

EPSCoR Curriculum Units  
– Draft Descriptions –  
May 24, 2021

ELEMENTARY UNIT #1

***Pond Scum***

Driving Question: In some bodies of water, we see a lot of pond scum and in others, we see none. Why does this occur? Is there anything we can do to make it go away?

This unit will have students “Seeing Green” as they explore aquatic ecosystems to discover what pond scum is and what it needs to thrive. They will also closely examine how environmental factors and interactions across communities support these needs. In the culminating activity, students will use what they have learned to address a community issue where pond scum has taken over the local pond. Students will evaluate the situation and decide what, if any, steps should be taken.

Main themes: Interdependent Relationships in Ecosystems/ Ecosystem Interactions and Human Activity

Predominant Crosscutting Concept: Systems and System Models

ELEMENTARY UNIT #2

***What's in My Water Bottle***

In the elementary grades, students are learning that organisms have unique and diverse life cycles, as well as that when an environment changes, organisms may survive and reproduce, move to new locations, or die. In the “What’s in My Water Bottle” unit, students will kick-off the unit with an exploration of a water bottle that has been sitting in the classroom. Students take time to notice and wonder about the organisms that may be living in the water bottle. This anchoring phenomenon will allow students to wonder and generate questions about what might happen to a water bottle and its contents when left for several days or weeks. Biofilms are introduced through student experiences with the water bottle as well as other supporting phenomena, such as areas in their school and home or outdoors that support the growth of biofilms - a teacher’s coffee cup, the drinking fountain, sinks, ripening fruit and vegetables, a nearby creek, etc. Students use their experiences with these phenomena to look for patterns and construct explanations about common conditions needed for biofilm growth and survival. Students conclude the unit by thinking about how what they know about biofilms can help them to design a water bottle that would inhibit the growth of biofilms.

MIDDLE SCHOOL UNIT #1

***Biofilms- Stuck Like Glue, Stuck On You***

Dental plaque is the over-arching unit phenomenon for this 5-lesson middle school curriculum module. Students explore a multitude of biofilms across a wide range of environments, including the biofilms found underground and at the Waste Water Treatment Plant of the Sanford Underground Research Facility. The unit concludes with an exploration of engineering methods for both inhibiting harmful biofilms and encouraging beneficial ones.

## MIDDLE SCHOOL UNIT #2

### ***Dead in the Water***

Students will discover that actions taken in South Dakota influence an algal bloom in the Gulf of Mexico, creating a dead-zone where oxygen is depleted and where many ocean organisms are unable to survive. One of the main causes of the algal blooms (nitrogen) will be discussed, as well as the sources of that nitrogen. Students will explore different solutions to this problem, including research in SD to increase soybean use of root nodules (a biofilm community of bacteria) to help fix more atmospheric nitrogen, thus reducing the amount of fertilizer needed..

## HIGH SCHOOL UNIT #1

### ***Water Quality***

Students develop an understanding of the importance of clean water for drinking and the environment as they explore the chemistry and biochemistry, including bacteria and biofilms, of corrosion. Using the Waste Water Treatment Plant at SURF as an example, they explore the roles of three different processes - filtration, chemical and biological - in cleaning up contaminated water.

## HIGH SCHOOL UNIT #2

### ***Biofilms in the Human Body***

Mucus, snot, and phlegm serve as the anchoring phenomena for this 5-lesson high school curriculum module. Students investigate the protective function of mucus using model "snot," act-out scenarios in explaining why biofilm infections are resistant to antibiotic treatment, explore a variety of biofilm-associated human diseases, and examine a dental office case study before analyzing possible methods of preventing biofilm-associated human disease.