Conservation   Name_____

Fall 2011   Lab Day (circle one): Monday Wednesday

LABORATORY 3: PLU GROUNDS & IRRIGATION

Due October 3rd or 5th

Purpose:

The purposes of this lab are to identify and characterize soil resources on campus, to explore the relationship between the University grounds and the resources needed to maintain the grounds, and to determine which soils are best suited for different uses. By studying the grounds we can help Facilities Management care for PLU land and conserve resources. We will work with **Ken Cote**, PLU Grounds Maintenance Specialist.

Background:

You have various resources that you need to utilize during this lab.

In your textbook, **pages 221-222** are a very important resource. Please review carefully **Section 11.4 Soils** and pay close attention to **Figure 11.14 on page 222**. You will want to refer to this section in your text in answering the questions for this lab.

You are provided with a **SOILS REFERENCE GUIDE** that contains several resources that you will be using during the lab activities. Please refer to this frequently.

Activities:

We will study two different aspects of the grounds: physical characteristics of soils and sprinkler water distribution. The lab has multiple parts:

(1) Examination and description of two different soils from the PLU campus

(2) Mapping and calculation of sprinkler output at a location on the PLU campus

(3) Interpretation of the field data that you have collected, focusing especially on understanding the components necessary for a productive soil and the relationship between soil characteristics and infiltration rates

Two warnings:
- First, the collection of field data for this lab is time consuming. Please pitch in and work efficiently with your peers to ensure that you have the time to collect all of the required field data.
- Second, because we will spend all of our lab time together collecting field data, completion of this lab will require <u>significant</u> time outside of the lab period before you turn it in next week. Please plan ahead!

Given the time commitment required to complete this lab, there are 150 possible points associated with this lab instead of the usual 100.

Part I: PLU SOIL PROFILE DESCRIPTIONS (*40 points*)

We will examine the soil profile at two different locations on campus. Depending upon how quickly we proceed through the lab, **you may visit one or two of these pits**. For each location you visit:

1. Sketch and label the horizons present (making sure to indicate the depth to the boundaries). (*16 points*)

2. Referring to the Soils Reference Guide, describe the <u>color</u>, <u>texture</u> and <u>structure</u> characteristics of each horizon (using the appropriate terminology). (*24 points*)

Site A	Site B

Part II: Mapping Water Distribution of a Sprinkler Array (*38 points*)

We are going to examine the efficiency of sprinkling an area of the PLU campus. To do this, you will first use graph paper and the pacing techniques established in Lab 1 to construct a sketch map of the area. From this sketch map, you will **construct a to-scale map** that shows where the sprinkler heads are located and where each of the catch cans are located. At each catch can, you will also indicate the amount of water that accumulated in each can. Your final **to-scale map** should include (*36 points*):

       i.   A small circle to indicate the presence of each catch can

      ii.   The amount of water that has collected in each catch can

    iii.   'x's to represent sprinkler locations

    iv.   Any other important features (trees, wall, etc.)

     v.   A scale, a title, an author, a date, and a north arrow

     Record the amount of time of the sprinkling period today: _____ (*2 points*)

Part III: Interpretation of Field Data (*72 points*)

In this section you are going to interpret your field data by integrating the soil properties you have observed with the behavior of water in soils. Use your observations in the previous sections, and what you have read about soils on pages 221 and 222 of your text.

1. Compare the soils at Sites A and B (described in Part I. What are the similarities? What are the differences? Consider all characteristics of the soil: structure, texture, color and horizons present (*8 points*).

2. Why do you think the soils are not the same at the two locations? Recall the surrounding features and think about the activities in the area. (*4 points*)

3. Review the descriptions of the constructed soil layers that you have recorded in Part I and explain which horizon would have the highest infiltration rate and which layer would have the lowest infiltration rate. (*4 points*)

4. Which layer(s) would have the highest moisture content after a rainfall event? Why? (*4 points*)

5. How might a soil be modified to enhance its ability to retain moisture (and hence have a higher moisture content)? (*4 points*)

6. How might soil moisture observations vary seasonally in our area (include winter, spring, summer, and fall)? (*8 points*)

7. Given your answer to question 6, briefly describe what you think the annual watering schedule should look like on campus. Consider all four seasons and how the pathways of the hydrologic cycle change on a seasonal timescale. (*8 points*)

8. What characteristics would you want in an ideal soil for a productive garden? Why? (*6 points*)

9. If PLU wants to construct a new sports field, what would be the ideal soil? Why? (*6 points*)

10. Using your map from Part II, qualitatively describe the pattern of water distribution illustrated by the accumulated volume in the catch cans. (*4 points*)

11. Determine the highest and lowest rates of water accumulation in ml/minute and record them below. Show one example calculation. Provide two possible reasons for the variation in accumulation rates. (*8 points*)

12. How could we design a sprinkler system to compensate for the irregular distribution of water from multiple sprinklers in a large area? What other factors or obstacles might have to be taken into consideration to minimize waste of water resources? (*8 points*)