



**Pima County Natural Resources, Parks and Recreation  
Environmental Education**

**Sum of the Parts  
Elementary and Middle School – 4-8 Grade Lesson Plan**

**Description: Sum of the Parts**

Students build a river model as a means to illustrate the contributing factors to the pollution of a river and identify ways to reduce sources of pollution.

**Linked to Arizona Academic Standards – Science** –S1: C1: G4-8PO1; S1: C3: PO2, PO4; S1:C4, G4-8PO3; S3: C1: G4PO1, G5PO2, G7PO1-PO3, G7PO1, PO2

**Duration:** 1-2 hours

**Objectives:**

- Students learn the definition of point and nonpoint source pollution.
- Students recognize that everyone contributes to and is responsible for a river's water quality.
- Students learn the definition of a watershed (a land area that drains into a water body)
- Students understand how non-point source pollution as well as point source pollution can pollute a watershed
- Students discuss land uses and learn how land uses determine the watershed's water quality
- Student identifies Best Management Practices to reduce pollution.

**Conceptual Framework:**

- Renewable natural resources are replenished through natural cycles, but are still finite.
- Effective conservation practices depend on clearly defined management objectives, and understanding of natural processes and the application of knowledge from many disciplines.
- The decisions and actions of individuals and groups of people impact natural systems.

**Vocabulary**

Point source pollution, nonpoint source pollution, infiltration, land use, precipitation, river, spring, stream, valley, water body, watershed

**Materials:**

The materials and lesson plan are in a tote bag or kit. Each bag contains:

- Large piece of paper with a river' sketch. Divided in sections with a bit of river and space for student's drawings. These represent the "piece" of property they inherited. These pieces are already done (numbered and laminated)

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- Erase markers, sponges, paper towels.
- Classroom “trash” (paper, paper clips, rubber bands, boxes, etc)
- Copies of “The Activity”
- Copies of Best Management Practices.

### **Description of Activity**

1. Define and discuss point source and non-point source pollution.

Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants include: Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas; Oil, grease, and toxic chemicals from urban runoff and energy production; Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks; Salt from irrigation practices and acid drainage from abandoned mines; Bacteria and nutrients from livestock, pet wastes, and faulty septic systems are also sources of nonpoint source pollution.

2. Determine student knowledge about watersheds. Review the definition.

Ask the students, where the Colorado, San Pedro or Santa Cruz River originates (where are the headwaters) and end? How many states, counties or countries they cross? What types of land uses are found along it flows? The activities will affect the river? The water quality can be affected downstream because the use from the upstream neighbors?

3. Pass the copies of “The Activity” to the students along with one “piece” of the property that they just have inherited. Set up markers in each table for students to share. Allow the students to work in their drawings for 15 minutes. When students have completed their drawing ask them to look at the number in their “property piece” and starting with number one, have students assemble their pieces; 1a facing 1b, 2a facing 2b, and continue until all the students are line up forming the river.

4. Ask each student to describe how she/he developed their property. What kind of pollution they produce? (see list above). How much is their polluted contribution or added materials to the river? If their contribution is big they receive more “trash” if its small they receive less. Each person passes their “pollution/trash” to the next student downstream. At the end the students located downstream receive all the “trash” from their upstream neighbors.

5. Discuss the activity, could a student downstream be affected by the actions of a student upstream? How is the water quality affected? Tell the students to reclaim their “trash”, explain that the items easy to identified are there own simulated point source pollution, and the other items more difficult to claim (example paper clips) represent nonpoint source pollution originated from different sources.

6. If the time allows review/discuss the list of best management practice together with all the students.

## The Activity

You just have inherited a one-acre piece of riverfront property and one million dollars.

1. Think about how you would like to develop or use the land.
2. In the "piece" of property that you own now, make a drawing that shows how you develop your land. You have one million dollars to spend!
3. You can have a farm or ranch, a vacation resort, homes, factories or parks. You could also plant forests, develop a mine or build a factory.
4. The piece of property has **NO** utilities (energy, water or sewage disposal).

**Things to consider before you make your final plan.**

1. Where will you get the energy that you need?
2. What will be your source of water?
3. How will you manage wastes/sewage?
4. What kind of resources do you need to develop your plan