Scooping for Clean Water

Pacific Shellfish Institute

Aimee Christy, aimee@pacshell.org or Mary Middleton, middleton@pacshell.org
Pacific Shellfish Institute, 360-754-2741, www.pacshell.org

Grades 5-10
50-60 minutes.

Overview

This program introduces students to fecal bacteria pollution: What is it? Where does it come from? How does it make its way into lakes and Puget Sound? Why do we care and what can we do? For a field component student's walk to a nearby park where they will use Field Investigation notebooks to map and label their survey site, collect data and reflect on their findings.

Students from Chambers Prairie Elementary map their survey plot.

Introduction:

Puget Sound is home to abundant shellfish resources. What are shellfish? Oysters, Mussels, Clams and Geoduck are popular recreationally and commercially harvested shellfish in Washington State. Shellfish are filter feeders, which means they filter their food out of the water. The geoduck model is a good example of a filter feeder, these animals live deep in the mud and are able to stretch their siphon to the surface to suck water in, filter their food out, and then spit out what they don't want from the other hole in their siphon. Because they are filter feeders, water quality is very important to all our species of shellfish. They need clean water to filter; not only for their health, but also what do we like to do with shellfish? Eat them! We want to make sure they are not filtering anything out of the water that might make us sick when we eat them. Being able to eat our

Standards

Common Core Standards:

Science and Technical Subjects, SL.8.1: *Reading science and technical subjects: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table)*

Reading #4: *Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a topic or subject area*

Writing #9: *Draw evidence from literary or informational texts to support analysis, reflection, and research*

Next Generation Science Standards:

MS-ESS3-3: *Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment*

Science and Engineering Practices –Asking questions, Developing and using models, Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations

Disciplinary Core ideas – ESS3.C Human impacts on earth systems

Crosscutting concepts – patterns, cause and effect, systems and system models

shellfish is a great indicator of how clean the water is, and even if we're not going to eat the shellfish there is a lot of other wildlife that depend on a healthy marine environment with clean water. Also, if we can't eat shellfish out of Puget Sound we may not be able to enjoy many other activities on and around the water like swimming and fishing.

What might be in the water that would make our shellfish unsafe to eat? The Health Department monitors waters for fecal coliform bacteria; do you know what that is? Fecal coliform bacteria are in the bodies of all warm blooded animals; can you name some warm blooded animals? We all have fecal coliform bacteria in our bodies and it's not necessarily bad, it helps us digest our food, but if it's found in the water what does it tell us is in the water? Poop! That poop could carry harmful pathogens that could make us very sick, such as salmonella, giardia, and e-coli. Fecal coliform bacteria is used as an indicator of how much poop is in the water, so the health department can make sure shellfish harvest areas are safe and clean, and they also test swimming areas as well.

In 2001 the Thurston County Department of Environmental Health tested the bacteria in Woodland Creek, which is one of the main creeks that run through Lacey and into the southern end of Henderson Inlet. They used microbial source tracking, this looks at the DNA of the bacteria and can tell what animal the bacteria came from. What source do you think most of the bacteria in Henderson Inlet were from? People! That indicates that there are septic systems that are not functioning properly and these are letting human waste into the water. What do you think the second most common source was? Dogs! Wherever there are a lot of people, there are usually a lot of dogs. Also, where there are many people there are usually lots of streets, sidewalks, parking lots and other hard surfaces. Our neighborhoods are also set up with storm drains and drainage ditches to keep our homes from flooding. These storm drains act as water slides to the nearest water body carrying with it anything that washes from our streets and sidewalks. Dog waste also contains a high concentration of bacteria, about twice as much as humans, and much more than vegetarian animals like deer, birds, cows, etc.

Pet Waste Math: How many of you have dogs? Have the students raise their hands and put up the number of fingers to indicate how many dogs they have. Add up all the dogs in the class and fill in the calculations below (the average dog poops 0.5 pounds/day).

Dogs in class x 0.5 lbs of poop/day = pounds of dog poop per day produced by the class's dogs. Multiply this number by 365 to get the amount of dog poop produced per year by the class's dogs.

That's just this group, how many dogs do you think live in Thurston County? Animal Services estimates there are about 45,000 dogs in Thurston County. 45,000 dogs pooping 0.5 pounds of poop per day is 22,500 pounds of dog poop produced every day in Thurston County. Does all that poop end up in the water? All our water bodies would smell pretty bad if it did, where does some of it go? Trash, in the ground. Throwing your pet's waste in the trash is the best way to make sure that bacteria stay so out of the water. If your dog poops somewhere where there are a lot of plants and trees around then when it rains the water will soak into the ground and a lot of that bacteria will be filtered out by the soil. That is why it's important to have plants around our

water bodies. Giving the water a chance to filter into the ground instead of just running off a hard surface will make it a lot cleaner when it reaches the nearest water body.

Scoopy Doo Demo: Select 2 volunteers from the class. Have one put on the Scoopy Doo mascot head and give them the fake poop. Give the other volunteer a bag. This is Scoopy Doo and this is his/her responsible pet owner who is going to take Scoopy for a walk, and then Scoopy is going to do his/her "business" and our pet owner is going to pick it up. Fun and giggling ensue.

This silly demonstration shows that it's quick and easy to clean up after our pets. It's gross, and no one wants to do it but it is part of being a pet owner. Also, picking our dog's poop is an easy way to really make a difference on the water quality in your watershed. We may not be able to control the poop from birds and other wildlife, but it is very easy to make sure our pets are not contributing to the bacterial contamination of our water bodies.

Field Component: Locate a park nearby your school to conduct a field investigation. Using the Pet Waste Survey Field Observations Journals students can map and collect data while flagging poop piles at the park. Before going into the field have the students read the poster, *Stormwater Pollution Problem: Pet Waste*, and fill out page 3 of their field journal. Also, go over the guidelines and survey procedures before leaving for the field trip.

Once students arrive at the park, have them map their survey location on page 5 of their journal. Using the survey flags have students look for pet waste and place a flag next to each pile they find. Once they have completed their survey area flags can be counted as they are removed and the total number can be recorded on page 7 of the field journal. Students can record additional observations on this page as well. Once the survey is completed and the data is collected students can answer the other questions in the journal either while still in the field or back in the classroom.

Data collected can be sent to Jennifer Johnson, Thurston County Public Health and Social Services Department, johnsoj@co.thurston.wa.us.

Lab Component: For this component you will need to incubate your sample for 24 hours at 44.5°C. If you do not have access to an incubator please contact the Pacific Shellfish Institute to arrange to use theirs.

Locate a stream or water body nearby your school to collect a water sample from. Following the Fecal Coliform Monitoring Instructions provided, collect a water sample using the sterile sampling container. Hold the sample bottle by the bottom and unscrew the bottle cap; hold the cap in one hand. Turn the bottle upside down and plunge it straight down into the water. When the bottle is completely submerged, tip the bottle opening up and into the current at about a 45 degree angle. Fill the bottle completely. Take the bottle out of the stream and pour off enough water to leave about 1 inch of air space. Cap the bottle immediately. Cover the top of the bottle with a piece of aluminum foil.

Return to the classroom and follow the Laboratory analysis instructions provided. Once the samples are prepared, incubate for 24 hours at 44.5°C. After incubating the samples count the fecal coliform colonies, these will appear as blue dots on the filter. Multiply by the necessary factor (multiply by 2 for 50 ml of water to get the number of colonies per 100 ml).

Additional Resources:

Pacific Shellfish Institute, Pet Waste Education. http://www.pacshell.org/pet-waste.asp.

Thurston County Natural Resource Planning – Shellfish Protection. The connection between Pet Waste and Water Quality. http://www.co.thurston.wa.us/planning/natural-res/shellfish-pet-waste.htm.

Glossary:

Bivalve Shellfish: Marine and freshwater molluscs with a shell consisting of 2 hinged parts.

Fecal coliform: Bacteria that live in the intestines of warm-blooded animals.

Indicator species: A species whose abundance is believed to indicate certain environmental or ecological conditions or suitable conditions for a group of other species.

Impervious surface: artificial structures, such as roads, sidewalks, driveways, and parking lots, that are covered by impenetrable material such as asphalt, concrete, brick, or stone.

Nonpoint source pollution: Pollution that comes from many different sources. Unlike pollution from industrial and sewage treatment plants. Caused by rainfall or snowmelt moving over and through the ground.

Urban: An area characterized by high human population density and vast human-built features in comparison to the areas surrounding it.

Watershed: An area of land where all the water drains off and goes into the same place. Divided by hills and mountains.

Aknowledgements:

Pet Waste Education – Dooing something about it! Is funded by the Henderson-Nisqually Shellfish Protection District funds and The Russell Family Foundation.