

# School Recycling Club SHIP

(Supporting Home Instruction Program)



## Lesson Plan 5

- Grade Level: 9-12
- Lesson: II—The Routes of Household Hazardous Waste  
Contamination on the Move
- Source: *Teaching Toxics*
- Activity/Craft: 3-D T-Rex
- Video Link: Introduction to the GHS of Hazard Communication  
(<https://www.youtube.com/watch?v=DaZw5B1A9F4>)
- Video Link 2: Groundwater Contamination (<https://www.youtube.com/watch?v=5xs1jLibztE>)

# Lesson Matrix Grades 9-12

## Teaching Toxics

Lesson	Concept	Objective	Common Core Alignments	Skills
9-12 <b>Assessing Awareness</b>	An informed public is more likely to make responsible decisions about household hazardous waste disposal.	<ul style="list-style-type: none"> <li>Assess community awareness regarding household hazardous waste</li> <li>Conduct a survey</li> </ul>	<b>Grade 9-10</b> CC.RI.9-10.1 CC.SL.9-10.1 CC.HSS.ID.6  <b>Grade 11-12</b> CC.RI.11-12.7 CC.W.11-12.2 CC.HSS.ID.5	<ul style="list-style-type: none"> <li>Analyzing</li> <li>Applying mathematical concepts</li> <li>Gathering data</li> <li>Synthesizing</li> </ul>
9-12 <b>Contamination on the Move</b>	Contamination does not stay in one spot; it moves through the environment.	<ul style="list-style-type: none"> <li>Understand how contaminated water can move through the environment</li> </ul>	<b>Grade 9-10</b> CC.RST.9-10.3 CC.SL.9-10.1 CC.WHST.9-10.1d	<ul style="list-style-type: none"> <li>Developing models</li> <li>Observing</li> <li>Predicting</li> <li>Using evidence</li> </ul>
9-12 <b>All Things are Connected: Native American Philosophy</b>	All species in an ecosystem are connected. Hazardous waste entering the ecosystem will disrupt its balance.	<ul style="list-style-type: none"> <li>Examine how our actions affect the environment</li> <li>Examine how all species in an ecosystem are connected</li> </ul>	<b>Grade 9-10</b> CC.RH.9-10.4 CC.SL.9-10.1 CC.W.9-10.4	<ul style="list-style-type: none"> <li>Analyzing</li> <li>Communicating solutions</li> <li>Defining problems</li> <li>Interpreting</li> </ul>
9-12 <b>Hazardous Materials in Your School</b>	Materials Safety Data Sheets (MSDS) are useful tools for properly managing hazardous products.	<ul style="list-style-type: none"> <li>Become familiar with how to use the MSDS for products used in schools</li> </ul>	<b>Grade 9-10</b> CC.RI.9-10.1 CC.W.9-10.6 CC.HSS.IC.3	<ul style="list-style-type: none"> <li>Interviewing</li> <li>Investigating</li> <li>Problem solving</li> <li>Researching</li> </ul>
9-12 <b>Silent Spring: A Book that Awakened a Nation</b>	<i>Silent Spring</i> illustrates ecological principles central to responsible environmental decision making.	<ul style="list-style-type: none"> <li>Examine how U.S. society became aware of pesticides' environmental impact.</li> </ul>	<b>Grade 9-10</b> CC.RI.9-10.3 CC.SL.9-10.1a CC.W.9-10.4	<ul style="list-style-type: none"> <li>Analyzing</li> <li>Gathering information</li> <li>Providing evidence</li> </ul>
9-12 <b>Household Hazardous Waste Collection Options</b>	Household hazardous waste disposal is the next focus in solid waste management.	<ul style="list-style-type: none"> <li>Examine household hazardous waste management issues</li> </ul>	<b>Grade 9-10</b> CC.RI.9-10.6 CC.SL.9-10.4 CC.WHST.9-10.4	<ul style="list-style-type: none"> <li>Analyzing</li> <li>Communicating information</li> <li>Problem solving</li> <li>Questioning</li> </ul>

# 9-12: Contamination on the Move

## Subject

Science

## Skills

Developing models, observing, predicting, using evidence

## Materials

For each group conducting experiment

- clear box
- two beakers
- dry, light colored sand
- powdered lemonade
- bright food coloring
- water
- toothpicks
- ruler or cloth measuring tape
- drawing paper
- pH testing paper

## Time

Two class periods

## Vocabulary

Percolation, precipitation, groundwater, leachate, watershed, soluble, plume

## Related Teaching Toxics Activities

- 4 - 6 Wading Through Water Pollution
- 7 - 8 Pondering Percolation

## Source

Adapted from *Bags, Beakers and Barrels - An Action Curriculum Towards Resolving Hazardous Materials Issues*

## Concept

Contamination does not stay in one spot; it moves through the environment.

## Objective

Students will see how contaminated water moves in the environment through experiment and discussion.

## Background

*See Information Section, pages 121-124*

How a contaminant moves in the environment is dependent upon a number of factors, including its individual characteristics and the surrounding geographic area. Generally, contaminants spread outward from the point of origin, forming a plume which points to the contamination source.

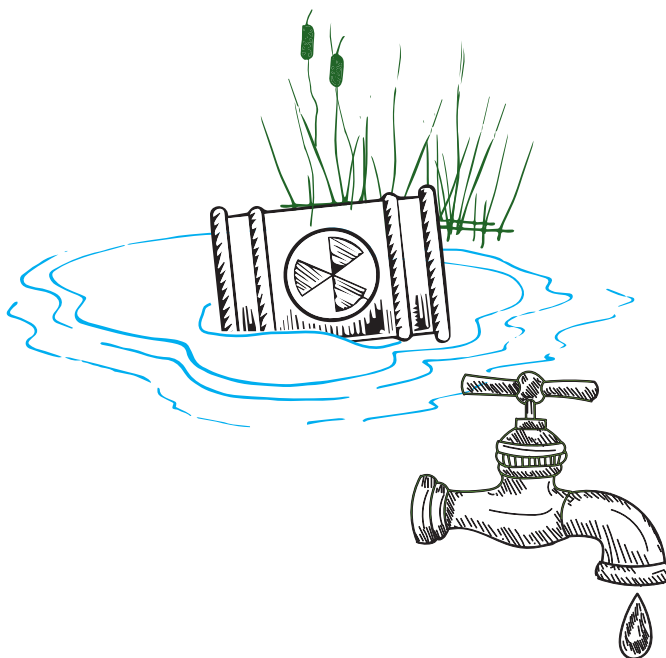
## Procedures and Activities

### Considering Contamination

- As a class, discuss the following questions. Do students know of any contaminated sites in the local area? Do students know how contamination is detected? What types of factors do students think would influence how contamination would move through the soil?

### Contamination on the Move

- In small groups, have students conduct the Contamination Movement experiment. See the student sheet on the following page. This experiment demonstrates how contamination tends to move in an elliptical plume.
- As a class, discuss the questions on the student sheet.



## Common Core Alignments

### GRADE 9-10

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#### **CC.RST.9-10.3**

Reading in Science & Technical Subjects:

Key Ideas & Details

#### **CC.SL.9-10.1**

Speaking & Listening:  
Comprehension & Collaboration

#### **CC.WHST.9-10.1d**

Writing in History/Social Studies,  
Science & Technical Subjects:  
Text Types & Purposes

### GRADE 11-12

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#### **CC.RST.11-12.3**

Reading in Science & Technical Subjects:

Key Ideas & Details

#### **CC.SL.11-12.1**

Speaking & Listening:  
Comprehension & Collaboration

#### **CC.WHST.11-12.2**

Writing in History/Social Studies,  
Science & Technical Subjects:  
Text Types & Purposes

### Taking the Next Step

- Challenge the student groups to solve the following problem:

You are the state's Hazardous Materials Emergency Response Team. Your job is to clean up contamination caused by hazardous materials accidents. Your team just received a call from Haz-Co., a business which has been storing some of its hazardous chemicals in underground storage tanks. They have just discovered that one of their tanks is leaking. Your job is to design a method to determine how far the contamination has traveled. The team can dig some test pits to determine this. However, digging these test pits is very expensive and your team can only dig eight pits. Based on your results from the experiment, draw a diagram of where you would dig the test pits in relation to the leaking tank.

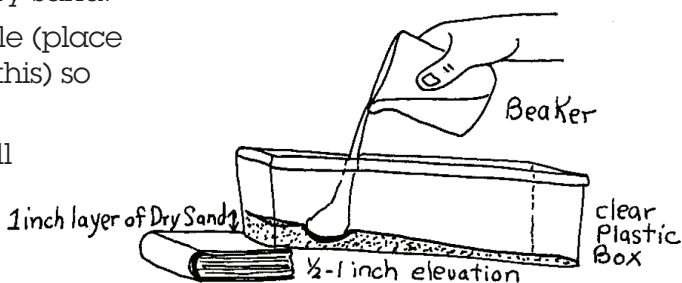
- Have the groups share their ideas in a class discussion.

# STUDENT WORKSHEET

## Contamination Movement

### Setting up the Experiment

1. Fill the clear box with an even layer of dry sand.
2. Tilt the box an approximate 30°- 40° angle (place a ½" - 1" block under the box to achieve this) so that you will be able to see the bottom.
3. In the top-center of the box, make a small depression in the sand.
4. Set up a string of pH testing paper on the desk.



### Procedure

1. Mix one cup of water, bright food coloring and some powdered lemonade in a jar, representing the contaminated water. The food coloring will make the water visible in the sand. We are using lemonade because its pH will register on the testing paper.
2. Every two minutes, slowly pour ¼ cup of the contaminated water into the depression in the sand. Begin the two-minute interval as you start pouring. After each two-minute interval, check the bottom of the box to see if you can see the water plume.
3. Once visible, measure the length and width of the plume at each two-minute interval. Record your results below.

	Plume Length	Plume Width
Interval 1		
Interval 2		
Interval 3		
Interval 4		

4. Using a straw, remove several plugs of contaminated sand from the box (rinse the straw with pure water between each sample). Mark where you took the samples with toothpicks. Drop each sample on the pH paper. If the resulting color indicates a drop in pH (detecting the acid from the lemonade), you know that the plume of contaminated groundwater has been found.

Take and test enough sand samples until you can detect the shape of the plume's movement.

On a separate piece of paper, sketch the plume movement at the four intervals (using a different colored pencil for each interval). Indicate where you find the lowest pH. If you continued this experiment, how would you expect the plume to move?

Write and/or discuss to answer the following questions:

- How would you describe the movement of the contaminated water through the sand?
- Based on you pH samples, where is the plume most highly contaminated?
- What factors in the environment do you think would influence the plume's movement?
- What does this experiment illustrate about the disposal of household hazardous waste?

## From School News You Can Use – May 2018

From our Friends at [AllFreeKidsCrafts.com](http://AllFreeKidsCrafts.com)

### Printable 3-D T. Rex

By: Robives for instructables.com



This image courtesy of instructables.com

Rawr! This Printable 3-D T. Rex is hungry and he's coming for you! Just kidding, printable paper models don't bite. These fun paper art projects make great activities for boys and girls of all ages. Young kids might need some extra help assembling these pint sized dinosaurs, but everyone will have a blast playing with them. Plus, these paper crafts are simple and budget friendly, so you can make a whole clan of fearsome predators. Just cut, fold, and glue, and you're one step closer to a time when dinosaurs roamed the earth!

[Click here for free kids craft](#)

**Time to Complete:** Under an hour

**Materials:** Paper