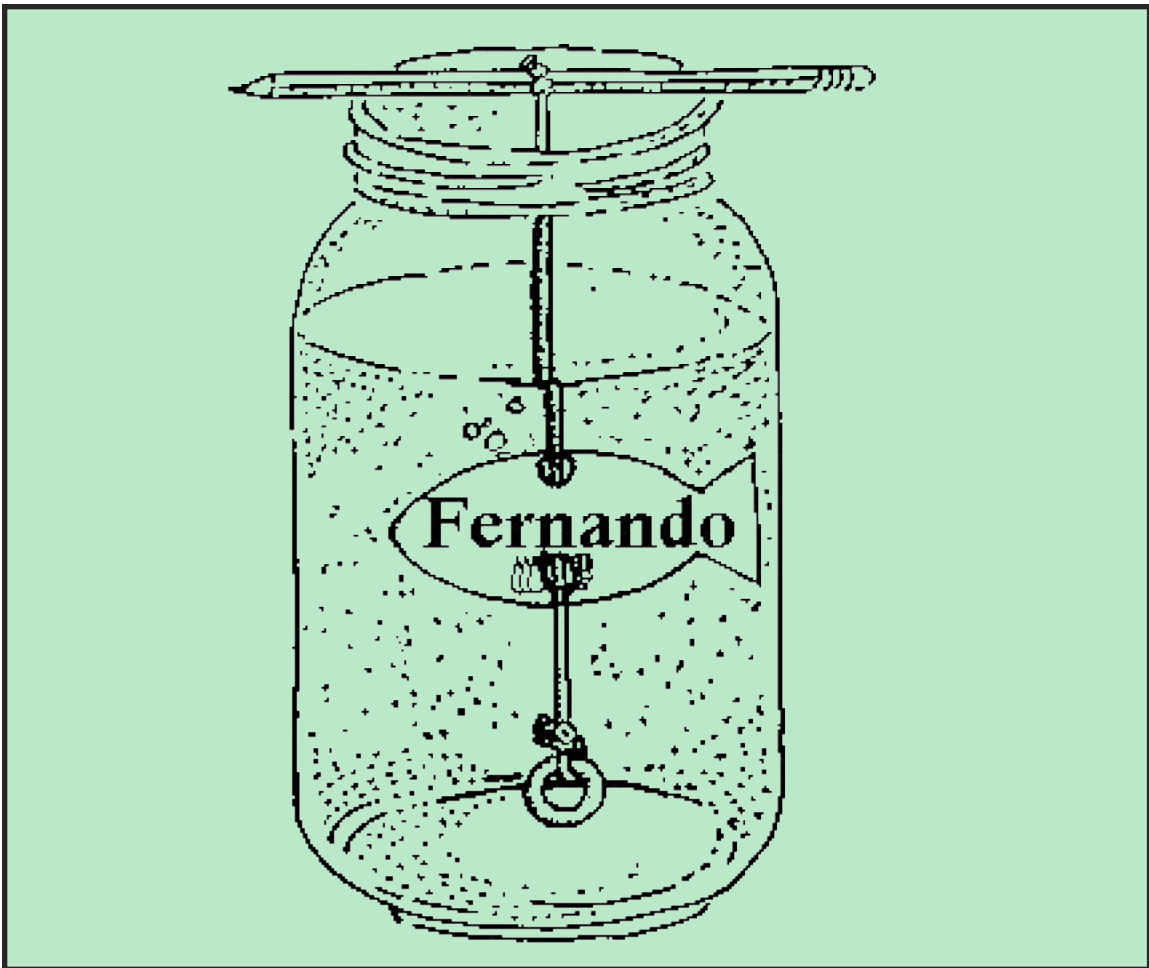


LESSON 2

FERNANDO'S BIG ADVENTURE



Students will follow a storyline while participating in a science experiment that defines water pollution and demonstrates how human activities affect water quality. We will also discuss Santa Cruz River issues, how current human practices affect water quality and potential solutions.

2



LESSON OVERVIEW

Students will follow a storyline while participating in a science experiment that defines water pollution and demonstrates how human activities affect water quality. We will also discuss Santa Cruz River issues, how current human practices affect water quality and potential solutions.

Subjects

Science and Reading

Science Standards

Science as Inquiry
History and Nature of Science
Personal and Social Perspectives in Science

Objectives

Students will:

1. Define water pollution and describe ways that water becomes polluted.
2. List ways in which human activities contribute to water quality.
3. Describe ways to prevent water pollution.

Preparation

Make a fish shaped out of a sponge. Attach a 12" string with a metal washer (1" diameter) on one end and a pencil or stick on the other; a gallon of water; script for Fernando the Fish's Big Adventure (Photocopy and see *Master Pages 2.5 and 2.6*); (*Page 2.2, steps 1 & 2*).

Time

50 minutes

Vocabulary

bacteria, pesticides, factory waste, refuse, toxic waste

FERNANDO'S BIG ADVENTURE

TEACHER BACKGROUND INFORMATION

One of the most significant problems facing the Santa Cruz River watershed is pollution. The river runs through both Mexico and the United States, making it a concern of international significance.

While litter is the most visible form of pollution, giardia, chemical leakage and spills are a reality. High occurrences of health hazards and diseases such as lupus are presently being studied.

Every year hundreds of bags of trash are cleaned out only to be replenished by summer rains. For the most part, the litter comes down from the Nogales Wash, when, during the monsoon rains, tons of trash are transported north from both sides of the border.

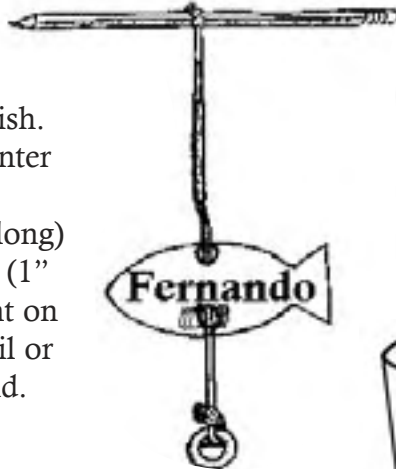
In addition to the fact that litter is ugly, we need to help our youth realize the impact it has on our present-day and future lives.

Habitat is destroyed or compromised, and string, plastic six-pack holders and sharp objects pose hazards to wildlife. Looking through the trash one can find oil cans, cleaning supplies, batteries and an assortment of other containers, many that hold harmful chemicals, which can and do leak into the water table. Our landfills are also reaching maximum capacity while we continue to increase the use of disposable products, many of which will never decompose.

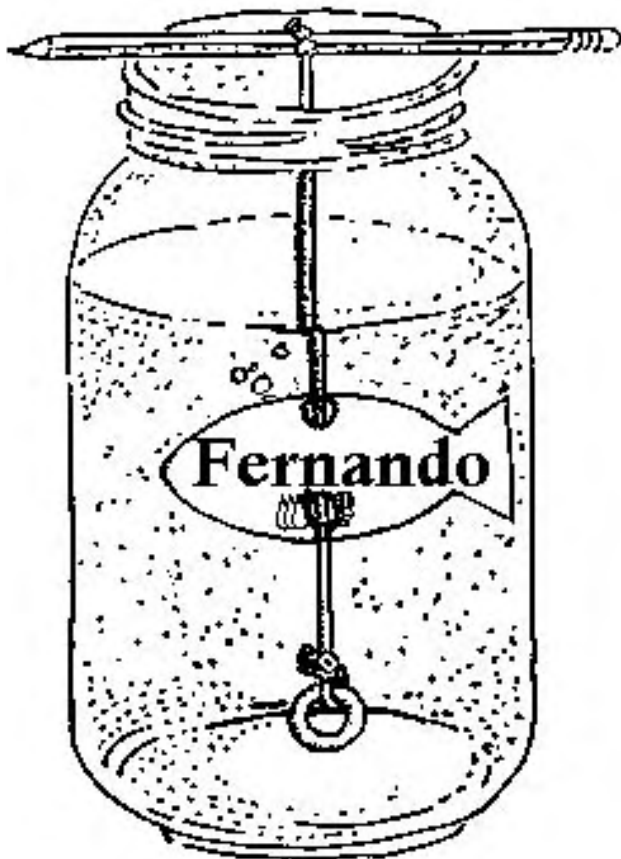
Through participating in these activities, students will become aware of the problems such as unsightliness of trash, the environmental impacts littering causes and the implications of using disposable products.

LESSON 2 - FERNANDO'S BIG ADVENTURE

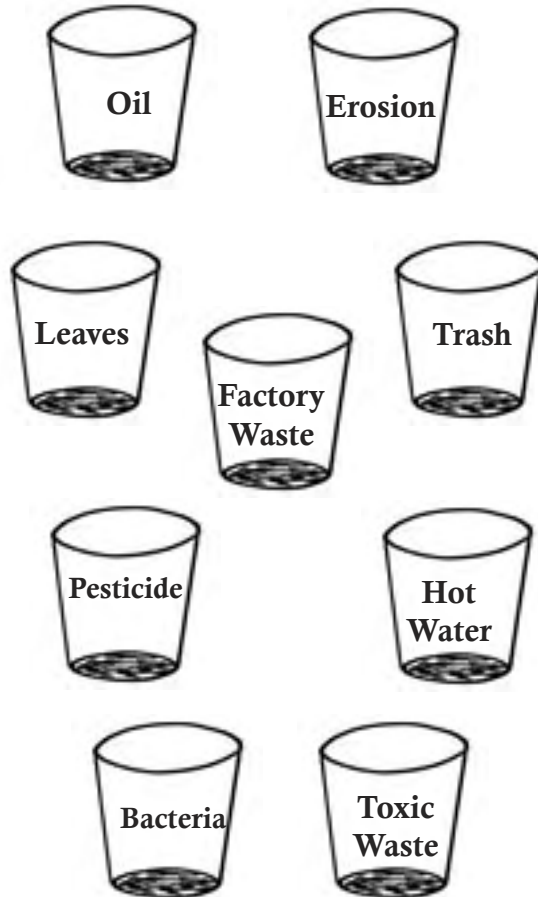
1. Cut a normal kitchen sponge into the shape of a fish. Attach this to the center of a piece of string (approximately 12" long) with a metal washer (1" diameter) as a weight on one end, and a pencil or stick on the other end.



2. Place the sponge in a gallon jar of water suspending it with the string attached to the stick or pencil on top. (See diagram below)



3. Fill and mark eight cups as follows:



Erosion - 1/2 cup soil

Oil - 1/8 cup cooking oil

Leaves - filled with leaves or other vegetation

Pesticides - 1 Tbsp sugar

Trash - 1/4 cup paper collected from a hole punch

Factory Waste - 1/8 cup soapy water

Bacteria - 1/8 cup cold water.

Toxic Waste - a pinch of salt.

Hot Water - 1/2 cup hot water

LESSON 2 - FERNANDO'S BIG ADVENTURE

4. Make photocopies of *Master Pages 2.5-2.6* and either: 1) cut out the separate parts for specific students to use or 2) make copies for all students to read along.

5. Using the prepared jar, introduce Fernando the Fish into the water. Explain that Fernando knows a lot about water quality and that he will be telling us how humans affect the quality of the water we use.

6. Discuss the meaning of the word “quality,” eventually leading to a definition of water quality. Explain that good water quality (water that is pure, clean and safe) is essential to the health of all living things. Even if we have all the water we need, if the quality is not good, we cannot survive.

7. Tell the students that Fernando is going to take us on an adventure in order to show us things we do that make water unsafe for living things. Everyone in the class will participate. Select nine students to read about Fernando’s Big Adventure. Pass out scripts (see *Master Pages 2.5-2.6*) and assign parts. You may also want to assign one student to write on the board listing Fernando’s adventures in order.

8. Ask all students to have a pencil and paper ready and each time someone says “How’s Fernando,” they should write down a word (an adjective) that describes Fernando’s condition.

9. Have selected readers read their roles, in order, while adding ingredients from the appropriately marked cup to Fernando’s jar. (For example, *Soil* add the cup marked soil, etc.) After each addition, and after each reader has read “How’s Fernando,” remind students to write down at least one descriptive adjective.

10. After Fernando has gone through all of his adventures, lift him out of the jar and discuss his condition. Ask students to share with the rest of the class some of their adjectives. Discuss whether the things that happened to Fernando are realistic (i.e., do people really do these things to water?) Using several of Fernando’s encounters with pollutants as examples, review how different human activities affect water quality.

11. Ask students to think of other human activities (which Fernando did not experience) that affect water quality.

JUST TRASH?

Aluminum Cans - not biodegradable; sharp edges may injure wildlife or people; small animals or insects may get trapped inside.

Paper - inks and bleaching chemicals contaminate soil and water.

Plastic six-pack rings - not biodegradable; may strangle wildlife.

Trash in water - may injure aquatic animals that get stuck or try to eat it; chemicals leak into water.

Household cleaners, chemicals & batteries - harmful chemicals may leak into the soil, water and air; potentially dangerous if touched by humans.

Glass - broken glass may injure people or wildlife; small creatures can get trapped inside jars or bottles.

Styrofoam and plastic - not biodegradable; may injure animals that mistake bits of plastic for food.

Old tires - may release harmful chemicals into the soil, water or air.

Candy and gum wrappers - many wrappings do not easily biodegrade.

LESSON 2 - FERNANDO'S BIG ADVENTURE

Some people think that water pollution occurs because of the activities of big industries. What about the things that many people pour down the drain like paint, cleaners and other chemicals? How would these harsh chemicals affect water quality? How does it affect people who use the water?

12. Using what students have learned, hold a discussion about problems affecting the Santa Cruz River.

Where does our drain water go?

To our septic tank or else a wastewater treatment plant in Rio Rico, Green Valley, etc.

What happens to it when it gets there?

It all eventually gets to a sewage treatment plant, is processed, cleaned and returned to the river.

Do you think the water quality in the river is good? Why or why not?

For the most part, the water is cleaned, although many people question whether there are undetected chemicals or pollutants. In 1999 water monitoring studies found high quantities of ammonia that are affecting the fish. Steps are being taken to improve the treatment process.

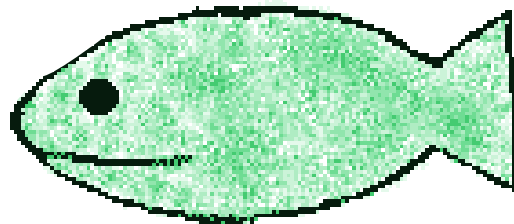
Do you think people and animals can get sick from the water? Why or why not?

Fish have died as a result of high ammonia content. Certain areas of Nogales are known to have a high rate of lupus believed to be caused, at least in part, by polluted water.

Are there any types of pollutants that you can see along the river?

Trash is a major problem along the Santa Cruz. Most of it is thrown in the Nogales wash, on both sides of the border, and then transported north with summer and winter rains. Trash found can consist of chemical bottles, oil cans, plastic, old toys, medical supplies and you-name-it. Students visiting the river at Tumacácori haul out hundreds of bags of trash annually which are redeposited every summer and winter.

13. Wrap up the activity by asking if there are ways to clean up polluted water such as Fernando's or the Santa Cruz River. What can your students do to help?



Enrichment

- Attempt to clean Fernando's water using sand, gravel and coffee filters.
- Pick up trash around your school, the Santa Cruz River or neighboring area.
- Ask students to survey what kinds of household cleaners and chemicals are used in their homes or school and how they are disposed of.

Fernando the Fish's Big Adventure

(Script)

NARRATOR: Fernando is a happy, healthy fish living in the clear, clean water of a stream on the mountain. It is a wilderness area - clean, unpolluted, and far from the effects of human activities. Fernando has lived here all of his life. One day, a big rain fell and Fernando decided to go with the flow and have an adventure.

HOW'S FERNANDO?

SOIL: Fernando swam past a big field that was recently cleared for a housing development. All the vegetation was removed from the field and, after the big rain, there was nothing to keep the soil in place. It washed away, eventually reaching Fernando's stream. **Add "Soil" and ask**

HOW'S FERNANDO?

LEAVES: Further down the stream, the vegetation that had been cleared from the fields was dumped. The same rain that washed the soil away also washed the uprooted vegetation into Fernando's stream. **Add "Leaves" and ask**

HOW'S FERNANDO?

PESTICIDES: The stream in which Fernando is swimming next flowed through an area where people were growing crops. There were cotton fields, grapes and alfalfa. The insects loved the crops and were doing quite a bit of damage. The farmer hired a plane to fly over and spray pesticides on the crops to kill the bugs. The pesticides killed the bugs but were then washed off the crops in the next rain. The poison flowed with the rainwater off the field and down to Fernando's stream. **Add "Pesticides" and ask**

HOW'S FERNANDO?

TRASH: A road leading to the edge of Fernando's stream goes to a pretty place with big cottonwood trees. Some people having a picnic near the stream did not bother to pick up their trash when they were through. The next wind blew the trash into the stream. **Add "Trash" and ask**

HOW'S FERNANDO?

FACTORY WASTES: Fernando next swam through water that was polluted when a factory located near the stream dumped some of its waste right in the stream. **Add “Factory Wastes” and ask**

HOW’S FERNANDO?

BACTERIA: Fernando could hear it and smell it before he reached it. The cows were packed in, mooing loudly. The local dairy farm was poorly managed and all those cows in that small space created quite a stink of refuse. The refuse drained right toward Fernando’s stream and before he knew it, he swam right into the runoff from the farm. **Add “Bacteria” and ask**

HOW’S FERNANDO?

OIL SPILL: When people change the oil from their car, it must be disposed of correctly. Also, sometimes people don’t properly maintain their cars and oil leaks out. Fernando was unfortunate enough to swim right into some oil that had washed into the stream from the gutters. **Add “Oil” and ask**

HOW’S FERNANDO?

HOT WATER: Sometimes water from streams and rivers is used to cool moving parts in big factories and energy generating stations. Unfortunately, some companies do not re-cool the water before returning it to the stream where they got it. **Add “Hot Water” and ask**

HOW’S FERNANDO?

NARRATOR: You call this an adventure? It’s amazing what people do to water! But maybe, just maybe, people like us can help save Fernando the Fish!

SAVE FERNANDO!
SAVE FERNANDO!
SAVE FERNANDO!

