UF|CPET

FFL Principle 3- Fertilize Appropriately
High School

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Program Type: 5E model lesson on Fertilizer application	**Duration:** 150 minutes

Standards:

SC.912.L.17.8: Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

SC.912.L.17.20: Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

This activity can also be applied to the soil and nutrient cycling activities within Big Idea 4 for AP Biology.

Learning Objectives:

1. Test the soil to see what nutrients it has and if it needs fertilizer.
2. Apply different amounts of fertilizer and observe what happens to the water that runs off.
3. Look at the data, make graphs, and figure out what it means.
4. Change one part of the experiment and test a new idea.
5. Share your results and explain how to fertilize in a way that protects the environment.

Guiding Questions:

1. How do we know if soil needs fertilizer?
2. What happens to fertilizer after it rains?
3. How can too much fertilizer affect nearby water bodies?
4. What do our data and observations tell us about fertilizer runoff?
5. What are some smart ways we can use fertilizer to protect the environment?

Intended Outcomes

As a result of the program, what I want my audience to LEARN…	**As a result of the program, I want my audience to ACT by…**	**Assessment: (*How will you know* your audience has reached your intended outcomes)**
How to determine when fertilization is necessary based on soil nutrient levels. The role of nitrogen, phosphorus, and potassium in plant health and how excess nutrients affect ecosystems. How improper fertilization contributes to nutrient runoff and eutrophication in Florida's aquatic environments.	Applying proper fertilization practices based on soil test results and plant needs. Avoiding fertilizer application before heavy rainfall and within 10 feet of water bodies. Sharing knowledge with peers, family, or community members about responsible fertilizer use and its impact on local waterways.	**Formative Assessments:** Observation checklists during soil testing, fertilization simulations, and runoff analysis. Student responses in group discussions, claim-evidence-reasoning activities, and reflective prompts. Completion of a KWL chart that demonstrates a shift from misconceptions to accurate understanding.

Schedule Layout:	**Items Needed:**
Day 1: Engage & Soil Testing ***Objective:*** Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.	Soil samples and test kits

Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

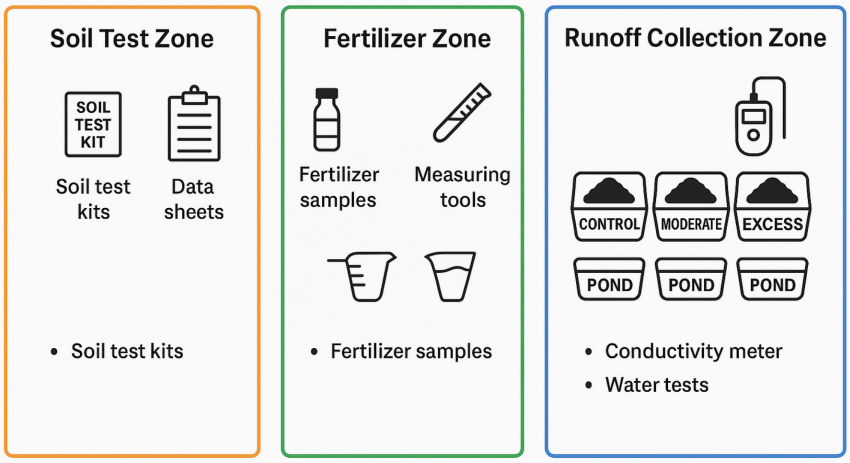
1. Show students an image or short video of algal blooms in Florida water bodies. 2. Discuss the environmental effects of fertilizer runoff. 3. Hand out KWL charts. Students fill in the "Know" and "Want to know" sections. 4. Divide class into small groups (3-5 students each) an distribute 5. Distribute soil samples, gloves, and soil test kits. 6. Guide students to test for pH, nitrogen (N), phosphorus (P), potassium (K), iron (Fe), and magnesium (Mg). 7. Record results on provided lab sheet or spreadsheet.	
Day 2 – Explore (Part 2) Fertilizer Application & Runoff Setup ***Objective:*** Apply varying amounts of fertilizer and simulate runoff. 1. Review soil test results and assign treatment groups: ○ Group A: Control (no fertilizer) ○ Group B: Moderate fertilizer (based on IFAS guidelines) ○ Group C: Excess fertilizer (2x guideline) 2. Distribute fertilizer samples and measuring tools. 3. Students apply the fertilizer to their labeled plots or containers. 4. Simulate rainfall using watering cans or graduated droppers. 5. Collect runoff in labeled "pond" containers. 6. Store collected water for testing the next day.	Planting containers and fertilizers
Day 3 – Explain: Water Testing & Explanation **Objective:** Test runoff water for indicators of eutrophication. 1. Distribute runoff samples from each group. 2. Provide water quality testing kits (nitrate, phosphate, turbidity, conductivity). 3. Students perform water tests and record data. 4. Groups graph results using bar or line graphs. 5. Facilitate a class discussion: ○ How did nutrient levels vary between groups? ○ What might happen if this runoff entered a lake or river? 6. Present mini-lecture on nutrient cycles and eutrophication	Run off water and test kits
Day 4 – Elaborate & Extension Activity **Objective:** Deepen investigation with a new variable or hypothesis. 1. Groups plan a second experiment testing a new factor: ○ Organic vs. synthetic fertilizer ○ Fertilizer on mulch vs. bare soil ○ Fertilization before vs. after simulated rain 2. Complete a planning sheet: ○ Hypothesis ○ Independent and dependent variables ○ Materials and procedure	soil and containers if new experiments are set up

3. Begin extended setup and data collection.	
Day 5 – Evaluate & Presentations **Objective:** Analyze data, reflect, and demonstrate learning. 1. Groups finalize data tables and graphs. 2. Each group presents findings (poster or short slide deck). 3. Students complete a reflection: *"How can smart fertilization protect Florida waters?"* 4. Administer a quiz on nutrient cycles, fertilizer impact, and eutrophication. 5. Exit slip: One way I will fertilize smarter is...	Evaluation rubric

Details:

Activity Set-Up:

Work Zones



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Materials Checklist

- Soil samples
- Soil test kits (N, P, K, pH, Fe, Mg)
- Fertilizer samples (synthetic and/or organic)
- Measuring tools (spoons, scales)
- Planting containers or trays
- Watering cans or droppers
- Runoff collection trays labeled "ponds"
- Water quality test kits
- Lab data sheets / Chromebooks
- KWL charts, planning sheets, reflection pages, quiz