

Land Use and Pollution Scavenger Hunt

Lesson 7

Objectives

The student will be able to do the following:

- Describe land uses directly influencing the stream near the school
- Identify possible sources of pollution to the stream near the school

Materials

- Worksheet, at least one per group or one per student if desired
- Gold sticky stars
- Mini chocolate bars or other prizes, if desired

Background

This unit builds on previous units on land use and pollution and asks students to apply the knowledge to their direct surroundings. This activity is structured like a scavenger hunt to create a sense of fun and personal competition.

In this particular unit we also continue asking students to think “outside of the box” or outside of the confines of the school. Even though they have not visited other sites, we will ask them to hypothesize about water quality conditions at other sites (e.g. in the forest, at the end of the Ala Wai Canal).

Advance Preparation

Students should have been introduced to the terms “land use” and “pollution” from previous units. Students will go outside so they may want to dress accordingly.

In this unit, students will fill out worksheets and must check with teachers in order to receive gold stars for their work. Teachers should each have a copy of the answer key or be familiar with the land uses in the area and possible sources of pollution in the area. Teachers should split up gold stars and prizes so that students have more teachers with which to interact.

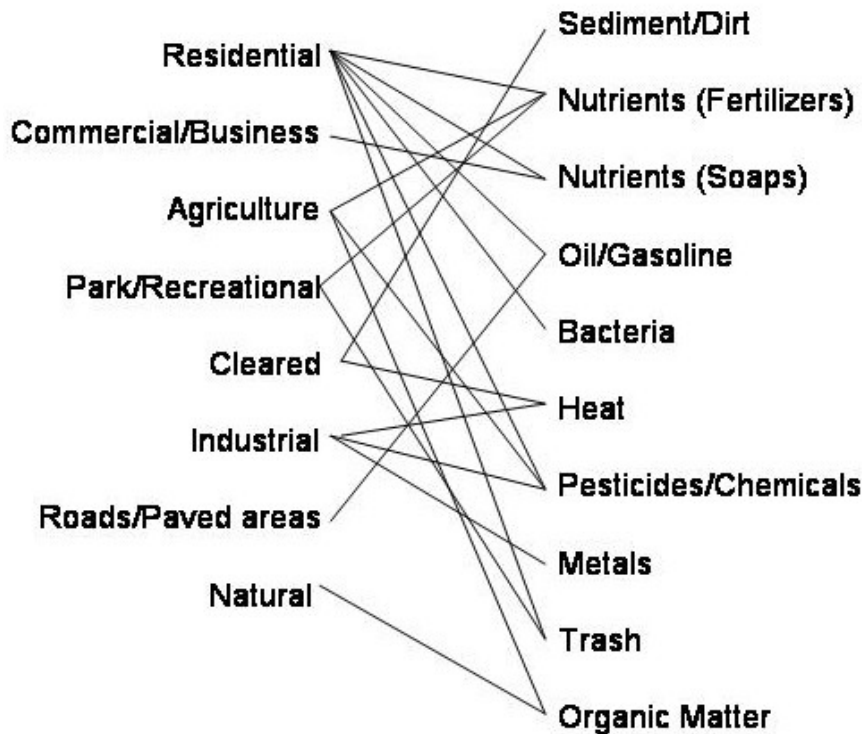
Students will fill in the worksheet and check with teachers to see if their answers are “right.” For each right answer, students will receive one gold star. Completely filled in worksheets can receive a prize. PLEASE NOTE: there is no one “right” or “wrong” answer. It will be at the teacher’s discretion to reward students or ask them to continue working. There are many possible answers – the student just has to make his/her case.

Each student or group (as desired) should have a copy of the worksheet.

Procedure

1. **Begin with a review of land uses and the types of pollution that can be produced by the land use.**
 - a. **Have students brainstorm land uses. List these on one side of the board**
 - b. **Have students brainstorm types of pollution. List these on the other side of the board.**

- c. Ask student volunteers to draw lines to collect the land sources to pollution. There can be many lines originating from one land use (an example is below).



2. While the chart is on the board, work through the possible land uses and sources of pollution at three different spots:

- a. At the edge of the forest (at the top of the Manoa valley)
 - i. Land use is mostly natural. There are some small parking lots, roads, and buildings above the main tree line. There are also some bare areas at the very top of the mountains, although these likely have very little sediment. Students should identify **NATURAL**.
 - ii. Sources of pollution – not very much pollution. Possibly some sediment, organic matter (any left over material from cut trees), or bacteria from pigs.
- b. Near the school
 - i. Near the school: Residential (on other side of creek – dorms, houses to the south of park), commercial/business (UH buildings, Hokulani elementary school), Park (Kanewai field), Cleared (area on the stream without any riparian zone, dirt path and dirt road along edge of stream), Industrial (none), roads/paved areas (Surrounding roads – can't see, but these are influencing the stream), Agriculture (can't see from field, but taro fields at Hawaiian studies building), Natural (areas with riparian zone)
 - ii. Sources of pollution – all of the sources of pollution are possible. There is not likely to be much oil or gasoline as there are few cars directly near the stream, although some is likely to come from upstream. The agriculture is small so it likely has little impact. Major sources of pollution could include nutrients (both types) and trash. Students should be able to identify that **ALL** types of pollution could be present, but in varying levels and possibly in low levels.
 - iii. You may also want to push students to think about what land uses are found in the intervening land between the school and the edge of the forest.










- Residential, roads, and commercial are major land uses. There are also large recreational areas.
- c. At the end of the Ala Wai Canal
 - i. Along the Ala Wai Canal, there is a lot of recreational area, roads, residential, commercial. There is a patch of cleared area; also baseball fields have bare areas. The sewage pipe runs along side the canal (from businesses and residential). There is no agriculture near the canal and very little natural riparian vegetation. There are many more parking lots. The Ala Wai golf course probably has a large influence on the stream
 - ii. All of the types of pollution are likely to be found here, but major ones include (fertilizers from recreational areas, pesticides from golf course, oil and gas from parking lots, soaps from residential areas, heat from the cleared areas along the stream, and trash from the many users in the areas. Students should be able to identify that there are likely to be MORE types of pollution present.
 3. By going through these examples, begin to put together some hypotheses for how water quality may differ between the sites. Hypotheses can be phrased either in terms of one site (e.g. Water quality at the edge of the forest will be good) or in terms of a comparison (e.g. There will be more sediment at the Ala Wai Canal than at the school).
 4. It might be hard to come up with hypotheses.
 - a. Talk about why:
 - i. They don't know much about water quality
 - ii. They don't know much about land uses
 - iii. They've just learned it
 - b. Talk about how scientists answer questions about land uses and pollution
 - i. They use different types of data (aerial photos, surveys, talk, etc.)
 5. Tell students that they will get to be like scientists by doing field surveys and talking to each other.
 6. Explain the activity and worksheets.
 7. Go outside and allow students the time to find all of the land uses and identify sources of pollution. This should take up the rest of the class period.

Activity:

1. Students, either alone or as teams, will work to fill in the blanks on the worksheet. The worksheet asks them for examples of each type of land use. They have to go outside and identify specific examples of land use (e.g., the dorm, or the trail, etc.)
2. The worksheets also asks them to identify sources of pollution. They must identify specific sources of pollution (e.g. people washing their cars, somebody fertilizing a garden, people throwing trash in the stream, etc.)
3. As students fill out each box on the worksheet, they can come to the teachers for "rewards." If the teacher is satisfied with each box, the teacher can put a gold star in the box. When all boxes have stars, the students can claim a prize (if desired).

On this page, identify specific sources of pollution for each type of pollution

- Be creative!
- For example: BACTERIA can grow in dead and decaying animals in the forest upstream.

<p>Dirt/Sediment</p> 	<p>Nutrients (Fertilizers)</p> 	<p>Nutrients (Soaps)</p> 
<p>Oil/Gasoline</p> 	<p>Bacteria</p>  <p>Hint: Bacteria can come from sewage, wild animals, and dead animals</p>	<p>Heat</p>  <p>Hint: What parts of the stream are hotter than others?</p>
<p>Pesticides/Chemicals</p> 	<p>Trash</p> 	<p>Organic Matter</p>  <p>Hint: Organic Matter comes from natural sources and provides energy. Too much energy can be a type of pollution.</p>

Land Use and Pollution Scavenger Hunt

TEACHER KEY TEACHER KEY TEACHER KEY - Students can provide **ANY** or **ALL** of the answers - at the teacher's discretion

Directions:

- On Page 1, identify specific examples for each type of land use
- Be creative and think about what you can and can't see. Look upstream, downstream, across the stream, and behind you.
- For example: One example of commercial and business land use is the Hokulani Elementary School!
- When you think you have identified a type of land use, check with the teacher. If you're right, you get a gold star.
- Fill up your worksheet with gold stars, and get a prize!

<p style="text-align: center;">Residential Land Use</p> <p>Dorms, houses surrounding park and school, ALL of the homes upstream</p>	<p style="text-align: center;">Commercial/Business</p> <p>Hokulani Elementary School, UH Buildings, ALL of the upstream grocery stores, office buildings, other stores</p>
<p style="text-align: center;">Agriculture</p> <p>None visible; taro \at Hawaiian studies</p> <p style="text-align: center;">Hint: It might be upstream</p>	<p style="text-align: center;">Park/Recreation</p> <p style="text-align: center;">Kanewai Field</p>
<p style="text-align: center;">Cleared/Bare</p> <p>Dirt road and dirt trail along stream; parts of stream with no riparian zone</p>	<p style="text-align: center;">Roads/Paved Areas</p> <p>Dirt road, any roads in nearby area. Big roads beyond the view</p>
<p style="text-align: center;">Natural</p> <p>Parts of the stream with riparian zone; Forested side of hill above campus</p> <p style="text-align: center;">Hint: What is the vegetation next to the stream called?</p>	<p style="text-align: center;">Industrial</p> <p style="text-align: center;">None</p> <p style="text-align: center;">Hint: If you can't see any factories, maybe there aren't any!</p>

TEACHER KEY TEACHER KEY TEACHER KEY

On this page, identify specific sources of pollution for each type of pollution

- Be creative!
- For example: BACTERIA can grow in dead and decaying animals in the forest upstream.

<p>Dirt/Sediment</p> <p>From cleared parts of stream, dirt paths, dirt road, dirt exposed in field (baseball diamonds), construction sites (dorm across street), cement from construction</p>	<p>Nutrients (Fertilizers)</p> <p>People fertilizing yards, gardens, fertilizers in landscaping in front of businesses, fertilizers from taro farm (if they use it), fertilizers to make grass green (Kanewai field?)</p>	<p>Nutrients (Soaps)</p> <p>People washing cars, any soaps or detergents that overflow, from taro farm (if they use phosphate as a fertilizer)</p>
<p>Oil/Gasoline</p> <p>Dripping from cars on the roads or parking lots (above the stream, may flow down); from garbage</p>	<p>Bacteria</p> <p>From nearby or high up in the watershed - any pigs or wild animals excreting into runoff; any dead animals in the stream; garbage</p> <p>Hint: Bacteria can come from sewage, wild animals, and dead animals</p>	<p>Heat</p> <p>Areas that are exposed to the sun can be hot (areas without riparian zones - NO SHADE)</p> <p>Hint: What parts of the stream are hotter than others?</p>
<p>Pesticides/Chemicals</p> <p>Any pesticides used in people's gardens, pest sprays, paints, cleansers used in driveways or carports, pieces of cement from construction; from garbage thrown into stream</p>	<p>Trash</p> <p>Whatever people throw in, things that fly in accidentally from garbage cans in the park</p>	<p>Organic Matter</p> <p>Any food/degradable garbage dumped in the stream; yard waste, leftovers from cutting down trees, algae</p> <p>Hint: Organic Matter comes from natural sources and provides energy. Too much energy can be a source of pollution</p>