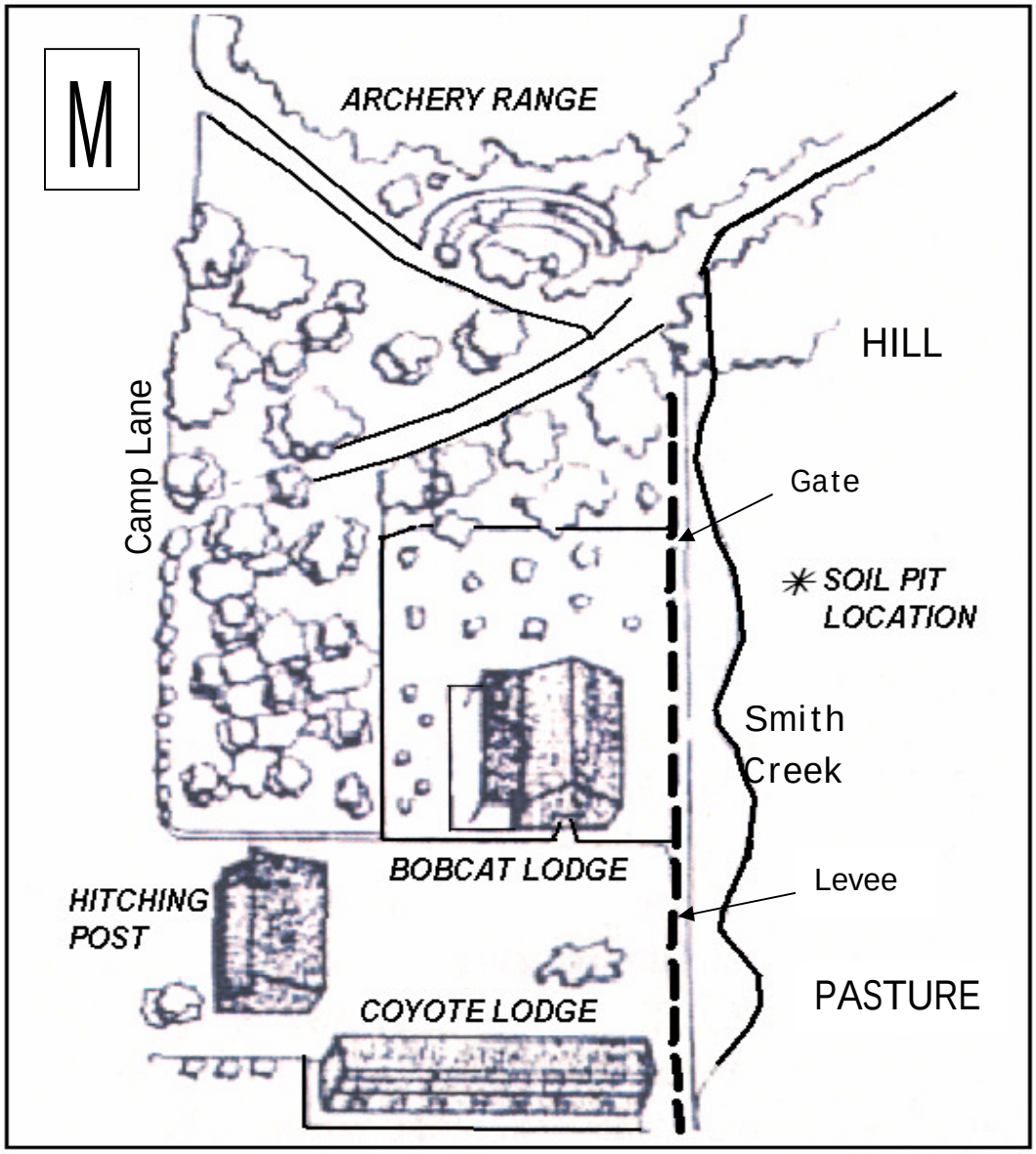
2004 California Envirothon
Soils Station Test
100 points
Suggested Time To Complete This Test - 35 Minutes

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. On multiple choice questions, circle as many letters as apply.

Below is a map of the soils test station. The soils test station should be considered to be the area within the box below. Note that the pasture and the hill on the west side of Smith Creek should be considered when answering the questions.



Introduction: You are a soils consultant hired by Highland Springs Resort to assess the impact of current (and probable future) urban development in the area surrounding the resort. Although to the west and northwest of the resort is the San Bernardino National Forest, directly north of the soils station is land that may potentially be developed in the near future. The resort's guests enjoy their proximity to the National Forest and the hiking, horseback riding and similar recreational activities it offers. You are concerned that increased urban development might impact negatively on the resort. Your task is three-fold. First, collect soil and site properties of the site to obtain baseline data for your client. Next, assess the site for past and present erosion, and address potential erosion problems under increased urban development. Finally, evaluate the

site for specific soil and environmental management concerns you might expect with increased use.

Describe Soil and Site Properties

Answer the following questions by making observations in the soil pit. **Write** your answer in the box to the left of the question

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? **(3 points)**
   A. Sand or loamy sand
   B. Loam, sandy loam, or silt loam
   C. Clay loam, sandy clay loam, or silty clay loam
   D. Clay, sandy clay, or silty clay

3. What is the permeability of the surface layer? **(3 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 first subsoil? **(2 points)**
   A. Very dark
   B. Medium or bright
   C. Very light
   D. Drab or mottled

6. What is the texture of the first subsoil? **(3 points)**
   A. Sand or loamy sand
   B. Loam, sandy loam, or silt loam
   C. Clay loam, sandy clay loam, or silty clay loam
   D. Clay, sandy clay, or silty clay

7. What is the permeability of the first subsoil? **(3 points)**
   A. Rapid
   B. Moderate
   C. Slow

8. What is the thickness of the first subsoil? **(2 points)**

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

9. What is the parent material of the soil at the pit location? **(2 points)**
   A. Lacustrine
   B. Colluvium
   C. Alluvium
   D. Marine Sediment

10. Why is the lower part of the subsoil darker? What explanation can you give for the present location of this subsoil in the profile? **(4 points)**

11. Measure the percent slope of the land between the stakes using the clinometer **and record your reading**. Find a teammate who is your height. Stand at one stake and aim the clinometer at the eye of your teammate who is standing at the other stake. Percent slope is the vertical feet of rise or fall for every 100 feet of horizontal run divided by 100. **(4 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

12. Rate the soil in the pit using the USDA Land Capability Classification System, the answers you obtained from your observations above, and the following information. 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)**

Effective rooting depth:	≥30 inches
Potential Evapotranspiration:	≥14 inches
Surface layer texture:	**your answer from question 2**
Permeability:	**your answer from question 3**

Depth to water table:	>20 inches
Available water capacity:	2.5 inches
Slope:	**your answer from question 11**
Erosion hazard:	moderate
Flooding (chance per year):	<50 percent chance
Frost-free season:	300 days

Your answer here

Class	Effective rooting depth (inches)	Potential Evapotrans-piration	Surface layer texture	Permeability	Depth to water table (inches)	Available water capacity (inches)	Slope (%)	Erosion Hazard	Flooding (%)
I	≥40	≥20	Sandy loam to clay loam	Moderate	>60	≥7.5	< 2	None or slight	< 5
II	≥40	≥14	Loamy sand through clay (may be gravelly)	Rapid through slow	>36	≥5.0	< 8	None to moderate	< 50
III	≥20	≥10	Any (may be gravelly or cobbly)	Rapid through very slow	>20	≥3.5	< 15	None to high	< 50
IV	≥10	≥6	Any (may be very gravelly, very cobbly, or stony)	Any	>20	≥2.5	< 25	Any	< 50
V	≥20	≥6	Any (may be extremely gravelly or extremely cobbly or	Any	Any	≥3.0	< 2	None or slight	Any

			very stony)						
VI	≥10	≥4	Any (may be extremely gravelly or extremely cobbly or very stony)	Any	Any	≥2.0	< 50	Any	Any
VII	Any	≥2	Any	Any	Any	1.0	< 75	Any	Any
VIII	Any	Any	Any	Any	Any	Any	Any	Any	Any

<u>Assessing the site for past and present erosion, and for potential erosion problems under urban development.</u>

Answer the following questions by observing the area around you as delineated in the soils test station map.

13. Name two locations where there is a hazard of soil erosion. **(4 points)**

14. Name two locations where soil is protected from erosion and describe what is protecting the soil. **(8 points)**

15. Name two clues at the site suggesting the creek can flood outside its banks. **(4 points)**

16. Based on the evidence around the creek and the adjacent pasture**,** what is one potential factor that appears to be contributing to current erosion and what is one solution to this problem? **(4 points)**

17. Assuming the area directly to the north were to be developed into houses with streets and sidewalks, describe what would cause the probable increase in erosion of the stream bed and bank? **(4 points)**

18. Preventing erosion is better than trying to fix the damage after it has already occurred. Describe at least three basic principles of erosion control **(Best Management Practices),** that you, as a manager, **would practice to prevent erosion**. **(8 points)**

Evaluate the site for specific soil and environmental management concerns expected under increased use

19. Erosion is a major concern at the urban—forest interface, often as a result of construction activities. Erosion has impacts both at the site where it occurs (onsite impacts) and offsite as well. Describe one onsite and one offsite impact of erosion. **(4 points)**

20. Compaction is another common problem at the urban—forest interface. Define compaction and explain under what (soil) conditions a soil is most vulnerable to compaction. **(4 points)**

21. Compaction influences the movement of air and water in the soil, the ease with which roots can grow and a soil's biological diversity and activity. Compaction results in changes in bulk density and porosity. Describe what happens to these two soil physical properties as compaction occurs. **(6 points)**

22. Describe two management practices to help overcome compaction problems in urban soils. **(4 points)**

23. Excessive phosphorous in runoff waters from fertilized fields may cause an increase in biological growth of algae and aquatic weeds in downstream lakes. This growth of algae and weeds has detrimental effects on using the lakes for fishing, recreation, industry, or drinking water. What is the process causing this rapid growth of algae and weeds called? Write your answer in the box at the left. **(2 points)**

A. Oligotrophia
B. Eutrophication
C. Phosphoresence
D. Hydrotrophia
E. Biophication

24. Heavy metal contamination of soils can become an issue as the city moves into the country and houses are built where old fields and orchards used to be. Describe one method (other than removing it) by which contaminated soils can be managed. **(2 points)**

25. If you were to construct a walking path from the gate, down the levee, across the stream and to the top of the hill what **Best Management Practices** would you **use** to prevent erosion from occurring at each location. (Think about practices you could follow or simple structures you could install.) **(8 points)**