

WATER QUALITY AWARENESS IN URBAN ENVIRONMENTS

LESSON 5 Erosion Effects



Erosion Effects

Subject Overview: **Dissolved Oxygen (DO)** is essential for healthy lakes and streams. Most plants and animals that live in freshwater need DO in order to survive. Without DO, lakes and streams will be practically devoid of these organisms.

Some of the DO in lakes and streams comes from the atmosphere. As waves and fast-moving water move and mix with the air, oxygen from the atmosphere dissolves in the water. Algae and rooted aquatic plants also produce oxygen through photosynthesis. In order to do this, however, sunlight must penetrate the water so the algae and rooted aquatic plants can undergo photosynthesis. Therefore, the water cannot be too cloudy or **turbid**. If the turbidity of the water is too high, adequate amounts of sunlight will not reach the algae and rooted aquatic plants, and therefore the amount of oxygen produced will drop.

One main factor that contributes to increased turbidity in lakes and streams is **soil erosion**. Soil erosion happens naturally through processes like wind and rain; however human activities cause soil erosion, and at a rate that is estimated to be 10 greater than natural causes. Examples of how humans cause soil erosion include: agriculture (plowing fields; harvesting crops); grazing and deforestation; building houses and roads; and watering lawns and gardens.

When the amount of DO in an aquatic environment drops, it can disrupt the “water web of life.” For example, aquatic insects may not survive, and this affects the fish that feed on them by lowering the amount of available food. Furthermore, even if the fish could find enough other food to eat, there may not be enough DO for them to breathe in through their gills to stay alive.

Activity Concepts: Webs of life; interdependency; dissolved oxygen (DO); turbidity; soil erosion.

Subject Links: Science.

Vocabulary: Web of life; dissolved oxygen (DO); turbidity; soil erosion; interdependency.

Purpose of activities: Youth will have the opportunity to explore how soil erosion affects the water web of life.

Overview of activities: Youth will explore the effects of soil erosion through a hands-on activity.

Time Required: Approximately 25-40 minutes

Getting Ready:

- Group the youth into pairs.
- Handout (2) *Why Photosynthesis?* labels to each pair of youth.
- Distribute (2) clear glass jars or glasses to each pair of youth.
- Tape the *Why Photosynthesis?* labels on one side of each jar.
- Fill the jars/glasses $\frac{3}{4}$ full with water.
- Provide each pair of youth with paper towels in case of spills.
- Provide each pair of youth with a tablespoon.
- Copy the human intervention erosion scenarios so each pair of youth receives one copy of each scenario.

Materials Needed:

- (2) one-quart jars or glasses (must be clear) per pair of youth.
- One bag of potting soil (shared).
- One tablespoon per pair of youth.
- Tap water (shared).
- Paper towels (shared).
- **Print: (2)** *Why Photosynthesis?* labels **per pair** of youth.
- **Handout:** Human Intervention Erosion scenarios.
- Butcher paper or Flip Chart.
- Markers
- Clear tape (shared).

Opening Questions

Ask the youth to discuss the following questions, record their thoughts on the butcher or flip chart paper provided, and share their ideas with the other groups.

- Where do they get the air that they breathe?
- How and where do wild animals in a forest get the air that they breathe?
- Do wild animals obtain their food the same way people do? Why or why not?
- How and where do animals in a stream or lake (e.g., insects; fish) get the air that they breathe?
- Do wild animals obtain their food the same way people do? Why or why not?

Note: The concept of photosynthesis was introduced in the previous “Water Web of Life” activity.

ACTIVITY

Exploration (Procedure):

- Request each group to look through the glass of water and read what's written on the "Why Photosynthesis?" label taped to each jar. Are they able to read what's on the labels? **Ask the groups to record their observations on the butcher or flip chart paper provided.**
- Provide each pair of youth with one human intervention erosion scenario. **Ask them to read the scenario and follow the directions that indicate how much soil to add to the water.** (Note: Soil will only be added to one jar; the second jar is the "control" to be used for comparison.)
- Request the youth to again look through the glass of water and read what's on the "Why Photosynthesis" label taped to each jar. Are they able to read what's on the stickers? **Ask the groups to record their observations on the butcher or flip chart paper provided.**
- Repeat the previous two steps with each pair of youth until they have completed all of the human intervention scenarios.

Sharing, Processing, & Generalizing:

- **Ask the youth to use their words and explain what happened in the activity.**
- **Ask them to record their thoughts on the flip chart or butcher paper provided.**
- Which human activities caused the most erosion, and how might this affect the different parts of the "water web of life"? **Ask them to record their thoughts on the flip chart or butcher paper provided.**

If necessary, use supplemental target questions as prompts to get to specific points. Additional questions might include:

- Explain how soil erosion might affect photosynthesis. How might this affect plants and animals living in the water?
- What are some things that humans could do in order to reduce the amount of soil erosion we cause?

Concept and Term Introduction: At this point, facilitators need to ensure that the following concepts and terms have been introduced: web of life; dissolved oxygen (DO); turbidity; soil erosion; interdependency.

Note: The goal is to have the youth develop these concepts through their exploration and define the terms using their own words.

Concept Application (Optional Extension Exercise):

- Take a field trip to a lake, pond, or stream. Have the youth observe the clarity of the water. Have them pick up rocks in the water and look at the number and types of insects living on them. A wide variety and high number of insects is usually a good indicator of high DO levels.
- Have the youth look for sources of soil erosion in their homes and/or communities. Ask them to develop ideas to help decrease the soil erosion (e.g., planting trees or shrubs).

Activity: Human Intervention Erosion Scenarios

Scenario 1: A new housing development is being built south of your town. The developers plan to build 500 new homes. To do this, however, they have to clear several acres of trees near a local stream. They began the project just before the rainy season, and this caused a lot of soil erosion.

Add 8 heaping Tablespoons of soil to the water.

Scenario 2: You added grass seed to your lawn. Because you want the grass to grow quickly, you decide to water it every day for the first few months. Because there is still quite a bit of exposed soil, there is also quite a bit of soil erosion. The soil washes into the street and down the storm sewer. From there it goes into a local stream.

Add 2 heaping Tablespoons of soil to the water.

Scenario 3: Because you live in a warm environment, farmers in your county plow their fields and harvest crops all year long. Last year, they decided to increase the amount of land they could farm by removing trees that lined the edges of their fields. The trees were planted originally to help decrease erosion by wind and water. Now the farmers have more room to plant crops, but more soil is being washed into the surrounding streams and lakes because of this action.

Add 6 heaping Tablespoons of soil to the water.

Scenario 4: In order to help ease traffic problems, a new road is being built on the edge of your community. To do this, however, trees along the local stream have to be cleared, as well as having soil brought in to build up the road bed. Without a natural soil erosion block (trees and their roots), and an elevated road bed, much more soil than normal is being eroded into the stream.

Add 5 heaping Tablespoons of soil to the water.

LESSON HANDOUT

Label for Jars

Why Photosynthesis?

Algae and rooted aquatic plants
that live in lakes and streams
undergo photosynthesis,
using sunlight to make food and oxygen.

Animals like insects and fish
need this food and oxygen
in order to live.

When soil erosion occurs,
less sunlight enters the water.

When there is less sunlight,
less food and oxygen are produced.

How can we help stop soil erosion?

LESSON HANDOUT

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