

# What is Your Phosphorus Footprint?

## Overview

In this activity, students will analyze their every day of activities for the overuse and overapplication of phosphorus and reflect on how to reduce the effects on the environment.

## Background

Most of us are familiar with a carbon footprint and associated surveys and “calculators” to assess an individual's or organization's impact on the environment in terms of carbon dioxide (CO<sub>2</sub>) emissions and other greenhouse gasses. These tools typically gather information about various aspects of one's lifestyle or operations that contribute to carbon emissions. The “What is your Phosphorus Footprint?” activity simulates this type of analysis of our choices and how it may contribute to the amount of phosphorus in our environment.

Phosphorus can be found naturally in soils and as a result of human activity, including construction, improperly maintained septic systems, and use of fertilizers. Even small increases in phosphorus use can lead to damaging effects on water quality leading to algal blooms. Runoff carries pollutants, including phosphorus, from the land into bodies of water. In order to prevent excess amounts of phosphorus entering our environments, all citizens should be aware of how our daily activities may be contributing to the problem. Because of the ambiguous processes within the phosphorus cycle, this tool is a basic version of a calculator to allow you and your students to be aware of phosphorus use.

## Materials

Phosphorus Footprint Survey  
Survey Scoresheet

## Engage

Have you ever heard of a carbon footprint? What does it mean?

- Reducing carbon footprints is crucial for reducing climate change and minimizing environmental impact. Ways to reduce carbon footprints include improving energy efficiency, transitioning to renewable energy sources, adopting sustainable transportation options, and promoting waste reduction and recycling initiatives.

Each of us also has a phosphorus footprint. What do you think that includes?

## Objectives

### Students will be able to:

- Explain negative effects of overuse phosphorus from fertilizer on the environment
- Analyze their phosphorus footprint in everyday activities
- Discuss ways to reduce the effects of overapplication of phosphorus

### Process Skills:

Predicting  
Calculating  
Analyzing

### Duration:

60 minutes

Have students get it into groups and brainstorm how they use phosphorus in their daily lives? Allow groups to share their responses.

## Explore

Once everyone has completed the quiz, allow them to get back into groups to share their results and compare with others.

## Explain

Discuss the overall results of a phosphorus footprint and the impacts humans have had on the phosphorus cycle. This basic survey is a starting point for students to think about their actions and how even a small change can make a drastic difference in their phosphorus footprint.

Discussion points about phosphorus:

- Used in farming for fertilizing crops for humans and farm animals.
  - Producing beef takes significant amounts of phosphate in fertilizer.
  - A plant-based diet helps reduce the amount of phosphate needed to feed the world.
- Mined from rocks as a nonrenewable resource.
  - Can be extracted from mining but can also disperse into the environment (soil and bodies of water) by erosion.
- Contributes to the basic component of the building block for life and life's processes (DNA and ATP)
  - Bones contain high levels of phosphorus and have historically been used for fertilizer.
- Travels as runoff from farms, golf courses, ball fields, manicured lawns into bodies of water.
  - Excess phosphorus in waterways contributes to algae blooms and can cause fish kills.
- Enters the environment after plant decay or animal produces wastes.
  - Dog poop (and yours) contains phosphorus. Dispose your pet's waste to ensure no damaging runoff.

## Extend

Review the components of a phosphorus footprint. A phosphorus footprint refers to the total amount of phosphorus that is used or consumed throughout the lifecycle of a product, service, organization, or individual, much like a carbon footprint. It encompasses the phosphorus inputs associated with various activities, such as agricultural practices, industrial processes, and human activities.

**Phosphorus Uptake:** This includes the phosphorus contained in fertilizers, animal feed, and other products and materials used in agricultural production, as well as phosphorus-containing chemicals used in industrial processes.

**Phosphorus Losses:** Phosphorus can be lost from agricultural fields through runoff, erosion, and leaching, leading to contamination of water bodies. It can also be lost during industrial processes and wastewater treatment.

Environmental Impact: Excessive phosphorus inputs can contribute to nutrient pollution in water bodies, leading to eutrophication, harmful algal blooms, and degradation of aquatic ecosystems.

Management and Reduction Strategies: Managing and reducing phosphorus footprints involve implementing practices to optimize phosphorus use efficiency in agriculture, improve wastewater treatment processes to reduce phosphorus discharge, and promote recycling and reuse of phosphorus-containing materials.

Assign groups to investigate how the following activities could affect the overall phosphorus footprint:

- a. Golfing
- b. Mining
- c. Farming
- d. Gardening

## Evaluate

Have everyone complete an exit slip to assess what they learned from the phosphorus footprint quiz and scenario discussions.

- Name 3 ways that you can reduce your phosphorus footprint.
- Choose one of the 3 ways you listed above and explain the science behind how that could reduce a phosphorus footprint.

## Resources

Phosphorus Fact Sheet for Health Professionals

<https://ods.od.nih.gov/factsheets/Phosphorus-HealthProfessional/>

Sewer vs. Septic Systems:

<https://theoriginalplumber.com/plumbing-tips/types-of-septic-systems/#:~:text=The%20Evapotranspiration%20bed%20system%20is,environmentally%20friendly%20wastewater%20management%20options.>

<https://www.bowensseptictank.com/septic-vs-sewer-system-the-major-differences#:~:text=Environmental%20Friendliness%20A%20properly%20maintained,system%20relies%20on%20natural%20decomposition.>

<https://www.angi.com/articles/septic-vs-sewer-system.htm>

Golfing and the Environment:

<https://www.greenmatters.com/p/golf-courses-environmental-impact>

<https://biofriendlyplanet.com/is-golf-bad-for-the-environment/>