII
- G. Class VIII

Effective soil depth: **see question 17**

Surface layer texture: **see question 11**

Permeability: **see question 16**

Depth to water table: **see question 19**

Available water capacity: **3 inches**

Slope: **see question 21**

Amount of erosion: **severe**

Guide for Placing Soils in Land Capability Classes in California
Modified from the FFA Land Judging Manual

Capability Class	Effective Soil Depth (inches) 1/	Surface Layer Dry land 2/	Permeability	Drainage Class 3/	Available Water Capacity 4/	Slope	Amount of Erosion
I	>40	Sandy Loam→ Clay Loam 0-15%	Moderate	Well or Mod. Well ≥60"	>7.5 inch	<2%	None or Slight
II	>40	Sandy Loams→ Clay 0-15%	Rapid→ Slow	Somewhat Poorly→ Somewhat Excessively ≥36"	>5.0 inch	<5%	None→ Moderate
III	>20	Sandy Loams→ Clay 0-35%	Rapid→ Slow	Poorly→ Excessively ≥20"	>3.5 inch	<15%	None→ Severe
IV	>10	Loamy Sand→ Clay 0-60%	Any	Poorly→ Excessively ≥20"	>2.5 inch	<25%	Any
V	>20	Any	Any	Any	>2.5 inch	<2%	None or Slight
VI	>10	Any	Any	Any	>2.5 inch	<50%	Any
VII	Any	Any	Any	Any	>1.0 inch	<75%	Any
VIII	Any	Any	Any	Any	Any	Any	Any

1/ Clay pans with slow permeability's will be treated as limiting the effective depth

2/ Percentage of gravel and rock fragments on the surface within the 10,000 ft² area

3/ Depth to water table during growing season

4/ Available moisture between field capacity and wilting point

INTERPRETING THE OBSERVATIONS.

27. Soil Profile 2 is in an area that has had more human disturbance than Soil Profile 1. Is this soil deeper or shallower or the same depth? **(3 points)**
- Profile 2 is deeper than profile 1
 - Profile 2 is shallower than profile 1
 - Profile 2 is the same depth as profile 1
28. What impact, if any, might differences in soil depth have? **(3 points)**
- No impact, soil depths are the same
 - Plant germination will be affected
 - More difficult to cut the grass
 - Suitability of soil for growth of different kinds of plants
29. How has the construction of the amphitheatre appeared to have changed the hydrology of the area (movement of water over or through the soil) **(3 points)**
- There is no difference
 - There is more runoff and less infiltration on the amphitheatre slope compared to the undisturbed slopes
 - There is less runoff and more infiltration on the amphitheatre slope compared to the undisturbed slopes
30. If there is a difference, which of the following would NOT be a reason for a possible change in hydrology? **(3 points)**
- There is less plant cover on the amphitheater slope.
 - Soils are shallower
 - There is greater plant cover on the amphitheater slope
 - Slopes are steeper
 - Does not apply—there is no difference in water movement
31. How would changes in runoff patterns affect the use and management of the camp? **(3 points)**
- There will be more water to deal with than the ecosystem can handle
 - Need to find a way for the water to be taken up by transpiration
 - Need to find a way to disperse flows of water so that surface waters are protected from pollution and sedimentation
32. Which of the following will likely be a major problem related to soil on the FLAT part of the amphitheatre? **(3 points)**
- Soil erosion by water
 - Soil compaction
 - Excess illuviation
 - Excess water capacity

33. Between the amphitheatre and the road, there are some shrubs and trees left standing. What is this an example of? **(3 points)**

- A. Integrating cultural and protected landscapes
- B. Poor planning
- C. Not enough money to finish cutting the trees

ADDRESSING SOIL CONCERN IN THE CULTURAL LANDSCAPE

34. Soil compaction is a major concern in cultural landscapes. Which is an example of a Best Management Practice that could lessen soil compaction? **(3 points)**

- A. Increasing organic matter
- B. Grading of lots with heavy equipment
- C. Foot traffic
- D. Vehicle traffic
- E. All of the above are causes of soil compaction

35. What are some of the effects of soil compaction? Circle all that apply. **(3 points)**

- A. Restricted root growth
- B. Decreased storm water runoff
- C. Increased water pollution potential
- D. Lush plant growth
- E. Reduced water holding capacity of the soil

36. Circle all the Best Management Practices that could reduce or prevent soil compaction? **(3 points)**

- A. Use pavement for trails and high use areas
- B. Use mulches over the soil
- C. Use vehicles and equipment with fewer and/or narrower tires
- D. Use vehicles and equipment with more and/or wider tires

37. To create the amphitheatre, the slopes were increased through grading. These resulting slopes were also initially bare of vegetation. This combination of steeper slopes and reduced vegetation can increase the susceptibility of the soil to erosion. If this erosion occurs, what are some possible off-site impacts? Circle all that apply. **(3 points)**

- A. Sediment can build up in stream channels, lowering flow capacity
- B. Water quality can be reduced by a reduction in turbidity
- C. Excess nutrients lost in runoff can impact water quality
- D. Algae blooms

38. Circle all the Best Management Practices that could reduce erosion when constructing landscapes? **(3 points)**
- Fit the development to the terrain
 - Cover the disturbed soils as soon as possible with vegetation or other materials
 - Divert water from disturbed areas
 - Maximize length and steepness of slopes
39. In order for trees to be healthy, the soil needs to be healthy. There needs to be adequate pore space for air and water movement. The soil must hold sufficient water for the trees. There needs to be sufficient amount of organic matter in the soil to maintain a healthy soil ecosystem. Soil disturbance due to the creation of cultural landscapes can have a detrimental effect on trees. Circle all the Best Management Practices that can help maintain a healthy soil and reduce the stress on the trees? **(3 points)**
- Use of mulches or compost
 - Till the soil when it is wet
 - Aerate the soil
 - When using pesticides, be careful to follow labels
40. All forms of wildlife need a good source of clean water. What are some Best Management Practices we can apply to the soil in cultural landscapes to help ensure a good supply of clean water.(Circle all that apply) **(3 points)**
- Encourage the growth of trees rather than grasses
 - Cover areas where vegetation is not desired with wood chips
 - Tillage of compacted soil
 - Reseeding

REFERENCE MATERIAL USED TO DEVELOP TEST

Questions 1-28:	California Land Judging Manual Observation
Questions 29-31:	Urban Soil Primer: pp 24, 25, 27, and 29
Questions 32, 34-36: ;	Urban Soil Compaction Soil Compaction: Detection, Prevention, Alleviation
Questions 33	Current issue reading, first page
Question 37, 38:	Erosion and sedimentation on construction sites Urban Soil Primer
Question 39:	Soil Quality Resource Concerns: Soil Biodiversity Urban soil compaction
Question 40:	Urban Soil Compaction Erosion and sedimentation on construction sites Soil quality resource concerns: soil compaction