

Lesson Plan 2:

Pollution and Conservation of Guam's Fresh Water

INFORMATION

Lesson Plan Title: Pollution and Conservation of Guam's Fresh Water

Primary Subject: Science and Social Studies,

Secondary Subjects: Art, Language Arts, Chamorro Studies, Spelling, Vocabulary

Grade Level: 3-7

Note to Educators: These educational materials are designed as a companion to the "Guam Water Kids" pre-recorded presentation and website at www.guamwaterkids.com. Contact: Ann Card, ann@cardandcard.com.

OVERVIEW

Protecting **Guam's fresh water**, one of the island's important **natural resources**, is the responsibility of everyone including young people. This is the focus of the "Guam's Water Kids" project, which downloadable educational materials at the companion website at www.guamwaterkids.com. An ample **supply of fresh water** means that people can live and thrive on our island. We can protect this natural resource by understanding the threats to Guam's natural supply of fresh water and developing responsible about responsible actions that prevent pollution and conserve fresh water.

Preventing Pollution

A wide variety of pollutants can affect Guam's fresh water and Guam's coastal waters and reefs. Pollution is generally divided into two categories:

Non-point Source Pollution (NPS pollution) – Pollution discharged over a wide land area, not from one specific location. An example of NPS pollution is the contaminants that are carried into rivers and streams when rainwater washes off city streets, backyards or plowed fields. The runoff water can carry pesticides, household chemicals and other pollutants into the water as it flows to the ocean. *NPS pollutants come from sources that we as individuals have control over.*

Single point-source Pollution – Water pollution coming from a single point, such as a sewage-outflow pipe. *Point Source Pollution is regulated by federal, state and local laws.*

Controlling Non-Point Source Water Pollution on Guam is possible through education.

Education can help everyone understand water pollution and its potential effects.

Choices: The actions and choices we make every day can help to prevent NPS pollution. Human activities pollute rivers, wetlands, coastal waters, and even our underground sources of fresh water.

Responsible Citizenship: Community advocacy and awareness campaigns can help to prevent NPS pollution by influencing the choices public officials make for our island such as zoning and erosion control ordinances.

Conserving Fresh Water

There are many ways to conserve fresh water through individual choices and responsible citizenship.

Individual Choices: The everyday actions and choices that everyone—including kids—can make help to conserve fresh water. This lesson and the website activities present examples of responsible habits that students can incorporate in their daily routines.

Responsible Citizenship: Students are encouraged to support and volunteer for community activities in this lesson.

GOALS / OBJECTIVES

Students will be able to identify common household substances that can pollute fresh water.

Students will be able to predict possible future problems for Guam's fresh water caused by improper disposal of household pollutants.

Students will be able to list personal habits that they could form for the responsible disposal of household pollutants and for conservation of fresh water in their daily lives.

Students will be able to create a Plan of Action for their households which includes responsible ways of disposing household pollutants and conserving fresh water.

Students will be able to work with others to design posters to raise awareness of ways to prevent pollution and conserve fresh water in daily life.

Students will be able to identify community projects that help protect fresh water resources.

MATERIALS NEEDED

General:

Computer with Internet access.

Lesson Plan: "Pollution and Conservation of Guam's Fresh Water" (Downloadable at www.guamwaterkids.com)

Teachers' Instructional Pre-Recorded Presentation – **Parts 4&5 Review, Kids Can Do** downloadable at www.guamwaterkids.com

Additional information sheet for handout or overhead projection: Protecting Guam's Fresh Water: Your Personal Solution (Page 7 below or Download at Guamwaterkids.com).

Paper (lined, poster, and butcher), pencils, crayons, markers, crayon pastels, and other art supplies.)

Overhead projector.

(For Activity #1:)

Use *empty, clean* containers from common household pollutants such as leftover motor oil, bleach, cleaners, herbicides, paint, batteries, and gasoline. (*Important: All containers should be emptied and thoroughly cleaned inside and outside so that children can handle them safely*).

(For Activity #2:)

5 clear plastic cups of water.
1 tablespoon each of 4 dissolvable additives: vinegar, salt, lemon juice, and sugar.
5 cotton swabs per student.

(For Activity #3:)

None

PROCEDURE

Lesson Introduction

Ask What is one of Guam's most important **natural resources**? Students respond.
Confirm that one of Guam's most important natural resource is **fresh water**.

Main Lesson

Ask students what do you do with something that is important? Students respond.

Tell students that we protect the things that are important. Guam's fresh water is one of our island's most important **natural resources**, and that it is important to develop responsible habits that will **prevent pollution and conserve Guam's fresh water**.

Show Teachers' Instructional Presentation: "Pollution and Conservation of Guam's Fresh Water." **Parts 4&5 Review, Kids Can Do**

Ask what are some common substances that are found around the house that could cause the pollution of our fresh water supply? Students respond.

Conduct Activity #1:

1. Distribute *empty, clean* containers from common household pollutants (such as bleach, paint and motor oil) around the room in plain sight on bookshelves, etc.
2. Divide students into groups of three or four.
3. Each group is to look around the room, recognize, and collect as many as possible.
4. Each group will record a list of the different household pollutants found.
5. Reconvene the class after 5-7 minutes and discuss the pollutants and responsible disposal.

Ask what are responsible ways to dispose of household pollutants? Students respond.

Confirm the responsible ways of disposing of household pollutants.

Ask how do we know if fresh water is polluted? Students respond.

Tell students that *sometimes* we can **see, smell or taste** pollution.

Conduct Activity #2

1. This activity will help students understand that clear fresh water isn't necessarily free of pollution by using their sense of taste.
2. Before the students are present, prepare five clear cups of water, four will have the additives to demonstrate that even clear water can be polluted.
3. Add one of the four additives to each cup, leaving one cup of only water. This will make a cup of salty water, sugary water, vinegar water, lemon water and one cup of fresh water with no additive.
4. Have students taste the liquids one at a time. Let each student dip the tip of a cotton swab into a cup. Use one swab per cup and dispose of the swabs immediately after each taste.
5. Once some of the students have had a chance to taste, guess the "pollutants" and discuss that some pollution cannot be seen.

Ask: These "additives" are not harmful, but ask what unseen pollutants could be harmful?

Confirm: Since pollutants can go anywhere the rainwater can go, we need to be careful not to pollute our fresh water supply in rivers, lakes and the underground Northern Guam Lens Aquifer.

Talk about responsible habits for disposing of household chemicals and other substances that can prevent pollution of Guam's fresh water resource.

Handout & Discuss: Protecting Guam's Fresh Water: Your Personal Solution (Page 7 below)

Activity #3 Brainstorming

Ask: What are your own fresh water usage habits? How do you use water each day? Students respond.

Record the habits on the board or on butcher paper. **Create** a two-column list of "Fresh Water Habits" with one column labeled "Helpful" and the other labeled "Harmful."

Ask Which fresh water usage habits are *helpful* habits? Students respond.

Ask Which fresh water usage habits are *harmful* habits? Students respond.

Ask What fresh water usage harmful habit would you like to *change*? Students respond.

Ask What fresh water usage harmful habits you would *stop*? Students respond.

Ask What fresh water usage helpful habits would you *develop*? Students respond.

Confirm that every decision (whether large or small) by every person (whether old or young) that we make about the use of fresh water is important to the conservation of one of Guam's most important natural resources.

EVALUATION

- 1. Divide** students into groups of three or four. Assign each group to create a poster showing either (1) how to prevent pollution of fresh water or (2) how to conserve fresh water on Guam. The posters could be put around the school or hung in the classroom.
- 2. Assign** each group to create a Plan of Action for use at home that will protect Guam's fresh water. Corresponding with the poster assignments above, assign each group either to (1) make a list of ways to dispose of common household pollutants responsibly or (2) make a list of ways to conserve and use water responsibly each day.
- 3. Provide** students the Defined Vocabulary List (downloadable online). Allow each group to share their poster and action plan with the class.
- 4. Allow** students to use computers or iPads to check out the Guam Water Kids website at guamwaterkids.com during the group activity time to do research for their posters and Action Plans, and to find out more about the idea that "what kids do matters." Students may also want to see the Guam Water Kids card which can be printed out and self-signed. The card reminds children of the ways they can preserve and conserve water.

TEACHER/LEADER REFLECTION

Were the students motivated by the "Guam Water Kids" educational materials?

Did the students work together cooperatively?

Did the activities reinforce the lesson?

Were the students able to follow the directions?

Was the presenter/teacher able to manage the class closely?

NOTES AND CREDITS:

This lesson plan is a component of the educational materials that accompany the "Guam Water Kids" multi-media presentation and website at www.guamwaterkids.com. Teachers and students may freely use these materials.

Presented by WERI–The Water and Environmental Research Institute of the Western Pacific at the University of Guam.

Funded by the U.S. Geological Survey, WERI, and Triple J Enterprises of Guam and the Ford Motor Company Conservation & Environmental Grants.

Website and graphic designer: Phil Card, Card & Card Advertising

Grantee: Ann Card, contact information: 565-2213, ann@cardandcard.com

(Additional information about disposal of household chemicals follows)

Protecting Guam's Fresh Water: Your Personal Solution

Wherever the Rain Can Go – Pollutants Can Also Go

We all depend on our island's natural supply of clean, fresh water. Guam's supply of fresh water falls as rain and makes its way to into bodies of surface water such as rivers and lakes and underground water collections such as the Northern Guam Lens Aquifer. Some of this fresh water will be pumped, cleaned, and piped into our homes for drinking, cooking, cleaning, gardening and much, much more.

If you wouldn't drink it, don't dump it!

Wherever the rainwater can go, pollution can also go. Whatever we dump in our yards, roadsides, drains, septic systems, storm drains and even our trash can get into our fresh water supply. So, if you wouldn't drink it, don't dump it.

Storing and Disposing of Your Household Chemicals

Here are some ways to manage your hazardous household chemicals such as automotive oil, paint, pesticides, fertilizers and solvents without harming our fresh water supply.

- Buy only the amount you need and use all or as much as possible before disposing of leftovers.
- If the product goes down the drain in normal use, then it's okay to dilute with water and pour it down the drain.
- Never mix chemicals together before disposing of them.
- Don't "hide" your hazardous household waste in your regular trash pickup.
- Fertilizer - Use organic fertilizers instead of chemical fertilizers. If you must use chemical fertilizers, cut back and don't fertilize during rainy season. Dispose of leftovers according to label directions.
- Insecticides and herbicides - Poisons that kill pests and weeds can introduce harmful chemicals into the water supply. Pull weeds and allow for a few munched leaves. If you must use insect or weed killers, use only the amount as directed follow safety precautions. Dispose of leftovers according to label directions.
- To find the best place to dispose of hazardous waste, check the Guam EPA's "Guam Recycling Guide." <http://epa.guam.gov/activities/recycling-guide/>

Keep Your Family Safe

Store household chemicals safely out of the reach of children. Always read the labels. Take care to store chemicals so that the labels remain readable for future use and disposal.

