

Fruitvale

Overview

Students try to solve a water pollution mystery in an imaginary town. Use the Fruitvale teacher's guide and the transparencies in it to work through this activity. The Fruitvale kit contains many excellent activities not covered in this Hydrosphere Teachers Guide. We encourage teachers to explore the kit beyond what we present here. The whole Fruitvale kit is included in the Hydrosphere textbook supplement. The Fruitvale teachers guide **MUST** be returned with the other non-consumable materials.

Background

Background is in the Fruitvale teachers guide starting on page 1, Activity 1, *The Fruitvale Story, Part I*. We recommend using all 12 lessons in Fruitvale in 14-20 class periods, but recognize that few teachers devote that much time to this topic. Of necessity, the workshop that comes with the Hydrosphere textbook supplement compresses 10 of the Fruitvale activities into several activities. You may choose to compress activities for your students, also in the interest of time, but this diminishes the power of the kit. For example, the workshop and this guide skip Activity 2, *Understanding Groundwater*, Activity 4, *Interpreting Maps*, and Activity 5, *Modeling Groundwater Contamination*. All of these are excellent and valuable. If you have time, we recommend doing them. The procedure below is for teachers who choose to compress activities.

Materials

Materials for the whole class

- 40 well samples in dropping bottles
- 4 dropper bottles of universal indicator
- Paper towels and sponges
- *Street Map of Fruitvale, Transparency 1.1*, p. 11
- *Topographic Map of Fruitvale, Transparency 4.1*, p. 55
- *Geologic Cross Section of Fruitvale, Transparency 4.2*, p. 56
- *Map of Fruitvale's Wells, Transparency 7.1*, p. 95
- *Rules for Drawing Isomaps, Transparency 9.1* p. 111
- *Map of Fruitvale's Groundwater Contamination, Transparency 10.1*, p. 123
- Transparency from *Fruitvale's Pesticide Plume, Student Sheet 10.1*, p. 121

Materials for groups of 2

- 1 *The Mystery of Fruitvale's Water* handout pp. 7-9
- 1 *Street Map of Fruitvale* handout *Student Sheet 1.1*, p. 11
- 1 *Topographic Map of Fruitvale* handout *Student Sheet 4.1*, p. 55
- 1 *Geologic Cross Section of Fruitvale* handout *Student Sheet 4.2*, p. 56
- 1 *Pesky Pesticides* handout, pp. 91-92
- 1 *Well Testing Results and Pesticide Testing Key, Student Sheet 8.1*, p. 103
- 1 *Map of Fruitvale's Wells*, handout *Student Sheet 7.1*, p. 95
- 1 *Fruitvale's Pesticide Plume, Student Sheet 10.1*, p. 121

- 1 *Making Isomaps, Student Sheet 9.1a and 9.1b*, p. 109
- 1 clean Chemplate®
- Access to the well samples and universal indicator (the teacher sets these out)
- *Paper towels and sponges

Preparation

Set out the well samples and universal indicator and setups for student groups. Read *The Mystery of Fruitvale's Water* and *Pesky Pesticides* from the Fruitvale teachers guide, pages 7-9 and 91-92. You might want to make copies of these to hand out to teams so that the teams can take turns reading the story aloud.

Procedure (for teachers who choose to compress the activities)

The following steps can take 3-5 class periods. Read through and determine break points before doing the activity.

1. Read *The Mystery of Fruitvale's Water*, pp. 7-9, aloud as a class, a paragraph at a time. Ask students each, in their own notebooks, to make three columns: one for information learned from the story, one for unanswered questions, and one for steps to find the answers to questions. Pause after each paragraph to give students time to put something in each column. Ask them to write a few paragraphs about the situation and what they would do to investigate it. Afterward, discuss the story as a class for a few minutes. At this point, students do not know the nature of the pollutant, but they will find out later. If students do not mention groundwater movement and topography, try to direct their attention to these factors.
2. Hand out a copy of *Street Map of Fruitvale*, *Topographic Map of Fruitvale*, and *Geologic Cross Section of Fruitvale* to each team. With the whole class, examine these 3 maps for more clues about Fruitvale's water pollution problem. Depending upon your knowledge and other resources, this process could take a full class period or several class periods. You might use these maps one-at-a-time. These topics are covered for a class period or more each in the Fruitvale teachers guide. They are Activity 2, *Understanding Groundwater*, Activity 4, *Interpreting Maps*, and Activity 5, *Modeling Groundwater Contamination*.
3. Read *Pesky Pesticide*, pp. 91-92, aloud as a class, a paragraph at a time. Afterward, ask teams to decide: 1) Which 3 locations on the map are the most likely sources of pesticide? Why did you pick each one? 2) What more would you like to know about Fruitvale and its water supply? Ask students to write reasons in their notebooks for the first three wells they have chosen to test.
4. Give students the *Map of Fruitvale's Wells, Student Sheet 7.1*, and ask them to make a testing plan. When they have a plan, ask them to write it in their notebooks (with reasons for their choices). Follow directions in the Fruitvale teachers guide from *Testing for Pesticide Concentrations*, Activity 8, pp. 97-100. Ask students to test samples from test wells 3-at-a-time and fill in *Well Testing Results and Pesticide Testing Key, Student, Student Sheet 8.1*. When they have

completed all 12 tests and recorded results on *Student Sheet 8.1*, ask them to transfer the hazard levels for the 12 locations they have tested to the appropriate circles on *Fruitvale's Pesticide Plume, Student Sheet 10.1*.

5. Explain to students that they will use their recorded results on the *Fruitvale's Pesticide Plume, Student Sheet 10.1* to draw the underground contaminant plume that is creeping under Fruitvale.
6. Hand out *Making Isomaps, Student Sheet 9.1a and 9.1b*, and ask students to try the exercise. Show *Rules for Drawing Isomaps, Transparency 9.1* and explain the rules to students. Tell them that this is practice for the plume they are about to draw on the *Fruitvale's Pesticide Plume, Student Sheet 10.1*.
7. Ask students to use the isomap procedure to draw the plume on their sheet. When students are finished, their plumes will differ. Compare several maps and use the differences to discuss the fact that many actions are taken under conditions of uncertainty. Afterward, take data from the whole class to fill in circles on a transparency made from *Fruitvale's Pesticide Plume, Student Sheet 10.1*. From that, draw the whole-class version of the plume. Depending on test results, the class map might not exactly match the one from the Fruitvale teachers guide, *Map of Fruitvale's Groundwater Contamination, Transparency p. 123*. Decide whether to show this transparency. In this case, the “correct answer” is not particularly important.