

# Unit 3: POLLUTION- KEEP IT CLEAN

## ACTIVITY 2 (CONTINUED)



### PHOSPHATE BACKGROUND INFORMATION



#### WHAT IS PHOSPHORUS?

Phosphorus is an essential element needed by living organisms to grow. Phosphate is the oxidized form of the element phosphorus. It is a nutrient. Water plants require nutrients, like nitrate and phosphate, to grow and mature. However, too much of these nutrients can cause major problems, such as algae blooms and the growth of water weeds. Algae generally refers to small, chlorophyll-containing plants such as seaweed and pond scum.

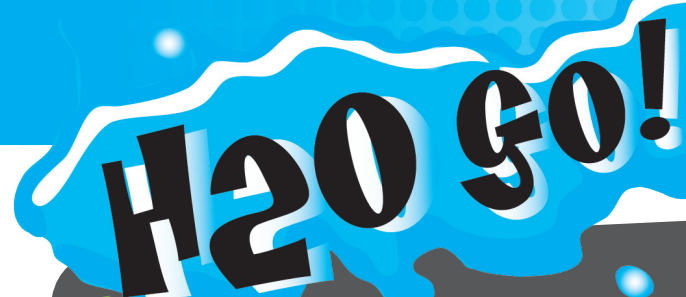
#### Why are phosphates and the resulting plant growth a problem?

High levels of nutrients in lakes or streams cause aquatic plants, such as algae, to grow and reproduce quickly, blocking sunlight from reaching plants at greater depths.

The lack of sunlight causes the death and decay of plant life and uses up oxygen in the process. Decreased amounts of dissolved oxygen in water causes aquatic animals to die. This process is referred to as eutrophication. Eutrophication can result from the pollution caused by human activity.

#### How do phosphates enter our water?

Phosphates enter the waterways through runoff, which collects pollution from human sources, such as fertilizers, pesticides, detergents and industrial wastes. Fertilizers containing high levels of phosphorus, even applied properly, are not good for our water. Fertilizer is more damaging when it ends up accidentally applied or spilled onto hard surfaces like streets, driveways and sidewalks. Rainfall or sprinklers carry the nutrients directly into our storm drains and into our waterways. The largest source of phosphate pollution, however, comes from storm drains clogged with grass clippings and leaves, which contain high phosphate levels. This yard waste, which is blown around the streets and sidewalks, ends up in the storm drains releasing phosphate at a very high rate. Research studies indicate that 80 percent of phosphorus from urban settings, like Boulder and its immediate area, comes from lawn clippings and leaves.



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### ABOUT THE UNIT

Students get a close-to-home, experiential look at water pollution. Explore pollution through real-life scenarios in which students must make thoughtful decisions about their actions. Students also analyze and graph Boulder County water quality data.



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#### objectives

- Understand the difference between point source and nonpoint source pollution.
- Identify the different types of pollutants and their effects.
- Discover how pollution is generated, how each individual can contribute to it and how to help alleviate it.
- Learn how development and land use also contribute to pollution.

#### teacher preparation

- Review all information provided in both the Teacher Guide and the Student Guide.
- Make necessary copies or overheads of the Pollution Student Guide for each of your students.
- Make necessary copies or overhead of the "Phosphate Background Information" from the Pollution Teacher Guide.





# Unit 3: POLLUTION- KEEP IT CLEAN ACTIVITY 1



## WHAT'S THE BIG DEAL?

### ACTIVITY DESCRIPTION

Students place themselves in everyday, real-life situations with their friends whose actions might harm water quality. How would they react? What would they say?

**my time** 45 minutes

**my materials** "What's the Big Deal?" in the Pollution Student Guide

- essential questions**
- What everyday activities might affect water quality?
  - What are possible sources of pollution and what are their impacts on the environment?
  - Where does the water that flows into storm drains end up?
  - How has land use and human development affected water pollution?

**lifeskills** Student learn to use critical thinking about their actions and interactions with friends. Students see that the consequences of things they do everyday can affect the world they live in.

- directions**
- Distribute the "Pollution-Keep It Clean Background Information" from the Pollution Student Guide. Read and review it with your students.
  - Review the difference between point source pollution and nonpoint source pollution.
  - Discuss the four types of pollution: sediment, nutrient, bacteria and toxins and their impact on the environment.
  - Discuss how non-permeable land uses contribute to water pollution.
  - Distribute "What's the Big Deal?" activity from the Pollution Student Guide to each student.
  - Divide your students into groups to complete the "What's the Big Deal?" scenarios or have them each do it individually.
  - After completion, review the scenarios with your students. Discuss what type of pollution is occurring in each scenario, what the impacts of the described pollution are and how can it be prevented or reduced.
  - Discuss other ways to prevent nonpoint source pollution.

# Unit 3: POLLUTION- KEEP IT CLEAN ACTIVITY 1



## PHOSPHATE ON THE LOOSE

### ACTIVITY DESCRIPTION

Students gain an understanding of what phosphorus is and the impact it has on human health. By graphing phosphate levels at two testing sites along Boulder Creek, students will think critically about the sources of pollution and how pollution is impacted by location.

**my time** 1 to 1.5 hours

- my materials**
- "Phosphate on the Loose" in the Pollution Student Guide
  - Two different colored pens or colored pencils

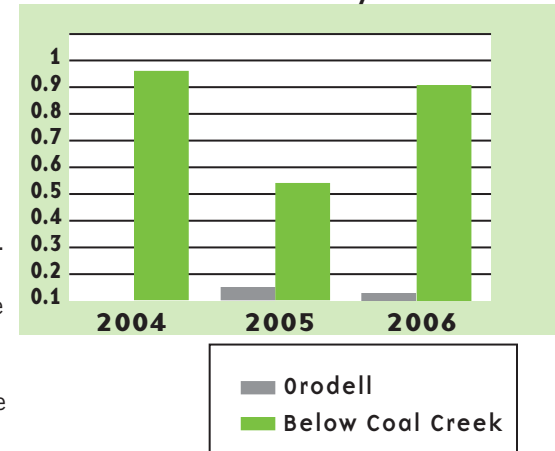
- essential questions**
- Why is clean water important to us and to aquatic animals?
  - What are phosphates and where do they come from?
  - What damage do phosphates cause?

**lifeskills** Students practice graph making, interpretation and analysis skills, while thinking critically about cause and effect.

**directions**

- Hand out a copy of the "Phosphate Background Information" included in the Pollution Teacher's Guide. Choose different students to read the phosphate information out-loud.
- Hand out a copy of "Phosphate on the Loose" activity from the Pollution Student Guide to each student.
- Review the purpose of the lab. Discuss the two testing sites, comparing their photos, their locations and the differences your students observe.
- Have each student write a hypothesis regarding their prediction of how phosphate levels will change between the two testing sites.
- Review the procedure for the lab.
- Have each student fill in the provided chart with the phosphate data given.
- Review the discussion questions.
- Have each student write a conclusion about the lab.
- Ask each student to re-read the Down the Drain scenario from "What's the Big Deal?" activity. Ask each student to respond to the scenario again. It is reprinted at the end of the "Phosphate on the Loose" activity in the Pollution Student Guide. Do your students feel more confident in responding to their friend after working with real data?

Answer Key



**H2O Go Farther**  
Take your students to the data source! Go on a field trip to Boulder Creek collection sites with water monitoring test kits provided by Keep it Clean Partnership. Test the water for certain water quality parameters. Visit: [www.KeepitCleanPartnership.org](http://www.KeepitCleanPartnership.org).