

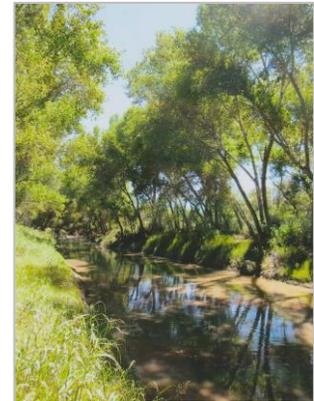


Air Photo North America

Riparian Ecosystems

Riparian zones are important components of rivers and streams. They occur at the interface between terrestrial and aquatic ecosystem. Riparian zones feature hydrophilic (highly water tolerant) vegetation and moist soils with high levels of organic matter content. These areas stabilize the channel banks, slow overland stormwater runoff, and can remediate some pollution from the surrounding landscape as well as river channel water. Riparian zones are easily identified in arid and semi-arid landscapes such as the desert in Arizona by the “band of green” adjacent to many washes and river channels. The riparian vegetation can often access subsurface water even if there is no water in the stream channel, remaining more green than the surround desert landscape.

In this 50 minute lesson, students will be introduced to riparian zone form and function. Students will examine an aerial photograph of the San Pedro River in southern Arizona and, through questions, identify the riparian zone and infer its function. After an initial discussion, the class will conduct an outdoor activity to simulate the pollution remediation function of the riparian area. The activity illustrates how riparian soil and vegetation interact to retain water and suspended loads.



Before beginning, students should:

- Understand that organisms in the desert are primarily limited by the availability of water.
- Be familiar with the water cycle.

Essential Question:

The objective of this lesson is to familiarize students with riparian areas in arid ecosystems and communicate the importance of riparian systems to water quality.

At the end of the lesson, students will be able to:

1. *Identify arid land riparian areas in aerial photographs.*

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2. Describe how riparian plants and soil contribute to water quality.
3. Describe how human and natural disturbances will affect a riparian area.

Standards Addressed: (use this format) Science Strand 3: Science in Personal and Social Perspectives, Concept 1: Changes in Environments; Social Studies Strand 4: Geography, Concept 5: Environment and Society

Themes: Systems thinking and cascading effects.

Skills: Oral communication, team skills, and problem solving skills.

Key Vocabulary

Riparian Zone: A riparian zone or riparian area is the interface between land and a river or stream

Riparian Vegetation: Plant habitats and communities along the river margins and banks are called riparian vegetation, characterized by hydrophilic plants.

Soil: Soil is the mixture of minerals, organic matter, gases, liquids, and myriad organisms that together support plant life

Water Load: Any material carried by water including nutrients, soil particles, trash, etc.

Ecosystem Services: The collective human benefits stemming from ecosystem functions.

Materials Needed

- Loads of Work Student Worksheet.pdf
- Loads of Work Student Activity Sheet.pdf
- Loads of Work PowerPoint.pdf
- Large outdoor area
- Paper grocery bags, 6-7
- Approximately 60-80 objects about the size of a tennis ball (balls of any kind, half-pint milk cartons, individual yogurt containers, sponges, wads of paper) enough to fill each bag to overflowing
- Rules for the 3 Roles: Water, Soil, Plants

Safety Precautions

Students will be running in an outdoor area. Be sure to choose an area without any obstacles.

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Teaching Instructions

Advanced Preparation

Cut the paper grocery bag to one half of their normal height

Fill each bag with the small objects to act as the “load” for the activity. It is important that each bag be overflowing with objects.

Mark an area outside that is approximately 30’ by 60’

Print out copies of the student worksheet

Print out copies of the roles for the activities. You need two copies of the soil role, six to seven copies of the water role, and then enough copies of the vegetation role for the remainder of the class.

Engagement

1. Divide the class into pairs of students. Distribute worksheets to each student. Ask the students to look at the picture on the first page and talk to their partner about what the photo is depicting. Encourage the students to circle features they think are interesting in the photo. (4 minutes)
2. Solicit students’ thoughts about the photograph. What do they see in the photo? What are the main features? What is going on in the photo? What type of ecosystem are they looking at?
3. Explain that the river depicted in the photograph is the San Pedro River, located in southern Arizona. Introduce the term “Riparian Zone” to the students if no one has identified it at this point.
 - a. Riparian zones are located along the banks of rivers and streams. They exist at the interface of terrestrial and aquatic ecosystems.
4. Ask the students to identify the riparian zone in the photograph. Ask them the following questions and to discuss them with their partner:
 - a. What features of the riparian zone make it different from the surrounding upland and the stream channel?
 - b. Why do these differences occur?
5. Ask the students make a guess about what is the function of the riparian zone.
6. Tell the students that now you will do an outdoor activity to illustrate one function of riparian zones.

Exploration

7. Introduce the term "load," which is a term used to describe the amount of stuff in water. Ask the student what types of things water might be carrying. Desired answers are nutrients, sediment, and trash.
8. Explain that each of the dozens of objects in the paper bags represent a type of load. Make sure the bags are overflowing with "loads."
9. Ask 6-7 students to be water; 2 to be soil. The rest will be plants.
10. Hand out the rules for each position, and make sure the students understand the rules for each position, not just their own. (One way to do this is to have each group of players explain their rules to the entire group.)

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11. Tell the students that the area within the boundary is the riparian zone. One boundary is the upland and the other boundary is the river.
12. Conduct the activity:

ROUND ONE: Ask the plant players to observe this round. Ask the two soil players to enter the riparian area. Position the water players in the upland and instruct them to run through the riparian area towards the river. (Make sure the students run! Their loads should spill out.) When all the water players have completed their runs, assemble the students and record the amount and locations of the loads on the student activity sheet.

How much load remains in the riparian area?

How much load was captured by the soil?

How much load made it into the river?
13. After the first round, ask the students to interpret what happened. Recollect all the load material for the second round. Tell them to compare the first round with the second one.

ROUND TWO: Ask six the plant players to position themselves in the lowland. Return the soil players to the lowland. Have the water players runs through the riparian area again. Repeat the evaluation at the end of the round.

Explanation

14. Ask the students what changed between the first round and the second round.
 - a. How did the presence of vegetation change the dynamics?
 - b. Did the amount and location of “load” change and why?
15. Ask the student to predict how the dynamics will change for the final round with everyone remaining in the class acting as vegetation. Will the amount of “load” in the riparian area increase or decrease?
16. Conduct the final round of the activity

ROUND THREE: As per Round Two, but with all the plants in the riparian area.
17. Ask the students to interpret what happened in this round of the game. Ask the students whether their prediction was correct or not.

Extrapolate

18. Discuss as a group what changed in each round of the activity. Make sure the students understand that plants slow down the water and because of this, some of the load is dropped and some is intercepted by the plants and soil.
19. Ask the students if they think that having the load stay in the riparian area is a problem? If the load is some type of pollution, how does this affect the riparian area? Discuss tradeoffs between having the load retained in the riparian areas versus flowing into the river. Ask the students how they might prevent load from getting into the water in the first place.

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Evaluate

20. Have the students pair up with their partner again to think through one of the scenarios on the second page of the student worksheet (5 min).
21. Ask a few groups to share their answers.
22. Wrap up by sharing that riparian zones are some of the most altered and degraded areas in the world. If these areas are compromised, it can have a big effect on the river ecosystem and all the people, plants, and animals that rely on that river ecosystem.

Homework (choose one)

1. Have students research a scenario for a riparian zone and write a short summary of the effect on the riparian vegetation, the capacity to remove water load, and the effect on the river ecosystem. Possible scenarios include:
 - a. A developer dredges the riparian zone and removes all the plants.
 - b. A storm dumps a huge amount of water on the riparian zone.
 - c. You have a wetter than normal summer or a drier than normal summer.
 - d. A mudslide buries the riparian zone.
 - e. A fire burns the trees and vegetation of a wetland.
 - f. A rare plant or bird is discovered in the wetland.
 - g. A non-native plant is discovered in the wetland.
2. Divide the students into three small groups: water, plants, soil. Ask each group to develop a poster that illustrates a real wetland and how their component contributes to filtering out pollutants. Display the posters where other students can view them.
3. Ask the students to choose a wetland in your community. Explain that they are to investigate this wetland: discover its hydrology, its plant and animal community, and what pollutants may flow into it and out of it. They can choose the format of their investigation and report, but it should be a group effort.

Additional Resources

To find out where the water in your area comes from, see the following website:

<http://www.nature.org/all-hands-on-earth/water>

References

Kesselheim, A. S., B. E. Slattery, S. Higgins, M. R. Schilling. *Wow! The Wonder of Wetlands: An Educators Guide*. A resource from Environmental Concern and Watercourse.

Clean Machine Lesson Plan, Dialogue for Kids Program, Idaho Public Television. *Idahoptv.org*.

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Activity Role Descriptions

Plants

1. Your objective is to collect "load" from the water players.
2. You must pick one place to stand and remain rooted there. You cannot move your feet, but you can bend and lean and reach with your arms.
3. Collect as much "load" as you can from water players and from the ground. Remember that you are rooted to one spot and cannot move around.

Soil

1. Your objective is to collect "load" from the water players.
2. Because "soil" is everywhere, you are free to walk or run all around the riparian area.
3. Collect as much "load" as you can from water players and from the ground. Hold as much load as you can.

Water

1. Your objective is to carry your bag through the riparian area without losing any of your "load."
2. If a "load" falls on the ground, you must leave it there.
3. If you are tagged by "soil" or "plant," you must give a "load" to that player.

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