The Country Club Creek Ichthycide (Condensed Version)

Overview

Students investigate a fish kill that occurred in Austin in 1979. Students determine watershed pollution sources by identifying locations on the land that drain to a pond where the fish kill occurred. They will investigate a watershed model and maps of Country Club Creek and must use information from the Country Club Ichthycide story to decide where to sample sites to discover the source of the pollutant.

TEKS (7th Grade Science)

7.1A-B, 7.2A-C &E, 7.3B-C, 7.4A, 7.8C, 7.10A

Time

1-2 class periods

Purpose

The students will:

1. Define watershed;
2. Identify flow paths in the Country Club watershed that drain to the fish kill site;
3. Identify possible pollution sites based on drainage patterns that could have caused the Ichthycide.
4. Work with other students and a budget to plan, research and analyze data.
5. Understand that research plans must consider limits in technical and economic resources.
6. Use a simulated testing procedure to determine the source of the pollutant.

Materials

For each student:

- ☐ laminated map of Austin's Watersheds
- ☐ laminated map of Country Club Creek Watershed
- ☐ laminated Student Sheet 3.1-map of test sites
- ☐ Student worksheet
- ☐ laminated newspaper article (to be passed out at end of lesson)

For each group of 4-5 students:

- ☐ chemplate
- ☐ dropper bottles of "pesticide test" (universal indicator solution)
- ☐ paper towels or sponge, as needed

For the teacher:

☐ Fish Kill story cards

☐ Country Club Creek watershed model

☐ food coloring

☐ spray bottle or watering can

☐ pan to catch runoff

☐ 2 sets of 35 site samples in dropping bottles

Overhead transparencies:

☐ Story

☐ Student worksheet

☐ newspaper article

Getting Ready

1. Set up the overhead projector.
2. Duplicate student worksheet for each student.
3. Divide the class into lab groups of 4-5 students (maximum of 6 groups).
4. Write vocabulary terms on the board.
   - **Watershed**- the area of land that drains to a creek, lake, or aquifer.
   - **Ichthycide**- a fish kill.
   - **Pesticide-** chemical used to kill pests. (Ex. Raid)
   - **Groundwater-** water within the earth that supplies wells and springs.
   - **Tributary-** a smaller stream that flows into the bigger main stem of Country Club Creek.
   - **Flow path-** the path runoff water takes over the land as it flows downhill to a lake, creek or river.
   - **Landfill-**a site for the disposal of our trash.
   - **ppb**-parts per billion (Ex. 1 tsp pesticide in 1 billion tsp water)

5. Set out watershed model with food coloring, watering can and pan in an area of the room where students can observe demonstration.
6. Arrange the two series of 35 site bottles in two separate areas of the room for easy student access. Put a bottle of universal indicator with each group of samples. Arrange for the distribution of Chemplates and paper towels to each group of students. Duplicate copies of student worksheets for each student.

THE ACTIVITY

1. Introduction

☛ Explain to students that Austin is a place of incredible beauty, due largely to the clean water found in the abundant creeks, springs, and water in the Colorado River. However, like any urban area, Austin's water resources are threatened by pollution. Pollution from past and current events are often reported by citizens and investigated by City employees. In this module,

students will investigate an Ichthycide in a tributary to Country Club Creek that was first reported on May 3, 1979. An **Ichthycide** is a fish kill. Students will follow the scientific process used by environmental investigators to determine the source of pollution that caused the Country Club Ichthycide.

2. Identify the Problem

☛ Display 'The Ichthycide Story' on the overhead. Ask for volunteers to read a paragraph (Story Cards) out loud to the class. Explain to the class that they will be investigating this fish kill which actually occurred in Austin in 1979.

3. Define Watershed

☛ Display overhead of Austin's Watersheds map and pass out to each student.

Tell students when investigating a pollution spill, we can limit the investigation by targeting the watershed in which the pollution event occurred.

a. Define Watershed: the area of **land** that drains to a creek, river, or lake. Discuss how water also flows through the ground in a watershed and emerges as springs. The extent of the land that drains to the creek is limited to the land between the high points or hilltops surrounding the creek and the low point where the creek is formed. The quality of that land (how it is used, the chemicals that are present on the land, etc.) determines the quality of the water in the creek. If a specific site on a creek is polluted, the watershed that drains to that site will be investigated.

b. Locate Country Club Creek Watershed. Mabel Davis Pond is located in Country Club Creek Watershed.

c. Locate your school's watershed.

☛ Display transparency of Map of Country Club Creek Watershed.

Locate Mabel Davis Pond on the map. Explain to the students that the pond flows into a tributary of Country Club creek. A tributary is a smaller stream that flows into the main stem of Country Club Creek.

4. Demonstrate watershed model

☛ Show map of test sites (3.1) and pass the map out to each student. Explain how the map corresponds with the model; however the model shows us more detail about the topography of the land. We will use the map and model to determine where sources of pesticide could have originated.

☛ Explain that when it rains, water runs off the land to the nearest creek. Ask "does all the water runoff?" (no, some of the water soaks into the ground to our groundwater). Explain that the pond in Mabel Davis Park where the fish kill occurred is **fed by surface water runoff and a groundwater spring**. The model will show the flowpath of surface water, but will not help identify the flowpath of groundwater.

☛ Explain that someone did not intentionally dump pesticide in the pond to kill the fish. The pesticide came from somewhere on the watershed and we need to determine the origin. Discuss the various land uses and which sites might be a source of pesticide ie. homes could use pesticide in gardens, farm could use pesticide on crops, storage units could be storing pesticide, landfill, etc.

☛ Determine **flowpath**. Explain that you will use food coloring to represent pesticide. Drop food coloring on sites discussed. Pour water over the model and tell students to watch where the water/food coloring flows. Note which sites flow to the "fish kill" pond. Students will determine which sites to test based on their observations. For example, Linder Elementary would not be a logical source since the flowpath is not to the fish kill pond.

5. Explain budget-Complete Part 1

☛ When scientists conduct field investigations such as this, they may be limited to sampling due to budget constraints. Hand out student sheet. Tell students that each group has $1,500 to spend for the project, and it costs $300 to drill a well to test ground water, $200 to test soil, and $100 to test water (the actual cost of lab tests). Therefore, each group can test any number of sites, as long as they don't exceed $1500. Remind students that they should choose sites that drain to the pond. Give students 5-10 minutes to fill out Part 1.

TEACHER NOTE:
The tests furnish information on pesticide concentrations expressed as parts per billion (ppb) or µg/l (micrograms per liter); 1 ppb is one liter of pesticide per billion liters of water. Monitoring stations in Austin can detect pollutants in water bodies in measurements of parts per million (ppm), parts per billion (ppb), and even per trillion. ppm is also equivalent to mg/l; ppb=µg/l

Health officials have decided that an allowable level of pesticide in drinking water is 3.0 ppb. Some students may disagree, suggesting that they would not drink water containing any pesticide. For them, 0 ppb is the only safe level. You may wish to respond that it is impossible to remove all the pesticide. Even to reduce it to extremely small levels, say 1 ppb or less, is extremely time consuming and costly. The important decision health officials have to make concerns the level at which the pesticide is harmful to our health. Environmental regulators set the standard for aquatic life at 0.0002 ppb (lower because the organisms are smaller).

6. Demonstrate Test Procedures-Complete Part 2

☛ Display Part 2 student sheet transparency.

☛ Demonstrate the test procedure on the overhead projector, using a transparent chemplate.

The following procedure is suggested for demonstrating the site testing:

a. Choose site #21 (a site where Pesticide was not detected). Do not disclose the site number to the class.

b. Squeeze 4 drops of the site solution into one of the cups in a Chemplate. Add 2 drops of indicator to the cup.

c. Ask students to describe the color of the solution in each cup, comparing it to the chart on Student Sheet -Part 2.

d. Note that the chart correlates color with the level of pesticide contamination and the corresponding code numbers. For example, purple indicates a pesticide concentration of

more than 32 ppb which is a code 4. If they detect a code 4, they have found the source of the pollution.

e. Announce that the sites must be tested one at a time to minimize unnecessary student traffic in the room. You should have already set up the two sets of samples in different parts of the room so that students will not congregate in one part of the room. Remind students to put the bottles back as soon as they are done using them so others students can use them.

SAFETY NOTE:
The liquids in the bottles are not solutions of pesticide but are nontoxic substances that simulate the pesticide.

☛ Ask the students why a real pesticide is not included in the module. Some may mention cost and convenience. These factors are considered; however, the sites contain nontoxic substance for safety reasons. A pesticide represents a health risk and requires special handling procedures. In this activity, the universal indicator test is used as an alternative to actual testing procedures requiring very specialized equipment and technically trained individuals.

f. Tell students to record their results on student sheet Part 2 as they test their sites. They should continue testing even if they find a Code 4 (tell them more than one site could be Code 4). If they do find a Code 4, tell students not to tell the other students in the class until everyone has completed the tests.
Remind the class that they are only testing for pesticides.

7. Clean up
The last tester from each group has the responsibility to rinse out the Chemplate. Distribute paper towels or rags to clean out the Chemplate. Distribute the towels to clean up any spills at the tables.

8. Wrapping up

☛ Have students answer the questions at the end of the lab sheet. Discuss their responses to the questions while filling out Student Sheet overhead transparency.

1. Which site caused the fish kill?
- the baseball field (pesticides-DDT, toxaphene and lindane were dug up during construction of baseball field)

2. How did the pesticides end up in the pond?
- Bags of pesticide were dug up during construction of baseball field and rain washed the pesticide off the watershed into the pond

3. Who in the community might be concerned?
- Residents around the park, downstream residents, people who visited the park-might be concerned that they were exposed to toxic chemicals (pesticide), government officials (don't want more people to be exposed), water and wildlife protection agencies.

4. Why is it necessary to clean up the pesticides?

- Pesticides (DDT, toxaphene, lindane) at these levels are hazardous to human and animal health. If they remain in the environment, people and wildlife will continue to be exposed to them. In the 1960s (when the pesticides were dumped in the landfill) there were no federal regulations regarding disposal of DDT. DDT was banned in the U.S. in 1972 and its use is illegal.

5. How did health officials plan to handle the clean up of the pesticides? (read the newspaper article)
Physically remove the pesticides (time-consuming and expensive-our tax dollars), build a concrete wall around the area, or cover the field with non-porous clay.

If there is not enough time for students to read the article in class, have them read it for homework.

CONCLUSION
Ask students what they think the cleanup cost?
Explain that in 1999, pesticide contamination was discovered again in Mabel Davis Park (it was not completely cleaned up in 1980s). The park closed in June 2000 to conduct a comprehensive environmental assessment to determine the extend of contamination and environmental hazards. The City designed and implemented a **$7.3 million** assessment and remediation project which was completed in November 2005 (environmental cleanup is costly!).