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STEM-8

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Draft of “We Can Save the World” Application for Seimans

Step 1:

Our team chose the topic of erosion into bodies of water. We attend Roland Park Country School in Baltimore, MD. Our school has 20 acres of forest on campus which we use for experiments in science class. There are different types of erosion barriers on campus, and in some places there are no barriers at all. The erosion going into our backwoods can affect the health of the ecosystem. Erosion can kill grasses in a body of water that take advantage of the nutrients in the water. This allows algae to absorb the nutrients and grow in abundance. Algae can block sunlight from reaching organisms below the surface of the water, causing them to die. Also, erosion can kill organisms living in an ecosystem. The Chesapeake Bay’s bad health can affect our economy due to our reliance on its resources such as fishing and recreation. The money that could be received could be used to benefit the Maryland community. Additionally if the RPCS’s ecosystem is not healthy, our backwoods could not be used as an educational tool for our science classes. The experiments/tests we would conduct in the backwoods would not be accurate because of the poor health of the ecosystem.

A major issue which affects the turbidity of our streams in the backwoods is that our school is on a hill with our woods at the bottom. Therefore, if there is a lot of precipitation, erosion runs-off directly into our stream. Erosion causes turbidity; turbidity is harmful because it can kill organisms, block sunlight, and affect the health of the ecosystem.

Our primary goal is proving that erosion is an issue and finding the best barrier solution to control it. We would then like to install that solution everywhere possible in our backwoods.

Step 2:

Some things that really alarmed us during our research were the consequences that could occur due to erosion. We found that erosion kills organisms in the water by blocking sunlight and making the water a more difficult environment for organisms to live in. This is because the water is not clear and healthy for organisms to live in and blocks the sunlight that they need to survive.

We decided that this issue was something that could greatly affect our backwoods, leading us to wonder what type of barrier could help reduce that amount of erosion into our streams. Besides the RPCS backwoods, there are many other streams in ecosystems around Maryland that could greatly affected by erosion, including the Chesapeake Bay. Just last year the Chesapeake Bay scored 38%, a D+, in overall health. This is a huge issue because the many streams throughout Maryland—including the steam in our back woods—lead into the Chesapeake Bay. The bay has a water-shed of 11,600 km. Bay grasses and other submerged aquatic vegetation suffer from high turbidity due to lack of sunlight. In 2011, the Chesapeake Bay reached its all-time high of 25.847 tons of sediment, about a 19 ton difference from 2010

Bay grasses are a crucial part of the Chesapeake Bay eco system. In 2007, the population of bay grasses decreased 25%. This is an issue because bay grasses provide underwater life with food and habitat, absorb nutrients, trap sediment, reduce erosion, and add oxygen to water. Therefore the condition of the bay’s bay grasses are a good signal of healthy water.

Citations for research:

1. Water Treatment Solutions, accessed December 2nd, 2012:<http://www.lenntech.com/turbidity.htm>
2. Turbidity Measurement, accessed December 2nd, 2012: <http://www.who.int/water_sanitation_health/hygiene/emergencies/fs2_33.pdf>
3. Raders Geography 4 Kids, accessed December 4th, 2012: <http://www.geography4kids.com/files/land_erosion.html>
4. Chesapeake Bay Program, accessed January 11, 2013 <http://www.chesapeakebay.net/issues/issue/bay_grasses#inline>
5. The Examiner Newspaper, accessed January 11, 2013 <http://washingtonexaminer.com/article/63832>

Step 3:

Our team researched the different types of barriers that could prevent erosion into streams. We also researched reliable devices to accurately measure the amount of turbidity in water. We plan on testing various locations in our backwoods with different erosion barriers to see which barrier is most effective. The three locations will be: natural, manmade, and no barrier. Many people trying to stop erosion have used both erosion and man-made barriers, and both have been effective. Our natural barriers are made up of vegetation such as trees and various shrubs and bushes. Our man-made barrier is the athletic complex on top of the hill leading into our backwoods. We posed the question: “Is the man-made building erosion barrier on the south side of RPCS more effective at reducing run-off into the surrounding stream than the natural erosion barriers on the north side of RPCS?” We plan on testing each barrier six times throughout the months of November, December, and January. We will use the TDS tester model ZT-2 to measure the turbidity of the various locations. Hailey records the data, Sally tests for turbidity, and Marsie organizes and manages the experiment. We would like to complete our full experiment by January 2013. After our experiment, we plan to find which barrier works most effectively and encourage our school to install this barrier throughout our campus. Our community will be made aware by telling the director of environmental sustainability, Mrs. Barss, and informing our head of school. If the vegetation barrier works most effectively, it will help the health of our woods to have more vegetation and less erosion. If no barrier works most effectively than it will lower costs for the school.

Step 4:

Our team tested the turbidity of the streams in the backwoods. Our team used an organized system of collecting data and keeping records to test our ideas and hypotheses. We made accurate observations because we tested six times in each location. Our school supplied us with the resources for this experiment. Our solution is original because this specific to Roland Park due to the landscaping of the environment here and the provided erosion barriers.

Our step-by-step procedure:

1. All three tested locations should be the same throughout the experiment, and the experiment must be done in the afternoon
2. Experiment must be done in late fall/early winter
3. Make sure you are using TDS tester model ZT-2 to measure turbidity
4. Make sure all units are in the metric system
5. It must be the same season throughout the experiment
6. Mark 3 locations: one section of the stream where there is no surrounding erosion barrier, one section of the stream where there is a surrounding man-made erosion barrier, and one section of the stream where there is a surrounding vegetation erosion barrier.
7. Go to the marked location in the RPCS backwoods where there is no erosion barrier (negative control)
8. Check turbidity of water using TDS tester model ZT-2
9. Hold TDS tester model ZT-2 in water until number stabilizes (approximately one minute)
10. Record stabilized number in data table using parts per million
11. Go to the section of the stream that is near the man-made erosion barrier (south side)
12. Check turbidity of water using TDS tester model ZT-2
13. Hold TDS tester model ZT-2 in water until number stabilizes (approximately one minute)
14. Record stabilized number in data table using parts per million
15. Go to the section of the stream near the vegetation (north south)
16. Check turbidity of water using TDS tester model ZT-2
17. Hold TDS tester model ZT-2 in water until number stabilizes (approximately one minute)
18. Record stabilized number in data table using parts per million
19. Repeat all steps five more times on different days

Step 5:

Our experiment went well and collecting data was not difficult. Using the TDS tester model ZT-2 made it very easy to find the first and last stable ppm number. The tests revealed our hypothesis to be disproven; the vegetation barrier had the highest turbidity. Our solution gave us the more effective barrier to use when wanting to stop erosion. Our plan to test the data worked because sections of the stream were close to each of the barriers we wished to test. A challenge we faced was we had to erase a portion of our data we failed to put the date on. Our testing demonstrated the vegetation barrier had the highest average turbidity out of all three barriers. The man made barrier did not have the lowest turbidity of the barriers we tested, rather it was the middle. The no erosion barrier was recognized to be the most effective in preventing erosion and high turbidity. We do not have a reason to why the no erosion barrier was more effective. If we were to do anything differently we would have tested for data more frequently. This would have enabled us to work with more data points and have more reliable information.