

Unit 4: Pollution Prevention

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Unit 4: Pollution Prevention

Unit Summary

This unit will show your green@school team how to ensure that your school is doing its best to prevent pollution on your school site. Students will learn ways to protect our shared air, water, and soil resources at school and at home. They will also evaluate your school’s practices around a number of potential sources of pollution.

<p>Actions <i>Here are some actions you will take to complete the green@school checklist and reduce your school’s environmental impact.</i></p>	<ol style="list-style-type: none"> 1. Become campus pollutant and chemical detectives—explore your classrooms, bathrooms, offices, janitorial closets, cupboards, the staff room, and even the cafeteria kitchen to find potential pollutants and chemicals. 2. Interview relevant school and district staff to find out what type of products are purchased and how potential pollutants are disposed of or recycled. 3. Investigate existing indoor and outdoor cleaning practices, field management, and pest control methods at your school and evaluate safe practices and where there is room for improvement. 4. Improve existing or implement new pollution prevention practices at your school and/or recommend actions to your district. 5. Determine how well Boltage is working. Find out what alternative transportation practices are in place and how your school can further reduce vehicle emissions.
<p>Campaign Opportunities <i>There are many opportunities to educate your teachers and peers about pollution prevention. Ask your green@school coordinators for guidance!</i></p>	<ol style="list-style-type: none"> 1. Conduct a “Pollution Prevention” campaign, educating your teachers and peers on alternatives to pollutants and chemicals and how to properly recycle or dispose of them. 2. Design a campaign that encourages your teachers, peers and parents to rideshare, carpool, or use alternative transportation, to reduce vehicle emissions.
<p>Skills <i>Here are some specific skill sets you may exercise.</i></p>	<ol style="list-style-type: none"> 1. Calling all Chemists—investigate the ingredients in potential pollutants and determine if the item is harmful to health of the handler and/or the environment 2. Think Outside the Car — design a program to increase the number of carpoolers, bikers, walkers, and rideshare students, teachers, and staff
<p>Contacts <i>Here are some of the “experts” you may want to contact (your green@school coordinators can help you make the connection!).</i></p>	<p>District Purchasing Manager Grounds-Custodial Manager</p> <p>Who else? Have students develop their own list!</p>

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Certification Checklist

As described in the green@school Handbook, each Unit corresponds with a targeted resource conservation goal and a specific section of the California Green Business Program's checklist, designed so that students will use this tool (the checklist) to assess their current campus environmental actions and identify opportunities for improvement (learn more at <http://www.greenbusinessca.org/>). This will occur following their deep dive into the subject through the lessons and activities shared in this chapter that seek to build their baseline knowledge on the subject before they are asked to become subject matter experts assessing their school's operations and practices. The checklist is included at the beginning of each unit so you can see what you're building towards, but again, know that its expected use will follow the activities and lessons shared below. Further, completing the actions in this checklist will enable your school to receive statewide recognition for your environmental leadership (bonus!). To assess the pollution prevention practices on your campus, walk through this list with your students, administrators, or other resource-relevant school site staff.

green@school Certification Checklist

#	Measure/Action/Practice	Does your school meet this measure?			Controlled by school staff administrator (SA), school district (D) or Students (ST)	Investigation Notes and Status
		YES	NO	DON'T KNOW		
Pollution Prevention						
Recycle/Reuse Potential Pollutants						
Required						
1	Properly store/recycle Universal Wastes as required by law. Designate a storage area for spent Universal Wastes, post a sign and notifying employees of this area. Ensure these are recycled. Universal Wastes are: spent fluorescent light tubes & bulbs, electronic equipment and batteries.					

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green@school Certification Checklist

#	Measure/Action/Practice	Does your school meet this measure?			Controlled by school staff administrator (SA), school district (D) or Students (ST)	Investigation Notes and Status
		YES	NO	DON'T KNOW		

Pollution Prevention

Complete at Least 2:

1	Recycle excess paint/solvents (keep only what is needed for touch ups, then give remainder to hazardous waste collection program, donate to anti-graffiti program, or return to contractor or manufacturer)					
2	Recycle used copier toner cartridges					
3	Recycle used ink jet cartridges					
4	When recycling electronic equipment, talk to a certified "e-Steward" for responsible recycling					
5	Recycle car fluids from company vehicles					

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		YES	NO	DON'T KNOW		
Pollution Prevention						
Reduce Chemical Use						
Required						
1	Reduce chemicals (cleaners, pesticides, paints, etc.) used and stored, safely dispose of unneeded products through local Household Hazardous Waste Program					
2	Replace all aerosols with pump dispensers					
3	Use low toxic cleaning products such as those that are SF Approved (www.sfapproved.org), Green Seal certified (www.greenseal.org), or receive at least an 8.1 rating on the GoodGuide (www.goodguide.com), in non-aerosol containers					
4	Use no products with added antibacterial agents, such as triclosan. This includes products for hand washing, dishwashing and cleaning					

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		YES	NO	DON'T KNOW		
Pollution Prevention						
Complete at Least 4:						
1	Use electric (not gas) powered tools					
2	If spraying, use high-efficiency paint spray equipment with high solids paint					
3	Eliminate the routine use of all disinfectants and sanitizers, unless needed to comply with Environmental Health					
4	Offer certified organic, fair trade, sustainably harvested and/or locally grown products					
5	Use recycled oil for vehicles/equipment					
6	Eliminate the use of chemical and aerosolized air fresheners/deodorizers. To freshen air, open windows or adjust fan speed in restrooms and kitchens					

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		YES	NO	DON'T KNOW		
Pollution Prevention						
7	Use route optimization software or have documented delivery plans					
8	Store any potentially hazardous materials securely, control access and rotate stock to use oldest product first					
9	Print promotional materials with vegetable or other low-VOC inks					
10	Replace toxic permanent ink markers/pens with water-based ones					
11	Use unbleached and/or chlorine-free paper products (copy paper, paper towels, napkins, coffee filters, etc.)					
12	Obtain a battery recharger for the office. Use rechargeable (instead of disposable) batteries for flashlights, radios, remote controls, etc.					
13	Replace standard fluorescent lights with low mercury fluorescent lights. Approved models can be found at www.sfapproved.org					

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		YES	NO	DON'T KNOW		
Pollution Prevention						
14	Use one or a few low-toxicity multipurpose cleaners, rather than many special-purpose cleaners					
15	Do business with other green vendors or services, such as recognized Bay Area Green Businesses (listings at www.greenbiz.ca.gov)					
Reduce Vehicle Emissions						
Complete at Least 3:						
1	Convert school vehicles to low emission vehicles (electric, hybrid, natural gas or alternative fuels)					
2	Use biodiesel (100% or blends) or vegetable diesel in place of petrodiesel in vehicles					
3	Offer lockers and showers for staff who walk, jog or bicycled to work					
4	Encourage employees and students to bike and use public transit by posting bicycle ride maps and transit schedules/maps					

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		YES	NO	DON'T KNOW		
Pollution Prevention						
5	Buy renewable energy credits or green tags to offset the CO2 emissions from your offices use of electricity and natural gas (see www.green-e.org)					
6	Larger employers: offer electric vehicle recharge ports for visitors and employees electric vehicles					
7	Install renewable energy sources, such as solar panels or wind generators.					
8	Offer a shuttle service to and from bus, train and/or light rail stops					
9	Larger employers: set aside car/vanpool/rideshare car parking spaces					
10	Larger employers: provide commuter van					
11	Provide secure bicycle storage for students and staff					

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		YES	NO	DON'T KNOW		
Pollution Prevention						
13	Offer telecommuting opportunities and/or flexible schedules so workers can avoid heavy traffic commutes					
14	Help employees rideshare by posting commuter ride sign-up sheets and providing other commuter incentive programs (e.g., rideshare incentive programs, guaranteed ride home in emergency situations, etc.) available at www.Rideshare.511.org					
15	Patronize services close to your business (e.g., food/catering, copy center, etc.) and encourage employees to do the same					
16	When possible, arrange for a single vendor who makes deliveries for several items					
17	Hire locally					

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Student Learning Outcomes

In this unit, students will become proficient in the vocabulary and concepts describing pollutants and toxins commonly found on a school site, and will learn how to identify potential sources of pollution in their school and home. After completing this unit, students should be able to:

1. Understand vocabulary around pollution, pollutants, and prevention, regulatory definitions, and become experts in pollution facts affecting you, your school, family, and community.
2. Investigate the products in their school, classroom, and home to determine the kinds of pollutants that they, their peers, teachers, and family are exposed to.
3. Study pictures of nearby sources of Particulate Matter (PM) and what can be done to minimize it.
4. Identify sources of potential sources of pollution and campaign for improvements to protect the health of their school and local environment.

Lesson Plan

This unit provides students with the resources to explore the concepts of pollution prevention. Through interactive activities, campaigns and initiatives, students will be campus pollution prevention experts, empowered to investigate sources of potential pollution on campus to educated fellow students, staff and faculty in achieving a healthier school environment.

LESSON 1: HOW TO PREVENT POLLUTION AT SCHOOL

LESSON 2: CLEAN AND GREEN

LESSON 3: PROMOTE POLLUTION PREVENTION AT SCHOOL

A note to instructors: the plug-and-play activities shared throughout all green@school units are framed for your students, with the hope that you can simply offer/print these activities for their direct use. No extra prep time required!

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Lesson 1: How to Prevent Pollution at School

The first step in preventing pollution is to understand what potential sources of pollution exist at your school site and what effects they might have on human health and the environment. The EPA has stated in the Pollution Prevention Act of 1990 (and amended in 2002) that the United States annually produces millions of tons of pollution and spends tens of billions of dollars per year controlling this pollution. While a lot of this pollution comes from industry, “pollution” is a very broad term that encompasses everything from gasses escaping from a factory smoke stack to exhaust from personal vehicles to a candy wrapper littered in a school yard. Pollution is something that happens even on the scale of an individual, and in schools this can affect student and staff health, and the local environment.

In your school’s daily operations, some activities and chemicals used on site may add to indoor and outdoor pollution by releasing harmful substances that can contaminate the air, soil, or water.¹ Common sources of air pollution in and around a school site may include the chemicals in cleaning products, air fresheners, building materials, and vehicle exhaust. Common sources of water and soil pollution could include fertilizers, pesticides, and soil runoff, litter, improper disposal of hazardous wastes, and any chemicals inappropriately poured down the drain. Polluted air inside and outside the school can irritate eyes, nose, and throat, cause shortness of breath, aggravate asthma, and impact the heart and cardiovascular system.² Pollutants that reach groundwater can lead to contaminated drinking water and can contaminate local watersheds.³

Pollution prevention is defined by the US Environmental Protection Agency (EPA) as: “Reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and re-using materials rather than putting them into the waste stream.”⁴

This definition is necessarily broad, and so the green@school checklist focuses on several key areas relevant to your school: proper disposal/recycling of potential pollutants, reducing chemical use, and reducing vehicle emissions. Before you engage students in discussion of potential sources of pollution at your school, review this description of these three key areas to help students focus their investigation:

- Disposal/Recycling of Potential Pollutants: many products used at school may actually be considered pollutants, and must be stored and recycled or disposed of in the appropriate way in order to avoid pollution. This is true of universal wastes (see definition above), mercury-containing items like fluorescent light bulbs, electronic

¹ Environmental Protection Agency, accessed on 11/20/14 at <http://www.epa.gov/p2>.

² Bay Area Air Quality Management District, accessed on 11/19/14 at <http://sparetheair.org/Stay-Informed/Air-Quality-and-Your-Health.aspx>.

³ Environmental Protection Agency, accessed on 11/02/14 at <http://water.epa.gov/drink/info/well/health.cfm>.

⁴ Environmental Protection Agency, accessed on 11/20/14 at <http://www.epa.gov/p2/>.

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- waste, and chemicals like cleaning products, paints, solvents, vehicle fluids, batteries, and other products. For a complete list of products requiring special storage, disposal or recycling, contact your city. They will also have information on services to help you make sure none of these products are going down the drain or in the landfill trash.
- **Reducing Chemical Use:** Schools use a variety of chemicals to maintain clean facilities. While cleanliness and sanitation are crucial to student and staff health, using non-toxic or less toxic products for cleaning, pest management, and grounds keeping can help reduce exposure to chemicals that can also affect health. There are a number of organizations that evaluate products for human and environmental safety, and are a resource for choosing products that are less toxic. See Lesson 2 below for suggestions.
 - **Reducing Vehicle Emissions:** Vehicle emissions are a principal source of carbon emissions and a major contributor to climate change. Reducing miles traveled by car by using alternative modes of transportation to and from school, using fuel-efficient or electric vehicles for school-related transportation are principle ways to reduce emissions. There are numerous ways to support alternative transportation to and from the school site for both students and staff, including carpooling, public transit, biking, walking, and more. Encourage students to be creative in promoting alternative transportation – for example, a bike buddy program to help students pair up to bike or walk to school, or a competition for most miles biked or walked.

Other pollution sources will be discussed in the green@school Wastewater Unit, which focuses specifically on water pollution. However, keep in mind that landscaping, grounds keeping, pest management, and litter control are also important sources of pollution that students should be aware of.

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Use the discussion activity below to have students brainstorm sources of pollution occurring at your school.

➤ **Discussion Activity** | *Your School's Facility Capacity and Health*

1. What do you think are potential sources of pollution at your school? In classrooms, bathrooms, school grounds, cafeterias, or other areas of the school?
2. How do you think these sources of pollution affecting students and staff, and the environment?
3. How many students/peers do you know that have allergies?
4. How many students/peers do you know that have asthma?
5. What kinds of cleaners are used in classrooms, bathrooms, and other areas of the school?
6. How is hazardous waste disposed of at your school?

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➤ **Action Activity** | *Fly Swatter Challenge: Pollution Prevention Expert Edition*

The *fly swatter challenge* is designed to engage students in learning terminology using friendly competition. Split the class into two teams and line them up in front of a white board. Ideally students would have access to a few iPads or computers to look up words. On the board, list words from the list below and circle them. You will read out a definition and the student must find the word on the board and slap it with a fly swatter. The first student to slap the correct word earns a point for their team. That student goes to the back of the line and the next student comes to the board. Refine the rules as you see fit for your class, such as repeating the definition only once per round, or allowing teammates to help the student at the board if they do not know a definition. Students will have fun with this fast-paced game while familiarizing themselves with the following terms around pollution prevention:

Aerosol: A substance enclosed under pressure and able to release as a fine spray (i.e., aerosol deodorizers or air fresheners).

Antibacterial agents: Chemicals often found in cleaning products, that halts bacterial growth or kills bacteria. A common antibacterial agent found in hand soaps and sanitizers is triclosan.

E-Steward: A professional who is certified to recycle electronic waste.⁵

Emissions: the gases and particles, which are put into the air or emitted by various sources.

Universal Waste: A category of waste materials designated as “hazardous materials.” These materials include batteries, pesticides, mercury-containing equipment, and bulbs/lamps.⁶

VOCs: Volatile Organic Compounds include a variety of chemicals, which are emitted as gases from certain solids and liquids. Some VOCs have adverse health effects, short-term and long-term. VOCs can be emitted from paints, cleaning supplies, printers, permanent markers, and more.

Active ingredient: “Active ingredients” in cleaning products are usually antimicrobial pesticides added to kill bacteria, viruses or molds.

Biodegradable: “Biodegradable” ingredients break down in the environment once they enter wastewater treatment plants, rivers and streams or landfills.

Chlorine-free/Bleach alternative: Products labeled “chlorine-free” do not contain chlorine bleach, which is corrosive and a respiratory irritant, and can release traces of harmful chlorine gas. Frequent users of chlorine bleach are at increased risk of developing asthma and other

⁵ Environmental Protection Agency, accessed on 10/30/14 at <http://www.epa.gov/wastes/hazard/wastetypes/universal/>.

⁶ Environmental Protection Agency, accessed on 10/31/14 at <http://www.epa.gov/waste/hazard/wastetypes/universal/index.htm>.

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respiratory problems. A special caution: never mix cleaners containing chlorine bleach with products containing vinegar, acidic chemicals, ammonia or oxygen bleach. They can generate dangerous chlorine and chloramine fumes.

Combustible/Flammable: A “combustible” or “flammable” substance is easily ignited and can burn quickly. Cleaning supplies that contain flammable ingredients may pose a fire hazard if stored or used around high heat or open fire.

Corrosive/Caustic: “Corrosive” or “caustic” substances can cause serious chemical burns to the skin, eyes or lungs. Bleach, oven cleaners and drain openers are common corrosive products.

Enzymes: Proteins added to cleaners to help break down and remove soils and stains. Enzymes can cause asthma and respiratory problems in factory workers who make cleaning supplies. There is no evidence that consumers who use cleaners with enzymes are at risk. Boric acid, a chemical toxic to the reproductive system, is often added to stabilize enzymes in cleaning supplies.

Essential oils: Essential oils are plant extracts that emit distinct, often appealing scents. Some contain naturally occurring chemicals that can irritate skin, trigger allergic reactions or cause other toxic effects.

Fragrance or scents vs. free & clear/free of perfumes and dyes: Many cleaning companies market their products’ scents – or the absence of added scent. The term “fragrance” on a product’s ingredient list may refer to a number of ingredients that are not listed and for which there may be limited safety data.

Inert: This term often refers to the non-pesticide ingredients in antibacterial cleaning supplies. There is no requirement to list them on the product label – only pesticides must be listed. “Inert” does not mean safe. Inert substances can include petroleum-derived solvents, preservatives or fragrances. In some cases these ingredients are irritating to the skin and respiratory system or can cause long-term adverse health effects such as neurological damage.

Irritant: An “irritant” is a substance that causes temporary inflammation, redness and often itching of the skin, eyes or lungs. Irritation can be caused by either physical damage or an allergic reaction. It can range from mild to severe, but by definition there is no permanent tissue damage, which is called “corrosion”.

Natural/Plant-based: On a cleaning product, the word “natural” can mean anything or nothing at all – there is no regulation of the word’s use. Some manufacturers use the term to mean that some or all of the ingredients come from plants or minerals rather than petroleum, but they rarely disclose how much or little of those ingredients is present. The term “natural” can

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mislead consumers to think that a product is safer or more environmentally friendly than it actually is. Always look at the ingredient list.

Non-toxic: This common marketing term implies that the ingredient or product will not harm human health or the environment. There is no standard definition in the cleaning products industry, so always look at the ingredient list.

Optical brightener: An optical brightener, found in some laundry detergents, makes fabrics appear brighter. It coats clothing in the washing machine and sticks to fabric even after rinsing. Optical brighteners can cause skin irritation. Some, like triazine-stilbenes, do not break down easily and can accumulate in the environment, where they can be toxic to aquatic life.

Organic: Organic implies that ingredients are from plants grown without use of synthetic fertilizers or pesticides, but only products bearing the U.S. Department of Agriculture's "Certified Organic" logo are legally bound to comply with that claim. Some manufacturers mislead consumers by using the term as a chemist would, to mean ingredients made mostly of carbon atoms (petroleum-based ingredients can fall in this category).

Pesticide: A pesticide prevents, kills or repels pests. Pesticides are added to cleaners to kill bacteria, viruses or fungi, such as mold.

Phosphate-Free: Phosphate ingredients, once common in laundry and dishwashing detergents, can trigger algae blooms when wastewater is discharged into rivers, lakes and the ocean, harming aquatic life. Few detergents now contain phosphate.

Sensitizing: A sensitizing ingredient can cause a dramatic immune system response, typically an allergic reaction such as hives and or an asthma attack. First-time exposure to a sensitizing substance frequently does not cause a reaction, but repeated exposure can trigger one.

Solvent: A solvent is a liquid that keeps other ingredients mixed in a solution. Solvents can also be used as specialized cleaners for tough soils and stains. Water, for example, is a non-toxic solvent, but many other solvents are flammable and release volatile organic compounds into the air. When inhaled, solvents can cause respiratory impairment, neurological damage, reproductive and developmental harm and cancer. Ventilation when using solvents can minimize inhalation. Spilling and disposing of solvents pollute the environment, so they must be disposed of as hazardous waste, not put down the drain.

Surfactant: Surfactants are chemicals that loosen dirt and grease from surfaces so that they can be washed away. They are essential for cleaning, but some are safer than others. Some, like nonylphenol ethoxylates, are toxic to aquatic life and decompose very slowly.

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Toxic: A toxic substance is any chemical or mixture that may be harmful to the environment or human health if inhaled, swallowed or absorbed through the skin. Many products used for home cleaning contain toxic substances.

Volatile organic compounds (VOCs): Volatile organic compounds (VOCs) is a broad term for substances emitted as gasses from other matter. Not all VOCs affect health, but some of these chemicals may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. Examples of products that emit VOCs include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions.

Instructor's note: many of the above terms were taken from the Environmental Working Group. Check out their web page on cleaning products for more information and ideas for safer cleaning: http://www.ewg.org/guides/cleaners/content/decoding_labels

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➤ Group Activity | *Fact or Fiction: Test Your Pollution Knowledge*

1. About 4,000 toxic chemicals are found in the air we breathe.⁷
2. Santa Clara has only one superfund site.
3. Gas leaf blowers put out more dirty pollutants than a pickup truck that drives 4,000 miles.⁸
4. About 44% of assessed stream miles, 64% of assessed lake acres, and 30% of assessed bay and estuarine square miles are not clean enough to support uses such as fishing and swimming.⁹
5. Each year 1.2 thousand gallons of untreated sewage, stormwater, and industrial waste are dumped into US water.
6. In a natural environment, 50% of the rain fall is absorbed in the ground, 40% is evaporated-transpired and 10% runs off; in an area of 75%-100% impervious surface (such as many urban areas) 15% of the water is absorbed in the ground, 30% is evaporated-transpired and 55% runs off.¹⁰
7. When you drive in bumper-to-bumper traffic, pollutants outside can seep into your car, making the air you breathe inside your car up to 10 times more polluted than typical city air.¹¹
8. The nutrients that cause algae to form in abundance in waterways is good for ecosystems because it is a natural source of food for fish and other aquatic life.

[Answers: 1. True 2. False. Santa Clara County is one of the most densely populated with a whopping 25 superfund sites in the county. 3. True 4. True. 5. False. That is 1.2 TRILLION gallons 6. True 7. True. 8. False. Algae forms an anaerobic environment, consuming oxygen in the ocean causing fish to die.]

⁷ Softpedia, accessed on 11/05/14 at <http://news.softpedia.com/news/About-4-000-Toxic-Chemicals-Are-Found-in-the-Air-We-Breathe-59802.shtml>.

⁸ KGW Portland, accessed on 10/16/14 at <http://www.kgw.com/lifestyle/health/Study-Gas-leaf-blowers-put-out-more-pollution-than-F-150-trucks-226825161.html>

⁹ Environmental Protection Agency, accessed on 11/01/14 at <http://water.epa.gov/aboutow/owow/waterqualityfacts.cfm>.

¹⁰ Environmental Protection Agency, accessed on 11/01/14 at <http://water.epa.gov/aboutow/owow/waterqualityfacts.cfm>.

¹¹ Conserve Energy Future, accessed on 10/06/14 at <http://www.conserve-energy-future.com/various-air-pollution-facts.php>

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Lesson 2: Clean and Green

Product use is a principle factor in exposure to chemicals and potential air and water pollution in schools. Sometimes facilities use cleaning products or other maintenance products that are toxic, or use a wide variety of specialized products that increases exposure to many different kinds of chemicals. Generally, choosing less toxic alternatives and limiting the number of products used in a facility is helpful for preventing pollution and maintaining a healthy environment in which to learn. The following activities will help students figure out for themselves which products are safe and which could be replaced with an alternative. They will also help students identify what the principle sources of air and water pollution are on their school site.

➤ **Action Activity** | *Decoding Labels on Cleaners*

Ask your custodian if you can borrow a box of cleaning products used on site or if you can peek into a utility closet. You can also bring in some cleaning products from home, or take a picture of the ingredient list to analyze in class. Divide into groups of 3 or 4 and give several cleaners to investigate (and hopefully some eco-friendly ones too). Using the definitions in Lesson 1, determine if each cleaner is “safe” to use and note down your findings.

Here are just some of the **NEGATIVE CHARACTERISTICS** to flag in a product:

1. Warning Labels: Danger, Caution, or Poisonous
2. Chemicals: Phosphorous, Petroleum, Sodium Hypochlorite, Dimethyl Ammonium Chloride, Alkyl
3. Aerosols
4. Concentrated cleaners (in spray cleaners)
5. Antibacterial Agents (especially triclosan)

Are there other negative characteristics to note?

What should you buy? Here are some **POSITIVE CHARACTERISTICS**.

1. Non-toxic or Low Toxic products
2. No VOCs
3. Biodegradable
4. Phosphate Free
5. Hazardous Air Pollutants Free (HAPs)
6. Ozone friendly

Are there other positive characteristics to note?

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Use the following table to help determine whether your school should keep the product or find an alternative:

Product name 1	
Purpose	
Label warnings	
Ingredients	(If you can't find any, write no ingredients listed.)
Is this product Safe to use? YES or NO	
Why or why not?	
Alternative needed? Suggest one!	(Use the resources listed above to identify an alternative product.)
Product name 2	
Purpose	
Label warnings	
Ingredients and instructions for use (e.g, dilute but it's in a spray bottle is confusing]	
Is this product Safe to use? YES or NO	
Why or why not?	
Alternative needed? Suggest one!	

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Which of the products you analyzed do you think your school should continue to use? Which should be discontinued? For those you think need to go, try to find an alternative product. State in your table above why you think the alternative you suggest will help prevent pollution and exposure to chemicals at your school. Here are a few resources to guide your search for green@school-approved products:

1. [Green Seal](http://www.greenseal.org/): <http://www.greenseal.org/>
2. [EPA's Design for Environment product database](http://www.epa.gov/dfe/): <http://www.epa.gov/dfe/>
3. [EcoLogo's product database](http://site.ul.com/global/eng/pages/offerings/businesses/environment/databasesearch/iframe/index.jsp):
<http://site.ul.com/global/eng/pages/offerings/businesses/environment/databasesearch/iframe/index.jsp>
4. Products rated at least **8.1** based on their health, environmental, and social performance on the "[GoodGuide](http://www.goodguide.com/)": <http://www.goodguide.com/>
5. [Environmental Working Group's "Hall of Shame"](http://www.ewg.org/cleaners/hallofshame/) (database of cleaners, their toxins, ingredients, and hidden facts): <http://www.ewg.org/cleaners/hallofshame/>

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➤ Action Activity | *Pollution Detectives*

Take a look at the Natural Resources Defense Council's **least wanted** list of AIR pollutants:

1. Diesel - in the emissions of older engines and construction trucks; made of 40 contaminants linked to cancer and asthma.
2. Formaldehyde - cancer-causing chemical used for a number of purposes, including the manufacturing of insulation, pesticides and disinfectants.
3. Benzene - Used in motor fuels, solvents, detergents, pesticides and many other substances, benzene is a carcinogen that causes leukemia as well as a number of other illnesses. Virtually the entire U.S. population is exposed to benzene in at least small amounts -- at gas stations (it's in the gasoline), in diesel exhaust or from cigarette smoke, including second-hand smoke.
4. Particulate Matter – These particles range in size from small visible particles to microscopic ones, and can be made up of numerous chemicals. Primary particles are larger and come from a direct source, such as construction sites, unpaved roads, fields, smokestacks or fires. Secondary particles are finer, and come from chemical reactions in the atmosphere from emissions originating from power plants, industries and automobiles.
5. Ground Level Ozone – High up in the stratosphere, ozone forms a protective layer blocking harmful ultraviolet rays from the sun; but when pollution causes excess ozone to form at the ground level, it can cause severe health problems. Ground-level ozone forms when nitrogen oxides and other pollutants emitted by cars, trucks, buses, coal-fired power plants and other fossil-fuel burners react with sunlight to form the principal ingredient in smog.

And The US Environmental Protection Agency named the **top three** WATER pollutants:

1. Dirt - Most of the dirt washing into lakes and streams comes from activities that remove trees and shrubs and leave the earth exposed. This exposed earth includes fields that have just been plowed, construction sites that have been bulldozed, and areas that have been logged or mined. Bare patches in your lawn or ballfield can also contribute to the problem. Some of the dirt polluting streams come from the stream banks. The water moves faster because the vegetation that would slow it down has been replaced with pavement and buildings.
2. Bacteria - The major sources of bacteria are combined sewers (which can overflow in a rainstorm and dump untreated sewage directly into our waters) and runoff of animal waste (including wild animal droppings!) from farmland and city streets.

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3. Nutrients - The two most common nutrients are nitrogen and phosphorus, which cause algae to grow and can turn the water green. The major sources of nutrients are runoff of fertilizers and animal waste from farms and cities (lawn fertilizers can wash away in heavy rain), sewage treatment plants, and failing septic systems. In the “State of the Air 2014” Report by the American Lung Association lists the top 10 most polluted cities in three categories. The report uses the most recent quality-assured air pollution data, collected by federal, state and local governments and tribes in 2010, 2011, and 2012. These data come from official monitors for the two most widespread types of pollution, ozone and particle pollution. The report grades counties, ranking cities and counties based on scores calculated by average number of unhealthy days (for ozone and for short-term particle pollution) and by annual averages (for year-round particle pollution).¹²

Now, in groups, with these pollutants in mind, walk around your classroom and outside on your school grounds with an eye for potential points of pollution. Appoint a member of each group to record your observations. Here are some tips to aid your investigation: Look in trash bins, look at the storm drains, think of the proximity of the road to your school, look at the ingredients on products like hand sanitizer or white board cleaner. Do you have a lot of automobile traffic during drop-off and pick-up? How often does the grass get cut or the leaves get blown? Do dogs frequent your campus after hours? Does the district use fertilizer and weed killer on campus? How much time do you spend outdoors? How many kids do you know who have allergies and/or asthma?

Name at least five ways your school site may be polluting air. For each, list an idea to prevent this pollution!

- 1.
- 2.
- 3.
- 4.
- 5.

¹²American Lung Association, accessed on 10/25/14 at <http://www.lung.org/press-room/press-releases/healthy-air/SOTA-2014-National-Press-Release.html>.

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Name at least five ways your school site may be polluting water. For each, list an idea to prevent this pollution!

- 1.
- 2.
- 3.
- 4.
- 5.

➤ Discussion Activity | Video: Water Pollution

This video discusses the aftermath of the Gulf Oil Spill where three years after the incident, oil is still there affecting ecosystems and economy. This video was created by students, the Monterey Bay Institute and the Marine Life Sanctuary:

<https://www.youtube.com/watch?v=SakDOUIDWDs>

1. Name the effects of the oil spill on the environment and the economy in the Gulf Region.
2. How do you think pollution in another part of the world affects you?
3. What are the ways we could be polluting water here at school?

➤ Discussion Activity | Video: Gas Leaf Blower

We have become accustomed to Leaf Blowers in our yards, on campus, near shopping centers, and other commercial buildings. The leaf blowers blow and contribute to an air space full of toxins, particulate matter, fecal matter and a host of other pollutants. Take a look at this video, read through the list of AIR pollutants and answer the questions:

<https://www.youtube.com/watch?v=naUEoKB0GWO>

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➤ Discussion Activity | Video: Air Pollution in the News

This video presents a broader view of the problem of air pollution. The map shows hot spots around the United States in summer and winter to illustrate how air pollution concentrates on certain areas in different seasons: <http://www.nbcnews.com/video/nightly-news/53309399#53309399>

Lesson 3: Promote Pollution Prevention at School!

This lesson aims to guide students through implementing pollution prevention measures on campus with ideas for starting their own pollution prevention campaign. Pollution Prevention, as we have seen, is closely linked to other green@school units, and a combined campaign could easily be formed among units.

Litter Pickup Contest: Students offer incentives to their fellow classmates on campus to pick up as much trash as possible and deliver it to a single station for weighing. The first, second, and third prizes could be gift cards to their favorite, sustainable, local business. Trash bags and gloves are needed as materials.

Bike Map Posting: Students can post bike maps on campus to inform students of various biking routes options. The maps encourage students to bike to school.


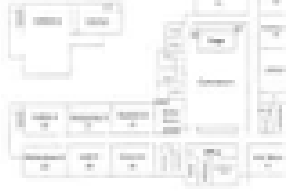

Bike Buddy/Walking Buddy Match-Up: Students can devise a match up event or service so that students can find a friend to walk or bike to school with, encouraging alternative school transportation and providing safety in numbers.

Replace hand soap and/or classroom hand sanitizer: To change district purchased hand soap to an environmentally preferable product, students will need to persuade their district administrators through memos, presentations, and hard evidence. Students are an influential force for district administrators. Run a petition signing lunch period and gather your student body behind your cause.

Unit 4: Pollution Prevention

Materials Needed

To complete various activities in the Unit 4 lesson plan, you will need some tools and materials:

Tool	Picture	Description	Where you can get it
Trash bags		Trash bags can be used as part of the litter pickup campaigns and also to collect trash near storm drains.	Your custodian or teacher may be able to spare a few.
Blank campus maps		This will be useful for keeping track of dumpster locations, storm drains, and hazardous waste sites on campus.	Ask your school administration for a blank map.
Sample Cleaners and products		Ask your janitor if you can take pictures of the labels of all the cleaners used on campus. This will be useful when determining the pollution levels for each cleaner used on your campus.	Ask your janitor for access to the cleaners.