**What’s In Your Water?**

**The Activity. The Investigation.**

**Introduction:**

If you want to help a dolphin, the best way to do so is to clean up the water it swims in. We have discussed water in great detail over the past few weeks, it is now time to investigate the cleanliness of water in our area, and how water quality can be detected using some unconventional methods. You will also investigate where the sources of water pollution are, environmental policies related to water quality and finally the health consequences of not having clean water.

**Directions:**

1. **Go to:** [**http://learning.blogs.nytimes.com/2012/01/04/making-the-invisible-visible-exploring-and-addressing-water-pollution/**](http://learning.blogs.nytimes.com/2012/01/04/making-the-invisible-visible-exploring-and-addressing-water-pollution/) **OR
Search: “making the invisible visible exploring and addressing water pollution” on Google.**
2. **Read the article “Illuminating the Perils of Pollution, Nature’s Way” by Edith Widder (found on the website), and answer the questions below.**
3. **With your group members, begin providing information for the topics provided. When you are finished you will share this information with other groups when everyone is finished. Again, all of the information you need can be found in embedded links in the main article.**
4. **Finally, begin investigating water contaminants in Los Angeles. Click on “What’s In Your Water” at the bottom of the main page, select “California” on the next page, and then choose the county “Los Angeles” and finally scroll down to select “Santa Monica” as your city.**

**Article Questions**

1. What is bioluminescence? How do animals use this property?
2. What are sediments?
3. How does Dr. Widder use bioluminescence to detect the presence of toxins in sediment samples she collects?
4. Why does she say sediments are a better indicator of pollution levels than water samples?
5. What is the Eye-In-The-Sea? How is this device able to document deep-sea creatures that have long eluded scientists in research submarines?

**What’s In Your Water Questions:**

1. What substance(s) exceed the legal limit? Where does this pollutant(s) come from [you can find out this information by placing your cursor over the substance]?
2. What substance(s) do not exceed the legal limit, but do exceed health standards? Where does this pollutant(s) come from [again, you can find this information by placing your cursor over the substance]?
3. Of the contaminants found within the health and legal limits, pick three that are not protected by the Environmental Protection Agency (EPA). Where does each pollutant come from?
4. Look up the Safe Drinking Water Act, and explain in your own words what this form of legislation is designed to do. Looking at your results of Beverly Hills water, do you think this form of legislation is being followed? If not, what do you think needs to be done to solve the problem?
5. Beverly Hills drinking water is high in Manganese. Where does this manganese come from? What are some health effects of Manganese in drinking water (look this up on Google)?

**Group 1: Types and Sources of Water Pollution**

Topics to consider include some or all of the following (2 pieces of information for each bullet point). Use the links in the article to find this information that you will include.

* [Sewage outflows](http://www.nytimes.com/2009/11/23/us/23sewer.html).
* Hydraulic fracturing, or “fracking,” which the Environmental Protection Agency [recently implicated in tainting groundwater supplies](http://www.nytimes.com/2011/12/09/us/epa-says-hydraulic-fracturing-likely-marred-wyoming-water.html).
* Shipping and other industries contributing to [marine pollution](http://www.unep.org/regionalseas/marinelitter/publications/docs/anl_oview.pdf).
* [Phosphorus and plastics pollution in the oceans](http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=659&ArticleID=6897&l=en), which the United Nations recently identified as emerging global issues.
* [Point source](http://oceanservice.noaa.gov/education/tutorial_pollution/03pointsource.html) and [nonpoint source](http://oceanservice.noaa.gov/education/tutorial_pollution/04nonpointsource.html) pollution.
* Major water pollution events like the [Gulf oil spill](http://learning.blogs.nytimes.com/tag/gulf-oil-spill/).

**Group 2: Emerging Technologies to Identify Sources of Water Pollution**

Students in this group should explain and describe emerging technologies like these:

* Use of [living organisms](http://blogs.ei.columbia.edu/2011/02/08/recruiting-tiny-organisms-to-detect-water-pollution/) to detect pollution, starting with Dr. Widder’s work to [“make the invisible visible”](http://www.youtube.com/watch?v=GnvS7CXdJ0U) as well as the steps in the FAST test she developed, and interpret the data the test provides.
* Other applications of bioluminescent bacteria in systems like [wastewater treatment](http://cfpub.epa.gov/safewater/watersecurity/guide/productguide.cfm?page=biologicalsensorsfortoxicity).
* Testing [microbial genetics](http://www.nytimes.com/gwire/2011/01/18/18greenwire-is-that-old-dump-leaking-ask-the-bugs-16711.html).
* Using organisms like [tadpoles to detect pollution](http://www.usnews.com/science/articles/2009/12/28/engineered-glowing-tadpoles-detect-pollution).

**Group 3: Policies and Water Regulation**

Students in this group should focus on government policy and regulation, especially the work of the [Environmental Protection Agency](http://topics.nytimes.com/top/reference/timestopics/organizations/e/environmental_protection_agency/index.html) with respect to water. They should also:

* Describe the [Clean Water Act](http://www.epa.gov/lawsregs/laws/cwa.html) and identity recent [recommendations](http://www.washingtonpost.com/national/epa-proposes-stricter-controls-on-water-pollution/2011/04/27/AFI8Y8zE_story.html) for changes to the act.
* Explore some of the provisions of the Act that establish various water pollution control measures, like the [National Pollutant Discharge Elimination System](http://cfpub.epa.gov/npdes/), which regulates companies, municipal facilities and other point sources of pollution, and the requirement that states adopt water quality standards that set guidelines for the [maximum amounts](http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/index.cfm) of various pollutants that can enter a body of water.
* Consider how the Act covers [Explore the Safe Drinking Water Act](http://water.epa.gov/aboutow/owow/programs/%3Emarine%20pollution%3C/a%3E.%3C/li%3E%3Cli%3E%3Ca%20href%3D).
* Find out what other regulations the Environmental Protection Agency makes with respect to [water](http://www.epa.gov/gateway/learn/water.html).

**Group 4: Health and Ecological Consequences of Water Pollution**

This group should do the following:

* Find out how the provisions of the Clean Water Act and the Safe Drinking Water Act are routinely [violated](http://www.nytimes.com/2009/12/08/business/energy-environment/08water.html) and the [consequences of these violations](http://www.nytimes.com/2009/09/13/us/13water.html).
* Explore how pollution affects habitats around the globe and the organisms that live in them, from the [oceans](http://wwf.panda.org/about_our_earth/blue_planet/problems/pollution/) to [freshwater systems](http://environment.nationalgeographic.com/environment/freshwater/pollution/).
* Consider not just the negative effects of pollution for the wildlife in these habitats but also how these consequences affect [people](http://marinebio.org/oceans/ocean-dumping.asp), like the presence of [mercury](http://www.cnn.com/2011/12/29/health/protecting-babies-neurotoxins/index.html) in both freshwater and ocean fish.