

TITLE: Nutrient Overload!



Figure 1 Storm water outfall

ABSTRACT: The estuarine waters of North Carolina are home to many important species of commercial and recreational fish and invertebrates. These organisms are part of an intricate ecological web where everything is connected. When this system is thrown off balance due to an influx of nutrients the consequences can be dire.

OBJECTIVE: This experiment provides an opportunity for students to see the harmful side effects storm water runoff and other nutrient loading processes have on our estuaries. This can act as a demonstration or a team experiment.

TIME: 1 class of 30 mins. to set up and discuss and then further observation and documentation once a week for 6-8 weeks

GRADE LEVEL: 8-12

STANDARDS: EEn.2.3.2, EEn.2.4.1, EEn.2.4.2, EEn.2.7.3

VIDEO:

Eutrophication: <https://www.youtube.com/watch?v=6LAT1gLMPu4>

Nitrogen cycle: <https://www.youtube.com/watch?v=372K0jyO0hQ>

Estuarine Ecology: <https://www.youtube.com/watch?v=h01JBiT6rg>

SUPPLIES:

- 2 large gallon glass jars
- vegetation (whether it be straw or grass, algae would be the best, only a small sample is needed)
- plant fertilizer

BACKGROUND: An overabundance of nutrients introduced into the estuarine system can come from a number of different culprits including leaky septic tanks, fertilizer from farms and golf courses, and storm water runoff. Bacteria breaks down these nutrients into nitrates and phosphates, which are absorbed by plants helping them grow. Under normal circumstance subaquatic vegetation, marsh grasses and other plants can cycle the nitrogen out of the system in an efficient manner. When a nutrient overload occurs single-celled algae proliferate in vast numbers consuming the nutrients, which negatively impact the other organisms in the ecosystem in a process called eutrophication. Subaquatic vegetation is unable to photosynthesize because the algae bloom is blocking the sunlight and when the alga consumes all of the nutrients they die off as quickly as they appeared. The bacteria feeding on the decomposing algae strips the water of dissolved oxygen and kills organisms dependent upon O₂ to live. This experiment offers an observable reaction to an increase of nutrients and provides an opportunity for discussion about the nitrogen cycle, food webs, and human effects on our environment.

PROCEDURES:

1. In preparation, fill each of the two-gallon jars with tap water and leave uncovered for a weekend. This “ages” the tap water or de-chlorinates the samples.
2. Place a mat of dead or dying vegetation or algae in each.
3. Add a teaspoon of fertilizer to the experimental jar and nothing to the control jar.
4. Position both jars in an area of equal sunlight.
5. Keep a photographic and tabulated record. If equipped, take samples from both jars and examine under a microscope. Protozoans and algae can be observed under a low power microscope.

DISCUSSION:

1. What were your observations?
2. What brought about these differences?
3. Looking at the results of this experiment, how do you humans affect our environments in this way?
4. What are some ways that you can be apart of the solution rather than the problem?
5. How does change in habitat affect food webs? How do these changes affect humans?