



# Is Too Much of a Good Thing a Bad Thing?

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## Eutrophication-The Problem with Phosphorus

This lesson will explain how phosphorus is cycled in our constantly changing ecosystem. This lesson will describe what phosphorus is and its importance to our way of life, as well as problems that arise when too much phosphorus enters an ecosystem.

### Overview

Students will view diagrams of the unique but limited phosphorus cycle. .

### Key Search Words

Earth Science, 9th grade, eutrophication, phosphorus cycle, inorganic, element, sediment, fertilizer, weathering,

### Learning Objectives

- The learner will be able to explain how phosphorus cycles through the lithosphere.
- The learner will be able to explain the positive and negative roles phosphorus plays in our environment.

### Curriculum Alignment

#### Related Next Generation Science Standards (NGSS)

- HS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics

#### Related North Carolina Essential Standards

- EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining)
- EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts.

### Classroom time required

- Tentatively, one block (90 minutes) should be sufficient to present the lesson, if extra time is needed, adjust as necessary.

### Materials & Technology

- Student Activity Sheet
- Computer access (students can work in pairs or small groups if computers are limited)
- Blank papers
- Colored pencils
- Presentation/Notes
- Notecards (to be used for vocabulary activity)

### Safety

No safety equipment required

### Teacher Preparation for Activity

Copies of activity sheets, colored pencils

### Student Preparation for Activity

*None necessary*

### Procedure

- Conduct the lesson on phosphorus- (notes are included, or you can create your own)

- Hand out student worksheets and allow students to complete them
- Go over the worksheet as a class.
- Give students blank paper and color pencils (for creating their public service announcement)
- Allow students to work on their individual public service announcement flyers (allow the remainder of class time to complete them and they may take them home to complete for homework. It should be written in a way to raise community awareness).
- Based on the notes the students took during the lesson, the flier should contain (1) explanation what phosphorus is, (2) the importance of phosphorus, (3) positive and negative impacts on the environment and (4) possible solution to the problem (this can be something they come up with)

## Differentiation

English as a Second language Learners (ESL)

- Will complete a vocabulary sheet to familiarize themselves with new vocabulary. (This can be done whole group or independently with a whole group check afterwards)
- Vocabulary sheet can also be used for all learners

Regular Ed/Gifted Students

- Activity can be extended by having students research real-life examples of eutrophication.

## Assessment/Check for Understanding

- Students will correctly label their phosphorus diagrams.
- Students will create a public service announcement flier that explains the impact phosphorus has on our environment.

## Required resources

[The Science Learning Hub](#) (background information on the phosphorus cycle)

[Purposegames.com](#) (phosphorus cycle worksheet)

## Sources

[The Science Learning Hub](#)

<https://www.sciencelearn.org.nz/resources/961-the-phosphorus-cycle>

[VisionLearning.com](#)

<https://www.visionlearning.com/en/library/Earth-Science/6/The-Phosphorus-Cycle/197>

[Purposegames.com](#)

<https://www.sciencelearn.org.nz/resources/961-the-phosphorus-cycle>

## Appendices

See the handouts at the end of the lesson.

## Vocabulary Activity

Directions: Using the definitions below, create flashcards. Include an image on the definition side. Use the provided notecards.

Term	Definition
<b><i>Eutrophication</i></b>	Process that causes excessive plant growth causing algal blooms, in response to excess nutrients, such as phosphorus, flowing into a lake or pond
<b><i>Inorganic</i></b>	Compounds that do not contain carbon and are often found in rocks as minerals
<b><i>Sediment</i></b>	Small particles produced during the mechanical or chemical weathering of rocks.
<b><i>Fertilizer</i></b>	A substance that contains a combination of organic and inorganic chemicals used to grow crops by adding nutrients to the soil
<b><i>Element</i></b>	A pure substance, such as phosphate. Elements cannot be broken down into smaller particles.
<b><i>Weathering</i></b>	the mechanical and chemical process that breaks down the Earth's surface into smaller particles
<b><i>Organic</i></b>	Compounds that contain carbon, that are used for life processes
<b><i>Phosphorus Cycle</i></b>	The movement of phosphorus through rocks, soil, water, plants and living things in a continuous cycle.

# Phosphorus

an important nutrient nuisance

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## 2. Its Importance

The element phosphorus is important for plant and animal life.

Plants use phosphorus for growth, and animals (to include us) eat plants.

Basically, we get phosphorus, from plants (most is stored in our bones, it is also found in the nucleic acids (DNA/RNA)

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## 2. What is the phosphorus Cycle?

Phosphorus move through our ecosystem in various ways.

One ways is during the rock cycle, as rock is broken down, phosphate is released from solid rock masses

Mining is another, much more common way that phosphorus is collected for use in fertilizer, for example.

Another important way phosphorus is cycled, is when plants use it for growth, and then are eaten by other organisms. The phosphorus is returned to the soil when the organism dies, or produces waste (poop).

## 3. What is the phosphorus Cycle?

However, most of the phosphors is locked up in the earth's crust.

Without any outside influence, it would remain there untouched.

Without human interference, the rock cycle would be the only way phosphorus is removed from solid Earth

## 4. The problem with Phosphorus

As a result of natural erosion, some phosphorus can end up in water sources, such as lake or ponds.

Natural erosion as well as mining, can result in an excessive amount of phosphorus in those water sources.

Excess phosphorus can throw off the balance in those stable water ecosystems resulting in algal blooms and eventual eutrophication.

Algal blooms, are rapid and excessive growth of algae and other plants due to the increase of phosphorus, a nutrient that plants use for growth

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## 5. The problem with Phosphorus

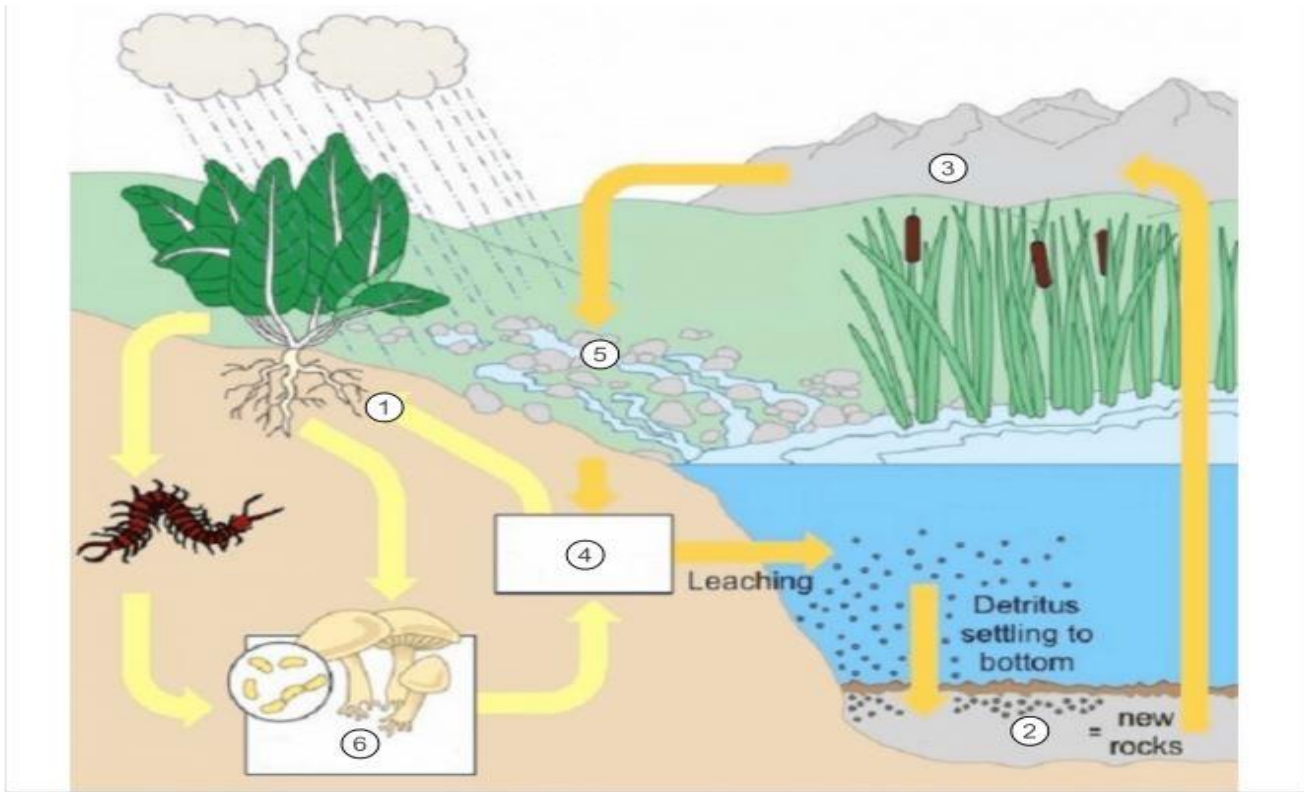
Eutrophication- when excess nutrients stimulate excessive plan growth in shallow water ecosystems.

The extra plant growth depletes the oxygen is the water, which in turn causes all the other aquatic organisms to die (fish kills, seagrass, shellfish)

Dead zones will be created (areas in the water with lowered oxygen content) where limited life can occur.

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Student Activity Sheet  
The Phosphorus Cycle



<https://www.sciencelearn.org.nz/resources/961-the-phosphorus-cycle>

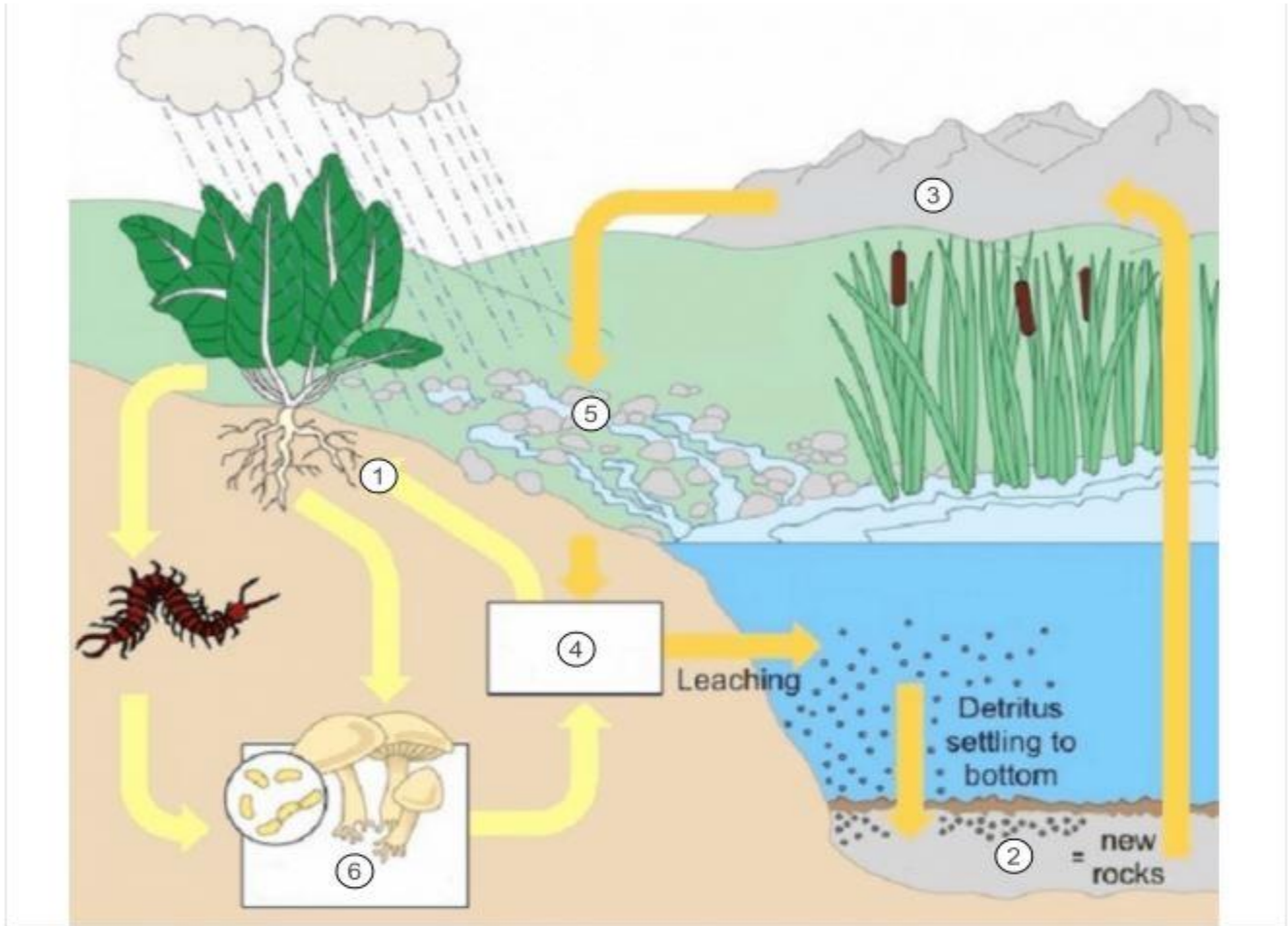
Directions: Match the descriptions to the numbered labels.

**sedimentation, plant uptake, weathering/erosion of rock, Soil phosphorus, decomposers release/recycle rock, uplift/rock exposure**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Student Activity Sheet Answer Key

The Phosphorus Cycle



<https://www.sciencelearn.org.nz/resources/961-the-phosphorus-cycle>

Directions: Match the descriptions to the numbered labels.

**sedimentation, plant uptake, weathering/erosion of rock, Soil phosphorus, decomposers release/recycle rock, uplift/rock exposure**

1. PLANT UPTAKE
2. SEDIMENTATION
3. UPLIFT/ROCK EXPOSURE
4. SOIL PHOSPHORUS
5. WEATHERING/EROSION OF ROCK
6. DECOMPOSERS RELEASE/RECYCLE ROCK