Name: _____

Five Essential Functions

Aligned to the following standards:
CS.03; CS.04; CS.06; NRS.02; NRS.04; FFA.PL-A; FFA.PL-B; FFA.CS-M; FFA.CS-N; AG3; AG4; AG6; AG-NR2; AG-NR4; CCSS.ELA.SL.9-10.1; CCSS.ELA.RST.9-10.3; HS-ESS3-1; CCSS..MP3; CCSS..MP6; CRP.02; CRP.04; CRP.05

Part 1

Directions:

Obtain a soil sample from your teacher to use for this activity. You will visit five stations, one for each of the five essential functions of soil. Follow the directions listed below for each station and record your observations for each essential function of soil.

My Soil Sample	

Station 1: Regulating Water

Directions:

1. Fill a clear plastic cup with soil, packing it gently
2. Poke a small hole at the bottom of the cup and hold it over another cup
3. Slowly pour 25 mL of water over the soil
4. Time how long it takes for water to start dripping into the bottom cup
5. After five minutes, use the graduated cylinder to measure how much water is in the bottom cup
6. Calculate how much water has soaked into the soil sample by subtracting the amount of water collected in the cup from the initial 25 mL.
7. Record these figures below and answer the analysis questions

Time until water started dripping	
Water collected in cup	
Water soaked into soil	

Analysis Questions:

1. How did your soil sample perform in this test? Did it hold a lot of water or a little? What do you think this means for its ability to support plant life? (Explain in one or two sentences.)

2. What impact do you believe your soil sample's ability to regulate water would have on plants growing in this soil?

Station 2: Sustaining Plant and Animal Life

Directions:

1. Obtain the container matching your assigned soil sample in which your teacher planted radish seeds.
2. Observe the sprouts in the container; count how many seeds have sprouted (out of 20) and record how the sprouts look. Make any observations you deem appropriate (color, size, strength, etc.).

Number of Sprouts	Observations:

Name: _____

Analysis Questions:

1. What percentage of the seeds that your teacher planted have sprouted?

2. What does this indicate about the ability of this soil to sustain plant life?

Station 3: Filtering and Buffering Pollutants

Directions:

1. Cut a plastic bottle in half, flip the top upside down to act as a funnel and place it in the bottom part of the bottle.
2. Place your soil sample in the funnel portion of the bottle and lightly pack it.
3. Pour "polluted water" (provided by your teacher) over your soil sample so that it saturates and drips through into the bottom portion of the bottle.
4. Compare the original "polluted water" to the water that has been filtered through your soil sample and observe changes in color, clarity and physical pollutants.

Original Polluted Water Sample	**Soil-Filtered Water Sample**

Analysis Questions:

1. What did you expect to happen to the water sample as it went through your soil? How did that differ from what actually happened?

2. Did any pollutants seem to get through the soil "filter"? Why do you think this happened?

3. Why is it important for soil to filter and buffer pollutants? What impact does that have on plants, animals and the environment?

Name: _____

Station 4: Cycling Nutrients

Directions:

1. Obtain the sample of your soil in which your teacher buried leaves/organic matter.
2. Dig around in the soil to find the organic matter that has been buried.
3. Compare it to the pre-burial pictures provided by your teacher.
4. Note any physical changes you see in the organic material.

Observations	
Pre-Burial Pictures	**Current State of Organic Matter**

Analysis Questions:

1. What condition was the buried material in when you found it?
2. What might affect how quickly organic material decomposes in soil?
3. What would happen if this process didn't occur in ecosystems?

Station 5: Providing Physical Stability

Directions:

1. Obtain a small, dried ball of your assigned soil sample.
2. Weigh one of the small weights provided by your teacher; record that figure here: _____.
3. Stack the small weights provided by your teacher on the ball one at a time until it begins to crumble and break apart
4. In the table below, note how many weights you stacked on the sample before it broke apart.
5. Calculate how much weight your soil sample was able to withstand by multiplying the number of weights by the weight of the material you recorded above. Record that total weight in the table below.

Number of Weights Stacked	**Total Weight Until Crumbling**

Analysis Questions:

1. How easily did your soil ball crumble? What does that tell you?
2. How does soil structure help plants stay upright and survive wind/rain?

Name: _____

Part 2

Directions:

Group up with other pairs of students so your group has every soil sample represented. Share about your soil sample and how it performed in each test, and discuss which soil sample(s) you believe best performed the five essential functions of soil. Answer the questions below as you have your group discussion.

1. As a group, discuss how each soil sample performed in all the tests. In the table below, state the soil sample you believe performed best in each test.

Essential Function Test	Best Performing Soil Sample
Regulating Water	
Sustaining Plant and Animal Life	
Filtering and Buffering Pollutants	
Cycling Nutrients	
Providing Physical Stability	

2. Which soil sample performed best overall? Looking at this soil sample, why do you think it outperformed the others?

3. Why is water infiltration important for agriculture?

4. How might soil life (like bacteria and earthworms) help plants grow?

5. How could this soil filtering ability affect nearby lakes, rivers or other water sources?

6. Why is decomposition and nutrient cycling an important part of soil health?

7. Why might compacted or weak soil be a problem for construction or agriculture?

8. Do you think it would be easy to perfectly balance all five essential functions of soil? Why or why not?