

Activity: Nonpoint Source Pollution

Summary: In this activity, students will read and interpret a map showing runoff drainage and how it affects Upper Newport Bay. Students will consider some solutions to the problem of nonpoint source pollution.

California State Content Standards

SCIENCE

Biology/Life Sciences

- **Ecology 6b.** Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.

Investigation and Experimentation

- **1a.** Students will select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

ENGLISH-LANGUAGE ARTS

Grades 9-10

Writing Applications

- **Expository Compositions 2.3**
 - a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.

- b. Convey information and ideas from primary and secondary sources accurately and coherently.
- c. Make distinctions between the relative value and significance of specific data, facts, and ideas.

Grades 11-12

Writing Applications

- **Reflective Compositions 2.3**
 - a. Explore the significance of personal experiences, events, conditions, or concerns by using rhetorical strategies (e.g., narration, description, exposition, persuasion).
 - b. Draw comparisons between specific incidents and broader themes that illustrate the writer's important beliefs or generalizations about life.
 - c. Maintain a balance in describing individual incidents and relate those incidents to more general and abstract ideas.

Objectives:

Students will be able to:

- Define nonpoint source pollution and explain how it affects the Upper Newport Bay
- Read and interpret a map showing drainage systems affecting Upper Newport Bay
- Consider some solutions to the problem of nonpoint source pollution

Materials:

- Newport Bay Flood Control & Drainage Map
(www.ocwatersheds.com/watersheds/maps.asp?mapname=highres_map/map55.gif)
- Handout
- *Examples of Nonpoint Source Pollution*

Preparation:

- Project or print the flood control and drainage map and make copies for each student group.
- Make a copy of *Examples of Nonpoint Source Pollution* for each student or group.

Time Required:

- Approximately 1 hour



Procedures:

1. Ask students if they know the difference between “point” and “nonpoint” sources of pollution.
2. After discussion, write the following definitions on the chalkboard, overhead, or chart paper, and have a student read them aloud:
 - **Point Source Pollution:** Pollution that originates from a specific place such as a golf course or power plant.
 - **Nonpoint Source Pollution:** Contaminated runoff originating from an undefined place, often an accumulation of sources.
3. Ask students to name as many types of nonpoint source pollution as they can (e.g., pet waste, soaps, lawn fertilizers, litter, motor oil) and list their answers on the board.
4. Discuss the challenges faced in attempting to prevent or reduce nonpoint source pollution versus point source pollution. Ask students why nonpoint source pollution might be more difficult to control. (*For example, point sources, such as factory discharge pipes, are more easily cited and regulated; nonpoint sources, such as people dropping cigarette butts on the sidewalk or washing their cars in the street, are much harder to locate and regulate.*)
5. Hand out a copy of the *Examples of Nonpoint Source Pollution* to each student or group. Discuss each pollutant type, where it comes from, and what effects it has on the environment and on humans.
6. Project or hand out to each student or student group a copy of the Flood Control and Drainage Facilities map of Upper Newport Bay. Review the legend together so that students understand what the symbols represent. Identify various locations on the map, such as their school, their homes, a local park. Ask the students:
 - a. Where does the water flowing along a gutter lead?
(*It leads to a storm drain, which generally empties into the ocean. During the dry season, however, some of Orange County’s runoff might be diverted to treatment facilities.*)
 - b. When should you see water flowing into storm drains?
(*Water should be flowing in the gutter only after it rains.*)
 - c. If it is not raining and you see water flowing along gutters, where might it be coming from?
(*This is runoff from irrigating plants, washing cars, watering lawns, cleaning pavement, etc.*)
7. Assign a portion of the map to each group, and have the groups identify on their portion where nonpoint sources of pollution originate and what the pollutants may be. Have students list those areas and pollutants on the chart *Examples of Nonpoint Source Pollution*, as well as potential solutions to the problem of each particular pollutant.



8. When all groups have finished, have each group share what they found. Keep a master chart showing locations and pollutants in the Upper Newport Bay watershed.

Follow-up:

1. Have students work in groups or individually to list ways to reduce nonpoint source pollution coming into Upper Newport Bay. For example:

Keep cars well maintained and free of leaks.

Recycle used motor oil.

Do not pour chemicals on the ground or down storm drains.

Properly dispose of trash in garbage cans.

Pick up pet waste.

Don't dispose of leaves or grass clippings in the storm drain; try composting yard waste.

Landscape yards with native, drought-tolerant plants that do not require fertilizer.

Prevent runoff by not over-watering.

Avoid allowing even clean water to run off into gutters.

Try "natural" (non-toxic) pest control.

Do not use degreasers, which break down oil, dispersing it throughout water.

2. Have students observe nonpoint source pollution in their local neighborhoods for one week. Ask students to keep a journal recording their observations on the way to and from school and as they travel around the neighborhood. Tell them to indicate the location of storm drains and possible sources of pollution that could make their way into the drainage system. Have them use their observation journals to write reports detailing how nonpoint source pollution could be reduced in their own neighborhoods. Consider sending this report to a city council member or to a local newspaper.

Extensions:

1. Ask students to develop a plan to reduce nonpoint source pollution. How would students go about enforcing it? Find out what measures Orange County is already taking to reduce run-off pollution.
2. Educate others. Discuss why people create nonpoint source pollution and how behavior can be changed. Research safe substitutes for toxic products. Create a handout or posters to educate others about nonpoint source pollution and about how they can help reduce it.

Adapted from "Searching Out Non-Point Sources of Pollution" in *Save Our Seas*, by the Center for Marine Conservation and the California Coastal Commission.



Examples of Nonpoint Source Pollution

Pollutant Types	Sources	Effects	Examples in Upper Newport Bay Watershed	Solutions
Debris (<i>plastics, glass, metals, wood</i>)	<ul style="list-style-type: none"> • roads • parking lots • playgrounds • parks 	<ul style="list-style-type: none"> • can injure or kill wildlife through entanglement or ingestion 		
Sediments	<ul style="list-style-type: none"> • construction sites • agricultural lands • erosion 	<ul style="list-style-type: none"> • clouds water • decreases plant productivity • suffocates bottom-dwelling organisms 		
Excess nutrients (<i>lawn fertilizers, animal wastes, sewage, green waste</i>)	<ul style="list-style-type: none"> • livestock • gardens • golf courses • lawns • failing sewage treatment systems 	<ul style="list-style-type: none"> • promotes algae blooms, causing eutrophication which depletes oxygen, harms aquatic life, and causes odor 		
Acids, salts, heavy metals	<ul style="list-style-type: none"> • roads • parking lots • brake dust 	<ul style="list-style-type: none"> • toxic to wildlife and can bioaccumulate in organisms 		
Organic chemicals (<i>pesticides, oil, detergents, etc.</i>)	<ul style="list-style-type: none"> • agriculture • boat paints • golf courses and other lawns • failing sewage treatment systems • parking lots 	<ul style="list-style-type: none"> • toxic effects on wildlife and humans • possibly carcinogenic 		
Pathogens (<i>e.g., coliform bacteria</i>)	<ul style="list-style-type: none"> • municipal and boat sewage • animal wastes • leaking septic/ sewer systems 	<ul style="list-style-type: none"> • causes typhoid, hepatitis, cholera, dysentery • closes beaches 		

