Name _____ Date _____

Climate Change and   *Farmland Soil Quality*

WASHED AWAY

As the climate changes, the frequency and intensity of extreme precipitation is likely to increase. While crops need adequate precipitation throughout their growing cycle, extreme precipitation can erode soil and degrade soil quality.

To determine soil quality, agriculture producers test the pH of soil and the level of nutrients such as nitrogen, phosphorous, and potash. These nutrients are necessary for crop health and production.

In this activity, you will examine the soil quality in an area of an imaginary farm before and after an extreme precipitation event has resulted in erosion of the topsoil.

PREDICTION

I predict that the:

- pH of the topsoil will be **HIGHER / LOWER** than the lower layer.

- Nitrogen of the topsoil will be **HIGHER / LOWER** than the lower layer.

- Phosphorous of the topsoil will be **HIGHER / LOWER** than the lower layer.

- Potash of the topsoil will be **HIGHER / LOWER** than the lower layer.

MATERIALS

- 4 tubes and caps
- 4 soil-testing capsules
- Tube rack
- 3 squeeze-bulb pipettes

- Paper towels
- Beaker of water
- Beaker of soil
- Soil solution

- Soil color chart
- Spoon

SOIL TESTING

1. Follow the instructions provided by your instructor to test your soil.
   a. Place a paper towel under your test tube while conducting the test.
2. Wait the specified time for the soil test to develop.

COMPARING SOIL ON AGRICULTURAL LANDS WITH SOILWEB

In this activity, you will investigate soil characteristics of agricultural land in three areas and at your location. These soil characteristics can help predict how agricultural producers in these areas may be affected by extreme precipitation events. Use a computer or tablet with internet access and follow the instructions below.

   a. Go to the California Soil Resource Lab SoilWeb Apps: casoilresource.lawr.ucdavis.edu/soilweb-apps/
   b. Click on the SoilWeb link.
   c. Click "OK" on the pop-up message.
   d. Click in the upper left corner on Menu.
   e. On the dropdown menu, click Zoom to Location.
   f. In the "Enter a location" box, enter the latitude and longitude for the first location in the Soil Variables table and press Enter.
   g. Locate the soil code for the location and click on that code.
   h. Select the soil component that comprises most of the map unit, the highest percentage.
   i. In the Soil Variables table, record % of slope. Then click on Org Matter (organic matter).
   j. Below the graph, click on the View Source Data link.
   k. Find percent organic matter and pH by water extraction on the data table, and record them in the Soil Variables table.
   l. Click on the blue triangle next to Hydraulic and Erosion Ratings to find Runoff, and record it in the Soil Variables table.
   m. In the left-hand corner, press the Close button until you get back to the Menu button. Repeat steps d-l for the next location until you have completed the first three columns of the Soil Variables table.
   n. Begin at step d to complete the last column of the Soil Variables table for your location. Instead of entering coordinates in step f, click "Use My Current Location." Use the "+" button in the right hand corner to zoom in on the map to find your location, and click on the soil code nearest your location.

SOIL VARIABLES				
LATITUDE, LONGITUDE	**21.5236, -158.0436**	**34.3823, -103.3695**	**36.4554, -120.1225**	**MY LOCATION**
CITY, STATE	Wahiawa, Hawaii	Clovis, New Mexico	Five Points, California	
% SLOPE				
ORGANIC MATTER AT 0CM				
PH BY WATER EXTRACTION AT 0CM				
RUNOFF				

SOILWEB CONCLUSIONS

1. Organic matter comes from the tissues of plants, animals, or microorganisms that are currently or were once living. In the soil, organic matter can be a source of nutrients for crops. In general, areas with higher organic matter tend to have soils with higher levels of nutrients.

   Which location or locations likely have the highest nutrient levels for crops? How do you know?

2. Which location or locations have the highest potential for runoff, which could result in the erosion of soil by water?

3. Would the soil in your location likely have favorable nutrient content and pH for crop growth? Why or why not?

4. How could an agricultural producer use SoilWeb to help in the decision to purchase a piece of land as a potential crop field?

Return to Soil Testing
1. Examine the tubes and compare to the corresponding charts to determine pH and nutrient levels.
2. Complete your group's data table and the whole class data tables.

DATA & ANALYSIS
Your Group's Data Table

GROUP NUMBER _____				
SOIL LOCATION (topsoil or lower layer)	PH (number)	NITROGEN (high, medium, low, or very low)	PHOSPHOROUS (high, medium, low, or very low)	POTASH (high, medium, low, or very low)

CLASS DATA TABLES
pH: record the pH level of each group as a number.

TOPSOIL		LOWER LAYER	
GROUP NUMBER	PH	GROUP NUMBER	PH
MEAN		MEAN	

NUTRIENTS: record nutrient levels of each group as **high, medium, low, or very low**.

	TOPSOIL				LOWER LAYER		
GROUP	NITROGEN	PHOSPHOROUS	POTASH	GROUP	NITROGEN	PHOSPHOROUS	POTASH
MOST COMMON LEVEL				MOST COMMON LEVEL			

RESULTS

1. pH was higher in the:

        A. TOPSOIL   **B. LOWER LAYER**   **C. NEITHER (SAME)**

2. Nitrogen tended to be higher in the:

        A. TOPSOIL   **B. LOWER LAYER**   **C. NEITHER (SAME)**

3. Phosphorus tended to be higher in the:

        A. TOPSOIL   **B. LOWER LAYER**   **C. NEITHER (SAME)**

4. Potash tended to be higher in the:

        A. TOPSOIL   **B. LOWER LAYER**   **C. NEITHER (SAME)**

SOIL TESTING CONCLUSIONS

1. How do you think the affected area of our imaginary farm changed physically? In other words, what changes in the way the area looked would we have seen before and after the extreme precipitation event?

2. Think about the nutrient levels in the lower layer of soil in the affected area of our imaginary farm after the extreme precipitation event. How were the resources, especially the nutrients, available for the crops affected by the precipitation event?

3. How would the crops in the affected area of our imaginary farm be impacted by the changes in nutrients after the extreme precipitation event?

4. How will the increasing frequency of extreme precipitation events affect agricultural producers? List any effects that you can imagine producers will experience as a result of extreme precipitation events.

5. Using your knowledge of climate change, list at least two other ways that our changing climate will impact agricultural producers.