

Threats To The Bay

Purpose:

To help students understand the causes and effects of pollution on air, water and land resources using the Tampa Bay watershed as a local example. The focus will be on pollution from the combustion of fossil fuels.

Objectives:

The students will identify several types of pollution that threaten the health of Tampa Bay and describe their origins.

Correlation to Sunshine State Standards:

- SC.D.2.4.1** Understands the interconnections of the systems on Earth and the quality of life.
- SC.G.2.4.5** Understands that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth.
- SC.G.2.4.6** Knows the ways in which humans today are placing their environmental support system at risk (e.g. rapid human population growth, environmental degradation, and resource depletion).

Correlation to Curriculum:

Chapter 6 of the IS 1 curriculum.
Chapters 34, 35, and 36 Biology Honor's curriculum.
Chapter 23 of Holt Physical Science Textbook and Fossil Fuels Anchor Lesson.

Background Information:

As early as 1950, people began to notice that Tampa Bay was becoming seriously polluted. The decline was due to industrial wastes, stormwater and sewer inflow from the surrounding populated areas, and dredging and filling of the bay bottom. A massive clean-up effort took place and huge improvements have been made. This lesson focuses on the remaining, long-term issues that challenge the restoration of Tampa Bay and other metropolitan areas.

Activities:

Activity 1 - Vocabulary Building

Purpose - To help students learn the vocabulary of water pollution

Materials - Pollution PowerPoint

Duration - 15 minutes

Teacher Directions - Begin to orient the students to local pollution problems by discussing the vocabulary words runoff, emissions, “NOX”, bio-accumulation, and fossil fuels. Show the slides “Stormwater Runoff” and “Nitrogen: Too Much is a Bad Thing” as you discuss increasing populations in our area related to the vocabulary words. Pin-point your location on the Stormwater Runoff slide and discuss how “your” stormwater runoff might end up in the Bay (or another water body) via a creek or canal.

Activity 2 - Building a Graphic Organizer

Purpose - Students will prepare for note-taking by making a graphic organizer.

Materials - Student-made graphic organizer, PowerPoint slide, Video Graphic Organizer

Duration - 5 minutes

Teacher Directions - Instruct students to fold a piece of notebook paper in half long-ways, then in thirds, so that when unfolded, the paper has six squares as shown on the PowerPoint slide, “Organized for Pollution.” Each square will be labeled with a topic presented in the video chapter. As the students watch the video, they will write facts in the appropriate squares on the graphic organizer.

Sample for Video Graphic Organizer and Graffiti Poster

Stormwater Runoff	Power Plants
Vehicle Emissions	Bio-accumulation
Increased Population / Low Impact Development	Industries / Water Quality

Activity 3 - DVD Chapter 4 - Threats to Tampa Bay

Purpose - Students will analyze this video segment to discover threats to Tampa Bay.

Materials - “Threats to the Bay” from *Tampa Bay: Living Legacy* DVD, student graphic organizers.

Duration - 20 minutes

Teacher Directions - Direct the students to use their graphic organizers to take notes on this segment. Stop the video after 10 minutes to give them a chance to consolidate their notes.

Activity 4 - Graffiti Posters

Purpose - Students will analyze this video segment to discover threats to Tampa Bay.

Materials - Student graphic organizers, paper for Graffiti Posters, colored pencils and markers

Duration - 20 minutes

Teacher Directions - After the video, divide the students into groups of four. Lead the class in a discussion on the video. Have each group of students share their individual notes from the video and then transfer the group’s consensus to Graffiti Posters labeled the same as each square on the graphic organizer (this could also be done as a whole class on a white board or an overhead transparency to save time).

Assessment: The graphic organizers could be collected for assessment or the students could be encouraged to add to their own notes after hearing from other students. Graffiti posters and/or presentations can be assessed.

Alternative: Create six cooperative groups. Give each group a video topic and ask them to pool their video notes and create one graffiti poster. Students will briefly present their graffiti posters to the class. The posters could be used around the school.

Note: Graffiti posters are colorful and fun, but informative. They present information in words and pictures in an organized display. Size of the poster is up to the teacher.

Assessment Component:

- Individual Video Graphic Organizer Notes
- Graffiti Posters or Presentations

Relevant Vocabulary:

- **stormwater runoff** - During a storm, water “runs off” of rooftops, roads, parking lots, and any hard surface. As the water passes over hard surfaces, it picks up trash or chemical pollution like spilled gasoline, oil, or excess lawn fertilizer (nitrogen). The contaminated rainwater flows into creeks, canals and storm sewers. These often flow into Tampa Bay. As builders add more hard surfaces, there is less grass to soak up rain, so more stormwater runoff ends up in the Bay (and other local water bodies).

- **nitrogen dioxide (NO₂ or “NOX”)** – In order to power cars or produce electricity in a power plant, a mixture of air and fuel is burned. The high temperature required to get energy from the fossil fuel results in a harmful by-product—a reaction between nitrogen and oxygen produces nitrogen dioxide or “NOX” for short. NOX can actually be seen over major cities as brown clouds of smog. The nitrogen in NOX can end up in water bodies, causing an increase in nitrogen levels.
- **fossil fuel** – Examples of common fossil fuels are coal, oil, gasoline and natural gas. These were formed from the fossilized remains of dead plants and animals by exposure to heat and pressure in the Earth’s crust over hundreds of millions of years. Burning coal releases mercury; burning all fossil fuels releases nitrogen dioxide. Natural gas releases the least amount of nitrogen dioxide.
- **bio-accumulation** - The process by which an organism absorbs a toxic substance at a rate greater than the substance is lost from the body. Some examples are heavy metals such as mercury and lead. Organisms low on the food chain pass on toxins to organisms at higher levels and ultimately people, if we eat the contaminated animals (e.g. fish). Two toxic substances passed on to people through aquatic food chains are mercury and lead. Both are produced by burning fossil fuels.
- **emissions** - Gasses that are produced as a result of the combustion of fossil fuels such as coal, fuel oil, gasoline or diesel are called emissions. They are discharged into the atmosphere both through the exhaust pipe on a vehicle and from a smoke stack at a power plant, or other industrial facilities.

Additional Resources:

Biology Textbook, Prentice Hall

Teacher Video Notes: Threats to the Bay

Hillsborough County Environmental Protection Commission

www.epchc.org/

Threats to the Bay Graphic Organizer - Teacher Notes

Note to teachers: The video provides a lot of information quickly. Students may be challenged at first with taking notes, so scaffolding the first section may be necessary. The topics are addressed in this order, but there is no specific segway on the video. Advise students to watch for picture cues and listen for word cues like “runoff” and “power plants” to know which section is being addressed.

1. Stormwater Runoff

- *Stormwater runoff contains toxins, excess nutrients*
- *Sewage treatment has improved*
- *Need to focus on treating stormwater runoff*
- *Explosive growth causes an increase in runoff*
- *Fixing stormwater runoff costs money*
- *Need to replace old equipment*
- *Need to buy generators for sewage treatment plants so power loss won't cause sewage spills*
- *Florida Friendly landscapes reduce nitrogen in stormwater runoff.*

4. Bio-Accumulation

- *Mercury concentration increases in higher levels of the food chain*
- *Mercury poisoning is dangerous to children and women of childbearing age*
- *Mercury causes birth defects*
- *Local fish that have high mercury levels are trout, freshwater bass and grouper*
- *People may not be aware of what's safe to eat*
- *Power plants that burn coal release mercury into the air*

2. Power Plants

- *nitrogen dioxide (NO₂, “NOX”) comes from power plants*
- *Coal-powered plants are the primary source of NOX*
- *Some plants are converting to natural gas*
- *Burning natural gas releases less NOX*
- *Power plants are trying to reduce NOX emissions*
- *Laws are needed to require power plants to reduce emissions at all new plants*
- *Power plants hundreds of miles away pollute our air*
- *Need an alternative to fossil fuels*

5. Increased Population / Low Impact Development

- *Increased population results in more habitat loss for wildlife.*
- *Between 1970 and 2000 the population of Florida doubled*
- *We need “growth management”*
- *People and wildlife need to coexist*
- *Low impact development means houses are developed around trees, preserving existing ecosystems*
- *“Layer” people into the existing ecosystem*
- *Low maintenance landscapes reduce water use and nitrogen runoff*

3. Vehicle Emissions

- *Too many vehicles cause congestion on roadways, more pollution*
- *Need transportation alternatives: commuter trains, better public transportation*
- *Need fuel-efficient cars*
- *Need alternative energy cars*

6. Industries

- *Phosphate industries have historically been major polluters to the Bay*
- *In 2004, 41 million gallons of toxic waste was released into a creek after the four hurricanes*
- *Laws are in place but need to be enforced to stop industry pollution*
- *No new phosphate plants will be built; we have enough*
- *Existing ones need to be shut down safely*
- *Taxpayers pay for clean up*

