

Pollution

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About **Pollution**

DeltaScienceModules, THIRD EDITION

Students start from the ground up, learning about litter and landfills. They sort schoolyard trash and calculate how quickly a classroom would fill with waste paper. They practice one way to recycle materials and brainstorm others. Next, they observe particulate matter in air and consider the implications. They create a filtration system, examine water pollutants, and try to clean up an oil spill. After testing the hardness, alkalinity, and acidity of water samples, students observe the effects of acid rain on plants. Finally, they define noise pollution based on opinion surveys and noise level tests.

In the Delta Science Reader *Pollution*, students read about how human and natural activities can cause land, air, and water pollution. They learn what can be done to reduce pollution and conserve natural resources. They read about the difference between renewable and nonrenewable resources. Noise and light pollution are also introduced. In a biographical sketch, students meet a famous scientist—Rachel Carson—whose warnings about the dangers of pesticides led to the banning of DDT. Finally, students learn about alternative energy sources and why it is important to develop them.

Overview Chart for Hands-on Activities

Hands-on Activity	Student Objectives
1 A Lot of Litter <i>page 13</i>	<ul style="list-style-type: none"> • collect litter found on school grounds • classify the types of litter found • record data about the amount and types of litter found • infer the source of the litter
2 Trash in Your Class <i>page 19</i>	<ul style="list-style-type: none"> • measure the amount of trash produced daily in their classroom • calculate how long it would take to fill their entire classroom with trash • explore ways to reduce the amount of trash produced in their classroom
3 Recycling Paper <i>page 25</i>	<ul style="list-style-type: none"> • recycle old newspaper into papier-mâché bowls • examine the properties of paper to determine its suitability for other uses • brainstorm ideas for other recycled-paper products
4 Particle Detectives <i>page 31</i>	<ul style="list-style-type: none"> • collect particles from the air at several different sites • determine the concentration level of the particles at each site • describe the properties of the particles • infer the source of the particles
5 Don't Muddy the Water <i>page 39</i>	<ul style="list-style-type: none"> • observe the particles in several different water samples • draw conclusions about the pollution levels of the water samples • infer the source of the particles found in the water samples
6 Oil and Water Don't Mix <i>page 47</i>	<ul style="list-style-type: none"> • observe what happens when oil is added to water • compare the structure of feathers before and after contact with oil • infer the effects of oil spills on birds • try to remove oil from water
7 Testing for Hard Water <i>page 53</i>	<ul style="list-style-type: none"> • test the relative hardness of three water samples • record and interpret data about water samples • infer that hard water contributes to water pollution by increasing the amount of soap and detergent that people use
8 The Acid Test <i>page 59</i>	<ul style="list-style-type: none"> • use pH paper to determine the acidity or alkalinity of six different water samples • discuss how the acidity or alkalinity of water affects the plants and animals that use it
9 Impurities in Rain <i>page 65</i>	<ul style="list-style-type: none"> • compare the pH of distilled water to that of rainwater • observe the residue left after rainwater has evaporated • infer why rainwater contains impurities
10 Growing Plants with Acid Rain <i>page 71</i>	<ul style="list-style-type: none"> • compare the rate of growth among plants that have been watered with tap water, acidic water, and a mixture of both • infer the reason for the different growth rates • draw conclusions about the effects of acid rain on plant life
11 What's in a Sound? <i>page 77</i>	<ul style="list-style-type: none"> • listen to a variety of sounds and classify them as either pleasant or unpleasant • discuss the characteristics of sounds that make them either pleasant or unpleasant • come up with their own definition of <i>noise pollution</i>
12 Sound Survey <i>page 83</i>	<ul style="list-style-type: none"> • observe the noise levels in three different areas at school • infer the causes of the noise • conduct an opinion poll of the most bothersome noises • discuss ways to reduce noise levels in the environment
Assessment <i>page 89</i>	<ul style="list-style-type: none"> • See page 89.

Process Skills	Vocabulary	Delta Science Reader
predict; compare; classify; collect, record, display, or interpret data; infer	litter	pages 2, 3
measure, use numbers, predict	landfill	page 3
observe, infer, hypothesize	recycle	pages 3–5
predict, observe, compare, experiment, use variables, communicate, infer	control, particle, pollutant, pollution	pages 6–8
observe, use variables, compare, infer	filtration	pages 9–12
observe, compare, infer, hypothesize		page 10
experiment; use variables; collect, record, display, or interpret data; infer	distilled water, hard water, soft water	page 11
observe, define based on observations, use numbers	acid, alkali, hydrogen, neutral, pH, pH scale	page 11
hypothesize, experiment, compare, observe, infer	acid rain, water cycle	page 7
hypothesize, experiment, use variables, compare, infer, communicate		pages 4, 7, 11
classify, communicate, define based on observations	noise pollution, pitch, volume	page 13
observe; infer; communicate; collect, record, display, or interpret data	decibel	page 13

See the following page for the Delta Science Reader Overview Chart.

Overview Chart for Delta Science Reader

Pollution

Selections	Vocabulary	Related Activity
Think About...		
What Is Pollution? <i>page 2</i>	ecosystem, natural resource, pollutant, pollution	Activities 1, 4, 10
Land Pollution <i>page 3</i> <ul style="list-style-type: none"> The Problem of Waste <i>page 3</i> Chemical Pollution <i>page 4</i> Changing the Land <i>page 5</i> 	land pollution biodegradable, incinerator, recycle, sanitary landfill chemical, groundwater, groundwater quality nonrenewable resource, reclamation, renewable resource	Activities 1, 2, 3
Air Pollution <i>page 6</i> <ul style="list-style-type: none"> Natural Air Pollution <i>page 6</i> Burning Fuels <i>page 7</i> Cleaning the Air <i>page 8</i> 	air pollution acid, acid rain, fossil fuel, global warming, greenhouse effect, ozone, smog conservation	Activities 4, 9
Water Pollution <i>page 9</i> <ul style="list-style-type: none"> Waste Water <i>page 9</i> Thermal Pollution <i>page 9</i> Oil Pollution <i>page 10</i> Chemicals in the Water <i>page 11</i> Preventing Water Pollution <i>page 12</i> 	water pollution thermal pollution food chain filtered, wetlands	Activities 5, 6, 7, 8, 9
Noise and Light Pollution <i>page 13</i>	light pollution, noise pollution	Activities 11, 12
People in Science		
<ul style="list-style-type: none"> Rachel Carson <i>page 14</i> 		
Did You Know?		
<ul style="list-style-type: none"> About Alternative Energy Sources <i>page 15</i> 		

See pages 97–106 for teaching suggestions for the Delta Science Reader.

MATERIALS LIST

Pollution

Quantity	Description	Quantity	Description
1	ammonia, 1 oz*	1	spoons, measuring, set
9	bags, plastic garbage, 12-gal*	1	string*
65	bags, plastic sandwich*	3	tape, masking*
1	baking soda, 0.5 oz*	24	test tubes, 20-mL
1	balloons, p/10*	8	trays, plastic
16	beakers, plastic, 100-mL	1	video, <i>Pollution</i>
1	calcium chloride, 250 g*	2	vinegar, 16 oz*
1	cassette tape, <i>Pleasant and Unpleasant Sounds</i>		
1	chart, Landfill	1	Teacher's Guide
1	chart, Water Cycle	8	Delta Science Readers
1	chart, Water Filtration System		
32	containers, fluted, 1/2-gal		TEACHER-PROVIDED ITEMS
4	cotton balls, p/100*	1	box, cardboard
16	cups, calibrated, 1-oz	1	cassette player
8	cups, plastic, 9-oz	-	crayons
16	cups, plastic with holes	1	hole punch
1	detergent, liquid, 10 oz*	1	ladle (or cup)
8	eyedroppers	32	markers
3	feathers, p/12*	1	measuring stick
1	food coloring, 1 oz*	9	newspaper, stacks*
32	gloves, plastic*	1	pail
1	gravel, 2 lb*	3	paper towel, rolls*
32	jars, clear plastic	32	pencils
32	lids for jars	-	rainwater*
32	magnifiers	8	rulers, metric
1	oil, cooking, 3 oz*	1	scissors
1	oil, motor, 4 oz*	1	VCR
1	paste, wallpaper*	1	water, distilled, 1 gal*
9	petri dishes	-	water, tap*
2	petroleum jelly, 1 oz*		
10	pH charts		
2	pH papers, p/100*		
2	pitchers, 2-qt		
9	plastic sheets, 8 1/2 in. x 11 in.**		
1	powder, mystery, 3.2 oz*		
1	rubber bands, p/36		
1	sand, 2 lb*		
1	screens, p/8		
8	seeds, grass, p/1,000*		
6	soil, 4 qt*†		
18	spoons, plastic		

* = consumable item

† = in separate box

ACTIVITY SUMMARY

In this Delta Science Module, students are introduced to the concept of pollution—the contamination of the environment caused by the introduction of natural or people-made waste or harmful substances.

ACTIVITY 1 Students begin this unit with a look at litter, one of the most obvious manifestations of the ways in which humans can harm the environment. Students collect, classify, and infer the sources of the litter found on school grounds.

ACTIVITY 2 Students explore the problem of overflowing landfills. After determining the average volume of paper waste that their classmates generate on a daily basis, students calculate how long it would take to fill their entire classroom with trash. This exercise shows students just how quickly trash is generated and that there are limits to the amount of space available for dumping it.

ACTIVITY 3 Students recycle old newspaper into papier-mâché bowls as they investigate one solution to the waste-paper problem: recycling. Then they brainstorm ideas for recycling other used-paper products. Students discover that some materials are more recyclable than others and that recycling programs work only when there is a market for the recycled materials.

ACTIVITY 4 Students are introduced to the concept of air pollution when they collect particles from the air and then determine their concentration level and infer their source.

ACTIVITY 5 Students learn about water pollution by constructing a simple water filtration system and examining the particles that get “filtered out” of several water samples they have collected.

ACTIVITY 6 Students discover the impact oil spills can have on the environment. They examine a feather that has been coated with oil to see how an oil spill can affect birds. Then they try several different methods for removing the oil from water, some more successful than others.

ACTIVITY 7 Students examine water again, this time to determine the relative hardness (mineral concentration) of several different samples. This exercise shows how hard water contributes indirectly to water pollution by increasing the amount of soap people use.

ACTIVITY 8 Students test the pH of six different water samples. They conclude that water samples can vary greatly in terms of acidity/alkalinity.

ACTIVITY 9 Students are introduced to the startling notion that rainwater is not pure water, as evidenced by the residue it leaves behind once evaporated. Students also learn that rainwater can sometimes contain higher-than-normal levels of acid.

ACTIVITY 10 Students demonstrate the effects of acid rain on plant life by growing plants watered with acidic water.

ACTIVITY 11 Students switch gears by examining a form of pollution that cannot be seen: noise pollution. Students listen to a variety of sounds and discuss the characteristics of each that make it either pleasant or unpleasant to listen to.

ACTIVITY 12 Students take a sound survey of three different areas in their school and conduct an opinion poll to determine which types of everyday sounds are the most bothersome to people. From their results, students develop a definition of noise pollution and brainstorm ideas for reducing the amount of noise pollution in the environment.