A Wetland System: Vegetation & Soil Types

Created and delivered by **Ursula Sherrill**, Biology M.S. candidate
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TEKS Objectives

6.5 Scientific concepts. The student knows that systems may combine with other systems to form a larger system.
(A) Identify & describe a system that results from the combination of two or more systems such as in the solar system. Specifications: Explain what happens to a system if one of its parts ceases to function. Students will be able to describe the parts of a system and the function of these parts.

References

Chihuahuan Desert Nature Park's *School Desert Discovery* (Rev. 2/2005)

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Lougheed VL, Crosbie B, Chow-Fraser P. 2001. Primary determinants of macrophyte community structure in 62 marshes across the Great Lakes basin: latitude, land use, and water quality effects. *Canadian Journal of Fish & Aquatic Science.* 58,1603-1612.

MitschWJ, Gosselink JG. 2000. *Wetlands.* John Wiley & Sons: New York, 231-258.

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Materials Required

Groundwater/aquifer model
Neon food color
Dried Pinto beans
Plastic 6oz cups
Potting soil
Rio Bosque soil from native plant colony
Rio Bosque soil from under salt cedar trees
Metallic stars
Cup labels

Banner paper
Double-sided tape
Post-it-notes

A Wetland System: Vegetation and Soil Types. Part One

At the 6th grade science lab period prior to the field trip, introduce the Systems Unit. The scientific concept employed here is that wetlands are systems containing interrelated subsystems, and the whole is part of the larger ecosystem. The soil subsystem supports biodiversity of producers but invasion by exotic non-native plants hinders this function.

Preparation

Obtain all materials, including three soil types. Affix labels on cups and add colored stars coded for soil type, or use another way to identify soil type at a glance. Punch holes with box cutter in cup bottom, fill with soil and store in high-sided trays for easy transport to school next day. Soak in water overnight to be ready for planting seed.

Obtain a working plexiglass model of groundwater/aquifer to show in classes. Plan for about one half hour to set up experiment before classes begin, including transporting materials from car to classroom, storing trays of cups, watering as needed, and setting up groundwater model. Flush model with clear water between each class if possible to prevent staining from food coloring. Reserve one hour to flush coloring completely after last class.

Engagement

Use questions to engage students and elicit preconceptions about the Rio Bosque Wetland, such as "Why do you think Rio Bosque wetland can be called a system? What are some of its parts we can call subsystems? We're focusing on one part of the wetland system there - the soil subsystem. What happens in the soil that makes it a system or subsystem? How do you think that non-native plants could become a problem in the soil? In nature?"
Finally in discussion, formulate a question, prediction, and hypothesis about soil type as most likely to promote seed germination and plant growth.

Exploration

After these discussions students get into groups of three. Ask for volunteers or appoint students to distribute soil-filled cups (in mini-trays for less mud on desks), indelible markers to label cups with their name and group number, beans and paper towels.

Students plant two dried pinto beans in cups of moist soil obtained from 1) a seepweed native plant colony, 2) a salt cedar exotic plant colony (but called mystery soil until results were analyzed), and 3) a commercial potting soil mix. Students label their cups and store them in trays to be watered from the bottom (maintain consistent moisture) and kept in a warm, humid location. After planting seeds, volunteers collect markers and cups in trays. Students clean up and wash hands. While students are planting beans, do final set up of groundwater/aquifer model on table within easy view of all.

At end of this activity, **Explain** how this experiment is related to mentor's research. Present research in context of growing understanding of soil system ecology.

Engage and Explore

Next, briefly introduce groundwater model, its parts, and elicit preconceptions of groundwater to help students conceptualize and visualize wetland hydrology. Students observe a plexiglass tabletop

groundwater model in which they can inject colored water into wells, a lake, and a leaking landfill to trace the path and identify potential dangers of a "pollutant" entering the groundwater.

Explain and Elaborate

Discussion of ground water issues related to drought, conservation, well protection, the Hueco Bolson aquifer and drinking water in the Chihuahuan Desert, especially El Paso.

Lesson Vocabulary

Wetland, Replacement Wetland, Water Cycle, Groundwater, Nutrient Cycle, Soil & Groundwater Salinity, Native Plant, Non-native Plant.

Evaluation

Students are asked to begin work on a paragraph of four sentences or more to discuss their expectations of Rio Bosque Wetland, and how it is a system made up of subsystems.

Safety Information

Students wash their hands after planting seeds to avoid contamination with soil-borne pathogens.

A Wetland System: Vegetation and Soil Types. Part Two

Scientific concept: A wetland is a system composed of dynamic subsystems, including the water cycle, the soil and the web of producers, consumers, and decomposers that support the ecosystem.

Engagement

Use questions to engage students and help them compare preconceptions with what they saw at Rio Bosque Wetland. Examples: Were you surprised or disappointed by what you saw? Or did Rio Bosque meet your expectations? Were some areas dry? Why do you think that was? Where does the water come from? What do you think about recycling water? Finally, review the questions, predictions, and hypotheses students made about the soil type(s) most likely to promote seed germination and plant growth. Make a transition to begin examining the results of germination experiment. **Explain** germination.

Exploration: Data & Graphing

Ask volunteers to take cups to the groups and hand out lab work sheets to each student. Front sheet has data table above and space below to write a paragraph. Graph paper is attached. Students observe, record group germination incidence. Afterwards, student groups put a post-it note on the class data table color-coded for germination per soil type. Introduce activity of calculating germination percentages for the class.

Explanation

Pose question to students about how to calculate percent germination. Set an easy, non-critical tone, and ask for volunteers to do the math on board (with support from teacher and mentor). Use humor, self-revelation about former attitudes toward math. For each type soil, students in seats assist classmates at board in calculation. Involve as many student volunteers as possible to calculate, construct bar on graph.

Students draw graph on their own graph paper. Discuss axes, labeling, units, and legend are all parts of graph for full credit. **Elaboration, Extension:** Class discussion to analyze results & draw conclusions. Was hypothesis accepted or rejected? Why, why not? Review variables - manipulated & responding. Pose question of why germination occurred where unexpected (in soil from under salt cedars in this case), and no germination occurred where it was expected to be the best (Native plant soil). Volunteers collect plants again. Students put worksheets in designated place.

Evaluation

Students to read their paragraphs about Rio Bosque. Discussion.

Fun! Elaboration

Students are asked to mimic the sounds or rhythms of the wetland to recall the parts that comprise the whole system. Students in turn made sounds of crickets, wind in trees, bird calls, a bird splashing in the water, sounds from surrounding neighborhoods, while walking on gravel trail, school bus bumping along, and crunching through the plants with butterfly nets. One student had heard a hawk take flight, and made the sound of its wings beating through air. Students recalled seeing a snake, tarantula's web, and animal scat on a dirt road, wasps and butterflies.

Peer Review

I reviewed this lesson with my co-teacher, with the GK-12 program coordinator, and sent copy to my advisor, although we did not get to discuss the lesson at length.